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Quality Assurance in Medical Laboratories in Developing Countries: Assessment of Pre-Analytical Errors in a Chemical Pathology Laboratory in a Tertiary Hospital in Nigeria

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Abstract
BACKGROUND: The total testing process is made up of the pre-analytical, analytical and post analytical phases. Most of the non-conformities to laid down laboratory procedures are known to be at the pre-analytical phase, amounting to about 70% of errors in the total testing phase. Most laboratories, in instituting total quality assurance, concentrate mainly on the analytical phase and the post analytical phase. The ISO, in a bid to correcting this oversight introduced a modifiable quality indicator system which monitors laid down processes and procedures of the laboratories. AIM- This study was therefore designed to assess the pre-analytical phase of the testing process in a Chemical Pathology laboratory of a teaching hospital in southern Nigeria. METHODS- The ISO quality indicators were modified to suit the standard operations of the Preanalytical phase of the said laboratory. With the help of a questionnaire, non-conformities to these laid- down procedures were assessed. Defects per million (DPM) of each indicator were calculated and a sigma value assigned as the performance level. A sigma value below 3 was seen as unacceptable performance and that between 3 and 4 was seen as acceptable performance. Lastly a sigma value above 4 indicated good performance. RESULT- A total of 17 quality indicators were used to assess the pre-analytical phase and 12 (70.6%) had unacceptable performance levels while 2 (11.8%) had acceptable performance levels. Only 3(17.6%) of these indicators had good performance levels. CONCLUSION- A holistic look at the performance of the quality indicators of the pre-analytical phase in this study showed that about 71% of the pre-analytical quality indicators assessed had unacceptable performance levels; 12% had acceptable performance level and only 18% had good performance level. This grossly indicates very poor quality pre-analytical sample acquisition and processing procedures. Steps therefore need to be taken to rectify these errors.

Keywords: Pre-Analytical Phase, Quality Assurance, Quality Indicators (QIs), Total Testing Process, International Organization for Standardization (ISO), Defect Per Million (DPM)

INTRODUCTION

Laboratory results play an important role in diagnosis and treatment of patients (Kalra & Kopargaonkar, 2016). A quality result depends on a lot of factors which includes all the processes and procedures from the time of test ordering by the physician to the time the sample is analyzed and the results forwarded to the end users. Each of these processes is subject to nonconformities/errors and reducing these nonconformities/errors at every stage of the testing process will cumulatively produce or guarantee a trustworthy result.

Studies have shown that 70% of errors in the total laboratory testing processes occur at the pre- analytical phase (Salinas et al, 2011) which includes test ordering, completing/filling the order form, patient preparation, selection of site and site preparation. Others include method of tourniquet application/ venipuncture technique, correct order of draw, collection of adequate volume of blood into the right anticoagulant container or collection of adequate volume of blood into the wrong anticoagulant tubes, proper technique of mixing blood with anticoagulant and so on. Lastly, the transportation, centrifugation and handling of specimens, if correctly carried out, will guarantee high quality results (Singh, Meyer, & Thomas, 2014).

Laboratory errors are divided into pre-analytical, analytical and post analytical errors (Lima-Oliveira, et al. 2017). Most times the analytical and post analytical phases are what pathologists, scientists and accreditation bodies concentrate on. This has led to laboratories overlooking the pre-analytical errors and processes when preparing for accreditation. The introduction of pre analytical quality indicators by the international organization for standardization (ISO) has helped laboratories to identify and assess the nonconformities to the processes in relation to specifications described in the standard operation procedures/ literatures (Lima-Oliveira, et al. 2017). The ISO quality indicators which are generally accepted as the basis for the assessment of the pre analytical phase of the total testing process has the capacity for modification, based on individual laboratory practice (Da Rin. 2009 & Plebani, et al. 2014). To this effect, any laboratory can modify the ISO pre-analytical quality indicators to monitor the nonconformities to the pre-analytical processes of that laboratory. A laboratory form should contain information that identify the patient (biodata), the doctor requesting the test, the type of specimen, the storage time of specimen (time specimen was collected to time it was analyzed), brief details of patient illness and the type of treatment carried out (Simundic, et al. 2014). This information, apart from helping in identifying the doctor requesting test, the patient and patient sample, will also help with the right interpretation of results (Fraser & Fogarty.1989) his study was therefore designed to assess the pre-analytical testing processes of all requests sent to the Chemical Pathology laboratory of a tertiary hospital in Nigeria for a period of one month.

METHODS

The selection of the pre-analytical quality indicators is to a reasonable extent based on the pre-analytical variables and the processes that drive them. These processes are all subject to Nonconformities (NC) in the physician's requisitions, patient's preparation, sample collection and tests registrations and these were then evaluated during the quality checking process.

The ISO 15189: 2012 standards for laboratory accreditation recognize the need to evaluate and improve the processes in the pre analytical phase of the Total Testing Process (Barth, 2011). To this effect, the processes of the Preanalytical phase of the total testing processes were assessed as quality indicators by critically evaluating non-conformities to each process. This was done using the standard ISO pre analytical quality indicators, which were modified to suit the modus operandi of the said laboratory for this study. A questionnaire was designed to assess the nonconformities in the Preanalytical processes using the right process as an indicator of such process. Another questionnaire was also designed to get information from patient or patient relatives as well as from managing physicians.

The modified ISO pre analytical quality indicators used for this study were as follows:

Number of requests without clinical questions
Clinical questions for this study meant request with properly filled provisional diagnosis and clinical details. Studies have shown that failure to order appropriate diagnostic tests accounted for 55% of observed breakdowns in missed and delayed diagnosis in the ambulatory setting (Barth, 2011)

Errors concerning input (selection) of test (Added)
For this, requests with more than one investigation or panel of investigations were cross checked against the clinical details and provisional diagnosis to see how appropriate the request were.

Number of inappropriate tests
To assess this, the provisional diagnosis, clinical details and investigations requested were evaluated to see if they helped to make diagnosis or evaluate treatment.

Number of requests without physician identification
Physician's identification: the names and signature of the consultant in charge and the doctor that filled the form must be provided. All forms without the names and signature of both the consultant and the doctor will be regarded as without physician's identification.

Number of unintelligible requests
For the number of unintelligible requests, all vital information given on the request form will be assessed for clarity. That is, filled forms that cannot be read or understood due to lack of clarity of hand writing was regarded as unintelligible.

Requests with errors concerning patient identification
Errors of patient identification for this study will include: Patient surname, other names, age, sex, hospital number, nationality and race, eligibly and correctly written. Any of the above not properly stated or missed meant patient not properly identified.

Samples lost or not received
This was difficult to assess in this study since the hospital is yet to be computerized and so samples are brought in together with patient's request form, meaning that samples received are assumed as samples requested. So this part was not evaluated in this study.

Samples collected into inappropriate containers
Samples not collected into appropriate containers for this study will mean checking the type of test and the container into which sample was kept. Specimen bottles contain specific anticoagulants with different mechanisms of actions which may affect or interfere significantly with the result/ value**.** The sample is expected to be collected into the right container based on type of test. The right container in this study means container with anticoagulant which has not expired or cannot affect the accuracy of the result.

Samples haemolysed /clotted.
A visual analysis of sample for haemolysis and clotting or samples rejected due to haemolysis or clotting before analysis was used for this category.

Sample with insufficient volume
All of the containers with anticoagulant have a line indicating the minimum volume of sample needed. Any volume below the minimum sample line was deemed insufficient for this study.

Samples damaged in transport
For this study, since all samples are transported to the laboratory by hand, those that were spilled or were allowed to stay for over 24 hours unseparated, judging from the time of collection to the time it got to the laboratory, or samples brought in a lysed state, were all seen as damaged.

Samples improperly labeled

Most specimen containers have provision for patients name, hospital number, date/time sample was collected and type of test requested. This was evaluated and compared with the information on the forms. Any specimen container not properly filled or had any discrepancy with the information on the request form was assessed as not properly labeled.

Samples not transported and stored under special conditions

For this category, samples that needed special handling for both transportation and storage were assessed. Samples for blood gas analysis are expected to be transported in ice, while bilirubin and certain vitamins are to be transported protected from light. Any samples for these assays not transported and stored correctly as above where noted under this category.

Sample not transported to the laboratory on time

In assessing this, the time sample was collected to the time it arrived the laboratory should not have been more than six hours, judging from our expected turnaround time. This is because most samples are kept and transported at room temperature in our setting. These samples are mainly blood (whole blood, serum and plasma). Others include urine, cerebrospinal fluid, ascites fluid, plural fluid, sweat and stones. Since blood make up about 80% of all samples brought to our laboratory, its shelf life was a determining factor for this indicator. Whole blood is believed to be stable at room temperature for about 24 hours (Eijsden, et al. 2004). This fact and the expected laboratory turnaround time informed our decision. Therefore for this study samples were expected to arrive at the laboratory at most 6 hours from time of collection.

Samples not analyzed on time.

Most samples received in the laboratory go through a process before they are analyzed: given a laboratory number, centrifuged to separate plasma which is aliquoted and sent to various benches for analysis. Considering our expected turnaround time, samples are expected to be analyzed at most six hours after it gets to the laboratory. Any sample found to exceed this time was noted as a non-conformity, using this indicator.

Samples with inappropriate request from

Frequently, our laboratory runs short of request forms, so requests are made on plain papers with scanty information about the patient, such as patient's name and test required. This makes proper patient identification and result interpretation very difficult as vital information that will aid interpretation may be absent. Samples brought to the laboratory without the proper forms were therefore noted as non-conformity.

Samples without physician's phone number

Results with critical values need urgent attention or intervention of the managing clinician and this is made easy through phone calls. Our laboratory forms have provision for the phone numbers of the requesting clinician, which expectedly should be filled. This makes communication between the laboratory physician and the clinician a lot easier, such as seeking clarification or more information on the request form. Request forms without the physicians' phone number are noted as non-conformity.

Data Analysis

The percentage error for each pre-analytical quality indicator was calculated. Defect per million (DPM) was calculated for each indicator using the formula below[11].

$$\text{DPM} = \frac{\text{No of Errors x 1 Million}}{\text{Total number of request}}$$

The performance of each indicator was evaluated by locating the DPM value on the sigma scale for the performance level: [11, 12]

Good	> 4.0 sigma
Acceptable	3.0 – 4.0
Unacceptable	<3.0

RESULT

The data collected was analyzed using the Epi info version 7 at a 95% confidence limits and a p-value of less than 0.05 was considered significant.

A total of 1450 request forms were analyzed using a questionnaire that assesses the processes. Out of these, about 1214 (83.72%) had no clinical details. The request forms with inappropriate test requisitions with respect to clinical questions were 508(35.03%), with majority coming from the outpatient clinics. About 1089(75.10%) requests were without time of sample collection and 119(8.21%) requests were unintelligible. Requests that were not truly urgent were 363 out of 465 marked urgent and 1163(80.21%) requests had errors concerning patient's identity. The number of requests with errors concerning physician's identity was 499 (34.4%), and those without physician's phone numbers were 1019 (70.3%). A total of 18(1.3%) samples were collected into inappropriate containers while 5(0.4%) and 12(0.86%) samples were haemolysed and clotted, respectively. Samples transported to the laboratory with blood stains on containers due to leakage or method of blood collection were 346(23.86%) and those damaged in transit were 51(3.52%). A total of 1188(81.93%) samples were brought in containers not properly labeled. Special samples that were not transported or stored under special conditions when they should were 282(19.45%) but represented about 100% of such samples. Samples that were not transported to the laboratory on time were 51(3.52%) while 625 samples were brought to the laboratory with inappropriate request forms. Samples containers with inadequate sample volume (this alters the blood anticoagulant ratio) were 324(22.34%). Samples not transported in time were 331(22.83%).

The differences in the inpatient and outpatient data were statistically significant for the following indicators: Appropriate test with respect to clinical question, requests that were truly urgent, requests with errors concerning patient identity, physician's identity and phone number. The remaining indicators were all also statistically significant except for samples with inappropriate request forms, improperly labeled, without time of collection and inadequate volume.

Defect per million (DPM) was calculated for every indicator and the sigma value determined was used to assess the level of performance of each indicators.(Table 3) Sigma values above 4 were taken as good performance levels while those between 3 and 4 were regarded as average performance. A sigma value below 3 was interpreted as unacceptable performance level (Martins, Rateke & Martinello. 2018 & Giménez-Marín, 2014) All the indicators had unacceptable performance levels, except for samples in inappropriate containers and those damaged in transport, which had an average performance level and samples haemolysed and those clotted which had good performance.

Indicators that had unacceptable performance level for the overall data but average performance for the outpatients were 'appropriate test with respect to clinical questions' and 'unintelligible request forms'. All others had unacceptable performance except for samples haemolysed and samples clotted, which had good performance levels, while samples collected into inappropriate containers and those damaged in transit had average performance.

Indicators that had acceptable performance level for inpatient, out-patient and the overall data include: age, laboratory number, provisional diagnosis, and sample damaged during transportation. Sample haemolysed had a good performance value for the overall data, in-patient and out-patient data while 'samples clotted' had good performance for only the in-patients and the overall data while the out-patients had a minimal performance level.

Table 1: Quality indicators and Percentage of Nonconformities

Variable	Yes		No
	Frequency (n)	Percent (%)	
Inappropriate test (with respect to clinical question)	508	35.03	
Requests without time sample was collected	1089	75.10	
	119	8.21	

Unintelligible requests		
Request that are not truly urgent	394	98.5
Requests with errors concerning patient identification	1163	80.21
Requests with errors concerning physician identification	499	34.41
Request without physician's number	1019	70.28
Samples collected into inappropriate containers	18	1.24
Samples haemolyzed	5	0.34
Sample clotted	12	0.83
Sample with blood stain on container (leakages)	346	23.86
Samples damaged in transport	51	3.52
Samples improperly labeled	1188	81.93
Samples not transported and stored under special conditions	282	19.45
Sample not transported in time	331	22.82
Sample with inappropriate request form	625	43.10
Sample with inadequate volume	324	22.34

Table 2: Sigma scores of performance of quality Indicators

	IN-PATIENT sigma value	**interpretation**	**OUT-PATIENT sigma value**	**interpretation**	**ALL PATIENT sigma value**	**interpretation**
Appropriate test (with respect to clinical question)	2σ	Unacceptable	3σ	Minimal	2σ	Unacceptable
Requests without time sample was collected	2σ	Unacceptable	2σ	Unacceptable	2σ	Unacceptable
Unintelligible requests	4σ	Good	4σ	Good	4σ	Good
Request that are truly urgent	2σ	Unacceptable	2σ	Unacceptable	2σ	Unacceptable
Requests with errors concerning patient identification	2σ	Unacceptable	2σ	Unacceptable	2σ	Unacceptable
Requests with errors concerning physician identification	2σ	Unacceptable	2σ	Unacceptable	2σ	Unacceptable
Request without physician's number	2σ	Unacceptable	2σ	Unacceptable	2σ	Unacceptable
Samples collected into inappropriate containers	4σ	Good	3σ	Acceptable	3σ	Acceptable
Samples haemolyzed	4σ	Good	4σ	Good	4σ	Good
Sample clotted	4σ	Good	3σ	Acceptable	4σ	Good

Sample with blood stain on container (leakages)	3σ	acceptable	3σ	acceptable	3σ	Acceptable
Samples damaged in transits	3σ	acceptable	3σ	acceptable	3σ	Acceptable
Samples improperly labeled	2σ	Unacceptable	2σ	Unacceptable	2σ	Unacceptable
Samples not transported and stored under special conditions	2σ	Unacceptable	2σ	Unacceptable	2σ	Unacceptable
Sample not transported in time	2σ	Unacceptable	2σ	Unacceptable	2σ	Unacceptable
Sample with inappropriate request form	2σ	Unacceptable	2σ	Unacceptable	2σ	Unacceptable
Sample with inadequate volume	3σ	acceptable	3σ	acceptable	3σ	Acceptable

Table 3: RANKING OF NON CONFORMITIES (first ten)

1-Samples not transported under special condition	100%
2-Request that are not truly urgent	98.5%
3-Samples improperly labelled	81.93%
4-Requests with errors concerning patient identification	80.21%
5-Requests without time sample was collected	75.10%
6-Requests without physicians' phone number	70.28%
7-Samples with inappropriate request forms	43.10%
8- Inappropriate tests with respect to clinical question	35.03%
9- Errors concerning physicians' identification	34.41%
10- Samples with blood stain on containers	23.86%
11- Sample not transported in time	22.82%
12- Sample with inadequate volume	22.34%
13- Unintelligible requests	08.21%
14- Sample damaged in transport.	03.52%
15- Samples collected into in appropriate containers	01.24%
16- Samples clotted	00.83%
17- Samples hemolysed	00.34%

DISCUSSION

The ISO pre-analytical quality indicators as modified and used in this study, has afforded us the opportunity to assess the pre-analytical phase of the total testing process in this tertiary institution for the first time. For this study, the indicators assessed proper patient, sample and physician's identification and the quality of samples. Samples and samples that put all that have contact with them at risk were also assessed. Lastly the indicators that assess the inter phase between the laboratory and the clinicians were also evaluated.

Patient's identification

This indicator had unacceptable performance level as all the requests had patients name on them but had various degree of incomplete information on hospital number, sex, age and clinical details of patients. Most had no hospital number; 'adult' was filled in place of the real age and no clinical information on the patient's illness. These factors put together usually give more detailed and clearer information about the patients and aids the interpretation of generated results. A properly interpreted result comes with detailed information on patient identity and illness which cannot be over looked. The lack of this information on the request forms could be due to lack of understanding of the importance of these information for the proper interpretation of the results by laboratory physicians or the lack of will to do just that by the clinicians who filled the forms, judging from how easy this information could be sought and recorded.

Physicians' identification.

This indicator also had an unacceptable performance level as most of the request forms were not properly filled. Some of those that were filled had only the Physician's first or last name. This omission makes it difficult to communicate with the managing physician. This was made worse by the fact that requests without physician's phone number also had an unacceptable performance level. Most doctors didn't write their phone numbers on the request forms. The increase in kidnapping of doctors in this region of late may have contributed to this. The poor performance of this indicator was worrisome as easy communication between cliniciacsns and laboratory physicians is very necessary, especially when dealing with some critical values of analytes.

Sample identification

Sample not properly labeled also had an unacceptable performance level. Many samples were sent with only the patient's first or last name on the container as the means of identification. Very few samples had patient's full name, date, time of sample collection and type of test requested on their containers. Most samples were brought to the laboratory with plain papers as request forms, due to unavailability of proper request forms. Others were brought in with request forms other than the appropriate one (chemical pathology) with only patient's first or last names. This can make identification of samples with same first name, last name or even the same full names difficult to identify especially if they come with ordinary plain papers. The poor performance level of these indicators mean that much needs to be done in training and retraining of staff/clinicians on the importance of properly filling request forms as well as the need to improve laboratory management to reduce or eliminate the 'out of stock syndrome', as was noticed to be the case within the period of this study.

Appropriate tests with respect to the clinical questions had a performance level that was unacceptable. Requests devoid of necessary information and those with information that could not be read made sample, patient and physician's identification, as well as result interpretation, difficult. The need for detailed information on laboratory request forms is important but more important is information that can be read. To this effect, though unintelligible requests performed well, the number of request that were unintelligible raises questions about patient, physicians and sample identification, as well as having enough information for proper interpretation of generated results.

Sample quality

Indicators assessing sample quality were seven (7) and their performance ranged from unacceptable, to acceptable and to good performance. Indicators like 'samples collected into inappropriate containers' 'number of samples that haemolyzed or clotted' and those that were 'damaged on transit' had good performance levels. Those indicators like 'samples transported in time' were difficult to assess as time of sample collection was most of the time not given. For the purpose of this study, these indicators were ticked in the negative to avoid assumptions on unavailable information. The mean estimated interval between sample collection time and time sample gets to the laboratory (according to the standard operating procedure of the laboratory) was six (6) hours. Therefore this indicator had an unacceptable performance level as exact time could not be ascertained.

Indicators like 'sample brought in haemolyzed or clotted' had good performance but action need to be taken to further reduce the number of such samples. Most of such samples were brought in by the patients or patients' relative, who most times brought these samples to the laboratory on their way home or whenever the finance was made available for payment. These samples, most times, are kept at room temperature and sent later same day or even next day. The good but worrisome performance of these indicators may also be due to lack of understanding of the need for early transportation of such samples to the laboratory.

'Samples not transported and stored under special conditions' had unacceptable performance as all bilirubin samples were brought in exposed to light. Only 282 samples fell under this category but this represented a hundred percent (100%) of such samples. These samples were separated and left standing even in the laboratory and uncovered for various lengths of time before they were assayed. This may have affected the quality of results, as the ratio of conjugated to non- conjugated bilirubin may have been significantly altered.

Some samples were brought with 'inadequate volume' and this may also affect the quality of the sample as the alteration of blood anticoagulant ratio may result to lysing of blood cells, thereby falsely increasing intracellular analytes in plasma. Most of such samples were observed to come from the Pediatrics' unit. Though most of these indicators assessing sample quality had good and acceptable performance levels, a holistic look at the entire indicators assessing the quality of samples was not too encouraging. This is because samples don't necessarily have to be clotted, haemolysed or be transported to the laboratory in inappropriate anticoagulant tubes to be deemed unfit for analysis. Quality of a sample can also be compromised when the volume in an anticoagulant tube is inadequate or the sample is left standing without separation for too long at room temperature or when not properly stored.

Safety

Some samples were sent to the laboratory with blood stains on containers due to either leaks or poor methods of sample collection and some even had blood stains on the request forms as well. It was observed that those from the wards and clinics were mainly due to leaks from improperly covered blood container caps. Those from the Pediatric unit may have been mainly due to the method of sample collection, as capillary blood may have been preferably collected by scooping oozing blood from skin due to difficulty in getting venous blood. This poses danger to all staff that come in contact with such stained blood containers and request forms. Though this had a good performance level, the health risk it poses calls for urgent need for training and re-training of all staff concerned in order to further minimize it occurrence.

Others

A total of 201 requests were marked 'urgent' but only 98 of these were found to be truly urgent. In evaluating the level of performance of this indicator, it was found to give an unacceptable performance.

Due to the frequent out-of-stock syndrome, some samples were transported to the laboratory with inappropriate request forms such as plain papers, with only patient's name, sometimes hospital number and occasionally type of test. This means that other necessary information was not given, making identification of patients, physicians and samples more difficult. Information needed to help in the interpretation of results was, in these cases, absent.

In this study it was noted that most of the indicators that had overall unacceptable performance levels, also had acceptable performance levels for the outpatient data. This could have been due to the fact that most of the request forms from the wards were filled by House Officers, while most of those from the clinics were filled by the senior doctors such as Registrars, senior registrars and Consultants.

Many of the pre-analytical indicators in this study had poor performance levels and judging by the saying 'garbage in garbage out' the results indicated that much needs to be done to ensure that samples taken from a rightly identified and prepared patient is rightly analyzed to produce the right result that will be rightly interpreted, based on rightly given information.

From the results of this study it is noted from the performance of these indicators that the pre-analytical stage of the total testing process in this hospital is currently encumbered with many errors. This calls for training and retraining of staff concerned and the need for regular communication between clinicians and laboratory staff in order to reduce this errors. Other studies have also affirmed these findings as more than half of the pre-analytical quality indicators in these studies were also noted to have unacceptable performance levels as was seen in this study (Plebani, Chiozza & Sciacovelli. 2013 & Englezopoulou, et al. 2016)

When the non-conformities to the laid down process were ranked in this study (Table 3) 'samples not transported under special conditions' was the leading non-conformity. Samples not transported under special condition was 100%. This was worrisome as results produced from this category of samples may not be reliable. This emphasizes the need for urgent intervention measures. This was followed by 'requests that are not truly urgent' which was second on the list with 98.5% frequency. Though this may not necessarily affect the outcome of the results, it is an indication of abuse of the process as the processing of such sample are usually prioritized over other samples. Most of these requests marked urgent were however left for days uncollected. A follow up of

such results by laboratory staff only showed that patients for which such results were meant for were stable in the ward. Sometimes such requests were sent on the day of patients discharge. Some of these urgent requests were made for even stable and mobile out-patients.

The Third most frequent non-conformity was, 'samples improperly labeled' which had 81.93%. This was a large percentage which meant that proper identification of samples was a major challenge. Similarly 'requests with errors concerning patient identity' was next with 80.21% followed by 'requests without time sample was collected'. Requests without Physician telephone number was 70.28%.

The performance of indicators that help in the identification of patients, samples and physicians all performed badly as most of them had more than 50% frequency. This made these indicators, and especially the others in the top five, the indicators of urgent attention. Though the other indicators on the non-conformity list had a frequency below 50%, the frequency alone may not necessarily be the only index for urgency of intervention. The effect of the indicator on the quality of samples and interpretation of the results also make them vital for urgent intervention, irrespective of their frequency. 'Samples with blood stains on container' (23.86%), 'samples not transported in time' (22.34%), 'sample with unintelligible requests' (8.21%) and those 'damaged in transport' (3.52%). They all affect the quality of samples. 'Samples collected into inappropriate container' had a frequency of 1.24%. Though this may appear low in frequency but it may have serious impact on the quality of the results.

Least on the list of non-conformities were 'sample clotted' (0.83%) and 'sample heamolysed'(0.34%). These were indicators worthy of note, as they affect the quality of samples and by extension, the quality of results/laboratory quality assurance. The poor performance of sample, physician and patient identification quality indicators are red flags for any laboratory and should be taken seriously.

From the result of this study, it could be advocated that similar studies be conducted in all major hospitals and where the pre-analytical quality indicators are found to have such poor performance levels, the Management of such hospitals and laboratories should be encouraged to introduce policies that will ensure that all House Officers and other involved staff undergo the needed training on the importance of proper filling of request forms, patient preparation and sample collection during their pre-engagement orientation exercise and periodically thereafter. The introduction of some form of a reward and penalty system may further encourage compliance with the right processes.

Conclusion

The results obtained from this study have shown that much needs to be done to improve the quality of samples sent for laboratory analysis. Results obtained from poor quality samples would be misleading as it would invalidate all the quality assurance processes put in place at both the analytical and post analytical phases (Garbage in garbage out). The use of quality control samples/measures, the regular calibration and recalibration of machines and proper interpretation of results will all be fruitless when poor quality samples are processed (garbage in garbage out). Most laboratories and accreditation bodies focus on the analytical and post analytical phase of the error control processes even though 70% of laboratory errors occur in the pre-analytical phase[3]. The pre analytical quality indicators holistically performed poorly in this study and this further affirmed the above fact. The poor performance of most of the pre-analytical indicators in this study is worrisome. Much therefore needs to be done to improve the quality of samples sent to clinical laboratories and this should be the first step and a very significant step in laboratory quality assurance.

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Carotid Paragangliomas: Report of 3 Cases and Review of the Literature

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Abstract
Introduction: Carotid Paraganliomas (CP) are relatively rare tumors and usually benign. They appear as a cervical mass of slow and painless evolution, which is often responsible for diagnostic and management delays. Surgery remains the recommended treatment, although there is a risk of neurological and vascular sacrifice for large tumors. The objective of this study is to report our experience and to review the literature on the clinical features, positive diagnosis and management of CP. Methods: It is about a retrospective study of 3 patients with CP who had undergone a surgical resection as a treatment of CP over a period of 5 years from 2013 to 2017. Results: The study concerns 3 female patients without any significant family history. The mean age was 63 years. The tumor has evolved on average 13 years before its diagnosis. The patients were admitted for a firm and incompressible lateral cervical mass on the right side in 2 cases and on the leftside in one case. The surgical treatment consisted on a total resection of the tumor in all cases with a vascular graft interposition in one case. A sacrificed of hypoglossal nerve was required in another case. Pathological examinations of the 3 tumors revealed a benign histology of paragangliomas. The follow-up was simple in 2 cases while one patient presented a transient peripheral facial paralysis. Conclusion: The diagnosis of CP should be evoked towards any firm and painless lateral cervical mass having evolved for several years. Surgical treatment is curative for benign lesions, despite its risks especially in advanced tumors.

Keywords: Carotid Paraganlioma, Surgical Treatment, Preoperative Embolization, Rare Case Report

INTRODUCTION

Paragangliomas are extra-adrenal tumors derived from the chain of neuroectodermal tissue, occurring from the skull base to the pelvic floor. In the head and neck region, they are found at the jugular bulb, the vagal and tympanic nerves and the aortic glomus. Carotid paraganglioma (CP), commonly known as carotid body tumor is the most frequent parasympathetic form. The majority of these tumors are benign but 2% to 13% of patients may have malignant lesions with metastases that could interest regional lymph nodes, lungs and even bones (1). The history of the disease and the clinical examination are essential to be determined for the diagnosis of these tumors.Because of the topography and the hypervascular character of these tumors, a radiological exploration remains a necessary. Indeed, ultrasound, CT-scan and MRI are crucial imaging tools as they can confirm the diagnosis of CP and eliminate other etiologies of cervical mass (2-4). Different therapeutic approaches are described in the literature,surgery consists the main curative approach. Through three cases report of CP and a

recent extensive review of literature, clinical presentations, imaging tools and therapeutic modalities being used in this pathology are presented and discussed.

PATIENTS AND METHOD

It is a retrospective study conducted within the department of vascular surgery of Mohammed VI University Hospital Center. It concerns three cases of CPthat had been hospitalized over a period of 5 years from 2013 to 2017.

1st Case

A-73-year woman presented to our department with a palpable right lateral cervical mass. She had a cholecystectomy as personal antecedent without family history of tumors. The onset of the symptomatology dates back to 11 years before her admission, with the occurrence of a right lateral cervical mass gradually increasing in volume, accompanied by intermittent pains without other associated signs. Physical examination revealed a mass that located below the right mandibular angle measuring 5 cm in its great axis. The mass was mobile laterally, firm, incompressible and pulsatile without any inflammatory signs. The rest of the somatic examination was normal.

The ultrasonography demonstrated a solid mass in contact with the right parotid gland. The tumefaction was taking the aspect of a homogeneous hypoechoic tissue, well limited and hypervascularized, measuring 6 x 4,9 x 3 cm. The mass was located within the carotid bifurcation causing a splaying of the carotid bifurcation.The angio-CT scan showed a right lateral cervical mass, centered at the level of the carotid bifurcation, with a tissue density. The mass was intensely and heterogeneously enhanced after injection of the contrast product with a repressing of the right jugular vein without any sign of invasion. Its measurements were 3,8 cm (anteroposterior diameter), 3,7cm (transverse diameter) and 5,6 cm (height). The therapeutic management consisted on surgical treatment of the carotid paraganglioma. A total resection of the tumor, without sacrificing the carotid axes has been practiced. The post-operative follow-ups were simple. The histological result of the resection piece reveals a benign tumor.

2nd Case

A 58-year-old woman was admitted in our department for the management of a painless, palpable mass in the right side of the neck. No family history was reported in the anamnesis. The beginning of the symptomatology goes back to 19 years by the apparition of a lateral cervical mass, gradually increasing in volume, without associated signs. Physical examination revealed a mass located below the mandible angle. The mass was mobile, firm, incompressible and without any inflammatory signs.Ultrasonography showed a homogeneous tissue lesion. The tumor was centered on the right carotid bifurcation, hypervascularized and fed by arterial branches of the external carotid artery. The CT-scan showed a homogeneous mass that measures 5,6 x 4,3 x 3,7 cm. The mass appears well delimited respecting the adjacent structures and without cervical lymphadenopathy.

A preoperative embolization was performed 24 hours before the surgery. Surgical exploration found a mass invading both internal and external carotid arteries. After releasing the hypoglossal nerve, a total resection of the tumor was performed and vascular graft interposition was performed between the common carotid artery and the distal internal carotid artery with inverted saphenous vein. The external carotid has been ligated and resected with the tumor. The postoperative follow-ups were simples, without any need for transfusion. The histological result of the resected mass was found benign.

3rd Case

A 71-year-old woman with a coronary artery disease, under oral anticoagulation, was admitted for the management of a left neck swelling. The tumefaction appeared 10 years before her admission in our department. The Physical examination had found a firm, incompressible and fixed mass. It extends upwards to the mastoid

bone.The Cervical CT-scan showed a hypervascular tumor being developed on the carotid body in favor of a carotid paraganglioma. Measuring 45 mm in its major axis.

As a received treatment, a surgical procedure revealed a huge tumor towards the carotid bifurcation extending superiorly into the mastoid bone. The mass was adherent to the hypoglossal nerve, and, hence, it had to be sacrificed. The facial nerve was dissected and spread by a soft instrument. A complete resection of the tumor was performed leading to a wound of the internal carotid artery, that was repaired by 7/0 Prolene thread.We noted, as an immediate follow-up, a peripheral facial paralysis with a positive Charles Bell's sign. This complication was successfully treated by oral corticotherapy (5 days).The Pathological examination of the tumor did not show any signs of malignancy. The evolution was favorable after 3 months of follow-up.

The radiological aspect of CP at the CT-scan:

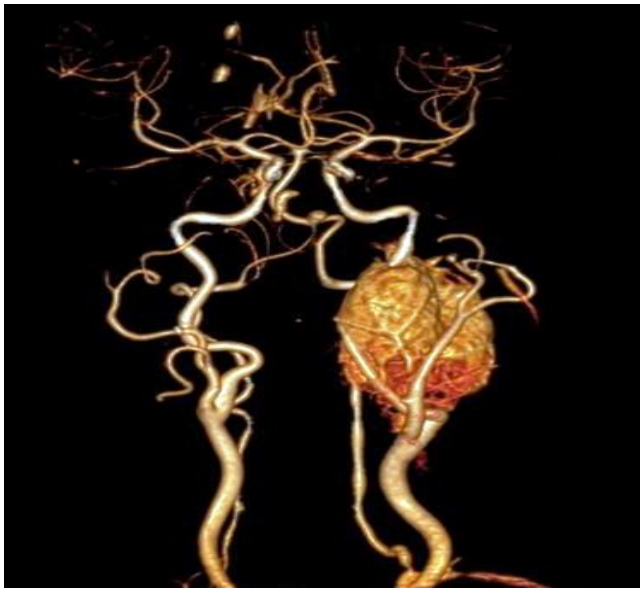

Figure 1: CT-scan with frontal and 3D view:Hypervascularized mass sitting at the left carotid bifurcation and extended upwards

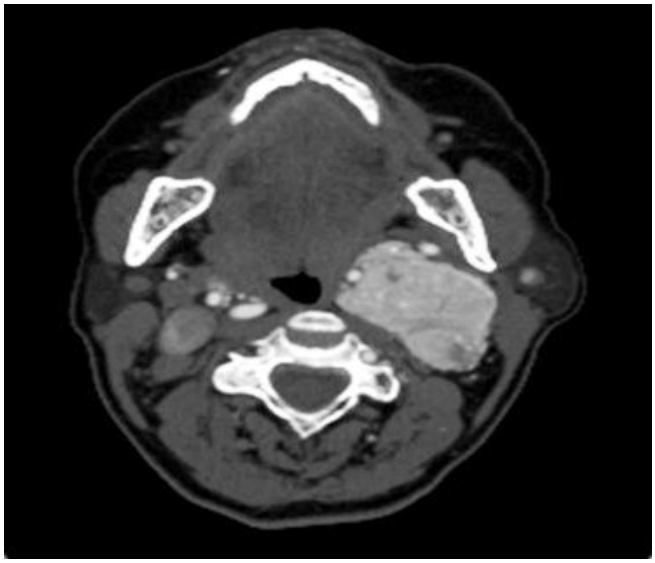

Figure 2: axial CT-scan: A cervical mass separating the internal and external carotid arteries at the level of the bifurcation. The mass presents an intense homogeneous enhancement after intravenous administration of contrast.

The aspect of CP at the arteriography:

Figure 3: Arteriography that shows the characteristic appearance of carotid bifurcation due to CP (Classic image in lyre)

Figure 4: Arteriography revealing the hypervascular character of CP

Surgical management of CP:

Figure 5:surgical resection of CP using the pre-sterno-cleido-mastoid incision

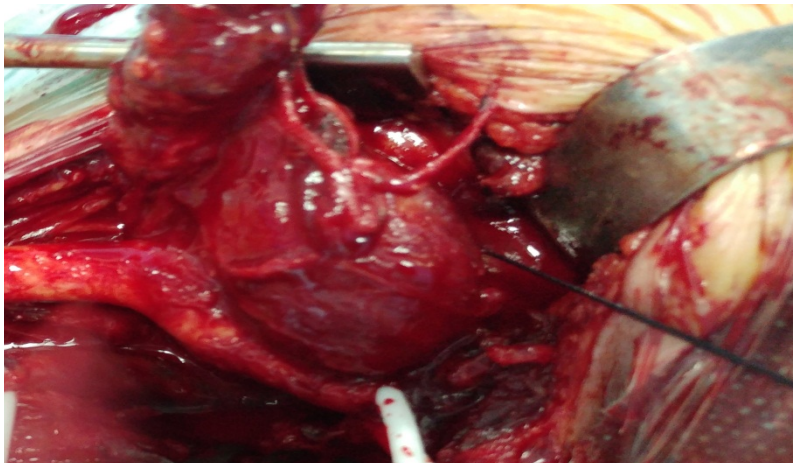

Figure 6: per-operative picture that shows the CP extension

Figure 7: CP after being completely resected

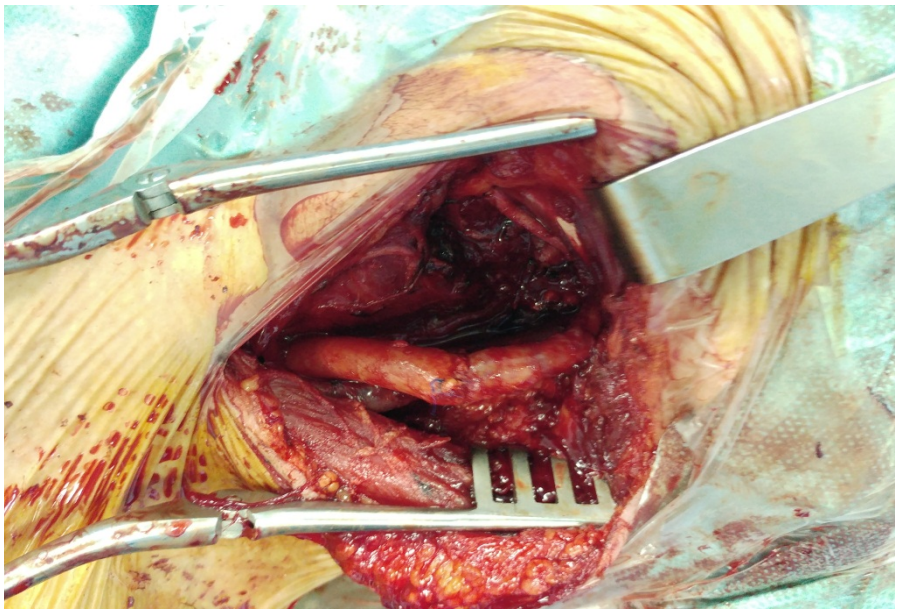

Figure 8: A post-operative image of resection of CP showing a simple anastomosis of the common carotid artery extremities

Figure 9: A vascular graft interposition between the common carotid artery and the distal internal carotid artery using inverted saphenous vein after a total resection of the tumor and external carotid ligation

DISCUSSION

Paraganglioma is rare and usually benign. It develops from diffuse neuroendocrine system cells. Cervical paraganglioma accounts for 0.6% of head and neck tumors (1) with incidence of 1/30,000 to 1/100,000 in the general population. Carotidparaganglioma (CP), named also carotid body tumor (CBT), is a hypertrophy of the carotid body tissue. CP remains the most common type of paragangliomas of the head and neck and its incidence is estimated at less than 0.03% (2).

The first description of CP was made by Von Haller in 1743, who described it as a chemoreceptor located in the adventitia of the carotid bifurcation (3). CPis very rare and most vascular surgeons will encounter only few cases during their career. This tumor is rarely seen in children. A recent review of the literature by Georgiadis et al. identified fewer than 20 cases of carotid tumors in children under 14 years old (4). Their etiology is still unknown (5). A high incidence of carotid paraganglioma was noted in patients suffering from chronic pulmonary disease and those living at high altitude (6). The resulting lesions are referred to as non-heritable or

sporadic tumors. These tumors can be bilateral in 32% in cases of familial forms and in 5% in non-familial forms. CP can occur at any age but are particularly common between 30 and 60 years of age. Unfortunately, nuclear pleomorphism, mitotic activity, necrosis, or vascular or perineural invasion cannot predict the biological behavior because all these features may also be found in benign forms of CBTs. Therefore, CBTs are mostly considered benign lesions; however, malignant behavior is often encountered. This diagnosis is reserved for the tumors with local, regional, and distant metastasis. The rate of malignancy is reported to be 6% to 12.5% of all cases (7-9), and 7% to 9% of hereditary cases (10,11).

Clinically, CBT presents as a painless, palpable, slow-growing swelling located in front of the sternocleidomastoid muscle at the level of the hyoid bone. Sometimes, it can cause hoarseness, dysphagia and dyspnea secondary to compression (12). Sometimes, clinical signs of hypersecretion of catecholamines such as hypertension, palpitations and diarrhea can be seen (13). Physical examination reveals a mass which may be pulsatile, located below the mandibular angle, typically laterally mobile but vertically fixed. The mass is usually no tender, rather rubbery, firm, and non-compressible. A sound may be audible (14). Neurologic abnormalities caused by vagal or hypoglossal nerve involvement and Horner's syndrome are unusual but may be present in some patients (15).

Since these tumors are highly vascularized, a direct biopsy is not recommended and diagnostic imaging modalities are very important for positive and differential diagnosis of this condition. Ultrasonography with B-mode ultrasound and duplex color ultrasound represent the first imaging step for cervical CBT. They are inexpensive and noninvasive diagnostic tools (16). It is a valuable diagnostic modality because it shows a highly vascularized hypoechoicmass located at the carotid bifurcation. CP are easily detected using computed tomographic (CT) imaging and magnetic resonance angiography (MRA). CT angiography depicts the anatomy more accurately than MRA because of its better spatial resolution. However, contrast-enhanced MRA is better suited for screening and detecting multiple lesions (17). On contrast-enhanced CT, the carotid body tumor appears as a hypervascular mass that tends to spread at the bifurcation between the internal carotid artery (ICA) which is posteriorly displaced and the external carotid. On magnetic resonance imaging (MRI), paragangliomas are observed in T1-weighted sequences with low intensity signal and in T2 with a hyperintense signal. After the intravenous administration of contrast material, these tumors exhibit a pattern of intense and homogenous enhancement similar to CT imaging. The angiographic examinations don't provide additional diagnostic information compared with CT imaging and MRI but may allow a possible preoperative embolization or ICA stenting of Shamblin class III CBT (18,19). In addition, angiography with or without embolization is mostly used to confirm the diagnosis and to identify the supplying artery before surgical resection.

The size of tumoris important to be determined not only for its clinical manifestations but also for treatment. In 1971, Shamblin introduced a classification system based on tumor size (13). He classified small tumors that could be easily dissected away from the vessels as group I. In this case, complete surgical resection is generally possible with minimal risk of vascular or cranial nerve injuries (20). Group II included paragangliomas of medium size that were intimately associated and compressed carotid vessels but could be separated with careful subadventitial dissection. Group III intimately surround the carotid artery, thus a complete resection is very difficult and often requires a temporary interruption of cerebral circulation for vascular reconstruction. The risk of permanent vascular and neural injuries is significantly higher than for Class I and II (21).

The treatment strategy includes conservative management, radiotherapy and surgical resection (22). Surgical resection is the only curative treatment for resectable CBTs. However, the rich blood supply sometimes makes CBT resection difficult. The intraoperative hemorrhage and cranial nerve injury incidence remains considerable (23). The incision is usually done along the anterior border of the sternocleidomastoid muscle. Avoiding the injuries of the vagus, hypoglossal or superior laryngeal nerve during the resection should be a must for every surgeon. External carotid artery could be sacrificed if it was invaded or taken by the tumor. When the internal carotid artery has to be resectied, a reconstruction with autogenous great saphenous vein should be performed (24).

Radiotherapy is suggested in cases of extensive involvement, making the tumor not resectable or when there is a high surgical risk (25). It is also recommended for giant and recurrent carotid body paragangliomas and metastatic carotid body paragangliomas of the regional lymph nodes (26).

The role of preoperative embolization is controversial, even though intraoperative hemorrhage may decrease, transfusion requirements are unaffected and the procedure may increase the risk of ectopic embolism. In 1980, Schick et al. (27) first reported preoperative transarterial embolization, which is proved to be effective in decreasing blood loss and operative time by some investigators (28). The aim of the embolization is to occlude the tumor's feeding vessels avoiding decrease of blood flow to the normal tissues. Vogel et al. (29) demonstrated that embolization reduces morbidity and mortality and shortens the time of surgery by reducing intraoperative bleeding. WhileLitle et al. (30) compared 11 embolized tumors and 11 non-embolized tumors and showed no differences in blood loss, operative time, transfusion requirements, or perioperative morbidity. In an opposite manner, Liapis et al. (31) concluded that preoperative embolization is helpful by decreasing intraoperative bleeding in patients who underwent embolization before surgical resection of CBTs in comparison to patients who had surgery alone. In patients with vascular tortuous, spasm or small feeding artery, percutaneous approach was preferred since it might have the advantage of obliterating the tumor capillary bed (32). When embolization is carried out, aseptic inflammation might exist and collateral circulation will form gradually. In this case, it is recommended to carry out CBT resection immediately after the embolization to avoid the consequences. Usually the time gap between the procedure of embolization and CBT resection varies from immediately to 3 days.

CONCLUSION

Carotid paragangiomas remain rare, poorly known and often benign. Its diagnosis should be evoked towards any pulsatile latero-cervical mass.The optimal therapeutic approach of the CP requires a meeting of multidisciplinary consultation and depends on several parameters (patient, tumor and expertise of the surgeon). A Complete surgical resection is the only curative treatment option. It is considered the treatment of choice by most experts.

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Reference Interval of Plasma Potassium: A Port Harcourt Based Study

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Abstract
BACKGROUND: Plasma potassium concentration is influenced by dietary intake of potassium when all other parameters that control potassium homeostasis are normal. Studies have shown significantly different potassium means across regions and since blood potassium concentration is important in the management of kidney, heart and organ transplant patients among others, it is, therefore, important to determine our own population-based reference interval. AIM: This study was to determine the reference interval of plasma potassium in this geographical region. METHODS: This was a retrospective study where results from the laboratory day sheets of patients who met the inclusion criteria were selected over a period of six months. This results were determined using ISE LWE60E by Landwind. This results were ranked and outliers removed and the mean calculated. The 2.5th percentile was calculated and used as the lower limit while the 97.5th percentile was determined and used as the upper limit. RESULTS: The mean age and result of the study population were 45.2 years and 4.3mmol/l, respectively. The reference interval was 2.4- 4.7mmol/l. CONCLUSION: The reference interval so determined in this study is about the same with those determined from other locations in Nigeria but significantly different from that of Caucasians. Most of the lower limits of the reference interval determined in Nigeria were below 3.0mmol/l. This is significant as it calls for a re-definition of grading hypokalaemia.

Keywords: Non-Parametric, Ions Selective Electrodes, Hypokalaemia

INTRODUCTION

Potassium is an electrolyte that can be found in blood. This is a very small percentage when compared with the concentration located within the cells (Agarwal, Afzalpurkar & Fordtran. 1994). The blood potassium is measured and this is used to assess the body potassium concentration. Basically, blood potassium is a balance between potassium intake and the amount excreted, which in this case is mainly through the kidney in the urine and through body sweat (Castrop & Schießl. 2014).

Still, the blood potassium concentration can be determined by factors that control the shift of potassium from intracellular space into the blood and vice versa (Viera & Wouk. 2015). A shift from intracellular into the blood

would falsely increase blood potassium (pseudo hyperkalaemia) while a shift from blood into cells will cause a false decrease of plasma potassium (pseudo hypokalaemia). Apart from the above mentioned homeostatic mechanism, plasma concentration of potassium is mainly determined by dietary intake in the presence of normal renal function (Penton, Czogalla & Loffing. 2015). While the excretion of potassium depends mainly on subject's renal status, the influence of potassium intake on the plasma concentration, depends on the type of diet. This was shown in a study where the difference in potassium means across geographical regions where found to be significant, which was attributed to the type of diet of the people (Reidenberg, et al. 1993) Other studies have also shown that potassium deficiency is a global problem (Dobermann, et al. 1998) and this may be due to changes in soil potassium across the world (Bengtsson, et al. 2003). Plasma potassium concentration of a subject is influenced by the amount of potassium rich diet when other parameters are normal (Harris. 1998).

A normal potassium blood concentration is necessary for normal heart and muscles activities among others (Bengtsson, et al. 2003). The determination of the reference interval of potassium is made even more significant with the very narrow reference range of the normal value. Since every laboratory is encouraged to determine its own population base reference interval, (Harris. 1998) the dietary influence on plasma potassium and the narrow range of potassium reference interval have therefore made it even more necessary to determine the reference interval of potassium in this region.

METHODS

Data of potassium results from a tertiary hospital in southern Nigeria, were collected from patients between the ages of 10- 80 years, who had no renal disorders, gastro intestinal disorders, cardiac disorders or on drugs that affect plasma potassium concentration. (ACE inhibitors, nonsteroidal anti-inflammation drugs, potassium sparring diabetics, laxatives, insulin among others). The plasma potassium values were determined using ion-selective electrode (ISO) LWE60E by land wind, results so generated were ranked and outliers were removed using the Dixon method (Horn, et al. 2001). from both sides of the data. The mean age and result of the data were calculated. The non-parametric method of determining reference intervals was used due to the skewedness of the data. The 2.5^{th} and the 97.5^{th} percentiles were determined and used as the lower and upper reference limits respectively (Solberg. 1993). The data were again grouped according to age groups of tens and the mean of each group was calculated.

RESULTS

Table 1: Results of age-related means of plasma potassium

Age group	Mean (SD)
10- 19	4.3/0.6
20- 29	4.2/0.6
30- 39	4.2/0.6
40- 49	4.3/0.6
50- 59	4.3/0.6
60- 69	4.3/0.6
70- 79	4.5/0.6
80- 89	4.5/0.8

∗Differences across age groups are not statistically significant. (P-value greater than 0.05)

Table 2: Results of data

Parameter	Results
Mean age of subjects (years)	45.2
Standard error	0.0
Mean result	4.3mmol/L
Standard deviation	0.6
Range	3.9
Lowest result	1.8mmol/l
Highest result	5.7mmol/l

2.5th percentile	2.4
97.5th percentile	4.7
Reference interval	2.4 -4.7mmol/l

RESULTS

A total of 2200 urea results were collected from one thousand (1000) males and one thousand two hundred (1200) females who met the inclusion criteria over a period of six months. The mean age was 45.2 years while the mean of the total result was 4.3mmol/l. The lowest potassium result was 1.8mmol/l while the highest plasma potassium result was 5.7mmol/l. The 2.5th percentile was 2.4mmol/l while the 97.5th percentile was 4.7mmol/l and this gave a potassium reference interval of 2.4-4.7mmol/l.

DISCUSSION

The potassium results collected were grouped according to the ages of the patients and the mean potassium result for each group was determined as seen in table 1. There was no noticeable age-related variation in the means till the age of 70 years. This showed that plasma potassium concentration of this study population was not necessarily affected by the ageing process until the age of 70years. This observation can be said to be due to the gradual organs failure associated with aging (Weidmann, et al. 1975). The glomerular filtration rate (GFR) has been shown to decrease with age and this may explain the increase (Danziger, et al. 1990). Though aging is arguably associated with decreased food intake (John. 2001), the reduced plasma potassium concentration expected with decreased intake is seen to be overwhelmed by the gradual decrease in renal potassium excretion. Again most elderly people are physically inactive and their sweat glands are failing in their functions and so are expected to sweat less thereby reducing potassium loss through sweating (Laure, et al. 2016 & Buono, McKenzie & Kasch. 1991). Organs that produce hormones (adrenal gland) are affected by the aging process and are therefore associated with a reduction in plasma concentration of these hormones and, in this case aldosterone (Weidmann, et al. 1975). Aldosterone controls the potassium pump at the cellular membrane, thereby controlling the shift between intracellular and extracellular potassium (Wanzhu, et al. 2017). Though aging is associated with decreased intake of diets in general (potassium diet), the decreased sweating, decrease urinary loss due to decreased GFR and slight reduction of plasma aldosterone activity could cumulatively explain the increase of plasma potassium associated with aging.

A slight renal disorder may be associated with slight metabolic acidosis (Frassetto, Sebastian & Morris Jr. 1996), which may also explain the slight age-related increase in plasma potassium. Cortisol activity is slightly increased in the elderly, this high cortisol has an aldosterone-like effect, since it stimulates the sodium pump thereby increasing intracellular sodium and this displaces intracellular potassium into the plasma to maintain electrochemical neutrality (Terker, et al. 2015). This means that the potassium moves from the cells into plasma (pseudo hyperkalaemia). All these factors that cause hyperkalaemia in the elderly are believed to outweigh and overwhelm the effect of reduced intake of potassium.

The reference interval of potassium in this study was 2.4-4.7mmol/l and is different from the one in use by the laboratory, which is 3.5-5.7mmol/l, believed to have been from manufacturers of potassium measuring kits. The reference interval determined in this study was also found to be about the same from a study done in Minna, Niger state of Nigeria which had a reference interval of 2.9-5.0mmol/l (Makun, et al. 2001) An Abeokuta study of children and adolescents residing in Abeokuta and its environs had a reference interval of 2.5-4.9mmol/l (Ajose. 2004). One thing was common in all the Nigerian studies and that is the lower reference limit below 3.0 mmol/l that is 2.4 mmol/l for the Abeokuta study, 2.4mmol/l in this study and 2.9mmol/l for the Minna study. While the upper reference limit is 4.7mmol/l in this study, 4.9mmol/l in the Abeokuta study and 5.0mmol/l in the Minna study, showing an upper reference limit of 5 mmol/l and below. These low values seen in the lower limit can be attributed to the effect of diet since most of the Caucasians reference interval had higher lower and higher limits above 3.0 and 5.0 mmol/l and above (Reidenberg, et al. 1993, Pagana, Pagana & Pagana. 2019, Jia, et al. 2015, Rustad, et al 2004). This, therefore, means that, it may be necessary to review the cut-off for hypokalaemia in this area and other economically non-viable areas.

Since a normal potassium reference interval has a narrow range, and potassium plasma concentration is very important when managing patients with acute or chronic renal failures, cardiac/adrenal disorders, and dialysis and transplant rejections among others have made the determination of potassium reference interval very important. A study of these reference values determined in various geographical locations in Nigeria has also made it important to re-evaluate the plasma concentration values referred to as low, mild, and severe hypokalaemia. To further buttress this point is a study that showed regional differences in the mean value of plasma potassium and found that the Chinese had the lowest mean value of 3.8mmol/l. Next were the Brazilians with 4.06mmol/l while the Australians had 4.14mmol/l the Americans had the highest mean of 4.3mmol/l followed by the Dominicans with a mean of 4.37mmol/l (Reidenberg, et al. 1993). These findings were attributed to the type of food intake of the people. Another study carried out in south-east Asia due to the sudden and unexpected deaths of young adults during sleep was also attributed to low plasma potassium due to low intake since the urine potassium concentration was found to be normal (Tosukhowong, et al. 2001). These findings have made the determination of potassium reference interval a must for every region and call for are-evaluationn of the classification of hypokalaemia.

CONCLUSION

The reference interval of plasma potassium generated in this study was found to be about the same with those from other Nigerian studies but had a significantly different lower reference limit from that of Caucasians. It may, therefore, be necessary to re-evaluate the value of hypokalaemia in this area and other economically non-viable regions for better management of patients.

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Anxiety and Depression Among Migrant Workers of Bangladesh Presenting with Gastrointestinal Symptoms

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Abstract
Introduction: This study was designed to see prevalence of anxiety and depression among migrant workers presenting with gastrointestinal symptoms. Material and method: Consecutive subjects working in middle-east countries attending at gastroenterology outpatient department were included. Psychiatric assessment of them was done using Hospital Anxiety and Depression Scale (HADS) by trained interviewer under supervision of a senior psychiatrist. Statistical analysis was done using SPSS 20. Chi square test was done to see differences. Result: Total 426 patients, age from 18 years to 61 years (mean 36.96), 364 (85.44% from rural community, 353 (78.64%) married, and 390 (91.54%) working as laborer were included. Among them 66 (15.5%) and 45 (10.6%) had symptoms score consistent with anxiety and depression respectively. Anxiety was more prevalent among workers with lower level of education, higher age, shorter duration of migration and single marital status. Depression was more prevalent among married people, of lower educational and economic background and of older age. Abdominal pain, anorexia, loose motion, abdominal fullness, weight loss, constipation and incomplete bowel evacuation are common presenting symptoms. Conclusion: Anxiety and depression are common among Bangladeshi migrant workers in middle-eastern countries. Level of education, marital status, economic background and older age affect mental health. Depression was associated with higher numbers of physical complaints. Migrant workers are playing a vital role in our economy. So, issues of their mental health and psychiatric morbidity which might adversely affect their overall activity and foreign remittance, should not be neglected.

Keywords: Anxiety and Depression, Migrant Workers, Gastrointestinal Symptoms

Introduction

Migration is a very common phenomenon of human history (Bhugra D. & Gupta S., 2010). About 192 million people (3% of world' population) in world are living outside of their own country (Ghent A., 2008). Migration for economic reason is common in developing countries and it arises due to lack of prospect of a person in his own country (Castle S, 2010). In 2014, about 500,000 people from Bangladesh were working abroad as temporary migrant. Among them about 17% were female. More than 50% of them were working in middle-eastern countries (BMET database, 2015) and remittance from these workers constituted about 08% of gross domestic product (GDP) in 2015- a major source of foreign exchange earning second to ready-made garments (ADB briefs,2016). Till April, 2018 about 273,304 workers left our country for different countries as migrant workers (Stillman S, McKenzie D & Gibson J, 2007).

Studies among migrants to New Zealand (Kirmayer L.J. et al., 2011) and Canada (Warffa N, 2006) showed improvement of mental health. But study with Somali migrants (El-Hilu SM, 1990) showed association of poor mental health. Psychiatric morbidity was found to be two to five times higher among women working in middle east countries than in their native country (Zahida MA et al, 2004; Bhugra D,2004).

Although people migrate for better quality and prospect of life, yet they have to pass through a stressful process. They have to cope with new culture, language, working environment. Majority of them like ours, are leaving their families behind in their country (Bhugra D. & Becker M.A., 2005) which are potential factors for disruption of mental health of migrants and also their family members (Zigmond A.S. & Snaith R.P., 1983).

Literature shows mental disorder especially anxiety and depression are much higher among patients with gastrointestinal symptoms (GI symptoms) than those without GI symptoms (Mussel M., 2008) and this psychiatric morbidity may interfere quality of life and thereby interfere their working performances.

With this background this study was designed to see psychiatric morbidity namely anxiety and depression among Bangladeshi people working abroad mainly Middle-eastern countries presenting with gastrointestinal symptoms.

Material and Methods

Consecutive subjects working abroad, coming home to meet relatives, attending gastroenterology outpatient department were included. Study period was from January 2015 to January 20017. In addition to evaluation of gastrointestinal symptoms, mental status was assessed using Hospital anxiety and depression scale (HAD) (Mussel M., 2008) by trained personnel under supervision of a senior psychiatrist. Those who were known patient of psychiatric disorder and those who were not agreed to participate in the study were excluded. We also did not include migrant workers who had returned home permanently. Socio-demographic data were recorded in a predesigned data sheet.

Statistical analysis

Data were analyzed using soft-wire statistical package for social science (SPSS version 20). Chi square test was done to see relations of categorical data and p value <0.05 was taken as significant. Score of mental state up to 07, 8-10 and more than 10 were taken as normal, border line and confirmed cases for both anxiety and depression. Univariate logistic regression analyses were carried out to find out the associations between anxiety/depression, socio-demographic, economic, health related variables and duration of migration. Multivariate analysis was done with variables that were associated with anxiety or depression in univariate analyses. Odds ratios were used to determine the strength of association in selected variable.

Result

A total of 426 patients, all are male, age ranging from 18 years to 61 years (mean 36.96 and SD 9.2) were included. Among them 364(85.44%) and 62(14.55%) were from rural and urban community respectively.

Table-1

variables	*Anxiety*				*Depression*			
	Normal (%)	*Borderline (%)*	*Confirm (%)*	*P value*	*Normal (%)*	*Borderline (%)*	*Confirm (%)*	*P value*
Rural(364)	236 (64.83)	71 (19.5)	57 (15.65)	0.69	262(71.9)	67(18.40)	35(9.61)	0.231
Urban (62)	38(61.29)	15(24.19)	9(14.51)		39(62.9)	13(20.96)	10(16.12)	
Married(353)	228 (64.58)	73(20.68)	52(14.7)	0.594	242(68.5)	74(20.96)	37 (10.48)	0.038
Single (73)	46(63.01)	13(17.8)	14(19.1)		59(80.82)	6(8.21)	8(10.96)	
Age group								
Up to 30 y(134)	91(67.91)	23(17.16)	20(14.9)	0.28	107(79.9)	15(11.19)	12(8.95)	0.052
>30-40 y (147)	85(57.82)	35(23.81)	27 (18.36)		97(65.98)	35(23.80)	15(10.2)	
>40 y (145)	98 (67.58)	28 (19.31)	19 (13.10		97 (66.89)	30(20.69)	18(12.41)	
Education								
Illiterate (39)	21 (52.84)	6(15.38)	12 (30.76)	0.014	19(48.71)	8(20.51)	12(30.76)	0.000
Primary (281)	171 (60.85)	64 (22.77)	46 (16.37)		192(68.3)	58(20.64)	31(11.03)	
SSC (58)	42 (72.41)	11 (18.96)	5(8.62)		47(81.03)	11(18.26)	0	
HSC (38)	30 (81.08)	4(10.81)	3(8.1)		34(91.89)	2(5.4)	1(2.7)	
Above (11)	10 (90.90)	1(9.09)	0		9(81.8)	1(9.09)	1(9.09)	
Duration of stay								
Up to 2y (27)	20(74.07)	4(14.81)	3(11.11)	0.95	19(70.37)	4(14.81)	4(14.81)	.363
>2-5y (71)	45(63.38)	13(18.30)	13(18.3)		50(70.42)	10(14.08)	11(15.49)	
>5-10 y(93)	60(64.51)	19 (20.43)	14(15.1)		67(72.04)	21(22.58)	5(5.37)	
>10-15 y (101)	66(65.34)	22(21.78)	13(12.8)		76(75.24)	15(14.85)	10(9.9)	
>15	83(61.94)	28(20.89)	23 (17.16)		89(66.41)	30(22.38)	15(11.19)	
Economy								
Poor (13)	9 (69.23)	0	4(30.76)	0.089	3(23.07)	5(38.46)	5(38.46)	0.000
Middle class (378)	237(62.70	80 (21.16)	61(16.1)		264(69.8)	74(19.57)	40(10.58)	
Rich (35)	28(80)	6(17.14)	2(2.85)		34(97.4)	1(2.85)	0	
Number of symptoms								
One (220)	151(69.1)	38(17.27)	30(13.6)	0.34	167(75.9)	32 (15.0)	20(9.09)	0.002
Two (129)	80(62.01)	26(20.15)	23(17.8)		91(70.54)	27(20.93)	11(9.2)	
Three (64)	35(54.68)	18(28.12)	11(17.2)		39(60.93)	16(25.0)	9(14.06)	
Four (11)	5(45.45)	4(36.36)	2(18.18)		3(27.27)	3(27.27)	5(45.45)	
Five (2)	2(100)	0	0		1(50)	1(50)	0	

Of them 353 (78.64%) were married and 73 (17.13%) were unmarried. Of this respondents 390 (91.54%) were in service mostly labor type job and remainder were involved in business. Sixty six (15.5%) and 45 (10.6%) had symptom scores consistent with anxiety and depression respectively.

Table 2

	Anxiety		*OR (95% confidence)*		*value*	*Depression*		*OR (95% confidence)*		*value*
	Present	*Absent*	*Lower*	*upper*		*Present*	*absent*	*lower*	*upper*	
Age ≤ 30	20	114	.603	1.88	1.066	12	122	.647	2.59	1.29
>30	46	246				33	259			
Rural	57	307	.427	1.95	.915	35	329	.844	3.87	1.808
Urban	09	53				10	52			
married	52	301	.715	2.638	1.37	37	316	.468	2.36	1.05

Single	14	59				8	65			
Poor & middle	65	326	0.2	1.09	.148	45	346	.854	.917	.88
Rich	01	34				0	35			
≤ primary	58	262	.170	.800	.369	43	277	.29	.521	.124
above	8	98				02	104			
≤2	53	296	.584	2.204	1.134	31	318	1.147	4.529	2.28
>2	13	64				14	63			

In this series 24 (5.3%) people had combined anxiety and depression. Anxiety was found slightly more among people of rural origin than that of urban origin (15.65% vs14.51%, P value 0.696). Incidence of anxiety was higher among unmarried people than that of married group (19.17% vs 14.73%). But difference was not significant (P=0.594).Anxiety symptoms were more prevalent among age group more than 30 to 40 years (18.367%) followed by up to 30 years age group (14.82%) with p value 0.289. Anxiety symptoms were found to be significantly more prevalent (P=0.014) among subjects with lower educational background. Anxiety was more prevalent among subjects staying abroad for 2-5 years followed by those staying more than 15 years, but difference was not statistically significant (P=0.95).

In this series symptom score consistent with depression was higher among subjects of urban origin than that of rural origin (16.12 vs 9.61%) and difference was not statistically significant (P=0.231). Prevalence of depression was higher among married workers than that of unmarried workers (10.95% and 10.48% respectively) with P value 0.038. Prevalence of depression was found to be 30.76% and 11.03% among illiterate people and people with education up to primary level (P=0.00). Depression was found to be more prevalent in poor economic group in comparison to people having higher economic status (38.46% vs 10.58%) (P=0.000). Subjects more than 40 years group were found to suffer from depression more (12.4%) than subjects of >30 y to 40 years group (10.20%) (P=0.052). It was also seen that number of physical symptoms were higher among depressed persons (P=0.002).

Both univariate (table-3 & 4) and multivariate (table-5 & 6) logistic regression models are presented.

Table 3

Parameter	*P-value*	*OR*	*95% CI*
Age	.449	.989	.961-1.018
Lower economic condition	.062	6.779	.912-50.409
Lower education level	.012	2.712	1.250-5.885
Rural residence	.818	1.093	.511-2.340
Laborer type job	.781	1.150	.430-3.073
Single	.341	.728	.379-1.399
Duration of stay at foreign country	.825	.996	.964-1.029
Symptoms > 2	.710	.881	.454-1.712

Table 4

Parameter	*P-value*	*OR*	*95% confidence interval*
Age	.233	1.020	.987-1.054
Urban residence	.127	.553	.258-1.184
Lower economic condition	.998	2.101	
Lower education level	.004	8.072	1.921-33.920
Married	.904	.951	.423-2.317
Duration of stay at foreign country	.551	.988	.950-1.028
Symptoms > 2	.019	.439	.221-0.872

Table 5

Parameter	*Significance*	*Exp B*	*95.0% C.I. for Exp B*	
			Lower	*Upper*
Lower Education	.035	2.354	1.063	5.216
Lower Economic Condition	.106	5.557	.695	44.453
Laborer type job	.467	.677	.236	1.936
Rural Residence	.849	.927	.426	2.019
Constant	.001	.027		

Table 6

Parameter	*Significance*	*Exp B*	*95.0% C.I. for Exp B*	
			Lower	*Upper*
Age	.310	1.018	.984	1.053
Laborer type job	.532	.659	.179	2.434
Lower education	.012	6.426	1.506	27.426
Lower economic condition	.998	1.347	.000	
Constant	.997	.000		

In univariate analyses lower economic condition (OR 6.779), education level primary or less (OR 2.712), rural residence (OR 1.093) and laborer type job (OR 1.150) were positively associated with anxiety in migrant workers. In multivariate analysis with the above mentioned factors, lower economic condition and lower education level appeared as independent predictors for anxiety in migrant workers.

Lower economic condition (OR 2.101), education level primary or less (OR 8.072), increasing age (OR 1.020) and laborer by occupation (OR 1.328) were positively associated with depression in migrant workers in univariate analyses. Multivariate analysis with the above mentioned factors showed lower economic condition, lower education level and increasing age appeared as independent predictors for depression in migrant workers.

Table 7

	Anxiety				*Depression*			
symptom	*No*	*borderline*	*confirm*	*P value*	*no*	*borderline*	*confirm*	*P value*
Abdominal pain (169)	107	35	27		121	34	14	
Vomiting(34)	18	9	7		25	4	5	
Loose motion (52	35	10	7		31	14	7	
Weight loss (66)	33	21	12	0.018	38	20	8	0.022
Anorexia (73)	42	20	11		42	18	13	0.017
Bloating (54	37	11	6		40	13	1	
Constipation (45)	29	8	8		30	7	8	
Chest pain (25)	13	6	6		17	4	4	
Incomplete bowel evacuation(56)	36	11	9		39	10	7	
Heart burn (28)	14	9	5		16	6	6	
Abd fullness (57)	36	9	12		31	14	12	0.005
No of symptom								
1	152	30	30		167	33	20	
2	80	26	23	0.343	91	27	11	0.002

3	35	18	11		39	16	9	
4	5	4	2		3	3	5	
5 and more	2	0	0		1	1	0	
Up to 3 symptoms	267	82	64	0.615	297	76	40	0.001
>3 symptoms	7	4	2		4	4	5	

Presenting symptoms of the people in this series were one or combination of several complaints. Common presenting symptoms of patients with both anxiety and depression were abdominal pain (27, 40.9% and 14, 31.1%), anorexia (11, 16.7% and 13, 28.9%), loose motion (7,10.6% and 7, 11.1%) , incomplete bowel evacuation (9, 13.6% and 7, 15.6%), abdominal fullness (12, 18.2% and 12, 26.7%), weight loss (12, 18.2% and 13, 8, 17.8%) and constipation (8, 12.1% and 8, 17.8%) etc (Table No. 6).

Discussion

In our study all participant were male which reflects the social scenario that males usually sought foreign jobs to improve economic condition of family which is consistent with reports from Nepal (Gaudel Y.S., 2006). In our study majority of people are from rural community which is also consistent with report from Nepal (Hyangwa P.M., 2009). Both anxiety and depression were more prevalent among people with lower educational background in our study. In our series about 75% of workers had lower educational background. Bangladesh Bureau of Statistics Survey in 2013 also revealed that most of Bangladeshi migrant workers' education levels were below secondary level.

More than three fourth of our subjects were married and having family in country and prevalence of depression was found significantly higher among them. This can be explained by mental stress of leaving family in country in addition to adaptation with unfamiliar environment abroad (Gaudel Y.S., 2006). On the basis of occupation at home before going to job, majority were farmer and day laborer followed by unemployed in our series. This might affect their skills, attitude and mental health in work abroad. Majority of our workers are from middle and lower middle class family which is consistent with report from Nepal (Gaudel Y.S., 2006). Duration of stay abroad for work was not found to have significant influence on both anxiety and depression. In our series people with depression had more physical symptoms for consultation with physicians.

Most of our study subjects were involved in low income jobs like construction work, cleaning, farming and labor of factory which are considered as difficult, dirty and dangerous. Most of our people stay in group like messes or labor camp with poor facilities of entertainment. All these make them vulnerable for psychiatric morbidity (Bhattarai P., 2005) .Reports from United Arab Emirates (UAE) showed high prevalence of depression and suicidal tendency among migrant workers and which was related to lower income, high cost of living, unfriendly working condition and also environment (Joshi S, Simkhada P. & Prescott G.J., 2009).In our study prevalence of anxiety was higher than depression. Prevalence of anxiety was higher in Nepal, but both mental illness - anxiety and depression was found higher than our report (Joshi S, Simkhada P. & Prescott G.J., 2009). Report on migrant people working in UAE (Al-Maskari F. et al., 2011) showed prevalence of depression was higher than anxiety and both are about two times higher than our report. This can be explained by difference in method of study. In Nepal they included repatriated and hospitalized people (Joshi S., Simkhada P. & Prescott G.J.,2009) and survey from UAE (Al-Maskari F. et al, 2011; Bhui K., 2005) included all types of migrant workers in their country. But in our study only people while at home in leave attending gastroenterology OPD were included.

In UK higher rate of mental disorders among immigrant workers were associated with unfavorable environment both within and outside the working places (Habtamu K., Minaye A. & Zeleke W.A., 2017). Mental disorders were about 27.6% among Ethiopian migrant returnees from middle-eastern countries and South Africa (Anbesse B. et al, 2009). These people had to experience sexual, physical and emotional abuse, starvation, imprisonment and difficulty in adaptation to different culture in their expatriate working life (Chapagai M. et al, 2017).

In univariate analysis lower socioeconomic condition, low level of education, rural residence and labor type job were found to be associated with anxiety among migrant workers. In multivariate analysis lower economic condition and lower education level appeared as independent predictors for anxiety in migrant workers.

Lower economic condition, lower education level, increasing age and labor by occupation were positively associated with depression in migrant workers in univariate analyses. In multivariate analysis lower economic condition, lower education level and increasing age appeared as independent predictors for depression in migrant workers.

Migrant workers have dissatisfaction as they are unable to actively participate in their family events including well-being of family members and education of children.
Study (Al-Maskari F. et al, 2011) showed that premigration factors, including preparation before migration, cross cultural awareness, knowledge and skills may be determinants of mental distress than stressors encountered in the destination country. Therefore the study group recommends that native country should design training and awareness creation program for potential migrant workers. This is applicable for our country as well.

Limitations

It is not a community based survey. So we cannot comment on true prevalence of anxiety and depression among migrant workers. Our study included only males mostly working in middle-eastern countries and interviewed while staying at home during leave. Our sample size was also small. Although a number of pre-migration, migration and post-migration factors are associated with adverse mental status of migrant workers .We were to able measure only selected factors. We did not assess experiences of migrant workers while travelling to destination country. We did not include permanent migrant returnees and migrant workers who have established psychiatric illness. This may affect true prevalence of mental disorders among migrant workers.

Conclusion

Prevalence of anxiety and depression among Bangladeshi migrant workers in middle-eastern countries were found 15.5% and 10.6% respectively. Level of education, marital status, economic condition and higher age affect mental health. Depressed persons usually have higher numbers of physical complaints. Migrant workers are playing a vital role in our economy. So, issues of their mental health and psychiatric morbidity which might adversely affect their overall activity and foreign remittance, should not be neglected.

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The Hemoglobin Levels and Characteristics in Malaria Endemic Region in Eastern Indonesia

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Abstract
Introductions: Anemia is the most common symptoms to appear in malaria infection. Hb levels in malaria infection are one of the benchmarks to determine whether or not a patient is anemic as a predictor of the severity of infection. Malarial anemia is capable of causing severe morbidity and mortality especially in children and pregnant women infected. The most prevalent etiology of malaria in Indonesia is *P. falciparum* (52%) and *P. vivax* (38%). There is no specific study about Hb level in the community in an endemic area. Accurate clinical diagnoses are necessary to determine the local specific malaria symptoms. Objectives: This study was conducted to assess the different of Hb levels between malaria *P. falciparum* and *P. vivax* in eastern Indonesia. Methods: This is a cross-sectional study using secondary data in 2013-2014 from 5 sub-districts in South Central Timor Regency. Data was collected and analyzed using bivariate and multivariate analysis with 95% confidence interval (CI) and α= 0.05. Results: Data consisting of 152 respondents were collected. 62,5% (95/152) were infected *P. vivax* and 37.5% (57/152) infected with the *P. falciparum.* Mean of Hb levels from *P. falciparum* 11.130 g/dL and *P. vivax* 11.296 g/dL. T-test resulted *the value of p-value 0.672 (*p-value >0.05) with MD 0.166, 95% CI -0.938-1.606, while multiple linear regression showed regression coefficient -0.059 and p-value 0.876 (p-value >0.05) for Hb levels on *P. falciparum* and *P. vivax*-infected patients. Conclusion: The average level of Hb in *P. falciparum*-infected patients is relatively lower than *P. vivax*-infected patients.

Keywords: East Indonesia, Hemoglobin, Malaria Endemic

1. Introduction

Currently, there are four of five species of *Plasmodium* which can infect human in Indonesia; *P. falciparum, P. vivax, P. malariae,* and *P. knowlesi,* while the *P. ovale* until uptodate never been reported occur in Indonesia (Direktorat Jenderal Pencegahan dan Pengendalian Penyakit, 2018; Suwandi, Asmara, & Kusnanto, 2014).

According to World Malaria Report in 2018, there are 219 million cases of malaria all over the world. The approximate estimation of death caused by malaria is 435,000 deaths, with an estimation of death in the Southeast Asia region is 19,700 deaths (World Health Organization, 2018). The most prevalent etiology of malaria in Indonesia is *P. falciparum* (52%) and *P. vivax* (38%) (Direktorat Jenderal Pencegahan dan Pengendalian Penyakit, 2018). Indonesian Annual Parasite Incidence (API) by the National Survey in 2018 was 0.4‰, with three provinces most contributed to malaria are: Papua, West Papua, and East Nusa Tenggara with the API >5‰ population (*Riset Kesehatan Dasar 2018*, 2018).

The clinical manifestations of malaria will usually show up 8-25 days post-infected in the form of recurrent fever, headache, fatigue, nausea, vomit, shiver, and anemia (Chakraborty, 2016). One of the most common complications of malaria is severe anemia with Hemoglobin (Hb) levels <5 g/dL in high endemic and Hb levels <7 g/dL in mild-moderate endemic (*Buku Saku Tatalaksana Malaria*, 2017; Natalia, 2015). Anemia is defined by the condition of Hb levels on blood that is less than the normal level (Cappellini & Motta, 2015). According to World Health Organization (WHO), the normal Hb level of men is ≥13 g/dL, non-pregnant women ≥12 g/dL, and pregnant women ≥11 g/dL (World Health Organization, 2011). The signs and symptoms of anemia are one of the bases of diagnosing malaria. One of the diagnostic criteria of severe malaria based on WHO is the presence of severe anemia with Hb levels <7 g/dL (*Buku Saku Tatalaksana Malaria*, 2017). The severity depends upon patient-specific characteristics as well as parasite-specific characteristics (Saxena, 2017).

Anemia in malaria may occur by several causes such as the destruction of *Plasmodium* infected-erythrocytes by reticuloendothelial, imbalance of cytokines caused by the hyperstimulation of the immune system, and/ or erythropoiesis suppression in bone marrow (Ahmad et al., 2014; Paniker, 2013). Every *Plasmodium* species has a different characteristic of infected erythrocytes. *P. falciparum* can infect old and young erythrocytes, different to *P. malariae* which can only infect old erythrocytes, and also *P. vivax* and *P. ovale which* can only infect young erythrocytes (A. Srivastava et al., 2015).

Study in M. Djamil Central General Hospital, Padang, West Sumatera which obtained p-value 0.02, concluded that there is a significant difference in the Hb levels of the patient infected by *P. falciparum* and *P. vivax* (Afdhal, Nurhayati, & Julizar, 2014). However, the study conducted in Lindimara Christian Hospital, East Sumba, East Nusa Tenggara which obtained p-value 0.523, concluded that there is not any significant difference in Hb levels of the patient infected by *P. falciparum* and *P. vivax* (Irawan, Merry, & Wuryaningsih, 2017).

Accurate clinical diagnoses are necessary to determine the local specific malaria symptoms. Health officers then may design a health education for the community that stresses how clinical malaria typically occurs in that community (Elyazar, Hay, & Baird, 2011). The lack of research talking about Hb levels on patient infected by each *Plasmodium* species and the different result from earlier research, makes the research on differences Hb levels caused by *P. falciparum* and *P. vivax* in a wider population and endemic areas is need to be done, one of which is in South Central Timor Regency. This research will assess the Hb levels and the characteristic among community in malaria endemic region in eastern Indonesia.

2. Method

2.1 Location and period of time

This is a cross-sectional study part of study done by Hutagalung *et al.* (2018) (Hutagalung, Kusnanto, Sadewa, & Satyagraha, 2018). The research was conducted on August 2013 until September 2014 from 5 sub-district of South Central Timor Regency, East Nusa Tenggara Province based on API: Amanatun Selatan (API >5‰), Amanuban Tengah (API >5‰), Amanuban Selatan (API 1-5‰), Batu Putih (API 1-5‰), dan Oenino (API <1‰).

2.2 Data Collection

A total of 555 respondents were selected from the study master data, only completed data were selected in to this study, such; demography, gender, age, and the malaria-confirmed data by only single infection between *P. falciparum* and *P. vivax* will be analyzed in this study, while for the other incomplete data will be rejected. The

previous research subject was obtained by systematic random sampling based on the household data from each sub-district.

The Hb levels were tested by using the HemoCue Hb test, Helsinborg, Sweden (HemoCue, 2013). The malaria etiologic agents-species is identified by using the microscopic thick and thin blood smears (Giemsa 3-5%) using protocols from the Ministry of Health and the WHO (World Health Organization, 2009). Identification the four species of *Plasmodium (P. falciparum, P. vivax, P. ovale,* and *P. malariae)* were detected that they used the nested Polymerase Chain Reaction (nPCR) method (Promega Corporation, 2014). The nPCR condition followed the protocol of Snounou *et al* (1993) (Snounou, Viriyakosol, Jarra, Thaithong, & Brown, 1993).

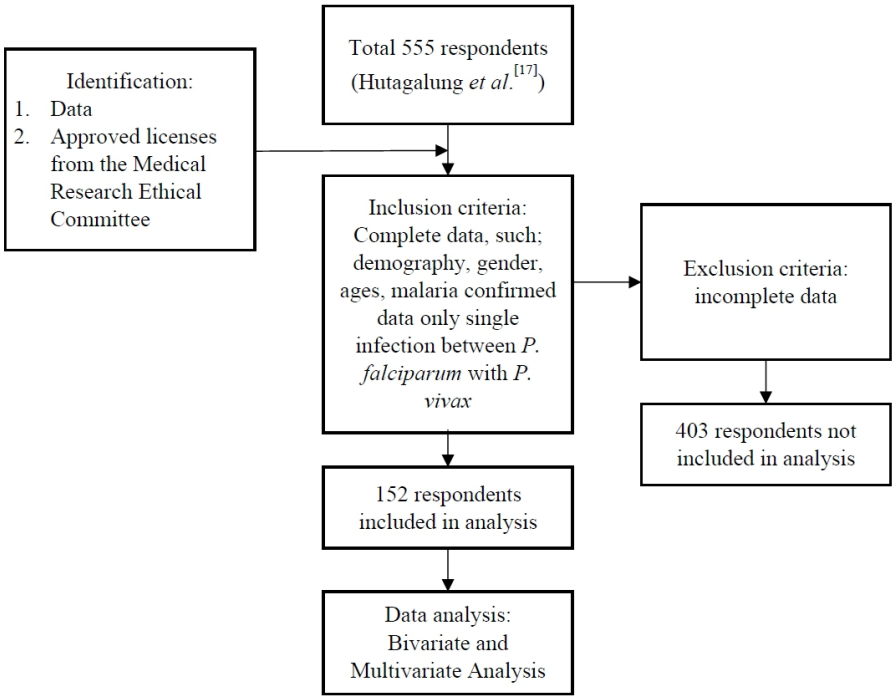

Figure 1. Research Flowchart

2.3 Data analysis

The data will be analyzed using the IBM® SPSS® 25th version software. Characteristics analysis only compared between *Hb levels* higher and lower average group. Data analysis using t-test and multiple linear regression to analyze the differences in Hb levels between *P. falciparum* vs *P. vivax*-infected patients, sex group, and endemic areas status. P-value >0.05 indicates no difference in Hb levels, and a p-value <0.05 indicates there is a difference in Hb levels.

This study has been approved by the Medical Research Ethical Committee, Faculty of Medicine, Universitas Padjadjaran, with ethic license number 663/UN6.KEP/EC/2019.

3. Results

3.1 Characteristic of respondents

Total of 152 respondents were collected for this research based on the inclusion and exclusion criteria. The average value of Hb levels among respondents in this study is 11.23 g/dL, therefor classified data to ≤11.23 and >11.23 group.

Table 1 shows the characteristics of the respondents. The *number of males are less than females in Hb levels* ≤11.23 group*, but the* number of males are more than females in *Hb levels >11.23 group*. The most prevalent age in *Hb Levels* ≤11.23 group is the 40-49-year-old group, while, in *Hb levels >11.23 group* is the 30-39-year-old group. From 5 sub-district that have been chosen as the research location, the largest *Hb Levels* ≤11.23 group are located at Oenino, and the *Hb levels >11.23 group* are located in Batu Putih. *Hb Levels* ≤11.23 group were

found more in sub-district with API index >5 ‰, but *Hb levels >11.23 group* were found more in sub-district with API index 1-5‰. Timor tribe was the largest tribe that *Hb Levels* ≤11.23 *and Hb levels >11.23 group.* The number of *P. falciparum* more than *P. vivax* in *Hb levels ≤11.23 group, on the contrary, the number of P. vivax is more than P. falciparum in Hb Levels* >11.23 group.

Table 1. The Distribution of the Respondents (n=152)

Characteristics	Hemoglobin levels		Total n=152 (%)
	Hb ≤11.23 g/dL n=75 (%)	Hb >11.23 g/dL n=77 (%)	
Gender			
Male	24 (32.0)	43 (55.8)	67 (44.1)
Female	51 (68.0)	34 (44.2)	85 (55.9)
Age (year old)			
<20	3 (4.0)	4 (5.2)	7 (4.6)
20-29	7 (9.3)	2 (2.6)	9 (5.9)
30-39	12 (16.0)	26 (33.8)	38 (25.0)
40-49	22 (29.3)	17 (22.1)	39 (25.7)
50-59	18 (24.0)	18 (23.4)	36 (23.7)
≥60	13 (17.3)	10 (13.0)	23 (15.1)
Sub-district			
Amanatun Selatan	11 (14.7)	11 (14.3)	22 (14.5)
Amanuban Tengah	17 (22.7)	18 (23.4)	35 (23.0)
Amanuban Selatan	10 (13.3)	11 (14.3)	21 (13.8)
Batu Putih	15 (20.0)	22 (28.6)	37 (24.3)
Oenino	22 (29.3)	15 (19.5)	37 (24.3)
Level of API (‰)			
API >5	28 (37.3)	29 (37.7)	57 (37.5)
API 1-5	25 (33.3)	33 (42.9)	58 (38.2)
API <1	22 (29.3)	15 (19.5)	37 (24.3)
Ethnicity			
Timor	68 (88.3)	71 (94.7)	139 (91.4)
Sabu	2 (2.6)	1 (1.3)	3 (2.0)
Rote	7 (9.1)	3 (4.0)	10 (6/6)
Plasmodium sp.			
P. falciparum	32 (42.7)	25 (32.5)	57 (37.5)
P. vivax	43 (57.3)	52 (67.5)	95 (62.5)

Note. API= Annual Parasite Incidence, Hb= Hemoglobin, Sp.= Species

Table 2 shows the bivariate analysis of Hb levels with characteristics of respondents. The results obtained the results of gender has a p-value of 0.003 (p <0.05) which shows there are significant results, while other variable did not show significant results.

Table 2. Bivariate Analysis

Characteristics	Hemoglobin levels		Total n=152 (%)	P-value (OR)	95% CI	
	Hb ≤11.23 g/dL n=75 (%)	Hb >11.23 g/dL n=77 (%)			Lower	Upper
Gender						
Male	24 (32.0)	43 (55.8)	85 (55.9)	0.003	0.192	0.721
Female	51 (68.0)	34 (44.2)	67 (44.1)	(0.372)		
Age						
≤45-year old	38 (50.7)	43 (55.8)	81 (53.3)	0.522	0.651	2.331
>45-year old	37 (49.3)	34 (44.2)	71 (46.7)	(1.231)		
Subdistrict						
Risk areas	28 (37.3)	29 (37.7)	57 (37.5)	0.967	0.526	1.956
No risk areas	47 (62.7)	48 (62.3)	95 (62.5)	(1.014)		
Level of API				0.967	0.526	1.956
High endemic	28 (37.3)	29 (37.7)	57 (37.5)	(1.014)		

Low endemic	47 (62.7)	48 (62.3)	95 (62.5)			
Ethnicity						
Timorese	71 (94.7)	68 (88.3)	139 (91.4)	0.161	0.125	1.447
Non-Timorese	4 (5.3)	9 (11.7)	13 (8.6)	(0.426)		
Plasmodium sp.						
P. falciparum	32 (42.7)	25 (32.5)	95 (62.5)	0.194	0.799	2.998
P. vivax	43 (57.3)	52 (67.5)	57 (37.5)	(1.548)		

Note. 95% CI= 95% Confidence Interval, OR= Odd Ratio

3.2 Analysis of Hb levels

Table 3 shows the t-test analysis for Hb levels. The Mean and standard deviation of Hb levels from *P. falciparum* and *P. vivax*-infected patients. The mean Hb levels from *P. falciparum*-infected patients (11.130 g/dL) tend to be lower than *P. vivax*-infected patients (11.296 g/dL). The mean difference value was -0.166, it means that the Hb level of patients infected with *P. falciparum* is lower by 0.166 g/dL than the Hb level of patients infected with *P. vivax*. *Based on t-test, the value of p-value 0.672,* indicates there is no difference in Hb levels between *P. falciparum* and *P. vivax*-infected patients.

The mean and standard deviation of Hb levels from *male and female patients.* The mean Hb levels from *male* patients (11.931 g/dL) tend to be higher than female patients (10.684 g/dL). The mean difference value was 1.247, it means that the Hb level of male patients is higher by 1.247 g/dL than the Hb level of female patients. *Based on t-test, the value of p-value 0.001,* indicates there is difference in Hb levels between male and female patients.

The mean and standard deviation of Hb levels from between patients live in low endemic area and high endemic area. The mean Hb levels from patients live in high endemic area (11.421 g/dL) tend to be higher than patients live in low endemic area (10.121 g/dL). The mean difference value was 0.300, it means that the Hb level of patients live in high endemic areais higher by 0.300 g/dL than the Hb level of patients live in low endemic area. *Based on t-test, the value of p-value 0.443*, indicates there is no difference in Hb levels between patients live in low endemic area and high endemic area.

Table 3. T-test Analysis for Hemoglobin Levels

Characteristics	n	Mean	SD	MD	95% CI		P-value
					Lower	Upper	
Plasmodium sp.							
P. falciparum	57	11.130	2.418	-0.166	-0.938	0.606	0.672
P. vivax	95	11.296	2.276				
Gender							
Male	67	11.931	2.146	1.247	0.522	1.973	0.001
Female	85	10.684	2.325				
Level of API							
High endemic	57	11.421	2.612	0.300	-0.470	1.071	0.443
Low endemic	95	11.121	2.141				

Note. 95% CI= 95% Confidence Interval, API= Annual Parasite Incidence, MD= Mean Difference, SD= Standard Deviation, Sp.= Species

Table 4 shows the results of the final steps analysis using multiple linear regression test with the entered method. The regression coefficient value was -0.059, it means after adjusted for gender and Level of API that the Hb levels of patients infected with *P. falciparum* is lower by 0.059 g/dL than the Hb level of patients infected with *P. vivax*. P-value was 0.876, it means that there was no difference in Hb levels between *P. falciparum* and *P. vivax*-infected patients.

Table 4. Multivariate Analysis

Variable	B	t	P-value	95% CI	
				Lower	Upper
Constant	11.410	17.408	0.001	10.115	12.705
Types of *Plasmodium*	-0.059	-0.156	0.876	-0.808	0.690

Gender	1.294	3.485	0.001	0.560	2.027
Level of API	-0.446	-1.171	0.244	-1.198	0.307

Note. 95% CI= 95% Confidence Interval, B= Coefficients regression

4. Discussion

The result of this research indicates that there are no differences in Hb levels in *P. falciparum* and *P. vivax*-infected patients. These findings are consistent with the research conducted in Tak Province, Thailand by Kotepui *et al.* (2015) which obtained a p-value of 0.21 (Kotepui et al., 2015), research conducted in India and Arab Saudi by Khan *et al.* (2014) which obtained a p-value 0.233 (Khan & Zakai, 2014), and research conducted in East Sumba, East Nusa Tenggara by Irawan *et al.* (2017) which obtained a p-value 0.523 (Irawan et al., 2017). It showed that there were no differences in Hb levels in *P. falciparum* and *P. vivax*-infected patients (Irawan et al., 2017; Khan & Zakai, 2014; Kotepui et al., 2015). In contrast to the research conducted in Vellore, Tamil Nadu, India by Mitra *et al.* (2015) which obtained a p-value 0.03 (Mitra, Abhilash, Arora, & Miraclin, 2015), and research conducted in Padang, West Sumatera by Afdhal *et al*. (2014) which obtained a p-value 0.02 (Afdhal et al., 2014). Their research showed that there were differences in Hb levels between *P. falciparum*-infected patients and *P. vivax*-infected patients (Afdhal et al., 2014; Mitra et al., 2015). There were differences in Hb levels due to differences in the pathogenesis of the disease. In *P. falciparum* produces more Th-1 than other *Plasmodium*, so the disease is more severe (Afdhal et al., 2014).

East Nusa Tenggara Province is an endemic malaria area that also stands in third place of area with the highest malaria prevalence in Indonesia (*Riset Kesehatan Dasar 2018*, 2018). In the endemic area, protection towards malaria can be obtained by repeated exposure. Individual who lives in the endemic area will be able to tolerate high parasite level without manifest any sign and symptoms. This shows that in the endemic area, the threshold to reach the border of clinical malaria is higher than in non-endemic areas (Ademolue, Aniweh, Kusi, & Awandare, 2017).

In this research, the results showed that there were no significant differences in Hb levels. That is because the respondents in this study were healthy populations and did not suffer from chronic diseases. However, in theory, the decrease in Hb levels in malaria infection can be caused by several things, such as: malaria species that infect, number of parasites, duration of infection, and individual immune status (Khan & Zakai, 2014). From the results of this research, researchers can conclude that in certain conditions, individuals who suffer from malaria and live in malaria endemic areas have no differences in Hb levels.

From the average Hb levels, there is a decrease in Hb levels in *P. falciparum* and *P. vivax*-infected patients. Hb levels in *P. falciparum*-infected patients is relatively lower than in *P. vivax*-infected patients. This shows that it is true that in malaria, infection from *Plasmodium* will attack red blood cells which later will make the red blood cell number is low and become anemia (Cox, 2010).

Even though there are many unexplainable complex factors that involve in the progress of anemia during malaria infection, there are several mechanisms that may responsible for malaria, they are; (1) *Plasmodium* which already invades red blood cell will digest the Hb with parasite protease into small fragments and produce hemozoin that later will projects antigenic molecule in red blood cells membrane and in the end the red blood cell will be phagocytized by circulating macrophage. (2) During the *Plasmodium* infection stage, schizont will destroy infected-red blood cell to release merozoites and hemozoin to blood circulation where hemozoin will sediment in uninfected-red blood cell and provoke lipid peroxidation in red blood cell membrane then will lead to cell deformity and hemolysis. (3) Hemozoin deposition in bone marrow shows inhibition of erythropoiesis and change in dyserythropeietic. (4) Hemozoin will increase TNF- α secretion, where pro-inflammatory cytokines like TNF-α have been proven to show the inhibition in all stages of erythropoiesis (Ihekwereme, Esimone, & Nwanegbo, 2014).

The result of this research indicates that there are significant differences in Hb levels in males and females. This due to differences in the direct effects of sex hormones, such as estrogen and androgens. Women have mean levels of approximately 12% lower than men (Murphy, 2014). Hb levels <11.23 g / dL are found in the age

group of 40-49 years, this is because the majority of respondents are the age group above 30 years. Other than that, age can affect the Hb level, where increasing age can decrease clinical protection and cause a greater decrease in Hb levels (Siqueira et al., 2014). Based on population data in 2016, the population of South Central Timor District was 461,681 people, with the majority being the Timorese tribe. This is the reason why this research is dominated by the Timorese tribe (*Provinsi Nusa Tenggara Timur Dalam Angka 2017*, 2017).

The limitation of this research is the data collection that was only done once. To see the difference in Hb levels more significantly, it is necessary to take continuous data collection (cohort study) since with continuous data collection, the pathogenesis of the disease will be clearer to see and also the difference in Hb levels. In this research, Hb tests were conducted by using HemoCue which has variated sensitivity and specificity towards the type of venous or capillary blood sample. This research used capillary blood which based on research has a sensitivity of 56-94.7% and specificity of 80.1-100% (T. Srivastava, Negandhi, Neogi, Sharma, & Saxena, 2014). The use of HemoCue with capillary blood also based on research results in an average value of Hb levels in the blood higher than veins (T. Srivastava et al., 2014; Yadav, Jacob, Ahamed, Mandal, & Kant, 2018). To obtain a better result, the next research may use a tool that has better sensitivity and specificity than HemoCue, for example, an automatic hematology analyzer (T. Srivastava et al., 2014). An automatic hematology analyzer can examine many additional parameters which later may result in more information given (Chhabra, 2018).

This research concludes that the average level of Hb in *P. falciparum*-infected patients is relatively lower than *P. vivax*-infected patients.

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Sonographic Comparison of Segmental Artery Resistive Index With Severity of Hydronephrosis

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Abstract
Background: Hydronephrosis is a major problem and colour doppler ultrasound is very useful to assess the hemodynamics of a diseased kidney, it is a therefore our research comprises sonographic analysis of segmental artery resistive index with the severity of hydronephrosis. Materials and Methods: This was a cross sectional analytical study carried out in Gilani Ultrasound center-Afro-Asian Institute, Lahore, Pakistan. Sixty patients of all ages were enrolled in this study with convenient sampling technique. A total of 60 individuals of all ages, both genders with calculus, masses, pregnant females, benign prostatic hyperplasia, (all the patients having hydronephrosis) were included in the study and individuals with Renal transplanted patients, nephrectomy, non-cooperative patients were excluded. The duration of the study was from December 2018 to October 2019. Toshiba (Xario 200) with convex transducer frequency range 2–5 MHz was used for this study. Age, gender, grade of hydronephrosis, pulsatility index and resistive index of segmental artery were the variables used in this study. Transabdominal scanning technique was used, Data were collected through data collection sheets and was tabulated and analyzed using Statistical Package for the Social Sciences (SPSS) version 24 (SPSS 24, IBM, Armonk, NY, United States of America), Microsoft Excel. Results: According to the results male patients with hydronephrosis (51%) were noted more than female hydronephrotic patients (48%). Mostly seen hydronephrosis grade in our study was mild (60%) while moderate hydronephrosis was (38.3) and severe was (1.7%). In our studies patients with left kidney hydronephrosis (56.7%) were more than that of right kidney hydronephrotic patients (43.3%). CONCLUSION(S): It is concluded that Doppler analysis is very helpful in the diagnosis of severity of hydronephrosis and to give detailed information about the pathophysiology of the hemodynamics of diseased kidney.

Keywords: Cross-Sectional Analytical Study, Pakistan, Hydronephrosis, Renal Stones, Ultrasonography

Introduction

Despite advances in medicine, hydronephrosis is a major problem. Obstruction results in increased pressure within the urinary tract, resulting in changes in morphology and physiology.The natural functioning of kidney comprises the elimination of end metabolic products and excessive quantity of water. In some cases because of

obstruction, the kidney becomes unable to do its work accurately resulting from this, the fluid resides within the kidney. The dilation or swelling of urine collecting system due to building up of urine is known as hydronephrosis. Moreover, the dilation of ureters due to the accumulation of urine is known as hydroureters.[1] During pregnancy, mostly prevalent pathology is the hydronephrosis. As stated by some writers in the third trimester, nearly 80 to 90 percent of females are affected by hydronephrosis,Patients with non-calculus hydronephrosis and hydroureter found that the most prevalent cause of hydronephrosis is pelvic ureteric junction obstruction, accounting for 38% of instances. The second most prevalent cause of benign prostatic hypertrophy is 22%, followed by vesicoureteral (16%), gravid uterus (8%) and retroperitoneal (6%). Other less known causes include urethral stenosis, neurogenic bladder, ureteric stenosis, and bladder outlet obstruction, which accounted for 2% of the remaining instances.[2]The main symptom of hydronephrosis is flank pain.Other symptoms include urinary pain, increased urge or frequency, inadequate urination, incontinence, nausea, and fever. These symptoms depend on the urinary blockage cause and severity.[3] The Society of Fetal Urology (SFU) grading system classified hydronephrosis into five grades. Grade 0 = no hydronephrosis. Grade 1 = dilatation of renal pelvis only. Grade 2 = grade 1 + dilatation of few calyces. Grade 3 = grade 2 + dilatation of all calyces. Grade 4 = grade 3 + thinning of the renal parenchyma.[4] Renal Doppler US offers useful hemodynamic data for multiple renal diseases, including blockage of the urinary tract, renal parenchymal disease, renal vascular disease, and kidney tumor. Ultrasound facilitates the non-invasive assessment of morphological alterations in the structure of the kidney (through B-Mode) and patterns of renal and extrarenal vascularization (through color-Doppler and enhanced contrast ultrasound). The renal resistive index was first shown to be a marker of the beginning and development of renal disease; later the effect of systemic vascular characteristics on the renal resistive index was shown and writers asserted its use as an essential predictor cardiovascular risk rather than of renal damage.[5]According to a study conducted on Sonographic Evaluation of Hydronephrosis in 2015: “Renal ultrasonography has become the standard imaging modality in the investigation of kidneys because it offers excellent anatomic details, requires no special preparation of patients is readily available and does not expose the patient to radiation or contrast agents”. Ultrasound is the best choice for the early investigation of the kidney. It is more sensitive to assess and classify the hydronephrosis and to determine its cause. One of the primary indications for referral to US evaluation of the kidneys is the evaluation of the urinary collecting system.[6] Another study done in 2017 by PetritNuraj, NexhmiHyseni for diagnosis of Obstructive Hydronephrosis with Color Doppler Ultrasound resulted that ultrasound is a simple, non-invasive tool to use, and a fast way to support and diagnose obstructive hydronephrosis. Due to ultrasound’s high sensitivity, it should be used as the first choice for screening method followed by other modalities, if important. Hydronephrosis is mostly seen in male patients with an average age of 55yrs. Urolithiasis is known to be the most common cause of kidney hydronephrosis of II degree. CT scan requires more time, money and exposes the patient to ionizing radiation. This last factor is of particular concern as renal calculi tend to recur and the mutagenic risks of radiation are cumulative in patients who undergo multiple studies.[7]For checking the sensitivity and specificity of ultrasound for the diagnosing purpose of hydronephrosis, 125 patients having normal renal function went through ultrasonography (high-resolution real-time scanning) procedure after urography. The overall result in detecting hydronephrosis was 85.2%, sensitivity was recorded 89.9% and specificity of 84.4%. Based on this result ultrasound should be used for initial testing in case of hydronephrosis. However, if the ultrasound shows simple dilation of nephrons or ureters, urography is still required for the diagnosis of flank pain, type of obstruction, renal dysfunction.[8]Study of RazaSayani in 2011 was conducted to identify the purpose of duplex Doppler ultrasonography (DDU) in patients under an acute unilateral renal obstruction.Persued by intravenous urography (IVU) about 161 patients having urolithiasis were assessed by DDU. Among both kidneys of respective patient mean intra-arterial resistive index (RI) and the difference of mean resistive index were measured, according to the IVU, 51 patients have both normal kidneys and 110 patients have unilateral obstructive kidneys .The mean RI for obstructed kidneys was higher as compared to the mean RI of normal kidneys. The patients with normal kidneys have lower mean delta RI than those patients with unilateral ureteric obstructions respectively. The sensitivity of RI and delta RI were 77.5% and 92.5% with a specificity of 84.3% and 90.1% in patients with complete obstruction. In patients with partial obstruction sensitivity of RI and delta RI were 22.8% and 62.8% with a specificity of 84.3% and 90.1%. As a conventional imaging approach DDU cannot substitute IVU because of rather low sensitivity for the apprehension of partial obstruction.[9] Renal Doppler US provides valuable hemodynamic information in various renal diseases including urinary tract obstruction, renal parenchymal disease, renal vascular disease, and renal tumor.The Doppler resistive index (RI) is a useful parameter for quantifying the alterations in renal blood flow that may occur with hydronephrosis. The intrarenal

resistive index is a physiological parameter that indirectly reflects the degree of resistance in the intrarenal vasculature. This research is therefore intended to know about the R.I of the renal segmental artery with the severity of hydronephrosis.

Materials and Methods

It was a cross sectional analytical study on Sonographic Comparison of Segmental Artery Resistive Index with the Severity of Hydronephrosis. Sixty patients of all ages were enrolled in this study with convenient sampling technique. The study was carried out in Gilani Ultrasound center-Afro-Asian Institute, Lahore, Pakistan. The duration of the study was from December 2018 to October 2019. Convenient sampling technique was used. The individuals of all ages, both genders with calculus, masses, pregnant females, benign prostatic hyperplasia, (all the patients having hydronephrosis). The individuals with Renal transplanted patients, nephrectomy, non-cooperative patientswere excluded from the study. Toshiba (Xario 200) with convex transducer frequency range 2–5 MHz was used for this study. Age, gender, location of hydronephrosis, family history (positive or negative), grade of hydronephrosis, and resistive index of segmental artery were the variables used in this study. Transabdominal scanning technique was used, the patient lie in supine position for the evaluation of urinary bladder and ureters and right lateral decubitus position for the evaluation of left kidney and left lateral decubitus position for the evaluation of right kidney. If needed, ask the patient to inhale or exhale, which allows for subtle movement of the kidney. Liver was used as an acoustic window for the right kidney and spleen for the left kidney. Obtain longitudinal (long axis) and transverse (short axis) views. Patient's history was asked before the scan. If needed, you can have the patient inspire or exhale, which allows for subtle movement of the kidney. Ethical approval was gained prior from the Ethical Committee of the University before study All information and collected data were kept confidential. Participants were remained anonymous throughout the study. The patient was informed that there is no risk or any harmful effect on the procedure of study. They were also informed that they were free to withdraw at any time during the process. Procedure was properly explained, and consent was signed from the patient or patient's legal attendant. Data were collected through data collection sheets and was tabulated and analyzed using Statistical Package for the Social Sciences (SPSS) version 24 (SPSS 24, IBM, Armonk, NY, United States of America), Microsoft Excel.

Result

In this study, we enrolled 60 individuals, all of whom were diagnosed with hydronephrosis, 31 (51.7%) were male and 29 (48.3%) were female Table 1. The minimum age was 8 years out of 60 individuals and the maximum age was 90 years Table 4. More than the other grades of hydronephrosis, 36 (60%) patients had mild, 23 (38.3%) patients had moderate and 1 (1.7%) patient had severe hydronephrosis in 60 patients Table 2. 34 (56.7%) patients were presented with left kidney hydronephrosis and 26 (43.3%) patients were presented with right kidney hydronephrosis Table 3. The mean RI= 0.65 ± 0.102 with a range of 0.47 - 0.86 and the mean PI 1.15 ± 0.358 with a range of 0.66 - 2.22 Table 4. Of 29 female patients, 15 (1.7%) had mild hydronephrosis, 14 (48.3%) had moderate hydronephrosis, and no female patient had severe hydronephrosis Table 5. Out of 31 male patients 21 (67.7%) were with mild hydronephrosis, 9 (29.0%) were with moderate hydronephrosis and 1 (3.2%) was with severe hydronephrosis Table 5. Of 60 patients, 36 patients with mild hydronephrosis had a mean RI of 0.60 ± 0.086, 23 patients with moderate hydronephrosis had a mean RI of 0.72 ± 0.83, and 1 patient with severe hydronephrosis had a mean RI of 0f 0.78 ± 0 Table 6.

Table 1: Gender

		Frequency	Percent
Valid	Female	29	48.3
	Male	31	51.7
	Total	60	100.0

Table 2: Grade of hydronephrosis

		Frequency	Percent
Valid	Mild	36	60.0
	Mode	23	38.3
	Severe	1	1.7
	Total	60	100.0

Table 3: Right/Left kidney

		Frequency	Percent
Valid	Lt	34	56.7
	Rt	26	43.3
	Total	60	100.0

Table 4: Descriptive Statistics

	N	Range	Minimum	Maximum	Mean	Std. Deviation
age	60	82.00	8.00	90.00	39.8333	19.48939
Resistive Index (RI)	60	.39	.47	.86	.6515	.10226
Pulsitility Index (PI):	60	1.56	.66	2.22	1.1510	.35822
Valid N (listwise)	60					

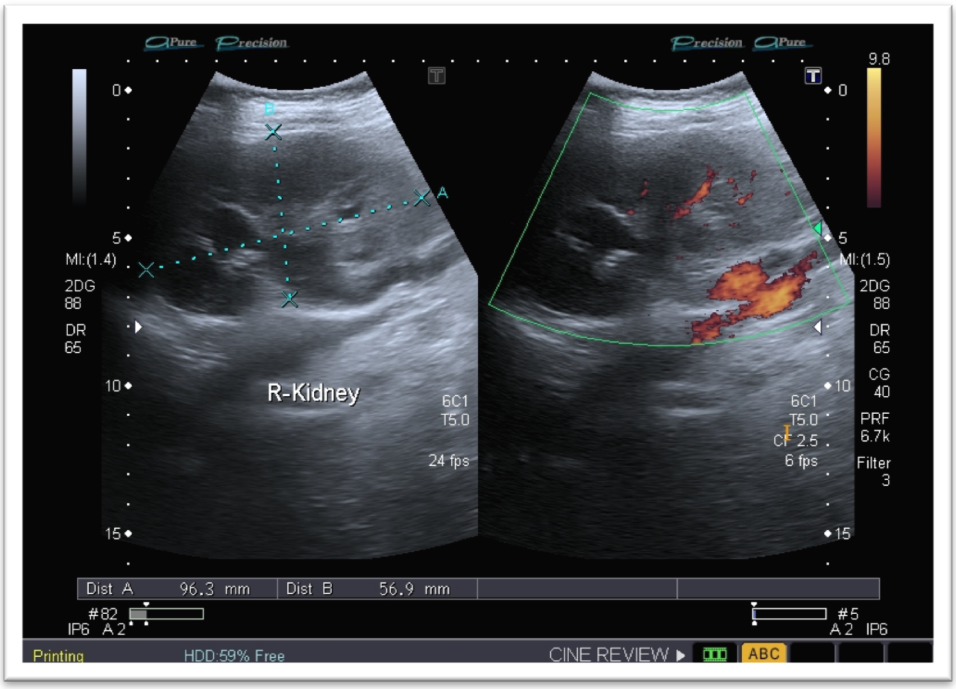
Table 5: Gender * Grade of hydronephrosis: Crosstabulation

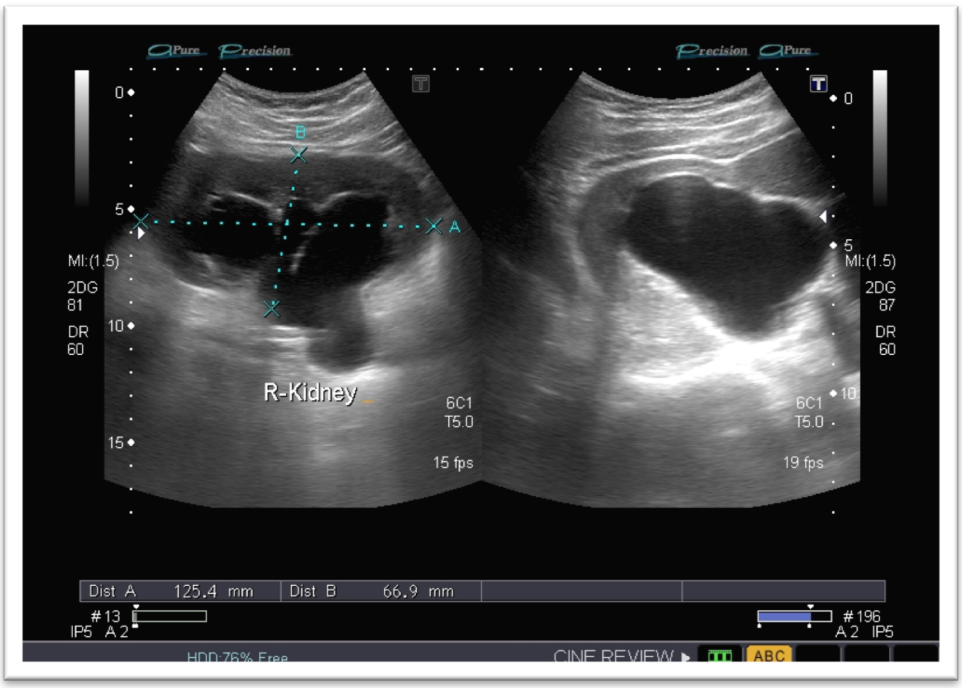
			Grade of hydronephrosis:			
			Mild	Mode	Severe	Total
gender	Female	Count	15	14	0	29
		% within gender	51.7%	48.3%	.0%	100.0%
	Male	Count	21	9	1	31
		% within gender	67.7%	29.0%	3.2%	100.0%
Total		Count	36	23	1	60
		% within gender	60.0%	38.3%	1.7%	100.0%

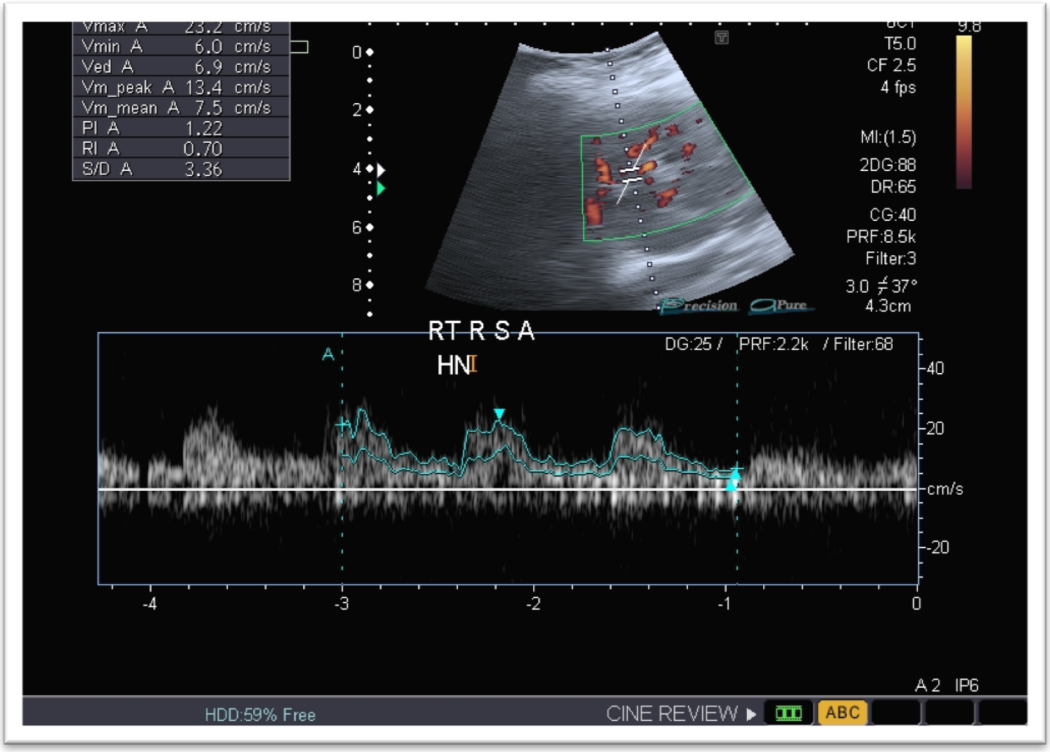
Table 6: Report

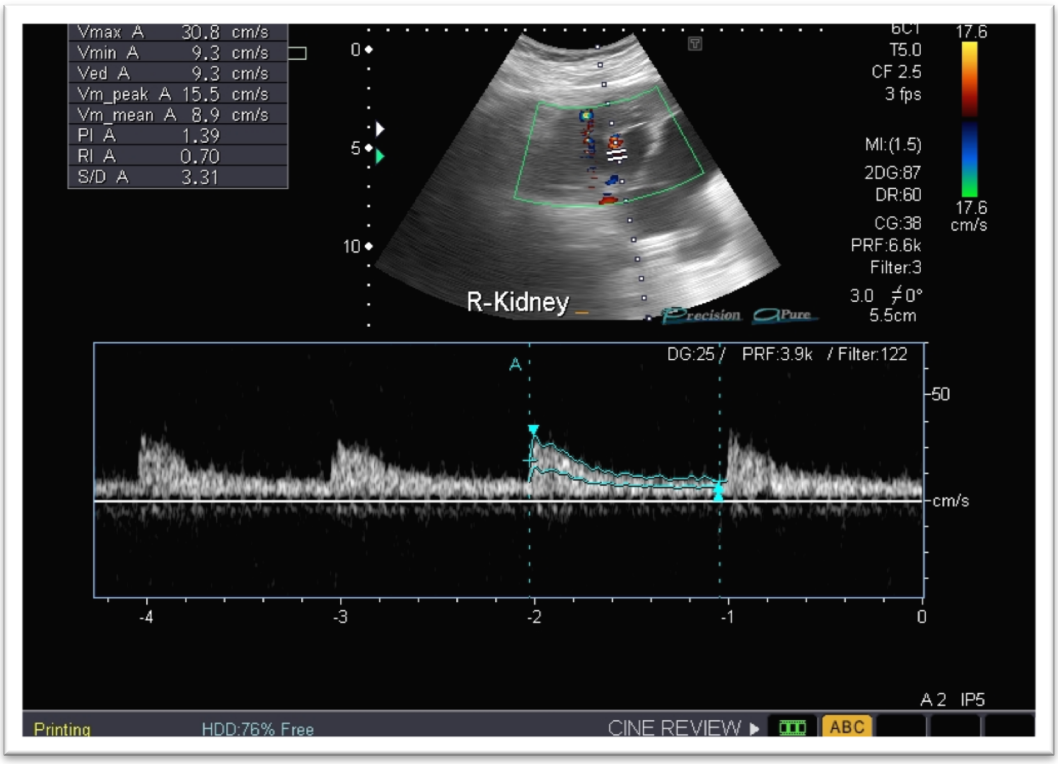
Resistive Index (RI)

Grade of hydrone phrosis:	Mean	N	Std. Deviation
Mild	.6042	36	.08650
Mode	.7200	23	.08257
Severe	.7800	1	.
Total	.6515	60	.10226









Discussion

We started our research on the topic of Sonographic Comparison of Segmental Artery Resistive Index with The Severity of Hydronephrosis because hydronephrosis is very common due to the blockage of urinary tract system and is a cause of flank pain. The cause of hydronephrosis is obstruction in urinary system. Obstruction can occur at the renal pelvic-ureteric unction due to many reasons some of them are mass, benign prostate hyperplasia, pregnancy, stone, etc. Several studies were performed on hydronephrosis. Urolithiasis formation is a common problem and is very common if a patient have a family history of it.[10] Obstruction due to stone is most common.

In a research done by Atar and his fellows, kidney stone prevalence was 8.8%. The prevalence of stone in men was 10.6% relative to 7.1% in women. Kidney stones were more common in overweight than normal-weight individuals (11.2% versus 6.1% , respectively; p<0.001). Obesity and diabetes were closely linked with the history of kidney stones.[11] In another study calcium containing stone were reported most common. The male to female ratio was 2.4:1. An increased tendancy of stone formation was noted in middle aged patients (40-47y).[12] In study by Sultan Abdulwadoud Alshoabi, Ultrasound reports of 210 patients with hydronephrosis were included. Males account for around 67.14% of the sample (67.14% vs. 32.86%). Unilateral hydronephrosis was found in most patients (91.8 percent). The right kidney was more affected than the left (52.7% vs. 41.4%).The sample showed hydronephrosis in grade 2 (58.57%), grade 3 (20%), grade 1 (12.38%) and grade 4 (9.1%) of patients respectively.[13] According to the study of Afshar Zomorrodi, Four factors might play a part in the development of stones within the lower pole of the kidney. Of these, the IPA and infundibulum diameter were more prevalent in the left kidney; therefore, the left kidney could be more engaged in stone disease.[14] Ultrasound imaging is a form of imaging that is non-invasive, low priced and widely available. It can obtain precise medical assessment without radiations in most scenarios of acute and chronic renal obstruction. However, it is a commonly accepted, a very helpful and highly accurate to diagnose hydronephrosis but it is not very effective to determine the cause of obstruction.[15] A study was done to evaluate the importance of Doppler resistive index (RI) ultrasound sampling in distinguishing non-obstructive and obstructive hydronephrosis in kids. Kidney Doppler evaluations of intra-renal renal arteries were conducted on 16 kids (19 kidneys) with maternal hydronephrosis from August 2011 to November 2012. The autonomous t-test was used to evaluate the important difference in RI outcomes between those with obstructive hydronephrosis (6 kidneys) and non-obstructive hydronephrosis (13 kidneys) as calculated by dynamic kidney scintigraphy. The evaluator was screened to the outcomes of the clinical findings and scintigraphy. Between obstructive and non-obstructive hydronephrosis, RI was considerably distinct. Higher RI values were transferred by obstructive hydronephrosis, with a mean RI of 0.78. Mean RI in non-obstructive hydronephrosis was 0.70, and the difference was significant (p <0.05). The sensitivity and specificity of Doppler ultrasound were 100% and 53% respectively. Doppler ultrasound measurement of the resistive index is useful in differentiating obstructive from nonobstructive hydronephrosis and provides an alternative non-ionizing investigation.[16] Piazzese EM, Mazzeo GI researched on 14 October 2012. The objective of this study was to determine whether the renal resistive index (RI) can predict hydronephrosis in patients with renal colic (RC) and whether or not its performance is time-dependent. The study population was composed of 54 patients admitted for unilateral RC. At the time of the first observation, each patient underwent routine examinations, abdominal ultrasonography, and renal color Doppler ultrasound (CDUS) with measurement of the RI. Each patient underwent non-contrast urinary tract CT 48-60 h after admission. A mean renal RI of >0.70 (mRI+) for the symptomatic kidney was considered indicative of obstruction. A mRI+ on CDUS predicted the onset of hydronephrosis with 100% sensitivity, 84% specificity, 92.6% accuracy, PPV and NPV of 87.9% and 100%, and diagnostic efficiency of 84%. [17] In our study male patients with hydronephrosis were noted more (51%) than female hydronephrotic patients (48%). Mostly seen hydronephrosis grade in our study was mild (60%) while moderate hydronephrosis was (38.3) and severe was (1.7%). Age is not related to hydronephrosis as we enrolled patients of all ages.

Clinical significance:
The performed study was clinically significant. Moreover, from the research, it is concluded that segmental artery resistive index can be used as an important tool in sonography for the detection of diseased renal vascular hemodynamics.

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There are no conflicts of interest

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Comparison of Diagnostic Accuracy of Focused Assessment with Sonography for Trauma (FAST) vs Computed Tomography for the Diagnosis of Blunt Torso Trauma

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Abstract
Background: FAST and CT scan are both widely used imaging techniques for diagnosing blunt torso trauma and have their limitaions and advantages. Objective: To evaluate the Accuracy of Focused Assessment with Sonography for Trauma (FAST) vs Computed Tomography for diagnosing Blunt Torso Trauma. Methodology: A cross sectional research which was done in Lahore in emergency department of Mayo hospital and Services hospital. Total 125 participants took part in the study who were victims of blunt torso trauma by road traffic accidents damaging mainly spleen, kidneys, liver, retroperitoneum, bladder and pancreas. FAST scan using Toshiba, Nemio model, Convex probe having a frequency of 3.75 MHz was carried out. Pictures were capture with different abdominal views. CT scan using Toshiba, 16 slice Hitachi and Scenaria, 128 slices was also done on the same population after giving contrast material. Results: Mean age of population under study was 37.87±11.678. FAST scan was administered on all patients and then CT scan was administered. Out of 125 scans 77 FAST positive scans were confirmed and 48 negative scans were confirmed by using CT scan. The values of sensitivity, specificity, ppv and npv of FAST scan were calculated to be 100%, 91.67, 100% and 85.42%. Conclusion: Although FAST is also a very valuable tool, some of the critical injuries that need immediate attention for the patient's life may be overlooked so CT scan is considered the best option for diagnostic accuracy of Blunt torso trauma.

Keywords: Blunt Torso Trauma, Focused Assessment for Sonography with Trauma (FAST), Computed Tomography (CT)

Introduction

Trauma is one of the most commonly reported causes of death in the younger population[1].If we talk about the frequency of trauma, the most commonly injured abdominal organs and structures are the spleen, liver, kidneys, small bowel and/or mesentery, bladder, colon and/or rectum, diaphragm, pancreas, and major vessels[2].The focused assessment of sonography in trauma (FAST) evaluates for free fluid (FF) around the heart and three areas of the abdominal–pelvic cavity[3].Computer tomography (CT) is a non-destructive method based on X-ray absorption that allows visualization of the material's internal microstructure[4].Currently the CT scan is considered as the best method for diagnosing intra-abdominal injury after blunt torso trauma[5].Blunt torso trauma leads to thousands of admissions each year, leading to high expenses for the health care system [6,]The results of blunt abdominal trauma have enhanced over the previous two centuries.The ready accessibility of CT scans also enabled doctors to monitor these patients carefully without unnecessary surgery[7,]Although the ultrasound machines have enhanced resolution, 50% of strong wounds are missed. For more specificity, CT was used in blunt trauma. Ultrasound is mostly considered the best option in the case of initial assessment of blunt abdominal injury[8,] A cross sectional study was done to assess the FAST diagnostic accuracy in patients with blunt torso trauma by using surgical results as the best modality. The study was conducted in a time of six months at the radiology department of a hospital in Multan. The study included 155 patients who were suffering from Blunt abdominal trauma. After the surgery all patients were prepared for FAST scan. The results of the study showed that FAST's sensitivity, specificity, and diagnostic precision were 82.1%, 90.6%, and 83.9%, respectively. It was concluded from the study that FAST was a reliable modality and must be performed in all cases of Blunt torsoTrauma[9].Another study was conducted to find the effectiveness of FAST and CT scan in the diagnosis of Blunt torso trauma. This was a prospective study conducted in a hospital of Faisalabad in a time span of two years between 2016 and end of 2017. The research included patients with blunt abdominal trauma who were stable enough to undergo both USG and CT scans.The results showed that Road accidents are the most prevalent cause of trauma (58.9%), followed by tripping from heights (32.1%). The most commonly injured intra-abdominal organs were liver (73.2%), spleen (51.8%), kidneys (46.4%) and pancreas (12.5%).CT scan was able to identify the existence of hemoperitoneum in 100 percent of patients, while only 83.9 percent of patients were identified by the use of FAST scan. It was concluded from the study that In comparison with FAST, CT scan is a superior imaging instrument to detect Blunt abdominal trauma. However, for CT to be conducted, the patient must be hemodynamicallystable[10].Another research was published for investigation on patients with abdominal injury.The point of this investigation was to assess the part of ultrasound in early finding of intra-abdominal damage following blunt abdominal injury and line up in patients with intra-abdominal damage for identifying late difficulties. 120 patients who introduced to the emergency room were assessed by Focused Assessment in Sonography for Trauma (FAST) and follow-up sonography was done after 12– 24 hrs. This investigation observed FAST to be 93% sensitive and 99% specific. Ultrasonography is viewed as the best methodology in starting assessment of blunt abdominal injury patients as it is noninvasive, easily available, and consuming less time. Ultrasonography is extremely valuable in line up of patients with intra-abdominal injury and reducing the need of CT which is costly, requiring high radiation dose[11].Another research was conducted which focused on assessing accuracy of diagnosis of emergency FAST in the case of torso injuries. It was a cross sectional descriptive study planned over a period of three months. 197 participants were hired for the study including average age of 27 years and SD =11. The overall ratio of male and female participants was 5:1. The specificity of EFAST was 97 percent, sensitivity was 100 percent, NPV was 100 percent and PPV was 87 percent. Completion time of an EFAST scan was 5 minutes on average. 168 which is 85 percent of the patients were scanned for EFAST. 82 (48%) of the participants were discharged on the same day of hospitalization. However, even after two weeks 7(4%) were still hospitalized. The death rate was 18 (9%). It was concluded from the study that EFAST is a reliable technique for the diagnosis of torso injuries in a restricted resource context[12].A descriptive observational study was carried out in Saudi Arabia between september 2016 and 2017. The patients (n=105) who were victims of Blunt torso trauma because of motor vehicles accidents were presented for CT and FAST scans for the identification of free fluid. Results showed that FAST sensitivity was calculated to be 76.1 percent. CI: 95%, 64.14-85.69%), 84.2 percent specificity (95% CI, 68.75-93.98%) and 79 percent precision (95% CI, 70.01-86.38%). In most instances of high-grade strong visceral injuries a focused sonography evaluation for trauma identified free fluid. Close to half of the true negative instances had visceral or other injuries of low grade. The study concluded that FAST is a valid tool for the starting assessments of Blunt

torso trauma with elevated sensitivity and specificity. Low grade solid visceral and other types of injuries are not excluded in a negative FAST scan[13].

Material and Methods

This was a cross sectional analytical study on the Diagnostic Accuracy of Focused Assessment with Sonography for Trauma (FAST) vs Computed Tomography for the Diagnosis of Blunt Torso Trauma. 125 patients who were victims of Blunt torso trauma. The study was carried out in emergency and accident department of Mayo hospital and Services hospital Lahore. The duration of the study was three months after the topic of study was approved. CT scan Toshiba aquilion, 16 slices and Hitachi scenaria 128 slices and Ultrasonography Toshiba Nemio model, convex probe 3.75 MHz were utilized in the current study. All of the patients were subjected to FAST scan initially in FAST scan position spine with four abdominal views the hepato-renal interface (Morrison's pouch) Angle and the right diaphragm, the spleno-renal interface and left diaphragm, Pelvis in both planes - I. Longitudinal II. Transverse, Pericardial: Subxiphoid or intercostal views of the pericardium and Pleura Bilateral: The fifth view is the pleura (bilaterally). After FAST scan CT was conducted in **CT** scan patient position spine. Contrast is given in patients with abdominal injuries. Plain CT scan was done in patients with thoracic injuries. Ethical considerations of the study were insured permission was taken from the higher authorities of hospital. All the information and details obtained from the patients was kept confidential. The subjects were explained in detail their rights related to study as well their right to withdraw from the study any time they wanted. Informed consent was signed by the patients or their guardians. All the statistical analysis was done on 20 Statistical package for social sciences.

Results

Our study included 125 participants and all of them were victims of blunt torso trauma by road accidents, falls and hits. The study included ninety six male (76.8%) participants and twenty nine female (23.2%) participants .The sample consisted of minimum six years of age and maximum fifty-nine years old. Most of the participants who participated in the study were around 37 years with mean age of 37.87±11.678 (table no 2) .As evident from the study most of the participants who were involved in the study had no visceral injury (n=42) 33.6%, followed by (n=32) 25.6% patients with spleen injury, (n=29) 23.2% patients who were victims of liver injury, (n=8) 6.4% with bladder injury, kidney, lungs, large bowel and injury of pancreas respectively as depicted by the (table no 1).The number of positive and negative FAST scans confirmed by the CT scan are also shown in (table no 2). Cross tabulation was conducted to understand the correlation between CT scan and FAST scan results. It is evident from the table that 48 negative FAST scans were confirmed by CT scan with a percentage of 38.4% and 77 positive FAST scans were confirmed with a percentage of 61.6% by the utilization of CT scan after FAST scan on similar population. Various views in which the FAST scans were carried out are mentioned. It is evident from the findings that the highest number of FAST scans were carried out showed no free fluid with (n=48) 38.4%, followed by interaperitoneal view (n=43) 34.4%, Hepatorenal (n=13) 10.4%, pelvic views of scan were (n=8) 6.4%. There were four FAST scans in perihepatic direction, pleural space direction and the Retroperitoneal direction. (n=2) were carried in pleural and splenorenal view. Lowest FAST scans (n=1) were carried out in peritoneal and RIF view (table no 3) it also displays the different views in which CT scans were conducted on the sample population. It can be seen that most of the scans showed no visceral injury (n=40) 32% followed by Laceration view (n=32) 25.6%, (n=29) 23.2% scans of hematoma view, (n=8) 6.4% of Hemorrhage, (n=7) 5.6% contusion and the remaining eight scans were carried out on one or two participants of capsular tear, pleural effusion, density fluid, perinephric fluid, pulmonary laceration and rupture. Overall various organs of the participants were affected when they faced blunt torso injury. The results represented that following values of FAST scan were achieved sensitivity was high 100%. Specificity was calculated to be 91.67 %, positive predictive value was found to be 85.42 % and negative predictive value was calculated 100% (table no 4).

Table 1: Frequencies and percentages of the organs injured of the sample under study

Organs Effected	f	%
Bladder	8	6.4
Kidneys	6	4.8
Liver	29	23.2
Lungs	6	4.8
Pancreas	1	.8
No	42	33.6
Spleen	32	25.6
Large Intestine	1	.8

Note. f=frequency, %=percentages

Table 2

Cross tabulation of positive and negative FAST scans within the positive and negative scans of CT scan

		CT P/N Positive
FAST P/N scan	Negative count within CT P/N	48 38.4 %
	Positive Count within CT P/N	77 61.6 %
Total	Count within CT P/N	125 100 %

Note. FAST=Focused assessment sonographic trauma, CT=Computed tomography, P/N=Positive/Negative

Table 3

Frequencies and percentages of the demographic characteristics of sample

Variable	f	%
FAST		
Hepatorenal	13	10.4
Intraperitoneal	43	34.4
Perihepatic	3	2.4
Pleural space	1	2.5
Retroperitoneal	3	13.3
Spleno renal space	2	1.6
No FF seen	48	38.4
RIF	1	.8
Pleural	2	1.6
Pelvic	8	6.4
Peritoneal	1	.8
CT		
No visceral injury	40	32.0
Pulmonary laceration	1	.8
Capsular tear	2	1.6
Contusion	7	5.6
Density fluid	1	.8
Hematoma	29	23.2

Hemorrhage	8	6.4
Laceration	32	25.6
Perinephric fluid	1	.8
Pleural effusion	2	1.6
Rupture	1	.8

Note. FAST=Focused assessment sonographic trauma, CT=Computed tomography, f=frequency, %=percentage

Table 4

Sensitivity	100%
Specificity	91.67%
NPV	100%
PPV	85.42%

Note. %=percentage, NPV=Negative predictive value, positive predictive value

Discussion

In present study CT scan and FAST were utilized for the assessment of Blunt torso trauma in 125 victims. Most of the participants in current study were males including 76.8 percent of males which is consistent with the previous studies as more men get involved in outdoor activities, road accidents and other blunt injuries because not many females get inadvertent wounds these factors combined leads to more males who are victims of blunt torso trauma[14]. Moreover, it is observed thatinstead of abdominal contrast CT scans, the use of FAST inspection has increased and its function as only imaging tool for blunt torso trauma has also increased. Precise evaluation of subjects with blunt torso trauma is a challenging task for emergency doctor by utilizing FAST method to detect abdominal free fluid is a quick solution that can be used by an affordable, compact unit of sonography during the initial survey.While CT of abdomen is considered the set standard as being best, but it has its drawbacks high expenditure and time, the requirement to move the subject from the emergency department and radiation exposure means that ultrasound can safely replace it, as long as FAST presents high values sensitivity and specificity[15]. Our study shows consistency with previous studies by showing very high values of sensitivity and specificity were obtained 100 percent sensitivity and 91.67 percent specificity. Computed tomography is considered a gold standard for blunt torso trauma as it includes shifting the patient, long time of assessment and also exposes the patient to different types of radiations. As a result, the FAST is increasingly being used in emergency departments and in trauma referral centres because of the workload in emergency as well radiology departments as it can easily be done on bedside. Therefore, the US plays a major part in the classification of victims who may require more procedures for hemodynamic stabilisation[16]. It was congruous in current study as a few patients with critical injuries could not be shifted for CT scanning due to shortage of time so it was preferable to shift the seriously injured patients for treatment procedures directly without undergoing CT scan. Research has shown that road traffic incidents, falls and attacks are responsible for most cases of Blunt torso trauma. The most often damaged organs are liver, spleen, visceral injuries and kidneys in blunt abdominal trauma which is congruous with the findings of our study most of the patients had no visceral injury (n=42), victims with spleen injury (n=32), liver injuries (n=29) showing consistency with previous findings [17]. Current Study also showed high negative and positive predictive values 100% and 85.42% respectively which is congruous with previous studies showing high npv and ppv values as in a recent study conducted in 2019 in which FAST scans were conducted to assess blunt torso trauma and the ppv and npv 90% and 80.5% [18]. In the present study most of the participants were between the age range 25 and 50. It is different from the findings of previous studies where most of the participants were of younger age as they tend to spend life in outdoor areas as compared to older people [16]. In this study it might be that the patients included different people who travelled on motor cycles and had a greater chance of injury and it depends upon the type of vehicle and driving skills. However there were few patients of young as well old age, around sixty as these age groups tend to be dependent upon other figures and are not used to of outdoor experiences that much. Keeping in view the findings of current study and comparing them with previous studies carried around the world in assessing the diagnostic accuracy of FAST scan VS CT scan it is clear that both play a major role in diagnosis of blunt torso trauma and are

increasingly being used in emergency departments, but it is recommended to get the CT scan of the patient done after FAST scan if the patient is stable for confirmation of in depth injuries and more accurate results (as shown in Image 1 and 2)

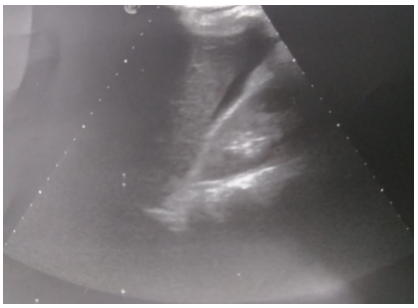

Image 1 :A patient showing free fluid in hepatorenal pouch.

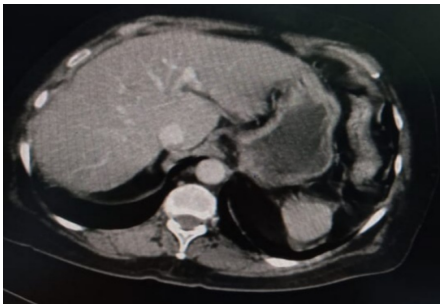

Image 2: Axial CT scan of a patient showing hepatic laceration and and free fluid surrounding liver.

Conclusion

CT scan is a superior diagnostic for the detection of Blunt abdominal trauma compared to USG. Although USG is very valuable tool, it can miss some of the crucial injuries which need immediate attention for the life of the patient. It is therefore recommended that if the patient is stable, all USG should be followed by CT scans.

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The Optimal Volume of Epidural Blood Patch in Treating Post-Dural Puncture Headache: a Mini-Review

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Abstract
Post-dural puncture headache is the major morbidity after intentional or unintentional dural puncture procedure, with CSF leakage and subsequent decrease intracranial pressure. An autologous epidural blood patch remains the most effective treatment and the option after failure of conservative treatment. The optimal blood volume of the epidural blood patch remains indeterminate, range from 5 to 30 mL. This mini-review aimed to review current evidence and literature of the blood volume injected into epidural space with the highest success rate, low repeated epidural blood patch procedure, and low complication rate.

Keywords: Epidural Blood Patch, Headache, Intracranial Hypotension, Cerebrospinal Fluid

Introduction

Dural puncture is a common procedure, intentionally or unintentionally, using a needle passing through the dura mater into subarachnoid space full-filled with CSF. The goals include diagnostic purpose as CSF analysis or therapeutic purpose, for example, spinal anesthesia or lumbar drainage before descending aortic surgery. Unintentional dural puncture is a potential complication of epidural anesthesia and analgesia. The subsequent leakage of CSF fluid sometimes causes post-dural puncture headache (PDPH)(Boonmak & Boonmak, 2010).

PDPH remains the major morbidity of dural puncture and increases the duration of hospitalization. The characteristic of PDPH includes postural in nature, worse on standing and relieving by lying flat. It usually occurred within 48 hours after dural puncture, and usually, resolves spontaneously within days. Differential diagnosis includes tension headache, migraine, caffeine withdrawal headache and furthermore, cerebral pathologies(Thew & Paech, 2008). However, symptoms may persist for days to weeks, causing disability and influence the daily activity. The associated symptoms include nausea, vomiting, hearing impairment and tinnitus.

The pathogenesis, risk factor and the timing of epidural blood patch in PDPH

The possible pathogenesis is thought to relate to dura defect, CSF leakage into epidural space, and the subsequent decrease intracranial pressure. As a result, downward traction of intracranial veins, meninges that are pain-sensitive as well as cranial nerves induces postural related headache (Boonmak & Boonmak, 2010). The theory supports the temporary hearing loss and PDPH after dural puncture (Candido & Stevens, 2003). Sudden drop of intracranial pressure may induce compensatory vasodilation of intracranial vessels, and the subsequent symptoms may similar to vascular headache (Kwak, 2017).

The obstetric population remains a high-risk group of unintentional dural puncture and PDPH because of the young age, gender and the widespread application of epidural anesthesia (Thew & Paech, 2008). In spinal anesthesia and diagnostic dural puncture, reducing the size of the spinal needle had a great impact on lowering the incidence of PDPH (Turnbull & Shepherd, 2003).

The dural puncture and the post-dural puncture headache are both common, an epidural blood patch is used for either prevention or treatment of refractory headache which is a poor response to conservative treatment. A therapeutic epidural blood patch is effective in treating severe PDPH and decrease the intensity of headache (Boonmak & Boonmak, 2010).

The epidural blood injection as the treatment of post-dural puncture headache was described with Gor mLey in 1960 (Crawford, 1980). The theory of the epidural blood patch is that, as the blood injected into the epidural space, will tamponade, clot then occluded the CSF leakage (Turnbull & Shepherd, 2003). The mass effect of the epidural blood patch is short-lived, as the clot degrades after hours of injection, leaving a mature clot over the dorsal part of theca sac. The rapid increase of subarachnoid pressure offers the immediate relief of headache after injection (Turnbull & Shepherd, 2003), but the long-term effect may relate to inflammatory response induced by blood in dura repair at the cellular level (Booth, Pan, Thomas, Harris, & D'Angelo, 2017). The complications of epidural blood patch are rare, including epidural infection, backache, nerve root irritation and lower limb paresthesia (Boonmak & Boonmak, 2010).

The technical aspect of the epidural blood patch remains a matter of debate, including the timing and the optimal blood volume. The USA anesthesiologists are relatively uniform in practice, most respondents usually wait at least 24 hours after symptom onset (Harrington & Schmitt, 2009), and some units only would consider epidural blood patch after the failure of conservative treatment.

The optimal blood volume of the epidural blood patch also remains indeterminate. We aim to review the literature and previous studies to estimate the blood volume of a high success rate, lesser needs of the repeated procedure and low complication rate.

The optimal autologous blood volume of epidural blood patch for PDPH

In 1980, Crawford et al. reported that injection of 6 to 15 mL of autologous blood into epidural space resulted in 70% of the recurrent rate, and 20 to 30 mL of blood is more likely to guarantee success, with success rate of 98% (Crawford, 1980). The prospective investigation in Finland, 1993, allocated the patient with severe PDPH into two groups, either 10 mL or 10-15 mL according to their height. The result showed there is no additional efficacy of the epidural blood volume more than 10 mL (Taivainen, Pitkanen, Tuominen, & Rosenberg, 1993). The following study revealed the average amount of blood spread per spinal segment was 1.6 mL. Thus, the blood volume required for successful epidural blood patch was 14.8 mL, range from 12 to 18 mL, with a mean longitudinal spread of 7 to 14 spinal segments seen in image study (Szeinfeld et al., 1986). Murphy et al. reported the volume of successful epidural blood patch in PDPH ranged from 5 to 25 mL, however, they still recommended to use 20 mL of volume if possible (Tubben, Jain, & Murphy, 2019). In patients with refractory PDPH after intrathecal drug delivery system (IDDS), a large retrospective cohort study also reported an effective epidural blood patch with a mean volume of 18.6 mL, with 80% of successful rate (Bendel et al., 2016).

Complications following autologous epidural blood patch include backache (35%), transient elevated temperature (5%), and neck ache (0.9%) (Candido & Stevens, 2003). The post-epidural blood patch back pain and radicular pain, possibly attribute to direct nerve root irritation or increased pressure of neuraxial canal, revealed no significance between groups of different injected blood volume (Paech, Doherty, Christmas, & Wong, 2011). Bleeding, infection, repeated dural puncture, unintentionally injection of blood into subarachnoid space induced arachnoiditis had been reported (Candido & Stevens, 2003). Long term complications of epidural blood patch are rare.

The optimal autologous blood volume of epidural blood patch in obstetric population

In obstetric patients who suffered from severe PDPH, Chen et al. investigate the analgesic efficacy of two groups. This randomized study compared the 7.5 mL of epidural blood volume with 15 mL. In these 33 Taiwanese women, the smaller blood volume of 7.5 mL shared almost the same efficacy with a larger volume group, and the 7.5 mL group reported fewer symptoms of nerve irritation (Chen et al., 2007). Effectiveness was reported in either 7.5 mL or 15 mL of blood were injected into epidural space in obstetric patients with PDPH (Thew & Paech, 2008). Later in 2011, a randomized and multicenter, blinded trial aimed to compare the three volumes of autologous epidural blood patch in 121 obstetric patients suffered from severe PDPH. Between the group of 15 mL, 20 mL and 30 mL, the incidence of partial or permanent relief of headache was 61%, 73%, and 67%. However, the incidence of permanent relief of headache was highest in the 20 mL group (Paech et al., 2011). In 2017, Booth JL et al. published the retrospective study of 466 epidural patches in 394 patients that mean volume of 20 mL may be adequate, as some patients felt uncomfortable and other neurologic symptoms as larger volume injected into epidural space. Increasing the volume to 30 mL did not reduce the rate of repeated epidural blood patch, as some patients could not tolerate 30 mL of volume (Booth et al., 2017). Injection of 15 to 20 mL of blood or until the patient reported back pain was performed in a large Spain prospective study in an obstetric population with PDPH, and the major morbidity of epidural blood patch was chronic low back pain (Martinez et al., 2018). These findings support the attempt of administration 20 mL of blood into epidural space to treat severe PDPH in obstetric patients.

Conclusion

Autologous epidural blood volume is effective in severe post-dural puncture headache. Smaller volume ranges from 7 to 15 mL resulted in a higher recurrence rate that may need a repeated injection. 20 mL of blood offers 98% of the success rate, and the complications rate between different volume groups showed no significant difference. Volume greater than 20 mL offers no additional advantage, and the patient may not tolerate the transient backache and nerve compression during the large-volume injection. In conclusion, the optimal volume of epidural blood patch is around 20 mL, within the range from a low success rate to a more confident outcome. The further prospective study enrolled more patients is needed to determine the precise blood volume in epidural blood patch in a patient with severe post-dural puncture headache.

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Risk Analysis of Homecare Physiotherapist Work Posture in Stroke Patients with Arm Paralysis

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Abstract
This study will examine to the extent of the homecare-service physiotherapist workload applies the task. This workload can be both physical and mentally which the first could bring greater burden than the latter one. In this discussion, the physical workload will be very much influenced by how good work the methods used or work postures to avoid the risk of illness due to incorrect work methods. The methodology in this study was using observation on the first stage. An observation to the working methods of physiotherapist was done to measure and observe the work posture of physiotherapist. Processing on work position data using REBA was then processed by calculating REBA scores from the working position of the arm therapy. Based on the ergonomic analysis that has been done on work postures, the risk of musculoskletal fatigue can be concluded that the physiotherapist needs to be improved, especially at the level of effort and time requirements of the physiotherapist. Improvement of work posture is needed because the results of the calculation of REBA score show the current work posture has a level of risk.

Keywords: Physiotherapist, Homecare service, Work posture, REBA score, Arm Therapy

1. Introduction

In an effort to cure stroke suffers is need therapy and treatment to restore body function and quality of life of patients (Catherine Woodyard,2011). One type of therapy that needs to be done is motion therapy. This therapy is to restore the muscle strength of stroke patients and is performed on every part of the body affected by a stroke. In its application stroke therapy is carried out by patients with the help and supervision of doctors, nurses or physiotherapists'. However, post stroke rehabilitation therapy so far has been done manually by physiotherapist. The implementation of stroke therapy can be done with homecare services, and it's at the patient's home. This is to make it easier for patients to remember that stroke patients have limited mobility. Stroke therapy with homecare requires the physiotherapist to bring the equipment needed to carry out the therapy and carry out the therapeutic process even though with limited place situations. Physiotherapists in homecare services can treat several patients in one day in a row. This physiotherapist's work can have health impacts both in the short and long term (Niall McGrane, et.al, 2014, Gregory Minnis, 2017). Work done manually and repeatedly can cause fatigue both physically and psychologically (Michael R. Frone and Marie-Cecile O. Tidwell, 2015).

In this study work analysis will be carried out on the physiotherapist in homecare services for stroke patients with arm paralysis. Meanwhile, studies on physiotherapists' workload in the hospital or homecare service had attracted

few interests (Bonnie Lau, et.al, 2016, Renate AMM Kieft, et.al, 2014). This study will examine to the extent of the physiotherapist workload applies the task. This workload can be both physical and mentally which the first could bring greater burden than the latter one. As it is related to a service job could be interfered by fussiness or uncooperative manners between patients and the physiotherapist.

In this discussion, the physical workload will be very much influenced by how good work the methods used or work postures to avoid the risk of illness due to incorrect work methods. According to Pullat (B.Mustafa Pulat, 1992), the risk of illness due to wrong and repetitive work methods will cause Cumulative Trauma Disorder (CTD). At first CTD was studied by researchers in relation to the types of jobs that exist in the industry (Somnath Gangopadhyay,2003, Clifford S. Mitchell MS, MD, MPH, 1996). Recently, the problem is not only studied for jobs in industry but also in all types of work that is done repeatedly (EHS Insight Resources, 2019, Chris Adams, 2018). Mistakes usually occur due to insecurity and comfort in interacting between people and objects or subjects in working or taking action sphere. Investigations will be carried out on physiotherapy workers in delivering their work or service on rehabilitation in cases of arm paralysis due to stroke. It is hoped that this study will get a picture of how the physiotherapy workload in his work at homecare and good work posture in interacting with patients to avoid the risk of illness due to work.

2. Methodology

An observation to the working methods of physiotherapist was done at the beginning of this stage. It observed the implementation of therapy. In addition to visual observation, a brief interview with a physiotherapist was made. It was about the obstacles they experienced in conducting therapy. At this stage data were also collected on physiotherapists and patients who were willing to become research respondents. Observations made by measuring and observing the work posture of the physiotherapist. The observed work position is to focus on the work position on arm movement therapy.

Data analysis was based on physiological physiotherapist conducted using REBA (Mark Middlesworth, 2019). This study was conducted on two physiotherapist respondents. Both physiotherapists are physiotherapists serving homecare service. Both physiotherapists do not want their names to be disclosed. The both profile of the Physiotherapist can be seen in Table 1.

Table 1. Profile physiotherapists

Details	Physiotherapist 1	Physiotherapist 2
Alias	HW	AY
Sex	M	M
Age	42	45
Weight/Height	84 kg /178cm	75 kg /173cm
Numbers of patients	16	10
Numbers of therapy/day Operational hr/day	4-5 3 hr/day	3-4 4 hr/day

Physiotherapists are male and are 42 and 45 years old respectively. The total number of patients in physiotherapist 1 was 16 people and 10 people for physiotherapist 2. All patients have different types and causes of stroke. They are in the range of 17 to 70 years old. In one day, physiotherapist 1 was able to do therapy for 4-5 patients, and physiotherapist 2 is 3-4 patients. Each patient takes therapy 3-4 times a week on average.

Therapy carried out by both physiotherapists was rehabilitation movement therapy for post stroke patients. Movement therapy was performed on the part of the body affected by a stroke. This therapy lasts 30-45 minutes to Adjustment the patient's needs. Movement therapy starts from the most distant limbs of the body such as the fingers and toes. According to interviews and observations, there are 2 types of motion therapy performed, namely

passive and active movement therapy (Evelyn C. Pearce, 2006). Each type of therapy has different goals, as follows:

Passive Motion Therapy

Passive motion therapy is a movement therapy which the patient's movements are fully supported by the physiotherapist. It can be said that the lifting force derived from the physiotherapist. In this type of therapy, the physiotherapist expends more energy to support the weight of the patient's limb. The purpose of this exercise is to reduce the risk and eliminate the patient's muscle stiffness caused by muscle's rarely usage. Muscles that are rarely used can cause muscle shortening and contractures.

Active Motion Therapy

Active motion therapy is a movement therapy in which the patient performs the movements themselves from the body members which are trained. It is different from the passive one where the force to move the patient's limbs is fully from the patient themselves. In this type of therapy, the physiotherapist only gives examples of movements to the patient in conducting therapy. The purpose of this therapy is to increase the muscle strength of the patient so that the muscles are expected to function normally and hold maximum resistance. In the implementation of active motion therapy could increase patient's muscle strength.

Procedure for Therapy Implementation

Before the implementation of the therapeutic movement, the body part to be trained is irradiated using infrared light. The process of warming up aims to relax the muscles and improve blood circulation in the part of the body to be trained (Figure 1). The duration of the warm-up time is 5 to 15 minutes. During the heating process, the physiotherapist provides a light massage to parts of the body. The supporting equipment of this process is a portable infrared lamp. Implementation of Passive Movement Therapy was done by stretching the fingers' muscles. It was derived from the fingers' muscle stiffnes of most of stroke patients. It was done on 2 sets processes in 8 reps. Furthermore, wrist was stretched with abduction and adduction in a same calculation as the previous but per repetition should be in a count of 2 seconds.

Figure 1. Infrared Heating Process

In the elbow, the flexion and extension movements are followed by the shoulder movements using the same counts. In the lower limbs, passive motion therapy starts from the ankle by doing dorsiflexion and plantarflection with 8 repetitions held for 2 seconds and the exercise is done in 2 sets of exercises and followed by flexion and extension movements of the foot with the same number of repetitions. Implementation of Active Movement therapy begins with giving the patient direction to stretch the palm of the hand and then unite each fingertip on both sides of the hand. Each movement in active motion therapy has the same number of repetitions as passive motion therapy. The flick of the wrist is next. Therapy on the elbows and shoulders is done the same as in passive motion therapy but in active motion therapy all movements are carried out independently by the patient and the physiotherapist only gives an example. In the legs, active motion therapy is done by walking exercises for patients accompanied by a physiotherapist.

3. REBA Analysis

REBA analysis is performed at the position of the physiotherapist when performing arm therapy movements. The analysis is carried out by measuring the angle on the part assessed in REBA. Angle measurements are made using a Geniometer. REBA analysis for the implementation of arm therapy for each physiotherapist is described as follows:

a. REBA Analysis for Physiotherapist 1

The position of the Physiotherapist 1 when performing arm therapy can be seen in Figure 2. The angular measurement data when the position of the Physiotherapist 1 arm can be seen in Table 2.

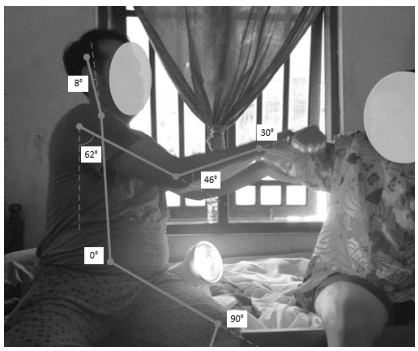

Figure 2. Physiotherapist 1's Posture on Arm Lifting Therapy

Table 2. Physiotherapist 1 Arm Position Data

Body Parts	Details	Adjustmentment
Neck	Forming 8° backward	-
Body	Straight (0°)	Circling
Leg	Balanced (Both feet are on the ground)	Forming 90°
Weight	Less than 5kg	
Upper Arms	Forming 62° upward	Shoulder is lifted
Lower Arms	Forming 46° to the upper arms	
Arms Position	Forming 30°	Bending
Holds	Acceptable	
Activity	16 repetitions in 1 min	

A score was determined for each part of the body based on observation. REBA assessment based on observations can be seen in Table 2. When doing therapy, the physiotherapist's neck position tends to lean backward to form an angle of 8 ° so as to get a score of +2. Physiotherapist's body position is not bent (has an angle of 0 °) ie score +1, plus rotating with a score +1. The total score on body position becomes +2. The foot is balanced with both feet perfectly tread has a score of +1, and sitting position with an angle of 90 ° so that the foot score +2. Total foot score +3. The neck, leg, and body scores were then processed with table A. The position A score on the arm therapy position was 5 (Figure 3.). A score is the sum of position A score plus the load score. Physiotherapist's weight is the patient's arm that weighs less than 5 kg so that the load score is 0 and the A score is 5.

Table A		Neck											
		1				2				3			
	Legs	1	2	3	4	1	2	3	4	1	2	3	4
Trunk Posture Score	1	1	2	3	4	1	2	3	4	3	3	5	6
	2	2	3	4	5	3	4	5	6	4	5	6	7
	3	2	4	5	6	4	5	6	7	5	6	7	8
	4	3	5	6	7	5	6	7	8	6	7	8	9
	5	4	6	7	8	6	7	8	9	7	8	9	9

Figure 3 . Physiotherapist 1 Table A Score Position

Part B was evaluated after the part A. Part B consists of the upper arm, forearm and hand. Position of the upper arm is at an angle of 62 ° and shoulders raised with a score of +3. Forearm position has an angle of 46 ° with a score of +1. The position of the hand has an angle of 30 ° and is bent so the hand's position score is +3. The position score of B is 5 which can be seen in Figure 4. B score is the sum of the position B with the handle score. The position of the handle can be accepted has score of 0, so the score B is 5.

Table B		Lower Arm					
		1			2		
	Wrist	1	2	3	1	2	3
Upper Arm Score	1	1	2	2	1	2	3
	2	1	2	3	2	3	4
	3	3	4	5	4	5	5
	4	4	5	5	5	6	7
	5	6	7	8	7	8	8
	6	7	8	8	8	9	9

Figure 4. Physiotherapist 1 Table B Score Position

Score A and score B are then processed with Table C score which produces a score of 6. The details can be seen in Figure 5.

Score A (score from table A +load/force score)	Table C: Score B, (table B value +coupling score)											
	1	2	3	4	5	6	7	8	9	10	11	12
1	1	1	1	2	3	3	4	5	6	7	7	7
2	1	2	2	3	4	4	5	6	6	7	7	8
3	2	3	3	3	4	5	6	7	7	8	8	8
4	3	4	4	4	5	6	7	8	8	9	9	9
5	4	4	4	5	6	7	8	8	9	9	9	9
6	6	6	6	7	8	8	9	9	10	10	10	10
7	7	7	7	8	9	9	9	10	10	11	11	11
8	8	8	8	9	10	10	10	10	10	11	11	11
9	9	9	9	10	10	10	11	11	11	12	12	12
10	10	10	10	11	11	11	11	12	12	12	12	12
11	11	11	11	11	12	12	12	12	12	12	12	12
12	12	12	12	12	12	12	12	12	12	12	12	12

Figure 5. Physiotherapist 1 Table C Scores

To get a REBA score, a C score is added with an activity score. Arm therapy activities carried out in 2 sets of movements. Each set consists of 8 repetition of movements. 2 sets of movements can be done in 1 minute so that the activity score becomes +1. The REBA score for the arm therapy position is 7.

Table 3. REBA Score on Physiotherapist 1 Arms Therapy

Body Part Position	Details	Adjustment	Score
Neck	Forming 8° backwards	-	2
Body	straight (0°)	Circling	2
Leg	Sit in balance	Forming 90°	3
Position A Score			5
Weight	Less than 5kg		0
Score A			5

Upper arms	Forming 62° upward	Lifted shoulder	4
Lower arms	Forming 46° towards upper arms		1
Hand	Forming 30°	bending	3
Position B Score			5
Holding	Acceptable		0
Score B			5
Score C			6
Activities	16 repetitions in 1 minute		1
REBA Score			**7**

Based on the provisions of the REBA score, the position of stroke arm therapy in Physiotherapist 1 has a moderate risk and immediate changes in work position are needed.

b. REBA Analysis for Physiotherapist 2

Physiotherapist 2 did not agree to do the documentation in the form of photographs, so the REBA analysis data on Physiotherapist 2 was elaborated using the Table which can be seen in Table 4.

Table 4. Data on Physiotherapist Position on Arm Therapy

Body Part Position	Details	Adjustment
Neck	Forming 0° (straight)	-
Body	Forming 24° ke depan	
Leg	Kneel down	Forming >90°
Weight	Less than 5kg	
Upper arms	Forming 48° upward	-
Lower arms	Forming 83° towards upper arms	
Hand	Forming 0° (straight)	

Based on observations made, then a score is determined for each part of the body. REBA assessment based on observations on Physiotherapist 2 can be seen in Table 4.

Physiotherapist neck 2 position was straight with an angle of 0 during the therapy service which scored +1. Physiotherapist body position bent to form an angle of 24 ° forward. That was score +3. The foot is not balanced and score +2. His sitting position formed an angle of more than 90 ° so the foot score is +2. Total foot score +4. The neck, leg, and body scores were then processed with table A. The position A score in the physiotherapist's arm therapy position 2 is 6 (Figure 6.). A score is the sum of position A score plus the load score. Physiotherapist's weight is the patient's arm that weighs less than 5 kg so that the load score is 0 and the A score becomes 6.

Table A		Neck											
		1				2				3			
	Legs	1	2	3	4	1	2	3	4	1	2	3	4
Trunk Posture Score	1	1	2	3	4	1	2	3	4	3	3	5	6
	2	2	3	4	5	3	4	5	6	4	5	6	7
	3	2	4	5	6	4	5	6	7	5	6	7	8
	4	3	5	6	7	5	6	7	8	6	7	8	9
	5	4	6	7	8	6	7	8	9	7	8	9	9

Figure 6. Score Posisi Table A Fisioterapis 2

Part B consists of the upper arm, forearm and hand. The position of the upper arm has an angle of 48 ° and above with a score of +3. The position of the forearm has an angle of 83 ° with a score of +2. Straight hand positions form an angle of 0 ° so that the score of the position of the hand is +1. The position score of B in physiotherapist

2 is 4 which can be seen in Figure 7. B score is the sum of the position B score with the handle score. The position of the handle can be accepted that has a score of 0, so the score B is 5.

Table B		Lower Arm					
		1			2		
	Wrist	1	2	3	1	2	3
Upper Arm Score	1	1	2	2	1	2	3
	2	1	2	3	2	3	4
	3	3	4	5	4	5	5
	4	4	5	5	5	6	7
	5	6	7	8	7	8	8
	6	7	8	8	8	9	9

Figure 7. Score Posisi Table B Fisioterapis 2

Score A and score B in physiotherapist 2 are then processed with Table C score which produces a score of 6. It can be seen in Figure 8.

Score A (score from table A +load/force score)	Table C: Score B, (table B value +coupling score)											
	1	2	3	4	5	6	7	8	9	10	11	12
1	1	1	1	2	3	3	4	5	6	7	7	7
2	1	2	2	3	4	4	5	6	6	7	7	8
3	2	3	3	3	4	5	6	7	7	8	8	8
4	3	4	4	4	5	6	7	8	8	9	9	9
5	4	4	4	5	6	7	8	8	9	9	9	9
6	6	6	6	7	8	8	9	9	10	10	10	10
7	7	7	7	8	9	9	9	10	10	11	11	11
8	8	8	8	9	10	10	10	10	10	11	11	11
9	9	9	9	10	10	10	11	11	11	12	12	12
10	10	10	10	11	11	11	11	12	12	12	12	12
11	11	11	11	11	12	12	12	12	12	12	12	12
12	12	12	12	12	12	12	12	12	12	12	12	12

Figure 8. Score Table C Fisioterapis 2

To get a REBA score need the C score to add with an activity score. Arm therapy activities carried out in 2 sets of movements. Each set consists of 8 repetition of movements. 2 sets of movements can be done in 1 minute so that the activity score becomes +1. The REBA score from the arm therapy position is 8.

Table 5. REBA Scoring on Physiotherapist 2 Arm Therapy

Body Part Position	Details	Adjustment	Score
Neck	Forming 0° (straight)	-	1
Body	Forming 24° ke depan		3
Leg	Kneel down	Forming >90°	4
Position A Score		Position A Score	6
Weight	Less than 5kg		0
Score A		Score A	6
Upper arms	Forming 48° upward	-	3
Lower arms	Forming 83° towards upper arms		2
Hand	Forming 0° (straight)		1

Position B Score		Position B Score	4
Holding	Acceptable		0
Score B		Score B	4
Score C		Score C	7
Activities	16 repetitions in 1 minute		1
REBA Score		REBA Score	8

Based on the REBA score, the position of stroke arm therapy in Physiotherapist 2 has a high risk and changes must be applied in work position.

4. **Discussion**

Based on the ergonomic analysis that has been done on work postures, the risk of musculoskletal fatigue and the workload of the physiotherapist can be concluded that the physiotherapist and mental workload needs to be improved, especially at the level of effort and time requirements of the physiotherapist. Improvement of work posture is needed because the results of the calculation of REBA score show the current work posture has a level of risk. Work improvement also needs to be done based on the mental workload scores which is considerably high level of workload.

It is hoped that improving the work system can reduce the risk of musculoskletal fatigue and mental workload of the physiotherapist. Improvements are made by analyzing the causes of the problems that occur at the first place. Cause and effect analysis is done using fishbone diagrams. The results of mental workload analysis show the type of workload that causes the high mental workload on physiotherapist. It is the level of effort. Proposed improvements are based on the cause of the problems found in the analysis with the fishbone diagram. Proposed improvements can be seen in Table 6.

Table 6. Improvement Ideas Based on Cause - Problems Analysis

Cause-Problems	Improvement Ideas
Improper place for therapy	Establishing standard operational procedures
No standardization on therapy position	
Wrong working posture	
Supporting tools specification does not match with the needs	Designing supporting tools that meets the needs
Immobilized supporting tools	
No fixed schedule from patients	Arranging therapy schedule
Patients numbers	

Proposed Improvement in Establishing Work Posture Standards

Proposed improvement of work posture is given by simulating several work posture alternatives that can be used and also calculating REBA score on each alternative proposal. The proposed improvement to be used is an alternative proposed improvement with the lowest REBA score. Alternative proposals that can be made are arranged with an alternative generation table which can be seen in Table 7.

Table 7. Working Posture Alternatives

Details		Patients	
		Sitting (1)	Laying (2)
Physiotherapist	Sitting (A)	A1	A2

	Standing (B)	B1	B2

The alternatives obtained are up to 4 alternatives, including:
a. Alternative 1 (A1): Sitting physiotherapist - patient sitting
b. Alternative 2 (A2): Sitting physiotherapist - supine patient
c. Alternative 3 (B1): Standing physiotherapist - patient sitting
d. Alternative 4 (B2): Standing physiotherapist - supine patient

a. REBA Proposed Alternative Improvement 1

In this alternative the position of the Physiotherapist is to sit upright on the side of the patient's body and face the patient. The patient's position is sitting straight. Simulation of work posture with alternative 1 can be seen in Figure 9.

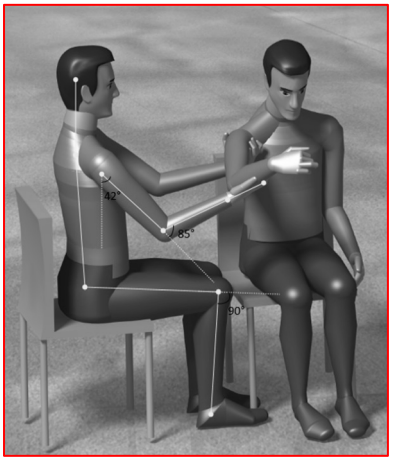

Figure 9. Proposed Work Posture on Alternative 1

Based on the proposed working posture alternative 1 will count the REBA score which can be seen on Table 8.

Table 8. Calculations of REBA Score on Alternative 1

Body Part Position	Details	Adjustment	Score
Neck	Forming 0° (straight)	-	1
Body	Forming 0° (straight)		1
Leg	Sit in balance	Forming 90°	3
Position A Score			3
Weight	Less than 5kg		0
Score A			3
Upper arms	Forming 42° upward	-	2
Lower arms	Forming 85° towards upper arms		1
Hand	Forming 0° (straight)		1
Position B Score			1
Holding	Acceptable		0
Score B			1
Score C			2
Activities	16 repetitions in 1 minute		1
REBA Score			3

REBA score calculation results in alternative work posture 1 is 3 with a low level of risk.

b. REBA Proposed Alternative Improvement 2

In this alternative the position of the physiotherapist is standing on the side of the patient's body and face the patient. The patient's position is laying down. Simulation of work posture with alternative 2 can be seen in Figure 10.

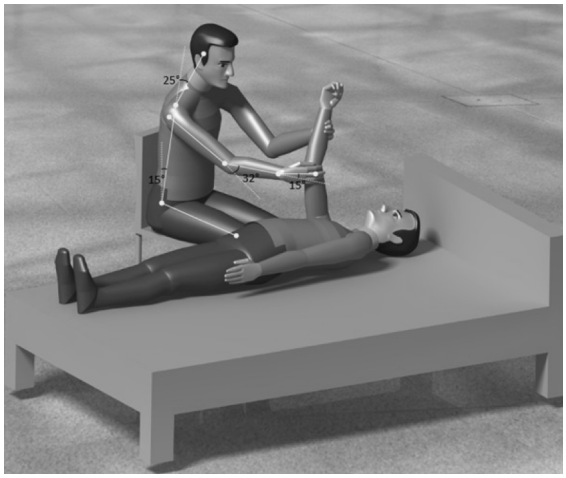

Figure 10. Proposed Work Posture on Alternative 2

The REBA score is calculated based on the work posture on simulation of alternative 2 which can be seen in Table 9.

Table 9. Calculations of REBA Score on Alternative 2

Body Part Position	Details	Adjustment	Score
Neck	Forming 25° (look down)	-	2
Body	Forming 15° (look down)		2
Leg	Sit in balance	Forming 90°	3
Position A Score			5
Weight	Less than 5kg		0
Score A			5
Upper arms	Forming 70° upward		3
Lower arms	Forming 32° towards upper arms		2
Hand	Forming 15° (bending)		1
Position B Score			4
Holding	Acceptable		0
Score B			4
Score C			5
Activities	16 repetitions in 1 minute		1
REBA Score			6

REBA score calculation results in alternative work posture 2 is 6 with a moderate level of risk.

c. REBA Proposed Alternative Improvement 3

In this alternative, the position of the physiotherapist is to stand on the side of the patient's body and face the patient. The patient's position is sitting up straight. Simulation of work posture with alternative 3 can be seen in Figure 11.

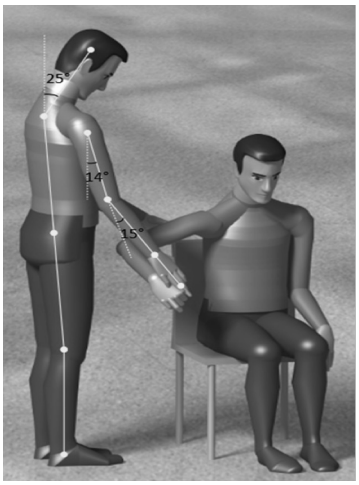

Figure 11. Proposed Working Posture on Alternative 3

The REBA score is calculated based on the work posture simulation of alternative 3 which can be seen in Table 10.

Table 10. REBA Score Calculations on Alternative 3

Body Part Position	Details	Adjustment	Score
Neck	Forming 25° (look down)	-	2
Body	Forming 0° (straight)	Tilting	2
Leg	Steadily standing up		1
Position A Score			3
Weight	Less than 5kg		0
Score A			3
Upper arms	Forming 14° upward	-	1
Lower arms	Forming 15° towards upper arms		2
Hand	Forming 0° (straight)		1
Position B Score			1
Holding	Acceptable		0
Score B			1
Score C			2
Activities	16 repetitions in 1 minute		1
REBA Score			3

The results of the calculation of REBA score on alternative work posture 3 are 3 with a low risk level.

e. REBA Proposed Alternative Improvement 4

The position of the physiotherapist is to stand on the side of the patient's body and face the patient. The patient's position is supine. Simulation of work posture with alternative 4 can be seen in Figure 12.

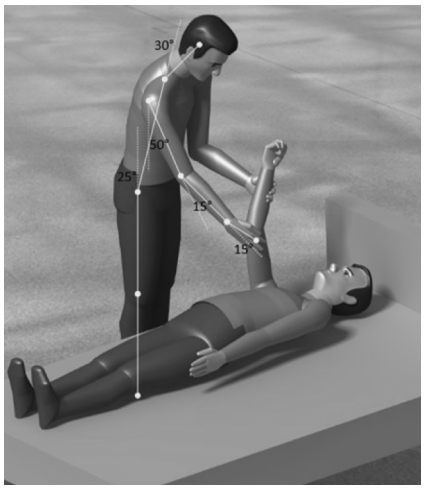

Figure 12. Proposed Working Posture Alternative 4

Based on the work posture simulation of alternative 4, the REBA score calculation is performed which can be seen in Table 11.

Table 11. REBA Score Calculation on Alternative 4

Body Part Position	Details	Adjustment	Score
Neck	Forming 30° (look down)	-	2
Body	Forming 25° (look down)	Tilting	3
Leg	Balanced		1
Position A Score			4
Weight	Less than 5kg		0
Score A			4
Upper arms	Forming 50° upward		3
Lower arms	Forming 15° towards upper arms		2
Hand	Forming 15° (bending)		2
Position B Score			5
Holding	Acceptable		0
Score B			5
Score C			5
Activities	Repetition 16 times in 1 minute		1
REBA Score			6

REBA score calculation results in alternative work posture 4 is 6 with a moderate level of risk. A summary of REBA scores obtained from 4 alternative work posture proposals can be seen in Table 12.

Table 12. Summary of REBA Scores on Alternatives Improvement Proposal

Alternatif	Score REBA
1	3

2	6
3	3
4	6

Alternative work postures that have low scores are found in Alternatives 1 and 3. They are the position of therapy with the patient sitting in a chair, with a REBA score of 3 and a low level of risk. This shows that based on simulations and recalculation of REBA scores, managing work positions in such a way can improve the physiotherapist's work posture and reduce the risk of musculoskletal disorder. Proposed improvements obtained through REBA analysis include:

i. The physiotherapist arranges the work position before taking therapeutic action by preparing chairs for the patient
ii. The position of the patient during the implementation of therapy is sitting in a chair
iii. The position of the Physiotherapist when performing therapy is on the side of the arm to be treated and facing straight to the patient

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Significant Breast Asymmetry in a Twelve Year Old Female Adolescent Secondary to Neonatal Breast Abscess

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Abstract
Introduction: Breast enlargement occurs commonly in term female neonates under the influence of maternal oestrogen. Neonatal mastitis results when there is a superadded bacterial infection on this physiologic neonatal breast enlargement with 50 to 70% of cases progressing to become breast abscess. One of the long term complications of neonatal breast abscess is poorly developed breast during and after puberty. Long term follows up of patients managed for neonatal mastitis and breast abscess is scarce. Case report: We present a 12year old Nigerian female adolescent who presented with underdeveloped right breast following poorly managed neonatal right breast abscess. The hormonal study, Chest X-ray, ultrasonography and clinical examination revealed no other abnormality. The patient was reassured and offered cosmetic measures as a coping strategy while awaiting definitive surgical correction.Conclusion: Underdeveloped and asymmetric breast is a common and traditionally serious long term complication of neonatal mastitis and neonatal abscess.

Keywords:Neonatal, Breast, Mastitis, Abscess, Asymmetry

INTRODUCTION

Approximately 70% of newborn develops varying degrees of breast enlargement due to the effect of transplacentally transferred maternal estrogen on neonatal breast tissue [Amer and Fischer, 2009]. After delivery, prolactin secretion is triggered in the pituitary gland of the newborn by decreasing levels of maternal estrogen in the newborn [Amer and Fischer, 2009; McKiernam and Hull, 1981]. The resultant neonatal prolactinaemia stimulates the newborn breasts to secrete milk (often called witch's milk) in 5 to 20% of neonates[Madlon-Kay, 1986] and this neonatal breast milk resembles maternal milk in concentration of IgA, IgG, lactoferin, lysozyme and lactalbumin [Yap et al., 1980]. Superadded bacterial infection of inadequately let-out or stagnated neonatal breast milk (galactocele) results in neonatal mastitis and breast abscess [Rudoy and Nelson, 1975]. Neonatal

mastitis occurs commonly during the 3rd and 4th week of life in term female neonates, usually affecting only one breast with no side predilection but rarely bilateral in less than 10% of cases[Ruwali and Scolnik, 2012; Stricker et al., 2005]. Staphyloccocus aureus is the commonest isolated organism in more than 60% of cases [Stricker et al., 2005; Faden, 2005] with 50 to 70% of neonatal mastitis progressing to become breast abscess with or without pretreatment [Ruwali and Scolnik, 2012; Stricker et al., 2005; Faden, 2005; Raveenthiran, 2013]. Hospital admission for intravenous antibiotics and surgical treatment is needed in 30 to 60% of affected neonates[Ruwali and Scolnik, 2012; Stricker et al., 2005; Faden, 2005; Raveenthiran, 2013]. Systemic manifestation occurs in 8 to 28% of cases and serious life-threatening systemic complications like cerebral abscess have been documented in the literature [Mahapatra et al., 2001; Manzer, 2001]. Long term follow up of children who had neonatal mastitis or breast abscess is rare hence the relevance of this case report of a 12 year old adolescent presenting with significant breast asymmetry following neonatal breast abscess

CASE PRESENTATION

A 12 year old girl who presented to the children outpatient department with complaints of a very small sized right breast of eight months duration compared to the normally sized left breast for age. Patient noticed progressive development of both breasts ten months before presentation but two months later the right breast was surprisingly observed to have stopped increasing in size compared to the left breast which continued to develop normally. There was no trauma to the breast or abnormal discharge or lumps felt within the breast. She had a right breast swelling during the first one month of life which was managed with hot formentation. This swelling later ruptured to discharge pus for which she was given oral ampiclox by the mother. There is no asymmetry of other body parts. She attained menarche about three months before presentation and bleeds for five days although cycle length is yet to be established. No dysmenorrhea.

Examination revealed a healthy looking girl with normal anthropometry. Breast examination showed a small right breast measuring 8cm by 10.5cm with tanner stage 3 and the left breast measuring 18cm by 15cm in Tanner stage 4 (Figure 1). Pubic hair distribution was Tanner stage 3. Other systems were essentially normal.

Figure 1: Disproportionately small right breast following neonatal right breast abscess

Breast ultrasound showed asymmetry of the breasts with right smaller than the left. The right breast had normal fibroglandular tissue with uniform parenchymal echopattern and significantly reduced volume compared to the left breast. Her chest x-ray and hormonal assay were essentially normal. An assessment of breast asymmetry following neonatal right breast abscess was made. Patient was counseled on diagnosis and cosmetic care by way of padded brassier or use of foam brassier to mask the breast asymmetry when out-door. She was also told of possibility of definitive correction by plastic surgery.

DISCUSSION

Neonatal abscess and its surgical treatment may damage developing breast buds resulting in a serious complication like underdevelopment and asymmetry of the breasts in adolescence and adulthood [Rudoy and Nelson, 1975; Raveenthiran, 2013]. The index patient has breast abscess during neonatal period treated at home with readily available syrup ampiclox and patient appeared to be doing well until she attained puberty and the

previously affected breast was observed to be underdeveloped and the disparity in size and shape was so embarrassing that the girl and her parents had to seek medical attention. It is a common practice in this part of the world to apply hot formentation or manual pressure on physiologically enlarged neonatal breasts to 'force' them back to the normal size; in the process, the neonatal breasts become traumatized, or scalded and many got infected. Some of these babies will eventually need to be admitted and treated for sepsis and other complications. There is often no long term follow up of affected children. This case report will serve as a case study of long term complication of neonatal mastitis and neonatal abscess. Panteli et al [2012] in a 10-15years follow-up study of eight neonates who had neonatal mastitis documented that 7 (87.5%) of them had surgical drainage of neonatal breast abscess, 50% of them had abnormal clinical and/or sonographic examination findings which include: reduced breast size (25%), altered breast texture (50%), and breast asymmetry (13%). There is therefore need for regular education of nursing mothers on proper management of physiologic neonatal breast enlargement, prompt intervention in management of neonatal mastitis/ neonatal breast abscess and long term follow-up of all affected neonates till adolescence and early adulthood for adequate support and holistic management.

CONCLUSION

Underdeveloped and asymmetric breast is a common and traditionally serious long term complication of neonatal mastitis and neonatal abscess. There is an urgent need for regular education of nursing mothers, prompt management of neonatal mastitis and long term follow up of affected neonates.

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The Relationship Between Thyroid Hormones (Thyroxin, Triiodothyronine) and Metabolic Activities of Body: Reviewed

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Abstract
The thyroid gland is located in front of the neck, within the thyroid are small, spherical chambers called follicles. Cells line the walls of the follicles and produce thyroglobulin, the substance from which thyroxine (T4) and triiodothyronine (T3) are made. Thyroxine is usually produced in greater quantity than triiodothyronine, and most thyroxine is eventually converted to triiodothyronine. TH regulates the body's metabolic rate and production of heat. It also maintains blood pressure and promotes normal development and functioning of several organ systems. TH affects cellular metabolism by stimulating protein synthesis, the breakdown of lipids, and the use of glucose for production of ATP. Library Methodology used in this article is Library research, Directly and indirectly Researcher views are discussed. In addition; Research Instruments used in this research are: Fiche card, updated and authentic academic text-books, Journals and articles. answers were sought for the questions from various academic resources. Recent development in basic and clinical investigations has augmented our grasp of the information and science. This review discusses and recognition the thyroid hormones, meanwhile described its relationship with metabolic activities state and some orders.

Keywords: Hormone, Thyroxine, Triiodothyronine, Metabolism

Introduction

Structure of thyroid gland

The thyroid gland located inferior to the larynx, it is composed of two lobes (right, left). Microscopic spherical sacs called thyroid follicles, abasement membrane surrounds each follicle when the follicular cells are inactive, their shape is low cuboidal to squamous, but under the influence, it becomes active in secretion and range from cuboidal to low columnar in shape (Hadad, 2020). Two lobes of thyroid gland secreted hormones such as: thyroxin, which also called tetraiodothyronine (T4), because it contains four atoms of iodine, Triiodothyronine (T3) it contains three atoms of iodine, both them which helps regulated metabolic rate, used oxygen, growth and development cell (Brent, 2000).

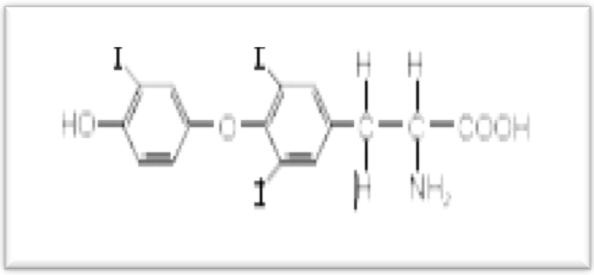


Figure (1:1) : seen triidothronin moelechol . (Tortora Et.al; 2014)

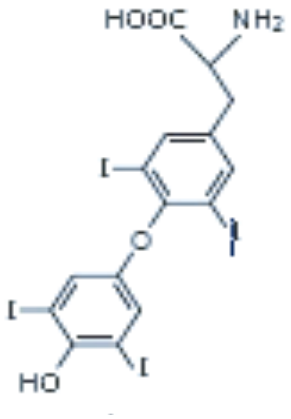


Figure (1 :2) seen thyroxine. (Lodish Et.al; 2016)

Increase of cellular metabolic and thyroid hormones secrete

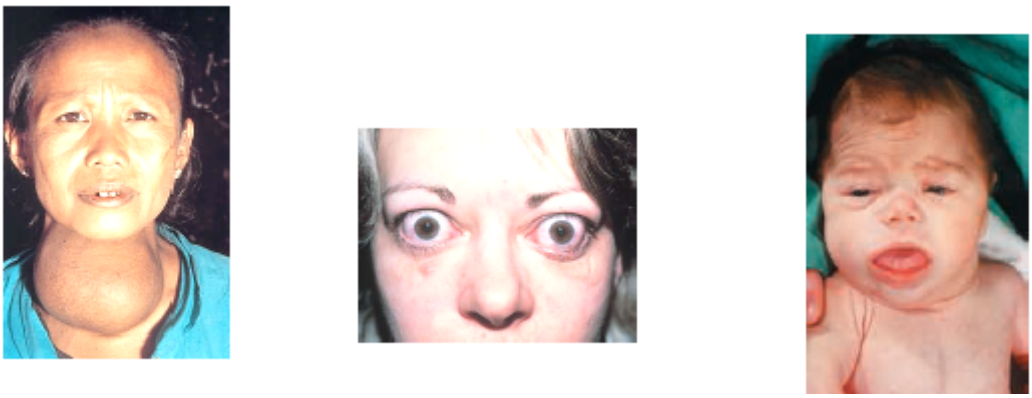
Most parts of body cells have receptors for thyroid hormones (T3, T4), also their effects throughout the organism. While thyroid hormones increase basal metabolic rate (BMR), The rate of oxygen consumption under the standard, rate of nutrition used increase about to produced energy and also increase some of endocrine glands hormones, in addition, mental activities partially motivate and increase hormonic activities in thyroid gland as follow (Reece, et, al,2014).

1. **Increase performance of some mitochondria:** while the rate of thyroxin and triiodothyronine inject the animal, amount mitochondria increase in organism. It increases ATP production in cells, therefore there is a positive strong correlation between mitochondria and cell activities (Harper, 4008).
2. **Thyroid hormones accession and transition of active ions:** a second major effect of thyroid hormones is to stimulus synthesis additional sodium, potassium pumps which used a large amount of ATP to continually sodium ions from the systole into the extracellular fluid and potassium from the extracellular fluid into the systole (Rowland, 2020).
3. **Growth hormones and its relationship with thyroid hormones:** most animals need thyroid hormones for the competition of their life cycle. For instance: humane especially children need thyroid hormones in their growth phase. In hypothyroid patients, the growth speed is very low. Meanwhile, hyperthyroid children gave a high speed of growth and long skeleton than normal ones. In embryonic period disfunction of thyroid hormones can cause lifetime mental deficiency. The most severe impairment of fetal mental and skeletal development known as cretinism, occurs when both mother and fetus have thyroid deficiency (Tortora, et, al, 2014). This tends to occur more often in regions of the world where severe iodine deficiency is a problem. Cretinism also occurs in infants who have little or no thyroid tissue, especially if the hypothyroidism is not recognized very soon after birth. The ability to prevent cretinism by prompt treatment has led to routine screening for hypothyroidism in newborns (Lars, et, al, 1998).
4. **The thyroid hormones effect to mechanism of body:**

- the carbohydrate metabolic instigation: while thyroid hormones are particular stimulus of humans about to metabolic actions, so increase the product of glucose with cells, meanwhile increase the rate of metabolic action about to (glycolysis, insulin secretion, and absorption) (Bernal, 2011).
- The motivation of lipids metabolic by an increase to thyroid hormones: the fatty acid density in cell plasma increase with thyroid hormones, against decrease triglyceride, phospholipid, and cholesterol in plasma. This function becomes fat sediment in the liver. They also increase lipolysis and enhance cholesterol excretion, thus reducing blood cholesterol levels (Johsotne, et, al, 2005).
- thyroid hormones, blood, and kidney correlation: The thyroid hormones enhance some actions of the catecholamines (norepinephrine and epinephrine) because they upregulate beta (*{3*) receptors. For this reason, symptoms of hyperthyroidism include increased heart rate, more forceful heartbeats, and increased blood pressure (Klein and Sara, 2007).

Thyroid Gland Disorders

Thyroid gland disorders affect all major body systems and are among the most common endocrine disorders. Genetic hypothyroidism, hyposecretion of thyroid hormones that is present at birth, has devastating consequences if not treated promptly. Previously termed cretinism, this condition causes severe mental retardation and stunted bone growth (Brent, 2000). At birth, the baby typically is normal because lipid-soluble maternal thyroid hormones crossed the placenta during pregnancy and allowed normal development. Most states require testing of all newborns to ensure adequate thyroid function. If congenital hypothyroidism exists, oral thyroid hormone treatment must be started soon after birth and continued for life. If a pregnant woman produces sufficient TH, many of the symptoms of cretinism do not appear until after birth, when the deficient infant begins to rely solely on her own malfunctioning thyroid gland to supply the needed hormones [31]. Oral doses of TH can prevent cretinism, so most infants in industrialized nations are now tested for proper thyroid function shortly after birth. In the United States, such testing reveals that incomplete development of the thyroid gland occurs in about 1 in every 3000 births (Tortora et, al, 2018). Hypothyroidism during the adult years produces myxedema, which occurs about five times more often in females than in males. A hallmark of this disorder is edema (accumulation of interstitial fluid) that causes the facial tissues to swell and look puffy. A person with myxedema has a slow heart rate, low body temperature, sensitivity to cold, dry hair and skin, muscular weakness, general lethargy, and a tendency to gain weight easily. Because the brain has already reached maturity, mental retardation does not occur, but the person may be less alert (Lars, et, al, 2005).



a: Goiter b: Exothalamous c: cretinsim

Figure (1.3). (Martini; 2018)

Thyroid hormones reduce the symptoms. The most common form of hyperthyroidism is Grave disease, which also occurs seven to ten times more often in females than in males, usually before age 40 (Brent, 2008). Grave disease is an autoimmune disorder in which the person produces antibodies that mimic the action of thyroid-stimulating hormone (TSH). The antibodies continually stimulate the thyroid gland to grow and produce thyroid

hormones. A primary sign is an enlarged thyroid, which may be two to three times its normal size (Flament and Karein, 2013). Graves patients often have a peculiar edema behind the eyes, called exophthalmos, which causes the eyes to protrude Treatment may include surgical removal of part or all of the thyroid gland (thyroidectomy), the use of radioactive iodine (131I) to selectively destroy thyroid tissue, and the use of antithyroid drugs to block synthesis of thyroid hormones hypothyroidism, which means normal secretion of thyroid hormone (Brent, 2008).

Research Methods: Library Methodology used in this article is Library research, Directly and indirectly Researcher views are discussed. In addition; answers were sought for the questions (how is the secretion of T3 and T4 regulated? And what are the physiological effects of thyroid hormones?) from various academic resources Research Instruments used in this research are: Fiche card, updated and authentic academic text-books, Journals and articles.

Results

To consider that thyroxine and triiodothyronine increase almost the majority of body cells, over secretion of hormone increase (BMR) between (60-100). Vis versa as the secretion of hormone stops, BMR decrease in half of its normal. It is shown in the figure of (1:5).

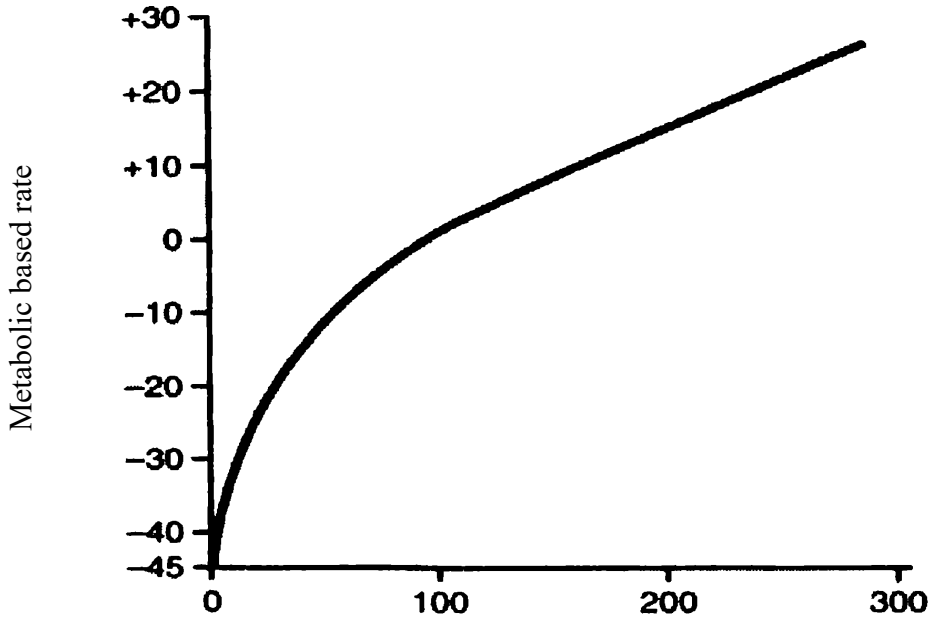


Figure (1:5). (Guyton et al 2011)

To precisely regulate secretion thyroid hormone in every moment it is vital to deep the normal level for body metabolism. To get this goal their ore feedback mechanisms through hypothalamus and hypophysis that they act to set out secretion of thyroid hormones (Huang and Hedely, 2008).

In “Principle of Anatomy and Physiology” author wrote about the summarize the hormones by the thyroid gland control of their secretion, and their principle actions, seen table (1:1).

Table (1:1): Summary of gland thyroid hormones

Hormones sources	Control of sectation	Principle actions
T3 (tridothyronine and T4 (thyroxin or thyroid hormones from follicular cells	Secration is increased by thyrotropin-releasing hormone (TRH), which stimulates the release of thyroid-stimulating hormone (TSH) in response to low thyroid hormone levels, low metabolic rate, cold, pregnancy, and high altitudes; TRH and TSH secration are ingibited in	Increase basal metabolic rate; stimulate the synthesis of protein; increase use of glucose and fatty acids for ATP production; increase lopolysis; enhance cholesterol excretion; accelerate body growth; contribute to the development of the nervous system.

	response to high thyroid hormone levels; high iodine level suppresses T3/T4 secretion.	

Disruption of thyroid hormone production and regulation can result in serious orders. One such disorder reflects the unusual chemical makeup of thyroid hormone, the only tiodine containing molecule synthesized in the body (Jansen, et, al, 2005). hThyroid hormone is actually a pair of very similar molecules derived from the amino acid tyrosine. Triiodothyronine contains three iodine atoms, whereas tetraiodothyronine, or thyroxine (T4), contains four (see figure 1:2).

Conclusion

In human thyroid hormones regulates bioenergetics; helps maintain normal blood pressure, heart rate e deand muscle tone; and regulates digestive and reproductive function. Meanwhile, Thyroid hormones increase **basal metabolic rate (BMR)**, the rate of oxygen consumption under standard or basal conditions (awake, at rest, and fasting), by stimulating the use of cellular oxygen to produce ATP (Braulke, et, al, 2008). When the basal metabolic rate increases, cellular metabolism of carbohydrates, lipids, and proteins increases.

Together with human growth hormone and thyroid hormones accelerate body growth, particularly the growth of the nervous and skeletal systems. Deficiency of thyroid hormones during fetal development, infancy, or childhood causes severe mental retardation and stunted bone growth. A goiter is simply an enlarged thyroid gland. It may be associated with hyperthyroidism (Harvey, et, al, 2002).

Under secretion of TH in adulthood causes myxedema. In some places in the world, dietary iodine intake is inadequate; the resultant low level of thyroid hormone in the blood stimulates secretion of TSH, which causes thyroid gland enlargement (Silva, 2008).

Like other endocrine glands, the thyroid releases these hormones directly into the bloodstream. Each follicle is surrounded by a basket-like network of capillaries, these are supplied by the superior and inferior thyroid arteries The thyroid receives one of the body's highest rates of blood flow per gram of tissue and consequently has a dark reddish-brown color. Thyroid hormone is secreted or inhibited in response to fluctuations in metabolic rate. The brain monitors the body's metabolic rate and stimulates. To ensure adequate blood and oxygen supply to meet this increased metabolic demand, thyroid hormone also raises the respiratory rate, heart rate, and strength of the heartbeat (Bernal, 2011). It stimulates the appetite and accelerates the breakdown of carbohydrates, fats, and protein for fuel. Thyroid hormone also promotes alertness and quicker reflexes; growth hormone secretion; growth of the bones, skin, hair, nails, and teeth; and development of the fetal nervous system (Bernal, 2011).

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A Family History as Dominant Factors Associated with Dysmenorrhea Among Adolescents

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Abstract
Menstrual pain that can be felt like cramps in the lower middle abdomen, pelvic pain, bloated, and nausea. This study aims to determine the dominant factors associated with dysmenorrhea in adolescents. A cross-sectional study was conducted among 177 female students in High School 5 Bekasi, West Java, Indonesia. The multistage sampling method was used to select the subject. Data is collected by anthropometry measurement for weight and height. A self-administered questionnaire for age, physical activity, breakfast habits, family history of dysmenorrhea, menstrual duration, and stress data. Data were analyzed using Chi-square, two-mean difference, correlation, and multiple logistic regression analysis. The result showed that 85.9% of respondents had dysmenorrhea. Significant associations were found between dysmenorrhea and breakfast habits (p = 0.044, OR = 1.3), and family history of dysmenorrhea (p = <0.001, OR = 6.8). The conclusion of this study family history of dysmenorrhea was the dominant determinant for dysmenorrhea among adolescents (OR=6.80) after controlling age of menarche and brekfast habits.

Keywords: Adolescents, Breakfast Habits, Dysmenorrhea, Family History

1. Introduction

Dysmenorrhea, which is pain that occurs during menstruation, can have an impact on the quality of life of individuals who experience it (Unsal et al 2010). Dysmenorrhea which is common in the age of 15-17 years can affect the performance and attendance of students in the school (Derseh et al 2017). Dysmenorrhea disrupts student school activities, including in the process of learning, school attendance, and academic performance. Individuals with severe dysmenorrhea have more absent classes than individuals with mild and no dysmenorrhea (Abd-El-Mawgod et al 2016, Al-Jefout et al 2015). Based on the results of a systematic review conducted by Latthe et al 2006, the prevalence of dysmenorrhea in women aged 10-20 years worldwide was 94%. Research in Iran shows the prevalence of dysmenorrhea in high school students is 67% (Kharaghani &Damghanian 2016)

and in Malaysia, it is 74.5% (Wong & KHO 2010). The results of the study in Surabaya (Indonesia) showed the prevalence of primary dysmenorrhea in adolescent girls aged 14-19 years around 54.9% (Mahmudiono 2011).

Various factors affect dysmenorrhea. The prevalence of dysmenorrhea is more prevalent in adolescents whose nutritional status is lacking (Chauhan & Kala 2012, Ju et al 2015). In addition to nutritional status, menarche age and physical activity also affect the incidence of dysmenorrhea (Khodakarakami et al 2015, Kazama 2015, Mahvash et al 2015). Based on the research of Fujiwara dysmenorrhea it is also influenced by breakfast habits. The group who breakfasted 0-3 times per week tended to have dysmenorrhea with higher severity than the group that ate 4-7 times a week (Fujiwara et al 2009). According to Kural et al 2015 individuals who have a family history of dysmenorrhea are three times more likely to develop dysmenorrhea. The characteristics of other individuals that influence the incidence of dysmenorrhea are the duration of menstruation. Students with abnormal periods of menstruation or more than 7 days experience dysmenorrhea (Proverawati 2009). Stress is known to be one of the risk factors for dysmenorrhea. Women with higher stress levels are more at risk for dysmenorrhea (Kordi et al 2013, Wang 2004). Dysmenorrhea is still a problem that is often suffered by young women, can affect the daily activities of adolescents, and can even cause the individual to be absent from school activities. The prevalence of dysmenorrhea in adolescents in Indonesia is quite high. This study aims to determine the determinants factors of dysmenorrhea.

2. Subject and Methods

This research is a quantitative study with cross-sectional study design. As the dependent variable is dysmenorrhea, while the independent variables are nutritional status, menarche age, physical activity, breakfast habits, family history of dysmenorrhea, menstrual period, and stress. The research is located at High School 5 Bekasi District, West Java Province, Indonesia and conducted in June 2018. The target population of all active female students for the 2017/2018 school year. The number of samples in this study was 177 samples consisting of 10th and 11th-grade students. The inclusion criteria were menstruation, active students in the 2017/2018 school year, and were willing to become respondents. The sample size calculated by hypothesis tests for a population proportion (two-sided) was carried out by the simple size determination software (Lemeshow and Lwanga, 1997). It is used $\alpha = 5\%$ and $\beta = 20\%$. Data collection was carried out by filling out questionnaires including data on dysmenorrhea, age of menarche, physical activity, breakfast habits, family history, duration of menstruation, and stress. Data on body weight and height as an indicator of nutritional status obtained through anthropometric measurements using a digital weight scale Seca has an accuracy of 0.1 kg and *microtoice* for height measurements having an accuracy of 0.1 cm.

Data on dysmenorrhea were obtained through filling in a modified questionnaire from the Women's Health Questionnaire and the Dysmenorrhea Assessment Questionnaire (Girod 2006, Right Diagnosis 2018). Data on physical activity through the Physical Activity Questionnaire for Adolescents (PAQ-A) questionnaire and stress using the Perceived Stress Scale 10 (PSS-10) questionnaire (Kowalski et al 2004, Cohen et al 1983). Data were analyzed by univariate, bivariate by Chi-square, two different mean tests, correlation analysis, and multivariate entering method multiple logistic regression analysis. A p-value of less than 0.05 was considered statistically significant. The data were analyzed using SPSS version 16.

3. Ethical Considerations

Ethical clearance was obtained from The Research and Community Engagement Ethical Committee Faculty of Public Health Universitas Indonesia (Ethical Approval: No.22 /UN2.F10/PPM.00.02/2018). Written informed consent was obtained from the parents of subjects. Furthermore, they were informed about the possibility to leave the study at any stage of the research.

4. Results

The frequency distribution of various characteristic subject is presented in Table 1. The prevalence of dysmenorrhea in adolescents is 85.9% and 48% of these groups state that their daily activities are disrupted due to dysmenorrhea. As many as 31.1% of respondents have obese nutritional status. The average age menarche of

respondents is 12.1 ± 1.15 years. The physical activity of the respondents showed 45.2% had low physical activity. The median frequency of the respondent's breakfast is five times a week and 51.4% of respondents had a history of dysmenorrhea in the family. Further, 25.4% of respondents have abnormal menstrual periods and the duration of menstruation has variation 3-18 days. The stress level of respondents showed 83.1% had moderate stress.

Table 1. Frequency distribution of the characteristics subject

Variables	Amount (n)	Percentage (%)
Dysmenorrhea (n = 177)		
Dysmenorrhea	152	85.9
Not dysmenorrhea	25	14.1
Pain level (n = 152)		
Low (1-3)	49	32.2
Moderate (4-6)	83	54.6
Severe (7-10)	20	13.2
Activity		
Disrupted	73	48.0
Difficulties in studying	58	78.4
Staying at school clinic	7	9.5
Absent from school	7	9.5
Nearly fainted	2	2.7
Not disrupted	79	52.0
Nutrition status (n = 175)		
Normal	120	68.6
Overweight	55	31.4
Physical activities (n = 177)		
Low	80	45.2
Moderate	84	47.5
High	13	7.3
Family history of dysmenorrhea (n = 177)		
Yes	91	51.4
No	186	48.6
Menstrual duration (n = 177)		
3-7 days	132	74.6
> 7 days	45	25.4
Stress (n = 177)		
Low stress	23	12.9
Moderate stress	147	83.1
Severe stress	7	4.0

Variables of the dysmenorrhea pain scale, nutritional status, physical activity, menstrual duration, and stress are categorized as listed in Table 2 were analyzed by Chi-square. A family history of dysmenorrhea has a significant relationship with dysmenorrhea ($p < 0.0001$). While for numerical variables as menarche age, breakfast habits, and stress were analyzed by two mean different tests is presented in Table 3. The results of the study show that there are no different means of stress variables and nutritional status but mean breakfast habits different at the dysmenorrhea and not dysmenorrhea groups ($p=0.044$).

Table 2. Chi-square analysis for categoric variables

Variables	Dysmenorrhea				Total		OR (95% CI)	*p value*
	Dysmenorrhea		Not dysmenorrhea					
	N	%	n	%	n	%		
Nutrition status								
Overweight	51	92.7	4	7.3	55	100	2.70	0.118
Normal	99	82.5	21	17.1	120	100		
Physical activities								
Low	70	87.5	10	12.5	80	100	1.28	0.853
Moderate	82	84.5	15	15.5	84	100		
Family history								
Yes	87	95.6	4	4.4	91	100	7.0	< 0.001*
No	65	75.6	21	24.4	86	100	(2.3-21.1)	

*Statistically significant (p<0.05)

Table 3. Independent t-test analysis for numeric variables

Variabel	N	Mean	Median	*p value*
Age of menarche				
Dysmenorrhea	152	12.04	11.99	0.063
Not dysmenorrhea	25	12.50	12.47	
Breakfast habits				
Dysmenorrhea	152	4.27	4	0.044*
No Dysmenorrhea	25	5.6	6	
Stress				
Dysmenorrhea	152	18.37	18	0.729
Not dysmenorrhea	25	18.72	18	

*statistically significant (p< 0.05)

After being tested bivariate, the significant variables were tested multivariate by logistic regression analysis. The results of multivariate modeling are presented in Table 4. Based on the final modeling it is known that the variable has the highest OR against the incidence of dysmenorrhea is a history of family dysmenorrhea (OR=6.80). Thus the dominant factor associated with dysmenorrhea is a family history after controlled age of menarche and breakfast habits.

Table 4. Logistic regression Analysis

Variable	p-value	OR	95% CI
Age of menarche	0.137	1.36	0.908-2.025
Breakfast habits	0.017	1.30	1.047-1.607
Family history of dysmenorrhea	0.001	6.80	2.184-21.173

5. Discussion

Based on the results of research on adolescents, the prevalence of dysmenorrhea was 85.9%. The high prevalence of dysmenorrhea shows that it is a common problem in adolescents. The prevalence of this study is higher than the prevalence of adolescent dysmenorrhea in Surabaya 54.89% (Mahmudiono 2011). More than three-quarters of respondents reported that they had difficulty learning, had to rest, not go to school, and felt almost faint when they experienced dysmenorrhea. These results are in line with previous studies that dysmenorrhea can disrupt student activities in schools as well as student learning activities, academic performance, learning processes, and attendance at school (Derseh et al 2017, Abd El-Mawgod et al 2016).

As many as 31.4% of respondents were overweight and most had dysmenorrhea. Based on bivariate tests, there was no significant relationship between nutritional status and dysmenorrhea. The results of the study are in line with research by Kazama et al 2015 which states there is no significant relationship between BMI and dysmenorrhea in adolescents. The results of this study are not in line with the results of the study of Ju et al 2015 which states that there is a significant relationship between dysmenorrhea and malnutrition and more. Differences in results may be caused by differences in the definition of dysmenorrhea and nutritional status indicators used. According to Ju et al respondents were said to be dysmenorrhea if several times or often experience pain, while respondents who rarely experience menstrual pain are considered not dysmenorrhea. The assumption from the research results that are not significant because the prevalence of dysmenorrhea at the study site is high (85.9%), so it tends to be homogeneous. More samples are needed to be able to detect differences in the proportion of dysmenorrhea in each nutritional status group (Filho et al., 2013).

The average age of the respondent's menarche was 12.11 ± 1.15 years. That is younger if be compare the results of the study by Batubara et al 2010 in women Indonesia which is 12.96 years and Amaliah et al 2012 amounting to 12.4 ± 1.08. This condition shows that as time changes, teens experience menarche at an increasingly young age. These results support Sohn's theory that there is a trend of decreasing age of menarche in developing countries since the 20th century (Sohn 2015). Based on the results of the independent t-test between menarche age and dysmenorrhea, the p-value of 0.043 was obtained. The results of this study indicate that there are differences in the average age of menarche between the dysmenorrhea and non-dysmenorrhea groups. The group of dysmenorrhea has a younger menarche age of 12.04 years compared with non-dysmenorrhea of 12.50 years. The results of the study are in line with the research by Kural et al 2015. This mechanism can be explained because women who menarche faster tend to be more and longer exposed to prostaglandin, so it is more likely to experience dysmenorrhea (Charu et al 2012). However, the exact mechanism underlying the relationship between menarche age and dysmenorrhea needs further investigation.

Almost 45.2% of respondents have a low level of activity, while 54.8% of respondents have a moderate level of physical activity. Based on the results of the bivariate test in Table 2, the value of p 0.853, so that the two variables are not significantly related. These results are in line with studies that state no significant association between physical activity and dysmenorrhea (Faramarzi & Salmalian 2014, Kamel et a. 2017). However, these results are not in line with the research by Mahvash et al, 2015 and Kazama et al 2012. There is a tendency for the risk of dysmenorrhea in a group of adolescents who had low physical activity. This can be explained through hormonal mechanisms when a person is physically active. Physical activity is known to increase endorphins in the blood. These hormones can reduce pain so that pain during menstruation can be reduced (Karoly &Yensen 1987). In addition, endorphins can also increase pain thresholds. This causes a person to be more resistant to pain and not quickly perceive that feeling as pain (Mahvash et al. 2012). The results of this study are not significant and assumed. to be the level of physical activity of respondents who tend to be homogeneous. PAQ-A is used to assess the level of physical activity through daily activities, both at school and outside of school. The questionnaire can only describe the general measure of physical activity carried out. The questionnaire cannot describe specific information about expenditure energy, frequency, time, and intensity of one's physical activity. The results obtained from the questionnaire tend to be homogeneous.

The distribution of breakfast habit data is not normal therefore the Mann-Whitney nonparametric test was conducted. It was found that there was a significant difference in the median breakfast frequency between the dysmenorrhea and non-dysmenorrhea groups. Median breakfast in the dysmenorrhea group 4, meanwhile the median group not - dysmenorrhea was 6. The results of the study were in line with the research of Fujiwara and Fujiwara et al which states that there is a significant relationship between breakfast habits and dysmenorrhea (Fujiwara et al 2009, Fujiwara 2003). The Fujiwara study found that the level of pain in dysmenorrhea was higher in the breakfast group compared to breakfast several times and every day of the week. The results of this study are not in line with some previous studies that did not find any relationship between breakfast and dysmenorrhea (Khodakarakami et al 2015, Faramazi &Salmalian 2014). The relationship between breakfast and dysmenorrhea can be explained by the mechanism of the sympathetic and sympathetic nerves that mediate pain during menstruation. The group of women who skip breakfast will experience deficiencies in certain nutrients due to incomplete frequency of eating a day (Fujiwara 2003). Nutritional deficiencies can cause the

hypothalamic-pituitary-ovarian axis to be disrupted. These disorders can trigger the production of excess prostaglandin during menstruation to cause pain (Dawood 1990).

The prevalence of respondents had a family history of dysmenorrhea is 85.9% and the majority of respondents experienced dysmenorrhea (95.6%). Based on the results of the Chi-square test, a p-value of <0.001 means that there is a significant relationship between family history and dysmenorrhea. Odds Ratio value was obtained at 7 that meaning the group with a family history of dysmenorrhea was 7 times more likely to experience dysmenorrhea than the group with no family dysmenorrhea history. The results of this study are supported by previous studies (Ju et al 2014, Pejcic & Jokovic 2016, Aher & Rajole 2016). The relationship between family history and dysmenorrhea can be explained through two theories, namely genetic and behavioral. Based on the genetic theory, the severity of dysmenorrhea pain is affected by chromosome 1p13.2 which is close to the locus nerve growth factor (NGF). NGF acts as a mediator of the inflammatory response and can increase the body's sensitivity to pain (Sanctis et al. 2016). Silberg et al 1987 state that there is a genetic influence in the incidence of dysmenorrhea that occurs in monozygotic and dizygotic twins. Based on behavioral theory, the risk of individuals with a family history of dysmenorrhea to experience dysmenorrhea can also be caused by the similarity of behavior and learning processes that the child does to his mother. This causes similarities to the perception of pain during menstruation between mother and child (Jones et al 2016).

As many as 25.4% of respondents experienced the duration of abnormal menstruation, more than 7 days. Most 91.1% of these groups experienced dysmenorrhea, as respondents from their menstrual group normal. Chi-square test results showed no significant relationship between menstruation and dysmenorrhea (p = 0.385). These non-significant results are in line with the research in Japan (Nagata et al 2005). Other results suggest a relationship between the duration of menstruation and dysmenorrhea. There was a tendency in the duration of menstruation groups to experience abnormal dysmenorrhea compared to the normal duration group, although the difference in proportions did not differ statistically. The tendency of the risk of dysmenorrhea in the group of an abnormal duration of duration may be due to excessive exposure of prostaglandin to the uterus (Unsal et al 2010, Fujiwara 2003).

Two different mean test results obtained a p-value of 0.729, meaning that there was no significant difference in mean stress levels in the dysmenorrhea and non-dysmenorrhea groups. The results of this study are in line with th, e research of Maryam et al 2016 which states that there is no relationship between stress severity with menstrual pain. While the dysmenorrhea group found a relationship between stress levels and the severity of dysmenorrhea. Several other studies differ from the results of this study which found a significant relationship between stress and dysmenorrhea on the results of the correlation test between stress and dysmenorrhea pain, a statistically significant relationship was found p-value 0.025. The correlation value obtained by 0.181. These results indicate that the higher a person's stress level, the higher the scale of pain dysmenorrhea she feels. This can be explained by the mechanism of stress and the neuroendocrine response in a person's body. When a person experiences stress, Corticotrophin Releasing Hormone (CRH) will trigger the secretion of Adrenocorticotrophic Hormone (ACTH) from the pituitary. These hormones are the main regulator of the stress response in the human body. ACTH produced will trigger cortisol secretion from the adrenal gland (Wadhwa 1996). Secretions that occur in the adrenal gland will affect the concentration of prostaglandins in the myometrium (Austin &Leader 2000).

6. Conclusion

The prevalence of dysmenorrhea in adolescents is 85.9%, the average age of menarche is 12.1 ± 1.15 years and breakfast habits are five times a week. There is a significant relationship between breakfast habits and a history of family dysmenorrhea with the incidence of dysmenorrhea. The dysmenorrhea group had a lower frequency of breakfast per week than the non-dysmenorrhea group. Adolescents who have a family history of dysmenorrhea are 7 times more likely to experience dysmenorrhea compared to adolescents who have no family history of dysmenorrhea. The dominant factor associated with dysmenorrhea among adolescents is a history of family dysmenorrhea after controlling age menarche and breakfast habit.

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Combination Therapy with TACE and Microwave Ablation to Increase Efficacy of Hepatocellular Carcinoma Treatment

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Abstract
To evaluate efficacy of microwave ablation (MWA) combined with conventional transarterial chemoembolization (cTACE) simultaneously or vice versa for the treatment of large hepatocellular carcinoma (HCC). Study was done from March 2017 and February 2019 and a total number of 66 patients with large hepatocellular carcinoma received TACE and ultrasound-guided percutaneous MWA combined with simultaneous TACE. Patients with primary liver cancer aged from 18-80 years, and life expectancy longer than three months were included. Ablation with different techniques were used along with standard doxorubicin TACE. As result, it was concluded that the combined treatment model is superior to single TACE.

Keywords: Hepatocellular Carcinoma, Microwave Ablation, Transarterial Chemoembolization

Purpose
To validate the efficacy of microwave ablation (MWA) combined with conventional transarterial chemoembolization (cTACE) simultaneously or vice versa for the treatment of large hepatocellular carcinoma (HCC).

MATERIALS AND METHODS

- From March 2017 and February 2019, a total number of 66 patients with large hepatocellular carcinoma received TACE (N=33) or ultrasound-guided percutaneous MWA combined with simultaneous TACE (N=32). One case was deferred.
- This prospective selected study was discussed in detail and approved by our hospital Ethics Committee.
- This specific treatment procedure of combination therapy was done on digital subtraction angiography (DSA) for TACE, followed percutaneous MWA (Microwave ablation) under ultrasound But in some cases we reversed the pattern with MWA first followed by TACE.,

1. **Imaging examinations:**
   Multiphasic CT or Multiphasic MRI imaging
2. **laboratory tests:**

Alpha-fetoprotein (AFP) levels (which were conducted after 6-8 weeks following procedure and every 8-12 weeks thereafter)

3. **According to the modified Response Evaluation Criteria in Solid Tumors (m-RECIST), The tumor response:**
   ⑴ Complete Response (CR)
   ⑵ Partial Response (PR)
   ⑶Stable Disease (SD)
   ⑷Progressive Disease (PD)

Local residual or recurrence is defined as the presence of enhancement within or around the treated area of the tumors after 1 month of treatment.

- **Repeat MWA-TACE or serial TACE was considered based on the hepatic function, post procedure status and patient's performance status.**
- **Assessment and comparison was made for local tumor response, progression-free survival (PFS) and overall survival (OS).**
- **Statistical analysis: Kaplan-Meier method, independent *t*-tests and chi-squared.**

INCLUSION CRITERIA

1. Patients with primary liver cancer aged from 18-80 years, and life expectancy longer than three months;
2. Large HCC (>5cm in diameter) and huge HCC (>=8cm in diameter),
3. Portal vein must be thrombus free.
4. LFTs classified as Child-Pugh A or B, ECOG PS ≤ 2;
5. No abnormal bleeding tendency
6. White blood cell count atleast>= 3.0×10^9/L;
7. Hemoglobin >= 9 g/dl;
8. Platelet >= 100×10^9/L;
9. INR <= 1.8 or PT not exceeding the upper limit of reference 3 seconds;
10. Blood creatinine must be less than 1.5 times of upper limit of reference;
11. Informed consent was done for Patients and/or their relatives willing to join in this clinical trial.

EXXLUSION CRITERIA

1. Diffuse type of liver cancer;
2. Thrombus in main portal vein (PV)
3. Hepatic vein thrombus;
4. Lymph node or distant metastasis outside of liver;
5. Liver function classified as Child-Pugh C
6. Coagulation disorder and abnormality
7. Intractable massive ascites;
8. ECOG PS >2;
9. Active infection, especially cholangitis;
10. Severe disorders of heart, lungs, kidneys, or brain;

THE TREATMENT PROCEDURES

1. TACE combined with ablation or MWA combined with TACE synchronously group

(1) Hepatic DSA (arteriography) is performed to investigate the tumor's location, size, number and to evaluate feeding artery and any shunt.
(2) MWA is performed under ultra-sound guidance. General anesthesia is done.

◆ **The ablation technique with three electrode needles (switching needles) placed at multiple different points were usually performed.**

◆ **Extent of ablation zone must reach or exceed more than two-thirds size of target tumors.**

◆ **TACE were immediately performed after MWA finished or similarly MWA were performed after completion of TACE procedure.**

TACE PROCEDURE

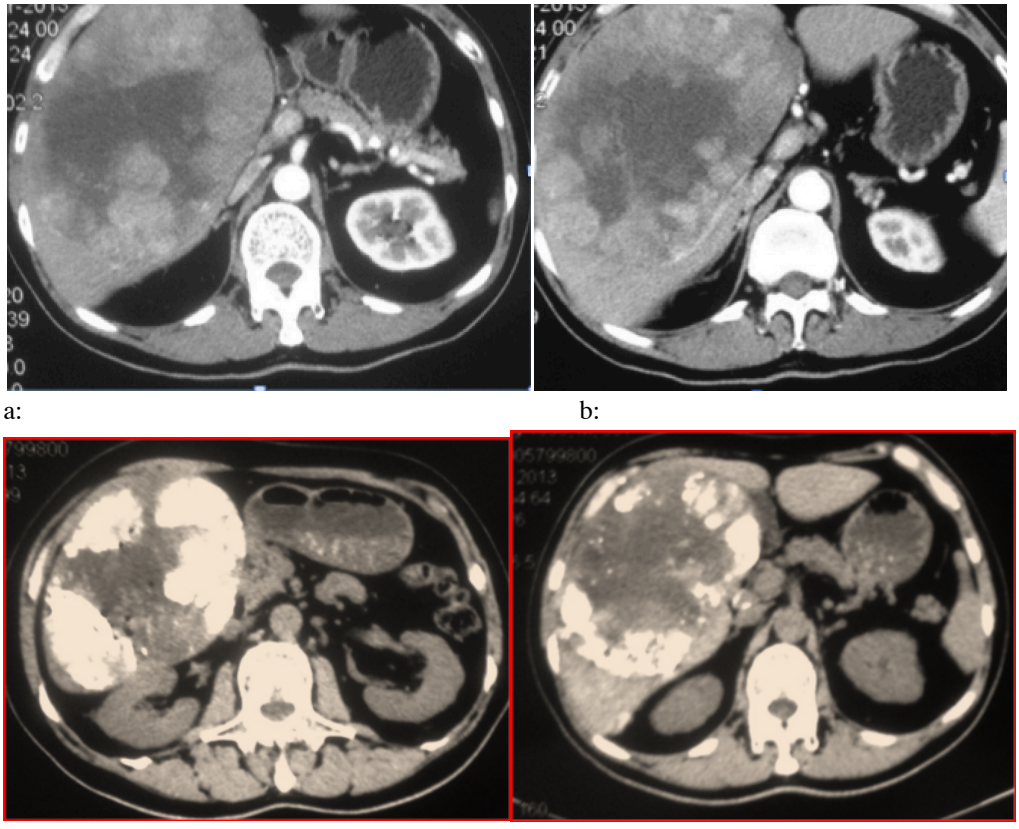
Chemotherapy drug: Doxorubicin30-50mg;

◆ Lipiodol Ultra-Fluide (Guerbet, France): < 20ml

◆ Embolization material: gelatin sponge articles with 350-560um in diameter will be used.

◆ We put catheter in celiac axis followed by micro catheter at the feeding artery branch of the tumor and inject the emulsion of 20-30mg of Doxorubicin and 5-10ml of ultra-fluid lipiodol , and then followed the particulate embolic agent (such as gel foam)

CASE 1



a: b:

c: d:

Case 1:Large HCC in right lobe of liver. Fig a and b are showing post ablational scan with a large ablated area. Fib c and d are showing scan followed by TACE.

RESULTS

Objective response rate:	
⑴ MWA-TACE group or TACE-MWA group	⑵ **In TACE group Only**
CR : 32.5% (21/ 65)	CR : 10.9% (7 / 66)
PR : 47.1% (31/65)	PR : 31.8% (21/66)

CR+PR ：80.6%.	**CR+PR : 48.0%**

Objective response rate was better in MWA-TACE group than in TACE group (*P*=0.001).

Overall and progression-free survival	
⑴ **The median survival time:**	MWA-TACE group: 14 months . TACE group: 9 months
⑵ **The 6-, 12- and 18-month OS rates**	MWA-TACE group: 80.5%, 35.9%, 50.6% TACE group: 65.5%, 40.2%, 20.3%
⑶ **The 6-, 12- and 18-month PFS rates**	Which were 60.9%, 25.1%,16.9% and 37.4%, 6.2%, 3.7% in MWA-TACE group and TACE group respectively.
⑷ **The median PFS time**	MWA-TACE group: 9 months TACE group: 4 months

◆ **The difference was significant between the two groups (*P*<0.05)**

3. AFP and hepatic function:

- AFP values before treatment

MWA-TACE group: 14175.0ng/ml ± 23241.1ng/ml,
TACE group : 13873.7ng/ml ± 21652.2ng/ml
AFP values one month after treatment
MWA-TACE group: 4218.4ng/ml ± 13716.1ng/ml
(*P*<0.001)
TACE group：7107.2ng/ml ± 15485.8ng/ml
（*P*<0.001）

◆ **The difference was significant** between the two groups after treatment (*P*<0.001). The decrease of AFP in the MWA-TACE group was higher than the TACE group.

THE LIVER FUNCTIONS

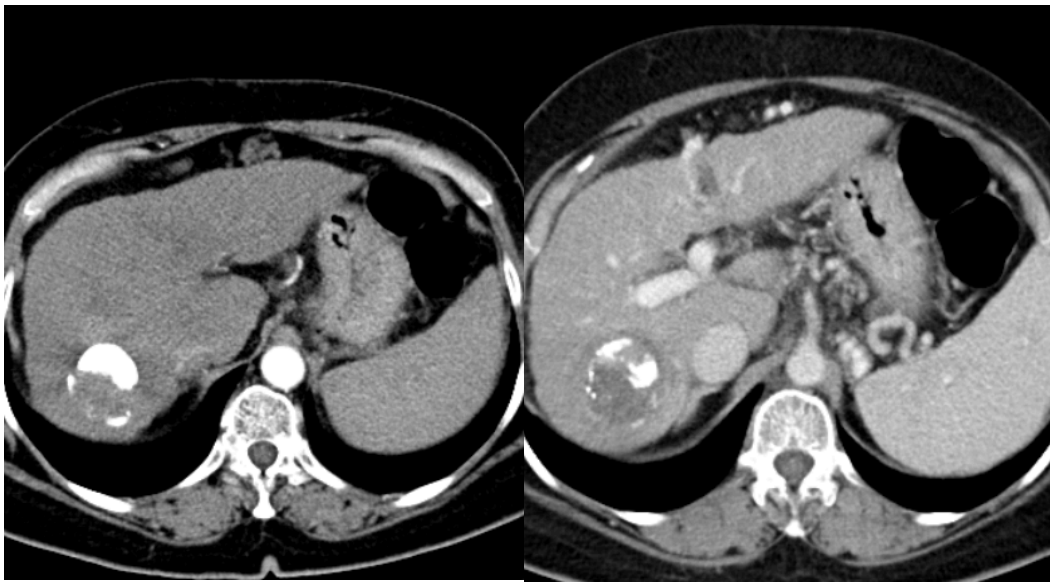
- The liver function was improved in MWA-TACE and TACE group after treatment, the difference was significant between the two groups (*P*<0.05).

4. Side effect

- Post-embolization syndrome : including mild-to-moderate pain, fever, nausea and vomiting
- A hemorrhage:
  MWA-TACE group: 3 patients (treated by TAE)
- A liver abscess
  TACE group: 3 patients (treated with tube drainage) (detected 1 month after treatment)

◆ **The combination therapy was well-tolerated in all patients, and no major complications or procedure-related mortalities were observed.**

CASE 2



a: b:

Case 2: CT images after ablation and TACE.

Objective response rate was better in MWA-TACE group than in TACE group (*P*=0.001).

◆The difference was significant between the two groups . (*P*<0.05)

Conclusion

- According to our results, MWA combined with simultaneous TACE therapy or TACE combined with MWA therapy can be performed safely and effectively in patients with large or huge HCC
- There were NO major complications.
- The combined treatment model is superior to single TACE. It enlarged the indications of mult needle MWA in large HCC, and was worth to be promoted.

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Tracing Symptoms of Psychological Health Status Among Construction Employees

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Abstract
Psychological health condition is known to be complex and multidimensional, with several scales developed as measures of its symptoms. The absence or presence of negative symptoms has been used to describe the state of psychological well-being and psychological ill-being, respectively. This study gathered 48 validated items from previous studies as symptoms of psychological health conditions. The 48 symptoms identified were explored among 300 construction employees in Ghana to determine their psychological health status. Thematic analysis was used to group the 48 symptoms into four main constructs, namely: physical symptoms, emotional symptoms, cognitive symptoms, and behavioral symptoms. A comparative analysis was conducted with the two groups of respondents, namely construction professionals and construction trade workers, to identify the group that is more prevalent with psychological well-being or ill-being conditions. The findings revealed that a significant number of the respondents had experienced the negative symptoms of psychological health conditions. The study also revealed statistically significant differences in the level of experience of psychological health conditions among the two construction employees, with psychological ill-being conditions found to be more prevalent in construction trade workers than the construction professionals. The findings from the study confirm the need to develop preventive psychological health management models for construction employees. The 48 symptoms put together as a measure for psychological health status had an acceptable internal consistency and reliability, and hence can be adopted by researchers and stakeholders to determine psychological health status. This study, therefore, makes an impactful contribution to the field of occupational health psychology.

Keywords: Psychological Health, Psychological Symptoms, Construction Industry, Construction Workers, Ghana

1. Introduction

Psychological health condition could be described as a condition in which the indicators are relatively constant; however, the psychological health condition itself could be dynamic (Russell, 2003; Fordjour, et. al., 2019a). The positive psychological health condition, also known as psychological well-being, is usually based on individuals' subjective feelings and experiences (Russell, 2003). The main indicators of psychological well-being conditions of workers are job satisfaction and work engagement (O'Donoghue, et. al., 2016). The adverse psychological health conditions, also known as psychological ill-being, are known to exist in all professions, with the common ones been stress, depression, and anxiety (Dragano, et. al., 2005). The main indicators of

psychological ill-being conditions of workers are workaholism and burnouts (Bakker and Bal, 2010; O'Donoghue, et. al., 2016).

Psychological health conditions of employees usually emanate from many interpersonal and organizational factors (Richman, et. al., 2001; Fordjour, et. al., 2020b; Bowen, et. al., 2014). The psychological health of construction workers can have severe consequences on the overall job outcomes of the construction firm (Fordjour, et. al., 2020a). It is of the essence for construction industries to pay critical attention to the psychological health of their workers and to understand causative factors that lead to workers' psychological ill-being and adopt preventive measures to mitigate its effects (Fordjour, et. al., 2019c). Research in occupational health investigates mainly physical health, with limited attention on the psychological health of individuals in the construction industry (Chan, et. al., 2016). Albeit the number of research works that have been carried out on health, there has been diminutive research attention on assessing the psychological health conditions of employees in the construction industry, especially those in developing countries. It has become necessary to conduct an empirical investigation to trace the symptoms of psychological health conditions among construction employees in a developing country, specifically Ghana.

2. Background of Study

Occupational health management continues to be a priority issue for those working and managing the construction industry across the world (Fordjour, et. al., 2019b). Studies have shown that psychological health conditions of construction workers could have an impact on the construction company (Chan, et. al., 2016; Leung, et. al., 2017; Fordjour, et. al., 2020a). The client's work satisfaction could be directly influenced positively by the workers' psychological well-being conditions (Salanova, et. al., 2005). Psychological ill-being conditions of workers, on the other hand, could negatively impact the financial returns of the construction firm (Xanthopoulou, et. al, 2013). Poor psychological health conditions of workers could also lead to some negative proactive behaviors at the construction workplace such as aggression, hostility, and offensive behaviors (Miner and Glomb, 2010; Bakker and Xanthopoulou, 2009).

The predominant sign of psychological ill-being conditions of workers at the construction workplace could be the frequent absenteeism of the construction worker (Fordjour, et. al., 2020a). The rate of absenteeism or sick leave could be high, especially in cases where construction workers are exposed to poor working and environmental conditions, leading to psychological ill-being conditions of Burnout and the workers may take longer duration to be absent from duties (Peterson, et. al., 2008; Schaufeli, et. al., 2009). The consequences of such occurrences could have a negative impact on the construction industry and the nation's economy, as it diminishes productivity, affect the overall work performances negatively and lowers the population of the workforce (Quartey and Bill, 2012). Poor psychological health conditions could have a direct impact on the productivity and work performance of the construction workers, which could be seen in the individual and team's work job outcomes (Halbesleben and Wheeler, 2008). Identifying the symptoms of psychological ill-health among the construction employees will promote the awareness of the conditions for appropriate measures to be taken to mitigate its causes and effects.

2.1 Research materials on symptoms of psychological health status

The World Health Organization (WHO) (2005), advocated that an individual's psychological health condition should be assessed based on the complete mental, physical and social well-being of the person, and not merely the absence of a particular condition, disease or infirmity. Adverse occupational psychological health conditions such as workaholism and burnout can lead to impaired well-being like fatigue, chronic tension, sleep problems, and other physical diseases (Russell, 2003; O'Donoghue, et. al., 2016). Indicators of adverse psychological health conditions can be grouped under physical, emotional, behavioral, and cognitive symptoms (Ademola, 2005).

A total of 48 items were identified from the extensive literature review of previous studies to assess the psychological health status of the construction professionals and construction trade workers (Leung, et. al., 2017; Enshassi, et. al, 2016; O'Donoghue, et. al., 2016; Magotra, 2016; Quick and Henderson, 2016; Bowen, et. al.,

2014; Ademola, 2005; Mehta and Chaudhary, 2005; Russell, 2003). The 48 symptoms identified were grouped under four major constructs of psychological health symptoms, namely: physical symptoms, emotional symptoms, cognitive symptoms, and behavioral symptoms. These four major constructs were analysed to determine the inter-item consistency and reliability. The measures used to assess whether the research participants were experiencing psychological well-being or ill-being condition, as shown in Table 1.

Table 1. Measures identified from extensive literature reviews

Label	Symptoms of psychological health condition
Construct 1: Physical Symptoms	
S1	Physically exhausted/ Worn-out/ Tired
S2	Muscular tension/aches
S3	Feeling nauseous/ stomachache/ diarrhoea/ indigestion
S4	Chest pain
S5	Increased rate of heartbeat
S6	Shallow or rapid breathing
S7	Lower Back Pain
S8	Chronic Headaches
S9	Skin Problems
S10	Blood in Urine or Urinate frequently
Construct 2: Emotional Symptoms	
S11	Tensed/ Stressed
S12	Worried
S13	Irritable
S14	Sad/ Depressed
S15	Emotionally exhausted
S16	Numbness
S17	Discouraged
S18	Anxious
S19	Frustration
S20	Mood swings
S21	Bitterness
S22	Rage
S23	Resentment
S24	Crying for no particular reason
S25	Palpitations/ perspiration/ sweaty hands
S26	Trembling/ Nervous ticks/ Butterflies in Stomach
Construct 3: Cognitive Symptoms	
S27	Hard to concentrate
S28	Difficult to think clearly, make decisions or remember things
S29	Insomnia/ difficulty sleeping
S30	Addiction to ungodly habits
S31	Difficulty relaxing
S32	Increase addiction of smoking, alcohol, and use of drugs
S33	Accident- prone
S34	Problems with speaking
S35	Brood on previous harm or insults
S36	Magnify issues such as injury and hurt
S37	Exaggerate unfairness
Construct 4: Behavioural Symptoms	
S38	Impulsive behavior
S39	Poor self-care
S40	Grinding of teeth
S41	Social isolation and withdrawal
S42	Laughing or speaking in high pitch
S43	Label or blame others for our problems
S44	Have conflict with others
S45	Yells at people
S46	Hostile to people

S47	Gives sarcastic comments
S48	Physically aggressive

Source: Leung, et. al., 2017; Enshassi, et. al, 2016; O'Donoghue, et. al., 2016; Magotra, 2016; Quick and Henderson, 2016; Bowen, et. al., 2014; Ademola, 2005; Mehta and Chaudhary, 2005; Russell, 2003.

3. Research Methodology

To explore the symptoms of psychological health conditions among construction professionals and construction trade workers, this study adopted the methods of survey questionnaires. A target of 300 participants comprising of 150 construction professionals and 150 construction trade workers were set for this study. The respondents were selected from thirty-two (32) construction companies in Ghana. A non-probability sampling technique, specifically the purposive sampling method, was adopted in selecting the research participants. The construction professionals group comprised of architects, engineers, quantity surveyors, contractors, supervisors, construction managers, and project managers. The construction trade working group also includes carpenters, masons, plumbers, steel benders, and plant operators.

3.1 Ethical Considerations

The American Psychological Association (APA) has provided some ethical code guidelines to guide the conduct of research in psychology. The goal of this code is to protect the rights and welfare of the survey respondents or groups who partake in a study (Fordjour, et. al., 2019d). In the conduct of the present study, the researcher paid attention to ensuring the APA guidelines were adhered to the latter throughout the conduct of the study. In the selection of research participants, for instance, under no circumstance was coercion or inducement utilized. Only persons who were willing to participate in the study utilized for the research.

As directed by the APA guidelines, informed consent, right to decline participation at any point of the research was strictly adhered to. The participants were therefore informed at the beginning of their right to drop out of the study at any point they wished. Confidentiality of the responses of the participants was also adhered to at every step of this study. Consent forms were also used to assure the participants of the confidentiality of their responses. Total anonymity of the participants was considered with a focus on the appropriate research design method.

3.2 Questionnaire design

This research aimed at identifying whether the participants were in a positive or negative state of occupational psychological conditions based on the responses provided. The questionnaire design was based on the 48 validated symptoms identified from the extensive literature reviews. Closed-ended questions were suitable for the quantitative nature of the survey questionnaire. The research questions were developed to suit the measures adopted by this study. The respondents were requested to indicate how often they have experienced each of the symptoms listed by circling the appropriate scale under the 6-point Likert scale. The following frequency qualifications were used 'Very frequently (that is, more than 2 times a day) rated as 6 points, 'Frequently (that is, 1 to 2 times a day)' rated as 5 points, 'Occasionally (that is, 2 to 3 times a week)' rated as 4 points, 'Rarely (that is, 2 to 3 times a month)' rated as 3 points, 'Very rarely (that is, once a month or less)' rated as 2 points and 'Not at all' rated as 1 point.

The 1 to 6 Likert scale adopted by this study was intended for an equal approximation of the descriptive statistics of the responses to determine where the respondent was in a positive state of psychological well-being or a negative state of psychological ill-being. Using this scale, data transformation was made possible by grouping the scales into two, with 1 to 3 scales assigned with value "7" to indicate a positive state of psychological well-being. Likewise, 4 to 6 scales assigned with value "8" to indicate a negative state of psychological ill-being.

A pilot study was conducted with 15 occupational health psychologists with more than 10 years of working experience, to test the appropriateness of the questionnaires by reviewing it. This initial exercise confirmed the content validity of the questionnaire and its appropriateness to determine the psychological health status of the research participants.

3.3 Hypothesis Testing Approach

The null hypothesis, (H_0), assumed there is no statistically significant difference between the scores of construction professionals "a" and construction trade workers "b" in psychological well-being or ill-being state for all indicators measured.

If the p-value ≤ 0.05, this means the difference in the scores is statistically significant, and hence the null hypothesis will be rejected, and the alternative hypothesis considered.

If the p-value ≥ 0.05, this means the difference in the scores is not statistically significant, and hence the null hypothesis will not be rejected.

3.4 Data analysis

The responses provided by the participants were used to determine whether a participant based on a measure was in a state of psychological well-being or ill-being. Using the Statistical Package for Social Scientists (SPSS) version 19, the data obtained was transformed and recoded into different variables. The old values of 1, 2, and 3 were changed to the value of 7 to indicate the positive state of psychological well-being. The old values of 4, 5, and 6 were also changed to the value of 8, to indicate the negative state of psychological ill-being. The data were analyzed using descriptive statistics, with the frequency and percentage scores of the positive state and negative state of the two construction working groups compared and presented in Table 2.

Independent two-sample T-test analysis was also done to test the significance of the difference between the scores obtained from the construction professionals' group and the scores obtained from the construction trade workers group. Levene's test for equality of variances was used for this test; the F values and Significant or P values obtained for each indicator measured have been presented in Table 3. The internal consistency and reliability of the indicators under each construct were measured, and the Cronbach Alpha values also presented in Table 3.

The frequency and percentage scores of the four main constructs were determined, and the scores obtained from the two-construction working group also compared to indicate which of the two construction groups were more prevalent in a positive or negative occupational psychological state. Table 4 presents this result. The following mathematical formulas were used:

Frequency score for a construct = summation of the total number of responses for all indicators under the construct.

$$\textbf{Percentage score for a construct} = \frac{\text{Frequency score for the category}}{\text{Total number of expected responses}} \times 100\%$$

Total number of expected responses = number of participants (150) × number of indicators under a specific construct

$$\textbf{Average frequency score for all constructs} = \frac{Cummulative\ frequency\ score}{Number\ of\ constructs}$$

$$\textbf{Average percentage score for all constructs} = \frac{Cummulative\ percentage\ score}{Number\ of\ constructs}$$

(Source of the formula: Norussi, 2001)

4. Results and Discussion

4.1 Results

Data transformation was done, and the respondents who chose from 1 to 3 scale for any of the measures were indicated to be in a negative state of psychological ill-being for that measure. Likewise, the respondents who chose from 4 to 6 scale for any of the measures were indicated to be in a positive state of psychological well-being for that measure. The results of the frequency distribution and percentage distribution are presented in Table 2. Values marked with ([a]) represent scores from the construction professionals' group and values marked with ([b]) represent scores from the construction trade workers' group.

Table 2: Results of the psychological state of construction professionals[(a)] and construction trade workers [(b)]

			Frequency values (150 participants each)		**Percentage values**	
Construct	**No.**	**Measure for Symptoms**	***Well-being State***	***Ill-being State***	***Well-being State***	***Ill-being State***
Physical Symptoms	S1	Physically exhausted/ Worn-out/ Tired	60 [a], 42 [b]	90 [a], 108 [b]	40% [a], 28% [b]	60% [a], 72% [b]
	S2	Muscular tension / aches	64 [a], 49 [b]	86 [a], 101 [b]	43% [a], 33% [b]	57% [a], 67% [b]
	S3	Feeling nauseous/ stomachache/ diarrhoea/ indigestion	66 [a], 68 [b]	84 [a], 82 [b]	44% [a], 45% [b]	56% [a], 55% [b]
	S4	Chest pain	106 [a], 101 [b]	44 [a], 49 [b]	71% [a], 67% [b]	29% [a], 33% [b]
	S5	Increased rate of heartbeat	117 [a], 46 [b]	33 [a], 104 [b]	78% [a], 31% [b]	22% [a], 69% [b]
	S6	Shallow or rapid breathing	97 [a], 79 [b]	53 [a], 71 [b]	65% [a], 53% [b]	35% [a], 47% [b]
	S7	Lower Back Pain	60 [a], 47 [b]	90 [a], 103 [b]	40% [a], 31% [b]	60% [a], 69% [b]
	S8	Chronic Headaches	53 [a], 50 [b]	97 [a], 100 [b]	35% [a], 33% [b]	65% [a], 67% [b]
	S9	Skin Problems	101 [a], 81 [b]	49 [a], 69 [b]	67% [a], 54% [b]	33% [a], 46% [b]
	S10	Blood in Urine or Urinate frequently	93 [a], 77 [b]	57 [a], 73 [b]	62% [a], 51% [b]	38% [a], 49% [b]
Emotional Symptoms	S11	Tensed/ Stressed	62 [a], 54 [b]	88 [a], 96 [b]	42% [a], 36% [b]	58% [a], 64% [b]
	S12	Worried	74 [a], 66 [b]	76 [a], 84 [b]	49% [a], 44% [b]	51% [a], 56% [b]
	S13	Irritable	96 [a], 81 [b]	54 [a], 69 [b]	64% [a], 54% [b]	36% [a], 46% [b]
	S14	Sad/ Depressed	80 [a], 69 [b]	70 [a], 81 [b]	53% [a], 46% [b]	47% [a], 54% [b]
	S15	Emotionally exhausted	102 [a], 79 [b]	48 [a], 71 [b]	68% [a], 53% [b]	32% [a], 47% [b]
	S16	Numbness	119 [a], 82 [b]	31 [a], 68 [b]	79% [a], 55% [b]	21% [a], 45% [b]
	S17	Discouraged	62 [a], 60 [b]	88 [a], 90 [b]	41% [a], 40% [b]	59% [a], 60% [b]
	S18	Anxious	70 [a], 74 [b]	80 [a], 76 [b]	47% [a], 49% [b]	53% [a], 51% [b]
	S19	Frustration	61 [a], 59 [b]	89 [a], 91 [b]	41% [a], 39% [b]	59% [a], 61% [b]
	S20	Mood swings	98 [a], 84 [b]	52 [a], 66 [b]	65% [a], 56% [b]	35% [a], 44% [b]
	S21	Bitterness	66 [a], 58 [b]	84 [a], 92 [b]	44% [a], 39% [b]	56% [a], 61% [b]
	S22	Rage	91 [a], 89 [b]	59 [a], 61 [b]	61% [a], 59% [b]	39% [a], 41% [b]
	S23	Resentment	90 [a], 83 [b]	60 [a], 67 [b]	60% [a], 55% [b]	40% [a], 45% [b]
	S24	Crying for no particular reason	118 [a], 97 [b]	32 [a], 53 [b]	79% [a], 65% [b]	21% [a], 35% [b]
	S25	Palpitations/ perspiration/ sweaty hands	72 [a], 71 [b]	78 [a], 79 [b]	48% [a], 47% [b]	52% [a], 53% [b]

	S26	Trembling/ Nervous ticks/ Butterflies in Stomach	70 [a], 57 [b]	80 [a], 93 [b]	47% [a], 38% [b]	53% [a], 62% [b]
Cognitive Symptoms	S27	Hard to concentrate	74 [a], 67 [b]	76 [a], 83 [b]	49% [a], 45% [b]	51% [a], 55% [b]
	S28	Difficult to think clearly, make decisions or remember things	52 [a], 51 [b]	98 [a], 99 [b]	35% [a], 34% [b]	65% [a], 66% [b]
	S29	Insomnia/ difficulty sleeping	49 [a], 44 [b]	101 [a], 106 [b]	33% [a], 29% [b]	67% [a], 71% [b]
	S30	Addiction to ungodly habits	122 [a], 99 [b]	28 [a], 51 [b]	81% [a], 66% [b]	19% [a], 34% [b]
	S31	Difficulty relaxing	48 [a], 41 [b]	102 [a], 109 [b]	32% [a], 27% [b]	68% [a], 73% [b]
	S32	Increase addiction of smoking, alcohol and use of drugs	107 [a], 91 [b]	43 [a], 59 [b]	71% [a], 61% [b]	29% [a], 39% [b]
	S33	Accident- prone	56 [a], 33 [b]	94 [a], 117 [b]	37% [a], 22% [b]	63% [a], 78% [b]
	S34	Problems with speaking	79 [a], 109 [b]	71 [a], 41 [b]	53% [a], 73% [b]	47% [a], 27% [b]
	S35	Brood on previous harm or insults	110 [a], 96 [b]	40 [a], 54 [b]	73% [a], 64% [b]	27% [a], 36% [b]
	S36	Magnify issues such as injury and hurt	114 [a], 82 [b]	36 [a], 68 [b]	76% [a], 55% [b]	24% [a], 45% [b]
	S37	Exaggerate unfairness	109 [a], 100 [b]	41 [a], 50 [b]	73% [a], 67% [b]	27% [a], 33% [b]
Behavioural Symptoms	S38	Impulsive behaviour	101 [a], 91 [b]	49 [a], 59 [b]	67% [a], 61% [b]	33% [a], 39% [b]
	S39	Poor self-care	131 [a], 53 [b]	19 [a], 97 [b]	87% [a], 35% [b]	13% [a], 65% [b]
	S40	Grinding of teeth	112 [a], 107 [b]	38 [a], 43 [b]	71% [a], 72% [b]	25% [a], 29% [b]
	S41	Social isolation and withdrawal	67 [a], 55 [b]	83 [a], 95 [b]	45% [a], 37% [b]	55% [a], 63% [b]
	S42	Laughing or speaking in high pitch	110 [a], 105 [b]	40 [a], 45 [b]	70% [a], 71% [b]	27% [a], 30% [b]
	S43	Label or blame others for our problems	65 [a], 72 [b]	85 [a], 78 [b]	43% [a], 48% [b]	57% [a], 53% [b]
	S44	Have conflict with others	64 [a], 69 [b]	86 [a], 81 [b]	43% [a], 46% [b]	57% [a], 54% [b]
	S45	Yells at people	95 [a], 88 [b]	55 [a], 62 [b]	63% [a], 59% [b]	37% [a], 41% [b]
	S46	Hostile to people	96 [a], 83 [b]	54 [a], 67 [b]	64% [a], 55% [b]	36% [a], 45% [b]
	S47	Gives sarcastic comments	84 [a], 104 [b]	66 [a], 46 [b]	56% [a], 69% [b]	44% [a], 31% [b]
	S48	Physically aggressive	114 [a], 102 [b]	36 [a], 48 [b]	76% [a], 68% [b]	24% [a], 32% [b]

Ranking of the symptoms, according to the most prevalent, was assessed among the two construction groups and within each group of construction professionals and construction trade workers. The results of the ranking have been presented in Table 3.

Table 3. Ranking of the prevalence of the symptoms among the construction professionals' (Group A) and construction trade workers (Group B)

			Ranks		
Construct	**No.**	**Measure for Symptoms**	**Between Groups**	**Within Group A**	**Within Group B**
Physical Symptoms	S1	Physically exhausted/ Worn-out/ Tired	4th	6th	3rd
	S2	Muscular tension / aches	8th	12th	7th
	S3	Feeling nauseous/ stomachache/ diarrhoea/ indigestion	15th	15th	18th
	S4	Chest pain	42nd	36th	43rd

	S5	Increased rate of heartbeat	23rd	44th	5th
	S6	Shallow or rapid breathing	26th	31st	26th
	S7	Lower Back Pain	7th	7th	6th
	S8	Chronic Headaches	5th	4th	8th
	S9	Skin Problems	31st	33rd	29th
	S10	Blood in Urine or Urinate frequently	24th	27th	25th
Emotional Symptoms	S11	Tensed/ Stressed	9th	9th	11th
	S12	Worried	19th	21st	16th
	S13	Irritable	27th	30th	28th
	S14	Sad/ Depressed	22nd	23rd	19th
	S15	Emotionally exhausted	30th	35th	27th
	S16	Numbness	40th	46th	31st
	S17	Discouraged	12th	10th	15th
	S18	Anxious	21st	18th	24th
	S19	Frustration	10th	8th	14th
	S20	Mood swings	33rd	32nd	34th
	S21	Bitterness	16th	14th	21st
	S22	Rage	29th	26th	36th
	S23	Resentment	25th	25th	33rd
	S24	Crying for no particular reason	44th	45th	40th
	S25	Palpitations/ perspiration/ sweaty hands	20th	19th	22nd
	S26	Trembling/ Nervous ticks/ Butterflies in Stomach	13th	17th	13th
Cognitive Symptoms	S27	Hard to concentrate	18th	20th	17th
	S28	Difficult to think clearly, make decisions or remember things	6th	3rd	9th
	S29	Insomnia/ difficulty sleeping	3rd	2nd	4th
	S30	Addiction to ungodly habits	48th	47th	41st
	S31	Difficulty relaxing	2nd	1st	2nd
	S32	Increase addiction of smoking, alcohol, and use of drugs	39th	37th	38th
	S33	Accident- prone	1st	5th	1st
	S34	Problems with speaking	37th	22nd	48th
	S35	Brood on previous harm or insults	41st	39th	39th
	S36	Magnify issues such as injury and hurt	38th	43rd	30th
	S37	Exaggerate unfairness	43rd	38th	42nd
Behavioural Symptoms	S38	Impulsive behavior	36th	34th	37th
	S39	Poor self-care	34th	48th	10th
	S40	Grinding of teeth	47th	41st	47th
	S41	Social isolation and withdrawal	11th	16th	12th
	S42	Laughing or speaking in high pitch	46th	40th	46th
	S43	Label or blame others for our problems	17th	13th	23rd
	S44	Have conflict with others	14th	11th	20th
	S45	Yells at people	32nd	28th	35th

S46	Hostile to people	28th	29th	32nd
S47	Gives sarcastic comments	35th	24th	45th
S48	Physically aggressive	45th	42nd	44th

Blom's fractional rank estimation test was used to assess whether the data obtained from the two construction working groups were normally distributed for all variables. The test revealed the data were normally distributed, and hence the results of the two groups could be compared for all the variables (Norussi, 2001; Fordjour, et. al., 2019c). The test statistics value of 0.05 was used to determine whether the difference between the scores obtained from the two construction groups was statistically significant. Values that indicate a statistically significant difference between the scores of the two groups are marked with (*). The results are presented in Table 4 with the Cronbach alpha values. The internal consistency and reliability test using Cronbach alpha values indicate that the inter-item consistency of all the four constructs was good. As reliability or internal consistency is considered unacceptable unless it is 0.7 or above (Enshassi, et. al., 2016). The Cronbach alpha values for the constructs, as shown in Table 4 ranges from 0.906 to 0.832.

Table 4: Results of the significance of the differences between the scores from construction professionals and construction trade workers group

Label	Symptoms of psychological health condition	Levene's Test		Cronbach Alpha
		F- value	P- value	
Construct 1: Physical Symptoms				***0.864***
S1	Physically exhausted/ Worn-out/ Tired	76.922	0.000*	0.739
S2	Muscular tension / aches	13.005	0.000*	0.769
S3	Feeling nauseous/ stomachache/ diarrhoea/ indigestion	0.211	0.646	0.864
S4	Chest pain	0.564	0.453	0.843
S5	Increased rate of heartbeat	11.716	0.001*	0.776
S6	Shallow or rapid breathing	12.659	0.000*	0.696
S7	Lower Back Pain	9.293	0.003*	0.752
S8	Chronic Headaches	11.931	0.001*	0.675
S9	Skin Problems	1.546	0.215	0.719
S10	Blood in Urine or Urinate frequently	8.769	0.003*	0.817
Construct 2: Emotional Symptoms				***0.906***
S11	Tensed/ Stressed	0.219	0.640	0.842
S12	Worried	1.418	0.235	0.855
S13	Irritable	9.826	0.002*	0.826
S14	Sad/ Depressed	0.053	0.818	0.904
S15	Emotionally exhausted	19.909	0.000*	0.851
S16	Numbness	18.072	0.000*	0.741
S17	Discouraged	0.842	0.360	0.872
S18	Anxious	0.589	0.443	0.904
S19	Frustration	0.484	0.487	0.852
S20	Mood swings	6.337	0.012*	0.859
S21	Bitterness	0.793	0.374	0.907
S22	Rage	0.494	0.482	0.865
S23	Resentment	2.459	0.118	0.883
S24	Crying for no particular reason	24.414	0.000*	0.661
S25	Palpitations/ perspiration/ sweaty hands	0.352	0.554	0.837
S26	Trembling/ Nervous ticks/ Butterflies in Stomach	2.909	0.089	0.884
Construct 3: Cognitive Symptoms				***0.832***
S27	Hard to concentrate	1.636	0.202	0.840
S28	Difficult to think clearly, make decisions or remember things	0.059	0.809	0.724
S29	Insomnia/ difficulty sleeping	2.269	0.133	0.711
S30	Addiction to ungodly habits	38.007	0.000*	0.727
S31	Difficulty relaxing	17.208	0.000*	0.832
S32	Increase addiction of smoking, alcohol and use of drugs	14.441	0.000*	0.803
S33	Accident- prone	33.669	0.000*	0.680

S34	Problems with speaking	61.471	0.000*	0.782
S35	Brood on previous harm or insults	0.528	0.468	0.795
S36	Magnify issues such as injury and hurt	49.552	0.000*	0.767
S37	Exaggerate unfairness	2.301	0.130	0.744
Construct 4: Behavioral Symptoms				***0.846***
S38	Impulsive behavior	5.569	0.019*	0.840
S39	Poor self-care	118.217	0.000*	0.816
S40	Grinding of teeth	1.085	0.298	0.761
S41	Social isolation and withdrawal	2.459	0.118	0.731
S42	Laughing or speaking in high pitch	0.267	0.606	0.824
S43	Label or blame others for our problems	1.873	0.172	0.807
S44	Have conflict with others	1.241	0.266	0.729
S45	Yells at people	2.64	0.105	0.818
S46	Hostile to people	8.015	0.005*	0.847
S47	Gives sarcastic comments	23.399	0.000*	0.773
S48	Physically aggressive	6.712	0.010*	0.822

*Significance values < 0.05 are marked with **

The detailed descriptions of the results of the indicators have been provided under their main constructs. The frequency and percentage scores of the four main constructs calculated by putting together the indicators have been presented in Table 5.

Table 5: Summary of results of the psychological state of construction professionals [(a)] and construction trade workers [(b)]

Constructs	Expected outcome	Total Frequency score		Percentage values	
		Positive State	***Negative State***	***Positive State***	***Negative State***
Physical Symptoms	1500	817 [a], 640 [b]	683 [a], 860 [b]	54% [a], 43% [b]	46% [a], 57% [b]
Emotional symptoms	2400	1331 [a], 1163 [b]	1069 [a], 1237 [b]	55% [a], 48% [b]	45% [a], 52% [b]
Cognitive Symptoms	1650	920 [a], 813 [b]	730 [a], 837 [b]	56% [a], 49% [b]	44% [a], 51% [b]
Behavioural Symptoms	1650	1039 [a], 929 [b]	611 [a], 721 [b]	63% [a], 56% [b]	37% [a], 44% [b]
All variables	7200	4107 [a], 3545 [b]	3093 [a], 3655 [b]	57% [a], 49% [b]	43% [a], 51% [b]

4.2 Discussion

4.2.1 Occupational psychological well-being and ill-being

The findings from the study revealed the absence and presence of the negative symptoms of psychological health conditions among both the construction professionals and construction trade workers. Psychological health conditions can manifest as physical symptoms, emotional symptoms, cognitive symptoms, and behavioral symptoms (Ademola, 2005). The responses of the level of frequency of experiencing the negative symptoms were used to determine whether the respondents were in the positive state of occupational psychological well-being condition or the negative state of occupational psychological ill-being condition.

The results indicate that construction trade workers were found to be more prevalent in the negative state of occupational psychological ill-being condition than the construction professionals. The results may be due to the stressful nature of the construction works, which are mainly executed by the construction trade workers (Bowen, et. al., 2014). Also, the construction trade workers usually undertake their works in the open under extreme weather conditions amidst the noise, chemical, and dust exposure (Fordjour, et. al., 2019a). In contrast, the major works of the construction professionals are carried out in office under comfortable temperature and lights (Langford, et. al., 2000). Construction trade workers such as masons, carpenters, steel benders and plumbers are therefore more likely to experience psychological ill-being conditions than the construction professionals such as architects, engineers and quantity surveyors (Fordjour, et. al., 2019a). Occupational psychological ill-being

conditions such as workaholism and burnout can lead to impaired wellbeing like fatigue, chronic tension, sleep problems and manifest diseases (Magotra, 2016; Bowen, et. al., 2014).

The key symptoms that were revealed among the two construction working groups included accident-prone, difficulty relaxing, insomnia, physically exhausted, and chronic headaches. Within the construction professionals' group, the most prevalent symptoms identified in the order of prevalence were difficulty relaxing, insomnia, difficulty to think clearly, make decisions or remember things, chronic headaches, and accident-prone. The most prevalent symptoms identified among the construction trade workers group in the order of prevalence also included accident-prone, difficulty relaxing, physically exhausted, insomnia, and increased rate of heartbeat.

The findings from this study confirm the statement of the World Health Organization (2001) that one (1) out of four (4) persons will suffer from one form of psychological or mental disorder in some point of their life. As the ecclesia goes, "many are crazy, but only a few are roaming". A mentally or psychologically ill person is not only the very dirty and unkempt ones who are seen on the street (Mehta and Chaudhary, 2005). The findings were also in conformity with the study of Dzirasah (2005), which revealed that about 60 to 70 percent of organizations visited in Ghana, had their workers having some form of psychological health problems with stress as the common one. Stress and other psychological ill-being diseases are gradually becoming the main source of mortality among Ghanaians (Dzirasah, 2005).

The p-value of most of the symptoms measured were less than 0.05, and this means the difference in the scores of the two groups were statistically significant. Hence the null hypothesis will be rejected, and the alternative hypothesis considered for those indicators. The psychological health symptoms from each of the main construct that revealed statistically significant differences between the two construction groups from each of the main constructs included physically exhausted, emotionally exhausted, difficulty relaxing, and poor self-care. The differences in the outcome of the results of the construction professionals and construction trade workers could be due to the differences in these characteristics: individual personality, age, marital status, gender, level of education, years of working experience, task level, role demands and income level (Bowen, et. al., 2014; Miao, et. al., 2017).

On the other hand, symptoms such as stomachache, tensed, hard to concentrate, and social isolation had their p-values greater than 0.05. This indicates that the difference in the scores of the two groups was not statistically significant; hence the null hypothesis will not be rejected for these other indicators. The similarities in the scores obtained from the construction professionals and construction trade workers indicate that these psychological indicators can affect any person regardless of their individual differences in various aspects (Mehta and Chaudhary 2005; Quick and Henderson, 2016). The World health report in the year 2001, revealed that about 450 million persons were suffering from psychological conditions such as stress, depression, and anxiety disorders, which has led to various forms of disability and ill-health globally (World Health Organization, 2001). The report also indicated that one in four persons in the world would be affected by psychological disorders at some point in their lives. The numbers presently are sure to have increased globally, and this is the reason why psychological health issues should be taken much seriously (Quartey and Bill, 2012; Fordjour, et. al., 2020a; Leung, et. al., 2017).

4.2.2. Physical Health symptoms

The findings from this study revealed physical health indicators of psychological ill-being among the two construction working groups, with the highest recorded ones as physically exhausted, chronic headaches, lower back pain, and muscular aches. The results indicate that construction trade workers, when assessed on the basis of physical symptoms, were more in the negative state of occupational psychological ill-being condition than the construction professionals.

Similar to the findings, Ademola, (2005) and Leung, et. al., (2017) also revealed that the workers' psychological ill-being can be manifested in the physical health of the person, with the person experiencing symptoms such as chronic fatigue, chest pain, rapid heartbeats, aches and pains, weakness, nausea, dizziness, diarrhoea or constipation, weight gain or loss, breathlessness, frequent colds, loss of sex drive, sweaty palms, hyperactivity,

muscular tension, tiredness, jaw clenching or teeth grinding. Workers' physiological problems such as fatigue, headaches, insomnia, and gastrointestinal disturbances have been linked with psychological ill-being such as burnout (Demerouti, et. al., 2001; Quick and Henderson, 2016).

4.2.3 Emotional Health symptoms

The findings from this study revealed that a significant number of both construction professionals and construction trade workers had experienced the emotional symptoms of psychological health conditions. The common emotional symptoms identified among the two construction working groups included tension, frustration, discouraged, trembling, and bitterness. Bono, et. al., (2007) stated that the emotional aspect of personality could reflect a person's psychological ill-being, with negative emotions leading to mental health disorders such as anxiety and depression. Emotional psychological health indicators are revealed to include feeling of being overwhelmed, irritability, mood swings, agitation, feeling tensed, inability to relax, frustration, depression, isolation, sense of loneliness, resentment and anger, substance abuse and on edge (Magotra, 2016; Mehta and Chaudhary, 2005; Ademola, 2005). Emotional problems are seen as the major indicators of burnout (Gakovic and Tetrick, 2003). The results of the study also revealed that the construction professionals, when assessed on the basis of emotional symptoms were more in the positive state of occupational psychology than the construction trade workers.

Psychological ill-being conditions such as burnout have been found to have significant relationship with various workers' emotional indicators of psychological ill-being conditions including decreases in self-esteem, depression, anxiety, feelings of helplessness, and irritability (Enshassi, et. al, 2016; O'Donoghue, et. al., 2016). Negative emotions, such as emotional exhaustion, can make workers feel very uncomfortable, which can negatively affect job performance at the workplace (Dragano, et. al., 2005; Ademola, 2005). The simplest definition of the concept of emotional exhaustion is given as depletion of emotional resources (Demerouti, et. al., 2001). Emotional exhaustion describes a feeling of being emotionally overextended and exhausted by one's work (Cropanzano, et. al., 2003).

4.3.4 Cognitive Symptoms

The findings from this study revealed that both construction professionals and construction trade workers who participated in the study had experienced cognitive symptoms of psychological health conditions. The most prevalent cognitive symptoms identified included accident-prone, difficulty relaxing, insomnia, difficulty to think clearly, make decisions, or remember things. The results indicate that the construction professionals when assessed on the basis of cognitive symptoms, were more in the positive state of occupational psychological well-being condition than the construction trade workers.

The mental scope and functionality of the workers are affected in various ways when cognitive psychological ill-being is present, with indicators such as: inability to concentrate, memory problems, seeing only the pessimistic, poor judgment, constant worry, anxiety, loss of objectivity and fearful anticipation (Mehta and Chaudhary, 2005; Ademola, 2005; O'Donoghue, et. al., 2016). Positive thought patterns evoke stronger emotions in workers enabling them to have greater involvement and engagement in work (Magotra, 2016).

4.2.5 Behavioral Symptoms

The findings from this study revealed behavioral symptoms among the two construction working groups, with the common ones being social isolation, have a conflict with others, and labeling or blaming others for one's problems. Occupational psychological ill-being can result in sudden changes in behavior, leading to unhealthy habits, including increase addiction to smoking and alcohol intake, weight loss or gain and poor lifestyle (Bono, et. al., 2007; Leung, et. al., 2017; Masood, 2013). Behavior changes can result from depersonalization or dehumanization (Sydney-Agbor, et. al., 2014). The diminished personal accomplishment or excessive negative evaluations of oneself can give rise to the insensitive behaviors of the worker toward others (Quick and Henderson, 2016). The results indicate that construction trade workers, when assessed on the basis of behavioral symptoms, were more in the negative state of occupational psychology than the construction professionals.

Attitude is considered by psychologists as a person's mental tendency to react in a certain manner, be it favorable or unfavorable, towards a certain aspect of reality (Faghhi and Allameh, 2012). Di-Martino (2003) stated that the negative actions of a worker could be due to stress, which is a physical and emotional response. The behavior indicators of psychological ill-being of workers are mainly antisocial, which can destroy the person's relationships with co-workers, friends, family, or even strangers (Enshassi, et. al., 2016). The negative actions arise when the expectations of one have not been met, the requirements of the job do not match one's capabilities, or there is a lack of or limited resources needed by the worker to do a job (O'Donoghue, et. al., 2016). Some of the behavior changes depicting workers' psychological ill-being include neglecting or procrastinating responsibilities, workplace or domestic violence, overreaction, increased arguments, sleeping too little or too much, eating disorder (Ademola, 2005; Di-Martino, 2003).

5. Conclusion

Previous studies have revealed that psychological ill-being could have adverse consequences on the individual employee's physical, mental, and social well-being. Psychological ill-being conditions of construction employees could lead to consequences for the construction industry, such as increases in turnover rate, decreases in job satisfaction, a general deterioration in work productivity, and poor performance outcomes. The devastating consequences of employees' psychological ill-health made it imperative that the research aimed to assess the current psychological health state of construction employees. This study was done by exploring 48 validated symptoms of psychological health conditions identified from literature reviews. The psychological health symptoms were grouped under physical symptoms, emotional symptoms, cognitive symptoms, and behavioral symptoms. The responses provided by the participants on how frequently they experience these symptoms using a 1-6 Likert scale, was used to assess whether a respondent was in a positive state of psychological well-being or a negative state of psychological ill-being.

A target of 300 questionnaires was equally distributed to construction professionals and construction trade workers in Ghana. A non-probability sampling technique, specifically the purposive sampling method, was adopted in selecting the research participants. Comparative analysis was done to indicate which of the two construction working groups was more prevalent in either a positive state of psychological well-being or a negative state of psychological ill-being. The findings from the study revealed that a significant number of construction employees had experienced the negative symptoms of psychological health conditions. The highly recorded symptoms identified among the two constructions groups were accident-prone, difficulty relaxing, insomnia, physically exhausted, and chronic headaches. These findings confirm the statement by the World Health Organization that every one (1) in four (4) persons in the world suffers from some symptoms of psychological ill-being condition.

The study revealed some statistically significant differences in the level of experiences of the symptoms of psychological health conditions. For instance, the symptom of difficulty relaxing, which was the predominant symptom among the construction professionals, was ranked as the 2nd symptom among the construction trade workers. Similarly, the symptom of accident-prone, which was the highest ranked symptom among the construction trade workers, was ranked as the 5th symptom among the construction professionals. The findings also indicated that psychological ill-being conditions were prevalent among the construction trade workers than the construction professionals, with more than 50% of them having experienced the negative symptoms of psychological health conditions.

The symptoms of poor psychological health conditions identified among the construction employees could have consequences undoubtedly on the ability of employees to carry out their construction works effectively, with an adverse effect on the construction industry. There is a need for occupational psychological support systems in the construction industry to enhance construction employees' health and promote their psychological well-being. Findings from the study provide valuable insights into the subject area, which can be built upon for future research studies in occupational psychology in the construction industry.

The study is limited in terms of the geographical setting of Ghana, where the research study was conducted. However, the findings from the study can be replicated in other countries, especially developing nations, where

their construction employees' health and well-being are not currently been given the much needed attention. It is recommended that further studies explore personal and construction work-related that could make construction employees vulnerable to psychological health conditions and adopt appropriate strategies to mitigate the causes and effects of these factors.

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Considering Xenobiotics as Risk Factors for Postpartum Depression: A Qualitative Systematic Review

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Abstract
Postpartum depression is a serious mental health condition with onset of symptoms appearing anytime within the first four months after delivery (e.g. irritability, severe sadness, profound feelings of hopelessness, etc.). Environmental toxicants are synthetic (i.e. manufactured) or naturally found chemicals that are not produced by organisms as a result of cellular metabolism (e.g. tobacco smoke, pesticides, etc.). There is limited consideration for how exposure to environmental toxicants/xenobiotics can create adverse psychological health effects, specifically postpartum depression. The purpose of this systematic review was to determine if the literature supports a link between exposure to environmental toxicants/xenobiotics during the prenatal/perinatal period and postpartum depression and if so, to identify whether there are specific classes of xenobiotics that provide a higher risk for postpartum depression. Several databases were used to search the online literature, with the following inclusion criteria: articles published in English, publication years between 1995-2018, and with women of reproductive age (15-49 years old). The article selection process comprised of screening each article by title/abstract, followed by screening those articles based on full-text. Six categories of xenobiotics were identified among the thirty included articles. Active/passive smoke exposure was largely found to increase the risk of developing postpartum depression; dietary supplements provided mixed results; antidepressants demonstrated preventative effects; particulate air pollution was found to be associated with postpartum depression; oral contraceptives (DMPA) exhibited an increase in postpartum depressive symptoms; and organochlorine pesticides had no associative risk. Quality assessments were performed for all of the included articles, with the majority being assessed as satisfactory. This systematic review presents as a foundation for encouraging future research to investigate the link between environment and mental health, in order to attain a greater perspective.

Keywords: Postpartum Depression, Environment, Toxicants, Xenobiotics, Prenatal, Perinatal, Exposure, Maternal Mental Health

1. Introduction

1.1 Postpartum Depression

Depression is among the most disabling disorders for women in their childbearing years (O'Hara, 2009). Childbirth represents a time of great vulnerability for women to become mentally unwell, with postpartum depression representing the most frequent form of maternal morbidity after delivery (Stocky & Lynch, 2000). Postpartum depression is a serious mood disorder affecting 10-13% of women worldwide with symptoms such as depressed mood, loss of interest and enjoyment, and reduced energy leading to diminished activity (World Health Organization, 2015). Postpartum [nonpsychotic] depression occurs in approximately 10-20% of women within 6 months of delivery (Miller, 2002). Postpartum depression is characterized by low mood and sadness accompanied by anhedonia, impaired concentration, disrupted sleep and appetite, psychomotor disturbance, feelings of worthlessness or guilt, social withdrawal, and recurrent suicidal ideation (Meltzer-Brody et al., 2018). There has been some debate over the phenomenology of postpartum depression as compared to depression not relating to childbearing (Seyfried & Marcus, 2003). Major depressive disorder with peripartum onset is defined in the DSM-V as the most recent major depressive episode occurring during pregnancy as well as within the four weeks following delivery (Segre & Davis, 2013; American Psychiatric Association, 2013).

1.2 Risk Factors

The risk factors associated with developing postpartum depression have been extensively reported and identified in the literature and these factors can be characterized as biological or psychosocial. Biological factors which have consistently been found to be associated with an increased risk of postpartum depression include: family history of depression, a past history of depression or premenstrual dysphoric disorder, and experiencing depressed mood or anxiety during pregnancy (Robertson et al., 2004). Psychosocial factors which have been consistently found to predict postpartum depression include: experiencing stressful life events, domestic violence, and lack of perceived social support (Miller & LaRusso, 2011). Several other factors, including low socioeconomic status, low self-esteem (particularly in relation to parenting ability), unplanned or unwanted pregnancy, negative birth experience or obstetric complications, as well as difficult infant temperament, have all been less consistently demonstrated to be risk factors for developing postpartum depression (Miller & LaRusso, 2011).

In the majority of cases, postpartum depression is self-limiting and could resolve within months of onset; however, for many women, childbirth can be the stressor that triggers the start of recurrent or chronic episodes of the depressive disorder (Roberston et al., 2004). The current evidence shows that untreated maternal depression can have serious and long-lasting effects: they range from a general negative impact on the child, the partner, and other family members to the danger of an increased risk of recurrence, suicidality of the mother, threat to the bonding between mother and child, as well as physical, cognitive, emotional, and social developmental disorders in the children (Schipper-Kochems et al., 2019). Although all women are susceptible to postpartum depression, it is possible for physicians and healthcare professionals to identify women at higher risk for closer follow-up and intervention when necessary (Roberston et al., 2004).

1.3 Xenobiotics

Environmental toxicants are synthetic (i.e. manufactured) or naturally found chemicals that are not produced by organisms as a result of cellular metabolism (e.g. arsenic) (Belson, Schier, & Patel, 2005). They can be chemical, biological or physical in nature and can be encountered in a variety of indoor and outdoor locations, via different routes of exposure. The following are examples of toxicants to which many are exposed: carbon monoxide, tobacco smoke, molds/biologic pollutants, lead/heavy metals, pesticides/disinfectants, methylmercury, plasticizers (BPA and phthalates), solvents, and asbestos (Falck et al., 2015). Routes of exposure can include inhalation, such as dust or fumes; ingestion, such as, of pesticide residues on fruits and vegetables; and dermal absorption, such as, of ultraviolet-B radiation from the sun or direct skin contact with corrosive household cleansers (Pope, Snyder, & Mood, 1995).

In addition to these environmental toxicants, there is the consideration of the 'environment' to be defined as 'any external exposure to substances.' This continued definition of 'environment' for this systematic review allows for the inclusion of articles which discuss other types of substances women may be exposed to in their perinatal environment such as antidepressants, dietary supplements, and oral contraceptives. For this reason, we employ the terminology of xenobiotics.

The focus of this research was expanded to include prenatal and/or perinatal exposure to those additional substances as potential risk factors for the development of postpartum depression. Antidepressants (ex: sertraline and nortriptyline) are a type of prescribed medication primarily used to treat clinical depression. A significant number of pregnant women use antidepressants with estimates from 4-10% in different populations and the majority of these women are being treated with selective serotonin reuptake inhibitors (SSRIs), however the use of newer antidepressants is increasing (Pedersen, 2017). The relative safety of such medication, for example, selective- serotonin reuptake inhibitors (SSRIs), has led to their widespread use to treat depressive disorders in women of childbearing age, despite knowledge regarding the risks of prenatal exposure to SSRI medication remains far from complete (Casper et al., 2011). The majority of these health risks mentioned in the literature have been largely centered on resulting neonatal developmental outcomes, while minimal research mentions potential adverse maternal health outcomes with prenatal and perinatal exposure to this type of medication (Dubovicky, Belovicova, Csatlosova, & Bogi, 2017).

Women may also take dietary supplements (for example, omega-3 fatty acids) before/during their pregnancy, in order to meet their extra nutritional needs. As defined by the U.S. Congress in the Dietary Supplement Health and Education Act (DSHEA), a dietary supplement is a product that: 1) is intended to supplement the diet, 2) contains one or more dietary ingredients (including vitamins, minerals, herbs, or other botanicals, amino acids, and other substances) or their constituents, 3) is intended be taken by mouth as a pill, capsule, tablet, or liquid, and 4) is labeled on the front panel as being a dietary supplement (Schweitzer, 2006). The interest in including these supplements is based on the notion that certain nutritional deficiencies such as low levels of DHA (docosahexaenoic acid, an omega-3 fatty acid) found in seafood, calcium, B vitamins, vitamin D, and iron have been investigated in relation to postpartum depression but so far this research has been inconclusive (Miller, 2002). Although, research studies have presented conclusive evidence that women have been found to be depleted in omega-3 polyunsaturated fatty acids during gestation and breastfeeding as there is preferential diversion of omega-3 fats to the baby (Huang, et al., 2013). An assumption can be concurred from this finding, in that pregnant women would be encouraged and feel more inclined to consume dietary supplements, such as omega-3 fatty acids, in order to compensate for this nutritional depletion. Given that these supplements could be beneficial in improving nutritional health during the perinatal period, there should also be consideration for the further exploration as to whether these supplements could in turn affect maternal mental health.

Hormonal birth control includes estrogen-progesterone combined hormonal contraception, which can provide effective protection against pregnancy with many non-contraceptive health benefits and can safely be used by most women (Lauring et al., 2016). Oral contraceptives regulate the changes in hormone levels during a woman's cycle by using different forms of synthetic hormones that mimic the estrogen and progesterone that is naturally produced in a woman's body ("Hormonal Contraception", 2018). There are many different types of estrogens and progestins, and different types of pills contain different combinations, though their mode of action is similar (Jin, 2014). Postpartum contraception is used to prevent unintended and closely spaced pregnancies in the first twelve months after giving birth (Singhal et al., 2014). Some types of contraception can be used immediately after delivery; however, it is recommended to use progestin only methods, which research shows has no effect on breast milk volume, or on infant-growth (Singhal et al., 2014).

1.4 Current Study

The link between adverse health effects and exposure to environmental hazards has been well documented in the literature. However, there is limited consideration for how exposure to environmental toxicants can create adverse psychological health effects; most research has focused on the link between xenobiotics and neurodevelopmental disorders. Taken together, these notions serve as the underlying rationale for this systematic

review, that is, in the determination of what has been reported in the literature in terms of xenobiotic exposure and maternal mental health, with a focus on postpartum depression. The objectives of this work are to: 1. Determine if the literature supports a link between exposure to xenobiotics and postpartum depression, and 2. Assess whether there are specific classes of xenobiotics that provide a higher risk for postpartum depression.

2. Method

2.1 Eligibility Criteria

For inclusion as part of this review, the following were fulfilled:

1. Studies: journal articles (peer-reviewed), reviews (literature, intervention, and systematic), prospective studies, longitudinal studies, follow-up studies, cross-sectional (prevalence) studies, research in progress studies, and conference proceedings/abstracts.
2. Participants: women of reproductive age (15-49 years old - as defined by the World Health Organization (2006)), single or married, first-time pregnancy or otherwise, vaginal or Caesarean birth, though in some studies this was not specified, and among either low-, middle-, or high-socioeconomic status.
3. Interventions (xenobiotic exposure): carbon monoxide, tobacco smoke, molds/biologic pollutants, lead/heavy metals, pesticides/disinfectants, methylmercury, plasticizers (BPA and phthalates), solvents, and asbestos as well as antidepressants (sertraline and nortriptyline), dietary supplements (vitamin A, vitamin B, vitamin C, vitamin D, omega-3 fatty acids, B_{12}), calcium, zinc, magnesium, selenium, iron, and folate) and oral contraceptives.
4. Outcome: all types of methods for the potential diagnosis of such symptoms were considered: Edinburgh Postnatal Depression Scale (EPDS), Beck's Depression Inventory II (BDI-II), and the Hamilton Rating Scale for Depression (HAM-D).

Studies were excluded if they included men as primary participants, or studied paternal mental health as the outcome.

2.2 Search Strategy

A systematic search was conducted for articles published in English between 1995-2018 searched using the electronic databases MEDLINE(Ovid), PsycINFO, EMBASE(Ovid), CINAHL(Ebsco),and Toxline. A set of search terms were created by key words, truncations, Subject Headings and Boolean operators, when appropriate; these were searched in Title, Abstract and Keywords, an example for our Medline (Ovid) search is shown in Table 1.

2.3 Data Extraction

The search results for each of the databases were imported into the Covidence software (Covidence systematic review software, Veritas Health Innovation, Melbourne, Australia. Available at www.covidence.org) (via uploaded RIS file formats). This software allowed for the removal of any duplicates across the five databases. The screening of articles for the eligibility criteria was completed by first screening title/abstract (by HM and SE) and then by full- text screening (by HM and SE). The data were then tabulated to show the author and year of publication, the population under study, the aim of the study, the study design, the interventions, and the primary outcomes. The extraction was completed by HM and SE with ATMK serving to resolve any opposing views.

2.4 Assessment of Quality

Quality assessment entailed evaluating whether the studies have been designed, conducted, and reported in such a way that they can be considered reliable (i.e. having rigour) and whether or not they provide meaningful

answers to the research question (i.e. have relevance) (Boland, Cherry, & Dickson, 2017). As suggested by Boland and colleagues (2017), a design-specific quality assessment was used for each of the different study types. A Risk of Bias tool was used to assess the quality of randomized controlled trials (Higgins & Green, 2011). The Critical Appraisal Skills Programme (CASP) contains quality assessment checklists for both cohort studies and literature reviews ("Home - CASP", 2018). Lastly, the Downs and Black (1998) 27-item checklist was used to assess the quality of the cross-sectional studies.

2.5 Data Analysis

Given our interest in looking at different types of studies, and the varied outcomes associated with each of these, we opted to conduct a narrative synthesis. This approach allowed us to include as many studies as possible as well as provide an analysis that was comprehensive.

3. Results

A total of 835 studies were imported from screening. A total of 270 duplicates were removed. From there, 565 studies were screened based on the title and abstract as well as the predetermined inclusion criteria. Of these, 500 studies were deemed irrelevant and were therefore excluded from the review. Therefore, 65 studies were screened based on the full-text, while 35 were excluded as these studies did not have full-text available (n=9), resulted in different study outcomes (other mental health conditions such as anxiety and suicidality) (n=9), comprised of the wrong interventions (e.g. non-environmental toxicants) (n=8), were unrelated to the research question (n=4), incorrect study design (n=2), duplicate (n=1), not published in English (n=1), and contained the wrong study population (e.g. men, children) (n=1). A final number of 30 studies were eligible to be included as part of the systematic review. See the Prisma flowchart (Figure 1) for additional details.

3.1 Description of Studies

The 30 articles included in this review comprised 11 literature reviews (including systematic and intervention) (37%), 10 cohort studies (33%), 5 cross-sectional studies (17%), and 4 randomized controlled trials (13%). Table 2 showcases the summary of the number of articles in each category. The inclusion of secondary data contributes to the overall investigation of this topic by exploring the comprehensive findings from prior literature reviews in order to obtain a greater sense of the extent to which these environmental toxicants have been previously reported in the literature in relation to postpartum depression. However, it is important to note that this ultimately lessens the rigor of this systematic review, as it affects the validity and reliability of the systematic review by including both primary and secondary data in the analysis and by impacting the exact replicability of the findings which were generated from the methodological process.

There were six categories of environmental toxicants which were studied among the 30 included articles in this systematic review. The categories and the associated number of articles (n) for each are:

1. Cigarette smoke exposure (n=14)
- Active smoking and second-hand smoke

2. Dietary supplements (n=8)
- Micronutrients, vitamins, omega-3 fatty acids

3. Antidepressants (n=5)
- Sertraline and nortriptyline

4. Air pollution (n=1)
- Particulate air pollution

5. Oral contraceptives (n=1)
- Depot medroxyprogesterone acetate (DMPA)

6. Pesticides (n=1)
- Organochlorine pesticides

3.2 Quality Assessment

The quality of the literature reviews (including systematic and intervention) (n=11) and cohort studies (n=10) was assessed using the CASP (The Critical Appraisal Skills Programme) checklist. The core CASP checklists (randomized controlled trial and systematic review) were based on JAMA 'Users' guides to the medical literature adapted from Guyatt, Sackett, and Cook (1994), and piloted with health care practitioners ("CASP – Systematic Review", 2018). Three literature reviews were assessed as being of satisfactory quality, another three of good quality while five were found to be of poor quality. Four cohort studies were deemed of satisfactory quality, three were adequate while two were deemed to be of poor quality. Please consult Table 2 for additional information regarding each study.

The quality of the cross-sectional studies (n=5) was assessed using the Downs and Black checklist, as suggested by Boland and colleagues (2017). Three of these studies were deemed of good quality, whereas one was deemed adequate and another of poor quality.

The quality of the randomized controlled trials (n=4) was assessed using the Cochrane Risk of Bias Tool. The Fard et al. (2017) study was judged as 'low risk' of bias, therefore of good quality. The Hantsoo et al. (2014) study had an overall judgment of 'low risk' of bias with two domains judged as 'high risk', therefore of adequate quality. The Singata-Madiliki et al. (2016) study was judged as 'low risk' of bias, therefore of good quality. Lastly, the Sunder et al. (2004) study had an overall judgment of 'high risk' of bias, therefore of poor quality.

3.3 Analysis of Results

Based on the findings from the included studies, prenatal/perinatal exposure to active/passive smoke was largely found to increase the risk of developing postpartum depression and depressive symptoms in the postpartum period. Prenatal active smoking was found to be associated with an increased risk for postpartum depression, particularly those who smoked prior to pregnancy and continued to smoke during pregnancy into the postpartum period, compared to those women who quit during pregnancy and those who were non-smokers (Chen et al., 2018; Dagher & Shenassa, 2012; Frandsen, Thow, & Ferguson, 2017; Munafò, Heron, & Araya, 2008; Salimi et al., 2015; Vivilaki et al., 2016). The study by Underwood et al. (2017) did not find an association between prenatal active smoking and postpartum depression. Perhaps the reason this study did not find an association between prenatal active smoking and postpartum depression could be because these investigators also measured perceived stress and alcohol consumption along with smoking status. The perceived stress experienced by the participants was significantly associated with the development of postpartum depressive symptoms and surpassed the presence of an association between prenatal active smoking and postpartum depression. The other studies which investigated active smoking exposure did not include any other factors in their outcome measurement and only focused on prenatal smoking. This in turn, could explain the difference in findings between these studies.

The studies which investigated dietary supplements found mixed results overall, however, omega-3 fatty acid intake was found to be the most beneficial in reducing depressive symptoms in the postpartum period. These studies which focused on omega-3 fatty acids were able to demonstrate a reduced risk of depression in the postpartum period with prenatal and/or perinatal consumption (Coletta, Bell, & Roman, 2010; Glenville, 2006; Leung & Kaplan, 2009) and identifying a decrease in EPDS scores by 52% (Freeman, 2006). However, there were other studies with opposite results pertaining to omega-3 fatty acids, in that omega-3 fatty acid intake and postpartum depression incidence findings are contradictory and with varying results (Derbyshire & Costarelli, 2008; Ellsworth-Bowers & Corwin, 2012). These variations could be reflected on their literature review study

design. As noted by Derbyshire and Costarelli (2008), the lack of associations may be a result of low supplement dosages, under-reporting of fatty acid intake, short-term follow-up and unsuitable ratios of EPA:DHA among the included studies. Furthermore, these investigators are primarily reporting preliminary findings in their reviews; additional larger studies and randomized controlled trials are recommended in order to further investigate this association.

The studies which investigated antidepressants found that sertraline was more likely to exhibit preventative effects in developing postpartum depression and reduce the extent of depressive symptoms in the postpartum period. These studies found that sertraline was more effective in reducing the risk of developing postpartum depression and experiencing postpartum depressive symptoms compared to nortriptyline (Howard et al., 2005; Molyneaux et al., 2018; Pariser, Nasrallah, & Gardner, 1997). Other studies compared sertraline with a placebo in treating postpartum depression. Hantsoo et al. (2014) found that sertraline produced a significantly greater response rate (59%) than placebo (26%) and more than a two-fold increased remission rate. Sunder et al. (2004) compared sertraline to a placebo and postpartum depression and they found no significant difference between the two in preventing postpartum depression. Both studies Hantsoo et al. (2014) and Sunder et al. (2004) were randomized controlled trials and they each had relatively small number of participants (38 and 11 women respectively). Considering the small number of participants for these two studies, this presents as a possible limitation in that there were not equal distributions between the intervention groups and could have therefore had an influence on the overall results.

The one study that investigated air pollution found that increased particulate air pollution exposure was associated with an increased risk in depressive symptoms in the postpartum period. Sheffield et al. (2018) aimed to determine a link between air pollution exposure with psychological functioning among postpartum women. The participants included an ethnically diverse, lower income urban cohort of pregnant women. The results demonstrated an association between prenatal ambient $PM_{2.5}$ exposure levels and postpartum total EPDS and the investigators observed a statistically significant sensitive window of $PM_{2.5}$ exposure for elevated anhedonia subscale scores during mid-pregnancy, especially gestational weeks 13 to 20 (Sheffield et al., 2018). In stratified analyses, effects were most evident among African-American women. For this group of women, increased exposure to $PM_{2.5}$ was significantly associated with higher total postpartum EPDS scores as well as higher scores on the depressive and anhedonia symptom subscales, with minor variability in the identified window of vulnerability in pregnancy across these outcome measures (Sheffield et al., 2018).

The one study that investigated oral contraceptive use in the perinatal period found an association with an increased risk of depressive symptoms in the postpartum period. Singata-Madiliki, Hofmeyr, and Lawrie (2016) aimed to determine whether DMPA (the most commonly used postnatal contraception option in South Africa) increases the risk of postpartum depression compared with the intrauterine device (IUD) when administered after delivery (within 48 hours of childbirth). The finding from this study indicated that one-month depression scores were significantly higher with DMPA use compared with IUD use according to EPDS data; 3-month depression scores were higher with DMPA according to the BDI-II data. Although the results are highly suggestive of a higher risk of postpartum depression with DMPA, the trial findings cannot be regarded as conclusive (Singata-Madiliki et al., 2016).

Lastly, the one study that investigated pesticide exposure found no associative risk in developing postpartum depression. Yalçin et al. (2015) aimed to determine the levels of organochlorine pesticides (OCPs) in breast milk and to evaluate the relation between OCPs and maternal psychopathologies. The authors state that breast milk is a unique biological matrix for investigating certain environmental contaminants because it can provide exposure information about the mother and her breastfed infant (Thundiyil, Solomon, & Miller, 2007). The results of this study identified and analyzed 12 OCPs among the 75 samples and found that no relation was detected between EPDS and OCPs (Yalçin et al., 2015).

The participants among the included studies were female and of an average age between 28-35 years old. This age range is on the lower end of the range sought from our review; the potential for exposure to certain toxicants

lessens for women of younger age. Furthermore, the participants were of various ethnicities: Caucasian, African-American, Hispanic, Asian, Native American, or unlisted.

Please refer to Table 2 for the complete data extractions. The production of this table by means of a narrative synthesis enables the examination of the similarities and differences between the included studies and warrants descriptive conclusions based on the present summary of the current knowledge surrounding this research topic.

4. Discussion

4.1 Main Findings

The main findings of this systematic review suggest that those exposed to active/passive smoke (cigarette/tobacco) during the prenatal/perinatal period had the greatest risk of developing postpartum depression and depressive symptoms in the postpartum period, compared to the other categories of toxicants. The literature does support a link between certain environmental toxicants and postpartum depression (Chen et al., 2018; Dagher & Shenassa, 2012; Frandsen et al., 2017; Munafò et al., 2008; Salimi et al., 2015; Sheffield et al., 2018; Singata-Madiliki et al., 2016; Vivilaki et al., 2016), although there were studies with inconclusive results and/or that found no association. These observations will be further explained throughout the following sections and the results for each category of toxicant will be interpreted.

The studies that focused on cigarette/tobacco smoke exposure studies reported that exposure to this toxicant during the prenatal and/or perinatal period was primarily found to increase the risk of developing postpartum depression and depressive symptoms in the postpartum period. It is already well known that active smoking can have harmful effects on one's health by increasing the risk of lung cancer and respiratory conditions (Hawari et al., 2019; Laniado- Laborín, 2009; Papadopoulos et al., 2011; Sousa et al., 2019), however, the studies in this review demonstrated that not only does tobacco exposure affect physical health but can most notably affect mental health. The prenatal and perinatal periods are sensitive times for women as they are undergoing physiological changes (Soma-Pillay et al., 2016; Talbot & Maclennan, 2016) and experiencing drastic lifestyle changes (relating to sleep, diet, exercise, etc.) (Barakat et al., 2015; Chien & Ko, 2004; Danielewicz et al., 2017; Hall et al., 2009), and with the introduction of harmful toxic chemicals to their bodies, this has been shown to ultimately affect their mental health well into the postpartum period, resulting in the experience of major depressive symptoms. The importance of recognizing the harmful effects of tobacco exposure during the prenatal and perinatal periods will further advance research in the investigation of this association and will hopefully create awareness of relating tobacco exposure to mental health.

Given the major presence of cigarette/tobacco smoke studies, we acknowledge the limited amount of evidence regarding the other toxicants identified in this review and their relationship with postpartum depression; investigation of the relationship between mental health and air pollution or pesticide exposure is particularly lacking. More often than not, people are unaware and inattentive to what they are regularly exposed to in their environment, especially regarding those toxicants for which it is difficult to measure their underlying effects on physical health (i.e. difficult to determine the amount of levels of these toxicants as they can be airborne). However, in a study included in this review, investigators did find the means to measure exposure levels and thus, were able to associate them with postpartum depression among their participants. From these experimental tools, we see a potential for measuring other pollutants present in the maternal environment in order to target their relationship with other mental health disorders in the same way. Aside from cigarette/tobacco smoke, more research is necessary in the investigation of other categories of toxicants and their effects on maternal health, in order to gather a greater understanding of the most advantageous techniques in addressing this association.

4.2 Limitations

This review was able to consider a variety of environmental toxicants as part of the search criteria in the investigation of risk factors for the development of postpartum depression and did not exclusively focus on more conventional toxicants (i.e. pesticides, cigarette smoke). This review also included worldwide studies as part of

the article selection process and was therefore not limited to North American studies. However, there were some important limitation to consider. First, this review did not consider non-English articles pertaining to our topic of study. Second, it was limited to the five online databases used in searching the literature for relevant articles and although this can be seen as a sufficiently diverse group of databases, there are many more databases available to use but that were not considered. Third, this review primarily included non-randomized studies (87%) while there were only a few randomized controlled trials (13%), which therefore established heterogeneity among the included studies. Relatedly, a meta-analysis was not performed for this systematic review and therefore the results from the four randomized-controlled trials were not combined to give an overall measure of the effect of the one toxicant compared to another - the small sample size would not have allowed a very good comparison. Fourth, in terms of the quality assessment of the non-randomized studies, only one reviewer assessed the quality of those studies and completed the required checklists. And fifth, although the Downs and Black (1997) quality assessment checklist was deemed suitable to use to assess the quality of the cross-sectional studies, this tool is somewhat outdated, and the use of a more recent assessment tool could have been more appropriate based on the prevalence of the fairly recent studies included in the review.

5. Conclusion

The findings from this review demonstrate the current knowledge and understanding surrounding the topic of environmental toxicants/xenobiotics as risk factors for postpartum depression. Based on the results from the included studies, the literature does support a link between certain categories of environmental toxicants and the development of postpartum depression – majority involving cigarette/tobacco smoke exposure and some evidence regarding particulate air matter exposure – although, there are other studies in this review which found inconclusive and/or differing results. Given these variations, this systematic review could present as a foundation for encouraging future research to investigate this matter, in order to attain a greater perspective when conducting further studies. Additionally, many countries seem to have policies and regulations set in place that take into account the environment and its effect on human health, and even though there are also informative services and resources regarding mental health, there is still an absence of recognition regarding the relationship between the environment and mental health specifically - much work is needed to help change this.

We are constantly exposed to a variety of environmental toxicants and other xenobiotics with a great potential to profoundly impact our health, often without awareness of the extent of this exposure. A better understanding of the potential risk certain xenobiotics may have on the onset and progression of mood disorders such as postpartum depression could influence its diagnosis and treatment with crucial consequences for the mother, child, and her family.

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7. Disclosure Statement

The authors have no potential conflict of interest to report.

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Prevalence of Gastroesophageal Reflux Disease in Saudi Arabia

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Abstract
Background
Gastroesophageal reflux disease (GERD) is a condition when stomach acid comes up into esophagus and induce symptoms or complications. Methods: We enrolled 584 in a cross-sectional community-based study to assess the prevalence of GERD symptoms in Saudi Arabia in addition to determine the risk factors associated with GERD occurrence. Data were conducted and randomly distributed through electronic questionnaire translated by the researchers to the Saudi population. We included the Saudi population above age of 18 years old and we excluded population under age of 18 years from our study. The Questionnaire was about 27 Arabic questions to assess the knowledge, prevalence and associated risk factors related to GERD symptoms. Results: A total of 584 subjects participated in the study from different regions in Saudi Arabia. Most of them were between 18 – 51 age group, majority were females and 57.4 from the west region. The mean height of the sample was 158.57 cm with a standard deviation of 58.72 cm, and the mean weight was 68.28 kg with standard deviation 19.21 kg. Most of the participants have no disease. The majority of the sample participants were non-smokers 84.6%, while there were 12 % of participants were smokers and 3.4 were former smokers. Half of the study group has a family member with GERD. Approximately 50% of the sample were experiencing heartburn or bitterness in the throat.19% of the sample has been diagnosed with GERD. Most of the participants think that taking medications and the type of food alleviates the symptoms of GERD. The most used mediations to relieve the symptoms of GERD are Gaviscon, Nexium, and Pantoprazole. Conclusion: Prevalence of GERD is increasing in our society due to the multiple factors we discussed, mainly lifestyle. These modifiable factors should be highlighted by educating the community and rising awareness about this condition before establishing complications.

Keywords: GERD, Saudi Arabia, Esophageal Reflux, Heartburn

Introduction

Definition

Gastroesophageal reflux disease (GERD) is a condition when stomach acid comes up into esophagus and induce symptoms or complications (Antunes and Curtis, 2019).

GERD is a common condition, with a prevalence of approximately 20% of adults in the western culture. Symptoms occur daily in approximately 7% of patients, weekly in 14% and monthly in 15% to 40% of all

patients. Gender does not affect the spread of the disease, but complications are more common in men than women. The rate of esophagitis is 2:1 and the rate of Barrett's is 0:1 in males compared to females; whereas on other study, female gender has been reported as risk factor (Antunes and Curtis, 2019). GERD incidence increases with age, especially after age forty; where in some studies no significant association between age and GERD symptoms (Antunes and Curtis, 2019) (Almadi, et al., 2014). Many studies have agreed that obesity, overweight and smoking increase symptoms of GERD. In a previous study, they found the relation between marital status effect and GERD symptom where it was obvious among divorced/widow approximately 34.9-31.7% and followed by the single approximately 25.1%. Another study has reported the relation between low educational level and GERD (Altwigry, Almutairi, and Ahmed, 2017).

Different studies done in Saudi Arabia to assess the prevalence of GERD among cities communities. A study was done at Riyadh in which GERD prevalence was 45.4% also more significant among older individual, obesity and smoker. There was no difference between male and female (Almadi, at.al., 2014). Also, another study was done in Qassim region among 200 Saudi school-teachers has reported the overall prevalence was 55%, more prevalence between female high school teachers and teachers age group 30-41 years (Altwigry, Almutairi, and Ahmed, 2017). A study conducted in southern Saudi Arabia to diagnose and measure the complications of GERD by using upper gastrointestinal endoscopy in which the GERD prevalence was 15% in Abha and the prevalence of Barrett's oesophagus was 0.003% in Jizan (Alsuwat, et al., 2018).

The typical symptoms of GERD are heartburn which is the cardinal feature of GERD and the diagnosis will be easily if present, regurgitation of gastric contents into the oropharynx, difficulty swallowing, excessive salivation, gas and bloating, pain or discomfort in the chest, bad breath or a sour taste in the mouth. In some cases, patients with no history of heartburn may have atypical symptoms such as hoarseness or laryngitis, persistent cough, asthma or asthma –like symptoms, dental erosion and discomfort in the ears and nose. GERD affects quality of life and may cause erosive esophagitis, esophageal strictures, and Barrett esophagus, a precursor to esophageal adenocarcinoma (Andreoli, et al., 2010).

The association between the age or gender with GERD symptoms is not clear until now, but the risk of GERD complications is associated with advancing age, male gender and white race. There are conflicting results about the gender who have high prevalence of GERD symptoms. Also, there is association between tobacco smoking which cause weakness of lower esophageal sphincter or alcohol consumption and GERD symptoms. Obesity and hiatus hernia are a strong risk for GERD and its complications. GERD is common during pregnancy due to decrease lower esophageal sphincter pressure by progesterone hormone. Some of foods as fat, sweets, chocolate and salt may aggravate acid reflex (Granderath, et al., 2006).

Investigations

GERD is one of GI diseases that can be diagnosed clinically based on a good history and physical examination. To confirm the diagnosis or to detect the complication of GERD doctor may request some medical tests.

Mandatory studies in GERD:

1) Upper gastrointestinal endoscopy

BENEFIT	INDICATION
Can demonstrate anatomy of esophagus	Old age (≥55 yrs with symptoms {anemia, loss of weight, anorexia, recent onset, melaena and swallowing difficulty})
Can detect GERD complication (Esophagitis, Barretts esophagus and stricture)	Persistent reflux symptoms after therapeutic
Obtain biopsy specimens	Heartburn associated with red flag (bleeding, weight loss)
excludes other diseases (eg, peptic ulcer) that present with similar GERD manifestation	High risk for barretts (male, age≥50, obese, white, tobacco use, long history of symptoms)

2) Esophageal manometry

BENEFIT	INDICATION
Help in GERD diagnosis when endoscopy is normal	Before surgery to ensure intact esophageal function
	Recurrence of symptoms while or after use of acid-reducing medications
	Diagnose abnormal peristalsis or ↓ LES tone

Optional studies in GERD:

1) 24 h pH monitoring:

Most accurate (96 % specific and sensitive) (Patti, 2019).

Treatment

The goal is to relive symptoms and to prevent complications. Treatment is divided into:

1) Lifestyle modification:

Weight loss, smoking cessation, reduce hot drinks, alcohol cessation, reduce spicy food, caffeine, raise bed head, avoid sleep immediately after eating (eat 3-4 hrs before bedtime).

2) Medications:

a. Prokinetic medications and reflux inhibitors: use in mild cases, include metoclopramide

b. H2 receptor antagonists and H2 blocker therapy: use in mild to moderate cases, include ranitidine (Zantac), cimetidine (Tagamet), famotidine (Pepcid), and nizatidine (Axid).

c. Proton pump inhibitors: used in severe and longtime cases include: omeprazole (Prilosec), lansoprazole (Prevacid), rabeprazole (Aciphex), esomeprazole (Nexium), sodium bicarbonate (zegerid) and pantoprazole (protonix).

NOTE: long term use of antacids is dangerous, it can result in serious side effect, include: Diarrhea, electrolyte imbalance (alter calcium metabolism that causes heart disease, also it ↑magnesium in the body can cause kidney disease) (Patti, 2019).

Objectives

This study was conducted to evaluate the prevalence of GERD symptoms in Saudi Arabia and the causes behind it's prevalence. We will be evaluating and answering questions of whether or not GERD is associated with a certain group of age, the role of gender in association to symptoms and the commonest risk factors in our community population. With our main aim in improving the general health by raising awareness and educating the public before the occurrence of complications.

Methodology

A cross sectional community-based study was conducted and designed to assess the prevalence of GERD symptoms in Saudi Arabia in addition to determine the risk factors associated with GERD occurrence. The study carried out from July to August 2019. The sample size was 584 participants from different regions in Saudi Arabia. Data were conducted and randomly distributed through electronic questionnaire translated by the researchers to the Saudi population. We included the Saudi population above age of 18 years old and we excluded population under age of 18 years from our study. The Questionnaire was about 27 Arabic questions to

assess the knowledge, prevalence and associated risk factors related to GERD symptoms. We included all participants above age of 18 years, and we excluded the participants below age of 18 years from our study population. The questionnaire was formulated and designed based on previous study was done on prevalence of GERD symptoms. The online questionnaire was formed in multiple choice questions and yes – no questions. We started our questionnaire involving 4 questions on the demographic data including the age, gender, nationality and residence area. Also, 2 questions about the Anthropometric measurements length (cm) and weight (kg). In addition to 4 questions about the risk factors such as smoking, drinking caffeine, pregnancy and associated co morbidities. Moreover, we involved 5 questions about positive GERD predictors and its frequency such as heartburn, food regurgitation and sleep disturbances from those symptoms. In addition to 2 questions about the negative GERD predictors such as nausea and epigastric pain. We included 4 questions about the awareness of GERD, aggravating factors, reliving factors and the medication used for decreasing GERD symptoms. Also, we added 2 questions about if the participant is diagnosed with GERD and the duration of symptoms occurrence. Finally, we ended our questionnaire with 3 questions about the presence of family history of GERD symptoms especially the first-degree relatives and one question about the presence of these alarming symptoms such as dysphasia, weight loss and chest pain. The scoring of GERD symptoms was depending on the frequency of these symptoms during the week if its once per week, 2 - 3 times or 4 - 7 times per week respectively. Where the scores ranging from 1 to 3 for the positive GERD predictors. After summation of the scores the patient who got score of 8 or more was considered to have positive GERD symptoms and patients who got less than 8 was less likely to have positive GERD symptoms. Based on our findings we can say that the majority of the participants was preferring to have medical treatment commonly than surgical interventions.

Results

A total of 584 subjects participated in the study from different regions in Saudi Arabia. Table 1 shows the sociodemographic characteristics of the study participants, the mean height of the sample was 158.57 cm with a standard deviation of 58.72 cm, and the mean weight was 68.28 kg with standard deviation 19.21 kg. Table 2 shows that most of the participants have no disease. The majority of the sample participants were non-smokers 84.6%, while there were 12 % of participants were smokers and 3.4 were former smokers, also approximately half of the sample participants were frequent drinkers of caffeine. Figure 1 shows that almost half of the study group has a family member with GERD. Table 3 illustrates the symptoms of GERD, approximately half of the sample were experiencing heartburn or bitterness in the throat, and half of the sample participants who suffer from heartburn or bitterness in the throat experience it one time a week, while 33.5% of the sample feel the symptoms from 2 to 3 times a week, and 16.8% of the sample feel the symptoms from 4 to 7 times a week. According to table 3, almost two-thirds of the sample participants do not suffer from the reflux of food to the throat or mouth. Also, almost one-quarter of the sample have difficulty sleeping due to heartburn and reflux. And almost two-thirds of the sample participants do not suffer from pain in the upper stomach. 19% of the sample has been diagnosed with GERD. Table 4 shows the period of time they have been experiencing it. Participants were asked regarding factors that aggravate the symptoms of GERD from their point of view, most of the participants think that eating fatty or spicy food increases the symptoms, while 21.4% of them think that tea and coffee are the main reasons. According to figure 2, most of the participants think that taking medications and the type of food alleviates the symptoms of GERD, while 13.01% of them thought that position during sleeping alleviates the symptoms. Table 5 illustrates that the most used mediations to relieve the symptoms of GERD are Gaviscon, Nexium, and Pantoprazole, while the less commonly used is Maalox.

Table 1: Demographic characteristics of the study participants (n=584)

	n	Percentage (%)
Age (years)		
18-25	179	30.7
26-34	178	30.5
35-44	132	22.6
45-50	52	8.9
>50	43	7.4
Total	584	100
Sex		
Female	498	85.3
Male	86	14.7
Total	584	100
Residence		
South region	69	11.8
East region	39	6.7
North region	103	17.6
West region	335	57.4
Central region	38	6.5
Total	584	100
Nationality		
Saudi	440	75.3
Non-Saudi	144	24.7
Total	584	100

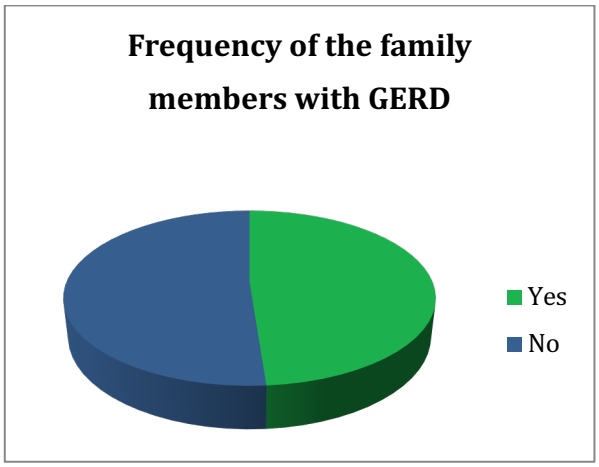

Figure 1: Frequency of family members with GERD.

Table 2: Frequencies and percentages of diseases among the study sample.

	Frequency	Percent
Asthma	48	8.22
Thyroid	46	7.88
Hypertension	40	6.85
diabetic	32	5.48
No disease	414	70.89
Another disease	51	8.73

Table 4: Periods of time that patients felt symptoms of GERD (n =184)

	Frequency	Percent
from two months or less	29	15.8
from 3 to 6 months	18	9.8
from 6 to 12 months	13	7.1
from 2 to 3 years	52	28.3
from 5 years or more	72	39.1
Total	184	100.0

Table 3: Symptoms of GERD (n=584)

Symptoms	**n**	**Percentage (%)**
Heartburn or bitterness		
No	289	49.5
Yes	295	50.5
Total	584	100
Reflux of food to the throat or mouth		
No	379	64.9
Yes	205	35.1
Total	584	100
Difficulty sleeping due to heartburn and reflux		
No	424	72.6
Yes	160	27.4
Total	584	100
Pain in the upper stomach		
No	362	62.0
Yes	222	38.0
Total	584	100.0

Table 5: Medications used by the participants to relieve the symptoms of GERD. (n=241)

	Frequency	Percent
Gaviscon	46	19.1
Nexium	45	18.7
Pantoprazole	42	17.4
Zantac	31	12.9
Maalox	3	1.2
None of the above	74	30.7
Total	241	100.0

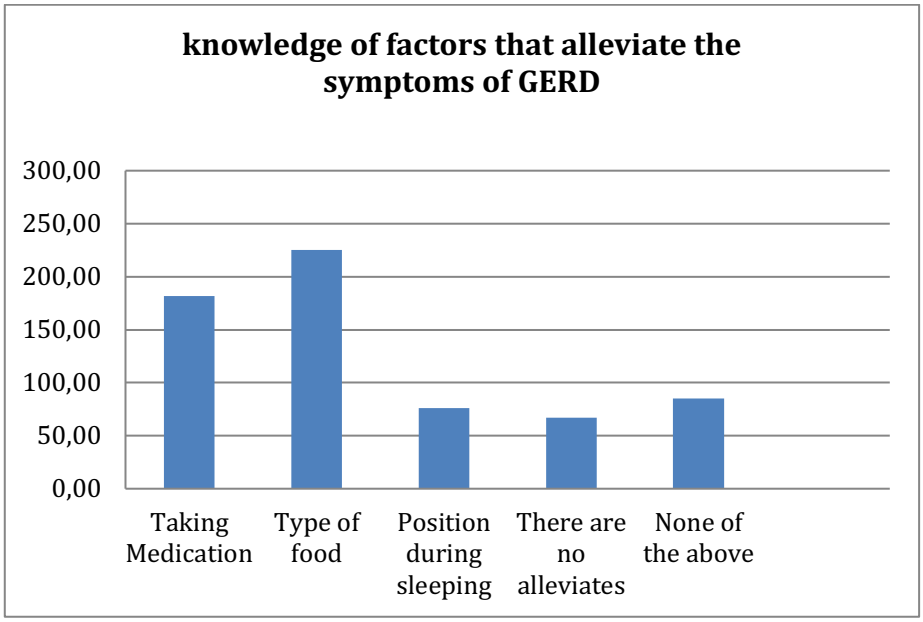

Figure 2: Participants' knowledge of factors that can alleviate the symptoms of GERD.

Discussion

Our study could be considered descriptive in nature. We found that Many factors have shown an association with GERD but still controversial. Nearly all epidemiologic studies have found a relationship between increasing body mass index due to obesity and changes in gastroesophageal anatomy and physiology. But we found that the mean weight was 68.28 kg with standard deviation 19.21 kg. The age group of most our participants is between (18-25) years. Our study has shown a significant correlation with the drinking caffeine in which half of the sample participants were frequent drinkers of caffeine. Also, half of the study group has a family member with GERD symptoms so, we can say it may runs in family. Most of the participants think that taking medications and the type of food alleviates the symptoms of GERD, while 13.01% of them thought that position during sleeping alleviates the symptoms. The most used mediations to relieve the symptoms of GERD are Gaviscon, Nexium, and Pantoprazole, while the less commonly used is Maalox among our study sample.

Conclusion

The prevalence of GERD is increasing in our society due to the multiple factors we discussed, mainly lifestyle. These modifiable factors should be highlighted by educating the community and rising awareness about this condition before establishing complications.

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Antenatal Care (ANC) Medical Record as an Effort to Reduce Maternal and Infant Mortality Rates

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Abstract
This article aimed to analyze the making of antenatal care (ANC) medical records in midwifery service as an effort to reduce the maternal and infant mortality rates. The importance of medical records in every given midwifery care, particularly the antenatal care, has been strengthened through the legislation. Practically speaking, the health practitioners, especially midwifes are aware of the significance of medical records in midwifery service, however, there are still some problems in their implementation since many incomplete, unclear, and unsustainable medical records were found. On the other hand, people insist on fast and accurate services, thus with poor medical records' documentation system, it results in counterproductive health services. Specifically, medical records are closely related to the effort of reducing maternal and infant mortality rates and it also works as valid written evidence to protect the midwifes if undesirable incidents may occur to the patients.

Keywords: Medical Record, Antenatal Care, Maternal Mortality Rate, Infant Mortality Rate

1. Introduction

The maternal mortality rate ranges from 305 per 100,000 according to the 2015 Intercensal Population Survey (SUPAS). The neonatal mortality rate (AKN) is 15 per 1,000 birth according to the 2017 SDKI (National Health Work Meeting, 2019). The maternal mortality rate (AKI) in Sidorajo is relatively high. Even at the provincial level, within the big five of all provinces in Indonesia, East Java ranks third. In 2017 maternal mortality rate is 82.62 per 100,000 births and in 2018 the number decrease to 62.23 per 100,000 births. Meanwhile, the infant mortality rate in Sidoarjo in 2017 is 6.27 per 1,000 births, in 2018 is 4.25 per 1,000 births (Sidoarjo Regency Health Office, 2018).

This documentation has an important role in relation to the maternal mortality rate since it establishes better midwifery services. The making of medical records is vital in midwifery services because a clear, complete, and continuous medical record can help the midwifes to detect early sign of danger and complication, so that the potential for late decision making, late to arrive at the reference place, and late in getting the treatment (3T) as the indirect causes of maternal death can be avoided. Overseas, some experts argue that there are four indirect factors (4T) that may influence maternal death (Widarta, Laksana, Sulistyono, & Purnomo, 2015). And direct

causes of maternal death include bleeding, eclampsia, abortion, and prolonged labor (National Health Work Meeting, 2019).

Some time ago a maternal death occurred due to the late decision making which resulted in the death of the patient while on the way to the reference hospital. After the Maternal Perinatal Audit (AMP) was held, it was found that the midwifes' documentation was incomplete and some even were not recorded. At every AMP, some incomplete and unsustainable medical records are always discovered (Sidoarjo Regency Health Office, 2019). The problems in the making of medical records in antenatal care services still have not yet been resolved (Midwifery Professional Organization, 2019). The problem is not only in the midwifery service in Public Health Centers, clinics, or independent practice midwifes, but also in hospitals, and the problem is the same which is the incompleteness of the medical records (Nuraini, 2015).

The compliance of the health staff in making the medical records, midwifes in particular, is still very low due to their bustles which lead some of them to make incomplete medical records, and in some cases there are a few missing points to be filled such as the signature, the date, the time, the diagnose, and even the management of the given midwifery service (Dewi & Karmelia, 2017). The referencing process and the late decision making can affect the maternal mortality rate, since a late early detection may cause several complications (Handriani & Melaniani, 2015). It is due to the records and documentation that are incomplete and below the midwifery service standard. Electronic Health Record (EHRs) is an innovation emerged in the 21st century. It works to determine the suitable services for the clients in health care services in developed countries, and many developing countries are now starting to use the EHRs because of the many benefits it offers (Adetoyi & Raji, 2020).

Midwifes in Indonesia is essentially needed to improve the welfare of the mother and the fetus. One of midwifes' responsibilities to the society is to provide good services as well as giving plenary services that are according to their competence and the requirements to enhance mothers' and children's health (The Decree of Minister of Health No. 369, 2017). Every health staff in giving health services must follow the professional standard, professional service standard, operational procedure, and professional ethics and according to the clients' health needs (Acts No. 36 the year 2014).

One of the effort to decrease the maternal and infant mortality rates is through early detection of the sign of danger and complication which may occur during the pregnancy. It can be done by making the medical record in every given midwifery service. The high numbers of maternal and infant mortality are caused by four too and three late, these cases occurred because of the lack of the empowerment for the health workers especially the midwifes in making the medical records for every given midwifery service (Chasanah, 2015). The MCH (Mothers' and Children's Health) or KIA (Kesehatan Ibu dan Anak) book is used as a communication tool between the midwifes and patients, with this book the midwifes may note important notes that can be read by other health workers or the patients, and their families (Sistiarini, Gamelia, & Sari, 2014). Early detection by 3T and 4T prevention by using Pudji Rochjati Scorecard (KSPR) in recording the medical records may help the midwifes in providing complete documentation (Widarta et al., 2015).

Based on the aforementioned problems, this research aims to investigate furthermore in the making of antenatal care medical records in midwifery services. This research focuses on the case of medical records making in Sidoarjo Regency. The theory of how the law works is used for this study. The purpose of this research is to observe the factors that influence the process of making medical records in antenatal care services in midwifery services in Sidoarjo. Thus, this research is closely related to the roles of midwifes, Midwifery Professional Organization (IBI) and Health Office. Moreover, this research emphasizes the effect of making medical records as an effort to reduce maternal and infant mortality rates.

2. Method

2.1 Type of Research

This is an empirical research (non-doctrinal) which is a type of research that analyzes and reviews how the law works within the society. How the law works in the society can be assessed from the people's obedience towards

the law itself, the role of legal institutions within the legal system, the implementation of the law, and the effect of the law towards a particular social problem and vice versa.

2.2 The Nature of Research

It is a qualitative research where in analyzing the data, the researchers intend to present the research's subjects and objects according to the outcomes of the research. This research is descriptive qualitative in nature which explains the obedience in making the antenatal care medical records as well as the hindrance in its process.

2.3 Location

This research was conducted in Sidoarjo Regency, involving Sidoarjo Regency Health Office, Sidoarjo Midwifery Professional Organization (IBI), Sidoarjo Public Health Centers, clinics and midwife independence practices in Sidoarjo.

2.4 Type and Source of Data

The primary data that were used to answer the research questions were obtained through interviews and observations. While the secondary data were the literature, law and regulation, books, documents, and other related published journal articles to support the primary data.

2.5 Technique of Data Collection

In empirical law research, the data are collected through interviews. The primary data were gathered through interviews with each coordinator midwife from Sidoarjo Public Health Centers, Candi Public Health Center, Buduran Public Health Center, some clinics and midwife independence practices, midwifery professional organization (IBI) administrators, and the head of the family health sub-division of Sidoarjo Health Office. The secondary data were attained from a literature study on primary legal materials from the law and regulation, secondary legal materials from textbooks and related journal articles, and tertiary legal materials from dictionaries that support the research.

2.6 Technique of Data Analysis

Techniques for analyzing qualitative data is a collection of words that are arranged in an expanded text. The data were analyzed using the interactive model proposed by Miles and Huberman, through data reduction, data display, and conclusion drawing (verification).

3. Findings

From the interviews regarding the making of antenatal care medical records as an attempt to reduce maternal and infant mortality rates with the midwifes in Public Health Centers, clinics, independent practice midwifes, Midwifery Professional Organization (IBI) and family health division of Sidoarjo Health Office which was conducted from September 23rd until October 10th, 2019, the data were gathered and categorized as follows:

3.1 Legal Substance

Most of the midwifes are not obedient yet in making notes and documentation particularly in ANC medical records, however, they have known the use of medical records as an effort to prevent 3T by early detection since the beginning of pregnancy. The large number of medical record formats that should be filled, caused them to use the patients' daily register as the documentation instead, since it is more simple which then they will copy the information from that documentation to mother or baby's cohort books. There is an uneven comprehension of the midwifes of the importance of the medical records, one of which is as early detection of the sign of danger and complication that may occur in the antennal care, as well as the fact that it can be used as a law patronage for themselves and the clients. It is all because of their lack of awareness in making the medical records that is according to the required standard as specified in the regulation as their obligation and responsibility in service. Moreover, the midwifes take medical record merely as an administration complement aspect. Coordinator midwife of Sidoarjo Public Health Center explained that before the Public Health Center's accreditation system was applied, the medical records have never received any attention, however, since the accreditation system was set, like it or not all the midwifes are required to pay more attention to the making of this matter and must provide the records that are according to the standard as it is one of the indicators for the Public Health Center's

accreditation. Midwife coordinator of Candi ad Buduran Public Health Center explained that electronic medical records have not optimally operated yet because there was no administrative staff to assist with the data entry.

3.2 Legal Structure

The monitoring activity to supervise the midwifery practices by IBI was not optimal yet, since it was carried out only once in a year due to the limited number of the supervising staff that is far less than the number of the midwifery practices. Moreover, the supervision activities that have been done focused more on the facilities of the midwifery practices and also for the documentation, IBI was focusing mainly on the patients' daily registers and the cohort of mothers and infants without any regards to the making of medical records. While the Health Office has paid more attention to maternal and children's health without evaluating the process of making the medical records in midwifery services. It is because the Health Office believed that the supervision of midwifery practices was handled by the local Public Health Centers where the practices are located. As well as the absence of an active role from the ethics committee to maintain the midwifery ethical codes from IBI in its practice on the field.

3.3 Legal Culture

Currently, people considers a good service is one that is fast where the inspection process does not take too much time. It was confirmed from the requests of the patients who want fast service in the ANC process. People's lack of understanding of the midwifery service process especially the antenatal care has impacts on the poor services.

4. Discussion

How the law works is inseparable from the existing rules and it also involves law enforcers which in this case are midwifes, IBI, and Health Office as the control holder. The attitudes and the values adopted within the society also play a role in how the law works, as the people are the main actor in the legal system, without the people as the implementer of the law, the law itself would not work. The antenatal care medical record analysis as an effort to reduce the maternal and infant mortality rates can be categorized as follows:

4.1 Legal Substance

The legal substance can be seen as norms, rules, and human's real behavior in its system (Rahardjo, 2009). The results of the research indicated that the antenatal care medical records' making cannot be said as it has been following the required standard since some incomplete medical records are still often found. It commonly happens in the documentation of the objective data, the analyses that only contain the diagnose without the information of the patients' problems, and also the management of the midwifery services that contains merely about the patients' vitamin therapy and counseling that are not in accordance with the patients' problems and needs. Medical records are also used as the quality benchmark of the given service (Sondakh, 2014), complete, clear, and continuous documentation shows good medical records so that the patients' medical history can be properly recorded (Handayani & Mulyati, 2017), thus if there is a sign of danger and complication on pregnant women, the potential of late decision making, late to arrive at the reference place, and late in getting the treatment (3T) (Widarta et al., 2015), in the end, the maternal and infant mortality can be prevented and the patients may receive their rights. The midwifery service delivery can be done through the family health program, one of which is Integrated Antenatal Care (ANC) that consists of ten investigation steps for the expectant mothers and the distribution of Mother and Child Health Book (KIA) at the first visit (K1) which can be used to record the examinations' results during the pregnancy until the child is five years old, this book also includes a Pudji Rochjati Scorecard to classify whether the expectant mothers are in a low risk, high risk or very high risk so that the early detection may be done to prevent the death. In other words, this KIA book is a method of recording and documenting for the expectant mothers which can be brought by the patients themselves or their families. KIA book also works as an education and information tool for the expectant mothers. However, its implementation has not yet been carried out as well as its functions and purposes (Health Minister Decree No. 284).

Midwife is a profession that is seen as a profession with knowledge, cleverness, devotion, and purity (physics and mind). Knowledge is the most important feature of this profession as knowledge guides someone to be

professional up to a certain competence level and norm for them to able to carry out their duties and dedication properly. Cleverness is an essential feature, in solving various kinds of health problems, cleverness, skills, and dexterity are required. Devotion is another important aspect since only with sincere devotion or sense of humanity they will be able to dedicate their life for such duty. And purity is the last feature because the patients and the society will put their trust into someone with a clean physical appearance and a clear mind (Jonsen, Siegler, & Winslade, 2006). It is important to provide training about the medical records to the midwifes in both conventional and electronic ways, not only about the recording system but also every aspect regarding the medical records that may affect the quality of the midwifery service in order to produce better medical records and minimize errors in medical records making in the future (Sungur, Sonğur, Çiçek, & Top, 2019).

Recording and documenting in midwifery service not only about medical records, but the documentation is also written in patients' daily register, mother and infant cohorts as well as KIA book that is used as the communication, information, and education tools between the midwifes and other health workers, patients, patients' families, and society. KIA book was provided by the Health Office and IBI to support the family health program. In its practice, midwifery care, not all the midwifes have accurately utilized this KIA book, however, with optimal use, this book can help the midwifes in doing early detection and complication, besides, the patients may use the information to educate themselves during the pregnancy up until the children reach the pre-school age. So that the sustainable services can be attained, while at the same time reducing the mortality rate and fulfilling all parties' rights and obligations (Sistiarini et al., 2014). The significance of medical records will give an impact on the quality of the health services, hospitals with electronic medical records (EMRs) have better service quality compared to those that use the conventional medical records in paper form (Ayaad et al., 2019). The use of electronic medical records allows an accurate service according to the patients' problems and needs so that a better decision can be made by the health staff (Chen et al., 2020). Electronic medical record (EMRs) is very important to provide a high-quality patient-centered-service, yet many health major students did not receive the curriculum experience in EMRs. Curriculum about EMRs can improve students' understanding of making patients' medical records (Gibson, Kwon, & Tatachar, 2019). Medical school graduates are required to be able to input the information from the patients and to give instruction and prescription in electronic medical records. A better understanding of the students regarding these electronic medical records during the clerkship may be used to determine how far do the students experienced the educational information they received during the training that can be adapted into the real practice (Hammoud, Foster, Cuddy, Swanson, & Wallach, 2020). The EMRs curriculum will provide the health major students with proper provisions when they enter the real practice in the future so that they can produce accurate medical records according to the standard and the rules.

Developed countries around the world are trying to spread information about the electronic medical records as a vital initiative in health policy. EMRs not only can reduce the problems related to paper medical records' management but can also improve the accuracy of the medical decisions of the doctors and improve the patients' safety (Tsai, Hung, Yu, Chen, & Yen, 2019), so that the high mortality rates caused by the incomplete and unsustainable medical records can be reduced. Nurses are the largest users of the EMRs at the hospitals, the EMRs are used to measure the nurses' work quality (Jedwab, Chalmers, Dobroff, & Redley, 2019). The making of medical records that are according to the standard can allow the appropriate treatment for the patients' problems and needs, conversely, the improper medical records would not solve the patients' problems and meet their needs as well.

Electronic medical records have the potential for future research from the patients' diagnoses to increase the knowledge in the health field (Zimmerman, Balling, Chelminski, & Dalrymple, 2019), thus, the making of complete and sustainable medical records will contribute to the improvement of the health research in the future. Nursing risk warnings on patients' EMR information are used to calculate the patients' probability of death. After the nursing risk warnings are used, the risk in infusion, surgical patients' transfer, and blood sample collection are significantly decreased from before the nursing risk warnings were used (Peng et al., 2019). A good and standardized medical record will prevent the nurses particularly midwifes from the nursing risk, therefore, the EMR is there to provide early detection for the sign of danger or complication that can cause maternal and infant mortality. A direct treatment can affect the patients' health state. In the last few years, the development of medical records has provided valuable sources to solve health problems. Nevertheless, most of the related studies are restricted in using the patients' information, identifying the various treatment records,

recognizing various types of treatment patterns, and interpreting the recommendation mechanism (Hoang & Ho, 2019).

Midwifery practice management must fulfill the obligation and responsibility, by performing the duty according to the standard, by doing so, the rights and the obligations of the patients and midwifes are in balance, moreover, the purpose of midwifery service which is to improve the mothers and infants' health can be achieved. The incidents of maternal or infant's death not always certainly are God's fate but also the midwifes' efforts in giving the proper nurtures that are in accordance with the norms and fulfill their obligations (Trisnadi, 2017). Professional services from the antenatal care stage until the postpartum will prevent the mortality of the mothers or infants (Walker, Arbour, & Wika, 2019). If there is a mistake made by a midwife during the midwifery service, then she may be asked to pay the responsibility based on the default or taken as an act against the law (Turingsih, 2012).

4.2 Legal Structure

The legal structure is a permanent outline of the legal system that keeps every process to be within its limits (Rahardjo, 2009). IBI here stands as the supervisor and the constructor of the midwifery practice management, particularly in the midwifery medical records' service. Health Office serves as the main supervisor and controller of the midwifery services and is responsible to the society for the midwifery services, make sure that every service is delivered according to the standard operating procedure (SOP) and the quality of health services. The roles of IBI in the midwifery services implementation are first, to guarantee and to ensure that every health staff is performing their task professionally based on the standard and profession ethics, SOP, and the laws and regulations. Second, to supervise and foster the members to be able to perform a proper, safe, effective, and sustainable midwifery service. Third, to develop knowledge in its field and to facilitate a sustainable education for its members. In optimizing its roles, IBI can work together with the Health Office, other professional organizations, and the law enforcer (Sidoarjo Regional Regulation No. 4, 2013). Interview results with IBI administrator reveal that one of the supervising activities that have been done is monitoring the midwifery practice once in a year, it is done with the intention to control the midwifery services given to the society.

Specifically, the midwifery services supervision emphasizes more on how the mothers' and children's health program run without paying attention to the supporting components of the KIA services one of which is the medical records in midwifery services. Family health division of the Health office realizes that the implementation of midwifery medical records is still far from good, it is seen from how the Maternal Perinatal Audit (AMP) is done, yet there are no follow-up actions of how the midwifes should make the medical records. The absence of the training program regarding the importance of midwifery medical records until now makes most of the midwifes take it merely as an administration document. The Health Office focuses more on the mothers' and children's health programs and all the aspects that support the programs, as a result, the medical records making is still a problem that has not yet been solved.

With the current information technology's development, electronic medical records have been established, in Sidoarjo, for instance, there is an application called *si cantik* (*Sidoarjo Cegah Kematian Ibu dan Anak* / Sidoarjo Prevent the Death of Mothers and Children). This application may ease the health staff especially the midwifes in providing the midwifery care, with this *si cantik* the midwifes can get the history of the patients' examinations even though the patients were previously getting treatment from other health facilities. However, this application has not been operated optimally due to various obstacles, such as the limited internet access, the unsupported facilities, and the absence of administration staff. Some government institutes such as Public Health Centers have applied the EMR in their services, however, in its practice, it still has not optimally operated yet. The application of *si cantik* which is collaborated with *si manies* (Sidoarjo Maternal Neonatal Emergency SMS Gateway) in Sidoarjo Regional Public Hospital (RSUD) is quite effective because this innovation provides a better and faster service for the patients (Anggraini, 2018). With the information and technology system that has developed rapidly and with this EMRs, the midwifery service providers and other related parties are allowed to offer recommendation and education to the midwifes regarding the EMRs to deliver a more efficient process of making the medical records as well as improving the midwifery service quality (Hoang & Ho, 2019). In this technology developing era, the EMR has a crucial role since it can help the patients in getting the sustainable midwifery treatments that may prevent the possibility of the medical records' loss or incidents where the records

are unreadable that will give an impact on the patients being treated late which may cause the death of the mothers and or the infants.

Electronic Health Record (EHRs) is an innovation that established in the 21st century. It is largely used in developed countries to determine the appropriate health service for the patients, while some developing countries such as sub-Saharan African have not yet used it despite the many benefits this innovation offers (Adetoyi & Raji, 2020). EMRs contain sensitive and detailed documents about an individual health state because it subjects confidentiality and limited access (Kartoun, 2019). The development of information and technology in electronic medical records surely has been operated in some hospitals and Public Health Centers in Indonesia, however, it does not come with the development of the human resources (SDM) so that its implementation in Sidoarjo in particular, is not optimal yet. Hopefully, the EMRs can give a good contribution to facilitate the health services, the midwifes, and the patients (He, Cai, Huang, Ma, & Zhou, 2019).

The role of health organizations is to improve the quality of the health services' data. There are five theoretical constructs that are used to comprehend the factors that influence the quality of the data which are, management endorsement, regulatory capability and process management, IT business, participation staff, and information system integrity. A survey on health arrangements in North Nevada discovers empirical results which show that there is a vital factor that can improve the completeness of the EMR's data which emphasizes that the human resources must be added (Liu, Zowghy, & Talaei-Khoei, 2020). The health organizations have not yet decided on the evidence-based method to increase the use of EMR, as well as the evaluation of the collaboration tasks that are needed to measure and to use the potential advantage of this health digital system (Austin, Barras, & Sullivan, 2020). IBI and Health Office's roles are very important in the process of medical records making. The lack of surveillance towards this process makes the midwifes pay very little attention to it. Moreover, their lack of understanding of all the aspects related to medical records may affect their midwifery services. Midwifes' quality control focuses on supporting and supervising in order to protect patients' and midwifes' rights (The Decree of Health Minister No. 10, 2018).

The effort to reduce the maternal and infant mortality rates also influenced by the government's effectivity, the quality of the regulations, the laws, the accountability, and the political stability, since this effort is a part of the government's goal of sustainable development (Maria, et al., 2019). Public health programs related to maternal and infant health have an impact on the decreasing number of maternal and infant mortality rates (Bernet, Gumus, & Vishwasrao, 2018). The effort of reducing the maternal and infant mortality rates requires cooperation between the midwifes, IBI, Health Office and local power holders because it requires sustainability from the laws that include five aspects mentioned above that will further affect the established community health programs and bring out the optimal results.

4.3 Legal Culture

Cultural factors are also related to the legal substance or legal rules and legal structure or law enforcer, because the law system cannot work alone, it requires a few associated components (Fuady, 2014). Legal culture (system) essentially includes the norms that underlie the laws. The conception of values that are considered to be good are adapted while those that are considered to be not good are avoided (Soekanto, 2012). The culture in the society sees a fast and the one that can alleviate or heal the patients' sickness as a good service. Without considering whether the services are done according to the required standard or not. Legal culture adapted within the community is currently giving negative impacts to the law enforcement, because in this case, there is no balance between the midwifes and the patients' rights and obligations. The midwifes have not yet carried out their responsibilities as specified in the regulations and the client as well have not yet fully received their rights. And even though the midwifes have not given the services that are in accordance with the standard requirements, they still get the law patronage, while on the other hand, the clients whose rights have not been fulfilled yet are always being aggrieved if negative things might happen in the future which one of them may lead to death.

The legal culture within the community makes the midwifes override the legal aspects in providing the midwifery services, and this case occurs in IBI and Health Office as well. People with varieties of culture adhere to their value system, they do not consider the legal protection between them and the midwifes, because they still believe in the old philosophy where they put all of their trust on the midwifes (Dartiwen & Nurhayati, 2019), and

even if a negative incident happens in the future, they consider it as God's will. It is evident that the communication between the midwifes and the patients is unidirectional, it only takes place to provide the information on the patients' current state. Active two-way communication rarely happens if there is no close relationship between the health staff and the patients or their families (Manias, Bucknall, Wickramasinghe, Schaffer, & Rosenfeld, 2020).

Nevertheless, the midwifes must understand that their existence is the spearhead of mothers' and children's health (Pramono & Sadewo, 2012), accordingly, they are obliged to perform their task to meet the professional standard, standard operational procedures, and midwifery ethical codes (Turingsih, 2012). Social and economic status can affect the infant mortality rate. People with low economic status contributes to the high number of birth and impede the mortality rate's reduction (Auger, Bilodeau-Bertrand, & Costopoulos, 2016). Indeed, the values of law on the community with average and low social and economic status influence the attitude and behavior towards the rules.

Dealing with birth case takes adequate experience, it needs a process to adapt and to learn how to overcome the unexpected problems, and learn how to be parents. The mothers focus on adapting the life after giving birth which comes naturally from their motherly instinct, while the fathers focus mainly on how to be a parent that can be seen from their low level of adaptability particularly on the case of premature birth due to their limited parental instinct (Provenzi et al., 2016). Patients' experience does contribute to their understanding towards the midwifery services, still, this experience does not affect their comprehension of the antenatal care process and the principles.

5. Conclusion

The antenatal care medical record in midwifery service that is out of the standard requirements is influenced by several factors that come from the midwifes themselves as the midwifery service practitioners, Midwifery Professional Organization (IBI), and the Ministry of Health as the controller of midwifery services and the society who influences the ANC process. The low rate of the medical record production indirectly becomes the cause of the high number of maternal and infant mortality rates, as one of its functions is to be used as early detection for the complications that may occur in antenatal care, thus it can prevent the late decision making, the late referring, and the late getting the treatment as an effort to reduce the maternal and infant mortality rates.

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