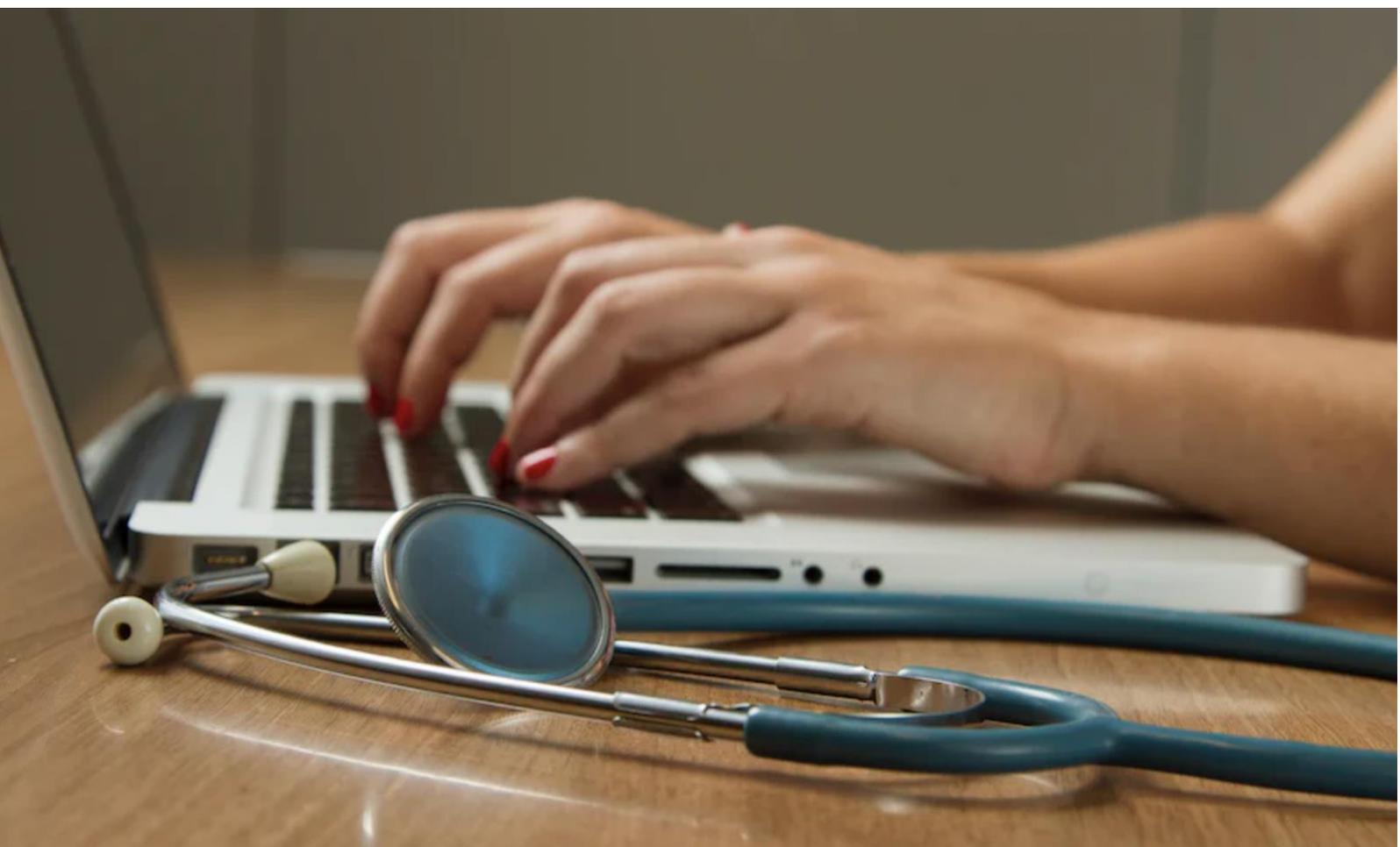


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Study of Functional Outcome of Cervical Laminoplasty with Fixation Versus Cervical Laminoplasty without Fixation for Multiple Levels for Degenerative Cervical Spondylotic Myelopathy with Modified Japanese Orthopedic Association Score

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Abstract

Objective: To determine functional outcome of cervical laminoplasty with fixation versus without fixation for multiple levels of cervical spondylitis myelopathy. Cervical laminectomy is the standard operation for multiple cervical stenosis, which need decompressive surgery, however it is associated with significant number of recurrence and instability if it is not associated with posterior cervical fixation, usually the disease happens as a result go aging in old people mainly and most of the patients are old and fixation need times and expert, this makes the development of laminoplasty which lead to less instability which if it done in proper way it will not need fixation, in this study I review the outcome in patient have laminoplasty and fixation with patient who did not have associated fixation. **Materials and Methods:** 50 diagnosed cases of multiple level cervical myelopathy at king Abdulazaiz Hospital in Taif between 2012—2013 were retrospectively analyzed at, 1-year using MJOA. **Results:** 25 patients underwent 4 levels cervical laminoplasty with posterior lateral mass fixation compared to the same number of patients have 4 level cervical laminoplasty without fixation. The correlation between Duration of Symptoms to Preoperative and postoperative MJOA was statistically significant. We noted statistically significant improvement in symptoms of axial neck pain, radicular arm pain, and gait disturbances post operatively at one year in both groups. No difference between the group who had fixation with the group who did not regarding the improvement of symptoms and functional improvement. **Conclusion:** Functional outcomes in operated patients at 1-year follow up are the same after laminoplasty with or without fixation. But using fixation increases time of surgery. Symptoms of axial neck pain; radicular arm pain, clumsy hand and gait disturbances show significant improvement at one year follow up. While bladder and bowel involvement showed the least recovery. Significant improvement in function occurs 1 year postoperatively.

Keywords: Cervical Laminoplasty, Fixation, Degenerative Cervical Spondylotic Myelopathy, Orthopedic Association Score

1. Introduction

Cervical spondylotic myelopathy defined as clinical syndromes arising from a compression of neural structures due to disc herniation, hypertrophy of the facet joints and hypertrophy of ligaments, osteophyte formation. Most of the time it is treated conservatively, but if conservative treatment fails, surgical intervention is considered. The aim of surgery is to decompress, stabilize and to restore the alignment of the spine. LaRocca was one of the first to recommend early spinal cord decompression with or without stabilization to stop the progression of the disease for patients presenting with moderate functional disability. (LaRocca, 1988) most common surgical technique for multiple level stenosis includes laminectomy or laminoplasty with or without fixation, laminoplasty gives less instability and decompression.

In the present study, we have analyzed post-operative functional recovery in patients undergoing early operation within 6 months from the symptoms and late after 6 months from the symptoms anterior cervical decompression and fusion surgery for degenerative cervical spondylotic myelopathy according to 'Modified Japanese Orthopaedic Association Scores' (MJOA).

2. Material and Methods

Studies have been on 50 patient's diagnoses between January 2012 to April 2013 with clinical and radiological of cervical spondylotic myelopathy of multiple levels were prospectively analyzed using Modified Japanese Orthopedic Association scoring (MJOA). All cases were operated on with laminoplasty C4 - C6 posterior approach. MJOA scoring was done pre-operatively and post-operatively for 1 year. Data was collected by direct observations. Radiographs of the cervical spine (Anteroposterior and Lateral) and MRI of the spine were done in all cases. Data were analyzed using – McNemar Test: For comparison between preoperative and post-operative symptoms of the two groups at 1 year follow up of axial neck pain, arm pain, gait disturbances and bowel and bladder symptom. For correlation between Duration of symptoms till surgery and Pre-operative MJO Correlation between Duration of symptoms till and postoperatively MJOA at 1 year, Chi-Square tests (Pearson Chi-Square, Continuity Correction, Fisher's Exact Test): -For association among the cases between- Number of levels Mann-Whitney test: - For comparison of blood loss and Anesthesia time by number of levels.

3. Results

The mean age in our study group one: was 50 years with (± 9.36 SD) range of 30 years to 70 years. Out of 25 patients enrolled 15 patients were male and 10 were female.

- Group two Out of 25 patients, 14 patients male and 16 female, the mean age was 50. (± 9.37 SD)
- all patients presented with signs and symptoms of myelopathy (30 MJOA 14 and above), 20 patients had moderate disability (MJOA 10 to 13),

At one year follow up, group 11 20 patients had mild disability (MJOA 14 and above), 5 patients had moderate disability (i.e. MJOA 10 to 13). Group 19 patients had mild disability (MJOA 14 and above) 6 patients had moderate disability (MJOA 10 to 13). The correlation between duration of symptoms (months) to post-operative MJOA scores was statistically nonsignificant both groups. This suggests that there was no significant difference after surgery if we do fixation or no fixation with laminoplasty

Table 1: One-year post-operative

MU	ML	Su	BL	TOTAL
3/7	5/7	3/7	3/3	20
3/7	5/7	3/7	3/3	10
4/7	6/4	2/7	3/3	15
2/7	5/7	3/7	2/3	5

MU	ML	SU	BL	TOTAL
4/7	5/7	3/7	3/7	20
4/7	5/7	3/7	2/7	10
4/7	5/7	3/7	4/7	15
3/7	6/7	3/7	5/7	5

JOA: Japanese Orthopaedic Association score, MU: motor function in the upper extremities, ML: motor function in the lower extremities, SU: sensory function in the upper extremities, BL: bladder function.

4. Discussion

The management of cervical spondylotic myelopathy continues to be debated due to the inadequacy of information available about natural history of this disorder (Bernard and Whitecloud, 1987). However, there is some agreement in literature that a shorter duration of symptoms and milder neurological deficit prior to surgery yields a better post-surgical outcome.

And this study supports that Successful surgical treatment of cervical myelopathy depend on identifying the specific pathology responsible for clinical syndrome. The surgical approach is then directed to deal with the factors causing the spinal cord compression.

In our study, 50 patients of cervical spondylotic myelopathy were treated by laminoplasty with or without lateral mass fixation. Majority (60%) of patients presented with symptoms of myelopathy and radiculopathy. C4-C5-C6-C7. The correlation between Duration of Symptoms to preoperative and post-operative MJOA scores was nonsignificant in both group of patients.

5. Conclusion

Laminoplasty of cervical vertebrae from c4 to c7 show no difference in one year out come with or without fixation. We recommend not to do lateral mass fixation if proper laminoplasty for cervical spine done. Functional outcomes in operated patients at 1-year follow up are with no difference if laminoplasty with fixation or without fixation. Symptoms of axial neck pain radicular arm pain, clumsy hand and gait disturbances show significant improvement at one year follow up following surgery compared to bladder and bowel involvement which showed the least recovery. JOA: Japanese Orthopedic Association score, MU: motor function in the upper extremities, ML: motor function in the lower extremities, SU: sensory function in the upper extremities, BL: bladder function.

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Food Habits/Preferences among Adults in a Tertiary Healthcare Institute

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Abstract

Background: The lack of local produce and the abundance of cheap and easily accessible fast food have led to an unfavorable food environment in Trinidad and Tobago, which has encouraged unhealthy eating. This study explored food habits and preferences among adult patients at a public tertiary healthcare institute. **Methods:** Patients were selected from adult medical and cardiac wards of public healthcare facilities using convenience sampling. The inclusion criteria were consenting adults who could communicate freely. The exclusion criteria included confused or critically ill patients. Patients were interviewed using a pre-tested questionnaire, which included eight commonly used categories of the diet (fruits, vegetables, sugar, salt, “low-fats,” carbohydrates, meat/protein, and wheat/grains). Furthermore, the variables were recoded as 1 = positive food choice and 0 = negative food choice. Descriptive and statistical analyses were performed. **Results:** Most patients based their main meals on starchy foods (89.9%), followed by high salt intake (75%) and high meat (72.4%). Approximately half (45.5%) of the population preferred fewer vegetables, and approximately one-third (35.1%) did not prefer “low-fat products.” There were 3 to 4 food risks that revealed differences by age, sex and ethnicity with greater occurrence in the over 50s, males and Indo-Trinidadian. At least 26.6% of the patients ate larger meals at night, and 61.5% admitted skipping breakfast at least once a week. **Conclusion:** Negative food habits and preferences are prevalent and generally homogeneous across subgroups except by age, sex and ethnicity which show higher occurrence of food risks in the over 50s, males and Indo-Trinidadian.

Keywords: Food Preferences, Food Habits, Public Health Environment, Healthy Food Lifestyles, Sociological Food Interventions

1. Introduction

Food is integral to survival and health. However, incorrect, excessive, or inadequate food intake can have negative consequences. Unhealthy food intake can increase the risk of cardiovascular diseases (Gao et al., 2021; Nestel et al., 2022); obesity, hypertension, diabetes, hyperlipidemia, and cancer (Giovannucci, 2018); allergies (Pal et al., 2012); complications, including stroke, myocardial infarction, peripheral vascular disease, sleep apnea, and

psychological problems, such as depression (Firth et al., 2020; Rao et al., 2008). The association between diet and the development of coronary artery disease (CAD) is controversial and sometimes contradictory (Zhang and Hu, 2012). Esrey et al. (1996) and Bahall (2019) concluded that no clear link exists between diet and the development of CAD in their local context, perhaps because it is difficult to quantify what someone eats (Anand et al., 2015). Food intake and its quantity have been reported to be related to or controlled by food preferences (Drewnowski & Hann, 1999; Bellisle, 2006; Kulothungan, 2018). In fact, food preferences may be a better indicator of actual food intake and a more useful marker because of the challenges in quantifying food intake (Drewnowski & Hann, 1999). Food intake is primarily determined by genetics and physiological or biological needs, including hunger, appetite, and taste; economics, such as cost, income, and availability; physical, including access and comfortable eating places; education; time; social factors, such as culture, family, peers, and meal patterns; psychological factors, such as mood, stress, and guilt; and attitudes, beliefs, and knowledge about food (Puoane et al., 2006; Bellisle, 2006). The social environment may also contribute to eating practices. In Trinidad and Tobago, there is a vast and easily accessible fast-food industry with over 128 restaurants (Prestige, n.d.) comprising KFC, Subway, Starbucks, TGI, and Pizza Hut. The total number of fast-food outlets is estimated to exceed 3000, including “street stalls and kiosks.” The remainder consists mostly of full-service restaurants, cafés and bars, and fast-food eateries (Food, n.d.). This exposure and an accompanying sedentary lifestyle make citizens more prone to fast food intake (Bahall, 2022). The intake of various fast/junk foods, such as pizza, burgers, noodles, chips, soft drinks, and candies; Indian delicacies, samosas, vada, pagodas, chips, candy gum, most sweets, fried fast food, and carbonated beverages have little or zero nutritional value (Global, n.d.; Soo et al., 2018; Dan Ramdath et al., 2011); and can cause harm and have several adverse health effects. A healthy diet consists of many fresh vegetables and fruits, a significant amount of cereals, little added salt and sugar, and considerably fewer carbohydrates and meat. Other factors other than the type of food include the timing and amount. There is a higher incidence of cardiovascular diseases in the elderly, males and Indo-Trinidadians. This study explored the general eating habits, preferences, and differences among subgroups (sex, ethnicity, age, cardiovascular risks, Myocardial Infarction (MI) status, and comorbid medical diseases).

2. Methods

The study was conducted at a public tertiary healthcare institute, which was a 745-bed hospital serving approximately 600 000 people. The hospital provides free 24-hour service to all citizens—the sample frame comprised all adult patients who attended this public healthcare institute. Quota sampling was conducted to obtain at least 400 patients based on a 5% margin of error, and the prevalence of patients engaged in poor dietary practices was 50%. Patients were selected from adult medical and cardiac wards using convenience sampling. The inclusion criteria were adult patients (> 18 years), able to communicate freely and be interviewed for approximately 20 minutes. Exclusion criteria were patients who were confused or critically ill. Potential patients were approached and informed about the nature and usefulness of the study and were asked about their willingness to participate. Data were collected partially from medical records and face-to-face interviews using a pre-tested questionnaire coded to conceal patient identity. Some of the survey data were previously used in another study. The questionnaire comprised socio-demographics, medical history, lifestyle practices, and food/dietary practices categorized as fruits, vegetables, starches, fats, meat, whole heat/cereals, sugars, salt, and other questions, such as nighttime eating and fried oil usage. A trained pre-medical student collected data on food habits and preferences. Food variables were recoded into 1 = positive choice (i.e., good food preferences/habits) and 0 = negative choice (i.e., bad food preferences/habits). Furthermore, the following eight food categories were selected: low preference for fruits, vegetables, whole-wheat/cereals, low-fat products, and/or high preference for salt, sugar, starchy foods, and meats/protein. Based on the local context, the food preference/habit was defined as “*If a person consumes a given item three or more times per week.*” The definitions of specific food risks are presented in Table 1. Food preferences/practices are good proxies for quantifying food (Nur et al., 2010; Stanga et al., 2003). Dietary patterns or preferences may better reflect diet (Kulothungan 2018) and be more obtainable from the patient. Such studies on preferences/habits were reported by Duffy et al. (2007).

Table 1: Food risk definitions

	Category	Variable - food risk
1.	<i>Fruits</i>	Low preference for fruits
2.	<i>Vegetables</i>	Low preference for vegetables
3.	<i>Whole wheat/cereals</i>	Low preference for whole wheat/cereals
4.	<i>Fats</i>	Low preference for “low-fat products” when available
5.	<i>Carbohydrates/starches</i>	High preference for meals around starchy foods
6.	<i>Meat/protein</i>	High preference for meat/proteins
7.	<i>Salt</i>	High preference for salt
8.	<i>Sugar</i>	High preference for sugar

The collected data were entered into a secure computer that was only accessible to the researcher and assistant. Analysis was performed using SPSS version 21 (IBM, Armonk, New York), and descriptive and statistical analyses were performed using Pearson’s chi-square test. In addition, Pearson’s chi-square test was used to determine the existence of associations between food factors and selected variables, including age, sex, ethnicity, MI status, and medical diagnoses.

3. Results

3.1 Socio-demographics

The patients were mainly > 50 years (58.7%), males (55.1%), Indo-Trinidadian (73.1%), married (50.8%), employed (50.1%), and non-Acute Myocardial Infarction (68.9%). Table. 2.

Table 2: Socio-demographics

Characteristics	N	%
Age (n = 634)		
≤ 50 yrs	262	41.3
> 50 yrs	372	58.7
Sex (n = 642)		
Male	354	55.1
Female	288	44.9
Ethnicity (n = 642)		
Afro-Trinidadian	104	16.2
Indo-Trinidadian	469	73.1
Mixed	64	10.0
Marital status (n = 638)		
Single	162	25.4
Married	324	50.8
Employment status (n = 629)		
Employed	315	50.1
Unemployed	314	49.9
Case type (n = 644)		
AMI	200	31.1
Non-Acute Myocardial Infarction	444	68.9

*The sum of certain percentages for the respective demographic is not 100% because the category “other” was omitted during the analysis.

3.2 Overall food preferences/habits

Of the types of food preferred by patients, starchy food accounted for the highest proportion (89.9%), followed by high salt intake (75.0%) and high meat intake (72.4%). However, approximately half of the population (45.5%) preferred fewer vegetables, and approximately one-third (35.1%) did not prefer “low-fat products” (Table 3).

Table 3: Overall food preferences among the participants

Food risk	n (%)
Low fruit preference (n = 632)	391 (60.9)
Low vegetable preference (n = 632)	292 (45.5)
Low “low-fat products” preference (n = 628)	224 (35.1)
High sugar preference (n = 631)	187 (29.2)
High salt preference (n = 631)	481 (75.0)
High starchy food preference (n = 631)	576 (89.9)
Low whole wheat/cereal preference (n = 631)	186 (29.0)
High meat/proteins preference (n = 627)	461 (72.4)

3.3 Food preferences by sociodemographic and MI status

No significant differences were observed between age and food risks, except for the consumption of fruits and vegetables, sugar intake, and meat preference, which were more common in the over 50s. For sex, significant differences were found in food risks, namely, “low-fat”, sugar, starch, wheat, and meat, which were more common among men. Differences between Afro and Indo-Trinidadians were observed in vegetable, salt, and meat intake, with increased food risks among Indo-Trinidadians. Differences between the employed and unemployed were observed in vegetable and meat intake, with food risks being more prevalent among the employed. In addition, significant differences were found in vegetable and “low-fat” intake associated with marital status (Table 4). However, no differences were observed in food risk and MI status, except for meat (Table 5).

Table 4: Food risk factors vs. demographics

Food risk	Age (n (%))		p-value	Sex (n (%))		p-value	Ethnicity (n (%))			p-value	Employment Status (n (%))		p-value	Marital Status (n (%))		p-value
	≤ 50 years	> 50 years		Male	Female		African	Indian	Mixed		Employed	Unemployed		Single	Married	
Low fruit preference	178 (46.0)	209 (54.0)	0.003	224 (57.6)	165 (42.4)	0.150	66 (17.0)	282 (72.5)	38 (9.8)	0.859	199 (52.1)	183 (47.9)	0.246	106 (27.3)	196 (50.5)	0.303
Low vegetable preference	134 (46.4)	155 (53.6)	0.018	172 (58.9)	120 (41.1)	0.094	56 (19.2)	197 (67.7)	37 (12.7)	0.021	158 (55.4)	127 (44.6)	0.017	90 (30.8)	138 (47.3)	0.017
Low “low-fat product” preference	86 (38.7)	139 (61.3)	0.346	144 (64.6)	79 (35.4)	0.000	40 (17.9)	157 (70.4)	24 (10.8)	0.633	107 (49.1)	111 (50.9)	0.671	60 (27.0)	95 (42.8)	0.004
High sugar preference	91 (49.7)	92 (50.3)	0.006	124 (66.7)	62 (33.3)	0.000	32 (17.2)	140 (75.3)	13 (7.0)	0.433	105 (56.8)	80 (43.2)	0.033	52 (27.8)	97 (51.9)	0.380
High/high salt preference	198 (41.9)	274 (58.1)	0.606	274 (57.1)	206 (42.9)	0.104	72 (15.0)	359 (74.9)	47 (9.8)	0.043	235 (50.1)	234 (49.9)	0.963	118 (24.6)	248 (51.8)	0.629
High starchy foods preference	228 (40.2)	339 (59.8)	0.080	329 (57.3)	245 (42.7)	0.002	93 (16.2)	422 (73.5)	55 (9.6)	0.642	276 (49.1)	286 (50.9)	0.120	144 (25.2)	295 (51.6)	0.480
Low whole wheat/cereals preference	74 (40.0)	111 (60.0)	0.654	120 (64.9)	65 (35.1)	0.002	33 (17.8)	141 (76.2)	10 (5.4)	0.098	83 (46.1)	97 (53.9)	0.198	47 (25.3)	92 (49.5)	0.838
High meat/proteins preference	205 (54.3)	248 (54.7)	0.000	271 (59.0)	188 (41.0)	0.005	86 (18.7)	323 (70.4)	47 (10.2)	0.037	253 (56.3)	196 (43.7)	0.000	115 (25.1)	235 (51.3)	0.850

Table 5: Food preference vs. MI status

Food Preference	n (%)		p-value	OR	CI (95%)
	Non-Myocardial Infarction	MI			
Low fruit	275 (70.3)	116 (29.7)	0.311	1.192	0.848–1.676
Low vegetable	206 (70.5)	86 (29.5)	0.395	1.157	0.826–1.620
Low “low-fat”	159 (71.0)	65 (29.0)	0.383	1.171	0.821–1.669
High sugar	133 (71.0)	54 (29.0)	0.615	1.156	0.796–1.678
High salt	149 (32.4)	311 (67.6)	0.598	0.900	0.609–1.331
High starchy foods	399 (69.3)	177 (30.7)	0.607	1.153	0.670–1.986
Low whole wheat/cereals	129 (69.4)	57 (30.6)	0.889	1.027	0.710–1.486
High meat/proteins	333 (72.2)	128 (27.8)	0.014	1.718	1.194–2.473

Note. CI=confidence interval; OR=odds ratio

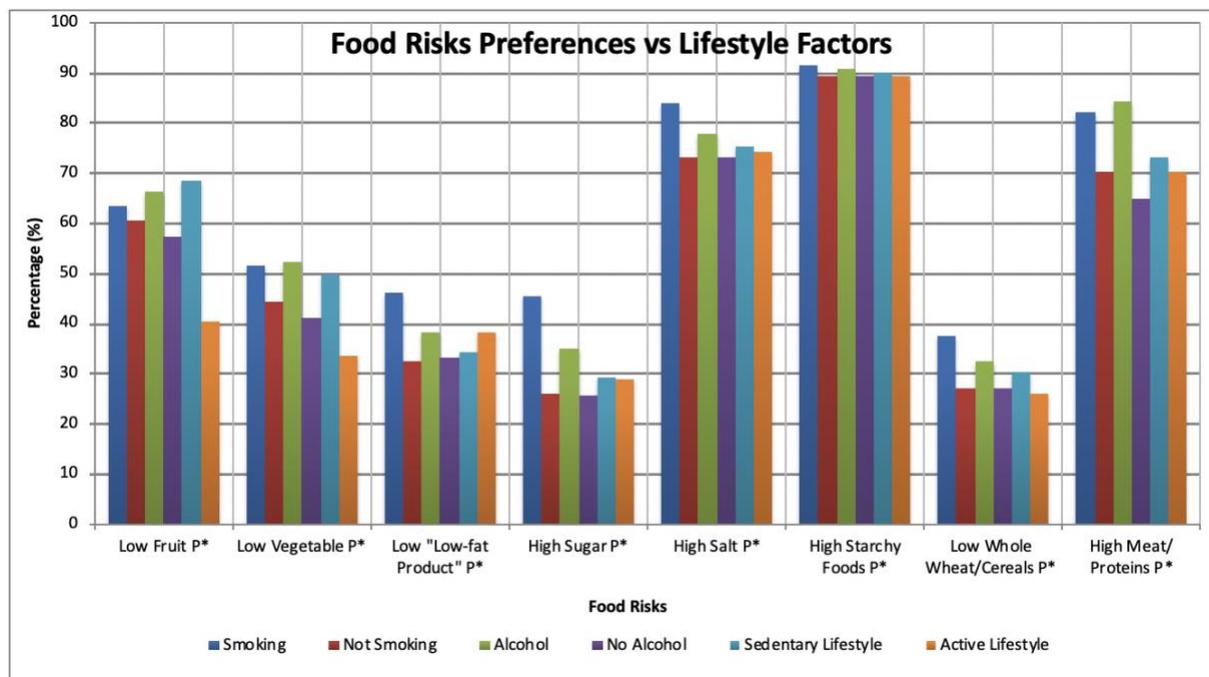
No differences were found between patients with and without hypertension and those with and without obesity. However, sugar and meat intake significantly differed between patients with and without diabetes ($p = 0.002$ and $p = 0.016$, respectively) (Table 6).

Table 6: Food risks vs. diabetes, hypertension, and obesity

Food risk	Diabetes			Hypertension			Obesity		
	Yes	No	p-value	Yes	No	p-value	Yes	No	p-value
Low fruit preference	62.0	60.2	0.651	59.3	62.1	0.486	59.6	60.9	0.811
Low vegetable preference	41.7	47.4	0.169	41.4	48.5	0.076	44.9	45.8	0.887
High fat preference	33.5	36.3	0.487	34.7	35.9	0.765	33.7	35.7	0.718
High sugar preference	21.3	33.0	0.002	25.1	31.7	0.069	34.8	27.9	0.182
High salt preference	75.5	75.1	0.911	72.7	77.0	0.215	78.7	75.0	0.463
High starchy foods preference	91.7	88.8	0.264	92.1	88.1	0.095	94.4	88.9	0.116
Low whole wheat/cereals preference	25.5	31.1	0.137	29.6	29.0	0.872	27.0	29.8	0.592
High meat/proteins preference	66.4	75.4	0.016	69.5	74.6	0.161	77.0	71.9	0.317

Food risks and lifestyle factors (smoking, alcohol, and sedentary)

Food preferences were similar in patients regardless of lifestyle factors, such as smoking, alcohol consumption, and sedentary lifestyle (Figure 1).



P* - Preference

Figure.1. Food risks vs. lifestyle factors

3.4 Other eating habits

Overall, 26.6% of the patients ate large meals at night. Although most participants (95.9%) preferred home-cooked meals, at least 40.3% ate fast food less than once a week, 18.2% ate twice a week, 7.8% ate three times a week, and 1.4% ate out every day, regardless of whether it was consumed at home or outside. In addition, of the participants, 61.5%, 27.2%, and 7.5% skipped breakfast at least once, 2–3 days, and 4–5 days per week, respectively.

4. Discussion

Most patients were aged > 40 years (78.2%), male (55.1%), Indo-Trinidadian (73.1%), married (50.8%), and employed (50.1%) and had hypertension (41.9%). This study revealed a greater preference for starchy food (89.9%), high salt intake (75%), and high meat intake (72.4%), non-preference for “low-fat products” (35.1%). Most patients had low fruit intake (60.9%), and preferred low vegetable intake (45.1%). This contrasts with the findings of Shahar et al. (2002) based on a study of geriatric patients, which revealed that participants preferred fruits, vegetables, and beans instead of milk, red meat, and dairy products. These atherogenic food factors are major contributors to diabetes, hypertension, and obesity, which can lead to stroke and heart attack. According to the International Diabetes Federation Atlas, Trinidad and Tobago ranked tenth in the Caribbean and North America, with a prevalence of diabetes of 13% (International et al. (2013). Another study showed the incidence of self-reported diabetes and hypertension to be 19.5% and 30.2%, respectively (Chadee et al., 2013). World Health Organization reported the hypertensive burden of Trinidad and Tobago to be 27% (World, n.d.). Sisa et al. (2021) also reported that the country has a “high cardiometabolic burden attributable to diet.” Furthermore, the younger population, because of sedentary lifestyle, and greater exposure to readily available, cheap junk food, there may be a greater propensity to consume unhealthy foods (Bellisle, 2006; Narine et al., 2007; Dan Ramdath et al., 2011; Francis-Granderson et al., 2018). These may be partly responsible for the higher levels of obesity as reported by Rambaran et al. (2018), where “the combined percentage of overweight and obese schoolchildren increased steadily from 12% in 2001 to 51.5% in 2018. High fruit, vegetable, and whole wheat/grain intake have been associated with decreased inflammation (Hosseini et al., 2018; Milesi et al., 2022), whereas inflammation has been linked to high carbohydrates (Karimi et al., 2021), saturated fats (Berg et al., 2020), protein, such as processed and red meats (Papier et al., 2022; Ley et al., 2014), sugar (Ma et al., 2022), and salt (Balan et al., 2020; Zhu et al.,

2014). Pro-inflammatory (Khatun et al., 2021) foods are unhealthy and do not fit into the Mediterranean or cardiac diet (Richards, 2020). The Mediterranean or a plant-based diet (Tuso et al., 2015) causes a decrease in plaque progression and even plaque regression. The good effects of fruits (Zhao et al., 2017) and vegetables (Blekkenhorst et al., 2018) are widely reported for their ultimate anti-atherogenic effects (Yusuf et al., 2004). Salty food increases the chance of developing hypertension (Rust & Ekmekcioglu, 2017; Choi et al., 2020), and fatty food causes hyperlipidemia (Kreisberg et al., 2005; Carson et al., 2020; Chiu et al., 2017). Sweetened foods increase the risk of cardiovascular events (Janzi et al., 2020), diabetes (Tseng et al., 2021), acne (Penso et al., 2020), and obesity (Faruque et al., 2019). Similar findings have been reported for the association between carbohydrates, diabetes, and other cardiovascular risks (Mohan et al., 2018).

Of the eight food types explored, most participants (approximately 70%) in the overall population and patients with confirmed MI indulged in using at least four food risks (Figure 2). This is consistent with other studies where a high preference for fast food, beverages, ice cream, sweets, soft drinks, and cookies was observed (Nur et al., 2010).

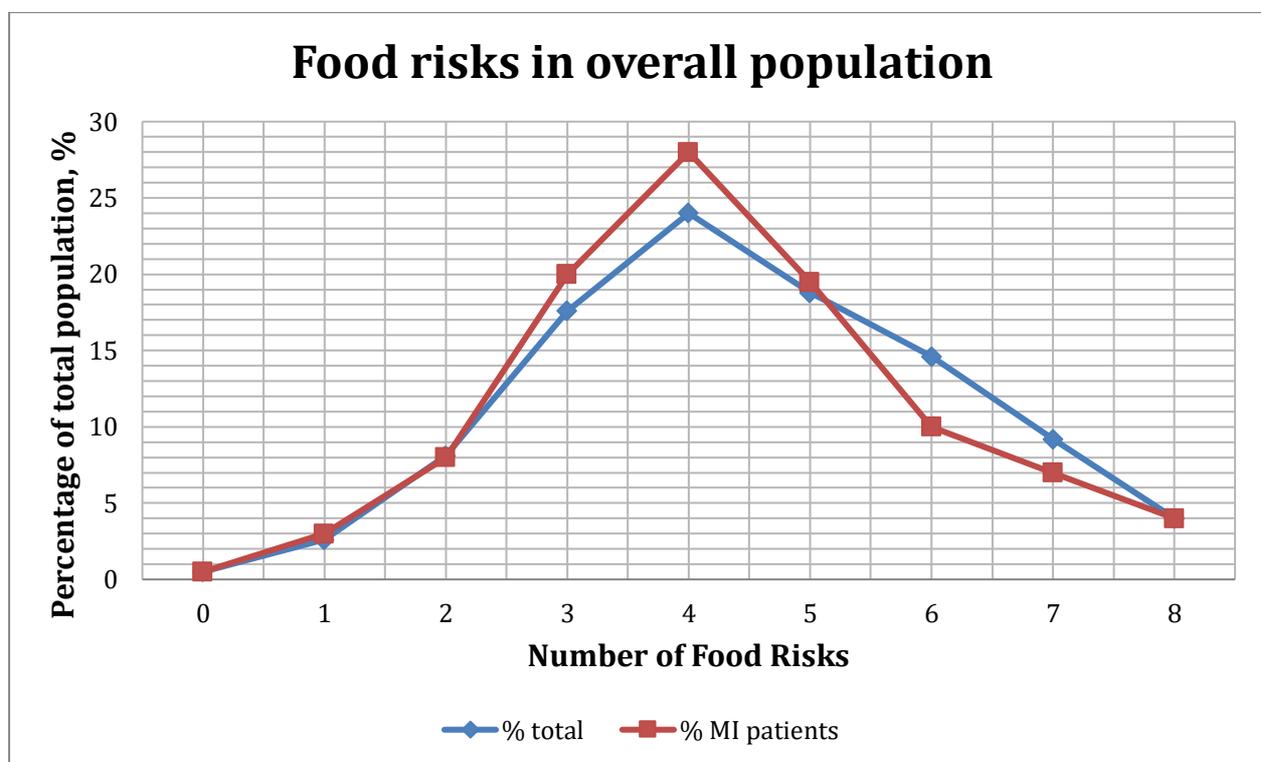


Figure 2: Food risks in overall and AMI population

This study revealed an absence of significant association between certain food risks and the subgroups particularly selected sociodemographic factors. This contrasts with the findings of Bortkiewicz et al. (2019) and Lockheart et al. (2007). Furthermore, significant differences in medical diseases (diabetes, hypertension, and obesity) subgroups were absent between the presence or absence of the medical condition, except in the patients with diabetes, which revealed differences in sugar and meat intake which were more common among non-diabetics. There were no significant differences in sociodemographic factors, such as age, gender, and ethnicity, except for certain specific food types (Table 4). There were 3 to 4 food risks that revealed differences by age, sex and ethnicity with greater occurrence in the over 50s, males and Indo-Trinidadian. A study by Shiferaw et al. (2012) revealed differences by sex, with males preferring meat and females preferring vegetables. No significant differences were observed in food preferences or habits for the MI status. This contrasts with the findings of Bortkiewicz et al. (2019), who reported that patients with MI consumed fruit, raw vegetables, cheese, vegetable oils, and fish less frequently, and “the consumption of salty or fatty foods was significantly higher” in MI cases. The local context may differ, and we tend to eat similar foods. No differences were found in sedentary lifestyles, smoking, or alcohol consumption. This contrasts with the findings of Jezewska-Zychowicz et al. (2018), who found an association

between “both healthy and unhealthy dietary patterns and some sedentary behavior.” Alharbi et al. (2021) concluded that eating and sedentary lifestyle habits were almost the same between cases and controls. Heydari et al. (2010) reported a positive association between cigarette smoking and an unhealthy diet, whereas Kesse et al. (2001) and Fawehinmi et al. (2012) reported an association between diet and alcohol consumption.

Other eating practices that indirectly affect patients are eating at night, eating outside, and skipping meals, particularly breakfast. In this study, 26.6% of the participants reported eating larger meals at night. This contrasts with the findings of Zhang et al. (2020), who reported that 6.9% of participants reported eating at night. Zhang et al. (2020) concluded that “habitual night eating was positively associated with the progression of arterial stiffness, a hallmark of arteriosclerosis, and biological aging.” In addition, night eating is associated with cardiovascular events and obesity (Okada et al., 2019). In this study, at least 27.4% ate outside, and 61.5% missed breakfast at least once per week.

4.1 Limitations

This study had some limitations. First, this was a single-center study with a catchment of relatively poor and predominantly Indo-Trinidadian population. However, extrapolation may not be reasonable for developed countries. Second, patients relied on the recall of their dietary preferences and habits. Although recall may be better than actual consumption, it may still pose challenges because the responses are subjective. Third, resource constraints generate smaller subgroups; therefore, subgroup analyses may be inaccurate. Fourth, fatty food preference is difficult to extract because of the varied interpretations for high-fat and more fatty foods. Finally, there was no distinction between saturated and unsaturated foods. Nevertheless, general food preferences were easily identified regarding other food risks, ensuring acceptable deductions.

5. Conclusion

Unhealthy food usage is relatively high, regardless of the subgroup; most of the population prefers at least four unhealthy food types or risks. There were 3 to 4 food risks that revealed differences by age, sex and ethnicity with greater occurrence in the over 50s, males and Indo-Trinidadian. There was no association of food risks by Myocardial Infarction status and lifestyles. Overall, the population appears to have homogeneous eating habits except with socio-demographic factors namely age, sex and ethnicity. Changing from an unhealthy food preference to a more acceptable one would require individual and societal efforts, as well as new cultural norms and legislation for processed food producers and other stakeholders. More research needs to be done on infrastructural, social and cultural determinants of food preferences and habits.

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Spatial Analysis of Children's Diarrhea in Urban Areas

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Abstract

Diarrhea is a condition in which an individual experiences bowel movements with a frequency of 3 times or more per day in the consistency of stool in liquid form. In addition, it can occur from person to person as a result of poor personal hygiene and environment. This research was conducted using quantitative methods and using a case series design. The population in this study amounted to 2533 toddlers with 56 samples. Data were collected using the case series method on 56 toddlers. Primary data were obtained through questionnaire interviews and recording the distribution of diarrhea incidence among toddlers with Google Maps and ArcGIS. Based on the results of the study, it was found that in the spatial analysis the incidence of toddler diarrhea was mostly spread in RW 01, as many as 36 respondents (64.3%) had a good household waste management system, as many as 41 respondents (73.2%) had a waste water management system. good, as many as 30 respondents (53.6%) had bad hand washing behavior, 37 respondents (66.1%) had poor knowledge, and as many as 37 respondents (66.1%) had higher education status. It was expected to Public Health Center to re-evaluate environmental health infrastructure recommendations.

Keywords: Diarrhea, Waste Water Management, Waste Management, Knowledge, Hand Washing Behavior

1. Introduction

Environmental health is a basic part of public health which includes all aspects of human life in relation to the environment. Environmental factors are the factors that have the greatest influence on public health status, in addition to behavioral factors, health service factors and heredity. Disease is basically the result of the interaction or relationship between human behavior and the environment, because the human environment is closely related to disease-carrying agents and can cause health problems. In developing countries like Indonesia, environmental-based diseases still dominate (Achmadi, 2011). One of the diseases that is closely related to environmental health aspects is diarrhea. Diarrhea is the loss of fluids and electrolytes by defecating in the form of watery or watery stools more than 3 times a day with or without blood or mucus. The second biggest cause of death among children under five in the world after pneumonia is diarrhea. Data from *The United Nations Children's Fund* (UNICEF) and *World Health Organization* (WHO), nearly one in five deaths of children under five in the world is caused by diarrhea. The under-five mortality rate caused by diarrhea reaches 1.5 million per year. The largest incidence occurs in the first 2 years of life and decreases with the growth of the child (Ministry of Health, 2017). The results of the 2017 Indonesian Health Demography and Survey (IDHS) show the high mortality rate for children under

five in Indonesia. The child mortality rate in Indonesia in the five years before the survey was obtained, the results of the neonatal mortality rate was 15 per thousand live births, the infant mortality rate was 24 per thousand live births, and the under-five mortality rate was 32 per thousand live births. Based on the results of the survey, the high mortality rate of children under five is caused by a number of diseases, such as ARI (acute respiratory infection), high fever and diarrhea. Handling diarrhea for toddlers is the worst. Because, out of 2,328 children with diarrhea, only 74 percent of them have received treatment (Ministry of Health, 2017).

The impact of diarrhea that occurs in children under five, apart from death, is dehydration, impaired growth (failure to thrive), and is the main cause of malnutrition in children under five years of age (WHO, 2009). Risk factors that influence the incidence of diarrhea are environmental factors (clean water facilities, family toilets, density of family dwellings, waste water disposal facilities and waste treatment), maternal factors (behavior, education, knowledge) and under-five factors (exclusive breastfeeding, measles immunization and status. nutrition) as well as family factors (number of children under five in the family and socio-economic conditions) (Ministry of Health, 2017).

According to Early Research in 2013, there was a significant relationship between household wastewater treatment channels and waste management with the incidence of diarrhea in children under five. Based on the results of research conducted by Arbain in 2017, there is a relationship between mother's hand washing habits and the incidence of acute diarrhea in toddlers (Arbain, 2017).

According to Hartati & Nurazila's research in 2018 there was a relationship between maternal knowledge and the incidence of toddler diarrhea and there was also a relationship between parental education and the incidence of diarrhea in toddlers (Hartati & Nurazila, 2018). According to Nurfita's Research, in 2017 there was a relationship between exclusive breastfeeding and the incidence of toddler diarrhea (Nurfita, 2017). In addition, other studies also show that there is a relationship between the nutritional status of toddlers and the incidence of diarrhea in children under five (Irawan, 2016).

Puskemas Cipondoh is the first level Puskesmas located at jl. KH. Hasyim Ashari, Cipondoh Village, Cipondoh, Tangerang City. Puskesmas Cipondoh oversees three urban villages, namely Cipondoh, Cipondoh Makmur and Kenanga Villages. Diarrhea tends to increase every year and is one of the 10 biggest problems in the working area of Puskesmas Cipondoh, this disease attacks all age groups, especially toddlers. Diarrhea tends to increase every year and is one of the 10 biggest problems in the working area of Puskesmas Cipondoh, this disease attacks all age groups including toddlers. Data on visits of diarrhea patients among toddlers from January to April 2020 in Cipondoh Village were 57 patients, Cipondoh Makmur Village as many as 36 patients and Kenanga Village as many as 27 patients. Kelurahan Cipondoh is a village with the highest number of diarrhea cases in the Cipondoh Community Health Center Working Area. Cipondoh Village consists of 13 RW and 69 RT. The prevalence of diarrhea incidence in 2018 and 2019 was 16.85%. Diarrhea is one of the environmental-based diseases that are included in the top 10 diseases in Cipondoh Public Health Center, Tangerang City which is ranked 9th with a total of 937 cases in 2019 (Diarrhea Data from Cipondoh Puskesmas, 2019). Spatial analysis has proven important in mapping the extent of infectious diseases and assisting control policies.

2. Method

2.1 Sample Design

The method used in this study was conducted using a quantitative approach using the *case series* study method. A *case series* is a simple descriptive report of case characteristics in a relatively short group of patients describing several patients with the same disease. Primary data in this study were obtained directly through a questionnaire with interviews and recording the spread of diarrhea incidence in children under five with the *Global Positioning System* (GPS). Secondary data in this study were obtained from the Cipondoh Public Health Center, Tangerang City. The population in this study were all toddlers (2533 toddlers) who administratively domicile Cipondoh Village. The sample in this study were all Toddlers with diarrhea from

January to April 2020 who live in Cipondoh Village and recorded at Cipondoh health Center as many as 56 toddlers.

2.2 Data Collection

The instruments that will be used in the data collection process are: 1. Household Waste Management System, Assessment of Household Waste Management Systems using the observation sheet. The observation sheet consists of some questions regarding the House Waste Management System Stairs. The assessment is done by giving point 1 on questions that were answered correctly and points 0 if they were answered incorrectly. With measurement results: 0 = Not good, if you don't have a trash can or have the trash can is not closed 1 = Good, if you have a trash can and it is closed. 2. Household Wastewater Management, System Household Wastewater Management System Data is obtained through interviews with respondents using instrument in the form of a questionnaire consisting of several questions, then the assessment is done by giving point 1 on questions that were answered correctly and points 0 if answered wrong. With measurement results: 0 = Not good, if the sewerage does not have a cover and smell or have a cover and smell 1 = Good, if the sewerage has a cover and does not smell. 3. Mother's Hand Washing Habit, Data on maternal hand washing habits were obtained using questionnaire by giving some questions to find out mother's hand washing habits related to all things related to toddlers. Each score is as follows: score 5 for Very Often (SS) answers, score 4 for Frequent answers (S), score 3 for Fairly Frequent answers (CS), score 2 for Infrequent answers (TS), score 1 for Unequal answers Once (TSS). With measurement results: 0 = Not good, if the value of the respondent's answer <mean / median 1 = Good, if the value of the respondent's answer > mean / median. 4. Mother's knowledge, Maternal knowledge data obtained from data collection primary using a questionnaire measuring instrument with a number questions about prevention, causes, symptoms and risk factors diarrhea. For questions with correct answers, the score will be 1 and 0 if the answer is wrong. Knowledge categories are divided into two with measurement results: 0 = Not good, if the value of the respondent's answer <mean / median 1 = Good, if the value of the respondent's answer > mean / median 5. Mother's Education, Data related to maternal education were obtained from interviews using a questionnaire by giving 1 question for know the level of formal education taken by the mother with the measurement results: 0 = low, if not in school / graduated from elementary school / graduated Junior high school and 1 = high, if graduated from high school / college graduated.

2.3 Data Analysis

To determine the normality of the data, it can be done using the Kolmogorov Sminov test (sample > 30) in the statistical program for social science (SPSS). If the significance of the p-value is <0.05, the data is not normally distributed, on the contrary, if the p-value > 0.05, the data distribution is normal. In this study, there were two variables that were tested for normality, namely the knowledge variable and the mother's hand washing behavior variable. In the knowledge variable, the data is not normally distributed so that the cut of point used is Median (8) so that the respondent is said to have good knowledge if he gets a score > 8 and has poor knowledge if he gets a score <8. Whereas in the variable the mother's hand washing habits, the test results are obtained. data normality is not normally distributed with the cut of point used is Median (16.5), so the respondent is said to have a good habit of washing hands if he gets a score > 16.5 and the habit of washing hands is not good if he gets a score of <16.5.

This spatial analysis was conducted to determine the distribution of diarrhea incidence using mapping techniques in geographic information systems. Applications used in spatial analysis are open source applications or those that can be accessed openly, namely the Global Positioning System (GPS) and ArcGIS (Geographic Information System).

3. Results

Following are the results and discussion of spatial and univariate analysis.

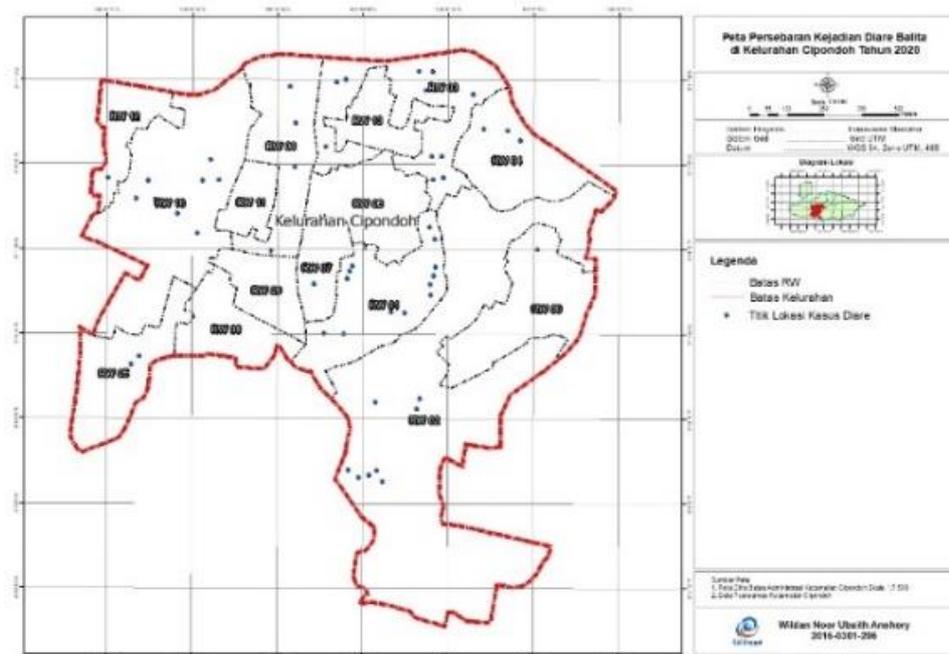


Figure 1: Description of Spatial Analysis Distribution Map of The Spread Point of Infants of Diarrhea for Toddler in Urban Areas

Based on Figure 1, it can be seen that the distribution of the spatial analysis of toddler diarrhea in Cipondoh Village with the highest cases is in the RW 01 area with a total of 13 cases (23.2%) and the areas with the lowest or clean cases of toddler diarrhea are RW 09, 11 and 13 with a number of 0 cases (0%).

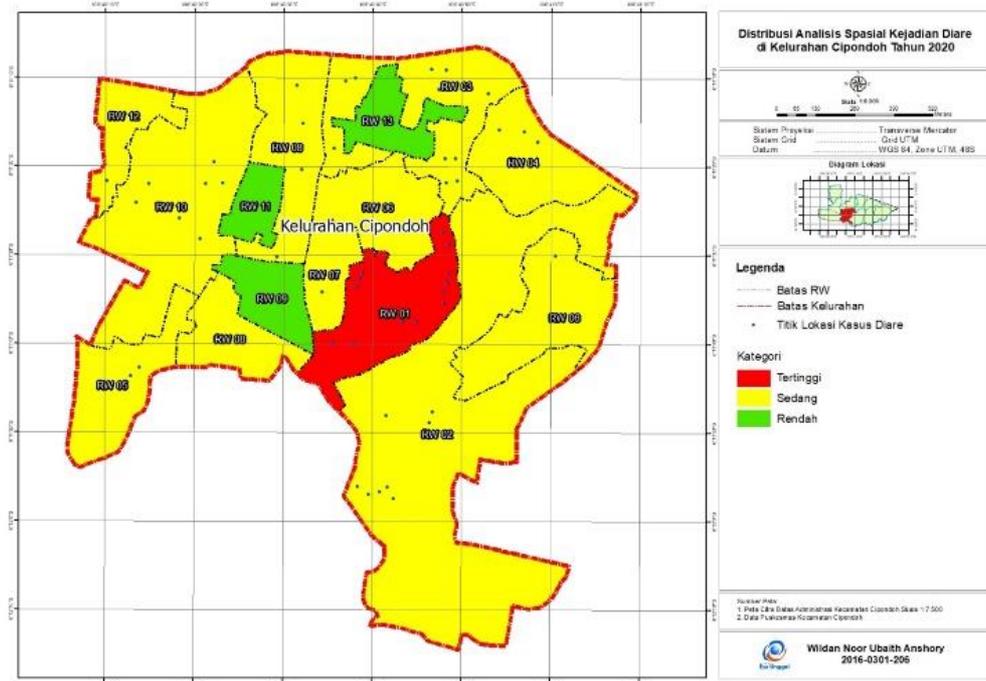


Figure 2: Description of Spatial Analysis Distribution Map of The Incidence Rate of Diarrhea for Toddler in Urban Areas

Based on Figure 2, it can be seen that the distribution of the spatial analysis of toddler diarrhea in Cipondoh Village is categorized into three categories, namely the highest which is depicted in red, while that is described in yellow and clean which is depicted in blue. The region is categorized as the highest if there are ≤ 13 cases, moderate if there are 1 to <13 cases and clean if there are no cases of diarrhea in children under five in the region. The area with the highest category is RW 01 which is depicted in red, while the area with the cleanest category is RW 9, 11 and 13 which are depicted in green.

Table 1: Univariate Results

Variable	Frequency	Percentage
Waste management		
Household		
Well	36	64.30%
Not good	20	35.70%
Wastewater Management		
Household		
Well	41	73.20%
Not good	15	26.80%
Behavior		
Wash your hands		
Not good	37	66.10%
Well	19	33.90%
Mother's Knowledge		
Not good	37	66.10%
Well	19	33.90%
Mother's Education		
High	37	66.10 %
Low	19	33.90 %

Based on the table above, it can be seen from 56 respondents that the highest proportion is found in respondents with good household waste management as many as 36 respondents (64.3%), respondents with good household waste water management as many as 41 respondents (73.2%), respondents with poor hand washing behavior were 37 respondents (66.1%), respondents with poor knowledge level were 37 respondents (66.1%), and respondents with high education level were 37 respondents (66.1%).

4. Discussion

4.1. Household Waste Management

Based on the results of questionnaires to respondents, it was found that there were more respondents with good household waste management because 36 respondents (64.3%) had a trash can equipped with a cover. Several respondents admitted that the puskesmas had several times provided health education about environmental health during health promotion at the posyandu so that the respondents were quite familiar with a good household waste management system. The puskesmas also has a sanitation clinic program where the community can carry out consultations related to sanitation problems that are not yet understood by environmental health officials to reduce the incidence of infectious diseases due to poor environmental health conditions.

4.2. Household Wastewater Management

Based on the results of the questionnaire obtained, 41 respondents (73.2%) had a high frequency with good household wastewater management. Based on interviews with several respondents, respondents admitted that the

reason for good household wastewater management owned by respondents was that they obtained information or explanations about how to manage household wastewater in a simple and easy to understand way from environmental health workers from Puskesmas Cipondoh during the house data collection program. However, from the author's observations while in the field, there are still many sewerage drains on the side of the road that are open and become a gathering place for insects, especially flies, which are feared to carry disease from the sewerage of household wastewater on the side of the road to residential areas.

4.3. Mother's Hand Washing Behavior

Based on the results of the interview, respondents with good hand washing behavior admitted to getting knowledge about the ways and important impacts of washing hands during diarrhea treatment at the health center and during immunization at the posyandu as explained by the health center staff, while some respondents with poor hand washing behavior admitted that they often Do not have time to wash your hands with soap because the situation feels urgent when you want to do activities related to toddlers. The puskesmas has provided several facilities for washing hands that are scattered in several points in the Cipondoh Village area to facilitate and increase the culture of diligently washing hands with soap for the community. Puskesmas officers can add physical and digital educational content related to the methods and important impacts of hand washing which are then distributed through posyandu cadres physically and digitally.

4.4. Mother's Knowledge

Based on interviews with several health center officers, the puskesmas has several programs related to increasing maternal knowledge regarding diarrhea, including sanitation clinics, home visits for diarrhea patients, data collection on healthy homes and counseling during immunization at the posyandu. However, there are still many mothers who consider health promotion materials to be trivialized with the theme of diarrhea because they feel that diarrhea is only a minor health problem so they do not pay too much attention to the material related to health promotion at the posyandu. In connection with the new normal order of the Covid-19 health protocol, these programs are temporarily suspended and only implemented in conjunction with DHF patient visits if there are DHF cases. Aims to avoid the crowd and could cause future collection without physical distances easily controlled, resulting in the spread of viruses Covid-19. The lowest proportion of correct answers was the question about the consequences of handling diarrhea inaccurately, so it is hoped that health center officers can prepare materials and media for information to the community due to inadequate handling of diarrhea in order to increase maternal knowledge related to inappropriate handling of diarrhea.

4.5. Mother's Education

Based on the results of the questionnaire to the respondents, it was found that more respondents with higher education, namely SMA and Higher Education, the majority of respondents were mothers with high school graduation education. This is related to the Tangerang City government program which requires schools to be up to 12 years old by providing support in the form of education funding assistance which encourages a high proportion of the people of Cipondoh Village, Cipondoh District, Tangerang City to graduate from high school education. This study is in line with the results of the Indonesian Health Demographic Survey (Indonesian Health Demographic Survey, 2007). Based on the survey results, it was found that there was a negative relationship between the incidence of diarrhea and the level of maternal education. However, in a study conducted by (Nadia & Kusumaningtiar, 2020) that mothers with a low level of education will have a 1.94 times greater risk of diarrhea in toddlers than mothers with a high level of education.

4.6. Overview of Spatial Analysis of the Incidence of Diarrhea for Toddlers in Urban Areas

Based on the results of spatial analysis of data processing the incidence of diarrhea in children under five in Cipondoh Village, from 56 observation points, the most prevalent distribution of diarrhea incidence among children under five is RW 01 with 13 incidents (23.2%) and the distribution of toddler diarrhea with the lowest or clean distribution is RW 09, 11 and 13 0 incidents (0%) which can be seen in the distribution in Figure 4.1 and

illustrated significantly by the category of the division of the area with red color to categorize the areas with the highest incidence of diarrhea, yellow for wikayah with moderate categories and green for clean or low categories in Figure 4.2. Based on the WHO report, in 2017. Nearly 1.7 billion cases of diarrhea occur in children with a mortality rate of around 525,000 in children under five each year. In Indonesia based on data from the Ministry of Health. In 2017, there were 21 outbreaks of diarrhea spread across 12 provinces, 17 districts / cities. Polewali Mandar, Pohuwato, Central Lampung and Merauke districts each had 2 outbreaks. The number of sufferers was 1,725 and 34 people died (CFR 1.97%) (Ministry of Health, 2017).

Diarrhea is a condition in which an individual experiences bowel movements with a frequency of 3 times or more per day in the consistency of stool in liquid form. This is usually a symptom of a digestive tract infection. This disease can be caused by various viruses, bacteria and parasites. The infection spreads from contaminated food and drink. In addition, it can occur from person to person as a result of poor personal hygiene and environment (sanitation). Severe diarrhea causes fluid loss, and can cause death, especially in children who are malnourished or have immune disorders (Sumampouw, 2017). Diarrhea is a disease that is influenced by several risk factors. These factors are environmental factors (clean water facilities, family toilets, density of family housing, waste water disposal facilities) and waste processing, maternal factors (behavior, education, knowledge) and under-five factors (exclusive breastfeeding and nutritional status) as well as family factors (number of children under five in the family and socio-economic family) (Ministry of Health, 2017).

The impact of diarrhea on children under five, apart from death, is dehydration, impaired growth (failure to thrive), and is the main cause of malnutrition in children under five years of age (WHO, 2017). Diarrhea can have impacts such as dehydration, malnutrition and death in children under five, but until now there has been no impact from diarrhea such as dehydration or mortality in children under five in Cipondoh Village. (Daud and Anwar, 2005) explains that healthy waste water disposal facilities must meet the following requirements

1. Do not pollute clean water sources
2. Does not cause standing water
3. Does not cause odor
4. Does not create a shelter and breeding ground for mosquitoes or other insects.

From the results of data collection in the field, RW 01 is the area with the most distribution points of diarrhea cases because 10 out of 13 respondents (77%) in RW 01 have a poor household wastewater management system. This is supported by the results of the author's observations during the field where there are still many sewage drains in the RW 01 area, especially along the road which is not closed, causing puddles and becoming a place of shelter and gathering of insects such as flies, this is contrary to the theory described. by (Daud and Anwar, 2005) which states that one of the requirements for good wastewater management is that it does not create a shelter and a breeding place for mosquitoes or other insects.

Based on the results of observations from interviews with health workers, it was found that the health center had made maximum preventive, promotive, curative and rehabilitative efforts through several programs including sanitation clinics, home visits for diarrhea patients, data collection on healthy homes, monitoring of ODF (open defecation Free) and sanitation inspections. . The sanitation clinic program and home visits for diarrhea patients are carried out every two weeks, data collection of healthy homes and monitoring of ODF carried out once a year and sanitation inspections every three months.

During the Covid-19 pandemic, routine programs that were carried out every two weeks and once every three months were only carried out in conjunction with DHF patient visits if there were cases of DHF. Many adjustments are being designed by the puskesmas in order to maximize existing previous programs, so that the previous existing preventive, promotive, curative and rehabilitative programs have not been implemented optimally. It is hoped that the puskesmas officers can pay more attention to handling the problem of household wastewater management in the RW 01 area which still needs to be addressed in order to reduce the spread rate.

4.7. Description of Distribution of Household Waste Management in Urban Areas

Based on research on 56 respondents in the Cipondoh Village, obtained the highest proportion of respondents with good household waste management as many as 36 respondents (64.3%). The results of this study are not in line with research conducted by Muhajjar (2015) which states that the proportion of waste disposal facilities that do not meet the requirements is 31 people (72.1%). Differences in research results can be influenced by environmental, economic and socio-cultural factors.

It is known that waste is a direct consequence of life, so it can be said that waste has arisen since human life. The emergence of togetherness with human activities ranging from efforts to add / take natural resources as raw materials, continue to become materials that are ready for energy, semi-finished materials for goods and service activities in consuming these goods to achieve their welfare. According to the WHO definition, waste is something that is not used, unused, disliked, or something that is thrown away from human activities and does not happen by itself (Chandra, 2014).

Waste produced by humans will rot due to the activity of microorganisms in nature, so that garbage often creates unpleasant odors so that waste must be properly managed. Waste management is an activity that is systematic, comprehensive and sustainable. The implementation of waste management includes waste reduction and handling. Reduction of waste is carried out by 3 R (Reduce, Reuse, Recycle) while handling waste is sorting, collecting, garbage to a Temporary Waste Collection (TPS) and transportation from the TPS to the Final Shelter (TPA).

Each individual is required to have a means or container for the garbage so that it does not cause odors and pollute the surrounding environment. The requirements for individual containers according to the Director General of Public Works Number 03 of 2013 are as follows:

1. Waterproof and Air
2. Easy to clean
3. Light weight and easy to lift
4. Have a lid
5. The container volume can be reused

Based on the results of questionnaires to respondents, it was found that there were more respondents with good household waste management because 36 respondents (64.3%) had a trash can equipped with a cover. Several respondents admitted that the puskesmas had several times provided health education about environmental health during health promotion at the posyandu so that the respondents were quite familiar with a good household waste management system. The puskesmas also has a sanitation clinic program where the community can carry out consultations related to sanitation problems that are not yet understood by environmental health officers to reduce the incidence of infectious diseases due to poor environmental health conditions. However, according to the author, this program has not been running optimally because not many people know about the program.

4.8. Description of Distribution of Household Wastewater Management in Urban Areas

Based on research on 56 respondents in Cipondoh Village, it shows that the highest frequency distribution of respondents is that of good household wastewater management as many as 41 people (73.2%). This is not in line with research by Nuraeni (2012) of 100 respondents, 62 respondents (62%) had SPAL that did not fulfill the requirements. Wastewater or wastewater is water left over from human activities, both household activities and other activities, disposed of in a form that is already dirty (polluted) and generally contains materials or substances that can be harmful to human health and disturb human health. life health (Notoatmodjo, 2007).

Wastewater from households includes feces that have the potential to contain pathogenic microbes, urine which then contains small microorganisms, and water used from kitchen, washing machine or bathroom washing. Household waste in the form of fat and soap / where fat or dirt from food scraps will break down and produce waste that smells bad due to the decomposition process. The results of the decomposition will reduce the amount of oxygen in the water and will increase BOD (biochemical oxygen demand), namely the need for oxygen to decompose organic matter in water through biochemical processes and increase the need for oxygen to decompose organic matter in water through chemical processes (Suyono and Budiman, 2010). The bad effects of bad waste treatment include:

- a) Health problems: Wastewater can contain germs that can cause water borne disease (Water borne Disease) and can contain toxic and dangerous substances, and can become a nest for disease vectors (for example flies, mosquitoes, cockroaches, etc.)
- b) Decreasing Environmental Quality: Wastewater that is discharged directly into surface water (rivers and lakes) can pollute the surface, the waste water will reduce oxygen levels in the water so that it can disturb the life in it. In addition, wastewater can pollute groundwater so that the soil can no longer be used according to its purpose.
- c) Beauty Distraction: Wastewater containing color pigments will cause discoloration in the receiving water body, although it is not disturbing to health, but there will be disturbance to the beauty of the water body. Sometimes the wastewater can cause an unpleasant odor.
- d) Interference with Damage to Objects: Sometimes wastewater carries substances that can be converted by anaerobic bacteria into aggressive gases such as H₂S, which can accelerate rusting of objects made of iron. In accordance with the substances contained in it, untreated wastewater will cause various health problems to the public and the environment, among which it will become a transmission / medium for spreading diseases, especially cholera, typhus abdominalis and bacillary dysentery, becoming a medium for breeding pathogens, becoming media for mosquito breeding or where mosquito larvae live, causing unpleasant odors and unsightly to the eye, is a source of contamination of surface water, soil and other living environments, reduces human productivity, because people work uncomfortable and others (Sarudji, 2010). Daud and Anwar (2005) explains that healthy waste water disposal facilities must meet the following requirements:
 1. Do not pollute clean water sources
 2. Does not cause standing water
 3. Does not cause odor
 4. Does not create a shelter and breeding ground for mosquitoes or other insects.

Based on the results of the questionnaire obtained, 41 respondents (73.2%) had high frequency with good household wastewater management. Based on interviews with several respondents, respondents admitted that the reason for good household wastewater management owned by respondents was because they received information or explanations about how to manage household wastewater in a simple and easy to understand way from environmental health workers from Puskesmas Cipondoh during the program. Healthy house data collection. However, from the author's observations while in the field, there are still many sewerage drains on the side of the road that are open and become a gathering place for insects, especially flies, which are feared to carry disease from roadside household sewerage to residential areas.

4.9. Description of Distribution of Handwashing Behavior in Urban Areas

Based on research on 56 respondents in Cipondoh Village, it shows that the highest proportion of respondents who wash their hands is not good, namely 30 respondents (53.6%). This research is not in line with research conducted by Nuraeni (2012) that the majority of respondents have a good hand washing behavior, namely 42 people (82.3%).

According to the Indonesian Ministry of Health (2007), washing hands is a very important behavior in the spread of diarrhea, because hands are a very important medium in spreading the disease through fecal oral. Not washing hands before eating or before feeding food to children, after defecating, and not washing hands before preparing food or preparing milk for children, this can increase the risk of diarrhea disease.

Washing hands with soap (CTPS) can prevent various infectious diseases that cause high morbidity and mortality of millions of children in Indonesia. CTPS behavior is a common knowledge in society, but this behavior is not carried out in a sustainable manner. This is because the facilities and infrastructure are not yet available. The advantage of the CTPS behavior is to reduce almost a proportion of cases of diarrhea and a quarter of cases of upper respiratory tract infections (ISPA), to prevent skin, eye infections and HIV / AIDS sufferers. The important time for CTPS is after defecating, after cleaning children who are defecating, before preparing the meaning, after handling animals (Ministry of Health, 2011).

Based on the results of the respondent's hand washing behavior questionnaire using the Likert scale, the most frequent respondent answered questions about washing hands using soap after defecating. Large 57 people (71.3%), wash their hands using soap, before feeding their toddlers 47 people (58.8%), wash their hands using soap with clean running water 47 people (58.8%). Based on the results of the interviews, respondents with good hand washing behavior admitted to getting knowledge about the ways and important effects of washing hands during diarrhea treatment at the health center and during immunization at the posyandu as explained by the health center staff, while some respondents with poor hand washing behavior admitted that they often Do not have time to wash your hands with soap because the situation feels urgent when you want to do activities related to toddlers. The puskesmas has provided several hand washing facilities scattered in several points in the Cipondoh Village area to facilitate and increase the culture of diligently washing hands with soap (CTPS) for the community. Puskesmas officers can add physical and digital educational content related to the methods and important impacts of washing hands which are then distributed through posyandu cadres physically and digitally.

4.10. Description of Mother's Knowledge distribution in Urban Areas

Based on the results of research on 56 respondents in the Cipondoh Village shows that the highest proportion obtained by respondents with less knowledge is 37 respondents (66.1%) and the proportion of respondents with good knowledge is 19 respondents (33.9%). This is not in line with research conducted of 107 respondents, there were 58 people (54.2%) with a good level of knowledge. Knowledge as something that is known to a person in any way and something that is known to people from the experience gained. Lack of knowledge or understanding of diarrhea and its handling is one factor in the increasing incidence of diarrhea in children under five. It is important to disseminate knowledge about diarrhea prevention because it is very helpful in the first treatment of children who experience diarrhea (Notoatmodjo, 2007).

Based on the results of the questionnaire, the following results were obtained: questions about the consequences of handling diarrhea inadequately (60.71%), nutritional disorders for toddler diarrhea (71.42%), good fluids for diarrhea sufferers (78.57%), condition of under-five sufferers diarrhea requiring referral (80.35%), definition Diarrhea (80.35%), causes of diarrhea (80.35%), spread of diarrhea (100%), risk factors for diarrhea (100%), and the impact of hand washing behavior (100%).

Based on interviews with several health center officers, the puskesmas has several programs related to increasing maternal knowledge regarding diarrhea, including sanitation clinics, home visits for diarrhea patients, data collection on healthy homes and counseling during immunization at the posyandu. However, there are still many mothers who consider health promotion materials to be trivial with the theme of diarrhea because they feel that diarrhea is only a minor health problem so they do not pay too much attention to the material related to health promotion at the posyandu. In connection with the new normal order of the Covid-19 health protocol, these programs are temporarily suspended and only carried out in conjunction with DHF patient visits if there are DHF cases. This aims to prevent crowds and lead to mass gathering without controlled physical distance, resulting in easy spread of the Covid-19 virus. The lowest proportion of correct answers was the question about the consequences of handling diarrhea inaccurately, so it is hoped that health center officers can prepare materials and media for education to the community due to inadequate handling of diarrhea in order to increase maternal knowledge related to inappropriate handling of diarrhea.

4.11. Description of the Distribution of Mother's Education in Urban Areas

Based on the results of research on 56 respondents, it shows that the highest proportion is mothers with a high level of education as many as 37 respondents (66.1%). This is in line with research conducted by Nuraeni (2012) in which 80 mothers with a high level of education were respondents (80%). According to Sander (2005) Education is a basic need, education can be obtained from formal education (basic education, secondary education and higher education) and informal education (courses, training and education and training). Education level plays an important role in public health. Low community education makes it difficult for them to be informed about the importance of personal hygiene and environmental sanitation to prevent disease infectious, including diarrhea. And it is difficult for them to receive counseling, causing them not to care about efforts to prevent infectious diseases.

Based on the results of the questionnaire to the respondents, it was found that more respondents with higher education, namely high school and university, the majority of respondents were mothers with high school graduation education. This is related to the Tangerang City government program which requires schools to be up to 12 years old by providing support in the form of education funding assistance which encourages a high proportion of the people of Cipondoh Village, Cipondoh District, Tangerang City to graduate from high school education. This study is in line with the results of the Indonesian Health Demographic Survey. Based on the survey results, it was found that there was a negative relationship between the incidence of diarrhea and the level of maternal education. However, in a study conducted by Nadia & Kusumaningtiar (2020) that mothers with a low level of education will have a 1.94 times greater risk of diarrhea in toddlers than mothers with a high level of education.

5. Conclusion

There are still many residents who are not familiar with the environmental health programs related to diarrhea owned by the puskesmas, one of which is the sanitation clinic, it is hoped that the puskesmas can introduce existing programs more to the community. One of the efforts that can be done is by disseminating information through posyandu cadres related to the existing program. Many mothers think that information about diarrhea is not so important as an additional job for puskesmas officer to make programs with information related to diarrhea more attractive and easier to understand, so that the message conveyed can be maximally accepted by the community. And the addition of health promotion media in the form of leaflets or physical and digital educational content distributed to the public about the importance of washing hands is felt to increase mother's awareness to pay more attention to cleanliness before carrying out activities related to toddlers

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Imprecision and Unconscious Moralism in Public Health Risk Communication

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Abstract

Risk communication is a foundation of the practice of public health. It is traditionally based on a carefully considered epidemiological computation of the likelihood of experiencing a condition given the presence of a particular exposure or behaviour. The extent to which numerical precision is important in such communication is a function of the availability of good statistics, the ability of the target audience to appreciate the meaning of the statistics, and the emotional heft represented by the chosen statistic. There is an inherent danger, however, in overweighting the latter consideration at the expense of the former two. When emotional impact and behavioural change become goals to the exclusion of complete scientific credibility, we risk brushing against the realm of propaganda in service of unexplored unconscious societal moralism. In this era of heightened distrust of state authority, it behooves public health communication to avoid the suggestion of data misrepresentation in service of behaviour change, regardless of how socially desirable that change might be.

Keywords: Unconscious Moralism, Public Health, Risk Communication

1. Public Health in Service of Social Norms

As economies become more intertwined, cross-border travel faster and more convenient, and telecommunications more seamless, the world continues to shrink both perceptually and effectively. The combination of rapid air travel and economic globalization has made every epidemic a potential pandemic, and thus every local public health decision worthy of the attention of global health policymakers.

Public health has become ever more present in our lives, now more noticeably so in the wake of the pandemic. Historic attempts to control tobacco consumption or driving speed were unrolled with minimal objection or examination. But calls for pandemic behaviour restrictions and COVID-19 vaccine uptake have met with very vocal resistance from those suspicious of state legitimacy, agenda, and purity of motivation. Much of this opposition has been framed twofold as an assault by public health on both individual autonomy and the very moral fabric of society. (Rodenberg, 2021) Distrust of public health in the Western world is at a very high level. (Hurt, 2022)

In a 2010 paper, (Dawson, 2010) Angus Dawson drew an important distinction between public health ethics and medical ethics. He argued that public health, as its own ethical framework, must do away with the bioethical “dogmas” of sacrosanct individual autonomy that is the core of ethical clinical care, contractual obligations arising from the consumerist model of health care, and an overreliance on the rule of law to justify interventions and restrictions. In essence, Dawson drew our attention to the problem of medical ethics dominating all bioethics, in particular public health ethics.

In his book, *The Philosophy of Public Health* (Dawson, 2012), Dawson further argued that within the practice of public health lies an implicit duty to promote social capital, which is loosely defined as a positive emergent phenomenon arising from social networks, akin to influence or trust. He stated that some of the important factors of social capital are, “norms, values and attitudes.” (Dawson, 2012)

The quest for social capital necessitates a role of public health that is never iconoclastic or fringe-oriented, but rather one that follows mainstream, though not necessarily dominant, values threads. An example would be public health campaigns seeking to promote safe needle exchange programs for heroin addicts. Such programs are often opposed by social conservatives as they are seen as celebrating and promoting an immoral activity. (Goldberg, 2021) Public health leverages the social capital of social liberals who support such programs from a values perspective. Relying solely on the effectiveness data of needle exchange programs would likely be unproductive, since values-based decision-making is not necessarily evidence-based. (Brighthouse et al., 2018) Thus, if needle-exchange programs did not align with the values of a substantial part of the population, they would likely not be adopted, regardless of the quality of evidence showing their successes at reducing drug usage.

Other examples abound. Publicly funded abortion care has been shown to be fiscally and socially advantageous. (Donohue & Levitt, 2020; Torres et al., 1986) Yet the legality of abortion has been substantially diminished in much of the United States this past year. Values are a pillar of social capital; and values, while defined as more personal and inherent in character, are nevertheless influenced by prevailing cultural morality.

The COVID-19 pandemic has rendered ever more so the precariousness of public trust in state-mediated health communication. Public health communicators must thus walk a fine line between transparent, nonjudgmental and objective expression of useful information, and the projection of societal value, inasmuch as such value dictates desired behaviour change, and inasmuch as that change aligns with the aforementioned social norms. According to public health orthodoxy, the roles of communicators during a crisis are to alert the public to the nature of the emergency, enumerate steps that authorities are taking and that the public should be taking, inform the public of key developments during the evolution of the crisis, explain some technical points, and lastly to assuage panic.

The latter role necessarily flirts with the promotion of propaganda, inasmuch as propaganda is defined as information used to promote a particular political cause or viewpoint; and unexamined social norms are indeed causes or viewpoints. It behooves us to examine the likely moral motivations and assumptions underpinning every public health communication missive. To that end, this paper presents two examples of such missives whose representations of risk are skewed by unexamined moralism which, I argue, are promoted through the selection of statistics meant to inflate the perception of risk.

2. Examples of Communication Oversteps

Example 1 – Ernestine’s Women’s Shelter Ad

In 2011, an ad by Ernestine’s Women’s Shelter in Toronto stated, “Approximately 3-5 children in every Canadian classroom have witnessed their mother being assaulted.” After that statement, the ad presented another statistic: “70% of men in court-ordered treatment for domestic violence witnessed it as a child.”

The ad was accompanied by the heartbreaking photo of a small child with his head in his hands. The clear implication was that domestic abuse is transmitted intergenerationally and that a child witnessing his mother being assaulted is likely to become an abuser himself.

The intent of the ad is admirable. Evidence is strong that children who witness abuse can suffer an array of mental health challenges, often lasting well into adulthood. (Willis et al., 2010) However, evidence for the cyclical nature of domestic abuse is not as well established. The United States government's Office on Women's Health website (*Office on Women's Health*, 2022) offers citations to peer-reviewed studies supporting their claims that "Many children exposed to violence in the home are also victims of physical abuse" and "Children who witness domestic violence or are victims of abuse themselves are at serious risk for long-term physical and mental health problems." But the following statement, that "Children who witness violence between parents may also be at greater risk of being violent in their future relationships" is glaringly unsupported by an accompanying citation.

This is not a benign omission, as one writer notes that, "While abusive behavior can be repetitive, it's important to note that abuse does not always occur in a cyclical pattern. In fact, assuming that violence occurs in cycles can lead to victim-blaming." (Plumptre, 2021)

The two statistics featured in the Ernestine's ad stand out first for their frightening scale and implications, and second for the absence of any attempt to connect them. It is implied, but not stated that many of those 3-5 children who witness abuse will grow up to become those 70% of men in court-ordered abuse programs. For a fast or innumerate reader, the incorrect assumption would be that 70% of children who observe abuse would become abusers when they grow up.

What allows this assumption is the absence of any estimate of relative risk. Depending on assumptions made when constructing a contingency table, and absent any additional information, the data presented in the ad could lead one to compute a 50% additional risk of becoming an abuser if abuse is witnessed. Or, making different contingency assumptions, witnessing abuse could actually substantially *reduce* the risk of becoming an abuser.

Clearly, an assumption of a protective effect of abuse-witnessing is facetious. But absent any information to guide a reader's appreciation of the risk numbers, the natural assumption is one of high association between with these particular exposures and outcomes, fueled as it is by the emotional force of the ad's imagery. It could be argued that this is the intent of the ad's phraseology and design: to compel an overestimation of risk in service of an emotional response toward a policy goal.

Example 2 – CANFAR Ad

Similarly, a Toronto subway ad posted by the Canadian Foundation for AIDS Research (CANFAR) in 2007 offered two statistics and a specific claim or question: "Did you know that 86% of HIV Positive Canadians are male; And 2/3 of boys, aged 15 to 19 are sexually active? You think your kids aren't at risk? Think again."

The clear implication is that sexually active boys are at high risk for contracting HIV/AIDS. And while it is certainly true that any sexually active individual is at risk for contracting any number of sexually transmitted diseases, the selection of the "86%" figure appears to be strategically chosen to suggest to the casual reader that that is indeed the proportion of elevated risk for Canadian boys. It is a shockingly high level of risk, sure to cause any parent to pause and possibly panic.

The problem, of course, is that those two figures are not necessarily statistically linked. In the early 2000s, there were approximately 58,000 Canadians living with HIV; 86% percent of that figure would be 49,880 males living with HIV, based upon the ad's claim. But what is the denominator? Canada's male population hovered around 16 million in 2007, suggesting a risk of exposure to an HIV positive male at 0.3%.

Importantly, youth between the ages of 15 and 19 accounted for approximately 1.5% of all HIV reports, according to CANFAR's own website in 2007, (*Canadian Foundation for AIDS Research*, 2011) out of a base population of approximately 3 million. This drops the prevalence of HIV among Canadian male youth to 0.03%. This is a far leap from the inciting and suggestive 86% teased in the ad.

Furthermore, the ad targets sexual activity specifically. Yet in 2007, sex was responsible for only 37% of male HIV diagnoses in Canada. (*Avert*, 2007) Drug use was a far more likely driver of infection for this demographic. The ad also makes the assumption that the sexual activity in question is both *unprotected* and likely penetrative, or at the very least unsafe. Whereas sexual activity need not be a risk for HIV transmission if proper steps are taken. (Petrova & Garcia-Retamero, 2015) The ad therefore seems designed to cast a judgmental eye on youth sexual activity as a whole, and not specifically HIV-unsafe sexual activity.

3. Applicability of the CERC Framework

Much like the adage oft applied to diplomacy, public health in a democracy is the “art of the possible”, with what is possible gated by public enthusiasm. Absent the heavy hand of the law, compliance and behaviour change must be encouraged and nudged rather than compelled. Enthusiasm must be cultivated and not threatened. Historically taking cues from the art of advertising, public health has been successful in such nudges via emotional tactics like associating certain behaviours with preferred social networks. Anti-tobacco campaigns expressing sentiments similar to, “smoking is not cool” are an example. They successfully associated a preferred behaviour with the desired social norm.

There is no denying that such approaches are successful. Qualitative analyses consistently show that emotion in public health advertising often elicits the desired response. (Lewis et al., 2007) But these are usually “positive emotional appeals” and not appeals to fear or social disengagement. (Lewis et al., 2007) Advertising strategies for health promotion range over a spectrum from individually oriented public service advertising to socially oriented counter-advertising. (Dorfman & Wallack, 1993) But fear-based or judgement-based messaging is controversial. As one writer noted, “Using appeal to fear as a tool of persuasion can be valid or fallacious depending on the truth of the premises within the argument.” (Simpson, 2017) And frankly, such approaches have been shown to be ineffective. (Ten Hoor et al., 2012)

The two examples presented above are troubling for three reasons. First, their sly presentation of unrelated measures is meant to suggest to the reader a level of risk that a proper expression of numbers would not render. Second, the unstated (and presumably unconscious) judgement against sexual activity in the second ad belies an unexplored moralism that is beyond Dawson’s justifiable norms of social capital. And third, in this time of deepened scrutiny of public health messaging, any deviation from complete and truthful transparency only serves to impair the longer-term goal of incremental positive behaviour change born of informed rather than coerced action.

In 2002, the US Centers for Disease Control and Prevention (CDC) published the Crisis and Emergency Risk Communication (CERC) manual. It was updated in 2012, 2014, and 2018. (Prevention, 2018) The manual presents a 6-point framework for proper public health communication, the second of which is, “accuracy is critical to credibility.” The COVID-19 pandemic revealed deep failures in this regard, with guesses presented as certainties in the wake of a novel virus about which very little was initially known. (Sauer et al., 2021) But clearly this tendency predates the pandemic, as the two examples above demonstrate.

Public health communicators must recommit to the CERC principles and not be seduced by the methods and promises of commercial advertising, where behaviour change is desirable at any cost. Our goal is not to sell a product or achieve a singular behaviour change but rather to catalyze community cohesion such that shared social goals can be both agreed upon and pursued. This must be the essence of public health ethics in a post-pandemic world.

4. Conclusion

When public health marketing is performed without due consideration of statistical precision, the communication products of a public health initiative run the risk of being perceived as propagandistic, or at the very least expressive of an unexplored societal moralistic norm. It is possible, though, to embrace accuracy in both computation and nuance, and still convey an effective public health message. The temptation to cherry-pick

statistics to convey emotional impact disproportionate to their reflection of reality must be resisted. Otherwise, we risk eroding public confidence and impairing our ability to enact positive population health improvement.

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Acute Transverse Myelitis as a Neurologic Complication in an Asymptomatic COVID-19 patient

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Abstract

We report a case of a female presenting with sudden onset of bilateral lower extremity weakness and hyperesthesia and was managed as case of acute transverse myelitis. Diagnostics such as CSF analysis, autoimmune and infectious workups were unremarkable. However, patient tested positive for COVID-19 incidentally since she didn't present any COVID-19-related pulmonary or systemic symptoms. Thoracolumbosacral spine Magnetic resonance imaging revealed longitudinally extensive transverse myelitis. She was then administered with intravenous methylprednisolone pulse therapy and underwent extensive physical rehabilitation with marked improvement during outpatient follow-up.

Keywords: Asymptomatic Patient, Covid-19, Transverse Myelitis, Case Report

1. Introduction

Although the COVID-19 virus is notorious for causing pulmonary symptoms, various neurological manifestations have been reported to include vascular disorders, Guillain-Barre syndrome, encephalopathy, and myopathy, to name a few (Ahmed et al., 2022; Gulati et al., 2022; Gupta et al., 2020). Moreover, there are still few case reports on acute transverse myelitis following COVID-19 infection (Qazi et al., 2021). Nonetheless, there are still no available reports regarding COVID-19 confirmed patients who only presented with neurologic manifestation, specifically acute transverse myelitis. Herein we present a case of acute transverse myelitis associated with COVID-19 in an asymptomatic patient.

2. Case Presentation

A 25-year old female, left-handed, fully vaccinated but not yet boosted, without known co-morbidities came in to emergency room department for sudden onset bilateral lower extremity weakness of 1 day duration. She noted

severe lower back pain after feeling a “pop” in the back during surfing. Progressive bilateral lower extremity weakness was felt hours after and was associated with hyperesthesia and bladder distention. Due to absence of any COVID-related symptoms, no Reverse Transcriptase-Polymerase Chain Reaction (RT-PCR) nor Rapid antigen test was requested and she was subsequently admitted to a non-COVID room.

Upon assessment, patient had stable vital signs and did not present with fever, cough, dyspnea and other COVID-associated symptoms. She only had hypogastric distention due to urinary retention. Therefore, foley catheter was inserted. She had otherwise normal vital signs upon arrival at the emergency room. On neurologic examination, patient had intact mental status examination and cranial nerves. There were no visual impairments or relative afferent pupillary defect. Motor strength revealed 5/5 on upper limbs while the lower limbs had 2/5 and 4/5 for flexors and extensors, respectively. Hyperesthesia was noted starting at the L1 level bilaterally. Hyperreflexia at 4+ was noted on lower extremities due to presence of unsustained ankle clonus bilaterally. Since she was asymptomatic for COVID-19, and fully vaccinated with booster, she was then admitted to non-COVID room, amidst the hospital’s loose restrictions at that time.

Initial blood workup revealed unremarkable findings, as shown in Table 1.

Table 1: Routine blood examinations

	Result	Reference
Hemoglobin	13.8	12.5-16.0 g/dL
Hematocrit	41	37-47%
Red blood cells (RBC)	4.6	4.5-5.5 x10 ¹² /L
Mean corpuscular hemoglobin concentration (MCHC)	33	32-36 g/dl
Mean corpuscular hemoglobin (MCH)	30	27 – 31 pg
Mean corpuscular volume (MCV)	90	78 – 100 fL
Red cell distribution width (RDW)	13.2	11.5-15.0 %
White blood cell count (WBC)	8.75	5.0-10.0 x10 ⁹ /L
Neutrophils	67	37-72 %
Lymphocytes	23	20-50 %
Monocytes	9	2-9 %
Eosinophils	1	0-4 %
Basophils	0	0-1 %
Platelet	248	150-440 x10 ⁹ /L

Moreover, only modest elevations in C-Reactive Protein and D-dimer were noted (Table 2).

Table 2: Complete metabolic profile

	Result	Reference
Sodium	137	136 – 145 mmol/L
Potassium	4.1	3.5 – 5.1 mmol/L
Magnesium	0.84	0.66 – 1.07
Ionized Calcium	1.07	1.18 – 1.30
Creatinine	52.8	49 – 90 umol/L
Aspartate aminotransferase (AST)	17	5 – 34 Iu/L
Alanine transaminase (ALT)	12	5 – 55 Iu/L
Erythrocyte sedimentation rate (ESR)	6	0 – 20
C-Reactive Protein (CRP)	14	0 – 5
Procalcitonin	< 0.05	<0.5 ng/mL
Lactate Dehydrogenase (LDH)	191	125 - 220
Ferritin	135.59	4.63 – 204

D-dimer	412	0 – 400
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She also underwent lumbar puncture with normal opening and closing pressures, as well as Cerebrospinal fluid (CSF) analysis within normal limits (Table 3).

Table 3: Cerebrospinal fluid (CSF) analysis

	Result	Reference
Color	Colorless	Colorless
Turbidity	Clear	Clear
Pellicle	Negative	Negative
Total protein	445 g/L	150-450 g/L
CSF Sugar	88.38 mg/dl	50-80 mg/dl
% sugar	52.6%	50-80%
White blood cell (WBC)	$2 \times 10^9/L$	0
Red blood cell (RBC)	$1 \times 10^9/L$	0
Total cell count	$3 \times 10^9/L$	0

Magnetic resonance imaging of whole spine revealed non-expansile signal abnormality involving lower thoracic spinal cord extending from T8 level down to conus tip. There was no evidence of focal disc herniation, spinal canal narrowing or cord compression at any level (Figure 1).

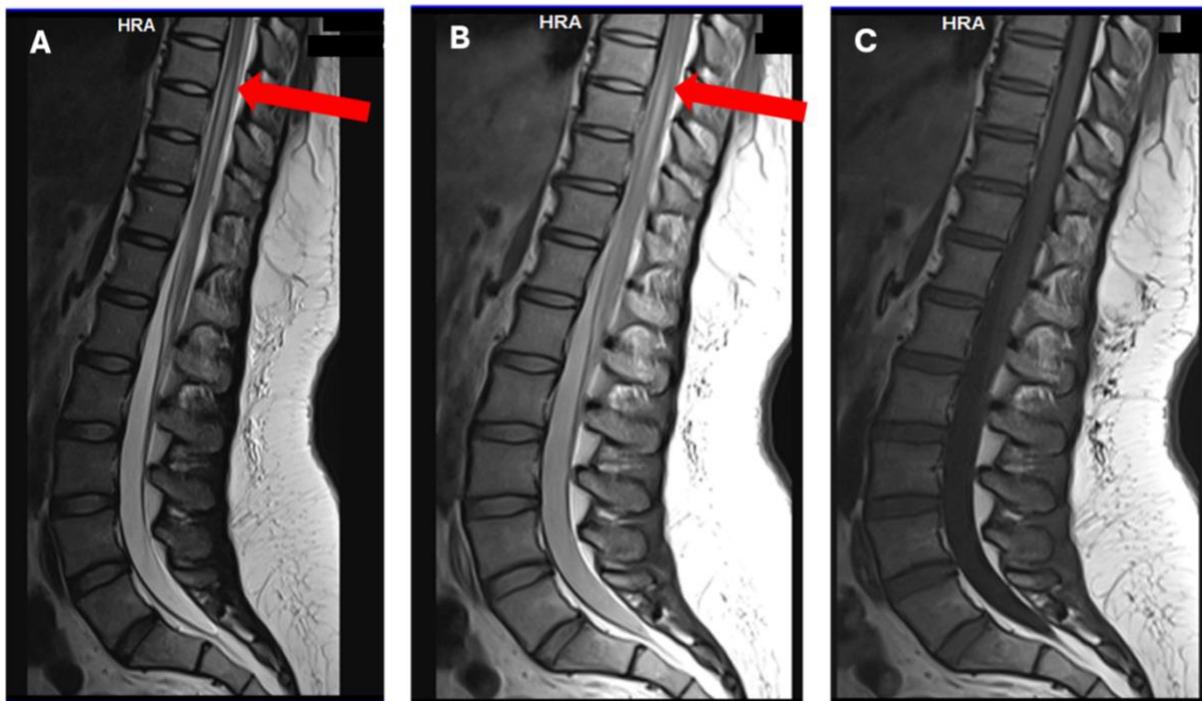


Figure 1: Thoracolumbosacral spine MRI sagittal view A) T2-weighted B) STIR/Short Tau Inversion Recovery C) T1- weighted

*Red arrows point to the longitudinally extensive hyperintense lesion starting at T8 level extending downwards

Cerebrospinal fluid analysis was also done which revealed unremarkable findings as well. CSF oligoclonal bands and IgG were negative. Moreover, both serum and CSF Anti-Aquaporin 4 antibody were negative (Table 4).

Table 4: Cerebrospinal fluid (CSF) analysis and Immunology Panel

	Result	Reference
CSF CALAS	Negative	Not detected

CSF TB Gene Xpert	Negative	Not detected
CSF Oligoclonal panel	Negative for overt CSF oligoclonal or monoclonal paraproteins	Not detected
CSF Culture/Sensitivity	No growth after 5 days of incubation	Not detected
CSF IgG	3.88 mg/dL	0.480-5.86 mg/dL
CSF Anti-Aquaporin 4 Antibody	Negative	Negative
Serum Anti-Aquaporin 4 Antibody	Negative	Negative
Cryptococcus neoformans CSF PCR	Not detected	Not detected
Varicella Zoster Virus CSF PCR	Not detected	Not detected
Human Parvovirus CSF PCR	Not detected	Not detected
Human Herpes Virus 6 CSF PCR	Not detected	Not detected
Herpes Simplex Virus 6 CSF PCR	Not detected	Not detected
Herpes Simplex Virus 1 & 2 CSF PCR	Not detected	Not detected
Enterovirus CSF PCR	Not detected	Not detected
Cytomegalovirus CSF PCR	Not detected	Not detected
Streptococcus pneumoniae CSF PCR	Not detected	Not detected
Streptococcus agalactiae CSF PCR	Not detected	Not detected
Neisseria meningitides CSF PCR	Not detected	Not detected
Listeria monocytogenes CSF PCR	Not detected	Not detected
Hemophilus influenza CSF PCR	Not detected	Not detected
Escherichia coli K1 CSF PCR	Not detected	Not detected

She was now managed as case of acute transverse myelitis, and intravenous methylprednisolone pulse therapy was immediately started, to be completed for 5 days. Since there is still no absolute explanation regarding the etiology of the disease, COVID-19 RT PCR was requested. Incidentally, it turned out positive with associated low cycle threshold or CT value. She was then transferred to COVID facility where she was diagnosed as mild case only of COVID-19. Pulse therapy was completed for 5 days wherein patient had gradual improvements of motor weakness and sensory deficits. She was advised to complete her 10-day quarantine at home. Moreover, foley catheter was removed prior to discharge as patient regained her bladder control. Rehabilitation was initiated during admission and was continued at home during her recovery for COVID-19 infection.

Patient was able to follow up two weeks after discharge and was reported to have significant improvement in motor strength of both lower limbs as she was able to ambulate independently again.

3. Discussion

Transverse myelitis is defined by an acute or subacute inflammation resulting in spinal cord dysfunction including motor weakness, sensory deficit, or autonomic impairments manifesting below the level of lesion. Moreover, different etiologies have been described such as post-infectious, immune-mediated, neoplastic, etc. (Beh et al., 2013). Given the current health landscape brought about by the COVID-19 pandemic, the virus-associated transverse myelitis has come to our attention as one of the possible neurologic complications.

There have been different pathophysiologic mechanisms proposed regarding the development of transverse myelitis in association with the COVID-19 virus. It has been studied that coronaviruses possess neurotropism, neuroinvasiveness and neurovirulence (Bauer et al., 2022). One possible mechanism is the direct invasion of the virus to spinal cord neurons. Another is the presence of angiotensin-converting enzyme 2 (ACE2), which acts as the primary receptor of the virus, on the spinal cord neuronal membranes. Furthermore, an immune-mediated injury would likely produce autoantibodies through molecular mimicry. Lastly, the virus can induce cytokine storms, which increases cytokine levels and activates complement, macrophages, T cells and endothelial cells (Beh et al., 2013; Lingas, 2022; Qazi et al., 2021; Schulte et al., 2021)

Majority of the COVID 19-associated acute transverse myelitis reported before was able to meet the criteria presented by the Transverse Myelitis Consortium Working group such as clinical evidence of motor or sensory symptoms bilaterally, or autonomic dysfunction due to a spinal cord lesion, and MRI confirmation (Román et al., 2021). Our patient presented with paraparesis, sensory level deficit, and bladder dysfunction, and with MRI-confirmed images of a longitudinally extensive lesion.

There are still no literature claiming transverse myelitis as the initial and lone presentation in an asymptomatic COVID-19 patient. There are some data on patients with transverse myelitis who have mild to moderate symptoms (Lingas, 2022; Qazi et al., 2021), or even after being clinically recovered from it (Quiles et al., 2022). Due to absence of other causation, we diagnosed this case as a post-COVID-19 acute transverse myelitis in patient without any signs and symptoms of COVID-19. Although some cases have described the appearance of transverse myelitis only after several weeks, at most up to 6 weeks post-COVID-19 infection (Ahmed et al., 2022).

High dose methylprednisolone pulse therapy was administered to our patient, and even to the reported cases as such (Qazi et al., 2021), with marked neurologic improvements afterwards. Apart from the medical therapy, our patient also underwent extensive rehabilitation at home, which also aided in her faster recovery. It has been shown that rehabilitation of post-transverse myelitis patients could help in generating the process of central plasticity and sensorimotor reprogramming (Vasconcelos et al., 2021).

4. Conclusion

Post-COVID-19 acute transverse myelitis is a rare neurologic complication that physicians especially neurologists must be wary of. Early recognition, workup, and management are needed to be able to preserve patient's functional capabilities. Furthermore, we must be vigilant that rare neurologic manifestations exist and can also present in either a COVID-19 confirmed symptomatic or asymptomatic patient.

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Checklist for Better and Simply Register: Bandung

Knee Orthopaedic Sport Checklist

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Abstract

Background: There were various complaints may present in the sports orthopedics clinic with different etiologies and treatment plans. To simplify the identification, diagnosis, and evaluation of knee joint complaints, a checklist form was developed. It is intended to be used in sports orthopedics for registration of patients with knee joint complaints. This study aimed to develop a checklist in sports orthopedics for registration of patients with knee joint complaints to simplify the identification, diagnosis, and evaluation of knee joint complaints. **Methods:** This was a qualitative study conducted at Dr. Hasan Sadikin General Hospital from April to May 2020. There were three aspects considered which include physical aspects, anatomical aspects and content aspects. This form was developed through existing medical records and brainstorming of consultants. **Results:** The form consisted of several sections which include history of disease, physical examination, MRI findings, treatment plans, postoperative rehabilitation and evaluation. History of the disease consisted of the chief complaints, etiology and onset. Physical examination includes the examinations to assess ligament laxity. Treatment plans were divided into conservative and operative. Operative treatment was further elaborated into technique, graft and implant type, and findings during the operation. Rehabilitation was including the use of crutches, knee braces and the type of physiotherapy that the patient must undergo. And lastly were postoperative complaints. **Conclusions:** The registration form is developed with the intention of creating a uniformed format of report thus simplifying and make ease of future evaluations by every consultant. Therefore, these checklists can be used for any orthopaedic consultant.

Keywords: Checklist, Knee, Orthopaedic, Sport Medicine

1. Introduction

The knee joint is the largest and most superficial joint. Stability of the knee joint requires the integration of a complex set of anatomical structures (Abulhasan et al., 2017). In addition to the surrounding muscles, passive stabilizers such as ligaments, menisci and joint capsule plays a crucial role (Moore et al., 2014; Majewski et al., 2006). Movements such as running and jumping, can cause the force on the knees reach up to 10 times the body weight (Akhtaruzzaman et al., 2019). Sudden change of direction, contact of participants which are commonly

involved in sports often times cause injury to various structures of the knee such as anterior cruciate ligament tear, posterior cruciate ligament tear, meniscal injury, etc (Nicolini et al., 2014; Hewett et al., 2016). Thirty two point six percent of all sports injury occur in the knee with 20-25% of the knee injuries occur while performing sports. It is also stated that in knee injuries like ACL rupture, there is a risk of recurrence about 11% (Gans et al., 2018). In a 10 year study, 6434 patients (37%) had 7769 injuries (39.8%) related to the knee joint which shows the possibility of multiple injuries (Majewski et al., 2006).

The treatment approach for knee sport injury depends on the type injury (Moatsche et al., 2017). A few components should be assessed before deciding the treatment. For example, ligament laxity. People with high-grade preoperative laxity that undergone ACL reconstruction have double the risk of a revision surgery (Magnussen et al., 2016). Skeletal maturity should also be considered because it influences quadriceps strength that can help predict the self-reported functional outcome after ACL surgery (Casp et al., 2021; Pietrosimone et al., 2016). Treatment maybe conservative or operative, although it is still unclear which treatment yield better results (Krause et al., 2018; van Yperen et al., 2018; Monk et al., 2016). Then the patient needs a continuous follow-up to assess the postoperative complaints and function of the knee. The whole process of assessment, diagnosis, treatment, and evaluation is a long continual process. The body of a manuscript opens with an introduction that presents the specific problem under study and describes the research strategy. Because the introduction is clearly identified by its position in the manuscript, it does not carry a heading labeling it the introduction. treatment and can be used as a tool to evaluate patients. However, conventional medical records are wordy and may be overwhelming to read for a long continual treatment process. The characteristic of the writing format of each consultant may be different from one another, thus making it troublesome to review, especially for multiple injuries, at a later time for other consultants (Majewski et al., 2006).

Thus, we develop a checklist form that includes the patient's identity, assessment, diagnosis, treatment, and evaluation with the intention of simplifying the overall process and generalizing the format of assessment to evaluate and facilitating periodic evaluation. This form is intended to be an additional form instead of a replacement for the existing medical record. This study aimed to develop a checklist in sports orthopedics for the registration of patients with knee joint complaints to simplify the identification, diagnosis, and evaluation of knee joint complaints.

2. Method

This was a qualitative study conducted at Dr. Hasan Sadikin General Hospital from April to May 2020. There were three aspects considered which include physical aspects, anatomical aspects, and content aspects. The data collection process was obtained through observation and brainstorming by the knee orthopedic sport consultants. Based on the discussion, expertise, and experiences of knee orthopedic sports consultants, we considered the aspects that needed to be included in the form. Brainstorming was performed to meet the consultant's requirements and agreement so that any consultant can uniformly and efficiently use the form. This study was conducted ethically and did not involve human subjects or patients' data.

3. Results

3.1 Physical Aspects

The form was intended to be printed and filled in through handwriting. Conventional medical record and other forms which are available in the clinic were white, 80-gram A4 papers, and text were printed in black ink. The consultants agreed to have the same physical aspects of other forms available in order to achieve convenient storage of forms.

3.2 Anatomical Aspects

The form is divided into two aspects which are the Headings and the Body. The headings include the title of this form “Bandung Knee Orthopaedic Sport Checklist” and the patient’s registration sticker. The body includes the content of the form itself which are the operator, patient’s identity, history of the disease, physical examination, MRI findings (if performed), treatment plans, postoperative rehabilitation, and evaluation.

3.3 Content Aspects

The contents included in this form were brainstormed by consultants. The points inserted were information that may help the evaluation of treatment in the future. The operator is referred to as the consultant who performed the treatment. The patient’s identity includes name, age, medical record, height, weight, and occupation for registration purposes.

The history of the disease consists of the chief complaints, etiology, and onset. Chief complaints were pain, instability, pain and instability, swelling, effusion, hemarthrosis, etc. Etiology was divided into accident or injury. Injury causes were further divided into professional (athlete) and recreational sports injury and elaborated into the type of sport causing the complaints e.g. basketball, football, futsal, martial arts, etc. Onset was divided into less than a month, one to six months, 6 months to one year, and more than one year.

Physical examination included the assessment of bone maturity (mature or immature) and ligament laxity examinations e.g. anterior drawer, posterior drawer, Lachman, sag sign, Mc Murray, pivot shift, valgus, varus tests, etc. The conclusion of the test was then concluded as the presence of absence of laxity (yes or no).

MRI findings are also reported, if performed, into total or partial rupture of ligaments, meniscus tear, osteoarthritis and osteochondral dissecans.

Treatment was divided into conservative and operative. Operative treatment is subdivided into open surgery and arthroscopy based on the technique performed. Graft choice includes BPTB, quadriceps, hamstring (Gracilis& Semi-T), peroneal, biograft, synthetic, etc. Implant includes a button and its size, screw and its type and size (e.g. stainless, titanium, or bio), or other additional fixation devices. The initial and final length of graft, number of strands (i.e. double, triple, quadruple, etc.), and diameter are also included. The next section is the length and diameter of the tunneling in the femur or tibia. After that, thigh circumference and length from the great trochanter to the lateral condyle are also included. Next is the reconstruction technique e.g. single or double bundle, anatomical or non-anatomical, etc.

Rehabilitation segments included the usage of crutches, knee brace and the amount of physiotherapy patient must undergo. Physiotherapy were divided into once a week, twice a week, thrice a week or every single day in a week. Finally, for evaluation, complaints such as swelling, pain, numbness, joint rigidity, atrophy, and instability.

4. Discussion

In the nonacute setting, a clinical evaluation by a surgeon is one of the most accurate diagnostic methods for knee pathology. In the acute setting, this accuracy decreased because of the pain the patient is experiencing which makes them uncooperative (Iobst et al., 2000). One study by Ibeachu et al. found that from 100 participants with the complaint of knee problems, only 31 realized that their problem was caused by a sudden injury. From those same populations, the majority (91%) provided information regarding their symptoms. The majority of the complaint was pain (69.9%) followed by “giving way” (22.5%) and locking (7.5%). Another important point is differentiating the onset of the problem and classifying them as acute (>3 weeks after injury), subacute (3 – 12 weeks), or chronic (>12 weeks) (Ibeachu et al., 2019). Most of the patient coming with knee problem was between 20 – 29 years old (43.1%) followed by 30 – 39 years old (20.9%) and 10 – 19 years old (16.9%). A very small proportion came from

pediatrics to patients older than 70 with the proportion 0.04% and 0.2%, respectively. Regarding the injured anatomical structure, no significant difference was found between age groups (Majewski et al., 2006).

A high proportion of sports injuries involve the knee and sports activities contributed to 20 – 25% of all knee injuries. This rate has increased significantly because more and more people started to perform sports, either as professional or as leisure activities. Sports that produced the highest rate of injury is the one that puts a high impact and burden on the lower limbs. The severity of sports injury is by no means a minor one. It has been found that it is comparable to that a traffic accident (Steinbruck et al., 1999). Sports injury also occurs at twice the rate of injury caused by traffic accidents, making it a prevalent problem in society (Holzach et al., 1994).

Regarding the type of sport that has a high rate of a knee injury, Nicolini et al. found that American football caused the highest number. This sport involves sudden large movement changes and exerts a massive burden on the lower limbs. Furthermore, inadequate flooring and technical or medical supervision push the rate even higher. Another study by John et al. has a different finding in which knee injury is mostly associated with football and kabaddi, a popular Indian rural sport. Knee injury accounts for 30.6% of injuries in football and 20.9% in the latter. Other sports that are associated with a knee injury are athletics, cricket, volleyball, and basketball (Nicolini et al., 2014).

Majewski et al. found that in 33.9% of cases, minor knee distortion occurred without damage to any particular structure. In 10.6% of the cases, acute and chronic lesions on the joint cartilage were found. The rate of ligament rupture was quite high with 22.3% of the patients having an anterior cruciate ligament rupture, 10.8% having a medial meniscus rupture, and 7.9% having an MCL lesion. Injury to postero-lateral structures was less frequent. PCL ruptures were seen in 0.65%, lateral meniscus in 3.7%, and lesions in 1.1% of the cases. Contusions were found in 10.6% of cases. They found that knee dislocation was rare, while patella dislocation was experienced in 3.3 % of cases. The rate of fracture and superficial skin wounds was low. However, in the long run, chronic and degenerative changes were prevalent (Majewski et al., 2006).

John et al. reported that the majority of patients (69.6%) underwent an arthroscopic surgical procedure while the rest were treated conservatively with bracing and/or physical therapy.¹⁹ There are several grafts available for ACL repairs such as autografts [bone patellar tendon-bone (BPTB), Hamstring (HS), etc.], allografts, and synthetic grafts. Before autograft was the method of choice but in recent decades allograft has gained popularity. It is now performed in 20 – 30% of cases in the United States of America (Dhammi et al., 2015).

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Appendix A

**KNEE ORTHOPAEDIC SPORT
BANDUNG CHECKLIST**



Dr/Operator :

Name :
Age :
Medical record :

Height :
Weight :
Occupation :

Complaints : Pain Efusion
 Instability Haemarthrosis
 Pain and instability Others:

Causes : Accidents Basketball
 Injury : Non-Sport Futsal/ mini soccer
 Sport Professional/athlete Football
 Recreational sport Martial arts
 Others....

Onset : < 1 month 1 – 6 months 6 month – 1 year > 1 year

Skeletal : Mature Physical Examination : Anterior drawer Pivot shift
 Immature Posterior drawer Valgus test
 Lachman Varus test
 Sag Sign Others....
 Mc Murray

Laxity : Tidak Ya

MRI : No Yes, results : Partial rupture ACL Partial rupture LCL
 Total rupture ACL Total rupture LCL
 Partial rupture PCL Medial meniscus tear
 Total rupture PCL Lateral meniscus tear
 Partial rupture MCL Osteoarthritis
 Total rupture MCL OCD (osteochondral dissecan)



- Management : Conservative
 Surgical : Open surgery
 Arthroscopy
- Reconstruction technique : Single bundle Anatomic Others....
 Double bundle Non anatomic
- Graft : BPTB Peroneal Lainnya...
 Quadriceps Biograft
 Hamstring (Gracilis & Semi-T) Synthetic
- Implant : Button , Size : 15 20 25 30
 Screw : Stainless } Diameter (mm) 4 5 6 7 8
 Titanium } Ukuran 9 10 11 12 ...
 Bio } Panjang (mm) 20 25 30 35 40
 45 50 ...
- Other additional fixation devices :
- Graft : Initial graft length: cm Double Triple Quadriple Lainnya.....
 Final graft length: cm
- Graft's diameter : < 6 mm 7 mm 8.5 mm 10 mm
 6 mm 7.5 mm 9 mm > 10 mm
 6.5 mm 8 mm 9.5 mm
- Tunnel : Femur Length (mm) :
 Diameter (mm) :
Tibia Length (mm) :
 Diameter (mm) :
- ALL Reconstruction : Yes : Intraarticular technique Extraarticular technique
 No
- Implant : Screw Staples
 Biosure Others:
- Thigh : Thigh circumference (middle) Right :..... cm Left :.....cm
 Thigh length (Great troch – Lat condyle) Right :..... cm Left :.....cm
- Tongkat : Yes No
- Knee brace : Yes No
- Physiotherapy : 1x/week 2x/week 3x/week Daily
 Swelling Joint stiffness
- Postoperative complaints Pain Atrophy
 Numbness Instability
- Other informations :

Troops on the Front Line of a Health Battle: Filipino Nurses' Lived Experiences in the Pandemic

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Abstract

The deadly pandemic spread due to infections with the Coronavirus (COVID-19). It has a disproportionately large effect on healthcare workers and presents unique challenges for this vital sector of society. As a result, the pandemic has heightened public awareness of the dangers that nurses face around the world. This study aimed at exploring the lived experiences of five purposively selected nurses in a public hospital in the southern Philippines. The phenomenological inquiry brought out themes encompassing (1) putting up with occupational stress, (2) reconfiguring personal and social time, and (3) coping with the situation's gravity. These themes have been fleshed out to capture deeper meanings in the experiences of nurses during the health crisis in which they are deemed to be crucial front liners. The study concludes that while the nurses' quality of life has been impacted due to the unprecedented situation, they remain committed to their profession. The study then implies that the government should be more responsive to the needs of the nurses and that support and assistance in their practice of the nursing profession amid the pandemic be provided substantially. Implications for hospital administrators and future researchers are also offered.

Keywords: Nurses, Quality of Life, Lived Experiences, Pandemic

Introduction

The Coronavirus (COVID-19) infections were the cause of the worldwide pandemic that devastated humanity. In particular, it has a significant impact on healthcare personnel and possesses certain issues for this crucial sector of society (Huang et al., 2020). In the Philippines, nurses make up a significant and the largest proportion of the workforce in fighting the disease; they are the ones who serve as main front liners at both communities and the patient's bedside (Martínez-López et al., 2020; Rossi et al., 2020; Sadang, 2021). With this, the pandemic has brought greater attention to nurses' vulnerability to health-damaging aspects worldwide; especially in the midst of the COVID-19 pandemic, many nurses' working circumstances around the world have turned unstable, worse, and unsafe (Llop-Girones et al., 2021; Pacheco et al., 2021). Rapid alterations in the field of their work are evident allowing nurses to be exposed to both physical and psychological distress (Kang et al., 2020; Kua et al., 2022; LoGiudice & Bartos, 2021).

Previous research regarding the experiences of nurses during the pandemic revealed that despite their escalated proficient sense of responsibility, self-sacrifice, and commitment, many concerns in regard to their physical and mental vulnerability and personal safety also increased (Cengiz et al., 2021; Chau et al., 2021). Along with the aforementioned concerns, there are issues such as the growing demand for medical personnel, as well as the numerous resources required for the quality treatment of COVID-positive patients (Galehdar et al., 2020; Macmillan, 2020). Indeed, the COVID-19 pandemic generated a health crisis that put a strain on the quality of life of healthcare professionals, as a result, their quality of life in terms of physical and mental health suffers (Sampiao et al., 2020). Moreover, previous research provides evidence that healthcare workers are experiencing sleep deprivation, a lack of resources and needs, long work shifts, and a high risk of disease exposure, which causes stress (Adriaenssens et al., 2016; Chau et al., 2021; Galehdar et al., 2020; Macmillan, 2020; New York University, 2022). As a result, they have already indicated that their mental and physical health has deteriorated, which is a hindrance, particularly in their workplace performance (Peñacoba et al., 2021; Liu et al., 2021). That being said, recognizing and evaluating the factors affecting nurses' quality of life can help to create a safer workplace for them.

In light of this context, the researchers felt the need to fulfill a research gap by carrying out a qualitative study in the Philippine context, and in Bukidnon in particular. The researchers deliberately used a descriptive phenomenological design in order to grasp the experiences of the nurses during the pandemic. In the context of care and nursing in the medical field in Northern Bukidnon, the purpose of the current research was to contribute to the little body of information concerning the experiences of nurses during the pandemic. The outcomes of this study may provide substantial new information to the body of knowledge that is used in other studies, which may pique the curiosity of other researchers. Information about the lived experience of health professionals during the pandemic based on research as well as other pertinent factors may offer qualitative research-based inputs for developing an improvement strategy for the investigated variables in this study to raise the standard of nursing care in the Philippines. To successfully assist and care for the needs of the nurses, it is critical to first get a thorough knowledge of their lived experience as nurses. The nurses gained the most from this research since they were given the opportunity to share their experiences and advocate for their own needs. For policymakers, the findings can be used to guide the development of policies and interventions that promote nurses' overall well-being, enabling them to accomplish their role of delivering excellent nursing care more effectively. While for hospital administrations, the findings may serve as an instrument to correctly analyze and improve nurses' quality of life. Furthermore, the students will have an insight into what the nurses are going through in times of a pandemic to help them decide if they want to pursue this kind of profession. With all these considerations, this study was pursued to shed light on the overarching question: What are the lived experiences of nurses in the context of their work as front-line health professionals during the COVID-19 pandemic?

2. Methods

2.1. Design

This study made use of the descriptive phenomenological approach. The method is a descriptive, qualitative study of the human experience with the aim to conceptualize the processes and structures of life (Nicholas et al., 2017; Levitt et al., 2017). Here the role of a researcher is to have an understanding of what the participant is expressing about their experience and engage the participant so as to impart rich in-depth descriptions (Penner & McClement, 2008; Streubert & Carpenter, 2007).

2.2. Locale and Participants

The study took place in one of the oldest hospitals in Bukidnon Province in the Philippines. Five purposively selected nurses took part in the in-depth interview (IDI). These nurses were chosen on the basis of the following inclusion criteria: he/she must have been working in the hospital as a nurse for at least 5 years; he/she must have first-hand experience in working as a nurse before and during the pandemic.

2.3. Instrument of the Study

An open-ended questionnaire was employed to gather data due to the nature of descriptive phenomenology and the proposed research question. This enabled an unstructured interview accompanied by maintaining some emphasis on the study subject. The use of an open-ended questionnaire allowed for more freedom in the responses supplied by the participants who were able to express freely in substantiating the phenomenon, i.e., their lived experiences (Streubert & Carpenter, 2011). The researchers formulated open-ended questions that were utilized during the in-depth interviews, and the interview guide was then validated and approved by three external examiners.

2.4. Data Collection

This research utilized four steps to collect the data for the study. The first two steps were focused on ethical considerations in asking permission from the hospital where the nurses are employed and asking permission from the nurses to participate in the study. Another step was given to explain confidentiality and the importance of the research through orientation. Then, interviews were conducted for the last step in the data collection. The researchers made sure that the data gathered were treated with confidentiality and that participants in this study had the option to either decline or accept their engagement in this research. Virtual semi-structured interviews were used to gather data from the participants for this study since in-person interviews were highly dangerous due to the pandemic. The researchers then conducted thirty to forty minutes of semi-structured interviews with each participant. Once the study's findings were obtained, to confirm the accuracy of the data, member checking was performed. The information gathered in this research was based on the responses of the participants. To facilitate transferability, all interviews were digitally recorded and then transcribed by the researchers. Permission to record the conversations was requested as part of the ethical protocol. Furthermore, the main study's main author kept a journal and recorded it after each interview, which was used throughout the data analysis process. Journaling was utilized to record the thoughts, emotions, and reactions that would surface throughout the data-gathering process. Also, the researchers ensured the quality of this study by carefully adhering to the protocols set by the University of Immaculate Conception Graduate School, the process flow in data collection, data analysis, and data integration was carefully reviewed ensuring quality and dependability.

2.5. Data Analysis

To assure the study's rigor and validity, the procedures of descriptive phenomenological data analysis developed by Colaizzi (1978) were applied. Using this strategy assisted in defining the analytical process and providing an outline for the study. This outline provided the framework and a clear knowledge of how the data analysis was conducted. Colaizzi's technique demonstrates connections between outcomes and data by ensuring that actual quotations and words from participants are utilized to build major assertions and categories (Elo & Kyngas, 2007). Colaizzi's (1978) technique also aided in outcome validation via the use of "member checking," which included participant agreement on the emergent outcomes (Shosha, 2012). Meaning, when the data analysis was finished and an extensive description of the phenomenon was completed, the researchers went through the findings with the participants to check correctness.

In particular, this approach entails the following steps: (1) collecting participants' descriptions of the phenomenon, (2) reading the transcribed document several times to gain a better understanding of the meanings conveyed, (3) identifying significant statements and phrases and converting them to general terms, (4) formulating meanings for nurses' quality of life and occupational stress during this COVID-19 crisis, (5) grouping the derived meanings into clusters of themes, (6) writing an exhaustive description of the issues examined, and (7) carefully validating the meanings derived from the study's participants prior to writing an exhaustive description of the issues examined.

3. Results and Discussion

After the rigorous data analysis, themes on the lived experiences of nurses during the pandemic have emerged and hence discussed in the proceeding parts.

3.1. Putting Up with Occupational Stress

One of the major themes formulated from the analysis concerns about stress and exhaustion experienced by Filipino nurses during the pandemic. This struggle could be boiled down to the experiences of nurses in various aspects of administrative and management problems, workload and environment problems, patient care problems, and health status.

Administrative and Management Problems. Administrative and management support is needed to be provided for the nurses to work effectively and efficiently. This will help also the hospital mechanism and process easier both for the hospital workers and patients. The hospital's main issues were a shortage of nurses and other health workers and scarcity in bed capacity because of the high admission rate, and the late response of nurses due to the time-consuming process of wearing level 4 PPE. Some of the nurses also mentioned that the transmission of the virus was hard to control. Participants express:

"Because of the increasing rate in the admission, our staffing becomes unstable. We are force to stop receiving admission for almost two weeks because we were understaffed. Now, that we have enough staffs, the admissions never stop increasing and room shortage became another problem" (Transcript 1, page 4, lines 118-123)

"...so usually we were understaffed, and the responses to the patients becomes a problem. We always explain to our patients that the pandemic brings lot of difficulties and we were very sorry for the late responses. The pandemic takes us a lot of time to prepare before we can attend to our patients." (Transcript 2, page 3-4, lines 139-150).

In early February 2020, the maximum daily shortage of inpatient beds for COVID-19 patients was 43,960 (95 percent confidence interval: 35,246, 52,929), 2,779 (1,395, 4,163), and 196 (143, 250). An earlier or later shutdown would have exacerbated the Wuhan hospital bed scarcity (Zhuang et al., 2021).

Workload and Environment Problems. The hospital administrators also need to provide healthy working loads and an environment for the nurses to passionately love their work. They must provide also equal treatment, opportunity, and protection for the nurses to fulfill their duties with accountability and responsibility. All participants had different responses to their workload during the pandemic and pre-pandemic. Some of them answered that their current workload is lesser than pre-pandemic, while some answered that it became heavier during the pandemic. One of the participants mentioned that his workload remained the same during the pandemic. Other extracts show:

"...I consider my work risky and hazardous because I'm assigned to medical and isolation area. Some of the patients are not careful enough to protect themselves and others, that makes it worst to work. Because us much as we want to protect others some are careless and stubborn not listening to the protocol and all... we all knew and even experienced the worst scenario in the hospital, and how contagious covid every day. At the back of my mind, I'm always risking my family to possible infection of covid just because others are stubborn and carelessly spreading the virus. It makes me angry to experience it every day." (Transcript 1, page 5, lines 143-150).

"We need to sacrifice more workload, considering the worst scenario in the hospital. From twelve hours to one-week straight work and another week for quarantine before we can go out the hospital... The worst is that we only given one week to stay at home, as a nurse one way to protect our family is to isolate ourselves for another three days before we can meet and be with them for four days." (Transcript 2, page 4, lines 166-168)

Relevant studies show that nurses working in hospitals in central Uganda dealing with COVID-19 patients reported significant rates of burnout, which was linked to PPE and workload. Contracting new nurses to reduce workload, following the WHO criteria on personal protective equipment, modifying working hours, and ensuring hours of effective rest should all be modified (Kabunga & Okalo, 2021); Zhang et al., 2020; Zhou et al., 2020.

Patient Care Problems. If there will be sufficient nurses, adequate facilities and equipment and satisfactory hospital responses will be provided then there will be fewer complaints, critical patients will be given attention and a comfortable environment will truly be served to the patients. The majority of the nurses explained that it was hard to take care of COVID positive patients. Aside from their fear of getting infected, their job was also very risky. They found it very challenging since they had limited access and had to wear PPE for a long period of time, making them sweat excessively whilst taking care of the patients. One of the participants mentioned that taking care of the patients was similar to the pre-pandemic time, but this time they had to take extra precautions to protect themselves from getting infected. Participants share:

"...as much as we want to calm down and stay manageable, everyone in the phone calls and some patients were infuriated, can't even understand anymore, and blaming us a lot of the happenings in the scenario... questioning our nursing service and other services in the hospital, and not thinking that we don't want also to be in this scenario and we are also taking it the hard way... we can only rest and cry a lot in our stations, sharing agonies with our colleagues praying that all of this will soon to end." (Transcript 4, page 3, lines 100- 109)

"... there's a lot to consider, you need to protect yourselves and care for others... you need also to be very careful in communicating with the patients and the family. Because everyone seems to be very sensitive, that may start the misunderstanding. As much as we to burst our feelings in what is happening, we keep it deep inside to at least give our quality nursing services." (Transcript 5, page 6, lines 173-179)

COVID-19 was deemed a terrifying sickness by the participants. They said that they were at a higher risk of contracting the virus; this risk was unavoidable, which increased their anxiety about infection. The majority of nurses expressed concern about being a possible carrier for family members. Physical exhaustion and psychological strain were also caused by work-related issues such as a shortage of personnel, working long shifts, increasing tasks, and insufficient rest time. Wearing personal protective equipment is also one of the leading causes of physical and psychological stress (Rathnayake et al., 2021).

Health Status. Occupational stress decreases the health status of nurses. This becomes the reason for the feeling of getting mentally exhausted. Yet, this is also the reason for the necessity to be emotionally stable and physically healthy. Some of the nurses' health status was negatively affected by the pandemic; one of them couldn't exercise as much anymore due to a hectic schedule, while the other one developed insomnia. Two of the participants mentioned that they were cautious about their health, so they just try to preserve their health as much as possible with the help of vitamins. But one of the participants was positively impacted by the pandemic, he became more active in order to strengthen his immune system.

"Before the pandemic, I feel healthy and strong... I seldom get sick and not even in two years... maybe because of the work-related stress, not enough rest and, nutrition. Now, I was diagnosed with hypertension, though its in the family already... and hard to sleep every night." (Transcript 1, page 7, lines 219-225)

"... our health is affected, because before the pandemic, we can still schedule for exercise, we have enough rest and have time with family and friends to enjoy. But during the pandemic our schedules are disturbed and it was very stressful that we are not even enjoying our day-off and rest with the family. There are a lot of limitation that we can't do in our profession during this time." (Transcript 4, page 4-5, lines 169-174)

"I think of it positively to stay healthy; I condition myself of what to expect in this pandemic and accept the reality that this might go worst. I need to be strong because this is the only investment to continue living. This made me active to boost my immune system during the pandemic." (Transcript 5, page 7-8, lines 233-240)

The nurses' time availability for themselves before and during the pandemic was most affected in a way that their allotted leisure time for themselves became lesser than it was pre-pandemic. Four of the nurses expressed that alone time became much more minimal as compared to before. During the pandemic, their time was mostly

occupied by work and family which leaves them with so little time for themselves. Aside from work, the nurses' pre-pandemic activities were almost held anywhere at any time, but due to present times, activities have been accompanied by constant limitations because of the pandemic's restrictions. The one remaining nurse, however, has indicated that his downtime with himself is the same because the number of hours off-duty is proportional to the number of hours on duty. Evident across responses was the disruption in the ability to participate in daily life in the ways they wanted to, and their limited opportunities to engage in their normal (pre-COVID) strategies to care for themselves: first, adjusting to disruption required new self-care strategies and mindsets; second, the multiple struggles of caring for self during a time of uncertainty; and finally, the importance of social connectedness and self-care (Lewis et al., 2022).

3.2. Reconfiguring Personal and Social Time

Amid the stresses brought about by the pandemic, nurses have found the avenue for reconstructing how they spend their time for themselves and with others. This theme could be deduced with elaborations on concepts of fear, rest, and break; short yet profound family time; consistent quality care; and social time, space, and activity closer to family.

Fear, Rest, and Break. Nurses express that their job during the pandemic brings limited rest and breaks, anxiety, and inadequate self-time. The nurses felt fear of getting and spreading the virus and sacrificed rest, breaks, and even their self-time. The nurses' social lives were transformed, particularly their social lives previous to the pandemic, which differ from what they have today during the pandemic due to the demands of their work caused by the virus's presence. All of the nurses' answers relate with each other as to how they have lesser time for a social life during the pandemic; one nurse mentioned not being able to request a day off because duty was an obligation for them, and another mentioned how their social life had been negatively impacted, another mentioned how socializing and attending events were now becoming limited, another mentioned being weary to spend time outside, and the last nurse mentioned how she had a different mindset on moments spent during the pandemic pertaining that she is anxious in every time she spends. A few excerpts convey:

"... our rest or breaks are really altered; we are sometimes absent to important family time and events. Because we can't request for leaves. Thus, we need to report on our scheduled duty, and sometimes if our colleagues get sick, we need to replace them so the hospital will not be understaffed. We are obliged to work even our free-time." (Transcript 1, page 6, lines 209-212)

"I feel fear spreading the virus, so I compensate my own socialization with others just to protect them... When we go outside wearing our uniforms I felt everyone is also afraid of us, there are instances where the public rides are not letting us ride. (Transcript 5, page 8, lines 260-271)

Job demands are organizational, physical, and social aspects of one's work that drain both psychological and physical reserves, resulting in tiredness and that they are not always bad until they exceed an employee's capability in his or her work, which may lead to burnout (Woodson, 2021). The pandemic's job demands on nurses interfered with their social lives in such a way that they were negatively altered, leading them to have less time for their social lives, become more worried about their time, and feel very tired. The nurses have different approaches in how they viewed their work demands; however, these demands caused them stress. Nurses are frequently exposed to infectious diseases, and they are required to wear personal protective equipment (PPE) regulations to protect themselves from disease transmission. The use of non-standard PPE caused excessive sweating, injuries, scars, and a sense of suffocation, which led to further exhaustion, hunger, and thirst (Zamanzadeh et al., 2021). Alongside the protective equipment are issues such as nursing shortage. Furthermore, perceived care pressure in nurses has been a result of the virus's unknown nature, the large number and variety of treatments performed by nurses for the patients, the side effects of drugs in patients, the death and pervasive struggle of patients, and the distress of treating the patients (Zamanzadeh et al., 2021). All of these exhaustive measures may have impacted directly and indirectly the social lives of nurses in the context of the pandemic.

Short yet Profound Family Time. With the advent of the pandemic, the working schedule becomes busier yet nurses prioritized family time over social activities. From physical and social activities to virtual activities. There are differences in the nurses' responses regarding their family time throughout the pandemic. One of the nurses spends his leisure time outside, seeing family members he has not seen in a long time, while the other three nurses spend their family time in less interaction with other people, and the other nurse spends time with his family through acts of service, particularly making meals. All of the nurses managed to spend time with their families, although in different ways, and even in today's setting, time with family is not forgotten because the nurses regard their families as their motivation and comfort throughout working during the pandemic. Direct statements from the responses show:

"...we have limited time to be with family, most of our time is in the hospital and quarantine facilities. Imagine, we only have one-week to visit our family in a month. (Transcript 1, page 2, lines 54-56)

"Our social activities are spend with immediate families only... as mush as possible we can still make it memorable, most especially in our children and love one's." (Transcript 5, page 2, lines 55-56)

"During duty schedule in the covid ward, when I don't have work to do, I video call my family or surf the social media and play mobile games..." (Transcript 3, page 2, lines 51- 53)

As a result of working in such a comprehensive and hazardous environment, they require some kind of support system to assist them to get through the day and deal with the stress that the pandemic has introduced to their work (Geoffroy et al., 2020). The study by Rathnayake et al. (2021) identified the importance of social networks such as support from family, management, peers, coworkers, and friends, and that the lack of adequate support during pandemics has both short-term and long-term effects on nurses' mental health (Kang et al., 2020; Kua et al., 2022). Additionally, interaction with family members helps nurses alleviate the stress that they have been feeling since the absence of family members, alongside other factors such as reusing PPE, the influx of high-acuity patients, and increased patient censuses, reportedly have been linked to increasing moral distress amongst nurses (LoGuidice & Bartos, 2021; Martínez-López et al., 2020).

Consistent Quality Care. The working schedule becomes busier and more focused on managing and maintaining quality care. Nurses shared extra care and sacrifices not just for the patients and for the family yet for others in general. In terms of the nurses' daily routines during the pandemic, each of them has specific things they do every day; such as communicating with family, playing mobile games, and doing PPE laundry; however, similarity among the nurses' answers is depicted in such a way that each of the nurses is taking extra precautionary measures as part of their daily routine, such as taking a bath more than once, being cautious of their surroundings, and applying a lot of alcohol, because it is their way of protecting themselves and those around them from becoming infected with the virus, especially their families. Some of the participants' statements speak:

"Our works becomes routinary; get vital signs and monitoring the patients' condition, prepare the labworks and medication, educating the family, and giving feed back to the doctors and family... it was very difficult but we need to overcome it daily." (Transcript 1, page 3, lines 73-79)

"...we need to double our PPE and wear it for 7 days, we need to sacrifice wearing urinary catheter or adult diapers for us to at least have limited exposure. We need to take a bath a lot of times, that make us develop rushes and other skin problems. I was very difficult but we need to endure it for our family and patients." (Transcript 3, page 3, lines 69-72)

"... we need to be extra precaution especially I have children and for the patients also..."(Transcript 5, page 3, lines 81-85)

The reason for these nurses may be the fear of them getting infected by the COVID-19 virus since according to a study, nurses were driven to adopt defensive behaviors because they were afraid of COVID-19, and fear is an unpleasant feeling that stimulates actions that has the capacity to impact both psychological and physical well-

being of nurses (Arnetz et al., 2020; Saladino et al., 2020; Shultz et al., 2016; Taylor et al., 2020; Yildirim et al., 2020), prompting them to develop behaviors to defend themselves and their family (Villar et al., 2021). Fear in nurses can be fueled by the fact that they are on the front lines of the fight against COVID-19, as well as the risk of infection and the likelihood of illness transfer to their family members. In the study by Koren et al. (2021), heightened anxiety and sadness among nurses in their study were also caused by a factor of them worrying about becoming infected with COVID-19 and infecting their family members.

Social time, Space, and Activity Closer to Family. Social time becomes limited to visitors and social space becomes closer to family space. Family social activities become closer also because of restrictions and fear of the pandemic. There are differences among the social lives of the nurses, as four of them described having a social life despite the pandemic, while one nurse mentioned having less time for social life. The nurse who had a lesser social life spent more time in the hospital and quarantine facility. Of the nurses whose social lives were centered on family, both specifically focused on their families alone. Of the nurses whose social lives were centered on technology, one specifically spent one's social life mostly browsing through internet apps and playing mobile games, the same as with the other whose social activities consisted of playing internet games. As participants deliver:

"Before off, I planned things already, make sure I wont missing out any of my plans to make the most of it worthy. Most of my plans are for family and other close relatives. (Transcript 1, page 3-4, lines 96-98)

"... I limit visitors in our house... during gatherings we seldom invite visitor." (Transcript 2, page 3, lines 110-112)

"... gatherings are usually spent in our house... movies, online games and social media becomes our social activities... (Transcript 3, page 3, lines 92-93)

The nurses from the study of Haussl et al. (2021) reported that working during the pandemic had an impact on social aspects of their lives, and the researchers found that the social impacts were similar among their nurses who switched to using technology or social media platforms to communicate with their family and friends since they could not see them physically, this relates to the four nurses' answers about still having social life during the pandemic but only are now limited to spending time with family, browsing through internet apps, and playing mobile games as instead of spending their leisure time together with lots of people or large social circles. Even though four of the nurses still have social lives during the pandemic, still it is not the same as what they had during pre-pandemic. On the other hand, the nurse who mentioned spending more time in the hospital and quarantine facility, his answer was more focused on work which can be supported by the study of Cengiz et al. (2021), wherein due to the nurses' requirement to comply with rigorous quarantine rules, their social lives were forced to a halt, and the nurses in their study described social life as an unending process between loneliness and hospital. Furthermore, some nurses felt lonely since they were distancing themselves from family and friends by going to work and then home with little contact with friends and family, and this isolation had a significant influence on nurses (Nelson et al., 2021). All of the nurses' social lives were altered; however, four of the nurses focused on a more positive remark because they mentioned having social lives despite the limitations, whereas the other nurse simply portrayed his answer in a direct remark, implying that his social life was directly negatively affected.

3.3. Coping with the Situation's Gravity

The last theme formulated out of the analysis deals with how the nurse participants deal with all the travails of the pandemic for them. These mechanisms include bringing up the essence of self-actualization, understanding their service experience, and choosing to divert their attention.

Self-Actualization. Preparing self becomes one of the strongest coping mechanisms of nurses. Their spiritual faith, self-meditation, facing the realities and resetting mindset becomes the step to actualize self-preparedness during the pandemic. Additionally, the nurse set his mind that the pandemic would end soon, so it helped him have hope. While the other nurse had difficulty adapting because of the workload since the patients require more care and attention now than pre- pandemic. In the excerpts:

"I always pray to God, to protect me and my family and for the healing our our patients... I also do regular meditation and mindfulness to keep me in sane." (Transcript 2, page 9 lines 399-415)

"... I always get strength in our family prayer. It is very helpful to at least lighten my day. I felt relieve after prayer, and I think God is helping me in helping others. Prayers becomes my strong tools in my daily fight. (Transcript 2, page 9, lines 427-428)

COVID-19 is a novel coronavirus with human-to-human transmissions, spreading around the globe since its December 2019 outbreak, with new cases reported daily at its height (Paules et al., 2020; Phan et al, 2020). Frontline nursing and medical workers, particularly during the pandemic's early phases, have reported feelings of anxiety and depression as a result of excessive workload, inadequate personal protective equipment, lack of understanding about the pathogen, and direct contact with patients (Zhu et al., 2020). As a result of the nature of the profession, nurses often report experiencing a higher loss in morale and work satisfaction (Tolomiczenko et al., 2005). As a result, mental health programs are critical for assisting nurses and physicians amid an extraordinary health crisis caused by the pandemic (Figueroa et al., 2020; Sampiao et al., 2020).

Service Experience. The service and the passion for nursing others become a coping mechanism. Nursing is a demanding career, where the stresses are a workload with intimate engagement with patients, strong emotional involvement, and responsible for patients' lives. Yet, for the participants, volunteerism helps in promoting quality experience, and imitating good practices of others helps you cope with the service experience with the patients. Two excerpts expound:

"I was lucky enough to be one of the nurses to be assigned in the covid ward, because I experience handling it with all the PPE and protocol with few patients ranging 3-6 at the moment... I think this experience help me to adjust working with 40 to 50 patients. Unlike with those who were deployed late because there was no transition they've experience. I think it was very stressful in their end." (Transcript 1, page 8-9, lines 254-260)

"I think our nursing care practices makes us cope up with the situation. Filipino nurses are trained to work under pressure and depressive situation. The resiliency of the Filipino nurses is rooted even in family values." (Transcript 5, page 10, lines 304-306)

Nurses are encouraged to do more because of serving others. Caring for a frail, ill, or traumatized client can be demanding on the nurse, but at the same time, fulfilling and gratifying (Zeller & Levin, 2013).

Diverting Attention. This coping mechanism brings the nurses to places where they can recreate and relax from the realities of work. Activities such as social media and online games give time to move faster from reality. Eating mechanism fulfills their hunger by consuming their energy. Also, household activities and gardening become their positive perspective of what life should be.

"...food becomes one of our friends during the pandemic, because I think I can work better when I'm full. Even more, I can think better when I'm full." (Transcript 4, page 6, lines 272-277)

"Before if I feel stress, I just go somewhere else to relieved my stress. But during this pandemic we can't do that... Food and social media becomes my coping mechanism to divert my attention from stressful day." (Transcript 4, page 6, lines 253-255)

"My coping mechanism is usually my family. I make sure to make use of my family time... another thing is gardening; my plants give me way to breath and makes me happy." (Transcript 3, page 8, lines 255-265)

Coping has been defined as any cognitive and/or behavioral attempt to regulate, reduce, or accept circumstances seen as potentially hazardous to one's well-being (Rodrigues & Chaves, 2008). When confronted with a stressful situation, individuals develop a variety of coping mechanisms that are related to personal factors, situational

demands, and available resources and aim to restore the individual's balance against the stressor-induced reactions. It is important to recognize that the sorts of coping methods utilized in a given scenario differ according to the subject's personality or experiences, as well as the situation's qualities (Laal & Aliramaie, 2010; Sehularo et al., 2021).

4. Conclusion

This study concludes that the experiences of nurses during the pandemic lead to struggles that could be related to administrative and management problems, workload and environment problems, patient care problems, and hazard problems. Accordingly, reasons that lead to administrative and management problems are shortage of hospital staff and nurses, scarcity of bed capacity, admission calls, late hospital response, and lack of infection protocol and control. Additionally, nurses have problems with workload and environment which encompass heavier workload, longer time schedule, harmful environment, uncomfortable feeling while wearing the PPE and limited to no access to facilities and equipment. Patient care becomes a problem because of double patient concerns, critical patient cases, and more sensitive patients. In the same way, the nurses reported hazard problems in terms of the fast transmission of the virus and the fear of getting infected. In the same way, for nurses, social time becomes limited to visitors and social space becomes closer to family connections. Family social activities become closer also because of restrictions and fear of the pandemic. Even though there are hectic schedules, nurses still give time to families. Moreover, they prioritized family activities over other social activities. It is recorded also that nurses opt to have fun with virtual or screenplay activities. To provide quality patient care, nurses have always been the initiative of preventing the spread of the virus, maintaining quality patient care, and taking extra sacrifices careful for others. Social time, space, and activity also redirected to the importance of family. Meanwhile, nurses are seen as capable to mechanize their coping mechanisms. In this study, preparing self becomes one of the strongest coping

mechanisms of the nurses. Their spiritual faith, self-meditation, facing the realities and resetting mindset becomes the step to actualize self-preparedness during the pandemic. This becomes the strength of the nurses in their battle during the pandemic; it is where they are rooted to stay on the ground and keep moving amidst problems. Likewise, the service and the passion of nurses for others are coping mechanisms. These encourage nurses to do more because of serving others. They also want to be at places where they can recreate and relax from the realities of work. Hence, the researchers found that, notwithstanding the disparities in some of the nurses' responses, their quality of life has been impacted, but they remain committed to their profession, i.e., nursing. Hence, in the current health battle, nurses are acknowledged to be hardworking front liners that serve humanity persistently. The study then implies that the government should be more responsive to the needs of the nurses and that support and assistance in their practice of the nursing profession amid the pandemic be provided substantially.

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A Haunting Tremor: A Rare Presentation of an Unruptured Arteriovenous Malformation and Review of Related Literature

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Abstract

Tremor is a common phenomenology characterized by an involuntary rhythmic and oscillatory movement. These are formed from any disruption in the dentate-olivary and the basal ganglia-cerebello-thalamic circuits due to neurodegenerative disease, stroke, head injuries, toxins, drugs, systemic illness, or metabolic disorders, and rarely, arteriovenous malformations (AVMs). Brain AVMs, as compared to AVMs in other anatomic locations, are less commonly studied. The pathophysiology, symptomatic correlation, and etiology of these brain AVMs are less reported, hence, current literature reviewed presented patients with a wide spectrum of signs and symptoms which were linked with AVMs of differing risk based on their diagnostic grading. This case report narrates the experience of a 29-year-old female physician presenting with fine high frequency hand tremors later found out to have a parietal AVM. We will discuss AVMs and their consequent course of diagnosis, treatment, and management.

Keywords: Arteriovenous Malformation, Tremors, Brain Arteriovenous Malformation

1. Introduction

Tremor is a common phenomenology seen in clinical practice. It is described as an involuntary movement that is both rhythmic and oscillatory (Louis, 2019). Several etiopathogeneses can cause tremors such as neurodegenerative disease, stroke, head injuries, toxins, drugs, systemic illness, or metabolic disorders (Kamble & Pal, 2018). However, in movement disorders practice seeing tremors, arteriovenous malformations (AVMs) rarely are the cause (Jurinović et al., 2017).

AVMs are tangles of dysplastic blood vessels which form abnormal fistulas between arteries and veins (Rutledge et al., 2021). These are dangerous structures as direct flow of arterial blood into the veins can lead to disruption of the venous walls and cause fatal hemorrhage. Intracranial AVMs are most diagnosed during the work-up for an acute intracerebral hemorrhage but can be also found incidentally during the evaluation of conditions including chronic headaches and seizures. Moreover, AVMs can also damage parts of the hindbrain, which can result in dizziness, giddiness, vomiting, a loss of the ability to coordinate complex movements such as walking, or uncontrollable muscle tremors (*Arteriovenous Malformations (AVMs)*, n.d.).

We report the case of a female patient with an unruptured AVM presenting who presented with fine hand tremors.

2. Patient Information

Our patient is a 29-year-old female, right-handed, single, Filipino, Roman Catholic, physician from Pampanga who was admitted at the Jose R. Reyes Memorial Medical Center on October 7, 2022 presenting with tremulousness of the right upper extremity of 3 years duration. The tremulousness was observed while reaching for objects, during sustained posture, general activity, and were absent at rest. These would occur intermittently at no particular time of the day. There were no associated cranial nerve deficits, motor and sensory weakness, seizures, nor cognitive impairment. She was able to perform activities of daily living until the time of consultation when she noticed progressive impairment when she would hold instruments like needles. Propranolol provided no relief of symptoms.

On examination, there was a postural and intention tremor on the right upper extremity. There was no cognitive impairment, cranial nerve deficits, motor weakness, sensory loss, nor dysarthria. Her reflexes were likewise normal. The rest of the physical examination was normal. The tremors would intermittently occur.

3. Workup

Routine blood examinations were unremarkable and thyroid function tests were within normal limits. Routine electroencephalography showed no focal changes or epileptiform discharges. Cranial MRI with contrast showed an arteriovenous malformation at the left frontoparietal periventricular region extending into the left lateral ventricle measuring 4.1 x 2.8x3.2 cm (AP x W x CC) (Figure 1). Further evaluation of the lesion on cerebral 6-vessel angiography showed a pial type arteriovenous malformation on the left parietotemporal and basal ganglia region supplied by the left internal carotid artery, left middle cerebral artery, left anterior cerebral artery, and left posterior cerebral arteries. Venous drainage was done through the left Vein of Labbe, left Vein of Trolard, and left internal cerebral vein. (Spetzler Martin Grade 5) (Figure 2). The patient subsequently underwent gamma knife surgery with noted improvement of tremor with regain of functions such as writing and holding instruments.

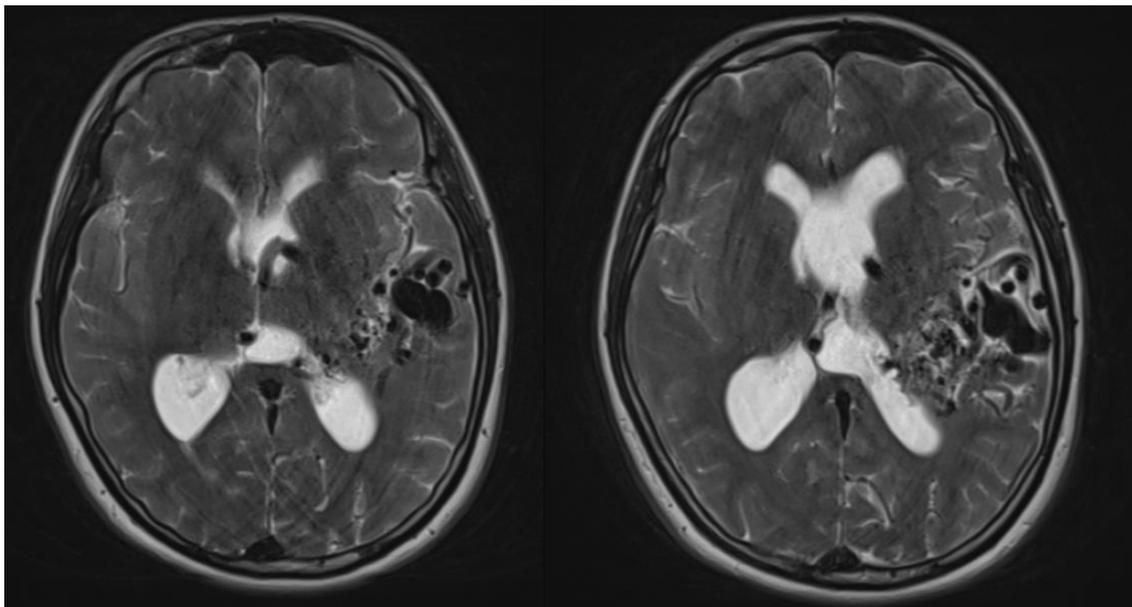


Figure 1: Magnetic resonance imaging brain scan axial T2W.

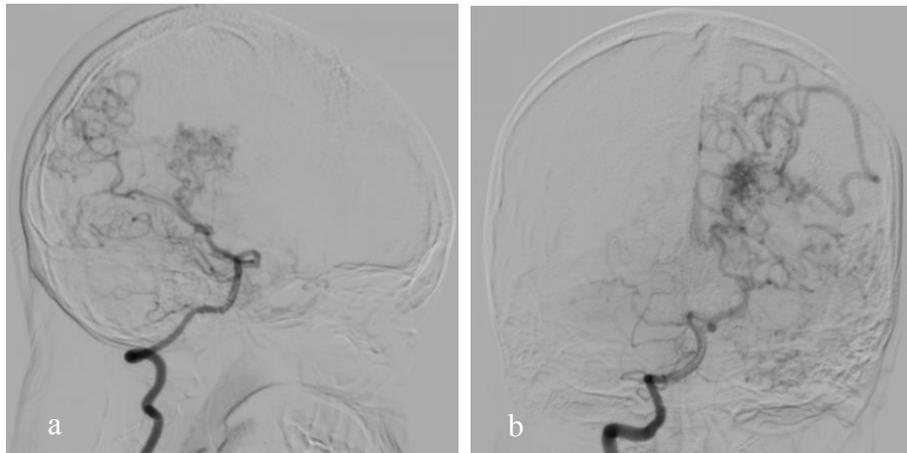


Figure 2: Digital subtraction 4-vessel angiography brain on (a) sagittal and (b) coronal views.

4. Discussion

The presentation of this case was rare in that the only reported symptom was an isolated tremor in the right arm. A quick PubMed literature search for case reports relevant to AVMs in tremors was done (Table 1). In addition, compared to the reviewed literature the attributed AVM in our case is found in the cortical areas superficial to the basal ganglia without other cortical signs.

Table 1: Recent Literature on Cases of Tremors and AVMs.

Author/s	Case Presentation	AVM Location	Intervention	Outcomes
Lobo Antunes et al., 1974	Tremor and dystonia right arm	Left basal ganglia, thalamus, upper mesencephalon	<i>Undisclosed</i>	Recurrent re-ruptures
	Tremor left arm Left hemiparesis	Right basal ganglia, thalamus, upper mesencephalon	Selective embolization	Unchanged
Krauss et al., 1999	<i>Pediatric case</i> Tremor right arm Seizures Aphasia Abulia Gait disturbance	Left high-frontal cortex and white matter	Clipping of nidial aneurysms	Ruptured twice and subsequently expired
	Tremor left arm Seizures Left hemiparesis Left hemihyphesthesia	Right high-frontal cortex and white matter	Staged partial embolization Surgical resection	Resolution of tremors and seizures Improvement of hemiparesis 2 years post- operatively
Ogungbo et al., 2001	Tremor left arm	Right medial frontal cortex	Embolization Surgical excision	Complete resolution
Demartini et al., 2020	Headache Tremors <i>Pediatric case</i>	Cerebellar culmen	Embolization	Developed mutism, dysmetria, dysdiadochokinesia, tremor of head and limbs after 6 th month of follow- up

Considering the literature reviewed, tremors are reported secondary to AVMs. However, most case reports show inconsistent improvement after treatment. A remarkable case report is present in the last retrieved report wherein the patient developed cerebellar mutism (CM) and tremors of the head and limbs after the treatment of the AVM (Demartini et al., 2020). The report explains that tremors may not only be a presenting symptom but also a complication of treatment and that CM is a possible complication of posterior fossa AVM.

As such, physicians should be adequately informed about these complications, along with further understanding of the pathogenic mechanisms and underlying anatomical circuit of CM to prevent similar mishaps like this procedure from happening. This is the first case report made locally.

Tremors may be due to various etiopathogeneses such as neurodegenerative disease, stroke, head injuries, toxins, drugs, systemic illness, or metabolic disorders however, its exact pathophysiology is still incompletely understood. The current hypothesis is that the generation of tremors is associated with the dysfunction of two main circuits namely, the dentate-olivary and the basal ganglia-cerebello-thalamic circuits. In the latter, the Globus pallidus internus (GPi) sends inhibitory GABAergic projections to the Ventral intermediate nucleus of the thalamus (Vim) which subsequently project to the motor cortex. As such, increased activity of the Gpi inhibits cortical motor activity. Alternatively, the Dentate nuclei in the cerebellum sends excitatory glutaminergic projections to the posterior part of the Ventrolateral nucleus of the thalamus (VLP) and subsequently the motor cortex. As such, the cerebellum facilitates cortical motor activity(Kamble & Pal, 2018).

The dentate-olivary circuit involves the dentate nucleus, red nucleus, and inferior olivary nucleus (ION) which forms the Guillain-Mollaret triangle. The dentate nucleus sends inhibitory GABAergic projections to the ION which then send excitatory projections to the Purkinje cells of the cerebellum. In addition, the ION also receives projections from the red nucleus. The ION serves an important role in the genesis of tremors in that its neurons demonstrate regular oscillatory depolarizations. These oscillations serve as pacemakers in the temporal coordination and timely processing of motor activity and cerebellar motor learning. Any disruption in these two circuits produce tremor(Kamble & Pal, 2018).

Not much is known about brain AVMs, especially their etiology, according to a recent review article. This article mentioned how brain AVMs can possibly be multifactorial, with influences from genetic mutation and angiogenic stimulation(Demartini et al., 2020). There are also mixed beliefs in the development of brain AVMs, including those that believe that they are developed either in utero, from an angiopathic reaction, or following an ischemic or hemorrhagic event(Abecassis et al., 2014).

Systematic literature review studies gave a clearer picture of the epidemiology of AVMs. In one study, the incidence of AVMs is evaluated at 1.12 to 1.42 cases per 100,000 person years, and 38-68% of new cases have first-ever experienced hemorrhage(Abecassis et al., 2014). This study also found that the annual rates of hemorrhage for patients with untreated AVMs range from 2.10% to 2.42%. Another meta-analysis pooling the results of nine studies with a total of 3,923 patients and 18,423 patient-years of follow-up determined other important epidemiologic indicators for AVMs. These include the overall annual hemorrhage rate of 3.0% (95% CI 2.7%-3.4%), with the rate for unruptured AVMs at 2.2% (95% CI 1.7%-2.7%) and ruptured AVMs at 4.5% (95% CI 3.7%-5.5%)(Gross & Du, 2013). The mortality rate is 10-15% of patients who have a hemorrhage, and morbidity varies from approximately 30-50%. There is no sex predilection. Despite the considered congenital origin of AVMs, the clinical presentation most commonly occurs in young adults. The case in this report has conformed to most of these epidemiologic features.

There are differing schools of thought regarding the pathophysiology of AVMs. Initially, they were thought to represent congenital lesions which are a result of disordered embryogenesis, but other studies support the postnatal development of these structures. Pathways which could lead to the postnatal development of AVMs include altered flow dynamics, structural vascular abnormalities, and other underlying molecular mechanisms(Moftakhar et al., 2009). 15% of cases tend to be clinically asymptomatic until such time the presenting symptom occurs, which are: (1) intracranial hemorrhage (in 41-79% of patients); (2) seizures (in 15-40% of patients) which increase in risk as the AVMs tend to have a more cortical location, are large, multiple, and superficial-draining; (3) progressive neurological deficits (in 6-12% of patients); and (4) headaches, to which there are no specific headache features associated with AVMs. Apart from hemorrhage, AVMs become symptomatic by several mechanisms. First is mass effect whereby the size of the AVM is sufficient to exert pressure on the surrounding brain. Second, large volumes of blood shunted by the AVM may lead to a "steal phenomenon." This leads to transient or permanent ischemia of surrounding areas causing focal dysfunction(Jurinović et al., 2017). The patient in this case presented

with tremors, which is quite different from the common pathophysiologic presentations mentioned and we deemed it necessary to shed light to the rarity of this case locally.

In the diagnosis of AVMs, the Spetzler Martin grading scale is often used. This scale estimates the risk of open neurosurgery for a patient with AVM by evaluating AVM size, pattern of venous drainage, and eloquence of brain location (Frisoli et al., 2021). Small, superficial, and a non-eloquent brain AVM location would usually present as Grade 1 AVMs while larger, deeper, and eloquent brain AVM locations would be given higher grades.

Treatment modalities for these cases involve invasive management, which is recommended for younger patients in the presence of one or more of the high-risk features of an AVM rupture, while medical management is recommended for older individuals with no high-risk features. The Spetzler-Martin grade of the AVM is important to consider as high AVM grades are usually associated with an increased risk of surgical morbidity and mortality risk. Though the case in this report was successfully treated, the observed grade of the case's AVM is enough to warrant high attention from the physician treating the condition as the highest Spetzler-Martin grade was given to the AVM seen.

There is still a paucity of current evidence pertaining to the specific mechanisms as to the development of brain AVMs and how the patient's symptoms correlate with the grading of their AVM, which would have helped greatly in devising an effective treatment and management plan. This case only reported with tremors, yet the Spetzler-Martin grade of the AVM seen in the patient is Grade 5. This indicates the highest surgical morbidity and mortality risk. In conditions like these, it is always important for the physician to exercise a high degree of suspicion to be able to diagnose this condition more efficiently and consequently manage and treat the susceptible patient.

Patient Anonymity, Consent, and Confidentiality

Written informed consent was obtained from the patient for the development and possible publication of this case report, as well as any image from the diagnostic procedures done to the patient which can be seen in this report. All personal information regarding the patient were kept strictly confidential, and any information that could lead to the identification of the patient were removed in accordance with the Data Privacy Act of 2012 and the ethical guidelines in the National Ethical Guidelines for Health and Health-Related Research 2022. The patient fully understood the content of the written informed consent, and is aware that the principal investigator, as well as the hospital's Research Ethics Committee (REC), would have access to their medical records for the purpose of verification prior to presentation of this case.

Declaration of Conflict of Interest

The author declares that there is no conflict of interest.

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‘Bunch of Grapes’ at the Occipital Lobe with 3.8ppm Singlet Peak on MRS: A Case of Tuberculoma

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Abstract

Intracranial tuberculomas can cause a variety of symptoms which may include headache, vomiting, hemiparesis and seizures. These lesions are often misdiagnosed as neoplasms and radiographic findings are still non-specific². We report a case of a 28 year old male presenting at the emergency room with blurred vision on both eyes with a 3 year history of recurrent seizures described as having sudden bright flashes of light on the right eye which was then associated with twitching of the right eyelid followed by stiffening of the right upper extremity, head veering to the right with associated loss of consciousness. Initial contrast MRI revealed multiple rim-enhancing lesions at the left occipital area with 3.8ppm singlet peak on MRS. This case highlights the need for high index of clinical suspicion for intracranial tuberculoma in an endemic area with an uncommon radiologic finding seen in contrast MRI.

Keywords: Bunch of Grapes, Tuberculoma, Occipital Lobe, 3.8ppm Singlet Peak

1. Introduction

Tuberculosis remains one of the most lethal disease worldwide. It is a known disease of the respiratory tract which may disseminate to extrapulmonary areas representing about 5-15% of tuberculosis cases². Intracranial tuberculomas are single or multiple central nervous system lesions which may result from hematogenous spread of tuberculous infection⁴. It is considered rare manifestation of mycobacterium tuberculosis as seen in 1% of the TB patients and are commonly located in the frontal and parietal lobes in adults and infratentorially located in children⁵. Clinical manifestation includes headache, seizures and papilledema. On imaging, there are no radiographic findings specific for tuberculoma. However, these present usually as round masses, occurring as a single or multiple lesions, with irregular borders which demonstrates ring enhancement on contrast imaging studies. Tuberculomas may also present as a solid lesion signifying caseation. The ‘target sign’, described as ring enhancing lesion with central nidus of calcification, was also a known radiographic finding for tuberculomas⁸.

2. Case Report

This is a case of a 28 year old male, Filipino, right handed who was born and raised in Quezon City. He had no comorbidities with no history of trauma or surgery and denies history of sexually transmitted infection. He had 1 male sexual partner, unprotected, in which he was on the receptive end and 2 female sexual partners, unprotected. He is a 7 pack year smoker, occasional alcoholic beverage drinker with 1 year history of marijuana use.

The patient presented with a 3 year history of seizure episodes characterized as twitching of the right eyelid followed by stiffening of the right upper extremity with associated head veering to the right and upward rolling of eyeballs for approximately 5 minutes with loss of consciousness. This was also accompanied by headache characterized as heaviness, located in midline, 8-9/10 on pain analogue scale (PAS), non-radiating, aggravated by straining and relieved by rest. Upon consultation, the vital signs, general physical examination and review of systems were unremarkable. On neurologic examination, the patient was seen awake, oriented to person and place and was able to follow commands. He was able to identify test substance on both nostrils, with poor visual acuity, 20/50 on the right eye and light perception on the left eye. Pupils are isocoric approximately 3-4mm briskly reactive to light on both eyes. On fundoscopy, there is papilledema on both eyes. Other cranial nerve findings were unremarkable. There are no sensorimotor deficits, no meningeal signs and long tract signs noted. Patient is normoreflexive.

The patient's laboratory examination results specifically complete blood count, electrolytes and coagulation studies were normal. Other ancillaries such as random blood sugar and creatinine were also normal. On chest Xray, there was noted nodular opacities in the bilateral upper lobes and right parahilar region which may represent inflammatory process and chest CT scan was suggested. On chest CT scan, it revealed multiple pulmonary nodules on the right upper and middle lobes and left upper lobe, to consider inflammatory or infectious process. Erythrocyte sedimentation rate and c-reactive protein both showed elevated results at 52 and 192mg/dl respectively. Toxoplasma panel, sputum AFB as well as TB PCR revealed negative results.

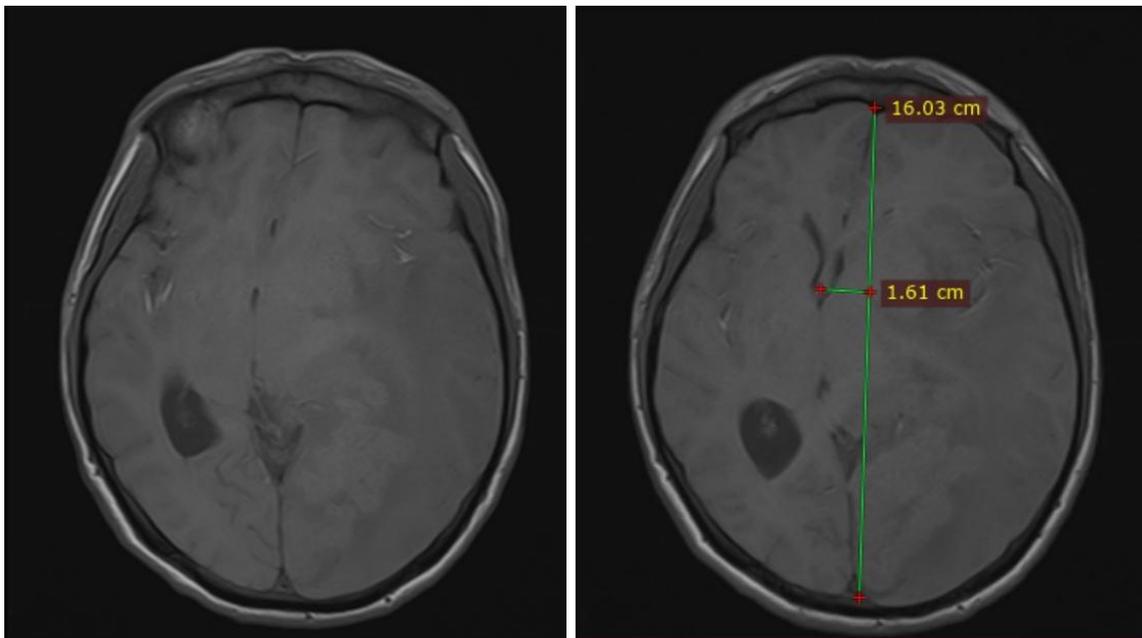


Figure 1 shows the cranial MRI T1WI showing isointense lesion at the left occipital area with surrounding iso to hypointensity which may represent perilesional edema. Midline shift of 1.5cm is also noted.

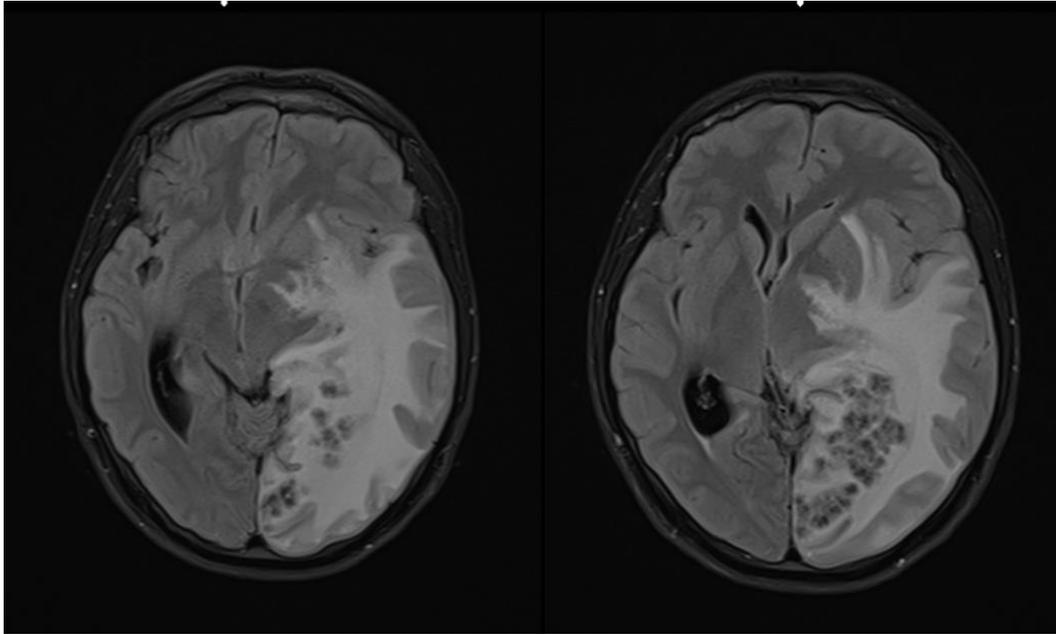


Figure 2 shows the T2 FLAIR with multiple circular hyperintense lesions with central hypointensities at the left occipital area with surrounding perilesional edema.

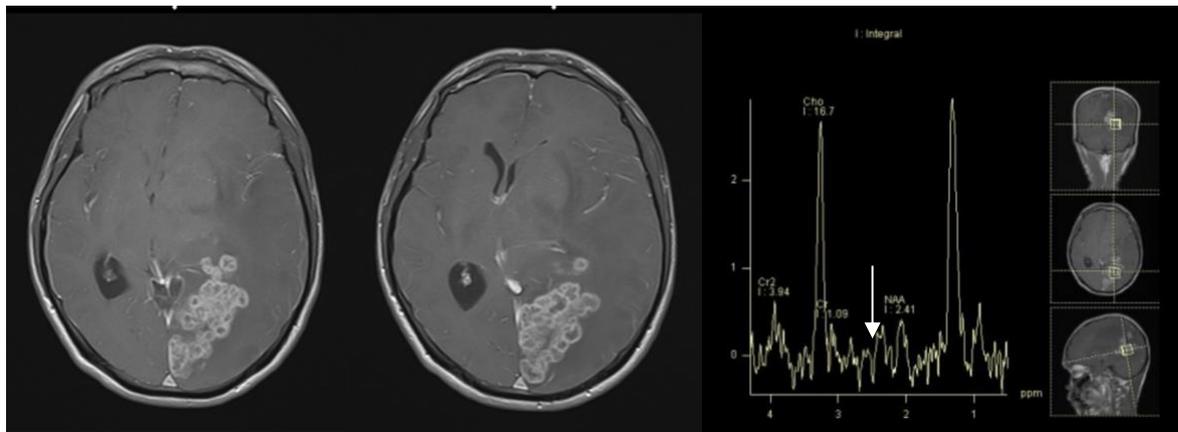


Figure 3 shows T1WI post gadolinium, with multiple rim enhancing lesions which may be described as “bunch of grapes” at left occipital area. The corresponding magnetic resonance spectroscopy (MRS) finding showing that there is high choline peak and low NAA peak which may signify a neoplastic process rather than infection. However, there have been studies showing similar MRS findings with biopsy proven tuberculoma showing elevated choline peak and low NAA peak with singlet peak at 3.8ppm (arrow). This finding have been consistent with other studies to be present in tuberculomas.

Upon examination of the Ophthalmology service, the patient had a visual acuity of 20/20 on the right eye and light perception on the left eye. Ishihara test revealed scores of 3/15 on the right eye and cannot be fully assessed on the left eye. His fundoscopy revealed (+) red orange reflex, clear media with 2-3 A-V ratio with indistinct disc borders (grade 2) on both eyes. On perimetry, there was noted junctional scotoma on the right eye. Optical coherence tomography showed posterior vitreous detachment on both eyes.

Electroencephalogram was also done for the patient which showed abnormal interictal EEG due to the presence of: a. symmetric background with mild slowing on the left, indicative of a mild left hemispheric dysfunction of non-specific etiology; b. focal slowing over the left temporal region suggestive of additional focal pathology over

the said area; c. frequent left temporooccipital epileptiform discharges. There was no clinical seizure or paroxysmal events during the recording.

During this time, patient was started on HRZE tablet, 3 tablets once daily, Dexamethasone 4mg TIV every 6 hours, Omeprazole 40mg TIV once daily, Paracetamol 600mg TIV every 6 hours if with headache, Vitamin B complex tablet once daily and Levetiracetam 500mg/tab, 1 tablet twice daily. After 2 weeks of treatment, patient had noted improvement on his visual field from light perception to counting fingers on the left eye. The patient was then discharged after 4 weeks. Before discharge, patient had undergone cranial MRI with contrast as shown in the figures below.

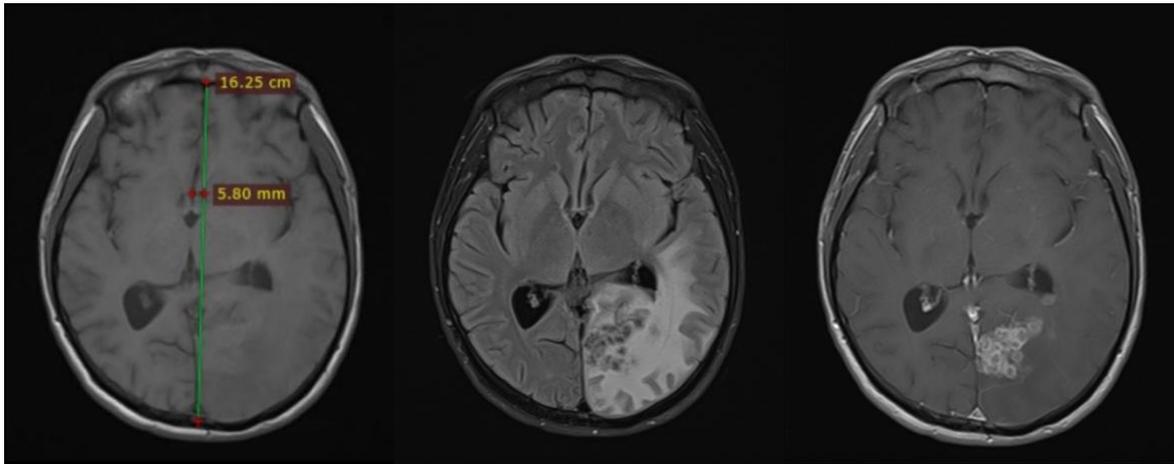


Figure 4, 5 and 6 showed T1WI, T2 FLAIR and T1 with contrast sequences done 1 month after initiation of treatment which showed interval decrease in the size of contrast ring enhancing lesions with significant decrease in surrounding edema. There was also decrease in midline shift from 1.5cm to 0.58cm.

He was advised for repeat contrast MRI with contrast at 3 months and 6 months after initiation of treatment for monitoring. He was able to follow-up at the out-patient department with gradual improvement in his visual acuity in his left eye, from counting fingers to a visual acuity of 20/200 after 3 months of treatment initiation. However, due to financial constraints, he was not able to undergo repeat imaging.

3. Discussion

Our patient presented with isointense lesion on left occipital area on T1WI, multiple circular hyperintense lesion with central hypointensities on T2 FLAIR and multiple rim enhancing lesions on T1WI post gadolinium appearing as “bunch of grapes” at the same area.

There have been rare cases of tuberculomas presenting as “bunch of grapes” especially on the occipital area. To our knowledge, there was one article about a 12 year old presenting with 1 month history of fever and 2 episodes of left focal seizures. On physical examination, the child had spastic hemiparesis on the left side of the body with chest auscultation of bilateral crepitations. The patient’s cranial MRI revealed multiple ring enhancing lesions in the right high parietal area with perilesional edema demonstrating a “bunch of grapes” appearance. One case report of a 36 year old female with a history of headache, abnormal behavior described as poor work performance, lack of inhibition in a social gathering, as well as gait disturbance. She also presented with urinary incontinence as well as frontal release signs including grasp, rooting and palmo-mental reflexes. Her cranial MRI revealed multiple contrast enhancing lesions presenting as a “bunch of grapes” located at the falx cerebri with significant surrounding vasogenic edema. She was treated with anti-tubercular medications and responded well with treatment. This pattern in a cranial contrast imaging had been related to intracranial granulomatous infection particularly tuberculoma. The ring enhancement of these lesions represents a conglomeration of contrast-enhancing layers of

predominantly lymphocytes and collagenous cells surrounding a granulomatous foci⁵. The ‘target sign’, which was once thought as a specific feature of tuberculoma, is a ring enhancing lesion with a central nidus of calcification is another presentation of tuberculomas². Ring enhancement in contrast studies may be seen in various inflammatory diseases such as neurocysticercosis, neurotoxoplasmosis, abscesses and in neoplastic lesions such as metastasis and a high index of suspicion is necessary in diagnosing tuberculoma in these patients.

In the study of Morales, et al, peaks representing lipids as well as peak at 3.8ppm were demonstrated in 77% (10/13) and 69% (9/13) cases of tuberculomas respectively. The cases that were included in the study were 10 patients which responded to anti-mycobacterial therapy and 3 of the cases were biopsy proven. These were then compared with the malignant lesions in which these peaks were seen in 79% (15/19) and 10% (two of 19) cases. With these findings, there is a statistically significant difference in comparison of tuberculoma and malignant lesions correlated with 3.8ppm peak ($p < 0.001$). In the study of Ranjan, et al in 2020, three cases of tuberculoma, all responsive to anti-mycobacterial treatment demonstrated singlet peak in 3.8ppm in MRS.

4. Conclusion

We present an uncommon case of tuberculoma in the occipital lobe presenting as a “bunch of grapes” on contrast imaging. Though in an endemic area, this case highlights the need for a high index of suspicion for patient presenting with a chronic progressive blurring of vision with repetitive seizures and AFB staining or culture of CNS tissue was not done. As seen in other cases, the radiographic characteristics of a tuberculoma can vary which may demonstrate ring enhancement, a solid center, or a nonspecific feature of “target sign”. This case adds to the increasing number of reports of tuberculoma presenting as a “bunch of grapes” on imaging when other diagnostics are inconclusive, not available or may not be done. With this, it may be hypothesized as a rare but specific feature of intracranial tuberculoma and further case documentation is warranted. Moreover, recent studies showed that aside from the lipid peak seen in the MRS of cases of tuberculoma, a singlet peak at 3.8ppm in MRS may be considered a supportive feature in the diagnosis CNS tuberculomas.

Ethical Consideration

Patient form was secured before submission of manuscript. Secured data collection will be implemented during the course of this study and will involve only the researcher and the staff of the Medical Records in charge of the patient’s records. Only necessary information such as identification of patient, date of birth, diagnosis, ICD-10 codes used, prenatal data, family history and treatment outcome will be collected and no other revealing personal information will be recorded upon throughout the study. A non-disclosure agreement and redacted data only will be recorded. The protocol was submitted to the Institutional Review Board for approval.

Data Plan

All data obtained from this study will be stored for 1 year in a secured envelope, in case the investigators need to review the source data should there be questions about the results. These data will be used solely for the study and only the principal investigators can access these data. We will destroy the data after the said duration. Data collection will commence after approval of the IRB and will last for the whole duration of the study.

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Declaration of Competing Interest

None declared.

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Beyond Childhood: Joubert Syndrome in a 34-Year-Old Female – A Case Report

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Abstract

A 34 years old female presented with developmental delay, hypotonia, ataxia, oculomotor apraxia, and intellectual disability. Cranial magnetic resonance imaging (MRI) revealed molar tooth sign (MTS) which is pathognomonic for Joubert Syndrome (JS). Joubert syndrome is a congenital autosomal recessive disorder that affects the area of the brain responsible for balance and coordination. Most cases are diagnosed in the neonatal period and most do not survive into adulthood. We report a case of Classic JS diagnosed in an adult, a first in our institution.

Keywords: Joubert Syndrome, Molar Tooth Sign

1. Introduction

Joubert syndrome (JS) is a rare autosomal recessive disorder. It is estimated to affect between 0.5 per 100,000 to 1.8 per 100,000 in children.(Al-Smair et al., 2022) It is characterized by hypotonia, ataxia, abnormal breathing patterns, sleep apnea and abnormal eye movements including nystagmus and oculomotor apraxia, developmental retardation with evidence of neuropathologic abnormalities of the cerebellum and brainstem.(Bainade et al., 2020) It is radiographically characterized by hypoplasia of the cerebellar vermis and a molar tooth sign (MTS) that can be seen on magnetic resonance imaging (MRI).(Al-Smair et al., 2022) More than thirty genes have been identified that cause Joubert syndrome. Mutations in the genes associated with Joubert syndrome lead to problems with the structure and function of primary cilia, which can disrupt important chemical signaling pathways during development but is not yet completely understood how it leads to specific developmental abnormalities. The signs and symptoms of this condition vary among affected individuals. Although some survive into adulthood with variable cognitive and motor impairments, depending on whether the cerebellar vermis is entirely absent or partially developed, many others do not survive.(Al-Smair et al., 2022) JS is mostly presented as sporadic cases. However, there are some familial incidents which appear to be inherited via recessive genes.

Here, we present a rare case of an adult female with Joubert Syndrome. We report typical features and characteristics in correlation to its radiologic findings and management. This is the first reported case of Joubert Syndrome in this institution.

2. Case Report

A 34-year-old female presented to our out-patient department with parental complaints of generalized chorea of the head, neck, arms and legs with difficulty in ambulation and speech. Her developmental history could not be followed up entirely in detail. But here are some of the developmental history of the patient that we were able to extract from the parent: she was born at home, delivered by a traditional birth attendant via vaginal delivery in breech presentation. She was exclusively breastfed up to 2 months old then formula milk-fed up to age 5. She was able to roll over from back to stomach at 8 months old and was able to stand and walk at 6 years old, when she was also noted to have abnormal movements. At 7 years old, her language included one-syllable words such as “nay”. She had no history of problems in respiration or breathing.

Pertinent physical examination findings showed her eyes looking into different directions, atrophic changes in both arms and feet, and hypotonia. Neurological examination showed ptosis of the left eye, truncal ataxia, severe dysarthria, and global hyperreflexia (Fig.1). There was absence of retinal anomalies or degeneration on ophthalmologic examination. In her psychiatric evaluation, she was deemed to have lack of appropriate awareness to surrounding environmental changes. She is able to follow simple commands such as “raise your hands” and to identify body parts by pointing to it, and was able to communicate by answering yes or no. She can identify the numbers 1 to 4 by answering through fingers. During the entire consultation her communication was done with the assistance of her mother. She was notably stuttering and severely dysarthric with one syllable only. The patient showed abnormal gait, had major difficulty in walking that of the appearance of a staggering-like gait disorder. She could not perform her own personal care activities, such as independent bathing and dressing.



Figure 1: Images of patient showing truncal ataxia.

A cranial MRI was done which revealed thickened and elongated superior cerebellar peduncle giving the midbrain a molar tooth appearance; the 4th ventricle showed a “bat wing” appearance, cerebellar vermis appeared mildly deformed (Fig. 2,3,4). The diagnosis of Joubert syndrome was made based on the patient’s history, physical examination, and pathognomonic neuroimaging features. No genetic testing was done due to its unavailability in our institution.

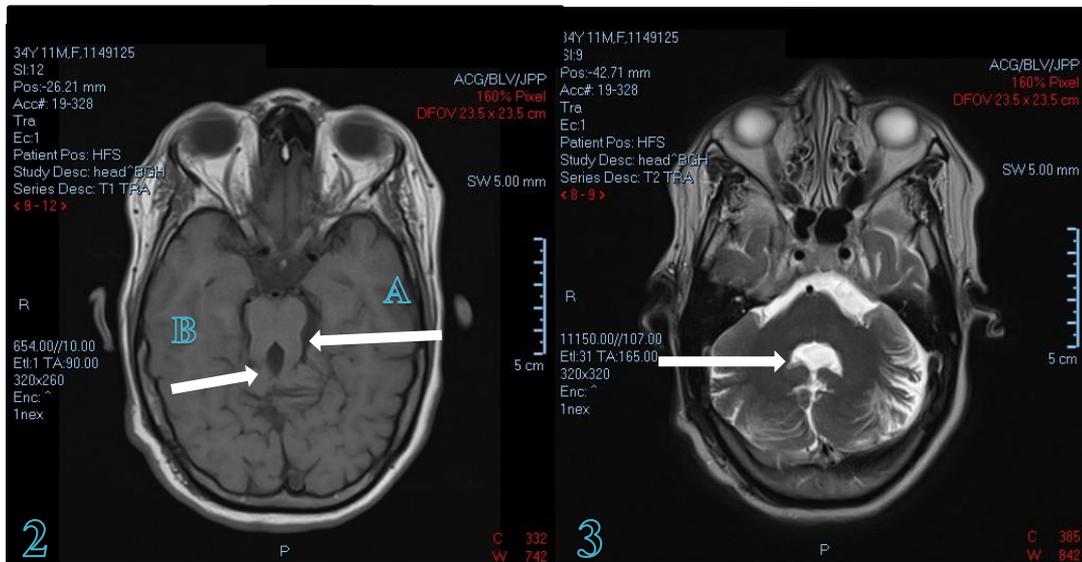


Figure 2: Axial T1 image showing (A) elongated superior cerebellar peduncles, (B) a hypoplastic cerebellar vermis (A, B) showing characteristic molar tooth sign; Figure 3: Axial T2 image showing the batwing shape of the fourth ventricle

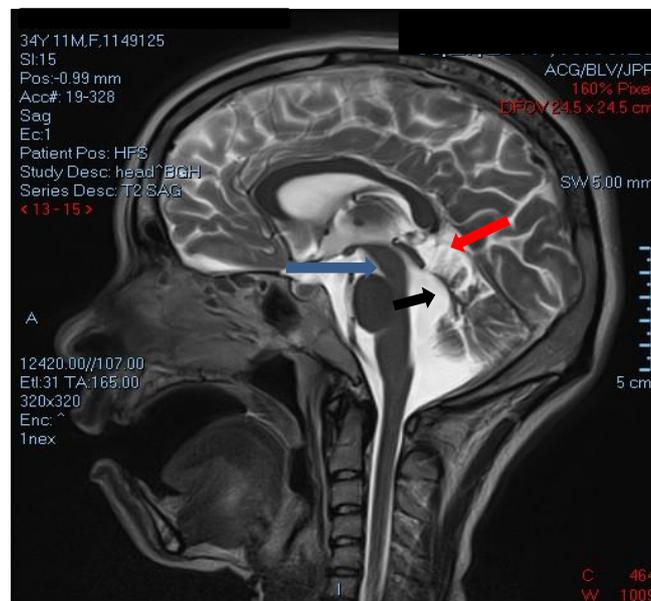


Figure 4: Midsagittal T2 -weighted MR image shows severe vermian hypoplasia-dysplasia (red arrow) and enlargement of the fourth ventricle with rostral shifting of fastigium (black arrow), deepened interpenduncular fossa (blue arrow)

3. Discussion

Joubert syndrome (JS) is a rare autosomal recessive neurodevelopmental disorder first identified in 1969 by Marie Joubert in siblings with agenesis of the cerebellar vermis, episodic hyperpnea, abnormal eye movements, ataxia and intellectual disability. (Elhassanien et al., 2013, Brancati et al., 2010) It is estimated to affect between 0.5 per 100,000 to 1.8 per 100,000 in children. (Al-Smair et al., 2022) However, this estimate may be too low because Joubert syndrome has such a large range of possible features, hence, is likely underdiagnosed. The mean age of diagnosis in JS is typically 33 months. (Al-Smair et al., 2022, Bainade et al., 2020) Many of the clinical symptoms of Joubert syndrome are evident in infancy and most affected children have delays in gross motor milestones. Our patient was diagnosed at 34 years old, but could have been diagnosed earlier if the parents sought consult at the first sign of delay in her development. The most common features are lack of muscle control (ataxia), abnormal breathing patterns (hyperpnea), sleep apnea, abnormal eye and tongue movements and low muscle

tone.(Brancati et al., 2010, Bachmann-Gagescu et al., 2019) Intellect ranges from normal to severe intellectual disability.

Classic or Pure JS is characterized by the triad of hypotonia in infancy with later development to ataxia, developmental delays, and pathognomonic brainstem and cerebellar malformation known as the molar tooth sign (MTS) on MRI.(Al-Smair et al., 2022, Akhtar et al., 2019) This syndrome is classified into two groups on the basis of presence or absence of retinal dystrophy. Those who have retinal dystrophy have decreased survival rates and have a higher prevalence of multicystic renal disease.(Bainade et al., 2020) Our patient has no retinal dystrophy thus decreasing the morbidity associated with it.

A group of disorders known as Joubert syndrome and other related disorders (JSRD) share the MTS and some clinical features of JS but also have other manifestations that may represent a distinct syndrome.(Bainade et al., 2020, Elhassanien et al., 2013) JSRD are categorized according to a newly adopted classification system based on genotype-phenotype correlation: Pure JS, JS with ocular defect, JS with renal defect, JS with oculo-renal defects, JS with hepatic defect, and JS with orofaciocaudal defects.(Bainade et al., 2020, Brancati et al., 2010, Akhtar et al., 2019)

Another feature of JS is its neuroradiologic characteristics, specifically in magnetic resonance imaging. MRI studies of patients with JS show a constellation of abnormalities of the central nervous system. The primary MR imaging features of JS are thinning of the isthmus with widened interpeduncular fossa, thickened superior cerebellar peduncles, hypoplasia of the cerebellar vermis with fourth ventricular deformity, rostral shift of fastigium, and sagittal vermian cleft due to incomplete fusion of the two halves of vermis.(Bainade et al., 2020, Choh et al., 2009) “Molar tooth sign” encompasses deeper than normal posterior interpeduncular fossa, prominent or thickened superior cerebellar peduncles, and vermian hypoplasia or dysplasia.(Bainade et al., 2020, Choh et al., 2009, Kendall et al., 1990) The characteristic neurologic finding of JS was shown in our patient’s MRI.

When a diagnosis of JS is suspected, a detailed cranial MRI to evaluate for the “molar tooth sign” is essential, as well as other evaluations that have been previously discussed. Because of the marked heterogeneity in this group of disorders and the relatively high frequency of associated medical conditions, it is difficult to make generalizations about outcomes.

Our patient presented with typical findings of hypotonia in infancy manifested as the delayed rolling over from back to tummy, which was also notably delayed for age. She presented with ataxia, nystagmus and oculomotor dysfunction, developmental delays and intellectual disability. No respiratory dysregulation was noted in our patient but the patient’s late diagnosis may account for improvement in breathing dysregulation with age. The patient’s MRI findings of a deeper than normal posterior interpeduncular fossa, thickened superior cerebellar peduncles, and vermian hypoplasia or dysplasia were consistent with the MTS. A fourth ventricle “bat wing” appearance was also seen.

Although the clinical presentation of JS is heterogenous, the diagnosis of classic or pure JS is based on the presence of the following three: molar tooth sign on MRI, hypotonia in infancy with later development of ataxia, and developmental delay or intellectual disabilities.(Al-Smair et al., 2022) Also, any instance that involve the molar tooth sign with the additional signs and symptoms, a diagnosis of JS is usually considered. Our patient satisfies all the above criteria and is diagnosed with classical JS.

4. Conclusion

Joubert Syndrome is a rare autosomal recessive disease which affects approximately 1/80,000 to 1/100,000 people worldwide. The first reported case in this institution was a 34 years old female who consulted in our out-patient clinic. She presented with hypotonia, abnormalities in gait and balance, developmental delay, and the pathognomonic “molar tooth sign” in her MRI. These are the diagnostic criteria suggested by Maria et al for the diagnosis of Joubert Syndrome. A suspicion of JS in a patient should warrant further investigation by neuroimaging study, i.e. MRI, to show the pathognomonic “molar tooth sign”. Genetic studies may also be done if available.

Early recognition and diagnosis of JS is important for early initiation of interventions, monitoring, and supportive therapy.

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