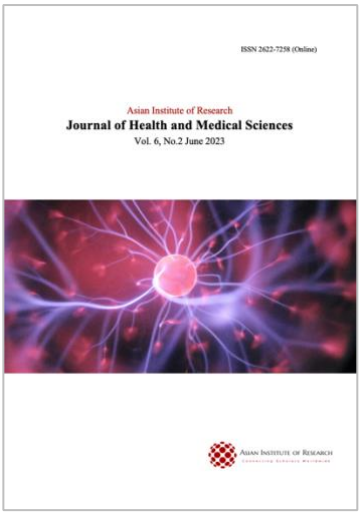

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Nutritional Knowledge and Dietary Diversity of Post-menopausal Women in Rural Areas of Bangladesh

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Abstract
Background: Nutrition has a significant impact on the health of post-menopausal women. An appropriate dietary plan provides women with the necessary nutrients to maximize their activity and help minimize chronic diseases that may arise after menopause. The objective of the study was to assess the nutritional knowledge and dietary diversity of post-menopausal women in the rural area of Bangladesh. Materials and methods: A cross-sectional study was conducted among post-menopausal women aged 45 to 60. A sampling frame of 167 post-menopausal women was created by visiting each household, and 101 participants were chosen randomly from this frame. Face-to-face interviews were used to gather data. The body mass index (BMI) was used to evaluate nutritional status. To gather dietary data and calculate dietary diversity scores, a 24-hour dietary recall questionnaire was used. Knowledge score was used to gauge nutrition-related knowledge. Result: The average nutrition knowledge score was 8.55 out of 13. Knowledge has a statistically significant effect on the dietary diversity of post-menopausal women ($P< 0.015$). In this study, BMI was 41 percent, within the normal range, 35 percent were overweight, and 22 percent were obese. Around 45 percent of the respondents had a low dietary diversity score. There was a weak association between BMI and dietary diversity ($P> 0.077$). Almost 90 percent of women experienced menopausal problems, and 25 percent had inadequate knowledge about menopause. Conclusion: Knowledge of nutrition is associated with post-menopausal women's dietary diversity. Nutrition knowledge can improve the dietary diversity of post-menopausal women.

Keywords: Dietary Diversity, Dietary Diversity Score (DDS), Nutritional Knowledge, Post-Menopausal Women

1. Background

Menopause is a significant turning point in a woman's life that marks the end of her reproductive years (Kashyap & Chhabra, 2019). Many women-entering in menopause are unprepared to deal with the changes and lack an understanding of dietary habits and diversity, which can lead to nutritional excess or deficiency (Tursunović et al., 2014). Postmenopausal women have poor nutrition knowledge (Mamgain & Lakhawat, 2019; Sirivole & Eturi,

2014). The causes include poor eating habits, heredity, and a lifestyle that provides for frequent use of betel leaf and cigarettes among other things (Tursunović et al., 2014). Inadequate nutrition and dietary diversity knowledge affect women's quality of life (Anjali & Pankaj, 2019).

Dietary diversity refers to the number of individual food items or groups consumed over time (Ruel, 2003). 26.8% of postmenopausal Korean women have poor dietary behaviors (Ra & Kim, 2021). Staple foods are a significant source of carbohydrates in the Asian diet, and around 94% consume food made of cereal (Khamis et al., 2021). Studies found that individuals with high consumption of staples had lower Dietary Diversity Score (DDS) scores. A positive association exists between nutrition knowledge and dietary intake (Spronk et al., 2014). Healthy eating habits and nutrient deficiencies contribute to various nutritional disorders (Lambrinoudaki et al., 2010).

Insufficient knowledge about nutrition leads to the poor nutritional status of post-menopausal women in Bangladesh (Harris-Fry et al., 2016). This poor knowledge makes Bangladeshi women vulnerable to choosing appropriate food for good health, ultimately hindering food diversification (Harun et al., 2020; Sheema et al., 2016). So, postmenopausal women must understand their nutritional knowledge and dietary pattern, especially those in rural Bangladesh. The present study aims to assess the nutrition and menopause-related knowledge of postmenopausal women and examine the nutrition knowledge with their food intake.

2. Materials and methods

A household cross-sectional survey was carried out among postmenopausal women in the Mirzapur subdistrict of the Tangail district. Two wards (Ward no two and Ward no 6) were selected around Mirzapur Union Health and Family Welfare Centre (UH&FWC). We communicated with the Family Welfare Assistant (FWA). Through them, we got the information from the registered book of the Family Welfare Centre, which helped us to get accurate information on postmenopausal women. Household lists of 167 respondents were prepared with the help of FWA, and 101 were randomly selected out of the list from the list. Participants aged 45 to 60 years, whose last menstrual period was more than twelve months, and who were willing to participate were recruited to the study. Ethical clearance was taken from the Institutional Review Board (IRB) of Bangabandhu Sheikh Mujib Medical University (BSMMU).

A semi-structured pre-tested questionnaire was used to collect data. Questions assessed thirteen questions on nutrition knowledge, and knowledge scores were calculated by adding the questions where the correct response was coded as one and the incorrect answer coded as 0 (Parmenter & Wardle, 1999). The questions were prepared following a dietary guideline for Bangladesh (Nahar et al., 2014). The height and weight of the respondents were measured by measuring tape and weighing machine to compute the Body Mass Index (BMI). The BMI of the respondents was calculated and classified according to World Health Organization (WHO) guidelines (World Health Organisation, 2010). A dietary recall for 24 – hours were used to obtain dietary information by dietary diversity score using Guidelines for Measuring Household and Individual Dietary Diversity (Kennedy et al., 2010). Based on food items consumed in the past 24 hours, respondents were assigned the number of food groups they consumed, ranging from 0 to 9, and the Dietary Diversity Scores (DDSs) were measured using these nine food group indicators where food group ≤ 3 Considered as having the lowest dietary diversity, the 4-5 food group has medium dietary diversity, and ≥ 6 has high dietary diversity (Kennedy et al., 2010). The nine food groups included starchy staples (e.g., rice, etc.), legumes and nuts, dairy, organ meats, eggs, flesh foods (meat, fish, or poultry), vitamin A-rich dark green leafy vegetables, other vitamin A-rich fruits and vegetables, and other fruits and vegetables.

SPSS software version 23 was used for the statistical analysis (Gouda, 2015). Descriptive data were given as percentages and frequencies for categorical variables, whereas for continuous variables, the mean and standard deviation were used to analyze data. A chi-square test was done to measure the association between variables, and ANOVA was used to compare means between more than two groups of subjects. Statistical significance was considered at $p<0.05$.

3. Result

Most participants were 49–52-year (38%). The majority of them was married (83%), housewife (88%), and Muslim (85%), and had no formal education (57%). Around 58% spouses of respondents were employed, and 11% were unemployed during the study (Table-1).

Table 1: Socio-demographic characteristics of the respondents

Variables	(%) *n*	Variables	(%) *n*
Age		**Occupation**	
45-48	(12.9) 13	Housewife	(88.1) 89
49-52	(37.6) 38	Government service	(5.9) 6
53-56	(29.7) 30	Teacher	(3.0) 3
57-60	(19.8) 20	Others	(3.0) 3
Religion		**Spouse's occupation**	
Islam	(85.1) 86	Service	(27.7) 28
Hindu	(14.9) 15	Business	(29.7) 30
Marital status		Unemployed	(10.9) 11
Married	(83.2) 84	Others*	(14.9) 15
Widow	(16.8) 17	Deceased	(16.8) 17
Educational status			
No formal education	(57.4) 58		
Secondary education	(31.7) 32		
≥ Higher Secondary	(10.9) 11		

*Others: Factory workers, Farmer, and Day Laborer

In Table 2 among 101 respondents 60.4% thought fruits should be eaten daily followed by 76.2% respondents think eating vegetables daily, 49.5% think fish should be eaten every day. Around 43% respondents think carbohydrates rich foods are rice, bread, potato etc., 46% think fish, meat, egg, legume contain rich amounts of protein, and 40% were not aware of any protein rich food. 70.3% admitted fiber is highly present in green and yellow leafy vegetables and fruits.

Table 2: Distribution of knowledge on dietary intake and disease prevention among respondents

knowledge of dietary intake		knowledge of disease prevention	
Variables	**(%) *n***	**Variables**	**(%) *n***
Minimum fruits intake per week		**Dietary fibre can prevent colon cancer.**	
≤3 days	(12.9) 13	Yes	(61.4) 62
> 3 days	(8.9) 9	No	(7.9) 8
Everyday	(60.4) 61	Do not know	(30.7) 31
Do not know	(17.8) 18	**Disease related to low intake of dietary fibre**	
Minimum vegetables intake per week		Bowel disorder	(64.4) 65
≤4 days	(12.9) 13	Anaemia	(8.9) 9
≥5 days	(5.0) 5	Tooth decay	(4.0) 4
Everyday	(76.2) 77	Do not know	(22.8) 23
Do not know	(5.9) 6	**Disease related to eating sugar**	
Minimum fish intake per week		High blood pressure	(1.0) 1
1-2 times per week	(7.9) 8	Diabetes mellitus	(94.1) 95
3-4 times per week	(32.7) 33	Do not know	(5.0) 5
Everyday	(49.5) 50	**Disease related to eating salt**	
Do not know	(9.9) 10	Diabetes mellitus	(4.0) 4
Carbohydrate rich food		High blood pressure	(82.2) 83
Rice, bread, potato	(42.6) 43	Do not know	(13.9) 14

Fish, meat, egg, legume	(25.7) 26	**Foods increase risk of cardiac disease**	
Vegetables, milk, fruits	(19.8) 20	Eating oily fish	(5.0) 5
Do not know	(11.9) 12	Eating fatty food	(84.2) 85
Protein-rich food		Do not know	(10.9) 11
Rice, bread, potato	(3.0) 3	**Foods raise blood cholesterol**	
Fish, meat, egg, legume	(46.5) 47	Egg	(2.0) 2
Vegetables, milk, fruits	(10.9) 11	Vegetable oil	(3.0) 3
Do not know	(39.6) 40	Animal fat	(85.1) 86
Fibered foods		Do not know	(9.9) 10
Fish, meat, egg, legume	(5.0) 5		
Green and yellow leafy vegetables, fruits	(70.3) 71		
Do not know	(24.8) 25		
Dietary fibre can maintain body weight			
Yes	(77.2) 78		
No	(3.0) 3		
Do not know	(19.8) 20		

Furthermore, 77% said dietary fibre helps maintain body weight, and 61% said dietary fibre could prevent colon cancer (Table-2). 64.4% of respondents stated that bowel disorder occurs due to low dietary fiber intake. 94.1% of respondents said diabetes mellitus is related to eating sugar, 82.2% said high blood pressure is related to eating salt, 84.2% said eating fatty food can increase risk of cardiac disease, and 85.1% respondents said animal fat is associated with increased blood cholesterol levels.

Sixty-eight percent of rural postmenopausal women experienced sleep disturbance, and fatigue was the most common symptom. The mean menopausal symptoms score was 9.77, and the standard deviation was 5.6. The maximum menopausal symptoms score was 18, and the minimum score was 0 out of 18.

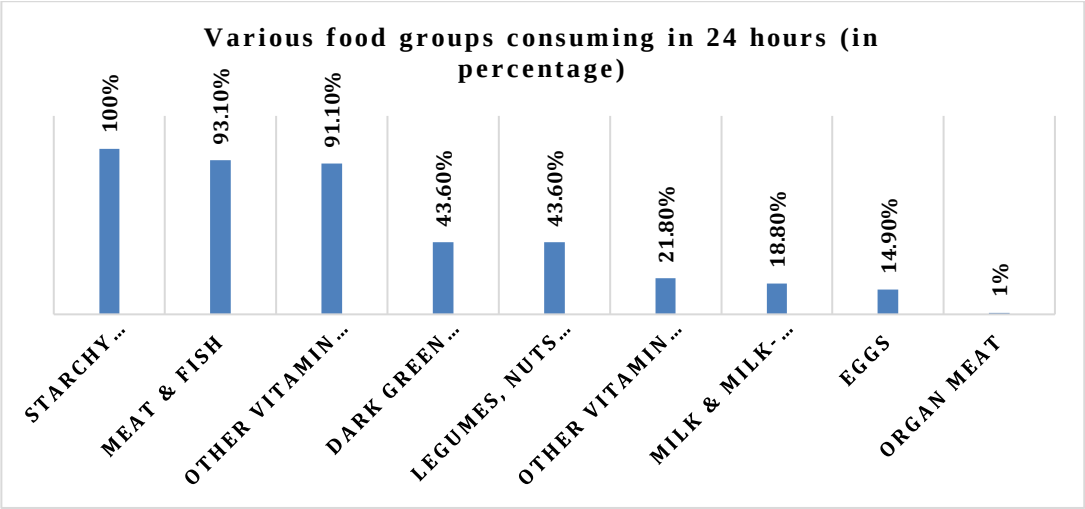

Figure 1: Food groups consumed in 24 hours

Figure 1, the data on the food intake of the respondents showed that within all food groups, every respondent consumed starchy staples, and organ meat consumption was only one percent. This diversity of food intake revealed the Women Dietary Diversity Score (WDDS), where only 7.9% of women consumed six or more than six food groups, and 44.6% finished three or less than three food groups, and they had the lowest dietary diversity.

Table 3: Pair-wise comparison among the mean of knowledge score (KS) and Women's Dietary Diversity Score (WDDS) among respondents

WDDS category	Comparison between WDDS category	Mean Difference of WDDDS category	Standard error	P value	95% confidence interval	
					Lower bound	Upper bound
Lowest WDDS	Medium WDDS	-0.942	0.509	0.202	-2.18	0.30
	High WDDS	-2.567	0.941	0.023*	-4.86	-0.27
Medium WDDS	Lowest WDDS	0.942	0.509	0.202	-0.30	2.18
	High WDDS	-1.625	0.937	0.258	-3.91	0.66
High WDDS	Lowest WDDS	2.567	0.941	0.023*	0.27	4.86
	Medium WDDS	1.625	0.937	0.258	-0.66	3.91

*The mean difference is significant at the 0.02 level.

A significant association was found between the Women's Dietary Diversity Score (WDDS) and the knowledge score (KS) (p-value 0.015). Since the ANOVA test was significant, a post-hoc (Bonferroni) test was done to determine which groups had significantly different means. The posthoc (Bonferroni) test in Table 3 shows a significant difference in mean knowledge score between the high and lowest women dietary diversity groups. It indicates a statistically significant effect of knowledge on the dietary diversity of post-menopausal women.

4. Discussion

This study revealed a statistically significant association (p-value 0.015) between knowledge and dietary diversity of post-menopausal women. Several studies found a significant association between nutrition knowledge and dietary intake or pattern (Mohamed & Tayel, 2012; Williams et al., 2012; Vriendt et al., 2009). Only 7.9% of women consumed six or more six food groups. The food groups considered in the score for the WDDS put more emphasis on micronutrient intake (Kennedy et al., 2010). Balancing micronutrients is a challenge for rural post-menopausal women. Since it requires a reasonable degree of knowledge of micronutrients (Nemati & Baghi, 2008). Improving the nutritional knowledge and dietary diversity of post-menopausal women in rural Bangladesh has important implications for their health and well-being. One potential strategy for achieving this goal may be providing targeted nutrition education programs focusing on critical areas such as micronutrient intake, protein-rich foods, and the health benefits of consuming diverse food groups.

In addition to improving the nutritional knowledge of post-menopausal women, efforts to increase dietary diversity could also have significant health benefits. A more diverse diet can help to ensure adequate intake of all essential nutrients, reduce the risk of chronic diseases such as cardiovascular disease and diabetes, and improve the overall quality of life (Chalwe et al., 2021). Strategies for increasing dietary diversity include promoting the consumption of local, seasonal, and culturally appropriate foods and intrahousehold communication (Sinharoy et al., 2017).

This study found that most women did not know about protein-rich foods. This was a reflection of needing a formal education. Furthermore, participants believed eating fewer green and yellow vegetables and fruits (fiber-rich foods) might cause bowel-related diseases such as diarrhea, constipation, and other digestive issues. Studies reported a positive relationship between higher nutrition knowledge, a greater intake of vegetables and fruit, and a lower fat intake (Spronk et al., 2014; Williams et al., 2012). So, if we increase nutritional knowledge, the diversity of food groups will increase; this result is similar to another study (Spronk et al., 2014). The finding that most women did not know about protein-rich foods may be attributed to various cultural and social factors. In rural areas of Bangladesh, there may be a lack of emphasis on protein-rich foods in the traditional diet, which may lead to a lack of awareness about the importance of these foods.

Furthermore, cultural and social norms may also play a role in limiting women's knowledge about protein-rich foods. This study revealed that more than half of the women needed formal education. Women in rural areas of Bangladesh may have limited educational opportunities and may need access to information about nutrition and healthy eating habits. Additionally, social norms may dictate that women's roles are primarily domestic, with little emphasis on learning about nutrition and food preparation outside of the home. These root causes of the lack of knowledge about protein-rich foods highlight the need for targeted interventions that address these cultural and social factors. Strategies such as community-based nutrition education programs, culturally appropriate messaging about the importance of protein-rich food and diversifying foods, and efforts to increase access to affordable protein sources may improve nutritional knowledge and dietary diversity post-menopausal women in rural areas of Bangladesh. By understanding the root causes of the lack of knowledge about diversifying foods, we can design interventions tailored to this population's specific needs and are more likely to improve their health outcomes.

On the other hand, this study figured that the prevalence of overweight among women was 35.6%. Notably, a higher proportion of rural women (21.8%) were classified as obese compared to their urban counterparts. This finding is consistent with a study conducted in Bangladesh (Hoque et al., 2015). Poor nutrition, lack of physical exercise, and symptoms of menopause were identified as possible factors contributing to the higher BMI observed among the study population (Dasgupta & Ray, 2009). These results suggest that targeted interventions aimed at improving diet, promoting physical activity, and addressing menopausal symptoms may be needed to prevent and manage overweight and obesity in this population.

Moreover, in the current study, of the women who reported menopausal symptoms, 68% experienced sleep disturbance and feeling tired/fatigued as the most common symptoms which significantly impact their overall health and well-being. This is comparable to the results conducted by other studies (Bashar et al., 2017; Singh & Pradhan, 2014; Dasgupta & Ray, 2009). However, this study also found that rural women in Bangladesh have lower knowledge about menopause and may feel uncomfortable discussing the topic due to social stigma and shame (Harun et al., 2020). By addressing these issues, we can help improve the overall health and well-being of post-menopausal women in rural Bangladesh, ultimately leading to better health outcomes for this vulnerable population.

Ultimately, improving the nutritional knowledge and dietary diversity of post-menopausal women in rural areas of Bangladesh requires a multifaceted approach that addresses individual and structural factors. This may include initiatives to increase access to fresh and healthy foods, promote physical activity, and address social and cultural barriers that limit women's ability to make healthy dietary choices. By taking a holistic approach to address the nutritional needs of post-menopausal women, we can help to improve their health outcomes and overall quality of life.

One limitation of our study is that it was conducted in one community, which may limit the generalizability of our findings to other rural areas in Bangladesh. While we took steps to ensure a random selection of households and a diverse sample of postmenopausal women, our findings may differ from other communities with different socio-demographic characteristics. Another potential limitation of our study is the possibility of bias in our results. For example, participants may have over-reported or under-reported their dietary intake due to social desirability or recall bias. Additionally, our study relied on self-reported data on menopausal symptoms, which may be subject to reporting bias. Despite these limitations, our study provides valuable insights into the nutritional knowledge and dietary diversity of post-menopausal women in rural Bangladesh. Future studies aim to replicate our findings in other communities and address potential sources of bias to strengthen further our understanding of this population's nutritional needs and health outcomes.

5. Conclusion

This study proves a significant association between nutritional knowledge and dietary diversity during post-menopause - a state of health maintenance for a healthy passage of the end of life. The diversity of food consumption among post-menopausal women in rural Bangladesh is inappropriate. Poor knowledge of nutrition and menopause and lack of awareness can lead to disease progresses, thus advancing the clinical illness. To

maintain good health and better quality of life, regular nutrition, exercise, and knowledge about menopause and nutrition are therefore necessary.

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Conflicts of interest

There are no conflicts of interest.

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