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RELATIONSHIP OF DIETARY HABIT AND CHRONIC DISEASE: A STUDY ON NAOGAON DISTRICT, BANGLADESH

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ABSTRACT: Chronic illnesses, including diabetes, hypertension, and cardiovascular disease, are becoming more common, especially in low- and middle-income nations. One key factor contributing to this burden is unhealthy eating habits. It is rare to find evidence in Bangladesh that links specific food patterns to particular health outcomes. The purpose of this study is to investigate the relationship between adult chronic illnesses and eating habits. The study identifies three dietary patterns: the Westernized pattern, characterized by a high intake of meat, red meat, dairy products, eggs, saturated fat, and sodium; the Fats & Sugar pattern, characterized by a high intake of vegetable fats and added sugars; and the Fruits & Vegetables pattern. Interestingly, the results show that the Westernized diet is significantly associated with an increased risk of hypertension (OR = 3.90, 95% CI; $p < 0.05$). On the other hand, individuals who favor fruits and vegetables are less likely to have chronic diseases, specifically hypertension (OR = 0.243, 95% CI; $p < 0.05$) and diabetes (OR = 0.208, 95% CI; $p < 0.05$). This suggests that a diet rich in fruits and vegetables

is protective for health, while a westernized eating style poses a significant health risk. No significant relationship is apparent between the Fats & Sugar pattern and hypertension or diabetes.

Keywords: *dietary patterns, health, chronic diseases, hypertension, diabetes.*

1. Introduction

A balanced diet incorporates a variety of food groups, ensuring a complete spectrum of vitamins, minerals, carbohydrates, protein, and healthy fats. A balanced diet acts as the foundation for a healthy body and mind. It provides the essential nutrients our body needs to function optimally, fight off disease, and maintain a healthy weight (Cena1 & Calder, 2020). An increase in the production of processed foods, rapid urbanization, and changing lifestyles have shifted people's dietary patterns; however, many people aren't eating enough fruits, vegetables, and fiber. People are eating meals that are probably high in fats, sugar, and salt or sodium (Waid et al. 2019). Consequently, malnutrition is caused by unhealthy eating habits, raising the chance of disease outbreaks. Moreover, Bangladesh is predicted to lose productivity due to malnutrition at a cost of over one billion dollars per year (World Bank, 2023). By examining existing evidence, we can gain a deeper understanding of how dietary choices can impact health and what strategies are effective for preventing and managing chronic diseases.

Chronic diseases, including cardiovascular diseases, type 2 diabetes, and obesity, have emerged as significant public health challenges worldwide, posing a considerable burden on individuals, families, and healthcare systems (Gianluca, 2023). A study in China indicates that unhealthy dietary habits, such as high consumption of processed foods, refined carbohydrates, and saturated fats, are linked to a higher risk of chronic diseases. In contrast, a diet rich in fruits, vegetables, whole grains, and lean proteins is associated with a lower risk. Increasing fruit and vegetable intake could reduce the burden of coronary heart disease and ischemic stroke, stomach and esophageal cancers, and low fruit and vegetable consumption was estimated to contribute about 1.8% to the global disease burden (Lock et al., 2005). Studies in Cameroon, Ethiopia, and Poland identify two main dietary patterns

among adults: a 'westernized' pattern and a 'traditional' pattern (Alamnia et. al., 2023; Czekajło et al., 2018; Nkondjock & Bizome, 2010). The studies find that higher adherence to the westernized pattern is associated with lower hypertension prevalence. Younger, married, and middle-income adults tend to follow the westernized pattern, while females and middle-income individuals are more likely to follow the traditional pattern. A high intake of fiber, fruits, and vegetables is linked to a decreased risk of ulcerative colitis (UC) (Hou, 2011). Studies also find a connection between a 'Western' style diet and an increased risk of respiratory issues among pre-school-aged children (Tromp et al., 2012; Zhang et al., 2015). Children who closely followed this pattern were more likely to experience frequent wheezing and shortness of breath at a young age and more frequent respiratory infections. A study examines the link between diet and type 2 diabetes (T2D) and finds that consuming animal protein, including unprocessed and processed meats, increases the risk of T2D (Andany et al., 2019; Villegas et al., 2010). In contrast, high-quality plant-based foods like whole grains, nuts, vegetables, and fruits are associated with a reduced risk.

Basak (2022) finds rice as the absolute staple grain, followed by moderate amounts of vegetables and even fewer fruits among Bangladesh's rural people. Protein intake is limited, with fish being the primary source. Mansoori et al. (2019) find that a higher added sugar intake in older adults (65-80 years old) is significantly associated with a higher systolic and diastolic blood pressure (BP) in females. Fruit consumption is linked to a lower diastolic BP; an increase in fruit intake by 0.71 cups decreases diastolic BP by 2.8 mmHg in both men and women. Shammi et al. (2020) highlight that consuming red meat, eggs, cheese, fast food, sugary drinks, and salty snacks is linked to higher Low-Density Lipoprotein (LDL) and triglycerides, primary cardiovascular disease (CVD) risk factors. Conversely, those who regularly eat fish, chicken, legumes, nuts, fruits, and vegetables have better lipid profiles and lower CVD risk.

Previous research has highlighted that only a few studies have been done on this topic. More specifically, the available literature is based on a global perspective and monthly food intake. But it is a notable fact that people can hardly recall what they

have eaten in the last month. Therefore, further study is needed on the relationship between dietary habit patterns and disease in Bangladesh using a more practical methodology.

2. Methods

This study uses primary data to examine the relationship between dietary habits and chronic diseases. A sample of 200 households was drawn using multistage random sampling in Naogaon District, Bangladesh. The data have been collected from adult individuals aged 15 years and above using a field survey with a well-structured questionnaire.

2.1 Dietary Intake Assessment

The nutrition assessment was performed using a food frequency questionnaire (FFQ). The FFQ includes sixteen food groups: cereals, pulses, roots and tubers, vegetables and fruits, meat (beef, lamb, and goat), meat (poultry), eggs, fish, dairy, oil and fat, mustard oil, sweets and sugar, coffee and tea, fast food and other snacks, spices and condiment, and salt/sodium. Each food group consists of food items read to participants during interviews. For example, the cereal group consists of food items such as local foods, bread, rice, noodles, biscuits, or other foods made from maize, rice, wheat, or any other locally available grain. Using the FFQ, participants were asked, 'During the past week, how often did you usually consume the following food groups?' There were eight response categories: every day, 1 day per week, 2 days per week, 3 days per week, 4 days per week, 5 days per week, 6 days per week, and not at all.

2.2 Other Variables Collection and Definitions

Dietary habit pattern refers to the overall types and proportions of foods we consume regularly, along with the frequency of our intake, rather than focusing on individual foods or meals. Some of the key aspects of it are: (i) *Types of foods*: This includes the variety of food groups like fruits, vegetables, whole grains, proteins, and dairy products that one consumes regularly, (ii) *Proportions of foods*: It refers to the balance between different food groups in our diet. For example, a healthy dietary

pattern emphasizes fruits, vegetables, and whole grains with moderate amounts of protein and dairy, and limited intake of processed foods and added sugars, (iii) *Frequency of intake*: This encompasses how often one eats throughout the day and the portion sizes of one's meals and snacks. Different types of dietary habit patterns depend on the availability of foods and the food culture of the particular region.

Data on socio-demographic and disease characteristics were collected and classified like- Demographic: age (continuous scale), sex (male, female); Socioeconomic status: income (continuous scale), educational status (illiterate, primary, secondary level, higher secondary, graduation, post-graduation); Disease: hypertension (yes, no), diabetes (yes, no), and digestive disease (yes, no).

3. Results

The collected data were coded and entered into MS Excel, and then exported to STATA software for descriptive analyses (frequencies and percentages) and inferential analyses (PCA and logistic regression).

3.1 Principal Component Analysis (PCA)

We first performed a principal component analysis (PCA) to derive dietary patterns in the population. The Kaiser-Meyer-Olkin (KMO) measure was performed to assess sampling adequacy. The test shows that the sampling adequacy is generally good (0.59, $p < 0.01$). The PCA was performed using Promax rotation, and factors with eigenvalues greater than 1 were first retained.

After assessing the relevance of the factors, we identified three factors to retain that best describe the principal dietary patterns of the population, with factor loading values greater than 0.2 being retained. The retained factors were labeled (named) consistently with previous literature and food culture in the study area. We computed quantiles of the identified dietary pattern scores to examine variations by socioeconomic factors. We examined the association between identified dietary patterns and diseases, including hypertension and diabetes, using logistic regression analysis. Statistical significance was declared at $p < 0.05$ for all parameters.

3.2 Socio-economic Characteristics and Chronic Disease Prevalence

As previously mentioned, data were collected from 200 households and 580 individuals aged 15 years and above. According to the data analysis, we find that 207 individuals are suffering from at least one of the chronic diseases. To achieve the study objective, PCA and logistic regression are used in this case. The socio-economic characteristics and prevalence of chronic diseases are presented in Table 1.

Table 1: Socio-economic characteristics

Variables	Variable category	Number	Percent (%)
Gender	Male	95	45.89
	Female	112	54.11
	Total	207	100
Age group	15-24 years	15	7.25
	25-39 years	59	28.5
	40-59 years	91	43.96
	60+ years	42	20.29
Education	Illiterate	42	20.29
	Primary	77	37.2
	Secondary	42	20.29
	Higher Secondary & above	46	22.22
Monthly income	Low	56	27.05
	Medium	127	61.35
	High	24	11.59
Hypertension	Yes	66	31.88
	No	141	68.12
Diabetes	Yes	43	20.77
	No	164	79.23

Source: Authors' calculation from field survey, 2024

3.3 Results of PCA and Eigenvalues

The results of a Principal Component Analysis (PCA) are presented in Table 2. In PCA, the eigenvalue for each principal component represents the amount of variance

in the data that is explained by that component. Higher eigenvalues indicate that the component explains a larger portion of the variance. The difference shows the difference in eigenvalues between successive components. It is helpful to see how much additional variance each subsequent component explains. Proportion represents the proportion of the total variance explained by each component. It is calculated as the eigenvalue of the component divided by the sum of all eigenvalues. Among the 16 food groups, cereals, spices, and salt have zero variance; therefore, the eigenvalues for the remaining 13 food groups are shown.

Table 2: Eigenvalues of PCA

Component	Eigen value	Difference	Proportion	Cumulative
Comp1	2.15565	0.736487	0.1658	0.1658
Comp2	1.41916	0.098978	0.1092	0.275
Comp3	1.32018	0.219176	0.1016	0.3765
Comp4	1.10100	0.052263	0.0847	0.4612
Comp5	1.04874	0.099214	0.0807	0.5419
Comp6	0.949527	0.043135	0.073	0.6149
Comp7	0.906392	0.049127	0.0697	0.6847
Comp8	0.857265	0.08469	0.0659	0.7506
Comp9	0.772575	0.029134	0.0594	0.81
Comp10	0.743441	0.060828	0.0572	0.8672
Comp11	0.682613	0.091024	0.0525	0.9197
Comp12	0.591589	0.139719	0.0455	0.9652
Comp13	0.45187	.	0.0348	1

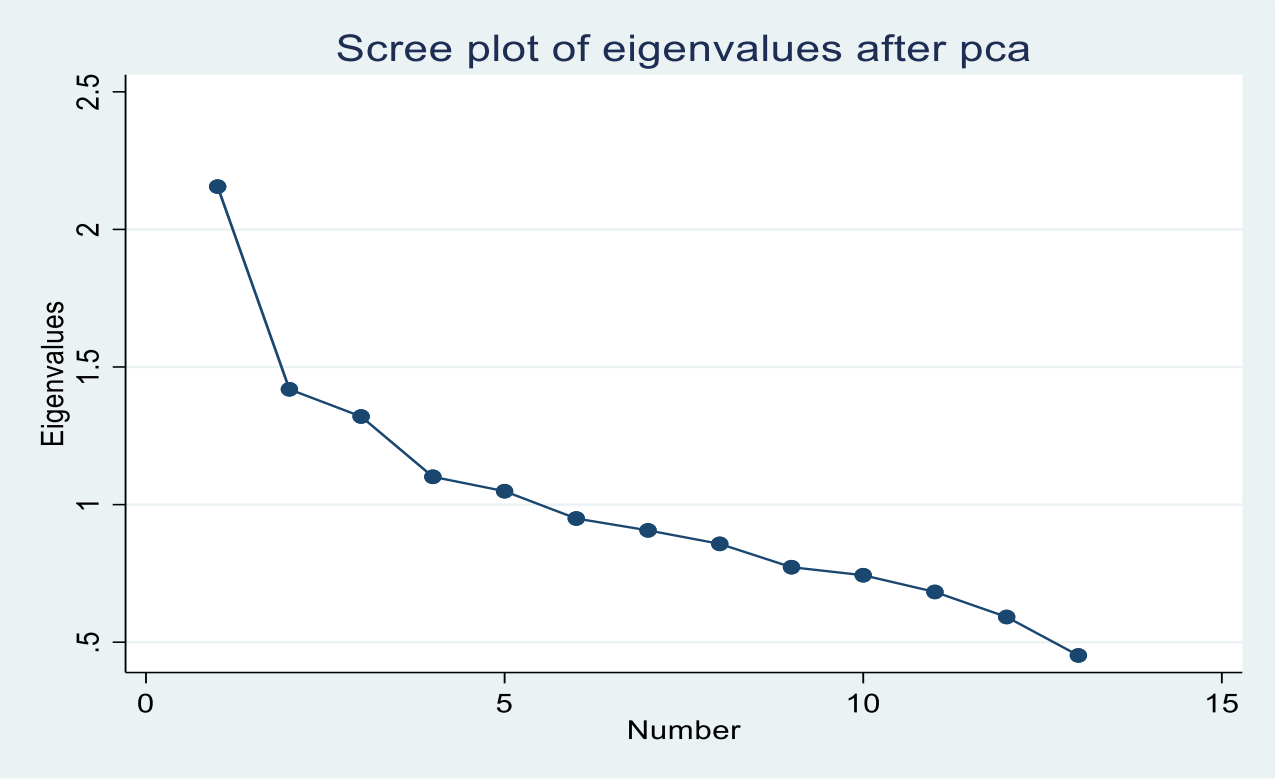
Source: Authors' calculation from field survey, 2024

Comp1 has an eigenvalue of 2.15565, explaining 16.58% of the total variance. This means that the first principal component captures the most significant variation in the data. Comp2 has an eigenvalue of 1.41916, explaining 10.92% of the total variance. Together with Comp1, it explains 27.5% of the variance. Comp3 has an eigenvalue of 1.32018, explaining 10.16% of the total variance. Comp4 has an eigenvalue of 1.10100, explaining 8.47%, and Comp5 has an eigenvalue of 1.04874, explaining 8.07% of the total variance. The five components combined explain 54.19% of the

variance. The first five components (Comp1 to Comp5) account for a substantial portion of the total variance, indicating that these components capture the most significant patterns in the data. The results indicate that the first five components would be selected.

The graph below plots the eigenvalues in descending order for the principal components. Each point on the curve corresponds to a principal component and its associated eigenvalue. In this case, based on the plot and eigenvalues (>1), it is reasonable to retain the first 3 to 5 components. Accordingly, three principal components (PC1, PC2, and PC3) are selected in this study to identify three dietary patterns, as shown in Table 3.

Figure 1: Scree plot



Source: Authors' calculation from field survey, 2024

3.4 Identification of Dietary Patterns

In this section, factor loadings of dietary patterns obtained among adults Promax Rotation in the PCA.

Table 3: Factor loadings of dietary patterns

Variables	Mean days/week	West DP	Fats & Sug. DP	Fruit & Vege. DP
1. Cereals (Rice and rice products, bread, maize, wheat, noodles, biscuits, or any other locally available grain)	7			
2. Pulses	1.2	0.3095		0.3295
3. Roots and tubers (any potatoes, sweet potatoes, carrots, mushrooms)	6.9	0.2005		-0.4547
4. Vegetables & fruits (like green leafy vegetables, papaya, tomato, cauliflower, cabbage, beans, banana, dates, apple, wood apple, pomegranate, orange, lemon, etc.)	3.3			0.4626
5. Meat (any beef, lamb, goat)	0.3	0.3176		
6. Meat (poultry)	1.5	0.5625		
7. Eggs (any food prepared with eggs)	3.6	0.4842		
8. Fish	6.4			
9. Dairy (yogurt, milk, or other milk products)	2.2	0.4322	0.2143	-0.2246
10. Oil and fat (soybean oil or butter)	5.4		-0.5231	
11. Mustard oil	3.1		0.6547	
12. Sweets and sugar (any sugar or honey)	2.3		0.3707	0.2319
13. Coffee and tea	2.6			0.4197
14. Fast food and other snacks (chicken fries, chops, chips, etc.)	2.7			0.3542
15. Spices and condiment	7			
16. Salt/sodium	7			

Note: Mean days/week = Mean days per week, West DP = Westernized Dietary Pattern, Fats & Sug DP = Fats & Sugar Dietary Pattern, Fruits & Vege DP = Fruits & Vegetables Dietary Pattern. Factor loading values greater than 0.2 were retained, as

values below 0.2 are considered not to significantly affect the variability of the outcome. (Source: Authors' calculation from field survey, 2024)

The main food groups are listed first, and the food items within each group are listed in brackets. The mean number of days was calculated by coding the response categories into the average number of days per week.

Using PCA analysis, we identified three major dietary patterns in the participants' dietary data. In line with previous literature and contextual food culture, the derived factors were labeled as Westernized DP, Fats & Sugar DP, and Fruits & Vegetables DP. High loadings for the consumption of meat and poultry, eggs, and dairy characterize the Westernized pattern. The Fats & Sugar pattern shows positive loadings for the consumption of soybean oil, mustard oil, sweets, sugar, and honey. Finally, the Fruits & Vegetables pattern features positive loadings for fruits and vegetables, pulses, roots and tubers, coffee or tea, and fast food and other snacks.

3.5 Dietary Pattern and Socioeconomic Characteristics

Three distinct dietary patterns are categorized into four quantiles (Q1 to Q4). Individuals in Q1 represent a low consumption score, Q2 and Q3 a medium consumption score, and Q4 a high consumption score of each dietary pattern. Each quantile in Table 4 represents the frequency of individuals within each quantile for a particular demographic group, such as age, gender, education, and income.

Age: Age groups 40-59 and 60+ years are more likely to adhere to the westernized pattern, particularly in the higher quantiles (Q3 and Q4). Individuals aged 25-39 and 40-59 years are more prevalent in the higher quantiles of the Fats & Sugar pattern. Individuals aged 15-24 years are more concentrated in the lower quantiles, while older individuals aged 40-59 years are more frequently found in higher quantiles.

Gender: The consistent distribution of gender across all dietary patterns and quartiles indicates no significant gender differences towards any particular dietary pattern. Females are more frequently found in higher quantiles in all three dietary patterns.

Education: Individuals with lower educational attainment (illiterate, primary, and secondary education) are found in the lower quantiles of the Westernized DP and the

Fats & Sugar DP. On the other hand, individuals with primary and secondary education are associated with more individuals in the lower quantiles of the Fruits & Vegetables DP.

Table 4: Quantiles of dietary pattern scores by socioeconomic characteristics

Variables	**Dietary Patterns**											
	Westernized DP				Fats & sugar DP				Fruits & Vegetables DP			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Age												
15-24 years	5	3	3	4	4	4	2	5	5	3	3	4
25-39 years	14	19	15	11	11	12	19	17	11	20	12	16
40-59 years	23	19	27	22	26	26	21	18	22	22	22	25
60+ years	10	11	8	13	11	10	10	11	14	9	13	6
Gender												
Male	26	25	22	22	28	24	21	22	25	23	25	22
Female	26	27	31	28	24	28	31	29	27	31	25	29
Education												
Illiterate	15	11	8	8	12	9	8	13	11	19	5	7
Primary	12	23	19	23	15	18	27	17	15	17	25	20
Secondary	11	11	12	8	17	9	7	9	14	5	10	13
Higher Secondary	13	7	14	6	6	14	8	12	10	11	10	9
Graduation	1	0	0	3	2	0	2	0	2	2	0	0
Post graduation	0	0	0	2	0	2	0	0	0	0	0	2
Income												
Low	16	11	22	7	10	19	20	7	14	19	6	17
Medium	36	31	25	35	34	29	30	34	34	27	40	26
High	0	10	6	8	8	4	2	10	4	8	4	8

Note: The results in each quantile show frequency (n). The dietary patterns are categorized into three groups: Westernized DP, Fats & Sugar DP, and Fruits &

Vegetables DP; each is further divided into four quantiles (Q1, Q2, Q3, and Q4). (Source: Authors' calculation from field survey, 2024)

Monthly Household Income: In the case of the Westernized DP and the Fats & Sugar DP, individuals are highly represented in the lower quantiles (Q1 and Q2). For the Fruits & Vegetables DP, medium-income individuals are highly represented in the higher quantiles (Q3 and Q4). In contrast, low-income individuals are more frequent in Q1 and Q2, indicating that higher-income individuals tend to prefer the Fruits & Vegetables diets.

This analysis reveals significant associations between socioeconomic characteristics and dietary patterns. Older age groups and females are more likely to adhere to less healthy dietary patterns, such as the Westernized pattern and the Fats & Sugar pattern. Conversely, younger individuals with higher education levels and higher incomes are more likely to adopt healthier dietary patterns, such as the Fruits & Vegetables pattern.

3.6 Diet and Disease Association: The Binary Logistic Regression

Table 5 presents an association between dietary patterns (DP) and chronic diseases, specifically hypertension and diabetes. The results of logistic regression include coefficients and odds ratios (OR) for each disease across different quantiles of dietary patterns: Westernized DP, Fats & Sugar DP, and Fruits & Vegetables DP.

Hypertension: The prevalence of hypertension is significantly associated with the consumption of the Westernized dietary pattern and the Fruits & Vegetables pattern. The coefficient of logistic regression indicates a positive relationship between the Westernized dietary patterns and hypertension, and a negative relationship between the Fruits & Vegetables dietary pattern and hypertension.

We used the first quantile (Q1) as the reference category for all cases. The odds ratio indicates a significant difference in hypertension prevalence among quantiles of the Westernized dietary pattern and the Fruits & Vegetables dietary pattern. Individuals in the fourth quantile of the Westernized dietary pattern are 3.9 times more likely to have hypertension compared to individuals in the first quantile (OR = 3.90, 95% CI;

$p < 0.05$). This suggests that adherence to the Westernized diet is associated with a higher risk of hypertension. On the other hand, individuals in the fourth quantile of the Fruits & Vegetables dietary pattern are 76% less likely to have hypertension compared to individuals in the first quantile (OR = 0.243, 95% CI; $p < 0.05$). The highest quantile (Q4) shows a significant association with reduced odds of hypertension, indicating that high consumption of fruits and vegetables protects against hypertension. This suggests that adherence to the Fruits & Vegetables diet is associated with a lower risk of hypertension.

However, the Fats & Sugar dietary pattern does not show a significant association with hypertension. Some studies show a negative relationship between the Fats & Sugar dietary pattern and hypertension, which is significant (Czekajlo et al., 2018; Gianluca, 2023).

Table 5: Logistic Regression results

DP	Quantile	Disease			
		Hypertension		Diabetes	
		Coefficient	OR	Coefficient	OR
Westernized DP	Q1(R)				
	Q2	.502	1.652	.048	1.049
	Q3	.837	2.310	-.451	.637
	Q4	1.361**	3.90**	.441	1.554
Fats & Sugar DP	Q1(R)				
	Q2	.418	1.519	.516	1.675
	Q3	-.023	.977	-.286	.751
	Q4	-.866	.421	-.806	.447
Fruits & Vegetables DP	Q1(R)				
	Q2	-.115	.891	-.669	.512
	Q3	-.365	.694	.455	1.576
	Q4	-1.415**	.243**	-1.571**	.208**

Note: ** indicates significant at 95% confidence interval, $p<0.05$. (R) = reference category. The Table shows the results of the Logit model coefficients and odds ratios

for patients' incidence of disease (hypertension or diabetes). The coefficients indicate the direction of probability (positive or negative) but cannot be interpreted to determine the magnitude of the coefficients. The odds ratio in favor of being sick shows the ratio of the probability that a person is suffering from a disease to the probability that the person is not suffering from a disease. (Source: Authors' calculation from field survey, 2024)

Diabetes: The prevalence of diabetes is significantly associated with only the Fruits and Vegetables dietary patterns. The coefficients of the Logistic regression indicate a positive relationship between the Westernized dietary pattern and diabetes, as well as between the Fats & Sugar dietary pattern and diabetes. In contrast, a negative relationship is observed between the Fruits & Vegetables dietary pattern and diabetes.

The odds ratio shows a significant difference in diabetes prevalence among quantiles of dietary pattern scores. Individuals in the fourth quantile of the Fruits & Vegetables dietary pattern are 80% less likely to have diabetes compared to individuals in the first quantile (OR = 0.208, 95% CI; $p < 0.05$). Hence, these results suggest that adherence to the Fruits & Vegetables diet is associated with a lower risk of Diabetes.

4. Discussion

This study suggests three major dietary patterns —the Westernized pattern, the Fats & Sugar pattern, and the Fruits & Vegetables pattern —which are significantly associated with diseases such as hypertension and diabetes. A previous study in Bangladesh identified six types of dietary patterns: 'westernized pattern', 'fish pattern', 'meat pattern', 'gourd vegetables pattern', 'fruits and vegetables pattern', and 'balanced pattern (Jiang et al., 2016). A study in Japan identified three dietary patterns: a 'Japanese dietary' pattern (highly related to soybean products, fish, seaweeds, vegetables, fruits, and green tea), an 'animal food dietary' pattern, and a 'high-dairy, high-fruit-and-vegetable, low-alcohol dietary' pattern by (Shimazu et al., 2007). In Ghana, a study identified two types of dietary patterns: 'purchase pattern' characterized by high intakes of sweets and sweet drinks, rice, foods rich in protein (red meat, poultry, egg, milk), plant oils (vegetable oil and margarine), fruits and vegetables (carrot, lettuce, cucumber), and low intakes of plantain), and 'traditional

pattern' characterized by high intakes of plantain, green leafy vegetables, beans, garden eggs, fish, maize, palm oil, okra, and fruits (Frank et al., 2014). Nkondjock and Bizome (2010) identified two dietary patterns in Cameroon: the 'fruit and vegetable' pattern (typified by a high intake of fruits, vegetables, tubers, and legumes), and the 'meat' pattern (characterized by a high intake of bush meat, poultry, and red meat).

Hypertension is a condition associated with increased risk for stroke, cardiac failure, renal failure, and peripheral vascular disease. Excessive intake of saturated fatty acids and trans fatty acids, along with higher consumption of salt and sugar, are risk factors for cardiovascular diseases, including hypertension (WHO, 2024). Our study reveals that the higher quantiles of the Westernized dietary pattern are significantly associated with an increased prevalence of hypertension. However, a previous study found that the higher quantiles of the Fruits & Vegetables dietary pattern are significantly associated with a decreased prevalence of hypertension (Jiang et al., 2016; Shimazu et al., 2007). Higher intakes of meat and meat-based foods increase the risk of hypertension, while adequate intakes of fruits and vegetables are preventive (Nkondjock & Bizome, 2010; Naja et al., 2019; Schwingshäckl et al., 2017). Our findings on dietary patterns and hypertension are consistent with previous studies, which suggest that the Western diet, characterized by high factor loadings for meat, milk, poultry, and eggs, is associated with an increased risk of cardiovascular disease (CVD) mortality (Chen et al., 2013). Our study results are also consistent with findings, mainly from developed and middle-income countries (Bazzano et al., 2013), that diets rich in fruits, vegetables, and low in saturated and total fat, as well as the Mediterranean diet, are protective for blood pressure control.

The prevalence of diabetes in the Bangladeshi population is increasing (Bhowmik et al., 2013). Over time, high blood sugar levels lead to serious health problems, such as heart disease, stroke, blindness, kidney failure, and nerve damage. Our study finds that the highest quantile of the Westernized dietary pattern is associated with an increased prevalence of diabetes. Conversely, the highest quantile of the Fruits & Vegetables dietary pattern is significantly associated with a decreased prevalence of diabetes. This finding is also supported by two other studies (Esposito et al., 2014;

Fung et al., 2004). An unhealthy diet, characterized by high consumption of sugar and processed foods and low intake of fruits and vegetables, is a significant risk factor for Type 2 diabetes (Zaroudi et al., 2016; Sami, 2017; Sarwar et al., 2020). As discussed, our study shows a positive relationship between the Westernized dietary pattern and disease prevalence, and an inverse relationship between the Fruits & Vegetables dietary pattern and disease prevalence.

5. Conclusion

Using a more practical methodology, this study examines the relationship between dietary habit patterns and diseases in Bangladesh. This study examines three major dietary patterns—the Westernized pattern, the Fats & Sugar pattern, and the Fruits & Vegetables pattern—which are found to have significant connections with diseases such as hypertension and diabetes among the population in Naogaon District, Bangladesh. Chronic diseases, such as hypertension and diabetes, are positively associated with higher quantiles of the Westernized dietary pattern. Identifying major dietary patterns in the population can be informative for developing dietary interventions to prevent and control chronic diseases. Therefore, this study highlights the role of reducing calories, saturated fat, and salt in processed and prepared foods, increasing the consumption of fruits, vegetables, and fiber in the human body to control the risk of hypertension and diabetes, because a high-fiber diet can lower cholesterol, blood pressure, and blood sugar; thus, potentially reducing morbidity, mortality, and the lifetime risk of an individual's becoming hypertensive and diabetic.

Nutrition education programs should be promoted to encourage an increased intake of fruits and vegetables, thereby reducing the risk of chronic diseases. Promoting healthier dietary patterns and reducing the consumption of red meat, processed foods, and unhealthy fats can play a vital role in preventing diabetes and hypertension. Because most animal fats are saturated and unhealthy, plants and fish can serve as an alternative to saturated fats, red meat, and processed foods.

The study results would be more generalizable if the study could include a larger number of respondents. Only one district out of 64 in Bangladesh was studied due to funding limitations, which can be considered in future studies.

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