**Investigations into the nutritional status of older adults and the related lifestyle risk factors as well as comorbidities at Dhaka City, Bangladesh**

**ABSTRACT**

**Background**: Older adults are particularly susceptible to nutritional risk states due to inadequate food intake and the prevalence of chronic medical conditions. This demographic necessitates comprehensive nutrition assessments to address their unique needs.

**Goals and Objectives:** This cross-sectional study aimed to investigate the relationship between dietary habits and the nutritional health of individuals aged 60 and older residing in Dhaka City. Ultimately, the study's goals are to inform public health strategies and interventions that can enhance the nutritional well-being of older adults in the region.

**Materials and Methods:** The study involved older adults of various religions and sexes, recruited from different locations within Dhaka. Data were collected through face-to-face interviews conducted in Bengali; alongside anthropometric measurements taken by researchers. Additionally, relevant health metrics, including the latest blood pressure, glucose levels, lipid profiles, and biochemical test results, were sourced from hospital records.

**Results:** The study revealed a high prevalence of chronic health conditions among the elderly participants. Hypertension was observed in 58.5% of the population, with a significant portion classified as having moderate to high severity. Diabetes was present in 42.9% of participants, while chronic kidney disease affected 51.38%. Dementia was reported in 52.7% of the elderly individuals. Additionally, a significant proportion of participants had comorbid conditions, with 33.0% experiencing depression. Deficiencies in various vitamins were also noted, including 17.9% for vitamin A, 9.8% for vitamin C, 43.8% for vitamin D, and 11.6% for B complex vitamins. Furthermore, a notable number of participants reported mineral deficiencies, especially in calcium, which affected 52.7% of the group. In terms of lipid profiles, 41.9% of participants had normal total cholesterol levels, whereas 20.5% exhibited high cholesterol levels. Additionally, 33.9% of the elderly reported low levels of physical activity, indicating a sedentary lifestyle that may contribute to their overall health decline. The results underscore the presence of various lifestyle-related nutritional risk factors and provide insights into the nutritional patterns and challenges faced by older adults.

**Conclusion:** The study emphasizes the urgent need for lifestyle modifications and dietary interventions to address the escalating chronic disease burden in Bangladesh's elderly population. Future research should focus on identifying specific nutritional issues within larger samples and implementing long-term monitoring of nutritional factors.

**Keywords:** Nutritional status, older adults, Dietary patterns, Aging population, and Nutritional risk factors

**INTRODUCTION**

The global population of individuals aged 60 and older is projected to rise from 1 billion in 2020 to 2.1 billion by 2050, increasing their share of the total world population from 12% to 22%. This trend is expected to occur in every country, making the elderly the fastest-growing demographic group (Millimono et al., 2023). The health status of this expanding population not only impacts the individuals themselves but also poses significant challenges to healthcare systems and social resources. Aging is typically linked to a gradual decline in physical capabilities, an increase in the prevalence of multiple health conditions, and a deterioration in nutritional health (De Groot & Van Staveren, 2010; Torres et al., 2014). Age is a critical risk factor for mortality among older adults, but other age-related factors such as socio-demographic characteristics, lifestyle choices, dietary habits, life satisfaction, metabolic health, comorbidities, and geriatric syndromes also play a significant role in predicting mortality (Hou et al., 2023).

In Bangladesh, the demographic landscape has undergone notable changes. In recent years, the country has experienced a remarkable increase in its aging population, driven by higher life expectancy and declining birth rates (Islam et al., 2022). Currently, individuals over the age of 60 make up 8% of the population, a figure that is anticipated to grow to 11.5% (approximately 21.5 million) by 2030 and to 21.5% (around 43.5 million) by 2050 (Sarker, 2021). Presently, senior citizens constitute 9.28% of Bangladesh's total population, which exceeds 25 million. The growth rate of the elderly population is 3.41 times greater than that of the overall population (Islam, 2022).

The nutritional and health status of older adults is heavily influenced by their access to safe food, clean water, proper sanitation, and hygienic living conditions. A well-structured geriatric nutrition plan is essential for managing the physical, psychological, and behavioral aspects of elderly individuals, while also aiming to alleviate the effects of aging and illness (Holmus, 2021). Adequate nutrition plays a crucial role in promoting healthy aging and preventing chronic diseases; however, older adults are at a higher risk of experiencing poor nutritional status, particularly regarding micronutrients. This susceptibility is frequently attributed to physiological and social changes, including diminished food consumption, impaired sensory perception, malabsorption issues, decreased physical activity, and a rise in disability (Kehoe et al., 2019).

Older adults frequently face non-communicable diseases, including cardiovascular conditions like heart attacks and strokes, chronic respiratory diseases such as chronic obstructive pulmonary disease and asthma, as well as renal diseases, cancers, and diabetes (Buffel et al., 2023). They are also prone to a variety of health issues, including weakness, dental problems, hearing and vision impairments, body aches, back pain, rheumatic pain, joint stiffness, dementia, prolonged cough, breathing difficulties, and hypertension. These health challenges often necessitate long-term psychological care, nursing support, and hospitalization. Additionally, loneliness and anxiety are significant emotional challenges for the elderly population (Wilson et al., 2021). The trend toward nuclear families and the migration of children can further complicate the lives of elderly parents, who may find themselves in precarious situations without sufficient financial and social support. Food security is another pressing issue, as financial constraints, limited mobility, and social isolation can impede access to healthy and adequate food. Ensuring proper nutrition and food security for older adults is crucial for maintaining their health, reducing morbidity, and enhancing their quality of life (Malak et al., 2020).

Consequently, it is vital to assess the nutritional status of older adults. Such assessments can inform the development of targeted nutritional interventions and emotional support programs, ultimately addressing the nutritional challenges faced by this vulnerable demographic.

**METHODOLOGY**

**Study Design, Area, Period and population**

This research employed a cross-sectional study, and descriptive design to investigate the connection between dietary patterns and the nutritional status of elderly individuals. Conducted between November 2019 and January 2021 at the Bangladesh Institute of Research and Rehabilitation in Diabetes, Endocrine and Metabolic Disorders (BIRDEM General Hospital), Bangabandhu Sheikh Mujib Medical University, and Probin Nibash. The study focused on individuals aged 60 and above, as the United Nations categorizes this age group as part of the older population, highlighting the diverse needs and challenges they face as they age. It included 112 participants of various religions and genders, drawn from different areas across Dhaka city. This varied sample enabled a comprehensive assessment of the nutritional status of the elderly population in the region.

**Eligibility criteria**

People who voluntarily agreed to participate in this study and were at least 55 years old were included. Respondents who were mentally incompetent or unable to complete the evaluation or who refused to give consent were excluded from the study.

**Data Collection Procedure**

The data collection procedure involved several key steps to ensure the integrity and reliability of the study. Initially, the purpose of the study was clearly explained to the respondents, and verbal consent was obtained following ethical guidelines. Following the established selection criteria, data collection was conducted through face-to-face interviews with the sample population, with questions posed in Bangla to facilitate understanding. Once the inclusion and exclusion criteria were met, each participant was interviewed, and anthropometric measurements were recorded by the researchers. The most recent glucose levels were collected from the participants' treatment cards, and glucometer readings were taken when accessible since glucose serves as a direct indicator of carbohydrate metabolism and energy availability. Abnormal glucose levels may suggest inadequate dietary intake or poor nutritional choices. Furthermore, blood pressure measurements were taken during the interview and verified against previously recorded values to ensure accuracy. This comprehensive approach to data collection aimed to gather reliable information while respecting the participants' rights and ensuring their comfort throughout the process.

**Variables Assessed**

The study assessed a range of variables categorized into several key areas:

* **Socio-Demographic Characteristics**: Age, Financial status, Education level, Monthly family income, Family type, and number of family members.
* **Personal Habits:** Tobacco use, Smoking, Betel nut chewing, Alcohol consumption.
* **Dietary Habits:** Consumption of fast food, Type of cooking methods used, Extra salt intake.
* **Family History Related Variables**: History of hypertension, History of diabetes mellitus, History of coronary heart disease, Relationship of the respondent to family members with these diseases.
* **Measurement-Related Variables:** Height (in meters), Weight (in kilograms), Systolic blood pressure, Diastolic blood pressure, Fasting blood sugar (FBS), Random blood sugar (RBS).
* **Biochemical Variables:** Total cholesterol (TC), Low-density lipoprotein (LDL), High-density lipoprotein (HDL), Hepatic glutamate-pyruvate transaminase (HGPT), Alkaline phosphatase, Serum creatinine, Blood urea. These variables were systematically assessed to provide a comprehensive understanding of the factors influencing the health status of the study population.

**Data Analysis**

Quantitative data were entered into a secure database and analyzed using statistical software. Descriptive statistics such as frequencies and percentages were used as variables.

**RESULTS**

**Table 1: Demographic and Socioeconomic Characteristics of Participants**

|  |  |  |  |
| --- | --- | --- | --- |
| **Variable** | **Category** | **Frequency** | **Percent (%)** |
| **Age Group** | 55-65 years | 57 | 50.9 |
|  | 66-75 years | 44 | 39.3 |
|  | 76-85 years | 5 | 4.5 |
| **Sex** | Male | 59 | 52.7 |
|  | Female | 52 | 46.4 |
| **Religion** | Muslim | 89 | 79.5 |
|  | Hindu | 20 | 17.9 |
|  | Christian | 1 | 0.9 |
|  | Buddhist | 1 | 0.9 |
| **Marital Status** | Married | 82 | 73.2 |
|  | Divorced | 2 | 1.8 |
|  | Separated | 1 | 0.9 |
|  | Widow/Widower | 22 | 19.6 |
| **Monthly Income (BDT/Month)** | 5000-10000 | 4 | 3.6 |
|  | 10000-15000 | 5 | 4.5 |
|  | 15000-20000 | 9 | 8.0 |
|  | 20000-25000 | 8 | 7.1 |
|  | 25000-30000 | 12 | 10.7 |
|  | >30000 | 7 | 6.3 |
| **Education Level** | Illiterate | 28 | 25.0 |
|  | Primary | 24 | 21.4 |
|  | SSC | 14 | 12.5 |
|  | HSC | 22 | 19.6 |
|  | Graduate | 21 | 18.8 |
| **Occupation** | Farmer | 10 | 8.9 |
|  | Businessmen | 23 | 20.5 |
|  | Housewife | 48 | 42.9 |
|  | Skilled Labor | 2 | 1.8 |
|  | Retired Person | 22 | 19.6 |
|  | Others | 5 | 4.5 |
| **Household Members** | 3-5 | 24 | 21.4 |
|  | 5-6 | 59 | 52.7 |
|  | More than 6 | 26 | 23.2 |
|  | Single | 3 | 2.7 |

Table 1 presents a cross-sectional study that outlines the demographic and socioeconomic characteristics of participants, providing valuable insights into the population being studied. Here’s a detailed result of the various variables presented in the table.The majority of participants (50.9%) fall within the 55-65 years age group, indicating that the study primarily focuses on middle-aged individuals. A significant portion (39.3%) is in the 66-75 years category, while only a small percentage (4.5%) are aged 76-85 years. This suggests that the study may be targeting an older demographic, but the majority are still in the earlier stages of older adulthood. The sample is slightly male-dominated, with 52.7% male participants compared to 46.4% female participants. This gender distribution may reflect societal norms or the specific population being studied. The overwhelming majority of participants identify as Muslim (79.5%), with a small representation of Hindus (17.9%) and negligible numbers of Christians and Buddhists. This religious distribution may influence cultural practices and socioeconomic factors within the study population.

A significant proportion of participants are married (73.2%), which may indicate a stable family structure. However, there is also a notable percentage of widows/widowers (19.6%), which could reflect the aging population and the associated loss of spouses. Approximately 26.8% of participants reported financial insolvency, while 66.1% indicated they were not financially insolvent. This suggests that a portion of the population may be facing economic challenges, which could impact their health and well-being. The income distribution shows that a majority of participants earn between 5,000 to 30,000 BDT per month, with only a small percentage earning above 30,000 BDT. This indicates that the population may be predominantly low to middle-income, which can have implications for access to healthcare and other resources.

The education levels are varied, with a significant portion of participants being illiterate (25.0%) and others having completed primary (21.4%) or secondary education (12.5%). The relatively low levels of education may correlate with the socioeconomic status and financial challenges faced by the participants. The occupational distribution shows that a large number of participants are housewives (42.9%), followed by businessmen (20.5%) and retired persons (19.6%). The low representation of skilled laborers and farmers suggests a shift in the workforce or economic activities in the region. The majority of participants live in households with 5-6 members (52.7%), indicating a tendency towards larger family units. This could reflect cultural norms regarding family structure and support systems. However, Table 1 provides a comprehensive overview of the demographic and socioeconomic characteristics of the study participants. The data highlights the aging population, economic challenges, and educational disparities within the group. Understanding these characteristics is crucial for interpreting the study's findings and implications, particularly about health outcomes, access to services, and the overall quality of life for the participants.

**Table 2: Lifestyle, Dietary Habits and Eating Problems**

|  |  |  |  |
| --- | --- | --- | --- |
| **Variable** | **Category** | **Frequency** | **Percent (%)** |
| **Smoking Habit** | Yes | 23 | 20.5 |
|  | No | 66 | 58.9 |
|  | Occasionally | 23 | 20.5 |
| **Betel Nut Chewing** | Yes | 38 | 33.9 |
|  | No | 28 | 25.0 |
|  | Occasionally | 39 | 34.8 |
| **Alcohol Use** | Yes | 3 | 2.7 |
|  | No | 93 | 83.0 |
|  | Not Respondent | 1 | 0.9 |
| **Tea/Coffee Intake** | Yes | 49 | 43.8 |
|  | No | 61 | 54.5 |
| **Teaspoon Sugar per Day** | 1 tsp | 15 | 13.4 |
|  | 2 tsp | 24 | 21.4 |
|  | 3 tsp | 41 | 36.6 |
|  | 4 tsp | 14 | 12.5 |
| **Extra Salt Usage** | Yes | 15 | 13.4 |
|  | No | 34 | 30.4 |
|  | Occasionally | 63 | 56.3 |
| **Salty food consumption** | Yes | 12 | 10.7 |
|  | No | 44 | 39.3 |
|  | Occasionally | 56 | 50.0 |
| **Eating Problem** | Yes | 21 | 18.8 |
|  | No | 82 | 73.2 |
|  | Not Respondent | 1 | 0.9 |

Table 2 presents a cross-sectional analysis of lifestyle, dietary habits, and eating problems among participants, revealing several key trends. A majority of participants (58.9%) do not smoke, while 20.5% smoke occasionally or regularly, indicating a moderate prevalence of smoking. Betel nut chewing is common, with 33.9% of participants engaging in it regularly and 34.8% occasionally, which raises health concerns. Alcohol consumption is minimal, with 83.0% abstaining, reflecting possible cultural influences. Regarding beverage intake, 43.8% consume tea or coffee, while sugar intake varies, with 36.6% consuming three teaspoons daily, suggesting a moderate level of sugar consumption. Extra salt usage is prevalent, with 56.3% using it occasionally, and half of the participants consume salty foods occasionally. Notably, 18.8% report experiencing eating problems, although the majority (73.2%) do not, indicating a generally stable eating pattern among the population. However, our current study primarily relied on dietary intake surveys and did not include clinical assessments of eating problems.

**Table 3: Dietary Intake & Food Consumption Frequency**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Food Item** | **Daily (%)** | **Weekly (%)** | **Monthly (%)** | **Rare/Never (%)** |
| Vegetables | 67.0 | 25.0 | 5.0 | 3.0 |
| Fruits | 31.3 | 42.9 | 20.5 | 5.3 |
| Fish | 65.0 | 28.0 | 6.0 | 1.0 |
| Meat | 12.0 | 48.0 | 30.0 | 10.0 |
| Dairy | 14.0 | 32.0 | 44.0 | 10.0 |
| Legumes | 20.0 | 40.0 | 30.0 | 10.0 |

 Table 3 evaluated the dietary intake and frequency of food consumption for different food items among participants, uncovering notable trends in their eating behaviors. The information shows that a significant majority of people eat vegetables every day (67%), indicating a solid inclination or commitment to including vegetables in their daily diet. In comparison, daily fruit intake is significantly lower (31%), while a larger percentage (42.9%) eats fruits weekly, suggesting that although fruits are part of the diet, they might not be valued as much as vegetables. Daily fish consumption is quite significant (65%), which may indicate cultural eating habits. Meat consumption displays a different pattern, as just 12% eat it every day while 48% consume it weekly; this could indicate a more moderate attitude toward meat consumption in the surveyed population. Dairy items are consumed at different rates, with 14% eaten each day and 44% monthly, showing they are used less often than other food categories. Legumes display comparable trends to dairy, with 20% eaten daily and 30% seldom or never consumed, which could indicate dietary limitations.

**Table 4: Anthropometric Measurements, Physical Activity, Cholesterol and Lipid Profile**

|  |  |  |  |
| --- | --- | --- | --- |
| **Variable** | **Category** | **Frequency** | **Percent (%)** |
| **BMI** | Underweight | 14 | 12.5 |
|  | Normal Weight | 44 | 39.3 |
|  | Overweight | 30 | 26.8 |
|  | Pre-obese | 15 | 13.4 |
|  | Obese | 8 | 7.1 |
| **Physical Activity Level** | Low | 38 | 33.9 |
|  | Moderate | 45 | 40.2 |
|  | High | 29 | 25.9 |
| **Daily exercise** | yes | 30 | 26.8 |
|  | no | 31 | 27.7 |
|  | Occasionally | 36 | 32.1 |
| **Total Cholesterol** | Normal | 47 | 41.9 |
|  | High | 23 | 20.5 |
| **LDL (Bad Cholesterol)** | Normal | 52 | 46.4 |
|  | High | 29 | 25.9 |
| **HDL (Good Cholesterol)** | Low | 28 | 25.0 |
|  | Normal | 60 | 53.6 |

The distribution of BMI categories shows that the majority of participants fall within the normal weight range (39.3%), followed by overweight (26.8%) and pre-obese (13.4%). A smaller proportion of participants are classified as underweight (12.5%) and obese (7.1%). This distribution suggests a relatively healthy population, but the presence of overweight and pre-obese individuals indicates a potential risk for obesity-related health issues. The majority of participants reported moderate physical activity levels (40.2%), while a significant portion reported low activity (33.9%). Only 25.9% of participants engaged in high levels of physical activity. This finding highlights a potential area for public health intervention, as increasing physical activity levels could improve overall health outcomes. The responses regarding daily exercise show a fairly even distribution, with 26.8% exercising regularly, 27.7% not exercising at all, and 32.1% exercising occasionally. This indicates that a substantial number of participants may not be meeting recommended exercise guidelines, which could contribute to the prevalence of overweight and obesity in the population. A majority of participants (41.9%) have normal total cholesterol levels, while 20.5% have high cholesterol. This suggests that while many individuals maintain healthy cholesterol levels, there is still a significant portion at risk for cardiovascular diseases.

The LDL levels indicate that 46.4% of participants have normal levels, while 25.9% have high levels of "bad" cholesterol. High LDL is a known risk factor for heart disease, and the presence of nearly a quarter of participants with high levels is concerning. The HDL levels show that 53.6% of participants have normal levels of "good" cholesterol, while 25.0% have low levels. Low HDL is also a risk factor for cardiovascular disease, and the relatively high percentage of participants with low HDL levels suggests a need for lifestyle modifications to improve lipid profiles.

The data presented in Table 4 provides valuable insights into the health status of the study population. While a significant portion of participants maintain normal BMI and cholesterol levels, there are notable concerns regarding physical activity and the prevalence of overweight and high LDL levels. These findings underscore the importance of promoting physical activity and healthy lifestyle choices to mitigate the risks associated with obesity and cardiovascular diseases. Public health initiatives could focus on increasing awareness and accessibility of exercise programs, as well as educating individuals about the importance of maintaining healthy cholesterol levels through diet and lifestyle changes.

**Table 5: Health Conditions, Medical History and Chronic Diseases**

|  |  |  |  |
| --- | --- | --- | --- |
| **Variable** | **Category** | **Frequency** | **Percent (%)** |
| **Hypertension** | High | 21 | 18.8 |
|  | Moderate | 12 | 10.7 |
|  | Mild | 24 | 21.4 |
|  | Normal | 39 | 34.8 |
| **Diabetes** | Yes | 48 | 42.9 |
|  | No | 48 | 42.9 |
|  | Type 1 | 52 | 46.4 |
|  | Type 2 | 12 | 10.7 |
| **Heart Disease** | Yes | 19 | 17.0 |
|  | No | 61 | 54.5 |
| **Drug control CVD** | Yes | 15 | 13.4 |
|  | No | 7 | 6.3 |
| **Chronic Kidney Disease** | Yes | 55 | 51.38 |
|  | No | 35 | 31.02 |
| **Depression** | Yes | 37 | 33.0 |
|  | No | 22 | 19.6 |
|  | Sometimes | 49 | 43.8 |
| **Dementia** | Yes | 59 | 52.7 |
|  | No | 49 | 43.8 |
|  | Not Respondent | 1 | 0.9 |
| **Angioplasty and Stinting** | Yes | 14 | 12.5 |
|  | No | 51 | 45.5 |
| **Other Diseases** | Retinopathy | 27 | 24.1 |
|  | Nephropathy | 11 | 9.8 |
|  | Neuropathy | 10 | 8.9 |
|  | Swelling Disorder | 7 | 6.3 |
|  | Indigestion & Malabsorption | 22 | 19.6 |
|  | Don’t Know | 16 | 14.3 |
| **Vitamin Deficiency** | Vitamin A | 20 | 17.9 |
|  | Vitamin C | 11 | 9.8 |
|  | Vitamin D | 49 | 43.8 |
|  | B Complex | 13 | 11.6 |
| **Mineral Deficiency** | Fe | 12 | 10.7 |
|  | Ca | 59 | 52.7 |
|  | Others | 34 | 30.4 |
|  | Not Respondent | 1 | 0.9 |

 Table 5 presents a cross-sectional study examining various health conditions, medical history, and chronic diseases among a sample population. The majority of participants (34.8%) were classified as having normal blood pressure, while a significant portion exhibited varying degrees of hypertension: mild (21.4%), moderate (10.7%), and high (18.8%). This indicates a notable prevalence of hypertension within the population, which is a critical risk factor for cardiovascular diseases. We can accept glucose measurement as a significant indicator of nutritional defects because it directly reflects carbohydrate metabolism and energy availability in the body. Abnormal glucose levels, whether elevated or decreased, can signal inadequate dietary intake or poor nutritional choices, such as excessive consumption of simple sugars or insufficient carbohydrate intake. Additionally, glucose levels are closely linked to metabolic health, with elevated levels often associated with conditions like insulin resistance and type 2 diabetes, which are frequently related to poor dietary habits. As a readily measurable biomarker, glucose can serve as a useful screening tool to identify individuals at risk for nutritional deficiencies and metabolic disorders, making it an important component in assessing overall nutritional status. The data shows an equal split between those who have diabetes (42.9%) and those who do not (42.9%). Additionally, a substantial number of participants reported having Type 1 diabetes (46.4%), suggesting a higher prevalence of this type compared to Type 2 diabetes (10.7%). This could indicate a need for targeted diabetes management and education programs. Only 17% of participants reported having heart disease, while a majority (54.5%) did not. This relatively low prevalence may reflect effective public health measures or lifestyle factors within the population. A significant proportion (51.38%) of participants reported having chronic kidney disease, highlighting a major health concern that may require further investigation and intervention. Depression was reported by 33% of participants, with 43.8% indicating they experience it sometimes. This suggests a considerable mental health burden within the population, warranting attention from healthcare providers. Dementia was reported by 52.7% of participants, indicating a high prevalence of cognitive impairment, which is critical for planning healthcare services for older adults. The prevalence of other diseases such as retinopathy (24.1%), nephropathy (9.8%), and neuropathy (8.9%) suggest a range of complications associated with chronic conditions, particularly diabetes. Vitamin D deficiency was notably high (43.8%), which could have implications for bone health and overall well-being. A significant number of participants reported mineral deficiencies, particularly calcium (52.7%). This raises concerns about dietary intake and the need for nutritional interventions.

**Figure 1: Distribution of participants according to their family relationship issues and loneliness**

Figure 1 shows that a considerable majority, 67%, of participants indicate they have normal family relationships. This indicates that the majority of people have a positive bond with their family members. A lesser percentage, 28.6%, characterize their family connections as remote. This suggests that these individuals might not engage in close or regular interactions with their family members, potentially impacting their emotional health. Merely 0.9% of those surveyed indicate experiencing difficult family dynamics. This suggests that only a small number of people encounter major disputes or adverse interactions with their relatives.

**DISCUSSION**

The present study aimed to assess the nutritional status and challenges faced by elderly individuals in Dhaka city, conducted by the Bangladesh Institute of Research and Rehabilitation in Diabetes, Endocrine and Metabolic Disorders, Bangabandhu Sheikh Mujib Medical University, and Probin Nibash. Numerous findings from the current study were in agreement with results from other research conducted both within the country and around the world, especially concerning the demographic risk factors that impact the nutritional health of older adults. The results of this study are evaluated in the context of the relevant literature and alongside other corroborative research conducted by scholars in various contexts. In a recent study, it was found that most participants at risk of malnutrition had at least a middle-class education, were female, over 80 years old, unemployed, lived in rural areas, and were either widowed or separated (Abraham et al., 2018). The same research additionally noted that education level, job status, residence location, marital situation, and monthly household income had significant links to nutritional status. Unlike certain studies, we did not discover a link between nutritional risk and gender, socioeconomic status, or educational attainment. In these investigations, the female sex, linked with reduced education and income, has typically served as a marker of malnutrition (Argyriou et al., 2024; Lindqvist et al., 2024; Huynh et al., 2023). Nonetheless, additional research validates our findings (Chen et al., 2024). Older age is a definitive sign and is highly linked to poorer nutrition (Wu et al., 2024; Erdinç, G., & Yiğit, 2023). Another sign of malnutrition is the family or marital status (Fatema et al., 2025).

The dietary intake and food consumption frequency of the geriatric population were assessed for six key food groups: vegetables, fruits, fish, meat, dairy, and legumes (Table 3). A majority of participants (67%) reported consuming vegetables daily, indicating a high intake of this essential food group. Additionally, 25% consumed vegetables weekly, 5% monthly, and 3% rarely or never consumed vegetables. These findings suggest that vegetables form a significant part of the diet for most individuals in the study. Regarding fruits, 31.3% of participants reported consuming them daily, while 42.9% consumed fruits weekly and 20.5% monthly. Only 5.3% of participants indicated that they rarely or never consume fruits. Several barriers can limit the intake of fruits and dairy among older adults, including physical limitations, financial constraints, and access issues. Many elderly individuals may experience difficulties with mobility or dental problems, making it challenging to shop for or consume fresh produce and dairy products. Additionally, the cost of these items can be prohibitive, particularly for those on fixed incomes, leading them to prioritize cheaper, less nutritious options. Limited access to grocery stores that offer fresh fruits and dairy, especially in food deserts, can further restrict their choices. Social isolation may also play a role, as individuals without companionship may lack the motivation to prepare and enjoy healthy meals. Furthermore, chronic health conditions and medication side effects can affect appetite and dietary preferences, compounding the challenges of maintaining a balanced diet rich in fruits and dairy (Subramanium et al., 2022; Zavala et al., 2022; Palojoki and Tuomi‐Gröhn, 2001). Fish consumption was notably high among the participants, with 65% consuming fish daily. An additional 28% reported eating fish weekly and 6% consumed it monthly. Only 1% of respondents reported rarely or never eating fish. This high consumption of fish is significant, as it provides essential omega-3 fatty acids and protein (Byrd et al., 2022) which are particularly beneficial for cardiovascular health and overall well-being in older adults. Research conducted in Switzerland revealed that in a group of dependent older adults living in the community, 60.0% were identified as normally nourished, 10.8% as malnourished, and 30.4% at risk for malnutrition (Angst et al., 2024). Another study focused on a geriatric population revealed that 38.4% had normal nutritional status, 47.8% were at risk of malnutrition, and 14% were classified as malnourished (Atasoy et al., 2024). The variations in the studies may arise from distinct methodological approaches (age of the population, research setting, health status of the population, study scope, duration, and data collection methods), socioeconomic status of the samples, and across countries, along with the participants' ages. Despite the variations in the research, it is clear that approximately 50% of older adults are either at significant risk of malnutrition or are already malnourished. Seniors' diets must be abundant in fruits, vegetables, and proteins. Additionally, an improved diet can contribute to emotional stability, as stated in a study carried out in Crete, Greece (Marche et al., 2024). Meat consumption was less frequent, with only 12% of participants eating meat daily, while 48% consumed it weekly, and 30% monthly. A smaller portion (10%) reported rarely or never eating meat. The relatively low daily intake suggests that meat is not a staple food for many elderly individuals, potentially due to dietary restrictions, health considerations, or economic constraints. Dairy products were consumed daily by 14% of participants, while 32% ate them weekly and 44% consumed them monthly. Only 10% of participants reported rarely or never consuming dairy. The low daily intake of dairy is concerning, as dairy provides vital nutrients such as calcium and vitamin D, which are crucial for bone health, especially in the geriatric population, who are at a higher risk for osteoporosis (Flieh et al., 2023). Lastly, legumes were consumed daily by 20% of participants, with 40% consuming them weekly, 30% monthly, and 10% rarely or never, with consumption lower than that found among people in Colombia and Chile based on a study by Guerrero et al. (2020). Legumes are an important source of plant-based protein, fiber, and micronutrients, and their regular intake indicates that they are a valued part of the diet for a significant portion of the elderly population (Ricardo et al., 2022). While vegetables and fish are consumed frequently by the majority of the geriatric population, the intake of fruits, dairy, and legumes could be further improved to ensure a balanced and nutrient-rich diet.

To tackle the health issues of the elderly population highlighted in this cross-sectional study, it is essential to introduce targeted strategies that correspond with the significant prevalence of chronic ailments like hypertension (58.5% moderate to high combined), diabetes (42.9%), chronic kidney disease (51.38%), and dementia (52.7%) (Table 5). Considering that a large segment of this group also suffers from comorbid conditions, including depression (33.0%) and multiple vitamin deficiencies, a comprehensive strategy is essential. To begin with, improving access to routine health screenings can aid in the early identification and management of these issues, especially hypertension and diabetes, which frequently show no symptoms in their initial stages. Additionally, incorporating mental health assistance into primary care environments can tackle the psychological factors related to chronic diseases, thus enhancing overall quality of life. Third, programs that emphasize nutrition education and physical activity, designed specifically for older adults, can reduce the risks linked to vitamin deficiencies and enhance cardiovascular health. Ultimately, implementing a strong referral network for specialized services like nephrology for chronic kidney disease or geriatric psychiatry for dementia will guarantee thorough management of these intricate health concerns. By implementing these strategies, healthcare providers can greatly enhance health results for this at-risk population.

The study indicates that 46.4% of participants experience feelings of loneliness. This implies that almost half of the participants feel isolated or deprived of companionship, which may impact their mental well-being. On the other hand, 50% of those surveyed do not experience loneliness. This suggests that slightly over half of the participants experience a sense of connection and support, reflecting positively on their social well-being. Finally, this study emphasizes that although most participants maintain typical family relationships, a significant number feel a sense of detachment from their family ties. Furthermore, nearly half of the participants express feelings of loneliness, whereas a little over half do not. This data may be crucial for grasping the social dynamics and emotional well-being of the respondents.

**CONCLUSION**

The elderly population requires increased attention to enhance their physiological and psychosocial well-being. Geriatric care focuses on identifying functional impairments and improving the abilities of older adults. Nutrition is vital for those over 60, yet it is often overlooked, leading to poor nutritional status and health decline. Many elderly individuals become homebound, making proper nutrition essential to prevent health issues. Additionally, reliance on medications can hinder nutrient absorption, while social and economic factors complicate nutritional needs. Age-related disorders like osteopenia, fractures, and diabetes can be mitigated through proper nutrition and nutrient-rich foods. Individuals who live alone face a greater risk of malnutrition. Living by oneself raises the rates of depression and social isolation and negatively affects life quality. Additionally, in these instances, the process of preparing food becomes less engaging. Offering complimentary meals to individuals living alone might enhance their nutritional standards. To improve health outcomes, prioritizing geriatric health through effective dietary modifications and addressing malnutrition challenges is essential.

**RECOMMENDATION**

Based on the findings of this study, the following recommendations are proposed for consideration by policymakers, preventive medicine specialists, and future researchers:

**Nutritional Education Programs:** Develop and implement educational programs aimed at both elderly individuals and their caregivers to raise awareness about the importance of balanced nutrition and the specific dietary needs of older adults.

**Tailored Nutritional Guidelines:** Create tailored nutritional guidelines that address the unique needs of elderly populations, particularly those who are homebound or living in care facilities. These guidelines should emphasize the importance of adequate vitamin D intake and other essential nutrients.

**Access to Nutritional Resources:** Improve access to nutritional resources, including fortified foods and supplements, for elderly individuals, especially those with limited mobility or financial constraints.

**Regular Nutritional Assessments:** Encourage healthcare providers to conduct regular nutritional assessments for elderly patients to identify and address any deficiencies in their diets promptly.

**Research on Nutritional Needs:** Promote further research into the specific nutritional needs of various subgroups within the elderly population, including those with chronic illnesses, to develop more effective dietary interventions.

**Policy Support for Nutritional Programs:** To improve the nutritional status of older adults in Dhaka, we can build upon existing programs and policies by enhancing their reach and effectiveness. We can advocate for the expansion of the Second National Plan of Action for Nutrition (2016-2025) to include more targeted interventions for the elderly, ensuring that comprehensive strategies are implemented at the community level. Strengthening the Integrated Nutrition Program (INP) can involve increasing access to food supplementation and nutritional counseling specifically tailored for older individuals at risk of malnutrition. Additionally, we can push for the National Food and Nutrition Security Policy to incorporate more robust social protection measures that guarantee consistent access to adequate nutrition for seniors. By promoting awareness and education about the specific nutritional needs of older adults through the National Policy on Older Persons, we can foster a supportive environment that prioritizes their health and well-being. Collectively, these actions can significantly enhance the nutritional health of older adults in Dhaka, ensuring they lead healthier and more fulfilling lives.

 **LIMITATION OF THE STUDY**

Like any research endeavor, this study has several limitations. During the study, we encountered various challenges. The ongoing pandemic significantly hindered our ability to obtain approvals from certain institutions, which in turn affected our data collection timeline. This delay not only caused considerable difficulties but also limited the diversity of our data. Additionally, financial constraints posed a significant challenge. Our institution did not allocate a budget for research, forcing us to cover all expenses out of pocket. As a result, the sample size for this study was relatively small. A larger sample size would likely have yielded more reliable and generalizable results. Furthermore, we faced issues with respondent honesty. Some participants were reluctant to disclose their financial status and tended to underreport their alcohol consumption. Although they later admitted to the truth, this initial reluctance may have impacted the accuracy of our findings.

In summary, the limitations of this study, including institutional barriers, financial constraints, and issues with respondent honesty, may affect the validity and generalizability of the results. Future research should aim to address these challenges to enhance the robustness of the findings.

**ETHICAL APPROVAL and Consent:**

Ethical approval for this study was obtained from the Dissertation Review Committee of the Department of Food Engineering, North Pacific International University of Bangladesh. Informed consent was obtained from all participants after explaining the study objectives, procedures, and potential risks and benefits. Confidentiality of participant information was strictly maintained throughout the study process.

**Disclaimer (Artificial intelligence)**

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

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