





Factors influencing food preferences and eating behaviour among the Forcibly Displaced Myanmar Nationals (FDMN) adolescents in Cox's Bazar, Bangladesh: a cross-sectional survey

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ABSTRACT

Background Adolescence is a pivotal period for physical, mental, social and behavioural development, so it is crucial to understand the factors influencing adolescent food preferences and eating behaviour. This study aimed to investigate the factors that influence adolescents' food preferences and eating behaviours in the Forcibly Displaced Myanmar Nationals (FDMN) camp in Cox's Bazar, Bangladesh.

Methods A cross-sectional study was conducted in the FDMN camp, recruiting 545 adolescents. The purposive sampling technique was applied. First, 12 camps in the Ukhiya region were randomly selected. Adolescents of both sexes, aged between 10 and 19, were included in the study. Respondents' sociodemographic characteristics and dietary patterns, as well as the participant's nutritional status, were recorded. Descriptive statistics were used to present the baseline characteristics, while Pearson's χ^2 test was used to assess the relationship between food preference and baseline characteristics.

Results A significant number of participants failed to meet their daily requirements for essential nutrients, including protein (89.9%), vegetables (82.8%) and dairy products (90.8%). Additionally, 58.9% of the respondents did not consume adequate water daily. Food preferences and eating behaviours among FDMN adolescents in Cox's Bazar were found to be influenced by a range of factors, including peer influence, access to nutritional education, food sources, cultural beliefs, ration sufficiency, food prices as well as age, gender, education level and household income.

Conclusions In conclusion, understanding and addressing the multifaceted factors that influence the food preferences of FDMN adolescents is crucial for developing targeted interventions and comprehensive nutritional programmes.

INTRODUCTION

The Forcibly Displaced Myanmar Nationals (FDMN), previously known as Rohingya, are an ethnic group in Myanmar that has been denied citizenship in Myanmar, making

WHAT IS ALREADY KNOWN ON THIS TOPIC

- ⇒ The Forcibly Displaced Myanmar Nationals (FDMN) adolescents living in Cox's Bazar, Bangladesh face numerous challenges, including food insecurity and limited access to adequate healthcare and education.
- ⇒ Adolescence is a critical period for establishing healthy eating behaviours and food preferences that can have long-term impacts on health and well-being.

WHAT ARE THE NEW FINDINGS

- ⇒ This study delves into the factors influencing food preferences and eating behaviours among FDMN adolescents in Cox's Bazar. While examining factors such as peer influence, access to nutritional education, food sources and cultural beliefs, it offers nuanced insights into their distinctive situations and obstacles.
- ⇒ The study also reveals that age, gender, education level, household income, ration sufficiency, extra-ration purchases, camp food prices and eating habits significantly influence food preferences among FDMN adolescents.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

- ⇒ The findings have important implications for public health interventions targeted at FDMN adolescents. By considering the identified factors, healthcare practitioners and policymakers can design context-specific strategies to improve the nutritional status and overall well-being of this population.
- ⇒ This study contributes to the evidence base and informs future research and interventions aimed at addressing the unique challenges faced by FDMN adolescents.

them the world's biggest stateless population.¹ Around one million FDMN refugees live in Cox's Bazar, Bangladesh, making it

the world's largest refugee camp.² Research showed that about 884 000 FDMN were forced to leave Myanmar and are currently living in 34 camps in the subdistricts of Ukhiya and Teknaf in the Cox's Bazar District of Bangladesh.³ Approximately 54% of the FDMN are under the age of 18 years.⁴ An estimated 400 000 adolescent FDMN live in Cox's Bazar, accounting for approximately 40% of the total FDMN population in the camps.⁵

Adolescence is a transitional period between childhood and adulthood, characterised by rapid physical, psychological and social growth and development.⁶ Despite being considered a healthy stage of the human lifecycle, adolescence is also marked by a high rate of illness and injury.⁷ Adolescents who do not consume the recommended amount of nutrients, skip meals or engage in poor eating behaviours are thought to be affected by many health issues later in life.^{8 9} Moreover, during adolescence, individuals develop behavioural patterns related to diet and exercise that can safeguard their health and the health of those around them.⁷

Adolescents' long-term health and well-being may be significantly impacted by their eating habits.¹⁰ Many adolescents experience a growth spurt and an increase in appetite and need healthy foods to meet their growth needs.¹¹ Healthy eating is crucial to meet adolescents' nutritional and dietary needs.¹¹ Consuming a diet high in fruits, vegetables, whole grains and lean proteins while limiting the intake of processed foods can help adolescents meet their nutritional needs and reduce their risk of chronic diseases such as obesity, type 2 diabetes and cardiovascular disease.^{11 12} The period of adolescence plays a critical role in determining an individual's future health and even the well-being of their future offspring, highlighting how essential a proper diet is in the developmental origins of health and disease.¹³

In the context of the FDMN camp in Cox's Bazar, the sustenance of the burgeoning adolescent population assumes pivotal significance. The World Food Programme (WFP) is the primary provider of food assistance in the FDMN camps in Cox's Bazar.¹⁴ WFP provides a monthly general food assistance ration to all households in the camps, which includes rice, wheat flour, lentils, oil, salt and sugar.^{14 15} Additionally, select outlets offer Fresh Food Corners (FFCs) with access to fresh produce and live poultry and fish.^{14 15} Vulnerable households receive an extra US\$3 per person per month for purchasing nutritious, protein-rich foods at FFCs.¹⁴

Food choice is a complex process deeply rooted in culture and affected by many personal, emotional, social and economic factors.^{16 17} During adolescence, food choices are essential because what you eat at this age affects your health now and in the future.¹⁸ However, globalisation is eroding traditional foods and increasing their availability and options, which could impact adolescents' food preferences.¹⁹ Adolescents' food preferences are shaped by various factors, such as individual taste preferences, family food culture, peer influence, media exposure and socioeconomic status.²⁰ These factors can

influence not only what adolescents eat but also their overall dietary patterns and food-related behaviours.²¹

Research revealed that adolescents' eating behaviours and dietary patterns are constantly changing.¹⁷ Nowadays, adolescents are becoming more independent and making many food decisions independently,¹¹ and sometimes they are also influenced by their peers.²² Previous research has shown that the impact of peers on the dietary habits of adolescents is frequently observed to be unfavourable, leading to greater consumption of calorie-dense and nutritionally deficient foods.^{23–25} Nonetheless, there are instances where this influence can yield positive results.²⁶ It is crucial to explore strategies that harness this influence to promote healthy eating behaviours among young individuals.²⁵ The eating habits and food preferences formed during adolescence tend to last into adulthood.^{27 28} Moreover, poor dietary habits during adolescence can lead to nutritional deficiencies, which can affect their growth and development, immune system, cognitive function and mental health.²⁹

Adolescents living in Cox's Bazar faced many challenges, including food insecurity, age-based and gender-based violence, disrupted educational prospects, widespread psychosocial distress and worry, limited health service uptake and inadequate health services for persons with disabilities.³⁰ FDMN adolescents were identified as a particularly marginalised subgroup.³¹ The FDMN adolescents also experience unusual circumstances, such as a poor living environment in the camp, displacement from the homeland, new peers and culture, and a struggle to adapt to a new environment and eating pattern.¹ FDMN depend entirely on humanitarian assistance for protection, food, water, housing and healthcare.^{31 32}

It is conceivable to improve adolescent health by improving food choices and eating behaviour, especially for those living in marginalised conditions like the FDMNs. Today's adolescents are the future leaders of the FDMN Community. Their proper eating behaviour and food preferences could ensure their health and well-being, which inquest them and the whole community in the future. No study has yet highlighted this vital issue; hence, the study aims to explore the factors influencing adolescents' food preferences and eating behaviours in FDMN camps in Cox's Bazar, Bangladesh.

METHODS AND MATERIALS

Study time and settings

Data for this cross-sectional study were collected between October 2021 and March 2022 from 12 camps in the Ukhiya area in Cox's Bazar district under the Chittagong division of Bangladesh. The study area of Ukhiya is to the north of the Ramu subdistrict. The Teknaf subdistrict is to the south, the Arakan state of Myanmar is to the east and the Bay of Bengal is to the west. To reach the study site, travellers need to travel 393 km from the capital of Bangladesh, Dhaka, and around 196 km from the Rakhine state of Myanmar.

Study population and sample

Adolescents living in the FDMN camps served as the study's baseline population. The number of adolescents in the camp was reported to be 400 000.⁵ Of these, roughly 1000 were approached to participate in the study and approximately 600 agreed to participate. The sample included adolescents of both genders and aged between 10 and 19 years old. Informed consent was obtained from all participants. Participants who were 18 years of age or older provided their informed consent. Participants who were between 12 and 17 years old provided their assent to participate in the study, and their parents also provided informed consent. Participants who were under 12 years old did not provide their consent, but their parents provided informed consent on their behalf. Individuals who declined to respond or did not meet the inclusion criteria were excluded from this study. Participants who were pregnant or breastfeeding mothers during the survey were also excluded.

Purposive sampling was employed to recruit study participants. The purposive sampling method is the process of selecting participants based on the researcher's convenience. In this study, we purposively approached adolescents to invite them to participate in this study, who were willing to participate, and who met the inclusion criteria of being between the ages of 10 and 19 years old. Data were obtained regarding the food preferences and eating behaviours of FDMN adolescents. The sample size was calculated assuming a 50% prevalence. The estimated sample size was 384. Due to availability and scope, data from 545 adolescents were collected to obtain a more generalisable study finding that reduces biases. In addition, participants were interviewed in private settings by trained interviewers of the same gender capable of communicating in both Bangla and Rohingya languages.

Data collection procedure

A total of twelve FDMN camps in Cox's Bazar were randomly selected at the first step (figure 1). Interviews were conducted in Bangla and Rohingya languages depending on the participant's comfort. The survey was administered via face-to-face interview, following the interview guideline (online supplemental file 1), and the participants' responses were recorded directly into the 'KOBo toolbox' (an open-source platform for field data collection that works both online and offline).³³ The anthropometric measurements (height and weight) of adolescents were measured and recorded. The weight was measured to the nearest 100 g with a digital scale, and the size was calculated using a locally built height scale with a 2 mm precision. Following established guidelines, the trained research team performed all nutritional status assessments.³⁴ We designed a semistructured questionnaire (online supplemental file 2) for our research, drawing on previous studies and relevant literature. This questionnaire aimed to gather demographic information from participants, assess dietary behaviours based on established research³⁵ and camp experiences and

investigate food preferences by incorporating insights from the literature³⁶ and camp-related experiences. Additionally, we included select questions to gather data on camp rations, considering factors such as availability, accessibility and price, with reference to existing literature,^{1 37} camp experiences and press releases.³⁸ To assess psychological behaviour, we used the Emotional Eating Scale.^{35 39} After getting permission from the Refugee Relief and Repatriation Commissioner (RRRC) to conduct research in the FDMN camp, we contacted Majhi (the local camp leader) for assistance in obtaining samples. The crucial assistance offered by the camp leader, a respected member of the Rohingya community, encompassed multifaceted support. Their active involvement included introducing us to the general population, endorsing the research objectives in their own views and fostering an atmosphere of trust and familiarity. This collaborative approach not only bolstered participants' confidence and belief in the research but also allowed their community to stay informed and engaged with our work, reflecting a harmonious partnership that recognised the research's sensitivity and significance. The team of data collectors consisted of four well-trained volunteers and one supervisor. The data collection team and the local majhis visited the camp houses to offer research participation. A total of 545 complete interviews were conducted and there was no missing data.

Patient and public involvement

Patient and public involvement were not applicable in this study.

Measurement/variables

Independent factors

Sociodemographic data were collected (age, gender, marital status, education, family member and income). In addition, camp-related factors (rations, food price and availability) were measured using questions adopted from previous research.^{1 37}

Dependent variables

Food preference

In this study, 'Food Preferences' encompassed the participants' inclinations and choices regarding dietary items. It was assessed based on several factors, including the regular consumption of carbohydrate-rich foods, protein-rich foods, fruits, vegetables and milk/dairy products, as well as the adequacy of water intake.

Eating behaviours

The 'Eating Behaviour' captured participants' patterns and habits related to food consumption. It included the frequency of meals per day (categorised as <3 times or 3 times), skipping breakfast habit, the magnitude of eating out (consuming food outside of the home, like from a small food shop or tiny restaurant), the decision-making process for food selection at home (involving parents or personal choice), the process of choosing food outside of

Table 1 Sociodemographic characteristics of study participants

Variables name	Category	Frequency (n=545)	Percentage
Age	Early adolescence (10–14 years)	289	53.0
	Late adolescence (15–19 years)	256	47.0
	<i>Mean Age±SD=(14.38±2.52)</i>		
Gender	Male	287	52.7
	Female	258	47.3
Marital status	Single	533	97.8
	Married	12	2.20
Educational qualification	No formal schooling	365	67.0
	Primary	177	32.4
	Secondary	03	0.60
Total number of family members (persons)	≤4 Members	67	12.3
	5–8 Members	358	65.7
	>8 Members	120	22.0
Household income (BDT/month)	Below 10 000	514	94.3
	10 000–15 000	25	4.60
	15 001–20 000	06	1.10

of the participants had no formal schooling (67%). Most adolescents (65.7%) had 5–8 family members. Monthly gross household income of less than 10 000 BDT (<100\$) per month was observed among 94.3% of respondents.

Figure 2 highlighted the status of BMI-for-age (z-scores), which was generated based on study participant anthropometric (height and weight) measurements and age comparison. In this study, most participants had normal BMI-for-age; male (73.2%) and female (74.0%). Female participants were comparatively more overweight

(23.3%) than their male counterparts (5.6%). In addition, 17.8% of males and 1.9% of females belong to the thinness category, respectively.

Table 2 describes participants' food preferences and eating behaviour. Among all the participants, 95.4% consumed carbohydrates such as rice, bread or other cereal-based products daily. Only 10.1% of the study population regularly consumed proteins (meat, fish, eggs or others). When we assessed their vegetable consumption, we found that 82.8% of respondents had not taken

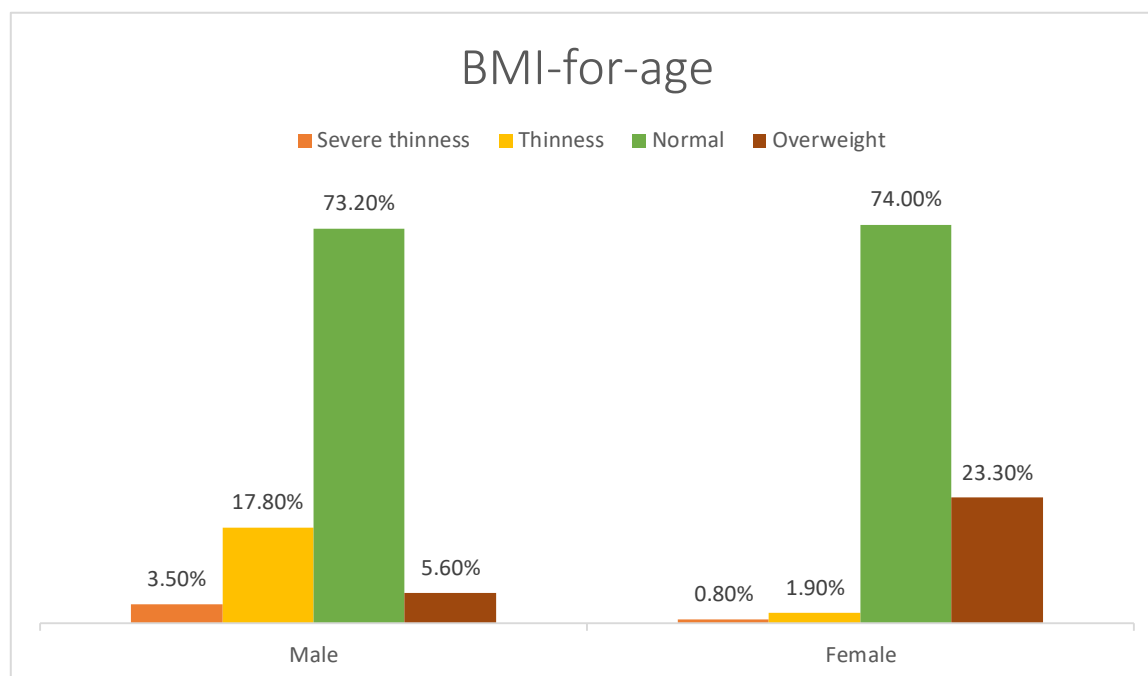
**Figure 2** Status of BMI-for-age (z-scores). BMI, body mass index.

Table 2 Food preferences and eating behaviour status with camp-rations related factors

		Frequency	Per cent
<i>Food preferences</i>			
Consume carbohydrate goods regularly	Yes	520	95.4
	No	25	4.6
Consume protein goods regularly	Yes	55	10.1
	No	490	89.9
Consume fruits and vegetables regularly	Yes	94	17.2
	No	451	82.8
Often consume milk and dairy products	Yes	50	9.2
	No	495	90.8
Drink enough water	Yes	224	41.1
	No	321	58.9
<i>Eating behaviours</i>			
Frequency of meals a day	<3 times	198	36.3
	3 times	347	63.7
Skip breakfast	Yes	303	55.6
	No	242	44.4
Eat food outside of home	Yes	449	82.4
	No	96	17.6
Select food menu at home	Parents	537	98.5
	Personally	8	1.5
Choose food outside of home	Parents	19	3.5
	Personally	465	85.3
	Friends	61	11.2
Eat food by seeing advertisements	Yes	12	2.2
	No	533	97.8
<i>Camp rations related-factors</i>			
Regular receive rations	Yes	543	99.6
	No	2	0.4
Rations are sufficient	Yes	199	36.5
	No	346	63.5
Purchase extra rations	Yes	217	39.8
	No	328	60.2
Food price of the camp is high	Yes	418	76.7
	No	127	23.3
Past eating habits are significantly different	Yes	399	73.2
	No	146	26.8
Difficult to cope with camp food	Yes	328	60.2
	No	217	39.8

fruits and vegetables as recommended. 90.8% of study subjects were unfamiliar with dairy products, while only 9.2% of adolescents occasionally consumed dairy products. When asked if they drank enough water (6–8 full glasses or approximately 1.5–2 litres daily), 58.9% said they did not drink enough water. Around one-third (36.3%) of the respondents did not eat at least three meals daily. A notable amount (55.6%) of study subjects

skipped breakfast regularly (4–5 days a week). Eating out was agreed on by 82.4% of our participants. Adolescents' household food menu plans (98.5%) depend mainly on their parents; 11.2% of adolescents preferred friends' decisions to take food outside the home; 97.8% responded that media (TV, radio, newspapers and the internet) did not play a role in choosing healthy food.

Table 2 also depicts the status of the camp and rations-related factors. The result found that 99.6% of participants received rations regularly. Furthermore, 63.5% of the sample population believed that rations were inadequate. In comparison, 36.5% of respondents considered they were insufficient and 39.8% had to purchase extra rations. Food price increases in the camp also affected their food accessibility; 76.7% of respondents believed the food price was significantly higher than their ability to purchase it and satisfy their desired food accessibility; 73.2% responded that they had to change their eating habits after migration, whereas 60.2% of study subjects faced difficulties coping with the new food habits.

Factors influencing participants' food preferences and eating behaviour are displayed in figure 3. Camp and ration-related factors, such as personal, social and psychological factors that influence food preference and eating behaviours, were reported.

Food availability, sufficiency, buying extra rations and adaptability were all ration-related factors. Their eating habits and food preferences are also influenced by camp-related components like food costs, accessibility and availability. Food preferences, including consumption of carbohydrates, protein, fruits, vegetables and dairy products, are mainly influenced by several factors. Mostly reported factors were whether it is supplied with relief (58.5%) and financial ability to purchase (27.75%). In addition, participants who did not drink enough water claimed lack of safe drinking water (90.66%) was their primary factor in consuming insufficient amounts. Furthermore, eating behaviours, including meal frequency and skipping breakfast, were hastened by financial ability, habit and appetite. Of study respondents who take less than three meals every day and skip breakfast regularly, 83.62% reported financial ability was the main factor.

The facts about the influence of psychological behaviours on eating habits 'Happy emotions' encouraged them to overeat; the statement was supported by 31.4%. Conversely, sad states led to less eating; 30.8% agreed with the response. The same 31.6% of adolescents thought their annoying mood caused them to eat less. Moreover, when they were nervous about anything, it led to less eating; this assertion was accepted by 31.9% of participants.

The bivariate analysis of food preferences by explanatory variables is shown in table 3. Significant differences were observed for age groups (protein: $p=0.012$, fruits & vegetables: $p<0.001$, dairy product: $p=0.012$, water: $p=0.001$) with all the presented dependent variables except carbohydrates. Gender had significant impacts

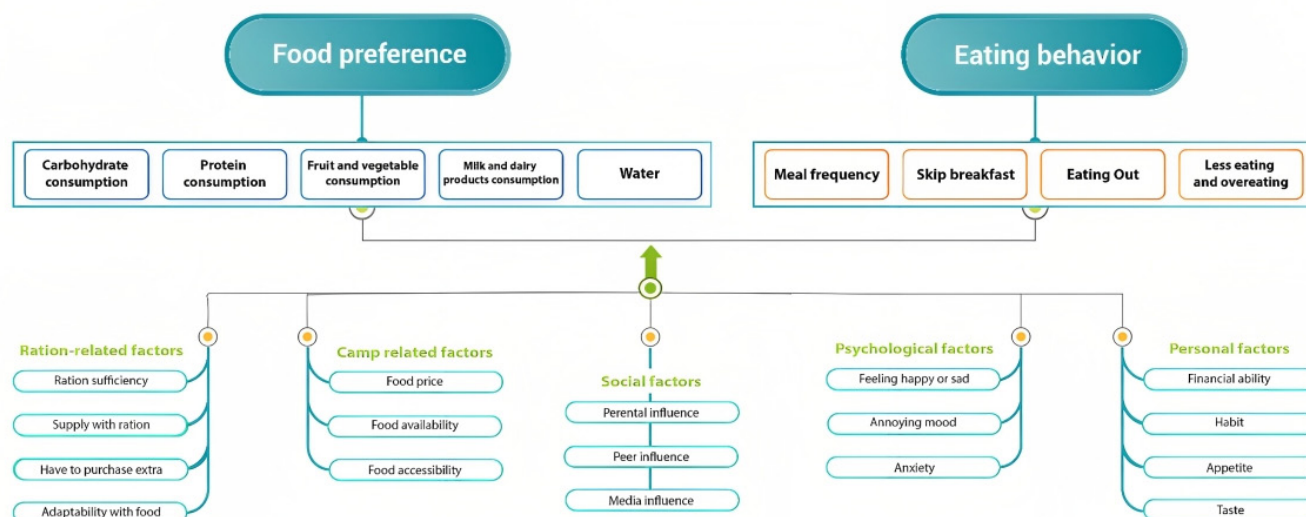


Figure 3 Influences on food preference and eating behaviours among adolescents at Ukhiya FDMN Camp. FDMN, Forcibly Displaced Myanmar Nationals.

on all of the outcome variables. Protein, dairy products and water consumption significantly differ among educational levels ($p=0.019$, dairy product= 0.001 , water= 0.010). Water consumption greatly varied with the size of the family. Household income significantly impacted all food groups rather than carbohydrate consumption. Dairy products and water consumption depending on the sufficiency of rations were statistically significant in the bivariate analysis. Other participants' food consumption significantly differed without carbohydrates due to extra-ration purchasing. Camp food prices and past eating habits significantly impact dairy products and water consumption. Water consumption was also statistically significant due to the adaptability of supplied water ($p<0.001$). Extra-ration purchasing needs also statistically differed in their consumption of protein ($p=0.008$), fruits and vegetables ($p<0.001$), dairy products ($p=0.032$) and water ($p<0.001$).

DISCUSSION

This study represents the first comprehensive exploration of the dietary behaviours and food preferences among FDMN adolescents residing in refugee camps in Cox's Bazar, Bangladesh. The key findings reveal significant sociodemographic disparities, gender-based discrepancies in nutritional status, concerning dietary patterns marked by low intake of essential food groups, challenges in accessing safe drinking water and the pervasive influence of camp-related factors on food preferences. These insights provide a foundational understanding of the unique dietary challenges faced by FDMN adolescents and underscore the urgent need for further initiatives to improve their nutritional well-being within the camp context.

Sociodemographic factors play a pivotal role in shaping the dietary preferences and habits of FDMN adolescents.

The study revealed that the majority of participants had no formal schooling, indicating a significant educational gap within the camp. This aligns with existing literature highlighting the educational challenges faced by displaced populations, often due to a lack of resources and limited access to schools.⁴¹ Moreover, the study's observation that 94.3% of respondents reported a monthly household income of less than 10 000 BDT underscores the dire economic circumstances of the FDMN population. This financial strain, coupled with large family sizes and high unemployment rates, contributes to the severe financial limitations faced by the camp residents. Similar economic challenges have been documented in other refugee settings.^{42 43}

An alarming finding was the significant gender-based discrepancies in nutritional status among FDMN adolescents, with a higher percentage of females being overweight compared with their male counterparts. This contrasts with existing literature indicating that females in refugee settings are often more susceptible to undernutrition due to gender-specific vulnerabilities.⁴⁴ These discrepancies raise questions about the underlying factors contributing to overweight status among female adolescents within the camp. Conversely, a considerable proportion of male adolescents fell into the thinness category, suggesting potential undernutrition issues. This aligns with the broader literature on refugee nutrition, which has often reported high rates of undernutrition among displaced populations.⁴⁵

Food security is not just about getting enough calories; it also means getting healthy food that fits the culture.⁴⁶ Analysis of dietary patterns revealed several concerning trends among FDMN adolescents. While the consumption of carbohydrates such as rice and bread was widespread, the intake of proteins (meat, fish, eggs or others), fruits, vegetables and dairy products was strikingly low.

Table 3 Association of food preference with sociodemographic and camp-rations-related factors

Consumption of		Carbohydrate	Protein	Fruits and vegetables	Dairy products	Water
Sociodemographic factors						
Age	Early adolescence	0.916	0.012	0.000	0.012	0.001
	Late adolescence					
Gender	Male	0.000	0.045	0.002	0.001	0.009
	Female					
Educational qualification	Illiterate	0.928	0.019	0.096	0.001	0.010
	Primary					
Occupation	Secondary	0.366	0.001	0.066	0.010	0.008
	Unemployed					
	Student					
	Housewife					
Total family members (persons)	Other	0.253	0.125	0.398	0.289	0.000
	≤4 Members					
	5–8 Members					
Household income (BDT/ month)	>8 Members	0.664	0.000	0.000	0.001	0.000
	Below 10 000					
	11 000–15 000					
Camp-rations related factors	16 000–20 000+	0.183	0.146	0.693	0.038	0.000
	Yes					
	No					
Ration sufficiency	Yes	0.203	0.008	0.000	0.032	0.000
	No					
Extra-ration purchasing	Yes	0.570	0.081	0.272	0.001	0.000
	No					
Camp food price	Yes	0.747	0.294	0.834	0.011	0.000
	No					
Past eating habits	Yes	0.217	0.368	0.574	0.123	0.000
	No					
Adaptability with food	Yes	0.217	0.368	0.574	0.123	0.000
	No					

χ^2 test was conducted, and p values <0.05 was considered significant. This table presented variables which were statistically significant with any of the dependent variable.

The majority of respondents failed to meet recommended intake levels for these essential food groups. The unavailability of food, financial problems and high food prices in the camp influenced low consumption. Protein and vegetable prices climbed dramatically compared with similar subdistricts of Cox's Bazar because of solid demand and limited availability.³⁷ However, at the moment, people in the camps have not received animal protein, and at the same time, they are not allowed to raise those or leave the camps to catch or collect. Some FDMN buy fish, meat and eggs from markets in their centres, but the prices are higher than those outside the camps. This finding aligns with previous reports in the Cox's Bazar FDMN camp.³⁸ Low intake of proteins and dairy products is of particular concern, as these foods are crucial sources of essential nutrients, including calcium, iron and vitamin

B12.⁴⁷ The inadequate consumption of fruits and vegetables further raises concerns about micronutrient deficiencies among FDMN adolescents, as these foods are rich in vitamins and minerals essential for growth and overall health. These dietary patterns align with existing literature on refugee nutrition, which often highlights the challenges of accessing diverse and nutritious foods within camp settings.⁴⁸

Local media in the camp area reported rising prices of essential commodities.⁴⁹ This trend has had a significant impact on FDMN adolescents, particularly regarding their access to fruits and vegetables. Despite the perishable nature and nutritional importance of these items, they have not been included in food aid distributions, leaving adolescents to purchase them at higher costs. Financial constraints often necessitate external assistance. One

potential solution could involve expanding arable land within the camps to cultivate these essential foods.³⁷

Inadequate water intake and irregular meal habits were prevalent among FDMN adolescents. More than half of them reported not drinking enough water daily, which is concerning given the importance of proper hydration for overall health. This finding echoes previous research highlighting challenges in accessing safe drinking water within refugee camps.⁵⁰ Furthermore, the shortage of water makes them vulnerable to drinking unsafe water, increasing the risk of waterborne diseases and related health issues.⁵¹

Camp-related factors significantly influenced the dietary behaviours and food preferences of FDMN adolescents. Food accessibility, ration sufficiency and affordability were major concerns, with a substantial portion of participants perceiving rations as inadequate and resorting to purchasing extra rations. The high food prices within the camp further exacerbated food insecurity, affecting the dietary choices of the FDMN adolescents. These findings resonate with existing literature on the challenges of food accessibility and affordability in refugee settings.^{52 53} The majority of the population reported they struggled to cope up with this meal habit in camp. Difficult to cope with camp food encapsulates a key challenge confronted by Rohingya individuals forcibly displaced from Myanmar to Bangladesh.^{54 55} This challenge arises from the significant cultural shift in food habits and dietary preferences experienced by these individuals when adapting to the new food culture in the camp setting. This phenomenon highlights the intricate interplay between cultural adjustments and nutritional considerations within this context. Similarly, a previous study conducted among immigrants from Iraq to Sweden discovered that they had trouble adjusting to new foods and habits.⁵⁶ High food prices and limited income opportunities within camps create barriers to accessing nutritious foods.^{37 55} Additionally, the need to adapt to new food habits after migration presents challenges for many adolescents, highlighting the intricate interplay between cultural adjustments and nutritional considerations within the camp context.

According to the current study, parents, friends and the media influenced food choices. Similarly, few studies revealed associations between food intake with adolescents' social networks, family decision-making and family meal types.^{57 58} This study revealed mass media had less impact on eating. Media could be explored more in the camps as it less impacted their eating choice. Mass media and other social platforms barely circulate about nutritious foods and good food habits.⁵⁹ In camp, language issues are another problem in catching up properly and realising Bangladeshi media programmes which broadcast about foods. Accessibility and availability were other reasons for getting less influenced by media. According to another research, just 37.8% of people use social media and traditional media, such as television, newspapers and radio.⁶⁰

Psychological factors and their profound influence on the eating habits of FDMN adolescents have been observed in the current research. It revealed that emotions such as happiness, sadness, annoyance and anxiety played a significant role in shaping their food consumption patterns. Psychological health is an aspect that can be overlooked or underestimated in discussions about displaced communities. Numerous studies demonstrate that emotional states, such as happiness, sadness, annoying mood and anxiety, affect eating behaviour.^{61 62}

These findings have significant implications for stakeholders, including camp authorities, non-governmental organisations (NGOs) and humanitarian organisations. First, tailored nutritional education programmes for FDMN adolescents are essential, addressing sociodemographic factors influencing food preferences and emphasising balanced diets. Collaboration between Bangladeshi authorities and humanitarian organisations is crucial to stabilise food prices and ensure a consistent supply of essential items like fruits and vegetables in refugee camps. The rationing system should be reconsidered to better align with the nutritional needs and preferences of the FDMN population, potentially increasing the variety and quantity of items provided. Engaging with the FDMN community, including parents and friends, is vital for promoting healthier eating habits through community-based initiatives and leveraging peer support and family involvement. Psychological factors' impact on eating behaviour underscores the need for psychosocial support services within camps, addressing emotional well-being and providing coping mechanisms. Ensuring a consistent supply of safe drinking water is also paramount. Lastly, continued research and monitoring of dietary patterns and food preferences among FDMN adolescents are crucial for adapting interventions and policies based on evolving needs and circumstances.

This research boasts several strengths. It represents the pioneering endeavour to investigate food preferences and eating behaviours among the FDMN population, filling a significant gap in our understanding of this community's dietary practices. Additionally, this research benefits from a large sample size, with participation from over 500 respondents. This enhances the statistical power and reliability of our findings, increasing the confidence in the representativeness of the results for the FDMN adolescent population under study. Current research also employed rigorous data collection and analysis methods, incorporating comprehensive dietary surveys and culturally sensitive approaches to ensure the accuracy and cultural relevance of our findings. This study has a few limitations as well. First, our use of purposive sampling, although aligned with the research objectives, limits the generalisability of our results to the broader adolescent FDMN population. Second, the cross-sectional design limits our ability to establish causal relationships. Moreover, the reliance on self-reported records for assessing eating patterns, food habits, preferences and related factors introduces a potential source of bias and measurement

error. Lastly, the COVID-19 pandemic itself introduced unprecedented resource constraints and logistical challenges that influenced the scope of the study, further limiting our ability to conduct direct observations. Moreover, future research opportunities include investigating the effectiveness of food security interventions, culturally tailored nutritional education programmes and psychosocial support services for enhancing dietary behaviours among FDMN adolescents in refugee camps. Researchers can explore long-term health implications and cultural sensitivity in these interventions.

CONCLUSION

According to our findings, FDMN adolescents' food preferences were influenced by age, gender, educational level and monthly household income. Ration availability, extra-ration purchasing needs, camp food price and eating habits also influenced food preferences. Protein, fruits and vegetables and dairy products were not adequately consumed. The relief programmes should accommodate FDMN people's protein, fruits and vegetables, and dairy requirements. Finally, they also need more safe drinking water. Access to safe drinking water and the role of the media in promoting nutritional education should be expanded among the FDMN population.

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REFERENCES

- Riley A, Varner A, Ventevogel P, *et al.* Daily stressors, trauma exposure, and mental health among stateless Rohingya refugees in Bangladesh. *Transcult Psychiatry* 2017;54:304–31.
- UNHCR. UNHCR's Report portal [Internet]. 2017;(90):1–5; 2017. UNHCR Bangladesh 1–5. Available: <https://www.unhcr.org/bangladesh.html>
- Abul Kalam Azad M, Zakaria M, Nachrin T, *et al.* Family planning knowledge, attitude and practice among Rohingya women living in refugee camps in Bangladesh: a cross-sectional study. *Reprod Health* 2022;19:105.
- Figures KEY, Of B. Vulnerabilities. In: *FACT SHEET - FAMILY COUNTING Arrivals by place OF FAMILY size Daily progress BREAKDOWN OF IDENTIFIED VULNERABILITIES * ASSISTANCE RECEIVED*. 2017.
- UNICEF. Education milestone for Rohingya refugee children in Cox's Bazar. UNICEF; 2022. Available: <https://gdc.unicef.org/resource/education-milestone-rohingya-refugee-children-coxs-bazar>
- Williford AP, Brisson D, Bender KA, *et al.* Patterns of aggressive behavior and peer victimization from childhood to early adolescence: A latent class analysis. *J Youth Adolesc* 2011;40:644–55.
- WHO. Vol. 82, health topics. 2020. P. 13–21, 28 adolescent health. 2020. Available: https://www.who.int/health-topics/adolescent-health#tab=tab_1
- Papadaki A, Hondros G, A. Scott J, *et al.* Eating habits of University students living at, or away from home in Greece. *Appetite* 2007;49:169–76.
- El Ansari W, Suominen S, Samara A. Eating Habits and Dietary Intake: Is Adherence to Dietary Guidelines Associated with Importance of Healthy Eating among Undergraduate University Students in Finland? *Cent Eur J Public Health* 2015;23:306–13.
- Johansen A, Rasmussen S, Madsen M. Health behaviour among adolescents in Denmark: influence of school class and individual risk factors. *Scand J Public Health* 2006;34:32–40.
- NHS. Healthy eating for teens. NHS UK; 2018. Available: <https://www.nhs.uk/live-well/eat-well/healthy-eating-for-teens/>
- O'Donohue WT, Benuto LT, Tolle LW. *Handbook of Adolescent Health Psychology*. New York, NY, 2013.
- Gluckman PD, Hanson MA, Mitchell MD. Developmental origins of health and disease: reducing the burden of chronic disease in the next generation. *Genome Med* 2010;2:4–6.
- WFP. WFP Bangladesh: General Food Assistance, December . 2022 Available: <https://reliefweb.int/report/bangladesh/wfp-bangladesh-general-food-assistance>
- FSS. Guidance NOTE – Ramadan food distribution. 2023.

- 16 Bublitz MG, Peracchio LA, Block LG. Why did I eat that? Perspectives on food decision making and dietary restraint. *J Consum Psychol* 2010;20:239–58.
- 17 Bargiota A, Pelekanou M, Tsitouras A, *et al*. Eating habits and factors affecting food choice of adolescents living in rural areas. *Hormones (Athens)* 2013;12:246–53.
- 18 Contento IR, Williams SS, Michela JL, *et al*. Understanding the food choice process of adolescents in the context of family and friends. *Journal of Adolescent Health* 2006;38:575–82.
- 19 Serra-Majem L, Ribas L, Ngo J, *et al*. Food, youth and the Mediterranean diet in Spain. Development of KIDMED, Mediterranean Diet Quality Index in children and adolescents. *Public Health Nutr* 2004;7:931–5.
- 20 Pearson N, Ball K, Crawford D. Predictors of changes in adolescents' consumption of fruits, vegetables and energy-dense snacks. *Br J Nutr* 2011;105:795–803.
- 21 Falkner F. In: *PREVENTION IN CHILDHOOD OF HEALTH PROBLEMS* Edited by. 1980.
- 22 Stanford Medicine. Healthy Eating During Adolescence. Stanford Med, . 2022 Available: <https://www.stanfordchildrens.org/es/topic/default?id=dieta-saludable-durante-la-adolescencia-90-P04711>
- 23 Ragelienė T, Grønhoj A. The influence of peers' and siblings' on children's and adolescents' healthy eating behavior. A systematic literature review. *Appetite* 2020;148:104592.
- 24 Fortin B, Yazbeck M. Peer Effects, Fast Food Consumption and Adolescent Weight Gain. *SSRN Journal* 2012.
- 25 McClain AD, Chappuis C, Nguyen-Rodriguez ST, *et al*. Psychosocial correlates of eating behavior in children and adolescents: A review. *Int J Behav Nutr Phys Act* 2009;6:54.
- 26 Fitzgerald A, Heary C, Nixon E, *et al*. Factors influencing the food choices of Irish children and adolescents: A qualitative investigation. *Health Promot Int* 2010;25:289–98.
- 27 Lytle LA, Seifert S, Greenstein J, *et al*. How Do Children's Eating Patterns and Food Choices Change over Time? Results from a Cohort Study. *Am J Health Promot* 2000;14:222–8.
- 28 Lien N, Lytle LA, Klepp KI. Stability in consumption of fruit, vegetables, and sugary foods in a cohort from age 14 to age 21. *Prev Med* 2001;33:217–26.
- 29 World Health Organization. Optimizing education outcomes: high-return investments in school health for increased participation and learning. Child and Adolescent Health and Development; 2018. Dis control priorities 265.
- 30 Emergency Nutrition Network (ENN). Nutrition and health challenges for Rohingya and Bangladeshi adolescents and the impacts of the COVID-19 pandemic. In: *Field Exchange* . n.d.: 66. 86.
- 31 Islam MM, Nuzhath T. Health risks of Rohingya refugee population in Bangladesh: A call for global attention. *J Glob Health* 2018;8:020309:020309..
- 32 UNHCR. UNHCR's report portal. UNHCR Bangladesh; 2017.
- 33 The Kobo Organization. Features of Kobotoolbox. 2022. Available: <https://www.kobotoolbox.org/features/>
- 34 World Health Organization. WHO child growth standards: training course on child growth assessment. *World Heal Organ* 2008;7:1–47.
- 35 Alolabi H, Alchallah MO, Mohsen F, *et al*. Social and psychosocial factors affecting eating habits among students studying at the Syrian Private University: A questionnaire based cross-sectional study. *Heliyon* 2022;8:e09451.
- 36 Al Banna MdH, Hamiduzzaman M, Kundu S, *et al*. Association between Nutrition Literacy and Bangladeshi Adults' Healthy Eating Behaviors: Evidence from the Nutrition Literacy Study 2021. *Healthcare* 2022;10:2508.
- 37 Alam A, Dutta I, Haque ME, *et al*. Impact of Rohingya refugees on food prices in Bangladesh: Evidence from a natural experiment. *World Development* 2022;154:105873.
- 38 GlobalDev KY. Rohingya refugees in Bangladesh: a trapped population seeking food security, . 2017 Available: <https://globaldev.blog/blog/rohingya-refugees-bangladesh-trapped-population-seeking-food-security>
- 39 Arnow B, Kenardy J, Agras WS. The Emotional Eating Scale: the development of a measure to assess coping with negative affect by eating. *Int J Eat Disord* 1995;18:79–90.
- 40 WHO. Growth reference data, . 2007 Available: <https://www.who.int/tools/growth-reference-data-for-5to19-years/indicators/bmi-for-age>
- 41 United Nations High Commission for Refugees. Supporting Enrolment and retention; 2016 Aug.
- 42 Qiu C, Hou M. Association between Food Preferences, Eating Behaviors and Socio-Demographic Factors, Physical Activity among Children and Adolescents: A Cross-Sectional Study. *Nutrients* 2020;12:640.
- 43 Islam MR, Rahman SM, Tarafder C, *et al*. Exploring Rural Adolescents' Dietary Diversity and Its Socioeconomic Correlates: A Cross-Sectional Study from Matlab, Bangladesh. *Nutrients* 2020;12:1–16.
- 44 Nasar S, Raz S, Parray AA, *et al*. An assessment of gender vulnerability in the humanitarian crisis in Cox's Bazar, Bangladesh: Developing a gender-based vulnerability index in the Rohingya and Host community contexts. *International Journal of Disaster Risk Reduction* 2022;81:103246.
- 45 Skinner A, Tester-Jones MC, Carrieri D. Undernutrition among children living in refugee camps: a systematic review of prevalence. *BMJ Open* 2023;13:e070246.
- 46 Diekmann LO, Gray LC, Baker GA. Growing 'good food': urban gardens, culturally acceptable produce and food security. *Renew Agric Food Syst* 2020;35:169–81.
- 47 UNHCR. Global report 2020; 2020. UNHCR
- 48 Ayal BG, Demilew YM, Derseh HA, *et al*. Micronutrient intake and associated factors among school adolescent girls in Meshenti Town, Bahir Dar City Administration, Northwest Ethiopia, 2020. *PLoS One* 2022;17:e0277263.
- 49 Alsaafin L. Price HIKES and jobs: how Ngos affect the economy in Cox's Bazar. Al-Jazeera; 2018. Available: <https://www.aljazeera.com/indepth/features/price-hikes-jobs-ngos-impact-economy-cox-bazar-180810090248437.html> [Accessed 26 Aug 2022].
- 50 UNDP. United Nations Dev Program; Impacts of the Rohingya Refugee influx on Host Communities, . 2018 Available: <https://www.undp.org/content/dam/bangladesh/docs/Publications/Pub-2019/Impacts of the Rohingya Refugee Influx on Host Communities.pdf>
- 51 Banerjee S. The Rohingya Crisis: A Health Situation Analysis of Refugee Camps in Bangladesh. *Obs Res Found* 2019;91:298–310.
- 52 Feeny T. Rohingya refugee children in Cox's Bazar. Bangladesh: Draft Discuss Doc UNICEF, 2001.
- 53 Prodig MA. Health and Educational Status of Rohingya Refugee Children in Bangladesh. *J PSS* 2017;25:135–46.
- 54 Release P. Bangladesh: Displaced within the world ' s largest refugee camp. 2023.
- 55 Sultana N, Sultana S, Saha R, *et al*. The challenges and coping of Rohingya refugees: a comparative study of registered and nonregistered Rohingya refugees in Bangladesh. *SEAMJ* 2023;23:95–120.
- 56 Al-Adili S. FOOD CHOICES AND FACTORS THAT AFFECTS FOOD CHOICES AMONG IMMIGRANTS FROM IRAQ RESIDENT IN SWEDEN. A quantitative study; 2018.
- 57 Das JK, Salam RA, Thornburg KL, *et al*. Nutrition in adolescents: physiology, metabolism, and nutritional needs. *Ann N Y Acad Sci* 2017;1393:21–33.
- 58 Scaglioni S, De Cosmi V, Ciappolino V, *et al*. Factors Influencing Children's Eating Behaviours. *Nutrients* 2018;10:1–17.
- 59 Cecchini M, Sassi F, Lauer JA, *et al*. Tackling of unhealthy diets, physical inactivity, and obesity: health effects and cost-effectiveness. *Lancet* 2010;376:1775–84.
- 60 Nachrin T. Social Media Use by the Rohingya Refugees in Bangladesh: A Uses and Gratification Approach. *IJSSS* 2019;8:1.
- 61 Ganasegeran K, Al-Dubai SAR, Qureshi AM, *et al*. Social and psychological factors affecting eating habits among university students in A Malaysian medical school: A cross-sectional study. *Nutr J* 2012;11:1–7.
- 62 Michels N, Sioen I, Braet C, *et al*. Stress, emotional eating behaviour and dietary patterns in children. *Appetite* 2012;59:762–9.