Research Article

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Associations between Hunger and Mental Health among Adolescents in Bangladeshi Slums Amid COVID-19

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Abstract

Objective: Identify the prevalence of hunger, anxiety, and depression, while also exploring the association between hunger, sociodemographic factors, and the presence of anxiety and depression among adolescents in Dhaka's urban slums during the Covid-19 pandemic

Methods: This cross-sectional study was conducted during April to May 2022 among 324 adolescents living in slums in Dhaka division, Bangladesh. Data collection was done onsite using a structured questionnaire. Anxiety and depression were assessed using pre-validated and reliable Bangla translated versions of Generalized Anxiety Disorder (GAD-7) scale and Patient Health Questionnaire (PHQ-9). Hunger was measured using the Household Hunger Scale (HHS). Binary logistic regression was used to find associations.

Results: 61.7% of the adolescents suffered from moderate – severe hunger. The prevalence of moderate to severe levels of anxiety and depression were high at 46.3% and 63.3% respectively. In logistic regression, hunger showed significant association with both anxiety (AOR= 2.345, 95% CI= 1.474- 3.731) and depression (AOR= 1.852, 95% CI= 1.166- 2.941). Additionally, early adolescence was associated with anxiety, and adolescents who were school going and lived in a household with >5 family members had more likelihood of both anxiety and depression.

Conclusion: Hunger during the Covid-19 pandemic was associated with increased risk of anxiety and depression. In crisis situations, public health measures should ensure that poor communities have access to at least basic meals to minimize impact on mental health of adolescents. Apart

from this, they should also focus on living situations in slums and enhance their efforts in the national school feeding program.

Keywords: Hunger, Food insecurity, Covid-19, Mental health, Poverty, Adolescents

What was known?

- Covid-19 pandemic worsened hunger in poor communities, especially in LMICs such as Bangladesh.

- The pandemic had also severely impacted mental health of people, with adolescents being the most affected but receiving the least attention in terms of mental health care.

- There is a lack of awareness and data regarding mental health and its associations among adolescents in poor communities like slums, such as how significant the impact of hunger can be on their mental health despite evidence suggesting how poor mental health in adolescence can lead to long term complications and impair adulthood.

What's new and next?

- Taking steps to combat hunger among adolescents in slums can possibly lead to better mental health outcomes and a better quality of life.

- Longitudinal studies or interventional studies can be done in larger samples to establish a causal relationship between hunger or access to food, and mental health outcomes and their severity, so that new measures can be taken or existing measures improved to alleviate hunger and potentially negate a factor that can contribute to poor mental health among slum adolescents.

Introduction

Adolescence, marked by significant physical, neurodevelopmental, psychological, and social changes, raises nutritional requirements, making food insecurity particularly acute for adolescents. Hunger is a physiological consequence of severe food insecurity that not only impedes physical growth of adolescents but also adversely affects their mental health due to the stress arising from insufficient food within families[1, 2]. In prior research, adolescents experiencing hunger showed increased odds of depression symptoms[3], and those from low-income families facing household food insecurity during Covid-19 had a significantly higher likelihood of experiencing anxiety and depression[4].

Amid the COVID-19 pandemic, the Bangladeshi government, like others, implemented nationwide lockdowns and isolation measures, disrupting food supply networks and causing an immediate scarcity in food accessibility and availability[5]. An early pandemic survey among 5471 households in urban slums and impoverished rural areas in Bangladesh revealed that 47% of urban slum households reported reduced food consumption, with around 70% expressing the need for increased food and financial support[6]. Adolescents were three times more likely to report hunger a year into the pandemic, with households twice as likely to restrict food for adolescents compared to pre-COVID-19 times. Girls were disproportionately affected in vulnerable households, experiencing increased hunger and reduced food intake. Although some received cash and food aid, it proved inadequate to reverse these negative trends. The efficacy of the Bangladeshi government's social safety net programs in mitigating adolescent hunger during the COVID-19 crisis remains inadequately substantiated[7]. A qualitative study among urban slum adolescents in Dhaka highlighted their neglect in the COVID-19 crisis response, despite evidence suggesting how the pandemic distinctly affected adolescents[8].

Various sociodemographic factors also contributed to mental health issues among adolescents during the pandemic. Nearly 89% of students were absent from school globally during the peak of the pandemic, potentially impacting their physical, social, and psychological well-being and future prospects[9]. Living in crowded households during the pandemic was also linked to a decline in mental well-being among children and adolescents[10].

Despite the prevalence of serious mental health conditions among youths in Bangladesh, it receives less attention due to societal stigmas and taboos, especially within marginalized communities[11]. Slum children in Bangladesh have shown higher rates of psychopathology compared to other children from non-slum urban and rural regions[12]. However, in most Low- or Middle-Income Countries (LMICs), including Bangladesh, mental health services are not integrated into primary care or community health centers, despite being the primary point of seeking care for those living in poverty[13]. Furthermore, lack of data and research on the mental health burden and its determinants among slum residents in Bangladesh complicates the effective allocation of healthcare resources for prevention and treatment[14].

Dhaka, a rapidly urbanizing place, houses over 8 million slum dwellers with the majority being rural migrants, and the slum population is projected to increase[15]. Hence, understanding mental health and its determinants in this population becomes imperative. This study aims to

examine the prevalence of hunger, anxiety, and depression among urban slum adolescents in Dhaka amid the COVID-19 pandemic. It also seeks to identify associations between hunger, various sociodemographic factors, and anxiety and depression to bridge the knowledge gap on the relationship between hunger and mental health in this context.

Materials and Methods

Study design, subjects and settings

In this quantitative cross-sectional study, data was collected from slum dwelling adolescents in Dhaka division, Bangladesh, in between April to May 2022 when the pandemic was still ongoing and a fourth wave was being predicted. The inclusion criteria were adolescents aged 12 to 18 years old, those residing in a slum for at least six months prior to the study, were never clinically diagnosed with a mental health condition and who had the ability to respond to the questions and who provided assent to participate in the survey. Adolescents who failed to clearly understand the Bengali language in the questionnaire were excluded. A sample size was estimated with Cochrane's formula, using 95% confidence interval, precision 0.05, expected prevalence 20%[16] and 10% non-response/missing data anticipated, a required sample size of 271 was calculated; 348 adolescents were interviewed, and 324 were included in the final analysis after sorting out incomplete data.

Dhaka division has four city corporations (CC): Dhaka North, Dhaka South, Gazipur and Narayanganj. 20 wards from a total of 213 wards in the four city corporations were selected using random lottery sampling. Wards are the lowest administrative unit in a city corporation that governs multiple areas including slum settlements. Following ward selection, permission to conduct the research was taken from ward councilors, and the lists of residents living within each ward were collected with assistance from the ward electoral offices and non-governmental organizations (NGO) working with slum residents. Adolescents living in slums from the lists were separated and numbered. 400 numbers were finalized using the random lottery method, and research team members reached out to them for taking part in the survey. 52 did not agree to take part, mostly as their guardians did not consent. Any other reasons for refusal were not investigated. 348 adolescents (87% response rate) were eventually interviewed. Data was collected via face-to-face interviews at the residence of the participants using a structured questionnaire. Due to the ongoing nature of the COVID-19 pandemic, appropriate precautions were taken while conducting interviews that included compulsory use of face masks and

disposable gloves, hands sanitized as required and social distancing of at least a meter or as much as the space allowed. The objective, procedure, confidentiality and potential benefits/ risks of the research were explained in detail to the participants and their guardians prior to starting an interview.

Measures of variables

The questions for measuring symptoms of anxiety and depression were adopted from previously validated Bengali versions of the GAD-7 scale and PHQ-9. The remaining questions about participant characteristics and hunger were written in English and translated into Bangla. Then, it was back translated into English by two experts in both languages. Their focus was on the similarity of the concepts rather than the literal translation. The questions in the original and back-translated versions were then evaluated by two different experts, who confirmed similarities in both.

Anxiety was measured using the Generalized Anxiety Disorder (GAD-7) scale. It is a 7-item self-report questionnaire developed by Spitzer in 2006 as a brief measure of the frequency of symptoms of generalized anxiety in the past two weeks[17]. It is utilized in clinical settings for screening and determining the severity of the condition, and has been used in numerous studies conducted in several languages. Response categories and their scores are 0 = not at all, 1 = several days, 2 = more than half the days, and 3 = nearly every day. The scores are added and categorized into none–mild (0-9), moderate (10-14) or severe (15-21). For statistical analysis, anxiety was regrouped into No (<10) and Yes (≥10) based on a cutoff value of ≥ 10[18]. Cronbach's alpha for this scale in our study was 0.770.

Depression was measured using the Patient Health Questionnaire (PHQ-9). It is a 9-item self-report questionnaire developed by Kroenke et al. in 1999[17]. Based on the experience of nine symptoms associated with depression in the past two weeks, it is applied as screening and symptom tracking tool in both clinical and nonclinical environments. Response categories and their scores are none–minimal (0-4), mild (5-9), moderate (10-14), moderately severe (15–19) or severe (20-27). For statistical analysis, none–minimal and mild were merged into one group (No); and moderate, moderately severe and severe were merged into another group (Yes), based on a cutoff value of ≥ 10[18]. Cronbach's alpha for this questionnaire in our study was 0.813.

To measure adolescent hunger, the Household Hunger Scale (HHS) was adapted. Derived from the Household food insecurity access scale (HFIAS), it is a 6-item questionnaire developed by Ballard et al. and has been validated for cross cultural use. It has been recommended by the creators as an appropriate tool to measure prevalence of hunger at households in a developing country, and is also suitable for adolescents. We adapted the HHS for use among our adolescents (Figure 1), taking cue from a study[19] that adapted the HFIAS for use on an individual rather than a household. The scores for each of the item in the scale are summed up and categorized into no-little hunger (0-1), moderate hunger (2-3) and severe hunger (4-6). For statistical analysis, we merged moderate and severe hunger into one group.

Patient characteristics collected were age, sex, whether the individual was attending school or not, if the participant was working or not working, and number of family members in their households.

Data analysis

Data analysis was performed using the statistical software Stata 16. The dependent variables in this study are anxiety and depression. For univariate data analysis, continuous variables are described with mean, median and standard deviation and categorized into two groups using the median value as the cutoff; and categorical variables are presented as counts and percentages. For bivariate data analysis, cross table and chi-square test was used to identify any association between participant characteristics and hunger, with anxiety and depression. A p-value of <0.05 was considered statistically significant. Multivariate binary logistic regressions, yielding adjusted odds ratios (AORs) and their 95% confidence intervals (CIs), were performed to identify if the significant variables from bivariate analysis can determine anxiety and depression.

No.	Question	Response option	Code
Q1	In the past [4 weeks/30 days], was there ever no food to eat of any kind in your house because of lack of resources to get food?	0 = No (Skip to Q2) 1 = Yes	
Q1a	How often did this happen in the past [4 weeks/30 days]?	1 = Rarely (1–2 times) 2 = Sometimes (3–10 times) 3 = Often (more than 10 times)	
Q2	In the past [4 weeks/30 days], did you go to sleep at night hungry because there was not enough food?	0 = No (Skip to Q3) 1 = Yes	
Q2a	How often did this happen in the past [4 weeks/30 days]?	1 = Rarely (1–2 times) 2 = Sometimes (3–10 times) 3 = Often (more than 10 times)	
Q3	In the past [4 weeks/30 days], did you go a whole day and night without eating anything at all because there was not enough food?	0 = No (Skip to next section) 1 = Yes	
Q3a	How often did this happen in the past [4 weeks/30 days]?	1 = Rarely (1–2 times) 2 = Sometimes (3–10 times) 3 = Often (more than 10 times)	

Figure 1. The Household Hunger Scale (adapted) used in our study

Results

From the 324 participants, majority were females (62.7%), early adolescents (51.5%), school going (88.3%), not working (92.6%) and belonged to a household with >5 family members (67.6%) (Table 1). Among all categories of participants, majority reported moderate – severe hunger, except among those who were working 62.5% reported no–little hunger (Table 1).

Table 1. Distribution of hunger across other sociodemographic characteristics

		Hunger	
		No–little	Moderate–severe
Participant characteristics	Total (%)	n (%)	n (%)
	324 (100)	124 (38.3)	200 (61.7)
Gender			
Female	203 (62.7)	80 (39.4)	123 (60.6)
Male	121 (37.3)	44 (36.4)	77 (63.6)
Age (Median = 14, Mean ± SD: 14.5 ± 1.8)			
Early adolescence (12-14y)	167 (51.5)	46 (27.5)	121 (72.5)
Late adolescence (15–18y)	157 (48.5)	78 (49.7)	79 (50.3)
School going			
No	38 (11.7)	16 (42.1)	22 (57.9)
Yes	286 (88.3)	108 (37.8)	178 (62.2)
Work status			

Not working	300 (92.6)	109 (36.3)	191 (63.7)
Working	24 (7.4)	15 (62.5)	9 (37.5)
No. of family members in household(Median = 5, Mean ± SD: 5.2 ± 1.5)			
≤5	105 (32.4)	47 (44.8)	58 (55.2)
>5	219 (67.6)	77 (35.2)	142 (64.8)

Majority (61.7%) of the participants reported experiencing moderate–severe hunger (Table 2). The prevalence was 46.3 % for anxiety (moderate 39.2 % and severe 7.1%) and 63.3% for depression (moderate 26.2%, moderately severe 31.5% and severe 5.6%) (Table 2).

Table 2. Prevalence of hunger, anxiety and depression across different categories

	Category	Prevalence	
		n	%
Hunger	No–little	124	38.3
	Moderate	171	52.7
	Severe	29	9.0
Anxiety	None	27	8.3
	Mild	147	45.4
	Moderate	127	39.2
	Severe	23	7.1
Depression	None-Minimal	6	1.9
	Mild	113	34.9
	Moderate	85	26.2
	Moderately Severe	102	31.5
	Severe	18	5.6

Table 3 shows the Chi square test analysis between hunger and personal characteristics with anxiety and depression. Hunger showed association (p-value<0.05) with both anxiety and depression. Personal characteristics associated with depression were school–going status and no. of family members; and age, school–going status and no. of family members showed association with anxiety.

Table 3. Distribution of hunger and sociodemographic characteristics, and their associations with Depression, and Anxiety

		Depression			Anxiety		
	Total	No	Yes[1]		No	Yes[2]	
	n (%)	n (%)	n (%)	*p-value*	n(%)	n(%)	*p-value*
Hunger							
No–little	125 (38.6)	57 (45.6)	68 (54.4)	**0.009**	83 (66.4)	42 (33.6)	**<0.001**
Moderate–severe	199 (61.4)	62 (31.2)	137 (68.8)		91 (45.7)	108 (54.3)	
Gender							
Female	203 (62.7)	78 (38.4)	125 (61.6)	0.412	113 (55.7)	90 (44.3)	0.359
Male	121 (37.3)	41 (33.9)	80 (66.1)		61 (50.4)	60 (49.6)	
Age (Median = 14, Mean ± SD: 14.5 ± 1.8)							
Early adolescence (12–14y)	167 (51.5)	56 (33.5)	111 (66.5)	0.218	80 (47.9)	87 (52.1)	**0.031**
Late adolescence (15–18y)	157 (48.5)	63 (40.1)	94 (59.9)		94 (59.9)	63 (40.1)	
School going							
No	38 (11.7)	21 (55.3)	17 (44.7)	**0.01**	27 (71.1)	11 (28.9)	**0.025**
Yes	286 (88.3)	97 (33.9)	189 (66.1)		148 (51.7)	138 (48.3)	
Work status							
Not working	300 (92.6)	13 (54.2)	11 (45.8)	0.060	158 (52.7)	142 (47.3)	0.086
Working	24 (7.4)	105 (35.0)	195 (65.0)		17 (70.8)	7 (29.2)	
No. of family members in household (Median = 5, Mean ± SD: 5.2 ± 1.5)							
≤5	105 (32.4)	47 (44.8)	58 (55.2)	**0.031**	66 (62.9)	39 (37.1)	**0.027**
>5	219 (67.6)	71 (32.4)	148 (67.6)		109 (49.8)	110 (50.2)	

[1] Indicates moderate-moderately severe-severe depression (PHQ 9 ≥10)

[2] Indicates moderate-severe anxiety (GAD 7 ≥10)

Table 4 displays the results from binary logistic regression analysis. Hunger was significantly associated with both depression and anxiety. Those who suffered moderate – severe hunger, were almost twice likely to develop symptoms of anxiety (AOR 1.852, 95% CI 1.166–2.941) and depression (AOR 2.345, 95% CI 1.474-3.731) compared to those who experienced no-little hunger. Personal characteristics significantly associated with depression were school going (AOR 2.453, 95% CI 1.230-4.893) and >5 family members in household (AOR 1.715, 95% CI 1.058-2.780). Early adolescence (AOR 1.623, 95% CI 1.045 – 2.521), school going status (AOR 2.328, 95% CI 1.107-1.069) and >5 family members in household (AOR 1.728, 95% CI 1.069-2.793) were associated with anxiety.

Table 4. Binary logistic regression analysis of hunger and participant characteristics with depression and anxiety

	Depression			Anxiety		
	p-value	AOR	95% CI	*p-value*	AOR	95% CI
Hunger						
Moderate-severe	**0.009**	1.852	1.166 – 2.941	**<0.001**	2.345	1.474 – 3.731
No-little	Ref			Ref		
Age						
Early adolescence (12-14y)	Did not enter model			**0.031**	1.623	1.045 – 2.521
Late adolescence (15-18y)				Ref		
School going						
Yes	**0.011**	2.453	1.230-4.893	**0.026**	2.328	1.107-1.069
No	Ref			Ref		
No. of family members in household						
>5	**0.029**	1.715	1.058-2.780	**0.026**	1.728	1.069-2.793
≤5	Ref			Ref		

Discussion

To the best of our knowledge, this may be the first study to measure the association between hunger and mental health of urban slum adolescents in Dhaka, Bangladesh, amid the Covid-19 pandemic.

Dhaka, with millions of rural migrants settled in slums, faces sociodemographic challenges due to rapid urbanization. Overcrowding, housing instability and poor environment in slums lead to health issues, including psychological such as depression[20]. Despite the availability of diverse food, 40% of these slum inhabitants in Dhaka endure severe or moderate food insecurity, especially affecting teenage girls. Financial constraints worsen health challenges, emphasizing the association between sociodemographic factors and prevalence of hunger[21].

Most participants in our study experienced moderate to severe hunger. Likewise, another study conducted among urban slum residents aged 10-25 years in India, reported that 62.7% faced food shortages during the pandemic[22]. Majority of the participants in our study reported depression, with nearly half experiencing anxiety. These findings corroborate with prior research

that has highlighted the high prevalence of adverse mental health conditions among Bangladeshi students both before and after the pandemic[16, 23].

The pandemic triggered a mental health crisis stemming from the food crisis. Several studies, including ours, demonstrate the association of hunger or food insecurity with psychological problems like depression and anxiety. A study among 418 Indian teenage girls in slums reported 47.6% faced food insecurity, significantly linked to higher levels of both anxiety and depression (24). Similarly, a study on African students reported a significant association between hunger and poor mental health outcomes[25]. Due to hunger, dietary deficiencies and concerns about their next meal, food-insecure adolescents experience stress impacting their mental health[26].

Our study also explored how sociodemographic characteristics are associated with anxiety and depression. Younger ages (12-14 years) in our study exhibited greater vulnerability to anxiety and depression during the pandemic, contrasting with studies where older adolescents were more likely to develop anxiety and depression[16, 27]. School-going participants in our study were more likely to experience anxiety and depression, aligning with similar findings in other studies[28, 29]. This was attributed to factors such as social isolation, loss of school meals, and increased screen time due to school closures. Bangladesh has persistently struggled with education quality, especially for children from poor communities due to additional socioeconomic barriers that restrict educational opportunities available to them. During the pandemic, as classes were broadcast on television and internet platforms it became challenging for parents of slum children to afford technology or private tutors, potentially leading to learning loss[30]. School closures and subsequent learning loss have been linked to negative mental health outcomes[31].

In our study, adolescents from households with more than five family members exhibited higher likelihoods of anxiety and depression. A prior study in Dhaka's slums before the pandemic hypothesized that overcrowded living spaces negatively affected residents' mental health, possibly due to a lack of privacy[14]. Additionally, during the pandemic, overcrowding and space constraints in slum households made it impractical to maintain physical distancing, increasing the chances of infection[32]. Fear of contracting the disease, as well as family members falling ill, had a negative psychological impact on children and adolescents[33].

Limitations and Strengths

Our study has limitations. It reflects an associative, not causal, relationship between hunger and mental health due to its cross-sectional nature. Additionally, the ongoing pandemic may have influenced participants' willingness to take part in our study. Living in slums comes with additional challenges such as existing family debts[34], parental loss of income during the pandemic[35] and low education of the household head[36] that may increase the susceptibility of adolescents to hunger and mental health issues; data on such factors were not collected or analyzed. Future research should consider other potential confounders, and establish causal relationships. Despite limitations, the study's findings may influence policies that directly or indirectly contribute to the improvement of mental health among slum adolescents.

There are also some strengths to our study. Data was collected in person via face-to-face interview unlike most online surveys conducted during the pandemic. We used standardized self-administered questionnaires to assess symptoms of anxiety and depression. Our study can also be foundational for longitudinal studies to assess effectiveness of mental health promotion or interventions if implemented and used for systematic reviews/ meta-analysis.

Conclusion

Our study identified a high prevalence of hunger, anxiety and depression among slum adolescents during the COVID-19 pandemic. This underscores the need for governments, particularly in low- and middle-income countries like Bangladesh, to prioritize enhancing food security as a key strategy in preventing the escalation of mental health issues during pandemics. This becomes especially crucial when healthcare services are overwhelmed by additional challenges.

The findings are also directed towards key stakeholders, including the Ministry of Health, urging the integration of mental health care into primary health services for better accessibility among the underserved to cope with the high prevalence of mental health issues. The Ministry of Primary and Mass Education is also encouraged to augment their curriculum to integrate mental health support for students. Policies like the National Urban Sector Policy need to prioritize improving housing infrastructure for the urban poor, with emphasis on ways that limit spread of infections and ensuring their right to safe housing and health. Additionally, we recommend the

National School Feeding program to intensify efforts in providing adequate meals to school students.

Abbreviations

AOR: Adjusted Odds Ratio, CI: Confidence Interval, COVID 19: Coronavirus 19, SD: Standard deviation, GAD-7: Generalized Anxiety Disorder-7, PHQ-9: Patient Health Questionnaire-9, HHS: Household Hunger Scale, LMIC: Low- or Middle- Income country, CC: City Corporation

Ethical Approval Statement

The study protocol was approved by the Institutional Review Board under Institute for Population and Social Research, Mahidol University (COA: 2022/03-053 and 2022/03-054, approved on 8th April 2022) and permission was also obtained from the Ward councilors of the selected study areas. The study was in accordance with relevant institutional guidelines and regulations in accordance with the declaration of Helsinki. Confidentiality was maintained by keeping participant identity anonymous, and the study questionnaire clearly stated research purpose and privacy policy at the beginning. Informed written assent and consent were taken from the adolescents and a guardian respectively, prior to the survey.

Author Contributions

Taslima, Taniya and SAH initiated and conceived the project research including the questionnaire development. Taslima and Taniya conceived the idea of this article. Taslima, Taniya, and SS were involved in participant recruitment and acquisition of the data. Taslima, SAH, Taniya, and SS completed the analysis and interpretation of data. Taslima and Taniya created the preliminary draft and revised the manuscript with SAH. Taslima, Taniya, SAH and SS were involved in critical revision of the manuscript for intellectual content. All authors have read and approved the manuscript.

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Conflicts of Interest

The authors have no real or perceived conflicts of interest to declare nor are any third-party materials being used within this manuscript.

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