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Socio-environmental factors affecting mental health of people during COVID-19 in coastal urban areas of Bangladesh

Rozina Akter[a], Mukta Akter[a], Md. Tanvir Hossain[b], Md. Nasif Ahsan[a]

[a]Economics Discipline, Social Science School, Khulna University 9208, Bangladesh
[b]Sociology Discipline, Social Science School, Khulna University 9208, Bangladesh

5.1 Introduction

The COVID-19 has become the paramount global challenge in recent times because of its devastating footprint upon China, the USA, Italy, the UK, Brazil, and more than 200 other countries and territories (Fitzgerald and Wong, 2020). People across the world are getting accustomed to the new emergent conditions, such as "lockdown," "quarantine," and "isolation" over the last few months. The episode of COVID-19 was out broken first from Wuhan, China on December 31, 2019 (Lee, 2020). Symptoms including fever, sore throat, dry cough, tiredness, and suffocation are noticed generally within first two weeks of being infected by COVID-19 (Ahorsu et al., 2020). As of August, just over 21 million people are found COVID-19 positive in 216 countries and territories, and just over 0.76 million succumbed to death globally (WHO, 2020a). In January 2020, after traveling Wuhan, an old lady died in New York and following this incident the government took necessary initiatives to curb the human-to-human transmission. Nearly, 4.6 million people are infected and another 154 thousand are prayed for rest in peace until first week of August 2020 in the USA only (Velásquez and Lara, 2020; WHO, 2020c). At the end of March 2020, official database of Italy portrayed a brutal face of COVID-19 with nearly 106 thousand positive cases, of which 15.1 thousand lost their lives (Chintalapudi et al., 2020). In India, near about 3.5 million people are infected by COVID-19 with 62.5 thousand deaths (WHO, 2020b). World research fraternity suspects that India can be the next noxious destination of COVID-19 with high transmission rate. In the first week of August, there were around 0.3 million cases are confirmed of COVID-19, killing 3.3 thousand people death cases in Bangladesh (WHO, 2020a). Medical researchers are attempting to discover effective vaccine (Dong et al., 2020). National and international health organizations keep updating relevant information, recommendation, and opinion on COVID-19. However, researchers and health organizations significantly ignored the psychological facet of COVID-19. Experts opine that up to 70% COVID-19 positive cases require both physical and mental health treatment (Lee, 2020). The COVID-19 pandemic hampers mental condition of the people at risk by exacerbating the level of anxiety, depression, stress, contamination concern, and finally suicidal tendency (Lee, 2020; Gavin et al., 2020; Kahambing and Edilo, 2020; Pompeo-Fargnoli and Fargnoli, 2020; Taylor et al., 2020; Tanoue et al., 2020; Islam et al., 2020a).

Mental health becomes a burning issue in the event of recent outburst of pandemic COVID-19 having great impact on physical and mental health of people at risk across the globe. Anxiety about COVID-19 is the fiend of having excessive psychological stress. The prevalence of post-traumatic stress disorder has boosted from 4 to 41% and severe depression rose by 7% globally at the time of this crisis (Torales et al., 2020). At present, people became familiar with new attributes, such as- work from home, education from home, less physical interaction with family, friends, and colleagues. These new attributes trigger new sources of mental unrests (Pompeo-Fargnoli and Fargnoli, 2020; WHO,

2020a; Tanoue et al., 2020). In Canada, 47% healthcare service providers were reported to require mental support (WHO, 2020b). Study results of Brennan et al. (2020) revealed that older people are going through psychosis problem in Ireland due to dramatically change of life. Since the outbreak of COVID-19 insufficient health care facilities, lack of opportunity to see loved once for the last time, and funeral rituals influence people's psychological health (Brennan et al., 2020). A study on COVID-19 patients in China found that admitted patients required both physical and mental health treatment even after discharging from hospital (Hu, et al., 2020). Under these circumstances, depression, anxiety, and insomnia prevailed for 45.9%, 38.8%, and 54.1% cases, thus, implying mental health problem appears to last for a considerable time period (Hu et al., 2020). Furthermore, rate of depression in Ethiopia has increased three-fold compared to the pre COVID-19 situation where medical staff and officials are experiencing an abnormal level of depression and stress, they have to deal with a surge of positive cases and deaths on daily basis (WHO, 2020c). Yeasmin et al. (2020) found in Bangladesh, children were significantly affected by depression, anxiety and insomnia as a result of parent's unstable mental condition for COVID-19 situation. Another study on university students in Bangladesh revealed that a notable percentage of students reported to suffer from moderate to severe depression and anxiety symptoms during the pandemic (Islam et al., 2020b). Diverse factors are reported to influence the mental health of the people during COVID-19. For example, a study on different cohort in Bangladesh denoted that socioeconomic status, along with exposure to mass media, is culpable for escalating degree of anxiety during COVID-19 in Bangladesh (Hossain et al., 2020). Furthermore, different socioenvironmental factors are also likely to affect the mental health of the people in Bangladesh though little or no evidence exists in this regard.

Socioenvironmental factors are highly associated with health behavior by forming social ethos and positive health synergy while sapping negative health behavior (Mama et al, 2016; Bourque et al., 2012). Having unequal socioeconomic opportunities may foster anxiety, depression, stress, sleeping disorder, and social disunion (Li and Liu, 2018; Lee, 2020; Gavin et al., 2020; Taylor et al., 2020). During COVID-19 both social and physical environment are taking a precarious form in the society (Tunstall et al., 2014). At present 55% global population live in urban areas and by 2050 almost 68% world population are going to live in the aforesaid areas (WHO, 2020b). Italy, one of the most urbanized country with seemingly sufficient medical facilities, faced a rapid COVID-19 transmission rate even before announcing lockdown (Sangiorgio and Parisi, 2020). While in Bangladesh, only 41 laboratories situated in urban areas to test COVID-19 samples and in some cases, samples are tested after the demise of COVID-19 patients (Shammi et al., 2020). In Bangladesh, the rate of COVID-19 infection is higher among urban residents than those of rural areas (Sakamoto et al., 2020). Considering this scenario, it is necessary to pay special attention for urban areas in Bangladesh to curb the COVID-19 transmission rate (Sangiorgio and Parisi, 2020).

Since March 18, 2020, the Government of Bangladesh decided to keep all educational institutions closed across the country to minimize the transmission rate of COVID-19 (Yeasmin et al., 2020). As an initiative to abate the spread of pandemic, government followed global trend and declared lockdown in a disguise of general holiday from March 26, 2020 to May 31, 2020 (Bodrud-Doza et al., 2020). Institute of Epidemiology, Disease Control, and Research (IEDCR) revealed first three positive cases in the first week of March 2020 (Islam et al., 2020c). Since then, the COVID-19 positive cases are growing rapidly in the urban areas (Shammi et al., 2020), although urban people have been following the preventive measures, such as wearing mask, cleaning hands with sanitizer and soap, and avoiding gathering and physical contact with nearest and dearest ones. The prolong confinement, however, is alarmingly damaging the mental health of urban people by encountering fear of- being infected, losing loved once, misleading information, inadequate medical equipment and treatment, prolonged isolation, job loss, supply shortage of required food, movement restriction, and social distance. For example, on March 25, 2020, a middle-aged Bangladeshi citizen (a suspected COVID-19 patient) committed suicide because of changing social behavior toward COVID-19 patients, though his COVID-19 report was negative (Mamun and Griffiths, 2020). Researchers across the world are busy to discuss about infection control, projection on future spread rate, and effective vaccine with a little emphasis on mental well-being of people. A good number of studies on COVID-19 pandemic attempted to address mental health to different groups of people, such as medical staffs and officials, front- line workers, older people, students, children, COVID-19 patients (Brennan et al., 2020; Yeasmin et al., 2020; Gavin et al., 2020; WHO, 2020b; Hu et al., 2020; Islam et al., 2020a; Hossain et al., 2020). Furthermore, the role of socioenvironmental factors on mental health during COVID-19 appears to be an issue that is yet to be addressed, especially in urban areas of developing countries. Policymakers, health officials, and medical practitioners need to understand the nature and level of psychological impact of socioenvironmental factor to formulate new strategies and policies to adjust with the "new normal." In this backdrop, the present study aims to present a snapshot regarding the role of socioenvironmental factors on mental health of people during COVID-19 in the costal urban areas of Bangladesh by analyzing two research questions: a) what is the role of socioenvironmental factors in regulating the mental health (anxiety and stress) of people in the costal urban area; and b) how COVID-19 affects the mental health of urban costal people in Bangladesh.

5.2 Method

5.2.1 Participants and data collection procedures

Data were collected from the coastal urban areas of Bangladesh deploying a web-based questionnaire (google-form). The participants were selected based on specific criteria, namely- (i) a citizen of Bangladesh, (ii) more than 15 years of age, (iii) living in urban areas of southwestern coastal region of the country, and (iv) having an email and/or social media account. Based on the aforementioned criteria, the questionnaire was shared with the participants using social media, e.g., Facebook, messenger, and email to collect information regarding their health status and perception about COVID-19. During a period of 14 days (01–14 August, 2020), we received responses from 128 respondents of whom we could finally include 115 in our sample. The rest of the responded were discarded due to nonresponse to a good number of questions.

5.2.2 Measures

Along with COVID-19 related questions, respondents were asked about their demographic features and socioenvironmental characteristics. Data collection began when the pandemic had spread out throughout the country and it seemed to go toward the saturation point in terms of number of affected people. In order to assess the mental health condition during the pandemic, respondents were asked about their prior and post health condition. They were also asked whether they are satisfied with the medical treatment or not through a five-point Likert scale (Highly dissatisfied = 1 to Highly satisfied = 5). Coronavirus Anxiety Scale (CAS) and Composite COVID-19 Stress Index (CCSI) were used for finding out the outcome of COVID-19 on mental health. Some specific factors had been selected through these scales to measure the level of stress and anxiety among the respondents. A complete list of variables used in this study is presented in Appendix 1.

5.2.2.1 Personal attributes and socioeconomic status

Demographic and socioeconomic factors influence the mental health and physical reactions toward any situation (Taylor et al., 2020). That is why the influence of personal attributes of the respondents, like age (in year), sex, literacy level, marital status, religion, and family type, had been assessed in this study. In addition, the role of employment status, income, expenditure, and household ownership of the respondents had also been analyzed. Relevant descriptive statistics were also produced for presenting the socioeconomic and personal attributes of the respondents.

5.2.2.2 Socioenvironmental factors

Socioenvironment is the immediate physical and cultural structure within which the people live. In this study, we consider all the surrounding elements, way of communication, physical utilities, and thoughts and beliefs among the dwellers in different localities are the main factors of social-environment. In this study, we measured socioenvironmental factors by considering living environment (1 = less noisy to 5 = very noisy), security status (1 = less secured to 5 = highly secured), rate of criminal activity (1 = very low to 5 = very high), source of drinking water (own pump; filter or bottle water) of the concerned locality (see Appendix 1 for detail).

5.2.2.3 Health status and care-seeking behavior

In this study, we used a group of items for examining the physical health status of the respondents and their family members. Frequency of illness (in number), type of illness (e.g., fever, cold, cough, headache, sneeze, asthma, rheumatics or distaste), days suffered (i.e., duration) for COVID-19 illness, number of physically challenged household members, number of mentally challenged household members and so on were used to measure the health status of the respondents (see Appendix 1 for detail).

5.2.2.4 Composite COVID-19 stress index

Composite COVID-19 stress index (CCSI) is a customized multifactorial parameter for assessing mental distress among people independent of physical status during any pandemic. It is formulated in such a way that it can be readily used in any pandemic situation that may arise in the future. In CCSI model, four factors have been identified related to the stress of COVID-19, including agitation, scarcity (of necessary commodities), trauma, and infodemic. A five-point Likert scale was used in this case (where, 1 = strongly disagree…5 = strongly agree) to reveal out the impact. A total of 39 variables for CCSI were adapted from Taylor et al. (2020) and customized in line with

Bangladesh context. These variables were broadly from five dimensions namely- fear of danger, socioeconomic vulnerability, traumatic stress, xenophobia and compulsive checking, and reassurance seeking. Final score value of CCSI is obtained by summing up concern scores from all variables. This index value ranges from 44 to 105.

5.2.2.5 *Coronavirus anxiety scale*

We parallelly applied Coronavirus anxiety scale (CAS) along with CCSI in the study where CAS measured the anxiety level of the respondents. It is a mental screener that determines the mental dysfunctionality associated with COVID-19. Following the study by Lee (2020), we selected concern variables for CAS from four dimensions, namely- cognitive (e.g., nightmare, worry); behavioral (e.g., compulsive behavior); emotional (e.g., fear, anger, anxiety) and physiological (e.g., sleep disturbance) dimensions of COVID-19. In order to measure the level of anxiety among the respondents regarding COVID-19, five questions were asked to the respondents using a five-point Likert scale to assess the effect of COVID-19 on participants' mental health (see Appendix 1 for detail). Concern values were summed up to obtain score for this CAS where the sore ranges from 5 to 19.

5.2.4 Analytical tools

In this study we applied exploratory factor analysis (EFA), which is a multivariate statistical tool used for extracting the principal dimensions representing the physiological behavior of the respondents. For testing the normality of the data, maximum likelihood approach was used to minimize errors in the data. Cronbach's alpha was also estimated to assess the internal consistency.

Sample size is important in factor analysis model. Different opinions were found in this respect where the size varies significantly. However, the minimum sample requirement for performing EFA is between 100 and 1000 or more. This study satisfied this requirement as it dealt with a sample over 100. At the same time, sample to variable ratio and Kaiser–Meyer–Olkin (KMO), measure of sampling adequacy/Bartlett's test of sphericity were also used to assess the suitability of the data for EFA. To simplify the factor structure of a group of items, high item loadings on one factor and smaller item loadings on the other factors were imposed through using Principal Component Analysis (PCA) approach. Cumulative percentage of variance and eigenvalue were assessed in this study where cumulative percentage of variance was 50% or above with a minimum of three factors/variables were considered for factor analysis. Moreover, Cattell's scree plot test and parallel analysis were also conducted in this study. In case the actual Eigenvalue surpassed random ordered Eigenvalues, the factor was retained from the group of factors.

Following the results of EFA, we applied an ordinary least square (OLS) regression model to evaluate the socioenvironmental factors affecting the degree of coronavirus triggered anxiety (CAS). In this regard, we considered the dependent variable as the values of CAS while a bunch of explanatory variables including the predicted principal components were considered.

5.3 Results

5.3.1 Socioeconomic characteristics of the respondents

The descriptive statistics denote that most of the respondents (about 40%) were from Khulna region and the average household size is around 5 members in the study area. The study-result presents that about 90% of the respondents were between the age group 15–35 and among these respondents- 60% were male. Seventy one percent respondents reported to be unmarried while their literacy level (with average schooling years of 22 years) denotes that none of them were illiterate. Result also demonstrates that 80% respondents were Muslims and the rest 20% were followers of Hinduism. Male-female ratio was found to be approximately 1.50:1 in the study area. Nearly 33% respondents reported to have physically challenged members in their households and of this group, 13% of them suffered mental problems.

Though around 33% of the respondents were paid workers (employed), nearly 60% of them were students and about 5% were unemployed. The study shows that the housing condition of the sampled respondents was good enough since 71% households lived in a *Paka* houses (i.e., brick-built) and about 20% in a Semi-*Paka* (semi brick-built) houses. Moreover, 66% of the respondents owned a house and only 46% of them lived in a rented house. For their drinking water, 40 respondents availed own pump/tube-wells; about 17% used boiled or filtered water; 14% used supply line, and about 8% used bottle water. Composition of household-structure suggest that nearly 66% respondents were from nuclear family whereas nearly 20% was from joint family while only about 14% respondents

were from *Akannoborty* family (large joint family). Number of living rooms in the household was mostly found in between two and seven rooms (86%) with maximum of eight rooms. On the other hand, only about 4% households had less than two rooms and about 8% had more than seven rooms in their house.

Average monthly income of the respondents was found to be approximately BDT 28,500 (±36,739) while average monthly expenditure was about BDT 23,000 (±25,442). The income and expenditure distribution pattern denote that there existed a wide range of disparity among the respondents since the estimated standard deviation was so high in case of both income and expenditure.

This study also seeks for the socioenvironmental status of the localities of the respondents implying the environment of the locality was moderately noisy and highly secured to live in. Similarly, on an average frequency of criminal activity was also moderate around these localities.

5.3.2 Exploratory factor analysis

The latent components from the 39 variables with five-point Likert-scale items measuring the coronavirus-induced stress were explored by the exploratory factor analysis (EFA) using the maximum likelihood extraction method. The Kaiser-Meyer-Olkin (KMO) and Bartlett's test of sphericity analyses in the preliminary Principal Component Analysis (PCA) signified the sampling adequacy as the KMO value was 0.763, which is higher than the benchmark value of 0.600 (Hair et al., 2014; Tabachnik and Fidell, 2013), while the Bartlett's test of sphericity was also found significant (χ^2 [210] = 1484.933, $p < 0.001$). To determine the numbers of latent components, the decisions was guided by three-rules guideline, (i) Kaiser's criterion, (ii) Cattell's scree plot test, and (iii) Horn's parallel analysis (Pallant, 2011; Pallant and Bailey, 2005). The Kaiser's criterion based on eigenvalues were inconclusive as it suggests 10 factors with an eigenvalue of 1 and above. In contrast, the scree plot test endorses a four-factor solution by accepting the "higher scree" and ignoring the "lower scree" (Cattell, 1966). The four-factor solution and its utility was assessed further by comparing the eigenvalues from the PCA with the eigenvalues generated from the same size of random data set, where the factors with the eigenvalues exceeding the values from randomized data were retained for analysis (Horn, 1965; Watkins, 2000). The parallel analysis also recommends a four-factor solution. Moreover, (i) pattern coefficients >0.50 on one item for practical significance (Hair et al., 2014), (ii) ≥three items with salient pattern coefficients (Jones et al., 2017) and (iii) an internal consistency of ≥0.70 was considered for a meaningful and consistent factor structures (DeVellis, 2003). Table 5.1 presents results of PCA where 21 variables were obtained.

Based on the above-mentioned criteria, a four-factor solution was retained from the EFA, which was explained by 21 variables (out of 39 variables). Each of the factor was addressed by a cluster of variables. The explored four-factors correspond to (i) *agitation*, explaining 26.6% of the variance with a Cronbach's α of 0.89 (i.e., internal consistency), entailed the items associated with the fear of contamination in social interaction, (ii) *scarcity*, with an internal consistency of 0.90 explaining 14% variance, referred to the items related to the fear of shortage of basic commodities and amenities during the pandemic, (iii) *trauma*, with a total variance of 11% and internal consistency of 0.87, consisted of mental health issues triggered by the pandemic, and (iv) *infodemic*, referring to the over-exposure or access to information regarding the health situation, explained around 8% variance with an internal consistency of 0.82. The four-factor measurement of coronavirus stress, explaining 59% of the total variance with an overall reliability of 87%, indicates that the measurement could possibly be applicable for other similar studies. Therefore, results of EFA suggest- the stress of COVID-19 for respondents was governed by the aforesaid four factors- agitation, scarcity, trauma, and infodemic. Each of these factors was addressed by a cluster of variables. For example, agitation is represented by seven variables which reflect mostly the notion of socioeconomic and contaminating attributes posed by COVID-19; scarcity is represented by five variables mainly indicating xenophobic attribute of the respondents; trauma is represented by six variables exhibiting stress from xenophobic situation; and finally infodemic is represented by three variables showing the characteristics of checking with updates of COVID-19.

5.3.3 Socioenvironmental factors affecting COVID-19

At this point, we inspect the role of socioenvironmental factors on COVID-19 by applying an ordinary least squared (OLS) regression model presented in Table 5.2. While analyzing this OLS, we tested for multicollinearity and heteroscadisticity. This model encountered only heteroscadisticity problem and thus, we apply a weighted (ordinary) least squared (WLS) regression model by applying an analytical weight. For this analytical weight, we used the fourth power to 'number of ailments'. This time obtained results of the weighted regression model did not encounter neither heteroscadisticity problem ($\chi^2(1)$ = 1.58 ($p < 0.208$) nor multicollinearity problem (VIF = 2.18) For this regression model presented in Table 5.2, we considered scores of Coronavirus Anxiety Scale (CAS) as dependent variable

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1. Environmental modifications, degradation and human health risks

TABLE 5.1   Exploratory factor analysis ($N = 115$).

Items	Description	Communalities (extracted)	Factor Agitation	Scarcity	Trauma	Infodemic
CSS_18	I worry about taking change in cash transactions	0.739	0.850			
CSS_20	I worry that my postal mail has been contaminated by mail handlers	0.658	0.790			
CSS_17	I worry that people around me will infect me with the virus	0.565	0.739			
CSS_19	I worry that I might catch the virus from handling money or using ATM	0.589	0.709			
CSS_16	I worry that if someone coughed or sneezed near me, I would catch the virus	0.413	0.630			
CSS_15	I worry that if I touched something in public space (e.g., handrail, door handle), I would catch the virus	0.408	0.624			
CSS_14	If I was in an elevator with a group of people from other areas, I'd be worried that they are infected with the virus	0.398	0.619			
CSS_9	I worry about grocery stores running out of cleaning or disinfectant supplies	0.741		0.844		
CSS_11	I worry about departmental stores running out of drinking water	0.653		0.798		
CSS_8	I worry that grocery and departmental stores will close down	0.685		0.797		
CSS_10	I worry about drug-stores running out of cold or flu remedies	0.653		0.791		
CSS_7	I worry about grocery stores running out of food-items	0.500		0.680		
CSS_23	I had nightmare because I worried about the virus	0.748			0.797	
CSS_25	Reminders of the virus causes me to have physical reactions, such as- sweating or a pounding heart	0.604			0.756	
CSS_24	I think about the virus when I do not mean to	0.626			0.732	
CSS_21	I have trouble concentrating because I kept thinking about the virus	0.565			0.702	
CSS_26	I have nightmares about the uncertain future	0.502			0.647	
CSS_22	Disturbing mental images about the virus pop into my mind against my will	0.422			0.551	
CSS_28	I am always updated about COVID-19 infection status within the country	0.833				0.906
CSS_29	I am always updated about COVID-19 infection status outside the country	0.787				0.881
CSS_33	I have always received COVID-19 related necessary information	0.313				0.550
	Variance explained (percent)		26.586	13.530	11.213	7.722
	Cronbach's α		0.887	0.895	0.874	0.816

TABLE 5.2 Regression results on factors affection coronavirus-related anxiety.

Variables	Description	Coefficients (standard errors)
Agitation	Predicted first component	0.710** (0.280)
Scarcity	Predicted second component	0.626* (0.356)
Trauma	Predicted third component	0.297 (0.424)
Infomdemic	Predicted fourth component	−2.313*** (0.448)
Age	Years	0.236*** (0.0531)
Education	Year of schooling	−0.460*** (0.0832)
Living condition	*Reference group: soil and straw shed*	
	Soil and tin shed	1.078 (1.389)
	Soil, fence, and straw shed	−0.0253 (0.977)
	Semi-*Paka* (semi brick-built)	−3.359*** (1.096)
	Paka (brick-built)	−1.147 (1.910)
Source of water	*Reference group: own pump*	
	Supply line	−3.411*** (0.854)
	Boiled/filtered water	−1.647** (0.712)
	Bottled water	−3.594*** (0.795)
	Others	−4.004 (2.473)
Criminal activity	*Reference group: very low*	
	Neutral	−1.641*** (0.593)
	High	0.0977 (0.913)
	Very high	−0.319 (0.848)
Number of ailments	Reported number of illness from a household	1.172*** (0.182)
Constant		6.733** (2.945)
Observations		88
R-squared		0.928

Significant at 10% level.
**Significant at 5% level.*
***Significant at 1% level.*

while a number of relevant socioenvironmental factors were represented as explanatory variables. We also considered predicted values of the four principal components extracted via EFA as explanatory variables in this WLS model.

WLS regression results presented in Table 5.2 denote how socioenvironmental features affected the CAS. First (i.e., agitation) and second (i.e., scarcity) components of EFA exhibited a significant positive relationship with Coronavirus Anxiety Scale (CAS) implying as concerned degree of agitation and scarcity increased, COVID-19 related anxiety also increased. While the fourth component of EFA (infodemic) implied, access to information regarding the health situation lessened significantly the anxiety level during coronavirus pandemic. Other results suggest that elderly people significantly suffered from the coronavirus anxiety while the literate respondents were significantly less affected by anxiety level during coronavirus pandemic. Results on living condition in terms of structural settlement suggested that respondents living in semi brick-built houses significantly encountered lower degree of anxiety while respondents living in brick-built and relatively weakly built (made of soil, fence, and straw) houses also exhibited an inverse relationship with degree of corona-related anxiety though the results were not statistically significant. Sources of drinking water also exhibited significant inverse relationship with CAS denoting that sources

of drinking water such as supply line, boil filter, and bottle water abridged the degree of coronavirus related anxiety. A statistically significant inverse relationship was obtained for respondents' neutral notion on relationship between Criminal activity in respondents' surrounding areas and corona-related anxiety. The mean coefficient for ailments was found significantly different than zero with a positive sign implying that number of illness significantly escalated the degree of coronavirus anxiety level significantly. Though this WLS model could consider only 88 respondents, the overall goodness of fit of this model was found slightly over 90% indicating this model explained just over 90% variation in the dependent variable.

5.4 Conclusion

The COVID-19 pandemic has introduced a complex hazard for the people across the globe. The main objective of this study was to present an overall scenario on role of socioenvironmental factors on mental health of people during COVID-19 in the costal urban areas of Bangladesh. Major findings of this study suggest that during COVID-19, socioenvironmental factors have affected mental health of the people in different way with a different category. in addition, we have applied customized Composite COVID-19 Stress Index (CCSI) and Coronavirus Anxiety Scale (CAS) to realize the study objective. As analytical tool, exploratory factor analysis (EFA) and regression model were used. Variables used in CCSI model were broadly from five dimensions namely- fear of danger, socioeconomic vulnerability, traumatic stress, xenophobia and compulsive checking, and reassurance seeking; which all are consistent with the study by Taylor et al. (2020). On the other hand, variables of CAS were broadly from four dimensions such as- cognitive, behavioral, emotional, and physiological. Applying EFA with CCSI, four factors namely- agitation, scarcity, trauma, and infodemic have been obtained and these four factors are explained by 21 variables from a set of 39 variables (see Tables 5.1 and 5.2). Empirical results from EFA suggest that respondents were highly worried about being infected through social interaction because COVID-19 is a transmissible disease. In addition, the anxiety level seemed to hike the fear of uncertainty of future availability of essential commodities including food, water, and medicine. This finding is consistent with the study of Islam et al. (2020a). Thinking all the time about COVID-19 affects mental health by generating sleeping disorder as well as subconsciously setting up of a xenophobic scenario in mind. Therefore, respondents have been going through traumatic situation because of this current pandemic. Furthermore, using internet for COVID-19 treatments, information, and checking with body signs are some important issues that exacerbated societal instability. Findings of this study also denote that the respondents seemed to be overexposed while accessing to required information for their health situation.

Results from liner regression model (i.e., a Weighted Least Squared regression model) examine that fear of contamination in social interaction and shortage of basic amenities play a crucial role for boosting the degree of Coronavirus Anxiety Scale (CAS) during COVID-19 pandemic. In line with the result from the study by Fitzgerald and Wong (2020), empirical result of this study also suggests that fear of inadequate supply of food and medicine enhances the degree of anxiety. In contrast- infodemic, over-exposure or access to information regarding health implies an indirect relation with the degree of anxiety. Under this pandemic situation, people usually set an image of virus on mind and hence, they cannot pass a healthy day without thinking about the impact and aftermath uncertainty of their lives. At this point, socioenvironmental factors such as- age, education, living condition in terms of settlement type, sources of drinking water, criminal activity, and number of ailments significantly affect the degree of Coronavirus related anxiety during COVID-19 pandemic.

In this study we have applied two different tools- Composite COVID Stress Index (CCSI) and COVID Anxiety Scale (CAS). For the former one, we applied EFA and obtained four factors affecting respondents' stress level while for the latter one, we applied a linear regression model to figure out socioenvironmental factors affecting the degree of COVID-19 triggered anxiety. Though each of the said tools (i.e., CCSI and CAS) were used separately, concerned chi squared value implies that there exists a statistically significant difference between the observed and expected values of CCSI and CAS ($\chi^2(431) = 523.12$ ($p < 0.001$)). Considering the empirical findings, we come up with the following three policy recommendations:

First, sufficient medical facilities in terms of testing facility for COVID-19 and its related healthcare services need to be set up not only in coastal urban areas but also other areas of Bangladesh. This would enhance the testing frequency and as a result it would be possible to unveil the actual COVID-19 scenario in Bangladesh. In addition, all COVID-19 related treatments need to be offered at a reasonable cost so that people from all walks of life can afford it if they need it.

Second, presence of at least one psychological consultant in each medical center or hospital is very important during and after COVID-19 pandemic across Bangladesh. COVID-19 triggered degree of fear, anxiety, stress, depression, loneliness, and other mental issues need to be addressed with proper importance. In addition, psychological health services need to be ensured for the COVID-19 infected patients, suspected COVID-19 patients, quarantined individuals, and healthcare providers. This is also suggested by the study of Mamun and Griffiths (2020).

Third, people are availing various online services, especially consultation with doctors and specialists for their both physical and mental health. However, in some cases people may adopt inappropriate medication and practice by consulting and/or following misleading information from noncredible online sources due to their knowledge limitation. These may result significant adverse consequences for them in many cases. Thus, it is important for the concerned agencies in Bangladesh to ensure authentic and credible information sources and advisories for the people to fight against the COVID-19 related issues and situation.

As a final remark, we would like to suggest conducting comprehensive future studies incorporating both sociodemographic and socioenvironmental factors on mental health during COVID-19, impact of socioenvironmental factors on mental health after COVID-19 as well as issues those are not considered in this current study. Furthermore, same study could be directed with multivariate statistical tools and providing justification with the help of qualitative tools also.

Appendix 1

List of variables, their types, units, and adapted sources.

Sl. no.	Variable name	Variable type	Unit of measurement	Adapted source(s)
1	Age	Continuous	Years	Ahorsu et al., 2020 and Brennan et al., 2020
2	Sex	Binary	1 = Male 0 = Otherwise	Li and Liu, 2018
3	Marital status	Binary	1 = Married 0 = Unmarried	Pitpitan et al., 2012
4	Religion	Categorical	1 = Muslim 2 = Hindu 3 = Others	Lee, 2020
5	Education	Continuous	Years of schooling	Ahorsu et al., 2020 and Gavin et al., 2020
6	Employment status	Categorical	0 = Unemployed 1 = Police 2 = Healthcare staff 3 = Soldier 4 = Others	Gavin et al., 2020; Pitpitan et al., 2012
7	Income	Continuous	BDT per month	Gavin et al., 2020
8	Expenditure	Continuous	BDT per month	Gavin et al., 2020
9	Family type	Categorical	1 = Nuclear 2 = Joint 3 = *Akannoborty*	Li and Liu, 2018
10	Household ownership	Categorical	1 = Own 2 = Rental 3 = Sublate	Tunstall et al., 2014
11	Number of rooms	Continuous	Number	Li and Liu, 2018
12	Living environment	Categorical	1 = Most noisy to 5 = Least noisy	Li and Liu, 2018
13	Security status	Categorical	1 = Highly insecured to 5 = Highly secured	Li and Liu, 2018

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Sl. no.	Variable name	Variable type	Unit of measurement	Adapted source(s)
14	Rate of criminal activity	Categorical	1 = Very low to 5 = Very high	Li and Liu, 2018
15	Source of drinking water	Categorical	1 = Own pump 2 = Supply line 3 = Boiled or filtered 4 = Bottle water	Pitpitan et al., 2012
16	Number of household older than 15 years	Continuous	Number	Pitpitan et al., 2012
17	Number of female household greater than 15 years	Continuous	Number	Pitpitan et al., 2012
18	Number of children younger than 15 years	Continuous	Number	Pitpitan et al., 2012
19	Number of physically challenged household	Continuous	Number	Subramaniama et al., 2020
20	Number of mentally challenged household	Continuous	Number	Subramaniama et al., 2020
21	Times of household illness	Continuous	Number	Lee, 2020
22	Types of illness	Categorical	0 = No illness 1 = Fever, cold, cough, headache 2 = Only fever 3 = Asthma, rheumatics, distaste 4 = Others	Lee, 2020
23	Days of sufferings each time	Continuous	Number	Lee, 2020
24	Consulted a doctor	Binary	1 = Yes 0 = No	Lee, 2020
25	Days to recover	Continuous	Number	Lee, 2020
26	Medical service	Categorical	1 = Very dissatisfied to 5 = Very satisfied	Taylor et al., 2020
27	Join office	Binary	1 = Yes 0 = No	Taylor et al., 2020
28	Worried of affecting others	Categorical	1 = Highly disagreed to 5 = Highly agreed	Ahorsu et al., 2020 and Taylor et al., 2020
29	Worried of affecting household members	Categorical	1 = Highly disagreed to 5 = Highly agreed	Taylor et al., 2020
30	Insufficient health care system	Categorical	1 = Highly disagreed to 5 = Highly agreed	Taylor et al., 2020
31	Inefficient health care system	Categorical	1 = Highly disagreed to 5 = Highly agreed	Taylor et al., 2020
32	Insufficient basic hygiene	Categorical	1 = Highly disagreed to 5 = Highly agreed	Taylor et al., 2020
33	Dissent of social distancing	Categorical	1 = Highly disagreed to 5 = Highly agreed	Taylor et al., 2020
34	Grocery item will run out	Categorical	1 = Highly disagreed to 5 = Highly agreed	Taylor et al., 2020
35	Grocery will close down	Categorical	1 = Highly disagreed to 5 = Highly agreed	Taylor et al., 2020
36	Cleaning item will run out	Categorical	1 = Highly disagreed to 5 = Highly agreed	Taylor et al., 2020

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Sl. no.	Variable name	Variable type	Unit of measurement	Adapted source(s)
37	Cold, flu remedies will run out	Categorical	1 = Highly disagreed to 5 = Highly agreed	Taylor et al., 2020
38	Drinking water will run out	Categorical	1 = Highly disagreed to 5 = Highly agreed	Taylor et al., 2020
39	People from other areas are spreading the virus	Categorical	1 = Highly disagreed to 5 = Highly agreed	Taylor et al., 2020
40	Worried of affecting from restaurants	Categorical	1 = Highly disagreed to 5 = Highly agreed	Taylor et al., 2020
41	Worried of affecting from elevator	Categorical	1 = Highly disagreed to 5 = Highly agreed	Taylor et al., 2020
42	Worried of public place	Categorical	1 = Highly disagreed to 5 = Highly agreed	Taylor et al., 2020
43	Worried of others' coughing or sneezing	Categorical	1 = Highly disagreed to 5 = Highly agreed	Taylor et al., 2020
44	Worried of people having cold around	Categorical	1 = Highly disagreed to 5 = Highly agreed	Taylor et al., 2020
45	Worried of taking cash-change by hand	Categorical	1 = Highly disagreed to 5 = Highly agreed	Taylor et al., 2020
46	Worried of using ATM for cash withdraw	Categorical	1 = Highly disagreed to 5 = Highly agreed	Taylor et al., 2020
47	Worried of mail contamination by the virus	Categorical	1 = Highly disagreed to 5 = Highly agreed	Taylor et al., 2020
48	Trouble in concentrating to anything	Categorical	1 = Highly disagreed to 5 = Highly agreed	Taylor et al., 2020
49	Popped up virus images	Categorical	1 = Highly disagreed to 5 = Highly agreed	Taylor et al., 2020
50	Trouble in sleeping	Categorical	1 = Highly disagreed to 5 = Highly agreed	Taylor et al., 2020
51	Unwillingly think about the virus	Categorical	1 = Highly disagreed to 5 = Highly agreed	Taylor et al., 2020
52	Physical reactions if think about the virus	Categorical	1 = Highly disagreed to 5 = Highly agreed	Ahorsu et al., 2020 and Taylor et al., 2020
53	Having nightmares about Covid-19 virus	Categorical	1 = Highly disagreed to 5 = Highly agreed	Taylor et al., 2020
54	Covid-19 situation affected office services	Categorical	1 = Highly disagreed to 5 = Highly agreed	Taylor et al., 2020
55	Updated with Covid-19 information within country	Categorical	1 = Highly disagreed to 5 = Highly agreed	Taylor et al., 2020
56	Updated about outside countries	Categorical	1 = Highly disagreed to 5 = Highly agreed	Taylor et al., 2020
57	Covid-19 is transfering from one to another	Categorical	1 = Highly disagreed to 5 = Highly agreed	Taylor et al., 2020
58	More dangerous than other virus	Categorical	1 = Highly disagreed to 5 = Highly agreed	Ahorsu et al., 2020 and Taylor et al., 2020
59	Unaware of Covid-19 treatment	Categorical	1 = Highly disagreed to 5 = Highly agreed	Taylor et al., 2020
60	Receiving Covid-19 information	Categorical	1 = Highly disagreed to 5 = Highly agreed	Taylor et al., 2020

(continued)

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Sl. no.	Variable name	Variable type	Unit of measurement	Adapted source(s)
61	Following all instructions	Categorical	1 = Highly disagreed to 5 = Highly agreed	Taylor et al., 2020
62	Created suicidal thoughts	Categorical	1 = Highly disagreed to 5 = Highly agreed	Ahorsu et al., 2020; Lee, 2020 and Taylor et al., 2020
63	Wanted mental support from family	Categorical	1 = Highly disagreed to 5 = Highly agreed	Taylor et al., 2020
64	Had sleeping pill	Categorical	1 = Highly disagreed to 5 = Highly agreed	Taylor et al., 2020
65	Worried of using public transport	Categorical	1 = Highly disagreed to 5 = Highly agreed	Taylor et al., 2020
66	Worried of losing job	Categorical	1 = Highly disagreed to 5 = Highly agreed	Taylor et al., 2020
67	Headache or senseless hearing of Covid-19	Categorical	1 = Not at all 2 = Rarely 3 = Sometimes 4 = Most often 5 = Always	Ahorsu et al., 2020 and Lee, 2020
68	Sleep disturbance	Categorical	1 = Not at all 2 = Rarely 3 = Sometimes 4 = Most often 5 = Always	Ahorsu et al., 2020 and Lee, 2020
69	Asleep thinking of Covid-19	Categorical	1 = Not at all 2 = Rarely 3 = Sometimes 4 = Most often 5 = Always	Ahorsu et al., 2020 and Lee, 2020
70	Loss of appetite while thinking of Covid-19	Categorical	1 = Not at all 2 = Rarely 3 = Sometimes 4 = Most often 5 = Always	Lee, 2020
71	Felt vomiting while thinking of Covid-19	Categorical	1 = Not at all 2 = Rarely 3 = Sometimes 4 = Most often 5 = Always	Lee, 2020

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