



Research article

Exploring COVID-19 stress and its factors in Bangladesh: A perception-based study

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ABSTRACT

Background: The COVID-19 pandemic has aggregated mental health sufferings throughout the entire world. Suicide completions are the extreme consequences of COVID-19 related psychological burdens, which was reported in many countries including Bangladesh. However, there are lack of study assessing COVID-19 related human stress and its' associations with other relevant factors affecting quality of life in the country, and which were explored in the present study.

Methods: An online based survey was carried out among 340 Bangladeshi adult populations (65.90% male; mean age 26.23 ± 6.39) by utilizing the socio-demographics, possible human stress due to COVID-19 pandemic and its consequences. Dataset were analysed through a set of statistical tools e.g., T-test, one-way ANOVA, Pearson's Correlation Matrix (PCM), Principal Component Analysis (PCA), and Cluster Analysis (CA).

Results: About 85.60% of the participants are in COVID-19-related stress, which results in sleep shortness, short temper, and chaos in family. Fear of COVID-19 infection (i.e., self and/or family member(s), and/or relatives), hampering scheduled study plan and future career, and financial difficulties are identified as the main causes of human stress. Results of PCM explain the relationship among the factors of human stress, and found economic hardship and food crisis are linked together causes stress of mass people, while hamper of formal education and future plan create stress of career seeker. T-test, and one-way ANOVA illustrate demographic characteristics (i.e., occupation, age, gender, and marital status) have significant effects on elevated mental stress. Moreover, PCA and CA results revealed significant interface among the respondents' perception and factors of human stress, which matched with the existing scenario of the country.

Conclusions: Considering the present findings, it is essential to introduce time-oriented policy, and implement care monitoring plans in the country, which may help in managing the pandemic as well as nurturing the public mental health to combat COVID-19 related psychological challenges.

1. Introduction

Since December 2019, the sought-after coronavirus disease (COVID-19) pandemic originating from the epicentre, Wuhan, China, started to spread quickly throughout the world (Wang et al., 2020). Scientifically, the virus is named Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) (Sakib et al., 2020) and will be referred to as coronavirus

and the disease as COVID-19 in this paper. The most common COVID-19 symptoms are fever, fatigue, dry cough, myalgia, dyspnoea etc. that may develop within 2–14 days of infection through respiratory droplets and close contact (Naser et al., 2020; Wang et al., 2020). However, due to its rapid worldwide exposure and the challenges it brought with, the World Health Organization had to declare it to be a pandemic in early March 2020. As of 23 May, 2020, affecting all but a few countries and territories,

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a total 5,103,006 cases (and 333,401 deaths) were confirmed around the world (WHO, 2020). Bangladesh reported the first COVID-19 case on March 8, 2020 (Satu et al., 2020) and the virus spread slowly in the initial period although, a rapid case increment started in April. A total of 141,801 people is contaminated with the virus and 1783 deaths in the country as of 29 June, 2020 (Figure 1). Likely the global trend aiming social distancing without emergencies, the country adopted lockdown as named general holidays since March 26 to 31 May 2020 (Bodrud-Doza et al., 2020a).

Along with the fear of infection to this highly contagious virus, fear of losing beloved ones, the COVID-19 related misinformation spreading, the lack of medical treatment, and the shortage of properly equipped units to treat the patients, the lockdown-related issues (i.e., prolonged home isolation, social distancing, food insecurity, fear of unemployment, loss of income etc.) are being sought to be associated with mental distresses like depression, anxiety, phobia, insomnia, trauma etc (Ahorsu et al., 2020a, b; Brooks et al., 2020; de Lima et al., 2020; Hossain et al., 2020a; Naser et al., 2020; Pakpour and Griffiths, 2020; Pakpour et al., 2020a, b; Rahman et al., 2020; Sakib et al., 2020; Tasnim et al., 2020). But, as the world is being arguably failed to combat with the physical treatments of the COVID-19, the mental health portion is somewhat being neglected or overseeing (Usman et al., 2020). Consequently, suicide rate increment is common during and aftermath of the pandemics that was also reported in the COVID-19 pandemic context too (e.g., Bhuiyan et al., 2020; Dsouza et al., 2020; Griffiths and Mamun, 2020; Mamun and Griffiths, 2020a; Mamun and Ullah, 2020; Shoib et al., 2020), where the mental health problems and its mediators aggravate the suicide risk (Jahan et al., 2020; Mamun and Griffiths, 2020b, c; Mamun et al., 2020d, e).

Individuals' physical performance as well as immunological stability are somewhat correlated with psychological states (Naser et al., 2020). But studies reported elevated psychological problems and decreased quality of life across nations and occupations (e.g., healthcare professionals to general people; Brooks et al., 2020; Naser et al., 2020; Pappa et al., 2020; Wang et al., 2020), which are reflecting the forthcoming worst mental as well as physical health situations to the risky people. Besides, most of the global COVID-19 studies are arguably concerned with infection control, effective vaccine, and treatment and its' spread and forecasting (Ahorsu et al., 2020a, b; Dsouza et al., 2020); hence, the psychological aspects are warranted to be investigated in a country like Bangladesh, whereas a few prior studies are done to the authors best knowledge (e.g., Bodrud-Doza et al., 2020a, c; Hossain et al., 2020b; Shammi et al., 2020). The government implemented an extensive public health awareness campaign and declared a stimulus package of USD 8.4

billion to be distributed in different sectors although, mental well-being strategies are not considered to be focused in the country (Star Online Report, 2020). Besides, as the Bangladeshi people are under lockdown, or quarantine, or social distance since of March 2020, it is anticipated that the probable direct or indirect psychiatric sufferings can be risen that was also reflected by COVID-19 related suicide occurrences in the country (Bhuiyan et al., 2020; Mamun and Griffiths, 2020a). Thus, the present study attempted to investigate the relationships between human COVID-19 stress with basic demographic, fear of infection, and insecurity-related variables, which can be helpful in facilitating mental health policies and strategies during the COVID-19 crisis period.

2. Methods

2.1. Participant and procedure

An online survey was conducted from 5 to 15 May 2020 among the Bangladeshi adult residents. An introductory paragraph describing the objective of the study as well as ethical issues of participating were shared to the respondents through emails, and social platforms e.g., Facebook, Messenger, LinkedIn and WhatsApp. To ensure participants from all the occupations, we formed a research team consisting with 15 members and it was told to share the online survey link from their online platforms, where all age groups are exposed. The team created a database of target participants through social media screening based on their occupation, education, knowledge, attitude and activities related to COVID-19. We collected 25 response based on purposive sampling method from each member. Approximately 370 participants were approached and of these, 340 of them partook in the survey (65.90% male and mean age = 26.23 [\pm 6.39] years). A flowchart describing the research methodology is presented in Figure 2.

2.2. Study measures

In considering the study aim (i.e., possible human stress due to COVID-19 pandemic), a self-developed question was applied in considering the stressors related to COVID-19 pandemic in Bangladesh. Besides, the questionnaire included basic socio-demographics (e.g., age, gender, occupation and marital status), fear and anxiety related to COVID-19 among the population (e.g., existing healthcare facilities, afraid of taking treatment, anxiety for family members etc.), insecurity related questions (e.g., towards job-career, financial supports, food supply, and study and future plan aftermath the lockdown), and social media analysis

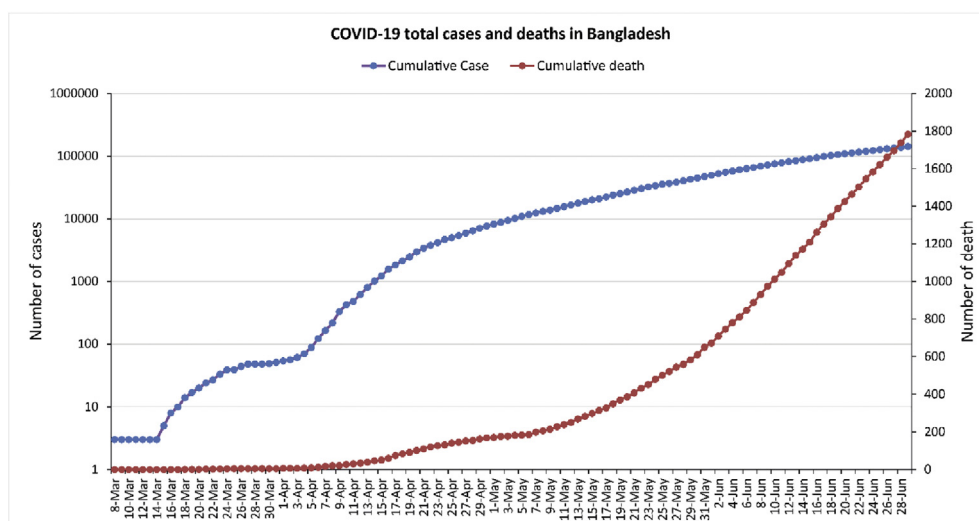


Figure 1. COVID-19 cases and deaths in Bangladesh as of 29 June 2020.

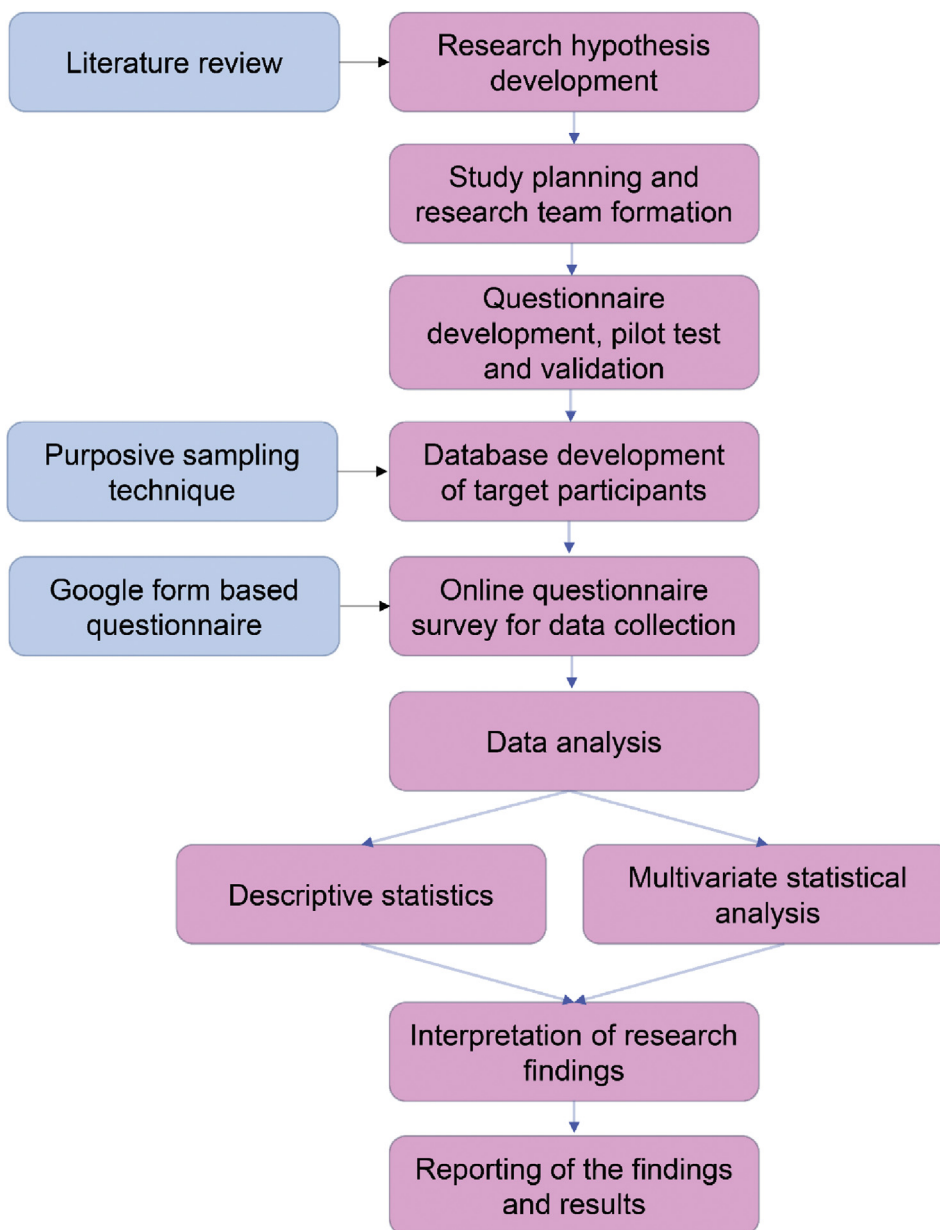


Figure 2. Research methodology flowchart.

Table 1. Descriptive statistics of the factors related to COVID-19 stress (n=340).

| Items | Mean | Std. error of mean | Median | Mode | Std. Dev. | Variance | Skewness | Kurtosis | Min. | Max. |
|--|------|--------------------|--------|------|-----------|----------|----------|----------|------|------|
| COVID-19 created fear in life (S1) | 4.67 | 0.08 | 5 | 5 | 1.45 | 2.11 | -1.21 | 0.54 | 1 | 6 |
| Afraid of taking any other health facilities or treatment (S2) | 3.94 | 0.10 | 5 | 5 | 1.79 | 3.19 | -0.57 | -1.09 | 1 | 6 |
| Feeling economical stress (S3) | 4.45 | 0.09 | 5 | 6 | 1.64 | 2.70 | -0.89 | -0.40 | 1 | 6 |
| Feeling stress in the fear of losing job (S4) | 3.16 | 0.10 | 3 | 1 | 1.93 | 3.74 | 0.17 | -1.52 | 1 | 6 |
| Feeling stress in managing food (S5) | 3.86 | 0.09 | 4 | 5 | 1.69 | 2.87 | -0.46 | -1.09 | 1 | 6 |
| Feeling stress for family members (S6) | 5.21 | 0.06 | 6 | 6 | 1.11 | 1.23 | -1.84 | 3.59 | 1 | 6 |
| Feeling stress as formal education/study is hampered (S7) | 3.99 | 0.11 | 5 | 6 | 1.94 | 3.75 | -0.54 | -1.28 | 1 | 6 |
| Feeling stress while thinking about future career (S8) | 4.75 | 0.09 | 5 | 6 | 1.58 | 2.50 | -1.27 | 0.44 | 1 | 6 |
| Stress increases while getting the updated news from TV and social media about COVID-19 (S9) | 4.65 | 0.08 | 5 | 5 | 1.43 | 2.05 | -1.14 | 0.44 | 1 | 6 |
| Having insufficient sleep due to mental pressure (S10) | 3.62 | 0.09 | 4 | 6 | 1.74 | 3.03 | -0.16 | -1.24 | 1 | 6 |
| Mental pressure creating short temper (S11) | 3.78 | 0.10 | 4 | 6 | 1.81 | 3.28 | -0.29 | -1.29 | 1 | 6 |
| Mental pressure creating chaos in the family (S12) | 3.24 | 0.09 | 3 | 1 | 1.71 | 2.93 | 0.11 | -1.23 | 1 | 6 |
| Stress influence mind to commit suicide (S13) | 2.09 | 0.07 | 2 | 1 | 1.37 | 1.87 | 1.29 | 0.96 | 1 | 6 |

(e.g., Facebook, WhatsApp etc.). Besides, effects of stress on individual's life (e.g., having insufficient sleep, create short temper, making chaos in family, and influence mind to suicide etc.) were assessed using a self-developed six-point Likert scale (1–6) for testing the statement descriptions that ranged from not applicable to strongly agree with the statements (Table 1).

2.3. Ethics

The consent of the respondents was taken before the survey, and they remained anonymous. All the participants were informed about the specific objective of this study before proceeding to fill-up the questionnaire. Participants were able to complete the survey only once and could terminate the survey at any time they desired. Anonymity and confidentiality of the data were ensured. Formal ethical permission of this study was taken from the respective authority (i.e., Institute of Allergy and Clinical Immunology of Bangladesh, Savar, Dhaka, Bangladesh).

2.4. Data analysis

The descriptive statistics (e.g., frequencies, percentages, T-test and one-way ANOVA) were employed to understand respondents' basic characteristics. Investigation of psychometric characteristics was included in the Classical Test Theory (CTT) analysis. A set of statistical techniques including Pearson Correlation Matrix (PCM), Principal Component Analysis (PCA) and Hierarchical Cluster Analysis (CA) were applied to explore the association between the studied factors of human stress. PCA is a data reduction tool that demonstrates each potentiality of parameters and their confidence level in large sample datasets. Before conducting the PCA, Kaiser-Maier-Olkin (KMO) and Bartlett's Sphericity tests were applied to confirm the necessity of this analysis. The results of the KMO > 0.5 (the KMO value was 0.781 in this study) and the significance of Bartlett's sphericity test at $p < 0.01$ supported our datasets to be fitted for the PCA (Bodrud-Doza et al., 2016). The number of factors chosen was based on the Kaiser's Principle, where the only factors with eigenvalues > 1.0 were considered. Cronbach's alpha was employed to test the consistency and reliability of the factor loadings in this study. Cronbach's alpha values > 0.6 (the Cronbach's alpha value was 0.81) are regarded to be suitable in social science research (DeVellis, 1991; Shammi et al., 2020). The Pearson correlation and CA is a crucial means of detecting associations among the items. CA assists to demarcate a population into various groups based on the same feature of a set of the dataset that may reveal causes, effects, and or the source of any unidentified relationships among the items. Furthermore, hierarchical clustering was used to determine the probable number of clusters. Statistical Package for the Social Science (SPSS) v. 25.0 was used for the analysis of the datasets.

3. Results and discussion

3.1. Respondents' profile

A total of 340 participants attended the online survey, among which the percentage of male and female was 65.90% and 34.10% respectively, and the composition of age groups were 18–30 years (71.52%), 31–40 years (17.95%), 41–50 years (8.18%), 51–60 years (1.47%), and >60 years (0.88%) old. It was found that, the frequency of young participants is higher than older and mid-age group because of frequent access and use habit of internet existing in the country (Mamun and Griffiths, 2019). Among the participants, 70% is single, 29.10% is married and 0.9% is in an affair at the time of study. However, in terms of occupation status, more than half of the respondents were students (56.8%) although, other groups such as teacher (5.3%), government service holder (3.2%), private service holder (19.1%), businessman (2.9%), unemployed (5.6%), and others (7.1%) participated in the study.

3.2. COVID-19 and psychological stress

Like other parts of the world, infection rate of COVID-19 is rising through community transmission. Among the 340 respondents of this study, nearly 43.20% ($n = 147$) claimed COVID-19 positive case(s) was identified in their community. The measures taken by the government to control the spread of virus, along with the fear of infection creates anxiety and psychological distresses of the people, like other developing countries (Brooks et al., 2020). However, in the present sample, 85.60% ($n = 291$) of the total respondents reported to be in stress due to the COVID-19 outbreak, which identified via asking a simple question. Consistent with other studies (e.g., Ahorsu et al., 2020a, b; Liebrezn et al., 2020; Torales et al., 2020; Qiu et al., 2020; and Zhang and Ma, 2020), the COVID-19 stress mediating factors included to be – (i) tension of personal, and/or family member(s), and/or relative(s) infection, (ii) disruption of normal flow of education and future plans, (iii) rising financial difficulties, (iv) losing jobs, (v) creating uncertainty of future career, (vi) increasing food crisis in the forthcoming days, (vii) sickness of respondents him/herself, and/or family member(s), and/or relatives, and taking medical treatment into hospitals and so on. However, most of the respondents claimed getting infection of own self and/or family member(s) and/or relatives by COVID-19, hampering scheduled study plan and future career, and financial difficulties as the main causes of stress (Figure 3). About 49 (14.40%) respondents reported they have no stress, because they have no family responsibility and others issues to create mental stress. Another thing was indicated by less stressed people is that they tend to take everything easy (either more resilient to traumatic event or not enough aware to realize the consequences of COVID-19 amid the threatening status throughout the world), and try to find happiness in every situation instead of being stressed out.

However, Table 1 depicts the descriptive statistics of the studied statement, factors of human stress and its' effects because of COVID-19. It is found that, COVID-19 created fear in most of the respondent's life (S1), with mean value of 4.67 in scale of 1–6 (1 denoting not applicable to 6 denoting highly agree). The mean value of reason of fear and stress S2–S8 ranging from 3.16 to 5.21 indicates highly agree with the statement. Respondents claimed, getting updated news of COVID-19 from television and other media is increasing the stress. The mean value (4.65) of the participant's response indicates the strength of claim. The fear and stress of COVID-19 (S10–S12) hampers the sound sleep (mean 3.62), creating short temper (mean 3.78), and making chaos in the family life (mean 3.24) of respondents. Similar findings are also reported by Cellini et al. (2020) in Italy, and Barkur and Vibha (2020) in India. Furthermore, the most destructive consequence of the stress noted was threat to take their lives (i.e., thinking about committing suicide). For instance, the mean value of the statement S13 regarding this issue is 2.09, indicates a group of people is feeling disturbed with the existing situation, and want to end their life. However, pandemic situation exacerbated the psychological issues especially depression, post-traumatic stress, adjustment disorder, and fear, which are some of the most common suicide causalities (Mamun and Griffiths, 2020d, e). Similarly, economic stress related to the COVID-19 crisis, such as rising poverty, economic recession, and unemployment rate aggregate the mental instabilities leading to suicide occurrences (Mucci et al., 2016; Oyesanya et al., 2015; Rafi et al., 2019); these incidences have been reported in Bangladesh and neighbourhood countries India, and Pakistan (Bhuiyan et al., 2020; Dsouza et al., 2020; Mamun and Ullah, 2020).

3.3. Causes and factors controlling the stress: results of statistical analysis

3.3.1. Relationship assessment

Pearson correlation matrix (PCM) is applied in this study to describe the relationship of the studied factors/variable of the human stress (Table 2). A strong significant correlation is found among the statement S3 and S5, indicates economic difficulties and crisis of food is linked together, which creates mental stress of the respondents. Besides,

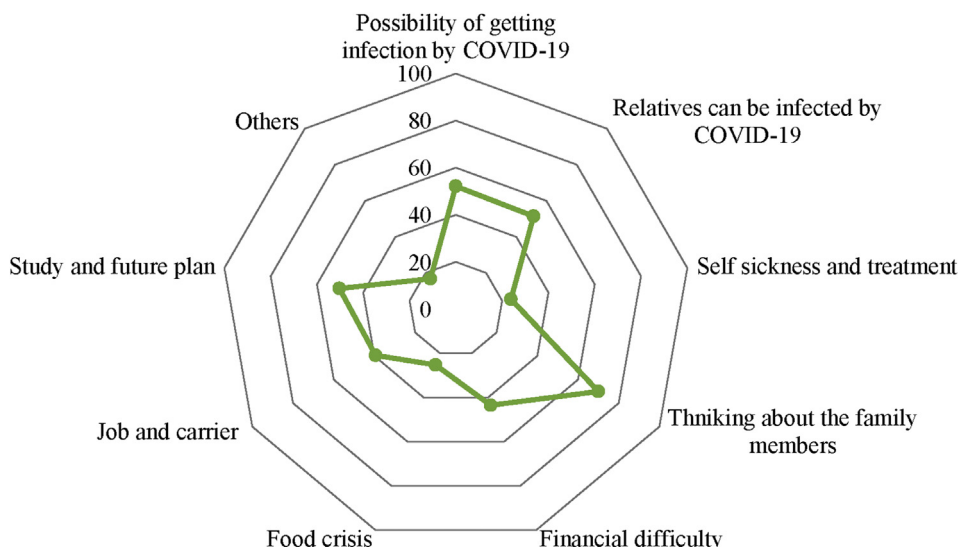


Figure 3. Radar diagram showing the participants' perception of the causes of stress in the time of COVID-19 pandemic.

Table 2. Pearson correlation matrix of the studied factors of human stress (significant values (>0.5) are in bold type face).

| Components | S1 | S2 | S3 | S4 | S5 | S6 | S7 | S8 | S9 | S10 | S11 | S12 | S13 |
|------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|-----|
| S1 | 1 | | | | | | | | | | | | |
| S2 | .422** | 1 | | | | | | | | | | | |
| S3 | .245** | .332** | 1 | | | | | | | | | | |
| S4 | .191** | .174** | .440** | 1 | | | | | | | | | |
| S5 | .313** | .289** | .623** | .448** | 1 | | | | | | | | |
| S6 | .430** | .297** | .294** | .140** | .286** | 1 | | | | | | | |
| S7 | .107* | .131* | .123* | 0.06 | 0.079 | .260** | 1 | | | | | | |
| S8 | .187** | .110* | .326** | .294** | .174** | .403** | .543** | 1 | | | | | |
| S9 | .394** | .402** | .167** | 0.097 | .213** | .235** | 0.078 | 0.067 | 1 | | | | |
| S10 | .347** | .306** | .260** | .210** | .304** | .209** | .187** | .164** | .427** | 1 | | | |
| S11 | .390** | .223** | .263** | .263** | .253** | .199** | 0.09 | 0.104 | .437** | .641** | 1 | | |
| S12 | .264** | .184** | .330** | .220** | .283** | .122* | 0.088 | 0.096 | .289** | .450** | .585** | 1 | |
| S13 | .177** | .185** | .133* | .213** | .179** | 0.032 | 0.033 | 0.038 | .147** | .289** | .317** | .351** | 1 |

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

between the statement S7 and S8, significant strong correlation is also found, which illustrates the relationship of formal education and future career, which creates stress of the young age respondent's life. Again, significant positive correlation is found within the statement S10 and S11, and S11 and S12 linked with the effects of stress. For instance, mental pressure results insufficient sleep is creating short temper, and chaos in the family and social life. [Jakovljevic et al. \(2020\)](#), and [Restubog et al. \(2020\)](#) also found lockdown and fear of COVID-19 create mental stress, which relates with sleep shortness, creates short temper and making chaos in family life.

Again, T test and ANOVA test were employed to determine the correlation between the factors of stress and respondent's demographic characteristics. From the result of T-test, it was found that, demographic items e.g., occupation, age, gender and marital status have significant effect on mental stress (Table 3). Moreover, the results of ANOVA test indicate, respondent's occupation has significant effects ($p < 0.01$) on the statement S3, S4, S7, and S8 (Supplementary Table S1). Occupation is an important factor which control human stress. For instance, third and fourth statement (S3, S4) stated about the economic or financial related stress, and stress in the fear of losing job, which are closely linked with the respondent's profession. [Mucci et al. \(2016\)](#) reported unemployment,

stuff reduction, and wage minimization, are linked with mood disorders, anxiety, depression, dysthymia, and even suicide. Due to lockdown of COVID-19, huge number of people are now losing jobs in Bangladesh, especially the people of hand to mouth categories. For instance, the extreme economic fallout among the hand to mouth living Bangladeshi people was reported to be per capita income dropped by 79% in the rural area, which was 82% for slums people within February to early April ([Kamruzzaman, 2020](#)). This increased financial crisis creates multiple problems like unavailability of foods, treatment, and many more. Consequently, life threatening situations are being reported due to scarcity of food and poverty in the country; that is, all but one Bangladeshi COVID-19 suicides are accounted for these financial issues ([Bhuiyan et al., 2020](#); [Mamun and Griffiths, 2020a](#)). However, seventh and eighth statement (S7, S8) is applicable for student, who are in stress because of hampering study and also for their future career. Because, due to lockdown of COVID-19, and close down of educational institution graduation time will delay, which ultimately effect on the future career of the students. Age of the respondents has also significant effects on statement S7 and S8 (Table S1). Student and career seeker are usually the early age group represents more than half of the respondents. These young age people are now feeling stressed as hampering their

Table 3. Results of T-test indicating the association between studied factors and socio-demographics.

| Items | t | df | Sig. (2-tailed) | Mean Difference | 95% Confidence Interval of the Difference | |
|----------------|--------|-----|-----------------|-----------------|---|---------|
| | | | | | Lower | Upper |
| Occupation | 23.048 | 339 | 0 | 2.51176 | 2.2974 | 2.7261 |
| Age | 75.658 | 339 | 0 | 26.22353 | 25.5418 | 26.9053 |
| Gender | 52.085 | 339 | 0 | 1.34118 | 1.2905 | 1.3918 |
| Marital status | 67.383 | 339 | 0 | 1.71765 | 1.6675 | 1.7678 |
| Presence | 58.263 | 339 | 0 | 1.56765 | 1.5147 | 1.6206 |
| MS | 59.98 | 339 | 0 | 1.14412 | 1.1066 | 1.1816 |
| S1 | 59.328 | 339 | 0 | 4.66765 | 4.5129 | 4.8224 |
| S2 | 40.652 | 339 | 0 | 3.93824 | 3.7477 | 4.1288 |
| S3 | 49.944 | 339 | 0 | 4.45294 | 4.2776 | 4.6283 |
| S4 | 30.187 | 339 | 0 | 3.16471 | 2.9585 | 3.3709 |
| S5 | 42.089 | 339 | 0 | 3.86471 | 3.6841 | 4.0453 |
| S6 | 86.697 | 339 | 0 | 5.20588 | 5.0878 | 5.324 |
| S7 | 37.952 | 339 | 0 | 3.98529 | 3.7787 | 4.1918 |
| S8 | 55.386 | 339 | 0 | 4.75 | 4.5813 | 4.9187 |
| S9 | 59.867 | 339 | 0 | 4.65 | 4.4972 | 4.8028 |
| S10 | 38.372 | 339 | 0 | 3.62353 | 3.4378 | 3.8093 |
| S11 | 38.505 | 339 | 0 | 3.77941 | 3.5863 | 3.9725 |
| S12 | 34.898 | 339 | 0 | 3.24118 | 3.0585 | 3.4239 |
| S13 | 28.258 | 339 | 0 | 2.09412 | 1.9484 | 2.2399 |
| Support | 61.697 | 339 | 0 | 1.62353 | 1.5718 | 1.6753 |

institutional education and their future career. Gender difference has not found any significant effects on psychological stress, but marital status of the respondents has relation with stress.

3.3.2. Consistency of respondent's perception

Multivariate statistical tools i.e., principal component analysis (PCA), and cluster analysis (CA) were applied in this study to examine the interface between the respondent's perception and factors responsible for human stress. PCA was performed using Varimax rotation with Kaiser Normalization, which used to maximize the sum of variance of the factor coefficients (Ahmed et al., 2019; Bodrud-Doza et al., 2019, 2020b), which better explains the possible causes of human stress. However, the calculated factor loadings together with cumulative percentage and percentages of variance are depicted in Table 4. From PCA a total of 4 factors or principal components (PCs) were extracted, which represents 64.109% of total variance. The scree plot was adopted to detect the number of PCs to be retained to insights into the underlying variable structure (Figure 4a), while plot of rotation matrix exhibits the significant

associations among the studied variables (Figure 4b). Generally, the loadings score is demarcated into three classes of strong (>0.75), moderate (0.75–0.50) and weak (0.50–0.30) respectively (Wang et al., 2017).

The first principal component (PC1) elucidated 18.229% of the total variance encompass a significant level of positive loading of the effects of mental stress which creates short temper (S11: 0.796), and chaos in the family (S12: 0.760); and moderate positive loading of insufficient sleep (S10: 0.703), and influence to suicide (S13: 0.614) (Table 4). The initiatives of virus protection (e.g., lockdown, isolation, social distancing etc) creates burden for the mass people in Bangladesh, which ultimately create mental stress and chaos in family as well as society. PC2 elucidated 16.796% of the total variance, with moderate positive loading of fear created in life because of COVID-19 outbreak (S1: 0.726), along with taking health care facilities and treatment (S2: 0.711), anxiety for family members (S6: 0.587), and during the time of getting updated news from TV and social media (S9: 0.675) (Table 4). Now, mass peoples are trying to avoid hospitals and clinic except for emergency because of the fear of virus infection. At the same time, due to fear of virus infection,

Table 4. Varimax rotated principle components analysis of the studied factors.

| Items | PC1 | PC2 | PC3 | PC4 |
|---------------|--------|--------|--------|--------|
| S1 | 0.2 | 0.726 | 0.149 | 0.094 |
| S2 | 0.081 | 0.711 | 0.22 | -0.001 |
| S3 | 0.13 | 0.214 | 0.795 | 0.143 |
| S4 | 0.22 | -0.034 | 0.741 | 0.109 |
| S5 | 0.144 | 0.274 | 0.782 | 0.002 |
| S6 | -0.078 | 0.587 | 0.199 | 0.451 |
| S7 | 0.102 | 0.05 | -0.054 | 0.856 |
| S8 | 0.02 | 0.062 | 0.263 | 0.844 |
| S9 | 0.372 | 0.675 | -0.061 | -0.03 |
| S10 | 0.703 | 0.35 | 0.073 | 0.149 |
| S11 | 0.796 | 0.298 | 0.089 | 0.053 |
| S12 | 0.760 | 0.097 | 0.206 | 0.037 |
| S13 | 0.614 | -0.04 | 0.165 | -0.037 |
| Total | 2.37 | 2.184 | 2.062 | 1.719 |
| % of variance | 18.229 | 16.796 | 15.86 | 13.223 |
| Cumulative % | 18.229 | 35.025 | 50.885 | 64.109 |

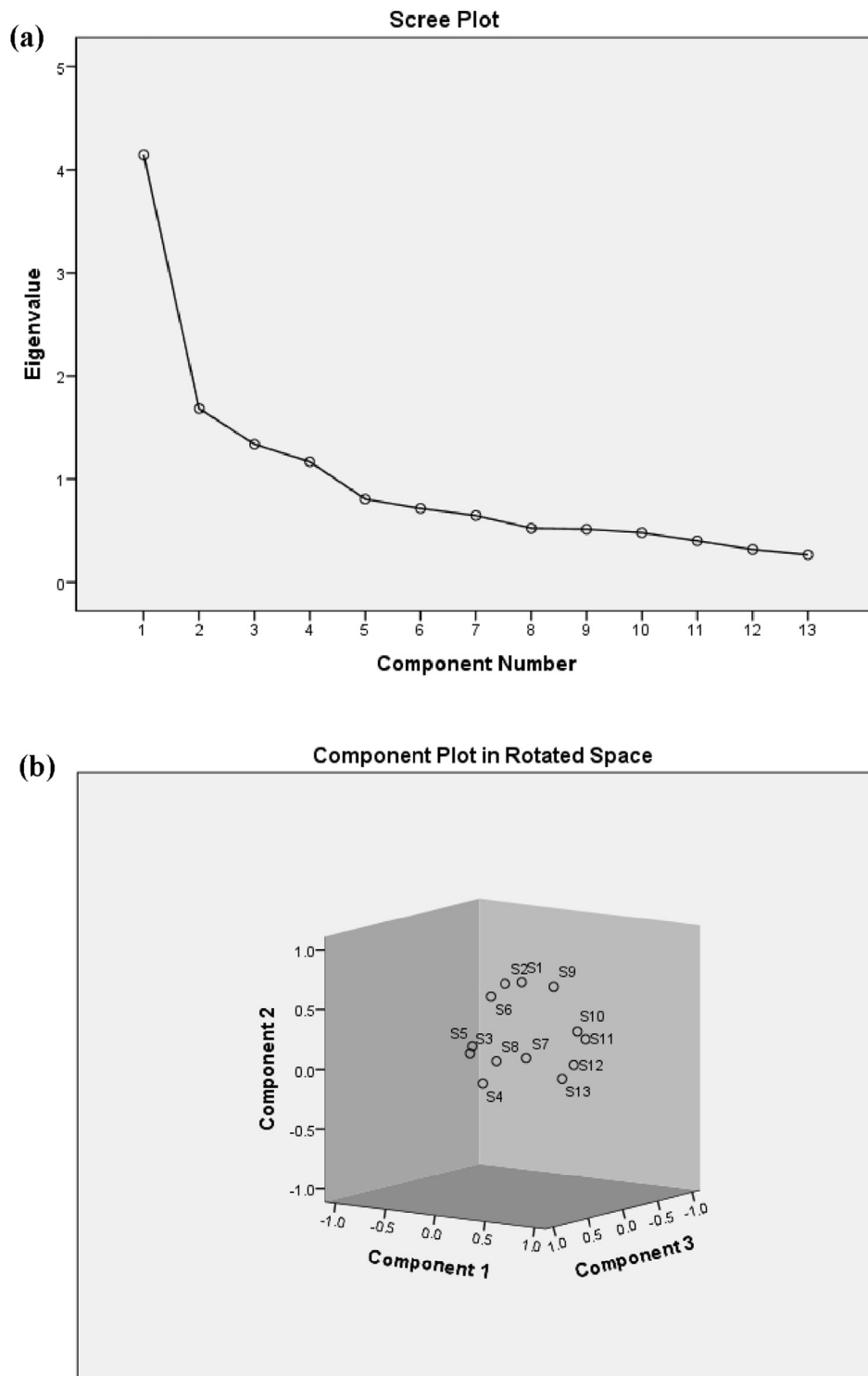


Figure 4. Principal component analysis by (a) scree plot of the characteristic roots, and (b) component plot in rotated space.

Bangladeshi doctors and health care professionals are not attending treatment seeking patient without ensuring that the patient is not infected with COVID-19. This creates extra burdens for the emergency patients and may even prolong threats to their life. For instance, a recent Bangladeshi press media reporting suicide of a 40-years old woman for not getting treatment supports for blood vomiting and throat pain depicts just how serious the matter of unnecessary public suffering gets during the emergency treatment seeking in the hospitals (Shafiq, 2020; Mamun et al., 2020a).

Moreover, peoples feel fear of own and/or family member, and/or relatives' infection, while getting the update of infection and death rate in TV news and others sources. However, the third principal component (PC3) explains 15.86% of the total variance, strong positively loaded of stress due to financial (S3: 0.795), and food crisis (S5: 0.782), and moderate positive loading of losing jobs (S4: 0.741) (Table 4). Due to slowdown of economic activities (e.g., industries, transportation, business) many people especially low-income groups of Bangladesh are in stress to managing food. Moreover, peoples are also in stress because of

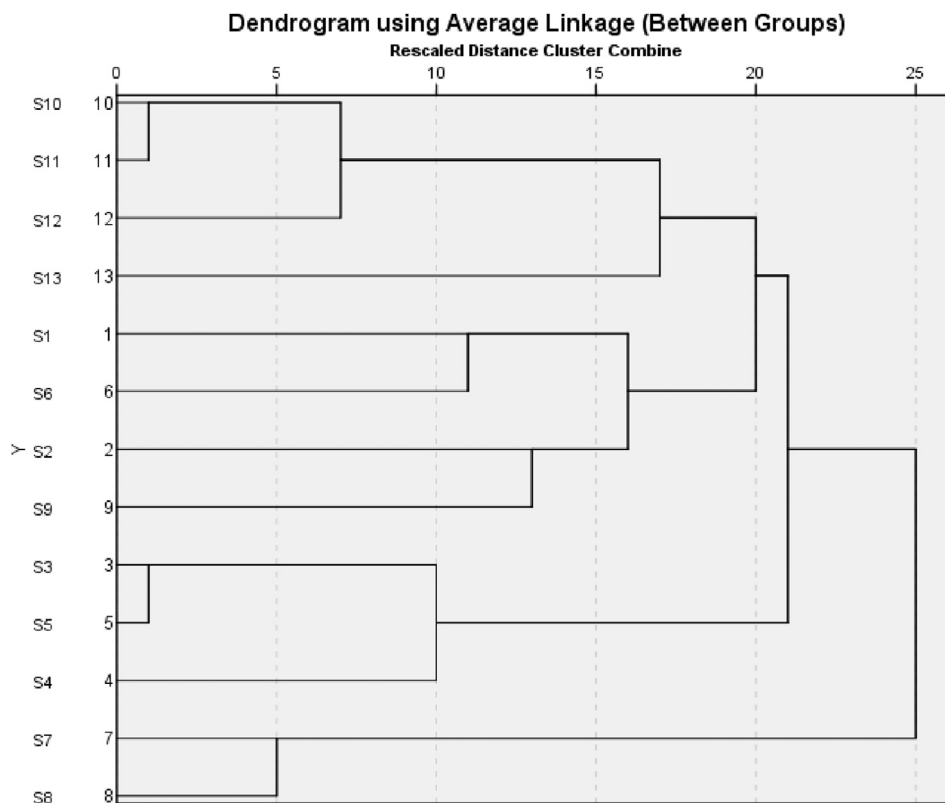


Figure 5. Dendrogram showing the hierarchical clusters of analysed parameters.

fear of losing their jobs, as many organizations already started the reduction of staff, and minimize the wages. Due to ongoing COVID-19 lockdown throughout Bangladesh, about nine million job losses accounting \$3 billion GDP loss was predicted for the country by the Asian Development Bank (Banna, 2020).

Lastly, PC4 elucidated 13.223% of the total variances with strongly positive loading of hamper of formal education (S7: 0.856), and stress for future career (S8: 0.844) (Table 4). In Bangladesh all the educational institutions are now close. Due to socio-economic structure of the country and limited access of internet facilities, e-learning and online class system is not implemented, which ultimately delay the graduation process of the student and create mental stress. Although e-learning system is not adopted formally in the country, some institutes are seen to have. But students with less facilities (i.e., abundance internet service costs, proper internet connection availability in residing village, having device to be connected with live classes etc.) can be potential mental distress mediating factors. For instance, a middle-school students' suicide attempt case was reported in China due to being disrupted of lacking digital devices availabilities for partaking online classes (Feng, 2020). Besides, suicides (i.e., mother-son suicide pact) are reported in Bangladesh because of online schooling issues with father (Mamun et al., 2020b).

Cluster analysis (CA) further applied to describe how studied variables influences human stress. It is found that, CA results strongly matched with the results of PCA, and classified into four major cluster or group (Figure 5). Generally, particular cluster shows similar characteristics with respect to the analysed factors (Bodrud-Doza et al., 2020b). However, Cluster 1 consists of statements S10–S13, which are related to the physical and mental effects of stress. Cluster 2 includes S1–S2, S6, and S9 delineates fear of virus infection, similar to PCA 2. Again cluster 3 consist of the statements S3–S5, linked with the stress due to financial and food crisis. Finally, cluster 4 contains statement S7 and S8 related to

the stress of young aged group. Overall it is found that, results of statistical analysis can delineate the current scenario of Bangladesh, and evident the consistency of respondents' views.

3.4. Study limitations

The present study is limited as of several issues such as being cross-sectional study among a non-representative sample with overwhelming response from students. Besides, the COVID-19 related human stress assessment can be a limitation as of not using any validated tools, although self-developed question was applied in consideration the factors-relevant to the Bangladeshi culture affected by the pandemic. Despite the limitations, the present study provides the novel findings on human stress and its relationships with other factors.

4. Conclusions

The COVID-19 outbreak creates fear and stress on the Bangladeshi citizens. It is found that stress of the respondents hampers the sound sleep, creates short temper, makes chaos in the family life, and even turns themselves to be suicidal ideators. However, to delineate the causes and factors controlling the human stress, several statistical applications were applied in this study. From the results of correlation matrix, it is found that, economic difficulties, and unavailability of food are linked together, while hamper of formal education and future plan create stress of career seeker. Overall, socio-economic conditions of mass people, forced lockdown without ensuring the fundamental human needs, weak governance, communication, infrastructure and healthcare facilities creates public's anxiety, and disturbed the human life. Therefore, it is essential to introduce time-oriented policy, and implement with care monitoring may help to manage the pandemic situation and nurture the public mental health.

Declarations

Author contribution statement

M. Bodrud-Doza: Conceived and designed the experiments; Performed the experiments; Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.

M.A. Mamun: Conceived and designed the experiments; Performed the experiments; Contributed reagents, materials, analysis tools or data; Wrote the paper.

S.M.D. Islam, M.A. Haque, R.M. Khan: Conceived and designed the experiments; Contributed reagents, materials, analysis tools or data; Wrote the paper.

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Competing interest statement

The authors declare no conflict of interest.

Additional information

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