



Research article

Fear and depressive symptoms amid COVID-19: A cross-sectional pilot study among adult population in Bangladesh

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ABSTRACT

Background: Fear is a primary emotional reaction to the deadly coronavirus disease which might be an associated factor for developing depressive symptoms. This study aimed to assess the level and associated factors of fear and depression amid the COVID-19 pandemic among the adult population of Bangladesh.

Methods: After providing informed consent, 1050 participants completed the cross-sectional online survey tool. Depressive symptoms and fear were assessed through the PHQ-9 and validated fear of COVID-19 scale (FCV-19S), respectively. Linear regression analysis was performed to predict potential factors of fear and depression.

Results: The study finds that females had higher scores for fear of COVID-19 scale ($\beta_1' = 1.81$; 95% CI: 1.15 to 2.47) and Patient Health Questionnaire ($\beta_2' = 1.92$; 95% CI: 0.95 to 2.88) than their male counterpart. Respondents considering the virus to be extremely dangerous had higher scores for FCV-19S ($\beta_1' = 1.55$; 95% CI: 0.66 to 2.44) and PHQ-9 ($\beta_2 = 1.59$; 95% CI: 0.25 to 2.92). Similarly, respondents considering themselves unsafe and very worried about the virus had increased scores for both FCV-19S and PHQ-9. On other hand, people those were reluctant to use masks ($\beta_1' = -1.58$; 95% CI: -3.12 to -0.04) or seek doctors' advice ($\beta_1' = -0.93$; 95% CI: -1.83 to -0.02) if COVID-19 symptoms appear, had comparatively lower scores for FCV-19S.

Conclusions: Fear of COVID-19 and depression were found to be associated with some specific knowledge, attitude & preparedness towards COVID-19 which should be adequately addressed in public health strategies to prevent the virus.

1. Introduction

Mental health problems such as depressive symptoms, increased stress levels, anxiety, and sleep disturbance are frequently common in adult people during the coronavirus disease of 2019 outbreak [1]. As of 29th June 2021, there were 181 176 715 confirmed cases of COVID-19, including 3 930 496 deaths globally [2]. On 18th March 2020, Bangladesh reported its first COVID-19 death. With an exceedingly high rate of infection and relatively high mortality, individuals started to worry about the COVID-19, and fear of approaching infected individuals and transmitting the virus to their family members is rising [3, 4]. An early-staged study in China assessed the immediate psychological response due to the COVID-19 pandemic and revealed 53.8% of

respondents rated the psychological impact of the outbreak as moderate or severe [5]. Besides, quarantined people lose face-to-face communications and normal social relations which is stressful as lack of personal communication among individuals can cause or exacerbate depression [6]. Furthermore, lockdown due to the COVID-19 pandemic has created loneliness and social isolation which not only increases mental health problems but also those are associated with increased risk of coronary heart disease, stroke [7] and, even premature death [8]. However, current management of the COVID-19 worldwide has concentrated exclusively on infection prevention, successful vaccination, and cure rate [9] which lacks attention to the psychological aspects [3].

Issues related to a pandemic like social distancing, quarantine, and isolation have heightened fear, contributing to stigma in a variety of

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situations [4]. Fear is considered to be one of the major causes of anxiety and depression in the general population [10]. Moreover, fear is also related to impaired physical health, insomnia, and immune system suppression [10]. Another study from China revealed that Chinese individuals with elevated levels of fear and anxiety had more physical and psychological effects, even though they had mild or no symptoms [11]. Fear of COVID-19 contributes to delays in accessing healthcare [12] and even suicide [13]. In addition to that, fear can be contagious, as illustrated in 1994 when hundreds of thousands of people fled the Indian city of Surat to avoid the pneumonic plague, despite the fact that no cases had been reported according to the World Health Organization (WHO) standards [14]. As a consequence, reducing fear and prejudice among individuals will help with transmission control [14, 15]. But the fear of COVID-19 may have a functional role to enhance compliance to public health measures such as improving social distancing, hand hygiene, and maintenance of other public health measures [16]. In Bangladesh during COVID-19, 52.87% adult population reported depression [20]. Study by Sakib et al. reported on presence of Fear of COVID-19 [15], but no study has attempted to present the association of fear, depression and knowledge.

Considering all the above factors, an investigation into fear of COVID-19 and depression with relevance to knowledge, attitude, and preparedness is urgently needed. Thus, the study was undertaken to evaluate the level and associated factors of depression and fear during the COVID-19 pandemic among the adult population of Bangladesh to assist in implementing appropriate strategies, interventional as well as support programs in a low resource setting like Bangladesh.

2. Methodology

2.1. Study design & participants

A cross-sectional study was conducted through an online survey among the adult population of Bangladesh. The study was conducted following the *Checklist for Reporting Results of Internet E-Surveys (CHERRIES)* guidelines [17]. Inclusion criteria include (i) willing to participate; (ii) providing informed consent; (iii) age ≥ 18 years; (iv) able to understand, read & write Bangla language.

2.2. Procedure

Data collection took place from 20th March 2020 to 20th April 2020. An online structured questionnaire was developed using Google forms which was used as the data collection tool. We developed the questionnaire of this study by gathering information from published literatures. When the draft of the questionnaire was developed, it was reviewed and revised repeatedly so that it could precisely agree with the objectives of the study. An expert questionnaire review panel consisting of four members, having expertise in public health and global mental health research, reviewed and edited the questionnaire along the lines of the objectives of the study. Based on the comments and suggestions from the review panel, the questionnaire was modified and sent back to the panel for approval to begin pre-testing. The questionnaire was initially pretested on 30 respondents to confirm the reliability to prevent any bias and further modifications were done in the questionnaire after that. Those 30 responses were discarded from the final analysis. The questionnaire link was disseminated online on different social media (i.e., Facebook, WhatsApp). For ensuring the quality of data, rapid checking of data was done every day. An electronic information sheet describing the aim and process, right to refuse their participation from the study was presented on the first page of the survey attaching a consent form with it. It took participants about 10–15 min to complete the survey. Participants were informed that their information will only be used for the research purpose. The questionnaire was fully anonymous and no personal information (i.e., name, phone number, address, etc.) was sought from the participants to ascertain confidentiality fully. All the procedures of this study complied with the Code of Ethics of the World Medical Association (Declaration of Helsinki) for any experiments involving humans. The ethical

approval (Ref No: BBEC, JU/M 2020/COVID-19/12 (1)) was obtained from the institutional review board, 'Biosafety, Biosecurity & Ethical Committee' of the Jahangirnagar University. After giving informed consent, participants voluntarily proceeded to the survey.

2.3. Measures

2.3.1. Socio-demographic characteristics, chronic disease, knowledge, attitude, and preparedness related information

Demographic variables included age, gender, number of family members, name of the residing district, educational qualification, and occupation. Educational attainment included three subcategories as: i) higher secondary ii) honors or above iii) up to secondary. Participants were asked if they had any chronic diseases such as diabetes, hypertension, renal disease, etc. Moreover, questions regarding knowledge about COVID-19 transmission, prevention were administered. Attitude towards COVID-19 was measured by close-ended questions. An example item includes "Do you consider yourself safe from the virus?" Preparedness towards COVID-19 was also assessed where an example item includes "I will self-isolation or quarantine if COVID-19 symptoms appear". All the questions had two response options either "yes" or "no".

2.3.2. Fear of COVID-19

Bangla validated version of Fear of COVID-19 scale (Bangla Fear of COVID-19 Scale) [3, 15], which was used to assess fear of COVID-19 among the participants. The scale contained 7 items such as "I am most afraid of Corona" and "My hands become clammy when I think about Corona" for example. The scale functions as five-item Likert-type scale. The response option included "strongly disagree," "disagree," "neutral" "agree" and "strongly agree". The score ranged from 7 to 35. The scale was previously used in Bangladesh [18]. The original version of the Fear of COVID-19 scale proved robust psychometric properties with good internal consistency ($\alpha = 0.82$) and acceptable test-retest reliability (ICC = 0.72) [3]. Bangla validated fear of COVID-19 scale confirmed unidimensional structure and construct validity [15].

2.3.3. Depression symptoms

The nine-item scale, Bangla Patient Health Questionnaire (PHQ-9) corresponding to DSM-IV Diagnostic Criteria of symptoms for the major depressive disorder was used to measure the level of depression of the participants [19, 20, 21]. PHQ-9 is a promising scale for assessing major depression having high sensitivity (89.5%) and high specificity (94%) [19]. Respondents were asked to answer on a 4-point Likert scale (from "0 = not at all" to "3 = nearly every day") based on the over past two weeks, whereby 0-27 score range is possible. A score of 0 indicates the absence of depression symptoms and a total score of 27 indicates daily depressive symptoms. A cut-off score ≥ 10 was set for indicating "having depressive symptoms" [20].

2.4. Data analysis

Data were analyzed with Microsoft Excel 2013 and STATA version 14.1 (StataCorpLP, College Station, TX, USA). Microsoft Excel was used for editing, sorting, and coding of data. Descriptive statistics such as frequency, percentage were obtained to understand participants' characteristics. Linear regression was conducted to predict potential influence factors related to fear of COVID-19 and depression. The Beta (Co-efficient) and 95% confidence interval (95% CI) were obtained from linear regression models. P-value less than or equal to .05 was considered to be statistically significant for all analyses.

3. Results

3.1. Socio-demographics

Responses came from 1050 participants who aged between 18-68 years old (mean age 24.3 ± 6.07). The majority of the respondents

were aged below 25 (65.90%), male (63.43%), and students (76.19%). The study finds that females had higher scores for FCV-19S ($\beta_1' = 1.81$; 95% CI: 1.15 to 2.47) and PHQ-9 ($\beta_2' = 1.92$; 95% CI: 0.95 to 2.88) than males. In addition to that respondents pursuing or had pursued higher secondary education (grade 11th & 12th) had increased score for PHQ-9 ($\beta_2' = 3.03$; 95% CI: 0.22 to 5.85) compared to respondents that pursued their education up to secondary level (up to grade 10th) only. Students had higher scores for PHQ-9 ($\beta_2 = 1.41$; 95% CI: 0.09 to 2.73) than other occupational classes (Table 1).

3.2. Fear of COVID-19

Only a minority of the respondents was suffering from chronic diseases (12.86%) and asthma was the most prevalent one to report (7.14%). Respondents suffering from serious or chronic diseases had increased score for FCV-19S ($\beta_1 = 1.01$; 95% CI: 0.07 to 1.96) than respondents who were healthy. Having other chronic diseases or conditions like diabetes, hypertension, cardiovascular disease (CVD), and renal disease had no significant association with FCV-19S (Table 2).

The study also showed that respondents who considered the virus to be extremely dangerous had higher scores for FCV-19S ($\beta_1' = 1.55$; 95% CI: 0.66 to 2.44) than those considering the virus to be slightly dangerous. Similarly, respondents acknowledging ignorance of quarantine regulations as a factor for virus spread had increased FCV-19S ($\beta_1' = 1.04$; 95% CI: 0.02 to 2.06) scores. In addition to that, respondents considering themselves unsafe from the virus had increased scores for FCV-19S ($\beta_1' = 1.65$; 95% CI: 1.06 to 2.25) than those feeling safe from the virus. Furthermore, those who were very worried about the virus had increased FCV-19S scores as well. However, respondents being knowledgeable about washing hands with soap and water or sanitizer as a prevention of the virus had lower scores for FCV-19S ($\beta_1' = -3.62$; 95% CI: -6.48 to -0.77) than respondents who were unaware of the fact (Table 3).

Most of the respondents reported to be using masks either always (46.38%) or sometimes (48.86%). Liquid soap is the most reported material to be used in hand washing (75.71%). Respondents also used soap and water (62.76%) and hand sanitizer (44.57%) for hand washing. It was seen that respondents never using any masks had lower FCV-19S (β_1'

= -1.58; 95% CI: -3.12 to -0.04) scores than those using mask always. In the similar manner, respondents that would not seek doctors' advice if COVID-19 symptoms appear also had lower FCV-19S ($\beta_1' = -0.93$; 95% CI: -1.83 to -0.02) score than respondents who would (Table 4).

3.3. Depressive symptoms

The study revealed that 36.57% of participants had depressive symptoms (Figure 1). Respondents suffering from serious or chronic diseases ($\beta_2 = 2.33$; 95% CI: 0.96 to 3.69) had increased score for PHQ-9 than respondents who were healthy. Similarly, respondents having asthma ($\beta_2 = 2.92$; 95% CI: 1.14 to 4.70) had higher scores for PHQ-9 (Table 2).

The study also showed that respondents who considered the virus to be extremely dangerous had higher scores for PHQ-9 ($\beta_2 = 1.59$; 95% CI: 0.25 to 2.92) than those considering the virus to be slightly dangerous. Respondents acknowledging ignorance of quarantine regulations as a factor for virus spread had increased PHQ-9 ($\beta_2 = 1.38$; 95% CI: 0.37 to 2.40) scores. Additionally, respondents considering themselves unsafe from the virus had increased scores for PHQ-9 ($\beta_2' = 2.05$; 95% CI: 1.12 to 2.99) than those feeling safe from the virus. Furthermore, those who were very worried about the virus had increased PHQ-9 score as well (Table 3).

4. Discussion

Mass fear of the COVID-19 has been termed as "corona phobia" [22]. Whilst analyzing trends in Google searches during the COVID-19 outbreak, a rise of fear was found globally [23]. Our study reports the associated factors of fear of the COVID-19 virus in Bangladesh. Being female was significantly associated with this fear which is consistent with some previous studies showing that females had higher fear [24]. A Bangladeshi study also showed that women recorded considerably higher scores of COVID-19 fear than men [15]. A possible explanation for this finding is either male population become sick less frequently or they avoid expressing fear compared to females for the existing gender roles [24]. Moreover, women are more emotionally reactive and perceive

Table 1. Association of socio-demographic factors with fear & depression.

| Variables | n (%) (N = 1050) | Fear | | Depression | |
|----------------------|---------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| | | β_1 (95% CI) | β_1' (95% CI) | β_2 (95% CI) | β_2' (95% CI) |
| Age (years) | | | | | |
| >35 | 38 (3.62%) | 0.36 (-1.34 to 2.06) | 0.21 (-1.69 to 2.12) | -2.02 (-4.50 to 0.46) | -1.19 (-3.97 to 1.60) |
| 25–35 | 320 (30.48%) | -0.61 (-1.30 to 0.09) | -0.16 (-0.93 to 0.60) | -0.52 (-1.52 to 0.49) | 0.21 (-0.90 to 1.33) |
| <25 | 692 (65.90%) | Ref. | Ref. | Ref. | Ref. |
| Gender | | | | | |
| Male | 666 (63.43%) | Ref. | Ref. | Ref. | Ref. |
| Female | 384 (36.57%) | 1.84** (1.19–2.49) | 1.81** (1.15–2.47) | 1.90** (0.95–2.85) | 1.92** (0.95–2.88) |
| Family member | | | | | |
| >6 | 128 (12.19%) | 0.09 (-0.91 to 1.10) | 0.33 (-0.68 to 1.34) | 0.78 (-0.69 to 2.25) | 0.76 (-0.71 to 2.24) |
| 5–6 | 398 (37.90%) | -0.41 (-1.09 to 0.27) | -0.36 (-1.04 to 0.31) | 0.10 (-0.89 to 1.10) | 0.04 (-0.94 to 1.03) |
| <5 | 524 (49.90%) | Ref. | Ref. | Ref. | Ref. |
| Education | | | | | |
| Higher secondary | 136 (12.95%) | -0.59 (-2.49 to 1.30) | -0.49 (-2.42 to 1.43) | 3.29* (0.53–6.04) | 3.03* (0.22–5.85) |
| Honors or above | 877 (83.52%) | -1.10 (-2.81 to 0.62) | -0.88 (-2.66 to 0.90) | 1.71 (-0.78 to 4.21) | 1.43 (-1.17 to 4.03) |
| Up to secondary | 37 (3.52%) | Ref. | Ref. | Ref. | Ref. |
| Occupation | | | | | |
| Student | 800 (76.19%) | 0.41 (-0.50 to 1.31) | 0.10 (-0.91 to 1.11) | 1.41* (0.09–2.73) | 0.97 (-0.51 to 2.44) |
| Govt./Pvt. Services | 151 (14.38%) | Ref. | Ref. | Ref. | Ref. |
| Others | 99 (9.43%) | 0.09 (-1.23 to 1.42) | -0.26 (-1.58 to 1.06) | 0.97 (-0.96 to 2.89) | 0.83 (-1.09 to 2.76) |

*P-value < 0.05; **P-value < 0.01.

β_1 = Co-efficient for Fear of COVID-19 (unadjusted); β_1' = Co-efficient for Fear of COVID-19 (adjusted); β_2 = Co-efficient for depression (unadjusted); β_2' = Co-efficient for depression (adjusted); CI = Confidence interval.

Table 2. Association of chronic diseases with fear and depression.

| Variables | n (%) (N = 1050) | Fear | | Depression | |
|--|---------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| | | β_1 (95 CI) | β_1' (95% CI) | β_2 (95% CI) | β_2' (95% CI) |
| Serious disease/chronic disease | | | | | |
| Yes | 135 (12.86%) | 1.01* (0.07–1.96) | 0.93 (-0.85 to 2.71) | 2.33** (0.96–3.69) | 2.18 (-0.40 to 4.77) |
| No | 915 (87.14%) | Ref. | Ref. | Ref. | Ref. |
| Diseases | | | | | |
| Diabetes | | | | | |
| Yes | 19 (1.81%) | 1.80 (-0.57 to 4.16) | 1.31 (-1.47 to 4.10) | 1.16 (-2.29 to 4.61) | 0.85 (-3.19 to 4.88) |
| No | 1031 (98.19%) | Ref. | Ref. | Ref. | Ref. |
| Hypertension | | | | | |
| Yes | 34 (3.24%) | 0.57 (-1.21 to 2.36) | -0.71 (-3.03 to 1.59) | 0.51 (-2.09 to 3.11) | -1.31 (-4.66 to 2.04) |
| No | 1016 (96.76%) | Ref. | Ref. | Ref. | Ref. |
| CVD | | | | | |
| Yes | 10 (0.95%) | 1.61 (-1.64 to 4.86) | 1.00 (-2.50 to 4.50) | -2.40 (-7.13 to 2.33) | -4.23 (-9.31 to 0.85) |
| No | 1040 (99.05%) | Ref. | Ref. | Ref. | Ref. |
| Asthma | | | | | |
| Yes | 75 (7.14%) | 1.06 (-0.16 to 2.29) | 0.21 (-1.79 to 2.21) | 2.92** (1.14–4.70) | 0.97 (-1.94 to 3.87) |
| No | 975 (92.86%) | Ref. | Ref. | Ref. | Ref. |
| Renal disease | | | | | |
| Yes | 8 (0.76%) | -0.59 (-4.22 to 3.04) | -1.57 (-5.41 to 2.26) | 2.21 (-3.08 to 7.50) | 1.51 (-4.05 to 7.06) |
| No | 1042 (99.24%) | Ref. | Ref. | Ref. | Ref. |

*P-value < 0.05; **P-value < 0.01.

β_1 = Co-efficient for Fear of COVID-19 (unadjusted); β_1' = Co-efficient for Fear of COVID-19 (adjusted); β_2 = Co-efficient for depression (unadjusted); β_2' = Co-efficient for depression (adjusted); CI = Confidence interval.

negative information easily, which may lead to a rise in this COVID-19 fear [25]. Having chronic illness was associated with both fear and depressive symptoms (Table 2). This particular finding echoes that of previous studies indicating that patients with chronic illnesses such as diabetes, cerebrovascular diseases, heart diseases, and other chronic conditions work as a risk factor for mental illnesses including depression [20, 26]. Respondents with chronic illness might feel themselves more vulnerable to COVID-19 and they may face difficulties in having treatment and hospital follow-up which might lead to depression and fear of COVID-19 [27].

An important finding of our study is that respondents who did not consider themselves safe from the corona virus and who were very worried about the virus were significantly identified as depressed and fearful. One possible explanation might be that the concern of getting infection increase fear and the fear propagated depression symptom among the general population [3]. Perceiving COVID-19 as 'extremely dangerous' was also found to be significantly associated with fear and depression in the present study. Fear of death and contracting the virus to the family members might play a role behind this extreme worriedness which in turn impose negative psychological consequences [20].

Having correct knowledge about the fact that ignoring quarantine regulations can spread COVID-19 was significantly associated with fear of COVID-19. Authentic knowledge may increase perceived risk towards COVID-19 which might rise fear. It was documented previously that fear is associated with elevated self-risk perception [28]. Evidence also showed that fear might raise people's consciousness about the intensity of risks that could persuade people's intention to control it [29]. In consistent with that statement, respondents who never wore masks and who were unlikely to seek doctors' advice if COVID-19 like symptoms appear had significantly decreased fear level. This means less fearless respondents are unlikely to adopt preventative measures which indicates risky behavior during this pandemic. It was consistently reported previously that fear of pandemic can be perceived as a normal reaction and it might favor a person by reducing the involvement with risky behaviors and can improve virus preventative responses in some context [16]. Another study from Bangladesh also reported that fear scores were found to have a highly significant relationship with adopting the health advisory and

mask-wearing [10]. It is interesting to note that respondents who had avoidance behaviors like staying out for more than 4 h had less fear indicating that fear of COVID-19 may improve social distancing and encourage people to complaint with healthy behavior. Previous studies also showed that fear is positively associated with preventative behaviors [16, 28]. In a previous study, 29% of respondents agreed strongly that fear of Middle East respiratory syndrome coronavirus raised public awareness [30].

The form of fear that helps people build coping mechanisms has been identified as 'functional fear' because it includes people using adaptive emotions and precautions to help defend themselves against the source of their worry [31]. "Dysfunctional fear," on the other hand, includes people's fears and claims that their quality of life is adversely impacted by this apprehension and/or their precautionary behavior [32]. The findings of the present study reveal that fear of COVID-19 at the current time have a functional role as fear had contributed to greater adherence to health measures such as, mask wearing, willingness to seek doctor's advice if COVID-19 symptoms appear which is consistent with previous studies [3, 16]. But higher levels of fear (dysfunctional fear) should be controlled with appropriate intervention as it can contribute to unreasonable and opaque thinking [3] and can cause adaptive and maladaptive avoidance behaviors [33] such as unnecessary hoarding and excessive concentration on pertinent knowledge, which can intensify their psychological pressure (e.g., depression, anxiety, posttraumatic stress disorder, and suicide) [34, 35].

In terms of depression, the present study revealed that 36.57% of respondents had depression (Figure 1). It is noteworthy to mention that the prevalence of depression found in the present study is lower than that found among Bangladeshi medical students (49.9%) [36], among Bangladeshi adult wage earners [37], among young adults in the U.S. (43.3%) [38]. The higher rate of depression in those studies may be attributed to the difference in scale usage and variation in socio-demographic backgrounds. Moreover, fear of COVID-19 can play behind this wide prevalence of depression which was documented before [3]. Again, the female population was significantly associated with depression in the study which is in line with a previous study [5]. This might be explained by the fact that women suffer from a higher burden during a pandemic (houseworks, role of caregiving, domestic violence

Table 3. Association of Knowledge & attitude regarding COVID-19 with fear and depression.

| Variables | n (%) (N = 1050) | Fear | | Depression | |
|--|---------------------|-------------------------|--------------------------|-----------------------|-----------------------|
| | | β_1 (95% CI) | β_1' (95% CI) | β_2 (95% CI) | β_2' (95% CI) |
| Know about virus | | | | | |
| Yes | 1034 (98.48%) | 0.47 (-2.11 to 3.04) | -0.96 (-3.65 to 1.73) | -0.58 (-4.33 to 3.18) | -0.92 (-5.16 to 3.33) |
| No | 16 (1.52%) | Ref. | Ref. | Ref. | Ref. |
| Source of virus knowledge | | | | | |
| Mass media | 218 (20.76%) | Ref. | Ref. | Ref. | Ref. |
| Social media | 715 (68.10%) | -0.10 (-0.90 to 0.69) | 0.07 (-0.66 to 0.80) | -0.31 (-1.47 to 0.84) | -0.18 (-1.34 to 0.97) |
| Doctor or family | 44 (4.19%) | 1.05 (-0.64 to 2.74) | 1.28 (-0.28 to 2.85) | 0.73 (-1.73 to 3.20) | 0.95 (-1.52 to 3.43) |
| Newspaper | 73 (6.95%) | -0.51 (-1.89 to 0.87) | -0.40 (-1.67 to 0.87) | -0.91 (-2.92 to 1.11) | -0.90 (-2.90 to 1.92) |
| Danger of virus | | | | | |
| Slightly Dangerous | 144 (13.71%) | Ref. | Ref. | Ref. | Ref. |
| Extremely dangerous | 906 (86.29%) | 3.11** (2.22–4.01) | 1.55** (0.66–2.44) | 1.59* (0.25–2.92) | 0.51 (-0.89 to 1.92) |
| Knowledge about virus spread | | | | | |
| Cough/sneeze | | | | | |
| Yes | 1032 (98.29%) | -0.75 (-3.18 to 1.68) | -0.76 (-3.06 to 1.55) | -0.21 (-3.76 to 3.33) | -0.69 (-4.33 to 2.96) |
| No | 18 (1.71%) | Ref. | Ref. | Ref. | Ref. |
| Surface contaminated with virus | | | | | |
| Yes | 979 (93.24%) | 0.20 (-1.06 to 1.46) | 0.28 (-1.00 to 1.56) | 0.42 (-1.41 to 2.25) | 0.33 (-1.69 to 2.35) |
| No | 71 (6.76%) | Ref. | Ref. | Ref. | Ref. |
| Non-isolated coronavirus patient | | | | | |
| Yes | 933 (88.86%) | 0.34 (-0.67 to 1.34) | -0.47 (-1.53 to 0.58) | -0.05 (-1.51 to 1.42) | -1.01 (-2.67 to 0.65) |
| No | 117 (11.14%) | Ref. | Ref. | Ref. | Ref. |
| Touching face with uncleaned hands | | | | | |
| Yes | 906 (86.29%) | 0.76 (-0.16 to 1.67) | 0.16 (-0.79 to 1.10) | -0.48 (-1.82 to 0.85) | -1.47 (-2.96 to 0.02) |
| No | 144 (13.71%) | Ref. | Ref. | Ref. | Ref. |
| Ignoring quarantine regulations | | | | | |
| Yes | 750 (71.43%) | 0.80* (0.10–1.50) | 1.04* (0.02–2.06) | 1.38** (0.37–2.40) | 1.31 (-0.30 to 2.92) |
| No | 300 (28.57%) | Ref. | Ref. | Ref. | Ref. |
| Public transport | | | | | |
| Yes | 713 (67.90%) | 0.21 (-0.47 to 0.88) | -0.92 (-1.90 to 0.06) | 0.92 (-0.06 to 1.91) | 0.06 (-1.49 to 1.61) |
| No | 337 (32.10%) | Ref. | Ref. | Ref. | Ref. |
| Knowledge about prevention | | | | | |
| Using tissue while coughing or sneezing | | | | | |
| Yes | 1035 (98.57%) | 0.45 (-2.21 to 3.11) | 0.68 (-2.14 to 3.50) | 1.94 (-1.93 to 5.82) | 3.62 (-0.84 to 8.07) |
| No | 15 (1.43%) | Ref. | Ref. | Ref. | Ref. |
| Washing hands with soap or using sanitizer | | | | | |
| Yes | 1032 (98.48%) | -3.15* (-5.72 to -0.58) | -3.62** (-6.48 to -0.77) | -2.67 (-6.42 to 1.08) | -4.48 (-8.99 to 0.03) |
| No | 16 (1.52%) | Ref. | Ref. | Ref. | Ref. |
| Distancing from infected person | | | | | |
| Yes | 984 (93.71%) | 0.92 (-0.38 to 2.22) | 1.13 (-0.42 to 2.68) | 1.44 (-0.46 to 3.33) | 2.62* (0.18–5.06) |
| No | 66 (6.29%) | Ref. | Ref. | Ref. | Ref. |
| Avoiding crowd | | | | | |
| Yes | 1023 (97.43%) | -0.03 (-2.03 to 1.96) | 0.84 (-1.26 to 2.93) | 0.87 (-2.04 to 3.78) | 1.36 (-1.95 to 4.67) |
| No | 27 (2.57%) | Ref. | Ref. | Ref. | Ref. |
| Staying home if sick | | | | | |
| Yes | 995 (94.76%) | 0.36 (-1.05 to 1.78) | -0.47 (-2.11 to 1.18) | 0.36 (-1.70 to 2.43) | -0.84 (-3.43 to 1.75) |
| No | 55 (5.24%) | Ref. | Ref. | Ref. | Ref. |
| Attitude towards COVID-19 | | | | | |
| Do you consider yourself safe from the virus? | | | | | |
| Yes | 479 (45.62%) | Ref. | Ref. | Ref. | Ref. |
| No | 571 (54.38%) | 2.15** (1.53–2.77) | 1.65** (1.06–2.25) | 2.33** (1.42–3.25) | 2.05** (1.12–2.99) |
| Worried about virus | | | | | |
| Very worried | 545 (51.90%) | 4.01** (3.43–4.60) | 3.44** (2.83–4.04) | 2.24** (1.33–3.16) | 1.82** (0.86–2.77) |
| Slightly worried | 505 (48.10%) | Ref. | Ref. | Ref. | Ref. |
| Duration of outdoor activities | | | | | |
| I don't go out | 471 (44.86%) | Ref. | Ref. | Ref. | Ref. |
| <30 min | 439 (41.81%) | -0.11 (-0.79 to 0.57) | -0.23 (-0.86 to 0.40) | 0.22 (-0.77 to 1.21) | 0.21 (-0.78 to 1.20) |
| 30 min-2 hrs. | 95 (9.05%) | -0.09 (-1.24 to 1.06) | -0.38 (-1.44 to 0.67) | 0.33 (-1.35 to 2.01) | -0.08 (-1.75 to 1.56) |

(continued on next page)

Table 3 (continued)

| Variables | n (%) (N = 1050) | Fear | | Depression | |
|---------------------------------|---------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| | | β_1 (95% CI) | β_1' (95% CI) | β_2 (95% CI) | β_2' (95% CI) |
| 2–4 hrs. | 14 (1.33%) | -1.90 (-4.68 to 0.87) | -1.20 (-3.72 to 1.33) | -0.95 (-4.99 to 3.10) | -0.48 (-4.47 to 3.50) |
| >4 hrs. | 31 (2.95%) | -1.38 (-3.28 to 0.52) | -1.29 (-3.03 to 0.45) | -0.67 (-3.44 to 2.09) | -0.78 (-3.52 to 1.97) |
| Aware relatives about the virus | | | | | |
| Yes | 994 (94.67%) | 0.84 (-0.56 to 2.25) | 0.85 (-0.52 to 2.22) | -0.92 (-2.96 to 1.12) | -0.62 (-2.78 to 1.54) |
| No | 56 (5.33%) | Ref. | Ref. | Ref. | Ref. |

*P-value<_0.05; **P-value<_0.01.

β_1 = Co-efficient for Fear of COVID-19 (unadjusted); β_1' = Co-efficient for Fear of COVID-19 (adjusted); β_2 = Co-efficient for depression (unadjusted); β_2' = Co-efficient for depression (adjusted); CI = Confidence interval.

Table 4. Association of preparedness regarding COVID-19 with fear & depression.

| Variables | n (%) (N = 1050) | Fear | | Depression | |
|--|---------------------|-------------------------|-------------------------|-----------------------|-----------------------|
| | | β_1 (95% CI) | β_1' (95% CI) | β_2 (95% CI) | β_2' (95% CI) |
| Mask usage | | | | | |
| Always | 487 (46.38%) | Ref. | Ref. | Ref. | Ref. |
| Sometimes | 513 (48.86%) | -0.30 (-0.95 to 0.34) | -0.26 (-0.91 to 0.40) | 0.90 (-0.04 to 1.84) | 0.85 (-0.11 to 1.81) |
| Never | 50 (4.76%) | -1.84* (-3.36 to -0.33) | -1.58* (-3.12 to -0.04) | 1.78 (-0.43 to 3.99) | 1.85 (-0.39 to 4.11) |
| Handwashing | | | | | |
| Only water | | | | | |
| Yes | 70 (6.67%) | Ref. | Ref. | Ref. | Ref. |
| No | 980 (93.33%) | 0.62 (-0.64 to 1.89) | 0.53 (-0.74 to 1.81) | -0.02 (-1.86 to 1.82) | 0.09 (-1.77 to 1.96) |
| Liquid Soap | | | | | |
| Yes | 795 (75.71%) | Ref. | Ref. | Ref. | Ref. |
| No | 255 (24.29%) | -0.26 (-1.00 to 0.47) | -0.14 (-0.90 to 0.63) | -0.40 (-1.48 to 0.67) | -0.51 (-1.63 to 0.60) |
| Hand sanitizer/alcohol | | | | | |
| Yes | 468 (44.57%) | Ref. | Ref. | Ref. | Ref. |
| No | 582 (55.43%) | -0.43 (-1.07 to 0.20) | -0.19 (-0.86 to 0.47) | 0.41 (-0.52 to 1.33) | 0.33 (-0.64 to 1.30) |
| Soap | | | | | |
| Yes | 659 (62.76%) | Ref. | Ref. | Ref. | Ref. |
| No | 391 (37.24%) | -0.30 (-0.95 to 0.35) | -0.22 (-0.90 to 0.45) | 0.15 (-0.80 to 1.10) | 0.04 (-0.95 to 1.04) |
| Seek doctors' advice if COVID-19 symptoms appear | | | | | |
| Yes | 897 (85.51%) | Ref. | Ref. | Ref. | Ref. |
| No | 152 (14.49%) | -0.88 (-1.77 to 0.01) | -0.93* (-1.83 to -0.02) | -0.34 (-1.65 to 0.96) | -0.37 (-1.69 to 0.95) |
| Self-isolation or quarantine if COVID-19 symptoms appear | | | | | |
| Yes | 963 (91.71%) | Ref. | Ref. | Ref. | Ref. |
| No | 87 (8.29%) | -1.00 (-2.14 to 0.15) | -0.96 (-2.13 to 0.20) | -0.20 (-1.87 to 1.47) | -0.44 (-2.15 to 1.26) |

*P-value<_0.05; **P-value<_0.01.

β_1 = Co-efficient for Fear of COVID-19 (unadjusted); β_1' = Co-efficient for Fear of COVID-19 (adjusted); β_2 = Co-efficient for depression (unadjusted); β_2' = Co-efficient for depression (adjusted); CI = Confidence interval.

etc.) and also go through stressful life events which increases the risk of developing mental disorders [39, 40]. In consonance with a previous study [5], being student was associated with depressive symptoms in the present study. Hampering in daily life routine, impediment in academic curriculum due to lockdown and other stressors might be the reason for mental disorders among students during the COVID-19 pandemic [41]. Higher secondary educational status displayed a significant association with depression in the study compared to the lower group (up to secondary) which is inconsistent with other previous studies reporting lower educational levels were associated with depression [37].

Furthermore, knowledge of COVID-19 spread and prevention indicating that ignoring quarantine regulations can spread COVID-19 and distancing from infected person can prevent COVID-19 was significantly associated with higher depression. This indicates people's concern about quarantine measures may increase depression. Positive attitude reporting that they aware relatives about virus had a protective effect to depression though the result was insignificant. The negative impacts from the outbreak demand timely mental health care support and appropriate

psychological interventions to the affected population which is feasible through online now.

This study has some interesting public health implications to strengthen up public health strategies and policies. The present study has revealed that respondents who had a greater fear of COVID-19 complied with preventative behaviors. Furthermore, less fearful respondents had avoidance and risky behaviors which might increase COVID-19 transmission. Public health practitioners and policy-makers should focus those people who had risky behavior to control the COVID-19 transmission by innovative preventative practices and interventions targeting these specific traits among the general population. In addition to that respondents who had correct knowledge about the COVID-19 spread and prevention had higher depression symptoms. This finding suggests that adequate mental health care should be provided along with authentic and careful pandemic information to educate the general people on the pandemic and as well protecting their mental health as depressed individuals are less likely to take preventative measures compared to those who were not depressed [42].

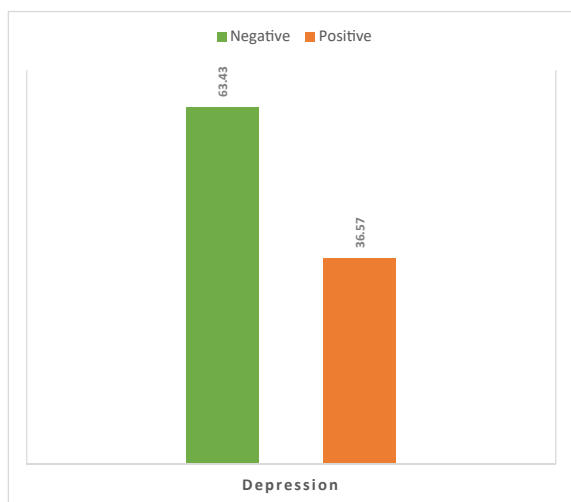


Figure 1. Depression among general population of Bangladesh during COVID-19 epidemic.

4.1. Strength and limitations

The present study has some limitations that should be noted carefully. The self-reported data from the study are subjected to some potential bias (social desirability bias, reporting bias). Moreover, online survey may over-represent educated and urban people. The convenience sampling technique is limited by selection bias. Also, the recruitment strategy favored young people which may limit the generalizability of the study. The cross-sectional design of the study limits the ability to draw causality which emphasizes the need for future longitudinal study. As the survey was online and voluntary in nature, we were unable to measure response rate. Notwithstanding these limitations, we believe that the study provides an important inceptive look at the intersection of fear of the COVID-19 pandemic, mental health difficulties of adult population and public health knowledge in a low-resource country during the COVID-19 outbreak.

5. Conclusion

This study revealed a potential association between fear of COVID-19, depression symptoms with adequate knowledge, attitude, and preparedness to fight against this novel virus during the initial phase of the COVID-19 outbreak in Bangladesh. These factors should be adequately addressed in public health strategies and messages to boost preventative practices and protecting mental health during the pandemic in such a resource limited setting.

Declarations

Author contribution statement

Md. Raisul Islam: Conceived and designed the experiments; Performed the experiments; Wrote the paper.

Mst. Sadia Sultana, Abid Hasan Khan: Performed the experiments; Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.

Sahadat Hossain: Conceived and designed the experiments; Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.

Md. Tajuddin Sikdera, M. Tasdik Hasan, Zezhi Li: Performed the experiments; Wrote the paper.

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Data availability statement

Data will be made available on request.

Declaration of interests statement

The authors declare no conflict of interest.

Additional information

No additional information is available for this paper.

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