Changes in loneliness prevalence and its associated factors among Bangladeshi older adults during the COVID-19 pandemic

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Abstract

Aims

Worldwide, loneliness is one of the most common psychological phenomena among older adults, adversely affecting their physical and mental health conditions during the COVID-19 pandemic. This study aims to assess changes in the prevalence of loneliness in the two timeframes (first and second waves of COVID-19 in Bangladesh) and identify its correlates in pooled data.

Methods

This repeated cross-sectional study was conducted on two successive occasions (October 2020 and September 2021), overlapping with the first and second waves of the COVID-19 pandemic in Bangladesh. The survey was conducted remotely through telephone interviews among 2077 (1032 in the 2020-survey and 1045 in the 2021-survey) older Bangladeshi adults aged 60 years and above. Loneliness was measured using the 3-item UCLA Loneliness scale. The binary logistic regression model was used to identify the factors associated with loneliness in pooled data.

Results

We found a decline in the loneliness prevalence among the participants in two survey rounds (51.5% in 2021 versus 45.7% in 2020; \( P = 0.008 \)), corresponding to 33% lower odds in the 2021-survey (AOR 0.67, 95% CI 0.54–0.84). Still, nearly half of the participants were found to be lonely in the latest survey. We also found that, compared to their respective counterparts, the odds of loneliness were significantly higher among the participants without a partner (AOR 1.58, 95% CI 1.20–2.08), with a monthly family income less than 5000 BDT (AOR 2.34, 95% CI 1.58–3.47), who lived alone (AOR 2.17, 95% CI 1.34–3.51), with poor
memory or concentration (AOR 1.58, 95% CI 1.23–2.03), and suffering from non-communicable chronic conditions (AOR 1.55, 95% CI 1.23–1.95). Various COVID-19-related characteristics, such as concern about COVID-19 (AOR 1.28, 95% CI 0.94–1.73), overwhelm by COVID-19 (AOR 1.53, 95% CI 1.14–2.06), difficulty earning (AOR 2.00, 95% CI 1.54–2.59), and receiving routine medical care during COVID-19 (AOR 2.08, 95% CI 1.61–2.68), and perception that the participants required additional care during the pandemic (AOR 2.93, 95% CI 2.27–3.79) were also associated with significantly higher odds of loneliness. However, the odds of loneliness were significantly lower among the participants with formal schooling (AOR 0.71, 95% CI 0.57–0.89) and with a family of more than four members (AOR 0.76, 95% CI 0.60–0.96).

Conclusions

The current study found a decreased prevalence of loneliness among Bangladeshi older adults during the ongoing pandemic. However, the prevalence is still very high. The findings suggest the need for mental health interventions that may include improving social interactions increasing opportunities for meaningful social connections with family and community members and providing psychosocial support to the vulnerable population including older adults during the pandemic. It also suggests that policymakers and public health practitioners should emphasise providing mental health services at the peripheral level where the majority of older adults reside.

Introduction

Loneliness is an emotional and mental state [1] that an individual faces in terms of subjective feelings of stress [2], sadness, low self-esteem [3], and hopelessness [4]. Loneliness is one of the most common psychological phenomena among older adults worldwide; around one-third of older adults are reported to be lonely [1, 5]. Loneliness increases the risk of heart disease, stroke, mortality, stress, chronic depression, dementia, and suicidal tendencies by damaging physical and mental health [6–9]. Empirical evidence showed that the risk of stroke and dementia raised by 30% and 50%, respectively, due to the sense of loneliness [10]. Loneliness also increased the chance of hospital visits [11], decreased quality of life [12], and mortality [13] among the older population. Additionally, one meta-analysis depicted that loneliness increases the risk of all-cause mortality by 26% among older adults [6]. Thus, loneliness in older adults remains a considerable public health concern.

The long-term COVID-19 pandemic has hard hit the world since early 2020 [14]. Recent studies showed that, amid the contemporary COVID-19 pandemic, a drastic increase in the prevalence of mental health-related issues (such as loneliness, fear, self-harm, frequent mood changes, and suicide) is seen worldwide [15–17]. Moreover, the mortality and associated physical and mental consequences of COVID-19 are disproportionately higher among the older populations [18]. The unpredictable nature of the disease, the fear of getting sick or dying, being stereotyped by others, restricted movements, home confinement for indefinite periods, limited social connectedness, and substantial and growing financial losses could aggravate the psychological situation of the general population, including older adults [19, 20].

The uncertainties and mitigating measures related to the pandemic have changed peoples’ everyday lifestyles and social relationships, making them vulnerable to loneliness. The concern about loneliness among older people is particularly worrying due to their living status, need
for long-term care, and weak physical and mental health conditions [21–23]. While social distancing is essential to limit the spread of viral infection, this can negatively affect the sense of social connectedness, ultimately affecting older people’s mental health. The consequence could be more severe for those with pre-existing loneliness and mental conditions [24].

Previous studies have documented that sociodemographic characteristics, such as being female, older age and unemployment, are linked to people’s loneliness during the pandemic [25–29]. Poor mental and physical health, anxiety and depression can increase loneliness [25, 30, 31]. Besides, chronic conditions and functional disability have been associated with higher perceived loneliness among older adults [25, 26, 28, 29]. One study demonstrated that more worry about COVID-19 infection and more financial strain because of the pandemic was linked to greater loneliness [32]. Conversely, social resources may promote resilience among older adults during the COVID-19 pandemic [33]. Greater household size, having a partner and more emotional support are associated with less loneliness [25–27, 29, 34]. However, there are limited studies that assessed the association of loneliness with socioeconomic (e.g. income, living arrangement, distance to healthcare facility) and COVID-19 related factors, including pre-existing health conditions of COVID-19 patients, feeling concerned about the pandemic, access to medical care and financial challenges during the pandemic among older people in LMICs, including Bangladesh.

This suggests an urgent need to assess the loneliness level among older adults during the COVID-19 pandemic. To fill this need, during the first wave of the pandemic in 2020, we surveyed 1,032 older Bangladeshi adults. In 2021, the second survey was conducted among the same population to observe changes in loneliness prevalence. In the present study, we used these two cross-sectional survey data to assess changes in the prevalence of loneliness across two timeframes (first and second waves of COVID-19 in Bangladesh) and to explore the factors associated with loneliness among the Bangladeshi older population.

Methods

Study design and participants

This repeated cross-sectional study was conducted on two successive occasions, i.e., October 2020 and September 2021, overlapping with the first and second waves of the COVID-19 pandemic in Bangladesh. The study was conducted remotely by the Aureolin Research, Consultancy and Expertise Development (ARCED) Foundation (a non-profit organisation based in Bangladesh). The primary challenge for this study was to develop a sampling frame to select participants. Thus, we utilised our pre-established registry, constructed by merging previously completed community-based studies conducted by ARCED Foundation as described in more detail in our previous studies [35–37], which included households from all eight administrative divisions of Bangladesh, as a sampling frame. Considering the 50% prevalence of loneliness with a 5% margin of error at the 95% confidence level, 90% power of the test, and 95% response rate, a sample size of 1096 was calculated. However, during the 2020 survey, 1032 approached eligible participants responded to the study with an overall response rate of approximately 94%. During the 2021 survey, 1045 approached eligible participants responded to the study with an overall response rate of approximately 95%. Based on the population distribution of older adults by geography in Bangladesh, we adopted a probability proportionate to size (of the eight-division) approach to select older adults in each division [38]. The inclusion criterion was the minimum age of 60 years. In each administrative division, households were selected using a simple random sampling technique from the list of eligible participants in the registry. Subsequently, one eligible participant was interviewed from each of the selected households. Hence, the number of included households and respondents is equal. The exclusion criteria included adverse
mental conditions (clinically proven schizophrenia, bipolar mood disorder, dementia/cognitive impairment), a hearing disability, or an inability to communicate.

### Measures

**Outcome measure.** The study’s primary outcome was loneliness, measured using the 3-item UCLA Loneliness scale [39]. The three items included: how often do you feel (i) lack of companionship, (ii) left out, and (iii) isolated in the last two weeks. Each item in the scale is measured in terms of 3-item Likert responses: hardly ever (1 point), some of the time (2 points), and often (3 points). The participants were classified as lonely if they answered ‘some of the time’ or ‘often’ to any item [1]. Dichotomised loneliness variable is used for all data analyses. We found it a reliable scale, indicated by the high internal consistency (Cronbach’s alpha 0.84) among our study participants in the pooled data.

**Explanatory variables.** An extensive literature review guided the selection of explanatory variables [40–45]. Explanatory variables considered in this study were administrative division (Barishal, Chattogram, Dhaka, Mymensingh, Khulna, Rajshahi, Rangpur, Sylhet), age (categorized as 60–69, and ≥70), sex (male/female), marital status (married/without partner), formal schooling (without formal schooling/with formal schooling), family size (≤4 or >4), family monthly income (BDT) (<5,000, 5,000–10,000, >10,000), residence (urban/rural), current occupation (employed/unemployed or retired), living arrangement (living alone or with family), walking distance to the nearest health center (<30 min/≥30 min), memory or concentration problems (no problem/low memory or concentration), suffering from non-communicable chronic conditions (yes/no), feeling concerned about COVID-19 (hardly, sometimes/often), feeling overwhelmed by COVID-19 (hardly, sometimes/often), difficulty in getting food, medicine, and routine medical care during COVID-19 (no/yes), difficulty in earning during COVID-19 (no/yes), perceived that family members are non-responsive (yes/no), and perceived that they required additional care during COVID-19 (yes/no). Self-reported information on non-communicable chronic conditions, such as arthritis, hypertension, heart diseases, stroke, hypercholesterolemia, diabetes, chronic respiratory diseases, chronic kidney disease, and cancer, was collected.

**Data collection tools and techniques.** A pre-tested semi-structured questionnaire was used to collect the information by interviewing the participants remotely using mobile phones. Data collection was accomplished electronically using SurveyCTO mobile app (https://www.surveycoto.com/) by trained research assistants, recruited based on previous experience administering health surveys on the electronic platform. The research assistants were trained extensively before the data collection through Zoom meetings.

The English version of the questionnaire was first translated into Bengali language and then back-translated to English by two researchers (SKM, AMA) to ensure the contents’ consistency. The questionnaire was then pilot tested among a small sample (n = 10) of older adults to refine the language in the final version. The tool used in the pilot study did not receive any corrections/suggestions from the participants on the contents that were developed in the local Bengali language.

**Statistical analysis.** The distribution of the variables was assessed through descriptive analyses. Given our variables’ categorical nature, Chi-square tests were performed to compare differences in the prevalence of loneliness by explanatory variables, with a 5% level of significance. We used binary logistic regression models to explore the factors associated with dichotomised loneliness in the pooled data. The initial model was run with all potential covariates listed in Table 2. Then, the final model was selected using backward elimination with the Akaike information criterion (AIC). Adjusted odds ratio (aOR) and associated 95% confidence interval (95% CI) are reported in Table 3. We also performed the model diagnostics, such as
multicollinearity, the area under the curve (AUC), and the Hosmer-Lemeshow test in the model. All analyses were performed using the statistical software package Stata (Version 14.0).

**Ethical approval**

The study protocol was approved by the Institutional Review Board of the Institute of Health Economics, the University of Dhaka, Bangladesh (Ref: IHE/2020/1037). Verbal informed consent was sought from the participants before administering the survey. Participation was voluntary, and participants did not receive any compensation.

**Patient and public involvement**

Patients and/or the public were not involved in developing the research questions, study design, data collection and result dissemination.

**Results**

**Characteristics of the participants**

Table 1 shows the characteristics of the study participants by survey year. In terms of survey participant coverage, there was a significant difference across geographic areas; for example, the highest coverage was from the Dhaka division in the 2020 Survey, while the highest coverage was from the Khulna division in the 2021 survey. In both surveys, most participants were 60–69 years old, male, married, without formal schooling, unemployed/retired, lived with family, and in rural areas (Table 1). However, participants’ characteristics, including sex, marital status, education, and income, were significantly different across the survey years. Compared to the 2020-survey, a considerably lower proportion of participants in the 2021 survey were male (59% vs. 66%), married (77% vs. 81%), and without formal education (52% vs. 58%). The proportion of participants living with family (92% in 2020 vs. 95% in 2021), in rural areas (74% vs. 83%) and proximity to health facility (49% vs. 56%) increased significantly between the survey years. We also noted a significant increase in the reported psychological characteristics, i.e., a higher proportion of participants reported poor memory or concentration, isolation, being overwhelmed with COVID-19, and having difficulty earning and obtaining food during COVID-19 in 2021 compared to 2020 (Table 1).

**Loneliness prevalence in older adults**

Table 2 shows the changes in the prevalence of loneliness over time and their variation and association with participants’ characteristics. We found a significant decline in the prevalence of loneliness between the two survey years (51.5% versus 45.7%; \( P = 0.008 \)). As seen in Table 2, the proportion of participants experiencing loneliness decreased for almost all the characteristics presented in Table 2.

Overall, the prevalence of loneliness decreased over time among females, among relatively older adults, those having a formal education, participants with higher family income, participants who were unemployed or retired, participants having memory problems, those suffering from non-communicable chronic conditions, participants who were concerned and overwhelmed by COVID-19, who faced difficulty in earning, getting medicine and routine medical care, and who perceived that they need additional care during the pandemic. However, the prevalence of loneliness seems to be static or increased a bit among the participants without a partner and those living alone (Table 2).
| Characteristics                          | 2020 survey |          | Survey 2021 |          |  \( P \) |
|----------------------------------------|-------------|----------|-------------|----------|----------|
|                                        | n           | %        | n           | %        |          |
| Overall                                | 1032        | 100.0    | 1045        | 100.0    |          |
| Administrative division                |             |          |             |          |          |
| Barishal                               | 149         | 14.4     | 146         | 14.0     | 0.001    |
| Chattogram                             | 137         | 13.3     | 98          | 9.4      |          |
| Dhaka                                  | 210         | 20.4     | 172         | 16.5     |          |
| Mymensingh                             | 63          | 6.1      | 69          | 6.6      |          |
| Khulna                                 | 158         | 15.3     | 198         | 19.0     |          |
| Rajshahi                               | 103         | 10.0     | 145         | 13.9     |          |
| Rangpur                                | 144         | 14.0     | 161         | 15.4     |          |
| Sylhet                                 | 68          | 6.6      | 56          | 5.4      |          |
| Age (year)                             |             |          |             |          |          |
| 60–69                                  | 803         | 77.8     | 790         | 75.6     | 0.385    |
| ≥ 70                                   | 229         | 22.2     | 255         | 24.4     |          |
| Sex                                    |             |          |             |          |          |
| Male                                   | 676         | 65.5     | 620         | 59.3     | 0.004    |
| Female                                 | 356         | 34.5     | 425         | 40.7     |          |
| Marital status                         |             |          |             |          |          |
| Married                                | 840         | 81.4     | 799         | 76.5     | 0.006    |
| Without partner                        | 192         | 18.6     | 246         | 23.5     |          |
| Formal schooling                       |             |          |             |          |          |
| Without formal schooling               | 602         | 58.3     | 540         | 51.7     | 0.002    |
| With formal schooling                  | 430         | 41.7     | 505         | 48.3     |          |
| Family size                            |             |          |             |          |          |
| ≤ 4                                    | 318         | 30.8     | 347         | 33.2     | 0.243    |
| > 4                                    | 714         | 69.2     | 698         | 66.8     |          |
| Family monthly income (BDT)            |             |          |             |          |          |
| < 5000                                 | 145         | 14.1     | 121         | 11.6     | <0.001   |
| 5000–10000                             | 331         | 32.1     | 469         | 44.9     |          |
| > 10000                                | 556         | 53.9     | 455         | 43.5     |          |
| Residence                              |             |          |             |          |          |
| Urban                                  | 269         | 26.1     | 182         | 17.4     | <0.001   |
| Rural                                  | 763         | 73.9     | 863         | 82.6     |          |
| Current occupation                     |             |          |             |          |          |
| Employed                               | 419         | 40.6     | 407         | 39.0     | 0.441    |
| Unemployed/retired                     | 613         | 59.4     | 638         | 61.1     |          |
| Living arrangement                     |             |          |             |          |          |
| Living with family                     | 953         | 92.3     | 992         | 94.9     | 0.016    |
| Living alone                           | 79          | 7.7      | 53          | 5.1      |          |
| Walking distance to the nearest health centre |     |          |             |          |          |
| < 30 minute                            | 503         | 48.7     | 581         | 55.6     | 0.002    |
| ≥ 30 minutes                           | 529         | 51.3     | 464         | 44.4     |          |
| Problem in memory or concentration     |             |          |             |          |          |
| No problem                             | 782         | 75.8     | 676         | 64.7     | <0.001   |
| Low memory or concentration            | 250         | 24.2     | 369         | 35.3     |          |
| Suffering from non communicable chronic conditions | |          |             |          |          |
| No                                     | 424         | 41.1     | 447         | 42.8     | 0.435    |

(Continued)
Factors associated with loneliness

Table 3 shows the correlates of loneliness in the pooled sample. Compared to the 2020-survey, the odds of loneliness were significantly lower in 2021-survey (AOR 0.67, 95% CI 0.54–0.84). Compared to their respective counterparts, the odds of loneliness were significantly higher among the participants without a partner (AOR 1.58, 95% CI 1.20–2.08), living with a family having a monthly income less than 5000 BDT (AOR 2.34, 95% CI 1.58–3.47), who lived alone (AOR 2.17, 95% CI 1.34–3.51), with poor memory or concentration (AOR 1.58, 95% CI 1.23–2.03), and suffering from non-communicable chronic conditions (AOR 1.55, 95% CI 1.23–1.95). Various COVID-19-related characteristics such as concern about COVID-19 (AOR 1.28, 95% CI 0.94–1.73), overwhelmed by COVID-19 (AOR 1.53, 95% CI 1.14–2.06), difficulty earning (AOR 2.00, 95% CI 1.54–2.59), and receiving routine medical care during COVID-19 (AOR 2.08, 95% CI 1.61–2.68), the perception that they required additional care during the pandemic (AOR 2.93, 95% CI 2.27–3.79) were associated with significantly higher odds of loneliness. However, the odds of loneliness were significantly lower among the participants with formal schooling (AOR 0.71, 95% CI 0.57–0.89) and with a family of more than four members (AOR 0.76, 95% CI 0.60–0.96) (Table 3).

Table 1. (Continued)

| Characteristics                       | 2020 survey | Survey 2021 | P    |
|---------------------------------------|-------------|-------------|------|
|                                       | n           | %           | n    | %    |
| Feeling concerned about COVID-19      |             |             |      |      |
| Hardly                                | 299         | 29.0        | 348  | 33.3 | 0.033|
| Sometimes to often                    | 733         | 71.0        | 697  | 66.7 |
| Feeling overwhelmed by COVID-19       |             |             |      |      |
| Hardly                                | 370         | 36.4        | 334  | 32.1 | 0.041|
| Sometimes to often                    | 647         | 63.6        | 706  | 67.9 |
| Difficulty in getting food during COVID-19 |         |             |      |      |
| No                                    | 553         | 55.3        | 514  | 49.7 | 0.011|
| Yes                                   | 447         | 44.7        | 521  | 50.3 |
| Difficulty in getting medicine during COVID-19 |         |             |      |      |
| No                                    | 733         | 75.3        | 764  | 74.8 | 0.765|
| Yes                                   | 240         | 24.7        | 258  | 25.2 |
| Difficulty in earning during COVID-19 |             |             |      |      |
| No                                    | 340         | 37.4        | 274  | 27.7 | <0.001|
| Yes                                   | 570         | 62.6        | 714  | 72.3 |
| Difficulty receiving routine medical care during COVID-19 |         |             |      |      |
| No                                    | 644         | 69.6        | 709  | 71.0 | 0.517|
| Yes                                   | 281         | 30.4        | 290  | 29.0 |
| Perceived that family members are non-responsive |         |             |      |      |
| No                                    | 687         | 66.6        | 738  | 70.6 | 0.047|
| Yes                                   | 345         | 33.4        | 307  | 29.4 |
| Perceived needing additional care during COVID-19 |         |             |      |      |
| No                                    | 769         | 74.5        | 770  | 73.7 | 0.665|
| Yes                                   | 263         | 25.5        | 275  | 26.3 |

1 USD = 85.75 BDT

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Table 2. Prevalence of loneliness over time and bivariate analysis (N = 2,077).

| Characteristics                      | 2020 survey |          |          | 2021 survey |          |          |
|--------------------------------------|-------------|----------|----------|-------------|----------|----------|
|                                      | n           | %lonely  | P        | n           | %lonely  | P        |
| Overall                              | 1032        | 51.5     |          | 1045        | 45.7     | 0.008    |
| Administrative division              |             |          |          |             |          |          |
| Barishal                             | 149         | 44.3     | 0.136    | 146         | 43.2     | 0.309    |
| Chattogram                           | 137         | 51.1     |          | 98          | 43.9     |          |
| Dhaka                                | 210         | 57.1     |          | 172         | 44.2     |          |
| Mymensingh                           | 63          | 46.0     |          | 69          | 39.1     |          |
| Khulna                               | 158         | 52.5     |          | 198         | 46.5     |          |
| Rajshahi                             | 103         | 49.5     |          | 145         | 41.4     |          |
| Rangpur                              | 144         | 57.6     |          | 161         | 53.4     |          |
| Sylhet                               | 68          | 42.7     |          | 56          | 53.6     |          |
| Age (year)                           |             |          |          |             |          |          |
| 60–69                                | 803         | 49.7     | 0.034    | 790         | 42.8     | 0.001    |
| ≥70                                  | 229         | 57.6     |          | 255         | 54.5     |          |
| Sex                                  |             |          |          |             |          |          |
| Male                                 | 676         | 48.5     | 0.009    | 620         | 40.5     | <0.001   |
| Female                               | 356         | 57.0     |          | 425         | 53.2     |          |
| Marital status                       |             |          |          |             |          |          |
| Married                              | 840         | 50.8     | 0.404    | 799         | 41.2     | <0.001   |
| Without partner                      | 192         | 54.2     |          | 246         | 60.2     |          |
| Formal schooling                     |             |          |          |             |          |          |
| Without formal schooling             | 602         | 54.8     | 0.011    | 540         | 51.1     | <0.001   |
| With formal schooling                | 430         | 46.7     |          | 505         | 39.8     |          |
| Family size                          |             |          |          |             |          |          |
| ≤4                                   | 318         | 51.9     | 0.853    | 347         | 49.0     | 0.126    |
| >4                                   | 714         | 51.3     |          | 698         | 44.0     |          |
| Family monthly income (BDT)          |             |          |          |             |          |          |
| <5000                                | 145         | 66.2     | <0.001   | 121         | 70.3     | <0.001   |
| 5000–10000                           | 331         | 45.0     |          | 469         | 43.7     |          |
| >10000                               | 556         | 51.4     |          | 455         | 41.1     |          |
| Residence                            |             |          |          |             |          |          |
| Urban                                | 269         | 45.7     | 0.029    | 182         | 42.9     | 0.406    |
| Rural                                | 763         | 53.5     |          | 863         | 46.2     |          |
| Current occupation                   |             |          |          |             |          |          |
| Employed                             | 419         | 53.7     | 0.233    | 407         | 39.6     | 0.002    |
| Unemployed/retired                   | 613         | 49.9     |          | 638         | 49.5     |          |
| Living arrangement                   |             |          |          |             |          |          |
| Living with family                   | 953         | 49.7     | <0.001   | 992         | 44.0     | <0.001   |
| Living alone                         | 79          | 72.2     |          | 53          | 77.4     |          |
| Walking distance to the nearest health centre | 503         | 46.9     | 0.004    | 581         | 46.3     | 0.635    |
| ≥30 minutes                          | 529         | 55.8     |          | 464         | 44.8     |          |
| Problem in memory or concentration   |             |          |          |             |          |          |
| No problem                           | 782         | 46.4     | <0.001   | 676         | 38.0     | <0.001   |
| Low memory or concentration          | 250         | 67.2     |          | 369         | 59.6     |          |
| Suffering from non-communicable chronic conditions | 424         | 40.8     | <0.001   | 447         | 37.1     | <0.001   |

(Continued)
Discussion

This repeated cross-sectional study assessed changes in the loneliness prevalence in older adults and its associated correlates during the first and second waves of the COVID-19 pandemic in Bangladesh. Findings found a decreased loneliness prevalence among older adults during the first and second waves of COVID-19, from 51.5% in 2020 to 45.7% in 2021.

Our study indicates that loneliness in older people during COVID-19 is still very high. To compare our study’s findings, we did not find any published study that reported changes in older people’s loneliness during the COVID-19 pandemic in Bangladesh and other low- and middle-income countries. However, loneliness prevalence among older adults (45.70%) in our study is broadly comparable with the rates reported by studies from high-income countries, including the United States (54%) [46], the United Kingdom (35.86%) [47], and Canada (43.1%) [18]. Meanwhile, a cross-sectional study that was conducted online on Columbian women (aged 40–59 years) found a similar rate of loneliness (44.5%) during the COVID-19 pandemic to that of the current study [48]. Pre-pandemic evidence found prevalence rates in older adults (aged ≥60 years) in Bangladesh [49] and Singapore [50], ranging from 42% to 54.3%. Many factors, including study design, study tools to measure loneliness, different time
| Characteristics                                      | aOR  | 95% CI    | P    |
|-----------------------------------------------------|------|-----------|------|
| Survey year                                         |      |           |      |
| 2020                                                | Ref  |           |      |
| 2021                                                | 0.67 | 0.54–0.84 | 0.001|
| Age (year)                                          |      |           |      |
| 60–69                                               | Ref  |           |      |
| > = 70                                              | 1.18 | 0.90–1.54 | 0.237|
| Marital status                                      |      |           |      |
| Married                                             | Ref  |           |      |
| Without partner                                     | 1.58 | 1.20–2.08 | 0.001|
| Formal schooling                                    |      |           |      |
| Without formal schooling                            | Ref  |           |      |
| With formal schooling                               | 0.71 | 0.57–0.89 | 0.003|
| Family size                                         |      |           |      |
| ≤4                                                  | Ref  |           |      |
| >4                                                  | 0.76 | 0.60–0.96 | 0.021|
| Family monthly income (BDT)                         |      |           |      |
| >10000                                              | Ref  |           |      |
| 5000–10000                                          | 1.01 | 0.80–1.29 | 0.907|
| <5000                                               | 2.34 | 1.58–3.47 | <0.001|
| Living arrangement                                  |      |           |      |
| Living with family                                  | Ref  |           |      |
| Living alone                                        | 2.17 | 1.34–3.51 | 0.002|
| Walking distance to the nearest health centre       |      |           |      |
| <30 minute                                          | Ref  |           |      |
| ≥30 minutes                                         | 1.18 | 0.95–1.47 | 0.130|
| Problem in memory or concentration                  |      |           |      |
| No problem                                          | Ref  |           |      |
| Low memory or concentration                         | 1.58 | 1.23–2.03 | <0.001|
| Suffering from non-communicable chronic conditions  |      |           |      |
| No                                                  | Ref  |           |      |
| Yes                                                 | 1.55 | 1.23–1.95 | <0.001|
| Feeling concerned about COVID-19                    |      |           |      |
| Hardly                                              | Ref  |           |      |
| Sometimes to often                                  | 1.28 | 0.94–1.73 | 0.113|
| Feeling overwhelmed by COVID-19                      |      |           |      |
| Hardly                                              | Ref  |           |      |
| Sometimes to often                                  | 1.53 | 1.14–2.06 | 0.005|
| Difficulty in earning during COVID-19               |      |           |      |
| No                                                  | Ref  |           |      |
| Yes                                                 | 2.00 | 1.54–2.59 | <0.001|
| Difficulty receiving routine medical care during COVID-19 | | | |
| No                                                  | Ref  |           |      |
| Yes                                                 | 2.08 | 1.61–2.68 | <0.001|
| Perceived that family members are non-responsive    |      |           |      |
| No                                                  | Ref  |           |      |
| Yes                                                 | 1.25 | 0.98–1.59 | 0.068|
| Perceived needing additional care during COVID-19   |      |           |      |

(Continued)
frames, pre-and post-pandemic factors, sampling differences, cultural factors, and socio-economic contexts, may elucidate the differences in older people’s loneliness during the pandemic.

The present study reported that loneliness was higher among older adults with a family with limited income, difficulty in earning and living alone. The declining traditional value system wherein family members live together and care for each other [51] and the increasing trend of nuclear families [52] are the potential reasons for older people’s loneliness in Bangladesh. Our study’s findings are reasonably comparable with existing literature, suggesting increased loneliness among older people with children, limited income and living alone in the community [53]. We also found a higher prevalence of loneliness in older people with no partners, those having poor memory or concentration and those suffering from non-communicable chronic conditions. Older people’s loneliness was expected because they tend to live alone, lose spouses, family and friends [46, 54], and face chronic illness and experience hearing loss more than younger individuals [55]. The current study’s increased loneliness in older adults may be due to COVID-19-related physical distancing and isolation measures [53]. Furthermore, limited participation in religious activities [56], limited regular activities (e.g. physical activity, exercise etc.) [57, 58], and quality of interpersonal relationships with them [48] might explain such increased loneliness in older adults. Our findings suggest loneliness prevention intervention that can address specific needs of older adults such as health conditions, housing environment, level of connectedness to close ones and cultural characteristics, the degree of loneliness experienced and the available supportive environment required for maintaining a good quality of life.

Our study found that participants feeling concerned about and overwhelmed by COVID-19, those perceiving that they required additional care, and receiving routine medical care during the pandemic were more likely to feel lonely. We could not find any related studies that had been conducted on loneliness in older adults in Bangladesh and beyond. Thus, to our knowledge, there are no or limited data available for comparison in this context. However, evidence indicates that the emergency of coronavirus interrupted [59] and overwhelmed individuals’ lives, thus requiring additional care during the pandemic [44, 60]. Furthermore, people’s access to public transport was limited due to coronavirus-related lockdowns [59]. As most people in Bangladesh primarily depend on public transport, such limited transportation services interrupted their routine medical care [61]. Lockdowns during the pandemic may also increase individuals’ sedentary behaviours and limit physical activity [62], heightening their tension, anxiety, and fear [48] and resulting in adverse psychological health [63]. During the pandemic, such changes in individuals’ everyday lives may increase the risk of loneliness in older adults [5]. Our findings suggest providing targeted care and services for reducing loneliness in older adults while maintaining Covid-1-related physical distancing measures.

To our knowledge, using a repeated cross-sectional survey, this is the first study examining the association of loneliness in older adults with their schooling and family size during the COVID-19 pandemic. As expected, decreased loneliness was found among participants with formal schooling and a family of more than four members in our study and previous research.
also documented similar results [33–35]. The potential reasons are that participants with formal schooling are educated and may be aware of the adverse effects of loneliness, and the potential strategies for preventing and responding to loneliness [64]. Education can minimise individuals’ loneliness by enhancing social networks and connectedness with friends and external individuals via social media [65]. Furthermore, older people with more family members have the potential to mix and interact with many family members, which reduces their risk of being lonely.

**Strengths and limitations of the study**

The current study has several strengths. First, this study is among the first in Bangladesh to estimate the changes in loneliness prevalence and examine its correlates among Bangladeshi older adults during the two timeframes (first and second waves of COVID-19 in Bangladesh). Our study contributed to the limited international literature [18, 46, 47, 66] that has examined loneliness prevalence among older adults and its predictors during the COVID-19 pandemic. Second, to the best of our knowledge, some of the correlates of loneliness in older adults (e.g. feeling overwhelmed by the COVID-19 pandemic, perceiving that they required additional care during the pandemic, and receiving routine medical care) in the current study have been reported for the first time in Bangladesh and globally. Despite these strengths, our study’s findings have several limitations. First, our research was cross-sectional in nature. Therefore, causality cannot be established. Second, our study is limited to quantitative analysis, as we did not explore the qualitative aspects of older adults’ feelings of loneliness during the first and second waves of the pandemic. Secondly, amidst the pandemic, the sampling frame for the study was constructed by merging the contact information of previously completed community-based studies conducted by ARCED Foundation. Also, we had to conduct telephone interviews, and the sample might likely exclude those who do not have telephone access. Therefore, our sample may not represent the entire older adults of Bangladesh. These limitations highlight the need for future nationally representative research with a mixed-method approach, including a qualitative study exploring older adults’ experience of loneliness and its associated factors during the COVID-19 pandemic. This will provide a better understanding of older adults’ feelings of loneliness and the related factors during the COVID-19 pandemic in Bangladesh.

**Implications for policy and practice**

Our findings have several implications for future research and policy for older people in Bangladesh. Firstly, our study’s findings highlight the necessity for interventions to engage older adults in social and community activities and improve social interactions and community participation (while practising safety measures to limit the COVID-19 spread) to minimise the likelihood of experiencing loneliness. Secondly, the current study emphasises that it is vital to reduce the higher loneliness prevalence among older people with limited income, difficulty earning and living alone by providing financial support. Older people’s loneliness can also be reduced by encouraging their children to contact and look after their parents and provide them with food and shelter. In this context, implementing the existing Parents Care Act (2013) [67] may help older people, including those who are poor, live alone, have earning difficulty, and integrate into their families. Such integration may help older people interact and live with their family members, including children and grandchildren, thus reducing their loneliness. Thirdly, it is equally important to change lonely older people’s perceptions and feelings of disconnection during the pandemic. Disseminating loneliness prevention strategies via information sessions and leaflets might be a potential option for minimising older people’s loneliness during the pandemic.
Conclusion
The present study revealed that while the prevalence of loneliness decreased among Bangladeshi older adults during the pandemic, still nearly half of the participants were lonely, which needs to be taken seriously. The study’s findings suggest the need for designing and implementing people-centered supportive mental health interventions for older adults to improve social interactions increasing opportunities for meaningful social connections with family and community members during this pandemic and beyond. While designing interventions, addressing the factors associated with loneliness is crucial. Policymakers and health care practitioners should also consider strengthening social support care and providing psychosocial support for the older population as part of the emergency management plan during this COVID-19 pandemic.

Supporting information
S1 Data.
(DTA)

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References
1. Perissinotto CM, Cenzer IS, Covinsky KE. Loneliness in older persons: a predictor of functional decline and death. Archives of internal medicine. 2012; 172(14):1078–84. https://doi.org/10.1001/archinternmed.2012.1993 PMID: 22710744
2. Burke TJ, Segrin C. Bonded or stuck? Effects of personal and constraint commitment on loneliness and stress. Personality and Individual Differences. 2014; 64:101–6.
3. Świątek P, Grygiel P, Anczewska M, Wciórka J. Experiences of discrimination and the feelings of loneliness in people with psychotic disorders: the mediating effects of self-esteem and support seeking. Comprehensive Psychiatry. 2015; 59:73–9. https://doi.org/10.1016/j.comppsych.2015.02.016 PMID: 25764908
4. Chang EC, Lian X, Yu T, Qu J, Zhang B, Jia W, et al. Loneliness under assault: Understanding the impact of sexual assault on the relation between loneliness and suicidal risk in college students. Personality and individual differences. 2015; 72:155–9.

5. Wu B. Social isolation and loneliness among older adults in the context of COVID-19: a global challenge. Global health research and policy. 2020; 5(1):1–3. https://doi.org/10.1186/s41256-020-00154-3 PMID: 32514427

6. Holt-Lunstad J, Smith TB, Baker M, Harris T, Stephenson D. Loneliness and social isolation as risk factors for mortality: a meta-analytic review. Perspectives on psychological science. 2015; 10(2):227–37. https://doi.org/10.1177/1745691614568352 PMID: 25910392

7. Hoogendijk EO, Smit AP, van Dam C, Schuster NA, de Breij S, Holwerda TJ, et al. Frailty combined with loneliness or social isolation: an elevated risk for mortality in later life. Journal of the American Geriatrics Society. 2020; 68(11):2587–93. https://doi.org/10.1111/jgs.17616 PMID: 32700319

8. Valtorta NK, Kanaan M, Gilbody S, Ronzi S, Hanratty B. Loneliness and social isolation as risk factors for coronary heart disease and stroke: systematic review and meta-analysis of longitudinal observational studies. Heart. 2016; 102(13):1009–16. https://doi.org/10.1136/heartjnl-2015-308790 PMID: 27091846

9. Cacioppo JT, Hughes ME, Waite LJ, Hawkley LC, Thisted RA. Loneliness as a specific risk factor for depressive symptoms: cross-sectional and longitudinal analyses. Psychology and aging. 2006; 21(1):140. https://doi.org/10.1037/0882-7974.21.1.140 PMID: 16594799

10. Donovan NJ, Blazer D. Social isolation and loneliness in older adults: review and commentary of a National Academies report. The American Journal of Geriatric Psychiatry. 2020; 28(12):1233–44. https://doi.org/10.1016/j.jagp.2020.08.005 PMID: 32919873

11. Gerst-Emerson K, Jayawardhana J. Loneliness as a public health issue: the impact of loneliness on health care utilization among older adults. American Journal of Public Health. 2015; 105(5):1013–9. https://doi.org/10.2105/AJPH.2014.302427 PMID: 25790413

12. Musich S, Wang SS, Hawkins K, Yeh CS. The impact of loneliness on quality of life and patient satisfaction among older, sicker adults. Gerontology and Geriatric Medicine. 2015; 1:2333721415582119. https://doi.org/10.1177/2333721415582119 PMID: 28138454

13. Holwerda TJ, Van Tilburg TG, Deeg DJH, Schutter N, Van R, Dekker J, et al. Impact of loneliness and depression on mortality: results from the Longitudinal Ageing Study Amsterdam. The British Journal of Psychiatry. 2016; 209(2):127–34. https://doi.org/10.1192/bjp.bp.115.168005 PMID: 27103680

14. Hui DS, Azhar EI, Madani TA, Ntoumi F, Kock R, Dar O, et al. The continuing 2019-nCoV epidemic threat of novel coronaviruses to global health—The latest 2019 novel coronavirus outbreak in Wuhan, China. International journal of infectious diseases. 2020; 91:264–6. https://doi.org/10.1016/j.ijid.2020.01.009 PMID: 31953166

15. Dawel A, Shou Y, Smithson M, Cherbuin N, Banfield M, Calear AL, et al. The effect of COVID-19 on mental health and wellbeing in a representative sample of Australian adults. Frontiers in psychiatry. 2020; 11:1026.

16. Liu X, Zhu M, Zhang R, Zhang J, Zhang C, Liu P. et al. Public mental health problems during COVID-19 pandemic: a large-scale meta-analysis of the evidence. Translational psychiatry. 2021; 11(1):1–10.

17. Terry PC, Parsons-Smith RL, Terry VR. Mood responses associated with COVID–19 restrictions. Frontiers in Psychology. 2020; 11:3090. https://doi.org/10.3389/fpsyg.2020.589598 PMID: 33312153

18. Savage RD, Wu W, Li J, Lawson A, Bronskill SE, Chamberlain SA, et al. Loneliness among older adults in the community during COVID-19: a cross-sectional survey in Canada. BMJ open. 2021; 11(4): e044517. https://doi.org/10.1136/bmjopen-2020-044517 PMID: 33811054

19. Salari N, Hosseinian-Far A, Jalali R, Vaisi-Raygani A, Rasoulpour S, Mohammad M, et al. Prevalence of stress, anxiety, depression among the general population during the COVID-19 pandemic: a systematic review and meta-analysis. Globalization and health. 2020; 16(1):1–11.

20. Polšek D. Huremović D, editor. Psychiatry of Pandemics: a Mental Health Response to Infection Outbreak: Springer International Publishing 2019; 185 pages; ISBN978-3-030-15346-5 (e-book), ISBN978-3-030-15345-8 (softcover). Croatian Medical Journal. 2020; 61(3):306.

21. Koyama Y, Nawa N, Yamaoka Y, Nishimura H, Sonoda S, Kuramochi J, et al. Interplay between social isolation and loneliness and chronic systemic inflammation during the COVID-19 pandemic in Japan: Results from U-CORONA study. Brain, Behavior, and Immunity. 2021; 94:51–9. https://doi.org/10.1016/j.bbi.2021.03.007 PMID: 33705870

22. Smith BJ, Lim MH. How the COVID-19 pandemic is focusing attention on loneliness and social isolation. Public Health Res Pract. 2020; 30(2):3022008. https://doi.org/10.17061/jphp3022008 PMID: 32601651
23. Leigh-Hunt N, Bagguley D, Bash K, Turner V, Turnbull S, Valtorta N, et al. An overview of systematic reviews on the public health consequences of social isolation and loneliness. Public health. 2017; 152:157–71. https://doi.org/10.1016/j.puhe.2017.07.035 PMID: 28915435

24. Khan MSR, Kadoya Y. Loneliness during the COVID-19 pandemic: a comparison between older and younger people. International journal of environmental research and public health. 2021; 18(15):7871. https://doi.org/10.3390/ijerph18157871 PMID: 34360164

25. Cohen-Mansfield J, Hazan H, Lerman Y, Shalom V. Correlates and predictors of loneliness in older-adults: a review of quantitative results informed by qualitative insights. International psychogeriatrics. 2016; 28(4):557–76. https://doi.org/10.1017/S1041610215001532 PMID: 26424033

26. Luhmann M, Hawkley LC. Age differences in loneliness from late adolescence to oldest old age. Developmental psychology. 2016; 52(6):943. https://doi.org/10.1037/0021-9434.52.6.943

27. Vozikaki M, Papadaki A, Linardakis M, Philalithis A. Loneliness among older European adults: Results from the survey of health, aging and retirement in Europe. Journal of Public Health. 2018; 26(6):613–24.

28. Kuwert P, Knaevelsrud C, Pietrzak RH. Loneliness among older veterans in the United States: Results from the National Health and Resilience in Veterans Study. The American Journal of Geriatric Psychiatry. 2014; 22(6):564–9. https://doi.org/10.1016/j.jagp.2013.02.013 PMID: 23806682

29. von Soest T, Luhmann M, Hansen T, Gerstorf D. Development of loneliness in midlife and old age: Its nature and correlates. Journal of Personality and Social Psychology. 2020; 118(2):386. https://doi.org/10.1037/pspp0000219 PMID: 30284871

30. Barnett MD, Moore JM, Archuleta WP. A loneliness model of hypochondriasis among older adults: The mediating role of intolerance of uncertainty and anxious symptoms. Archives of gerontology and geriatrics. 2019; 83:86–90. https://doi.org/10.1016/j.archger.2019.03.027 PMID: 30974401

31. Beutel ME, Klein EM, Brähler E, Reiner I, Jünger C, Michal M, et al. Loneliness in the general population: prevalence, determinants and relations to mental health. BMC psychiatry. 2017; 17(1):97. https://doi.org/10.1186/s12888-017-1262-x PMID: 28320380

32. Polenick CA, Perbix EA, Salwi SM, Maust DT, Birditt KS, Brooks JM. Loneliness During the COVID-19 Pandemic Among Older Adults With Chronic Conditions. Journal of Applied Gerontology. 2021;073346821996527.

33. Van Orden KA, Bower E, Lutz J, Silva C, Gallegos AM, Podgorski CA, et al. Strategies to promote social connections among older adults during “social distancing” restrictions. The American Journal of Geriatric Psychiatry. 2021; 29(8):816–27. https://doi.org/10.1016/j.jagp.2020.05.004 PMID: 32425473

34. Hawkley LC, Wrobleswski K, Kaiser T, Luhmann M, Schumm LP. Are US older adults getting lonelier? Age, period, and cohort differences. Psychology and Aging. 2019; 34(8):1144.

35. Mistry SK, Ali ARM, Akther F, Yadav UN, Harris MF. Exploring fear of COVID-19 and its correlates among older adults in Bangladesh. Globalization and Health. 2021; 17(1):1–9.

36. Mistry SK, Ali ARM, Hossain M, Yadav UN, Ghimire S, Rahman M, et al. Exploring depressive symptoms and its associates among Bangladeshi older adults amid COVID-19 pandemic: findings from a cross-sectional study. Social psychiatry and psychiatric epidemiology. 2021; 56(8):1487–97. https://doi.org/10.1007/s00127-021-02052-6 PMID: 33661353

37. Mistry SK, Ali AM, Rahman MA, Yadav UN, Gupta B, Rahman MA, et al. Changes in tobacco use patterns during COVID-19 and their correlates among older adults in Bangladesh. International Journal of Environmental Research and Public Health. 2021; 18(4):1779. https://doi.org/10.3390/ijerph18041779 PMID: 33673087

38. BBS. Elderly Population in Bangladesh: Current features and future perspectives. Dhaka: Bangladesh Bureau of Statistics, Ministry of Bangladesh, Government of Bangladesh, 2015.

39. Hughes ME, Waite LJ, Hawkley LC, Cacioppo JT. A short scale for measuring loneliness in large surveys: Results from two population-based studies. Research on aging. 2004; 26(6):655–72. https://doi.org/10.1177/0164027504268574 PMID: 15804506

40. Abir T, Osuagwu UL, Kalimullah NA, Yazdani DMN-A, Husain T, Basak P, et al. Psychological Impact of COVID-19 Pandemic in Bangladesh: Analysis of a Cross-Sectional Survey. Health security. 2021; 19(4):1779. https://doi.org/10.1177/1525805321978719 PMID: 34360164

41. Mamun MA, Sakib N, Gozal D, Bhuiyan Al, Hossain S, Bodrud-Doza M, et al. The COVID-19 pandemic and serious psychological consequences in Bangladesh: a population-based nationwide study. Journal of affective disorders. 2021; 279:462–72. https://doi.org/10.1016/j.jad.2020.10.036 PMID: 33120247

42. Cheruvu VK, Chiayaka ET. Prevalence of depressive symptoms among older adults who reported medical cost as a barrier to seeking health care: findings from a nationally representative sample. BMC geriatrics. 2019; 19(1):1–10.
43. Banna MHA, Sayeed A, Kundu S, Christopher E, Hasan MT, Begum MR, et al. The impact of the COVID-19 pandemic on the mental health of the adult population in Bangladesh: a nationwide cross-sectional study. International Journal of Environmental Health Research. 2020;1–12. https://doi.org/10.1080/09603123.2020.1802409 PMID: 32741205

44. Mistry SK, Ali AM, Akther F, Yadav UN, Harris MF. Exploring fear of COVID-19 and its correlates among older adults in Bangladesh. Globalization and Health. 2021; 17(1):1–9.

45. Mistry SK, Ali AM, Hossain MB, Yadav UN, Ghimire S, Rahman MA, et al. Exploring depressive symptoms and its associates among Bangladeshi older adults amid COVID-19 pandemic: findings from a cross-sectional study. Social Psychiatry and Psychiatric Epidemiology. 2021:1–11. https://doi.org/10.1007/s00127-021-02052-6 PMID: 33661353

46. Kotwal AA, Holt-Lunstad J, Newmark RL, Cenzer I, Smith AK, Covinsky KE, et al. Social isolation and loneliness among San Francisco Bay Area older adults during the COVID-19 shelter-in-place orders. Journal of the American Geriatrics Society. 2021; 69(1):20–9. https://doi.org/10.1111/jgs.16865 PMID: 32965024

47. Li LZ, Wang S. Prevalence and predictors of general psychiatric disorders and loneliness during COVID-19 in the United Kingdom. Psychiatry research. 2020; 291:113267. https://doi.org/10.1016/j.psyres.2020.113267 PMID: 32623266

48. Monterrosa-Bianco A, Monterrosa-Castro Á, González-Sequera A. Online assessment of the perception of loneliness and associated factors in Colombian climacteric women during the COVID-19 pandemic: A cross-sectional study. Health Promotion Perspectives. 2021; 11(2):230–9. https://doi.org/10.34172/hpp.2021.26 PMID: 34195047

49. Rahman MS, Rahman MA, Rahman MS. Prevalence and determinants of loneliness among older adults in Bangladesh. International Journal of Emerging Trends in Social Sciences. 2019; 5(2):57–64.

50. Malhotra R, Tareque MI, Saito Y, Ma S, Chiu CT, Chan A. Loneliness and health expectancy among older adults: A longitudinal population-based study. Journal of the American Geriatrics Society. 2021; 69(1):3092–102. https://doi.org/10.1111/jgs.17343 PMID: 34231876

51. Hossain F. Needs of the destitute elderly of Bangladesh: A sociological inquiry. Middle East Journal of Age & Ageing. 2013; 10(5):21–30.

52. Barikdar A, Ahmed T, Lasker SP. The situation of the elderly in Bangladesh. Bangladesh Journal of Bioethics. 2016; 7(1):27–36.

53. Seifert A, Hassler B. Impact of the COVID-19 pandemic on loneliness among older adults. Frontiers in Sociology. 2020; 5:87. https://doi.org/10.3389/fsoc.2020.590935 PMID: 33869519

54. Pate A. Social isolation: its impact on the mental health and wellbeing of older Victorians: COTA Victoria Melbourne, Australia; 2014.

55. Centers for Disease Control and Prevention. Loneliness and social isolation linked to serious health conditions 2022 [cited 2022 17 January]. Available from: https://www.cdc.gov/aging/publications/features/lonely-older-adults.html

56. Frenkel-Yosef M, Maytles R, Shrir A. Loneliness and its concomitants among older adults during the COVID-19 pandemic. International psychogeriatrics. 2020; 32(10):1257–9.

57. Bai Z, Wang Z, Shao T, Qin X, Hu Z. Association between social capital and loneliness among older adults: a cross-sectional study in Anhui Province, China. BMC geriatrics. 2021; 21(1):1–10.

58. Fullana MA, Hidalgo-Mazzei D, Vieta E, Radua J. Coping behaviors associated with decreased anxiety and depressive symptoms during the COVID-19 pandemic and lockdown. Journal of Affective Disorders. 2020; 275:80–1. https://doi.org/10.1016/j.jad.2020.06.027 PMID: 32658829

59. Huda MN, Uddin H, Hasan MK, Malo JS, Duong MC, Rahman MA. Examining Bangladesh's responses to COVID-19 in light of Vietnam: Lessons learned. Global Biosecurity. 2021; 3(1).

60. Van Jaarsveld GM. The effects of COVID-19 among the elderly population: a case for closing the digital divide. Frontiers in psychiatry. 2020;11.

61. Shammi M, Bodrud-Doza M, Islam ARMT, Rahman MM. COVID-19 pandemic, socioeconomic crisis and human stress in resource-limited settings: a case from Bangladesh. Heliyon. 2020; 6(5):e04063. https://doi.org/10.1016/j.heliyon.2020.e04063 PMID: 32462098

62. Stockwell S, Trott M, Tully M, Shin J, Barnett Y, Butler L, et al. Changes in physical activity and sedentary behaviours from before to during the COVID-19 pandemic lockdown: a systematic review. BMJ Open Sport & Exercise Medicine. 2021; 7(1):e000960. https://doi.org/10.1136/bmjsem-2020-000960 PMID: 34192010

63. Violant-Holz V, Gallego-Jiménez MG, González-González CS, Muñoz-Violant S, Rodríguez MJ, Sánchez-Nadal O, et al. Psychological health and physical activity levels during the COVID-19 pandemic: a systematic review. International journal of environmental research and public health. 2020; 17(24):9419. https://doi.org/10.3390/ijerph17249419 PMID: 33334073
64. Burns T. OECD education and skills today 2021 [cited 2022 18 January]. Available from: https://oecdedutoday.com/how-can-education-help-fight-loneliness/.

65. Faizi R, El Fkihi S. Investigating the Role of Social Networks in Enhancing Students' Learning Experience: Facebook as a Case Study. International Association for Development of the Information Society. 2018.

66. O'Shea BQ, Finlay JM, Kler J, Joseph CA, Kobayashi LC. Loneliness Among US Adults Aged> 55 Early in the COVID-19 Pandemic: Findings From the COVID-19 Coping Study. Public Health Reports. 2021:00333549211029965.

67. International Labor Organisation. Civil, commercial and family law; old-age, invalidity and survivors benefit 2013 [cited 2022 19 January]. Available from: http://www.ilo.org/dyn/natlex/natlex4.detail?p_lang=en&p_isn=95797.