# Depression and Associated Factors Among the Elderly Population in an Urban Tertiary Geriatric Hospital in Bangladesh

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## Abstract

**Background:** Geriatric depression becoming a serious concern worldwide, but no studies addressed depression among patients attending outpatient department of a tertiary geriatric care hospital in Bangladesh. **Methods:** This cross-sectional study was conducted in face-to-face interview using the Geriatric Depression Scale (GDS-15) to measure depression among 230 elderly outpatients (60–80 years old) who visited the hospital for medical reasons in Dhaka city; a variety of socio-demographic, behavioral, and psycho-social variables as well as history of chronic diseases were assessed to detect factors associated with depression. **Results:** The prevalence of depression was 81.7%; 52.6%, 25.2%, and 3.9% showed mild, moderate and severe depression (the GDS scores 5–8, 9–11, and 12–15), respectively. In logistic regression models, the associated factors included marital status, occupational status, educational status, physical activity, and history of cerebrovascular diseases or stroke. The prevalence of depression was generally higher than other reports elsewhere, and the reason behind this may include the use of the GDS-15 and the setting to carry out this study. **Conclusion:** Nationally representative investigations are warranted to further address depression among the elderly in Bangladesh; these findings would be helpful for future studies and intervention programs.

## Introduction

Over the past few decades aging society is affecting Bangladesh, as is seen in the rest of the world. Psychiatric disorders including depression become more common among aged population irrespective of gender (Barikdar et al., 2016; Jindal et al., 2019; Khanam et al., 2011; Shahar et al., 2011; WHO, 2017). It has been reported that 7.9% of people in Bangladesh are older than 60 years; 16.8% and 6.7% of adults have any mental disorders and depression, respectively (DGHS Health Bulletin [WWW Document], n.d.). Depression increases health care utilization costs and reduces quality of life. It is certainly one of the prevalent geriatric health concerns (Abe et al., 2012; Luppa et al., 2012). Depression can be noted over the lifespan and is considered a heterogenous, multifactorial mental disorder with diverse phenotypes across the individuals (Barcelos-Ferreira et al., 2013). In 2020, depression was projected to be the second most prevalent health condition after ischemic heart disease, as predicted by the World Health Organization (WHO) (Kessler & Bromet, 2013). According to the WHO, approximately 280 million people in the world have depression, among them 5.7% older adults (above 60 years) are suffering from depression (Depression [WWW Document], n.d.

In general geriatric depression (GD) affects people aged 60 years or older; it is also termed late-life depression (Grover et al., 2019; Van Damme et al., 2018). The fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) defines geriatric depression as follows: anhedonia (losing interest in what were

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previously enjoyable entertainment activities) and/or depressed mood through most of the day, along with (four or more) other features: (1) significant decrease or increase in weight or appetite; (2) insomnia or hypersomnia; (3) fatigue, psychomotor agitation, or retardation; (4) diminished ability to concentrate or make decisions; (5) recurrent thoughts of death or suicidal ideation (Diagnostic and Statistical Manual of Mental Disorders [WWW Document], n.d.; Van Damme et al., 2018).

A 4.1% prevalence of depression is reported in Bangladesh, explaining 7.1% of years lived with disability (YLD) ("Mental health of older adults," n.d.). As life expectancy is increasing gradually, the number of older adults (aged 60 or above) is also increasing, in 2012 the proportion was 6.9% in Bangladesh (Bangladesh Health Bulletin 2017 | GHDx [WWW Document], n.d.). Research suggests the estimation will rise to 20% within 2051 (Kabir et al., 2013). A previous study reported that in Bangladesh, older persons (aged over 60) had 2.79 times higher risk of depression than the middle-aged (aged 40–59) (Das et al., 2014). There have been three other studies conducted among geriatric population in different districts of Bangladesh, to our knowledge (Das et al., 2014; Disu et al., 2019; Uddin et al., 2017).

Urbanization is likely characterized with nuclear families and busy work schedules of beloved ones, which may ultimately make an older person to feel more isolated despite living with family members; at these latter decades of life, an older person is normally retired from job, maybe has bereaved from partner and frequently suffers from various chronic physical diseases. With increasing life expectancy, negative experiences such as loneliness and fear of death are expected to increase, potentially contributing to depression. Several biological, social, psychological, and environmental risk factors are reported in the literature such as female, older, single, drug and multiple medication user, having lower educational status, low income, unemployment, lack of health insurance, poor physical health and frailty, loneliness, lack of social support, stressful life events, nutritional deficits, cognitive impairment, and neurodegenerative diseases (Ageing and health [WWW Document], n.d.; Barcelos-Ferreira et al., 2013; Cong et al., 2015; Domènech-Abella et al., 2018; Luppa et al., 2012; Sözeri-Varma, 2012; Van Damme et al., 2018; Yaka et al., 2014).

Depression is often under-recognized by both patients and clinicians, and as a result, depressive disorders can lead to a greater level of disability than physical illnesses (Dan & Younossi, 2010). However, policy makers may have been unable to take necessary actions on this regard due to lack of baseline data. The purpose of the study was to investigate the prevalence of depression and the associated factors, using regression analyses, among the elderly people who were suffering from chronic diseases at a tertiary geriatric care setting in Bangladesh.

## Methods

### Participants, Design, and Procedure

From March to April 2019, a cross-sectional study was conducted among 300 elderly people, who were attending the outpatient department of a tertiary geriatric care hospital named Probin Hospital situated in Agargaon, Sher-e-Bangla Nagar, Dhaka City (total population of Dhaka city in 2019 was 20,284,000). Purposively a convenient sampling technique was used; 300 patients were randomly included who visited the outpatient department. The participants were included in the study if they were (i) aged above 60 years, (ii) speak Bengali, (iii) capable of giving informed consent willingly. The patients who were not ambulant, were not willing to participate, or unable to reliably recall their past histories, were excluded, leaving the final sample size of 230.

Data were collected through face-to-face interview; a structured questionnaire was used that lasted for approximately 40 min in a private room, and history of co-morbidities was extracted from the medical records. The interview evaluated the following five components: (a) socio-demographic information (b) lifestyle-related behavioral factors, (c) psychosocial factors, (d) history of chronic diseases, (e) the Geriatric Depression Scale (GDS). The Bangla version of the GDS has been shown to be valid and reliable (Sultana et al., 2022).

### Measures

*Socio-Demographic Information.* The socio-demographic information included age, gender, educational status, marital status, occupational status, family income, type of family, family history of depressive disorder.

*Lifestyle Related Behavioral Factors.* Several lifestyles related behavioral factors were addressed to find association with depression, which included smoking habit, smokeless tobacco use, physical activity, alcohol consumption, tea and coffee drinking habit.

*Psychosocial Factors.* A wide range of psycho-social factors (i.e., duration of retirement from job, feelings after being retired, feelings after bereavement from partner, feeling alone despite of living with a family (this study termed as socially isolated), fear of insecurity, satisfaction with allowance or wages, satisfaction with social media usage) were assessed.

*History of Chronic Diseases.* The participants were asked if they were suffering from any kind of chronic disease including their past histories. The past history of chronic diseases was examined by their past medical records.

*The Geriatric Depression Scale.* The presence as well as the severity of depression was assessed by short Bangla version of the Geriatric Depression Scale (GDS), which

consists of 15 items and is widely used in other studies (Disu et al., 2019; Uddin et al., 2017); it had been tested in community and clinical settings (Yesavage et al., 1982). Of the 15 items, 10 represented the tendency toward depression when answered positively, while the rest (question numbers 1, 5, 7, 11, 13) did so when answered negatively. The potential total scores ranged from 0 to 15, where a score of 0 to 4 was considered normal; a score of 5 to 8, 9 to 11 and 12 to 15 was considered to indicate mild depression, moderate depression; and severe depression, respectively (El-Gilany et al., 2018; Pramesona & Taneepanichskul, 2018).

### Statistical Analysis

The data were analyzed in a statistical software 20.0 version of SPSS (Statistical Package for Social Sciences). Descriptive statistics, including the frequency, percentage, average, and standard deviation were used to present the socio-demographic, lifestyle, psycho-social, chronic diseases, and depression-related data. Multivariate analysis was done by regression model—binary logistic regression and multinomial regression to investigate the influence of independent variables on depression. A $p$ value of $<.05$ (two-tailed) was considered to indicate statistical significance.

### Ethics

This study received ethical approval from the Ethical Review Committee of the Bangladesh University of Health sciences. Data collection permission was also being taken from the authority of the Probin Hospital, Dhaka. All the ethical issues regarding this study were strictly maintained according to the Declaration of Helsinki. The study purpose in detail was described to all respondents. Written informed consent was taken from each respondent prior to fill up the questionnaire. All the information collected from the respondents was kept confidential and was not used other than this purpose. The respondents had the right to refuse to answer any question without providing the reasons for their decisions and could withdraw from the study at any time. There was no risk of physical harm to the study participants as there was no invasive procedure. No incentive was provided to the study participants for participating in the study.

## Results

### Socio-Demographic and Clinical Characteristics

Table 1 shows socio-demographic and clinical characteristics of the participants. The majority was within the age group of 60 to 70 years, women, Muslim and living in a nuclear family. A total of 38.7% had a positive family history of depression, but all were classified as upper middle-income (74.3%) and high-income groups (25.7%). Among 14.4% of current smokers, the mean duration of smoking was $21.9 \pm 8.6$ years. The majority of the respondents were tea drinker (70%), but fewer than a half were coffee and alcohol drinker. About two-third of the respondents were physically active, with the mean active days per week being $5.6 \pm 1.3$. The majority was retired ($10.3 \pm 5.5$ years ago) and feeling empty without partner, but they felt secured and satisfied with allowance. Among those 41.3% were social media users, 77.9% felt satisfied with that. As for physical morbidities, hypertension, diabetes was commonly noted; and cerebrovascular diseases (CVD)/stroke, chronic obstructive pulmonary disease (COPD) and chronic kidney disease (CKD) were also noted in about 40% to 60% of the respondents.

### Distribution in the GDS-15 Scores

The average score in the GDS-15 was $7.0 \pm 2.5$ among 230 participants. Figure 1 shows that the majority of the respondents (81.7%) reported having depression; more than half of the study participants ($n = 121$) were suffering from mild depression, 58 people were moderately depressed, and 9 people were severely depressed.

### Predictors of Geriatric Depression in Bangladesh

The results in Tables 2 and 3 indicated that depression was more frequent among divorced/separated/never married/widow/widower people, and retired or unemployed people. Moreover, those with below primary level of education and socially isolated participants were more prone to depression, while coffee drinkers were less likely to have depression.

Table 4 indicates the results in a multinomial logistic regression model. Consistently, those with primary or less education was more likely to have depression, regardless of the severity of depression. Coffee drinkers were less likely to have mild and moderate depression. Retired people were less likely to have mild depression. Finally, those with more physical activity were significantly less likely to have severe depression, while those with a history of CVD/Stroke were more likely to have severe depression.

## Discussion

This study found that the prevalence rate of geriatric depression was 81.7%, which is close to Uddin (2017) (84.3%); depression rate was higher than two other studies conducted among the elderly population in other districts of Bangladesh. The rate was 36.9% in Disu et al. (2019) and a small sample size and exclusion of respondents with history of chronic diseases may be a major source of discrepancy. In fact, patients in this study came with symptoms of other chronic diseases and indeed had a high rate of somatic comorbidities such as

**Table 1.** Socio-Demographic Characteristics of Respondents (*N* = 230).

| Variables | Number *(%)* |
|---|---|
| Age (Mean ±*SD*) | 67.9 +/–6.3 |
| 60–70 | 157 (68.3) |
| 70 and above | 73 (31.7) |
| Sex | |
| Men | 96 (41.7) |
| Women | 134 (58.3) |
| Educational status | |
| Up to Primary school | 57 (24.8) |
| Up to Secondary | 121 (52.6) |
| Higher Secondary (up to HSC) and above | 52 (22.6) |
| Marital status | |
| Never married | 7 (3.0) |
| Married | 110 (47.0) |
| Widow/widower | 98 (42.6) |
| Divorced/Separated | 15 (6.5) |
| Occupational status | |
| Housewife | 72 (31.3) |
| Unemployed | 17 (7.4) |
| Employed | 48 (20.9) |
| Retired | 93 (40.4) |
| Type of family | |
| Nuclear | 199 (86.5) |
| Joint family | 31 (13.5) |
| Family history of Depressive disorder | |
| Yes | 89 (38.7) |
| No | 141 (61.3) |
| Monthly income (BDT) | |
| Low income (<4,906) | |
| Lower middle income (4,907–19,488) | |
| Upper middle income (19,489–60,252) | 171 (74.3) |
| High income (>6,0252) | 59 (25.7) |
| Smoking status | |
| Regular smoker | 33 (14.4) |
| Ex-smoker | 17 (8.6) |
| Smokeless tobacco use | 57 (24.8) |
| Tea drinker | 163 (70.9) |
| Coffee drinker | 110 (47.8) |
| Alcohol consumption | 51 (22.2) |
| Recommended level of Physical activity (>150 min/week) | 149 (64.8) |
| Retirement from job | 92 (65.7) |
| Feeling well after retirement | 36 (39.1) |
| Absence of partner | 120 (52.2) |
| Feeling of emptiness without partner | 100 (89.3) |
| Feeling alone within family/Social Isolation | 99 (43.0) |
| Fears of insecurity | 21 (9.2) |
| Satisfied with allowance | 104 (98.1) |
| Social media use | 95 (41.3) |
| Hypertension | 135 (58.7) |
| Diabetes | 137 (59.6) |
| CVD/Stroke | 96 (41.7) |
| COPD | 98 (42.6) |
| CKD | 136 (59.1) |

BDT: Bangladesh Taka (1 US dollar = 105 BDT April 2023); CKD: chronic kidney disease; COPD: chronic obstructive pulmonary disease; CVD: cerebrovascular disease.
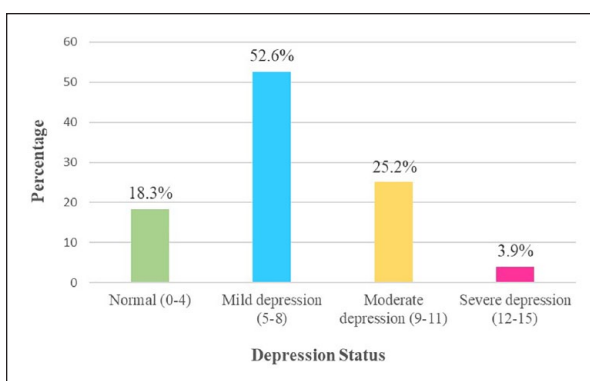


**Figure 1.** Levels of depression according to the GDS-15, where the mean score was $7.0 \pm 2.5$.

hypertension, diabetes and CKD. Das et al. (2014) reported the rate of 42% for mild depression and 17% for severe depression, whereas the percentage was 52.6% and 3.9%, respectively, in our study. In interpreting and comparing the results, it is critical to bear in mind the investigation settings, the background characteristic of the study sample and the rating scales used to denote depression. Our study used the GDS and dealt with outpatients who were visiting a tertiary geriatric care hospital for medical reasons.

Around the world, the following prevalence rates of geriatric depression were reported: 44.4% in Egypt (El-Gilany et al., 2018), 42.5% in Indonesia (Pramesona & Taneepanichskul, 2018), 23.7% in Thailand (Wongpakaran et al., 2019), 18.5% in Turkey (Yaka et al., 2014), 14.4% in India (Pilania et al., 2017), 10.5% in China (Cong et al., 2015), 3.8% in Brazil (Barcelos-Ferreira et al., 2013); the prevalence of depression was not so high in these developing countries. The probable cause may be due to a variety of psychosocial factors as well as a community-based setting and the use of other instruments to address the presence of depression (Vishal et al., 2010). Likely, the elderly people are more prone to develop depression due to socio-demographic, behavioral, psycho-social, and issues related to chronic illnesses (Das et al., 2014; Disu et al., 2019; Ge et al., 2017; Shensa et al., 2018).

Within the age of 60 years, most of the employed person go to retirement in Bangladesh and some of them lose their partners after this decade of age; the average life expectancy is 71.1 years in men and 74.2 years in women (Bangladesh Bureau of Statistics-Government of the People\'s Republic of Bangladesh [WWW Document], n.d.) They may become socially isolated even though living with their families. In our study, we found 47.8% were unemployed compared to a 60% unemployment rate reported in Disu et al. Almost 55.0% respondents were illiterate and 51.2% received below primary education in Uddin et al. study; our study sample included 24.8% of people who were below the primary level. The number of nuclear families is increasing in Bangladesh; about 74% (Uddin, 2017) and 53.2% (Disu

**Table 2.** Association Between Depression With Socio-demographic Variables Using Binary Logistic Model (*n* = 230).

| Variables | B | p-Value | OR | 95% CI for OR | |
|---|---|---|---|---|---|
| | | | | Lower bound | Upper bound |
| Sex | | | | | |
| Men | | | Reference | | |
| Women | 0.458 | .272 | 1.580 | 0.698 | 3.576 |
| Education | | | | | |
| Below primary | | | Reference | | |
| Above primary | −2.733 | .009 | 0.065 | 0.008 | 0.510 |
| Marital status | | | | | |
| Married | | | Reference | | |
| Divorced/ Separated /Never married/ Widow/Widower | 1.042 | .016 | 2.834 | 1.217 | 6.604 |
| Occupation | | | | | |
| Housewife and Employed | | | Reference | | |
| Retired and Unemployed | 0.865 | .039 | 2.375 | 1.043 | 5.412 |
| Age | | | | | |
| 60–70 | 0.626 | .126 | 1.869 | 0.838 | 4.168 |
| 70 and above | | | Reference | | |
| Family type | | | | | |
| Nuclear family | | | Reference | | |
| Joint family | 0.734 | .141 | 2.083 | 0.783 | 5.538 |

**Table 3.** Association Between Depression With Behavioral and Psycho-Social Variables Using Binary Logistic Model (*n* = 230).

| Variables | B | p-value | OR | 95% CI for OR | |
|---|---|---|---|---|---|
| | | | | Lower bound | Upper bound |
| Physical activity | | | | | |
| Yes | −0.912 | .055 | 0.402 | 0.158 | 1.018 |
| No | | | Reference | | |
| Coffee drinking | | | | | |
| Yes | −1.000 | .011 | 0.368 | 0.170 | 0.796 |
| No | | | Reference | | |
| Social isolation | | | | | |
| Yes | 0.802 | .053 | 2.230 | 0.990 | 5.024 |
| No | | | Reference | | |
| Social media use | | | | | |
| Yes | | | Reference | | |
| No | 0.263 | .505 | 1.301 | 0.601 | 2.816 |
| CVD/Stroke | | | | | |
| Yes | 0.381 | .366 | 1.464 | 0.641 | 3.344 |
| No | | | Reference | | |

CI: confidence interval; CVD: cerebrovascular diseases; OR: odds ratio.

et al., 2019) of the respondents lived in a nuclear type of family, and the value was 86.5% in our study. It is noteworthy that lower educational levels are associated with depression, irrespective of the severity in our study. The association between lower education and higher depression risk had been consistently reported in the literature (Taqui et al., 2007; Uddin et al., 2017). It would be thus critical to provide appropriate education to the people at potential risk.

A study in India found 9.3% of the elderly had depression; increased age, co-morbid conditions, economic dependence and physical dependence for daily activities were associated with a higher risk (Chauhan et al., 2013). A rate of 3.8% has been reported in Brazil, in which female gender, being widowed, previous depressive episode, hypertension, use of psychotropic medication, and alcohol use, were noted as risk factors of depression. A lower odds ratio of depression diagnosis was associated with physical activity and going to cinema in another study (Barcelos-Ferreira et al., 2013). An Indonesian study showed a 42.5% prevalence of depression; female gender, lack of social support, ≥3 chronic

**Table 4.** Association Between Depression Status With Variables of Interests Using Multinomial Logistic Model (*n* = 230).

| Depression | | *B* | *p*-Value | OR | 95% CI for OR | |
| --- | --- | --- | --- | --- | --- | --- |
| | | | | | Lower Bound | Upper Bound |
| Mild | Intercept | 2.558 | .000 | | | |
| | Educational status | | | | | |
| |   Illiterate and Primary | 2.715 | .010 | 15.108 | 1.925 | 118.590 |
| |   Above primary | | | Ref. | | |
| | Marital status | | | | | |
| |   Married | −.985 | .065 | 0.373 | 0.131 | 1.062 |
| |   Never married and others | | | Ref. | | |
| | Occupational status | | | | | |
| |   Retired and unemployed | −.865 | .032 | 0.421 | 0.191 | 0.927 |
| | Employed and others | | | Ref. | | |
| | Physical activity | | | | | |
| |   Yes | −.404 | .451 | 0.668 | 0.234 | 1.907 |
| |   No | | | Ref. | | |
| | Coffee drinking | | | | | |
| |   Yes | −1.002 | .020 | 0.367 | 0.158 | 0.851 |
| |   No | | | Ref. | | |
| | Social isolation | | | | | |
| |   Yes | 0.059 | .911 | 1.061 | 0.377 | 2.987 |
| |   No | | | Ref. | | |
| | Social media use | | | | | |
| |   Yes | 0.056 | .897 | 1.058 | 0.454 | 2.463 |
| |   No | | | Ref. | | |
| | CVD or Stroke | | | | | |
| |   Yes | 0.489 | .293 | 1.631 | 0.655 | 4.066 |
| |   No | | | Ref. | | |
| Moderate | Intercept | 1.482 | .073 | | | |
| | Educational status | | | | | |
| |   Illiterate and primary | 3.029 | .005 | 20.671 | 2.481 | 172.251 |
| |   Above primary | | | Ref. | | |
| | Marital status | | | | | |
| |   Married | −1.024 | .095 | 0.359 | 0.108 | 1.193 |
| |   Never married and others | | | Ref. | | |
| | Occupational status | | | | | |
| |   Retired and unemployed | −0.376 | .433 | 0.686 | 0.268 | 1.758 |
| |   Employed and others | | | Ref. | | |
| | Physical activity | | | | | |
| |   Yes | −0.906 | .121 | 0.404 | 0.128 | 1.271 |
| |   No | | | Ref. | | |
| | Coffee drinking | | | | | |
| |   Yes | −1.257 | .012 | 0.285 | 0.107 | 0.760 |
| |   No | | | Ref. | | |
| | Social isolation | | | | | |
| |   Yes | 0.919 | .120 | 2.507 | 0.788 | 7.977 |
| |   No | | | Ref. | | |
| | Social media use | | | | | |
| |   Yes | −.479 | .361 | 0.620 | 0.222 | 1.730 |
| |   No | | | Ref. | | |
| | CVD or Stroke | | | | | |
| |   Yes | 0.775 | .144 | 2.171 | 0.767 | 6.148 |
| |   No | | | Ref. | | |

*(continued)*

**Table 4.** (continued)

| Depression | | B | p-Value | OR | 95% CI for OR | |
| --- | --- | --- | --- | --- | --- | --- |
| | | | | | Lower Bound | Upper Bound |
| Severe | Intercept | −1.990 | .191 | | | |
| | Educational status | | | | | |
| | Illiterate and Primary | 3.296 | .011 | 26.993 | 2.119 | 343.791 |
| | Above primary | | | Ref. | | |
| | Marital status | | | | | |
| | Married | 0.221 | .827 | 1.248 | 0.171 | 9.122 |
| | Never married and others | | | Ref. | | |
| | Occupational status | | | | | |
| | Retired and unemployed | 0.160 | .849 | 1.173 | 0.228 | 6.047 |
| | Employed and others | | | Ref. | | |
| | Physical activity | | | | | |
| | Yes | −1.839 | .049 | 0.159 | 0.026 | 0.991 |
| | No | | | Ref. | | |
| | Coffee drinking | | | | | |
| | Yes | −1.435 | .086 | 0.238 | 0.046 | 1.224 |
| | No | | | Ref. | | |
| | Social isolation | | | | | |
| | Yes | 0.614 | .524 | 1.848 | 0.280 | 12.220 |
| | No | | | Ref. | | |
| | Social media use | | | | | |
| | Yes | 0.704 | .416 | 2.021 | 0.371 | 11.000 |
| | No | | | Ref. | | |
| | CVD or Stroke | | | | | |
| | Yes | 2.166 | .025 | 8.727 | 1.305 | 58.338 |
| | No | | | Ref. | | |

CI: confidence interval; CVD: cerebrovascular diseases; OR: odds ratio; Ref.: Reference group.

diseases, and perceived inadequacy of care were identified as significant risk factors (Pramesona & Taneepanichskul, 2018). In China, the prevalence of depression among the elderly was 10.5% using the same scale and outstanding risk factors included lack of social engagement, low family support, chronic disease, and disturbed sleep (Cong et al., 2015). Those with more physical activity were less likely to have severe depression in our study; protective effects of physical exercise against depression have been a well-established finding (Dinas et al., 2011). Coffee drinkers were less likely to have mild and moderate depression, suggesting a potential role of self-relaxation (Navarro et al., 2018; Park & Moon, 2015).

The risk of depression is reported to differ according to sex. Women had a 1.5-time higher prevalence of depression than men (61.2%vs. 38.8%) in present study, although the difference was not statistically significant, possibly reflecting type Ⅱ error. This finding was similar to other studies conducted in India (Pilania et al., 2017; Taqui et al., 2007) and Bangladesh (Das et al., 2014). There are several factors that might explain this observation such as death of spouse, socio-cultural barriers, and less participation in income generating

activities during the life span of the elderly females (Md. Ripter Hossain, 2006 ). Elder women may face a multiple jeopardy of being old/women/poor, bereavement from spouse that results in loss of social status, insecurity and economic crisis; higher burden from physical comorbidities may further increase women's dependency on their families. Being widowed/separated/divorced was a significant factor for depression; married respondents were less afflicted in this study. This finding is consistent with the results reported elsewhere (Sinha et al., 2013 ; Uddin, 2017).

Furthermore, living in a nuclear family was a significant factor affecting depression in a Chi-square analysis, like other studies (Sinha et al., 2013; Uddin, 2017). Another study also found that those living alone were more likely to suffer from depression (Sengupta & Benjamin, 2015). Likewise, retirement was identified to play a role in developing depressive disorder among geriatric people, in accordance with Lee and Smith et al., 2009, who reported a significant relationship between depression and retirement (the results of Chi-square analysis are available upon request). Collectively, these results imply a significant role of loneliness and social integration in geriatric depression. The following factors need to be

investigated further in future studies in light of past evidence; sense of social isolation (Ge et al., 2017), social media use (Shensa et al., 2018) and coffee drinking (Navarro et al., 2018; Park and Moon, 2015).

In our study, severe depression was more prevalent in those with a history of CVD/Stroke among elderly population, which is similar to what was reported from a tertiary hospital of Delhi (Akhtar et al., 2013). Research suggests that stroke patients with post stroke depression suffer higher mortality rates and show a minor improvement in rehabilitation programs in comparison to non-depressed stroke patients; they consequently have worse functional outcomes and quality of life (Lenzi et al., 2008). In Sri Lanka and Turkey for instance, a significantly higher prevalence of depression in the elderly was reported in the presence of chronic comorbidity (DGHS Health Bulletin [WWW Document], ; Malhotra et al., 2010). In fact, the relationship between depression and chronic comorbidities is considered bi-directional (Katon, 2011).

### *Limitations*

The findings of the present study should be interpreted in light of a cross-sectional nature of the data, a relatively small sample size through convenient sampling without any formal sample size calculation, and use of the GDS-15 to index depression. Limited sample size resulted in wide confidence intervals and may have resulted in beta error. Moreover, if we used more expansive GDS-30 the results would be more informative and the gold standard would have been a standardized diagnosis with a use of structured clinical interview. Finally past history of depression and cognitive status of participants were unavailable.

### Conclusion

The majority of the elderly population in urban Bangladesh had depression, where more than a half showed mild, a quarter moderate and 3.9% people in severe depression. Socio-demographic, behavioral, psycho-social, chronic diseases related factors appeared to have effects on mental health of the respondents. Educational levels in particular had a critical impact on geriatric depression, irrespective of the severity. Further physical activity levels and a history of CVD/Stroke were found to serve as significant predictors for severe depression. These findings have an important clinical implication for future studies that aim to further evaluate the prevalence as well as the current treatment status of depression and devise effective interventions, and can be useful for health professionals to focus on under-recognized mental health disorders among the elderly Bangladesh.

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### Author's Contribution

TT conceived the study. TT and TS wrote the initial version of the manuscript. All authors significantly contributed to the subsequent revisions for intellectual input, and approved to submit the final version of the manuscript.

### Declaration of Conflicting Interests

### Funding

### Ethical Consideration

This study received ethical approval from the Ethical Review Committee of Bangladesh University of Health Sciences (BUHS). Data collection permission was also being taken from the authority of Probin Hospital, Agargaon, Dhaka. All the ethical issues regarding this study were strictly maintained according to the Declaration of Helsinki. The study purpose in detail was described to all respondents. Written informed consent was taken from each respondent prior to fill up the questionnaire. All the information collected from the respondents was kept confidential and was not used other than this study purpose. The respondents had the right to refuse to answer any question without providing the reasons for their decisions and could withdraw from the study at any time. There was no risk of physical harm to the study participants as there was no invasive procedure. No incentive was provided to the study participants for participating in the study.

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