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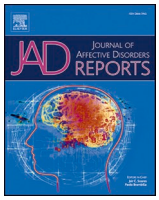

Research Paper



Physio-psychosocial risk of depression among college-going adolescents: A cross-sectional study in Bangladesh

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ABSTRACT

Background: Depression among adolescents is a growing concern worldwide, including in Bangladesh. This study aimed to investigate depression and its associated factors among college-going adolescents in Bangladesh.
Methods: A cross-sectional survey was conducted among 1919 college-going adolescents through a Google-based questionnaire covering all administrative divisions of Bangladesh. Respondents' socio-demographic information was collected, and the Patient Health Questionnaire-9 (PHQ-9) was used to assess depression. Different statistical analyses, including descriptive statistics, Chi-square test, and multinomial logistic regression, were performed to analyze the data.
Results: The results showed that a majority of the adolescents (65.5 %) were female and identified as Muslim (92.0 %). The average age was 17.5 years, with 33.9 % reporting pre-marital relationships and 10.7 % engaging in daily exercise. Alarmingly, over 80 % of college-going adolescents experienced moderate to severe depression (24.3 % moderate; 29.1 % moderately severe, and 26.8 % severe). Factors including gender, social media use, physical exercise, pre-marital relationships, religious practices, experiences of blackmail, and major physical illnesses have significant association ($p < 0.001$) with the increased risk of depression among college-going adolescents in Bangladesh. The multinomial logistic regression analysis found female adolescents, social media users, those not engaged in regular exercise, individuals in pre-marital relationships, non-practitioners of religion, victims of blackmail, and those with major physical illnesses had the higher odds of experiencing moderate to severe depression.
Conclusion: The high depression level among Bangladeshi college-going adolescents underscores the urgent need for targeted mental health intervention to address associated risk factors and promote the well-being of college-going adolescents in Bangladesh.

1. Introduction

Adolescence may be seen as a transitional stage between childhood and adulthood, during which individuals are more susceptible to developing mental health issues (World Health Organization, 2021). This vulnerability arises due to the various physiological, emotional, and social changes they experience, including exposure to poverty, abuse, or violence (Gleason and Thompson, 2022). Globally, there has been a

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significant increase in the prevalence of mental health issues among children and adolescents (Alslman et al., 2017). Specifically, they are more prone to developing depression and anxiety disorders compared to other forms of mental illness (Chiu et al., 2016; Merikangas et al., 2009).

The World Health Organization (WHO) defines depression as a common mental disorder (CMD) that is characterized by emotions of melancholy, loss of pleasure or interest guilt or a sense of self-worth, interrupted sleep or appetites, and feelings of exhaustion and poor concentration (Ionescu et al., 2013). It is a prevalent mental disorder that affects millions of people every year due to different physio-psychosocial factors including deadly COVID-19 and dengue epidemics in many countries in the world (Noman et al., 2021; Haque et al., 2021; Paul et al., 2022; Rahman et al., 2021). It might be persistent or recurring, and as a result, it can significantly impede a person's capacity to perform at work or school or to deal with the challenges of everyday life (World Health Organization, 2020).

The percentage of mental illness among teenagers and adolescents is steadily rising across the globe. According to the findings of a meta-analysis, the global average prevalence of mental illnesses in children and adolescents was 13.4 percent (Polanczyk et al., 2015). There have been several research conducted in the Asian zone that have looked at the prevalence of depression among young people there. For instance, it had been reported that the prevalence of depression among adolescents can vary from 15 to 40 percent (Ang et al., 2019; Hysenbegasi et al., 2005; Khalid et al., 2019). The adolescents' depression is linked to factors, such as sleep deprivation, academic stress, social isolation, smoking or alcohol addiction, and self-injurious behaviors (Adams et al., 2008; Kenney and Holahan, 2008; Ridner et al., 2005). In addition to these, social factors, including financial stress, family conflict, and cultural adjustment difficulties, can also be risk factors for depression in college-going adolescents (Adams et al., 2008; Ponnet et al., 2013).

Bangladesh has a neglected CMD issue in teenagers. According to the WHO, 10.2 % of Bangladesh's population suffers from suicidal behavior (suicidal thoughts, suicidality with a plan, attempted suicide), anxiety, loneliness, lack of close relationships, and drug usage (i.e., cigarette, alcohol, various substances) (WHO, 2017). According to the recent literature, the prevalence of mental health among the total proportion can vary from 6.5 to 31 percent, while the prevalence of such issues among children can range from 13.4 to 22.9 percent (Hasan et al., 2021; Rozario and Islam, 2022). Literature also suggests that academic stress, poor sleep quality, and family conflict were significant risk factors for depression among Bangladeshi college students.

The issues of adolescents' health and well-being is still new in Bangladesh. Very recently, the government has taken some school-based pilot initiative on adolescents' health, and developed a national strategic plan for adolescents' health (Directorate General of Family Planning Ministry of Health and Family Welfare, 2016). But there is a lack of mental health literacy and intervention among this vulnerable age group (Chowdhury and Deb, 2022). In addition to this, Bangladesh has a severe lack of research on the topic of mental health, for which policy recommendations are hard to pose, and the statistics is not well documented (Arafat et al., 2019; Chowdhury and Deb, 2022; A. Khan et al., 2020; Khan et al., 2020; Moonajilin et al., 2020; Paul et al., 2022). Therefore, a special investigation on adolescent depression and associated factors is needed in terms of implementing effective measures and well documentation of the data. Considering these, the current research assessed the prevalence of adolescents' depression and evaluated the associated physio-psychosocial risk factors of depression among College-going adolescents in Bangladesh.

2. Methods

2.1. Ethics and permission of data collection

The study was designed following the ethical standards of the Helsinki Declaration of 2000 which was supported by the Department of Biostatistics, National Institute of Preventive and Social Medicine (NIPSOM), Mohakhali, Dhaka-1212, Bangladesh. Following the guidelines of the Helsinki Declaration of 2000 (revised version), informed consent was taken from each participant by asking a question, 'Do you want to participate in this survey? (Yes/No)' before entering the section of main survey questions in the google-based questionnaire form. Answering 'Yes' was considered as consent allowing them to enter the section of main survey questions, while answering 'No' is considered as no consent, and excluding them automatically from the main questionnaire survey.

2.2. Study design, population, sampling and study duration

This was a cross-sectional study where the data were collected throug a Google-based questionnaire, covering all administrative divisions of Bangladesh from May 2022 through August 2022. The questionnaire was shared among randomly selected collage adolescents from all administrative division. The study population was the adolescents who were the college students during the survey. The estimated sample size was 1400 considering 5 % non-response rate and 5 % error margin. However, a total of 1950 college-going adolescents were giving consent and included in the survey. Out of this, 31 respondents were excluded due to incomplete questionnaire. finally, the study included 1919 adolescents for further assessment.

2.3. Selection criteria

The inclusion and exclusion criteria of this study were: i) students who were studying at the college level (during the data collection period); ii) adolescents aged 13 to 19 years old; and (iii) who were Bangladeshi by birth. The exclusion criteria were: i) adolescents who were holding dual citizenship; ii) foreign adolescents currently studying in Bangladesh; and iii) adolescents who did not provide consent.

2.4. Data collection

The data were collected from the adolescents who were attending college currently. Because of funding constrained, data were collected through a Google-based questionnaire, a straightforward and uncomplicated electronic questionnaire. The questionnaire consisted of sociodemographic and Patient Health Questionnaire (PHQ-9) items. Before initiating the survey, the questionnaire was translated into Bengali language and validated through pre-testing. To establish the practicability and efficacy of the research, a pilot study (pre-testing) consisting of 43 students was carried out. After that, they were disregarded in the further examination of the data. The questionnaire passed through a few rounds of edits before the final research was ever carried out to make sure it met all the requirements.

2.5. Sociodemographic information

Sociodemographic information included age (13–19), gender (male, female), family economic condition (lower class, lower middle class, middle class, middle-upper class, upper class), marital status (married, unmarried), religion (Islam, Hinduism, Others), uses of social media (yes, no), engaged in pre-marital relationship (yes, no), pre-marital sex experience (yes, no), regular physical exercises (yes, no), practicing religion (yes, no), smoking (yes, no), family unrest (yes, no), experiencing blackmail (yes, no), major physical illness (yes, no), affected by covid-19 (yes, no), GPA (GPA-2, GPA-3, GPA-4, GPA-5), family mental illness history (yes, no).

2.6. Outcome variables

The Patient Health Questionnaire was utilized to assess the respondent's level of depressive symptoms to get to a conclusion (PHQ-9).

The Patient Health Questionnaire-9 (PHQ-9) has become one of the most well-known and easy-to-use questionnaires when it comes to detecting depression in a person. The validity of the scale had been confirmed in Bangladesh (Rahman et al., 2022). The codes for the PHQ–9 questions vary from "0 = not at all" to "3 = virtually every day." The severity of depression was classified into one of five categories- none-minimal (PHQ-9 score: 0 to 4); mild (PHQ-9 score: 5 to 9); moderate (PHQ-9 score: 10 to 14); moderately severe (PHQ-9 score: 15 to 19); and severe (PHQ-9 score: 20 to 27) respectively. Those individuals who took part in this study and received scores in the moderate to severe level (that is, 10 or above) were regarded as having a positive depression diagnosis (Kroenke et al., 2010).

2.7. Data quality control

To maintain the quality of data, we applied several techniques-cleaned and checked the filled questionnaire, employed SPSS 26.0 in data analysis, explored the frequency of each variable to identify the unusual results, performed reliability analysis (Cronbach's alpha, the reliability coefficient values for PHQ-9 were 0.78) and used different statistical techniques to ensure reliability and validity of the study results.

2.8. Statistical analysis

The descriptive analysis was used to summarize the socio-demographic and depression-measuring variables. Respondents were categorized into various levels of depression according to the score bands of the PHQ-9 Likert scale. The distributions of depression according to respondents' socio-demographics were presented through different charts. The cut-off score for the PHQ-9 is 10. By using a cut-off score, we categorized the scores according to severity of depression. Next, we employed the Pearson chi-square test to identify the factors significantly associated with depression. A multinomial logistic regression model was fitted between depression categories as the dependent variable and all the other variables as independent variables. Adjusted odds ratios (AOR) with 95 % confidence intervals were derived for all the categorical variables. For all analyses, the statistical significance was

Table 1
Characteristics of the respondents according to different levels of depression.

Variables	Frequency n (%)	None-minimal Depression n (%)	Mild Depression n (%)	Moderate Depression n (%)	Moderately severe Depression n (%)	Severe Depression n (%)	p-value
Age	Mean age 17.5, (Min 15, Max 18, SD 6.104)						
Sex							
Female	1257(65.50 %)	44 (3.50 %)	144 (11.40 %)	281 (22.30 %)	393 (31.20 %)	395 (31.40 %)	**<0.001**
Male	662(34.50 %)	55 (8.30)	138 (20.80 %)	185 (27.90 %)	165 (24.90 %)	119 (17.90 %)	
Family income							
10,000 to 15,000	328(17.10 %)	17 (5.10 %)	50 (15.20 %)	89 (27.10 %)	84 (25.60 %)	88 (26.80 %)	0.198
15,000 to 25,000	414(21.60 %)	19 (4.50 %)	64 (15.40 %)	102 (24.60 %)	132 (31.80 %)	97 (23.40 %)	
25,000 to 40,000	449 (23.40 %)	18 (40 %)	58 (12.90 %)	112 (24.90 %)	134 (29.80 %)	127 (28.20 %)	
Above 40,000	369 (19.20 %)	18 (4.80 %)	45 (12.10 %)	86 (23.30 %)	108 (29.20 %)	112 (30.30 %)	
Below 10,000	359 (18.70 %)	27 (7.50 %)	65 (18.10 %)	77 (21.40 %)	100 (27.80 %)	90 (25.00 %)	
Use of social media							
No	133 (6.90 %)	17(12.70 %)	17 (12.70 %)	25 (18.70 %)	27 (20.30 %)	47 (35.30 %)	**0.0001**
Yes	1786(93.10 %)	82 (4.50 %)	265 (14.80 %)	441 (24.60 %)	531 (29.70 %)	467 (26.10 %)	
Religion							
Hinduism	145 (7.60 %)	10 (6.80 %)	20 (13.70 %)	33 (22.70 %)	44 (30.30 %)	38 (26.20 %)	0.309
Islam	1765 (92.00 %)	89 (5.00 %)	262 (14.80 %)	431 (24.40 %)	513 (29.00 %)	470 (26.60 %)	
Others	9 (0.50 %)	0 (0 %)	0 (0 %)	2 (22.20 %)	1 (11.10 %)	6 (66.70 %)	
Physical Exercise							
No	1714(89.30 %)	74 (4.30 %)	228 (13.30 %)	402 (23.40 %)	514 (29.90 %)	496 (28.90 %)	**0.0001**
Yes	205 (10.70 %)	25(12.10 %)	54 (26.30 %)	64 (31.20 %)	44 (21.40 %)	18 (8.70 %)	
Pre-marital Relationship							
No	1268(66.10 %)	92 (7.20 %)	209 (16.40 %)	331 (26.10 %)	333 (26.30 %)	303 (23.80 %)	**0.0001**
Yes	651(33.90 %)	9 (1.00 %)	73 (11.20 %)	135 (20.70 %)	225 (34.60 %)	211 (32.40 %)	
Practicing Religion							
No	211 (11.00 %)	10 (4.70 %)	16 (7.50 %)	39 (18.40 %)	69 (32.70 %)	77 (36.50 %)	**0.0001**
Yes	1708 (89.00 %)	89 (5.20 %)	266 (15.50 %)	449 (25.00 %)	489 (28.60 %)	437 (25.50 %)	
Smoking							
No	1850(96.30 %)	96 (5.10 %)	268 (14.40 %)	449 (24.20 %)	540 (29.10 %)	497 (26.80 %)	0.734
Yes	69(3.59 %)	3 (4.30 %)	14 (20.20 %)	17 (24.60 %)	18 (26.00 %)	17 (24.60 %)	
Experiencing Blackmail							
No	1742(90.80 %)	98 (5.60 %)	273 (15.60 %)	435 (24.90 %)	506 (29.00 %)	430 (24.60 %)	**0.001**
Yes	177 (9.20 %)	1 (0.50 %)	9 (5.00 %)	31 (17.50 %)	52 (29.40 %)	84 (47.40 %)	
Family unrest							
No	978(51.00 %)	89 (9.10 %)	209 (21.30 %)	286 (29.20 %)	238 (24.30 %)	156 (15.90 %)	**0.0001**
Yes	941(49.00 %)	10 (1.00 %)	73 (7.70 %)	180 (19.10 %)	320 (34.00 %)	358 (38.00 %)	
Major illness							
No	1663(86.70 %)	94 (5.60 %)	259 (15.50 %)	421 (25.30 %)	481 (28.90 %)	408 (24.50 %)	**0.0001**
Yes	256(13.30 %)	5 (1.90 %)	23 (8.90 %)	45 (17.50 %)	77 (30.00 %)	106 (41.70 %)	
Covid-19							
No	1447(75.40 %)	90 (6.20 %)	230 (15.80 %)	368 (25.40 %)	395 (27.30 %)	364 (25.10 %)	**0.0001**
Yes	472(24.60 %)	9 (1.90 %)	52 (11.0 %)	98 (20.70 %)	163 (34.50 %)	150 (31.70 %)	
Mental illness							
No	1729(90.10 %)	94 (5.40 %)	269 (15.60 %)	426 (24.60 %)	493 (28.50 %)	447 (25.80 %)	**0.0001**
Yes	190 (9.90 %)	5 (2.60 %)	13 (6.80 %)	40 (21.00 %)	65 (34.20 %)	67 (35.20 %)	
Pre-marital Sex experience							
No	1712(89.20 %)	91 (5.30 %)	1259 (5.10 %)	418 (24.40 %)	502 (39.30 %)	442 (25.80 %)	0.067
Yes	207(10.80 %)	8 (3.80 %)	23 (11.10 %)	48 (23.10 %)	56 (27.00 %)	72 (34.70 %)	
Marital status							
Married	28(1.50 %)	3 (10.70 %)	4 (14.20 %)	8 (28.50 %)	5 (17.80 %)	8 (28.50 %)	0.528
Unmarried	1891(98.50 %)	96 (5.00 %)	278 (14.70 %)	458 (24.20 %)	553 (29.20 %)	506 (26.70 %)	

considered at a 5 % level with a 95 % confidence interval. To draw the figures, this study used Microsoft Excel version 2021.

3. Results

3.1. Socio-Demographic characteristics of the respondents

The study surveyed a total of 1919 participants, with a predominant majority of 65.5 % identifying as female (Table 1). A minority of 7.6 % of the respondents reported adherence to the Hindu faith, while a significant majority of 92.0 % identified as Muslim. A small proportion of 0.5 % reported belief in other religions. Out of all the respondents, a majority of 98.5 % reported being unmarried, while the remaining participants reported being married. The study found that the average age of the participants was 17.5 years, with a range of ages between 15 and 18 years. 3.59 % were involved in smoking, and the rest no. 33.9 % had a pre-marital relationship, and 10.8 % experienced pre-marital sex experience and 10.7 % of the participants did daily exercises (Table 1).

3.2. Prevalence of depression among college-going adolescents

According to Fig. 1, a total of 80.2 % of people were moderate to severely depressed where 26.8 % suffering from severe depression, 29.1 % from moderately severe depression, and 24.3 % from moderate depression (Fig. 1a). Depression severity was comparatively higher in females than males (Fig. 1b). For the students who did not exercise every day, 23.4 %, 29.9 %, and 28.9 % had moderate, moderately severe, and severe levels of depression, respectively (Fig. 1c). Additionally, individuals who had been experiencing blackmail had mild, moderately severe, and severe depression present in 17.5 %, 29.4 %, and 47.4 % respectively (Fig. 1d).

3.3. Factor associated with depression of the respondents

The Pearson chi-square test was utilized to identify the physio-psychosocial factors associated with depression among college students (Table 1). Use of social media, physical exercise, pre-marital relationships, practice of religion, experiencing blackmail, family unrest, major illness, mental illness, and COVID-19 had a significant association with increasing depression among college-going adolescents of Bangladesh (Table 1). Age, family income, religion, smoking habit, pre-martial sexual experiences, and marital status were not found to be significant factors.

3.4. Risk factors of depression among college-going adolescents

Multinomial logistic regression showed the degree of associated factors of depression among the respondents obtained by adjusted odds ratio (Table 2). Adjusted model showed that female students had a 3.36 [AOR: 3.36, 95 % CI: 2.00 - 5.62] times higher risk of suffering from moderately severe depression and 4.85 [AOR: 4.85, 95 % CI: 2.84 - 8.31] times higher risk of suffering from severe depression than males. Participants who use social media were 4.66 [AOR: 4.66, 95 % CI: 2.22 - 9.80] times more likely to suffer from moderately severe depression and 2.47 [AOR: 2.47, 95 % CI: 1.19 - 5.11] times more likely to suffer from severe depression than those who do not use social media, respectively. Students who do not exercise regularly had 2.16 [AOR: 2.16, 95 % CI: 1.14 - 4.10] and 4.70 [AOR: 4.70, 95 % CI: 2.23 - 10.14] times higher likelihood of moderately severe depression and severe depression compared to non-minimal depression, respectively, in comparison to their counterpart. Individuals who were in a pre-martial relationship were 7.74 [AOR: 7.74; 95 % CI: 3.39 - 17.64] more likely to have moderately severe depression and more than 7.17 [AOR: 7.17, 95 % CI: 3.12 - 16.50] times more likely to have severe depression than those who were not in a relationship (Table 2). Students who do not engage in

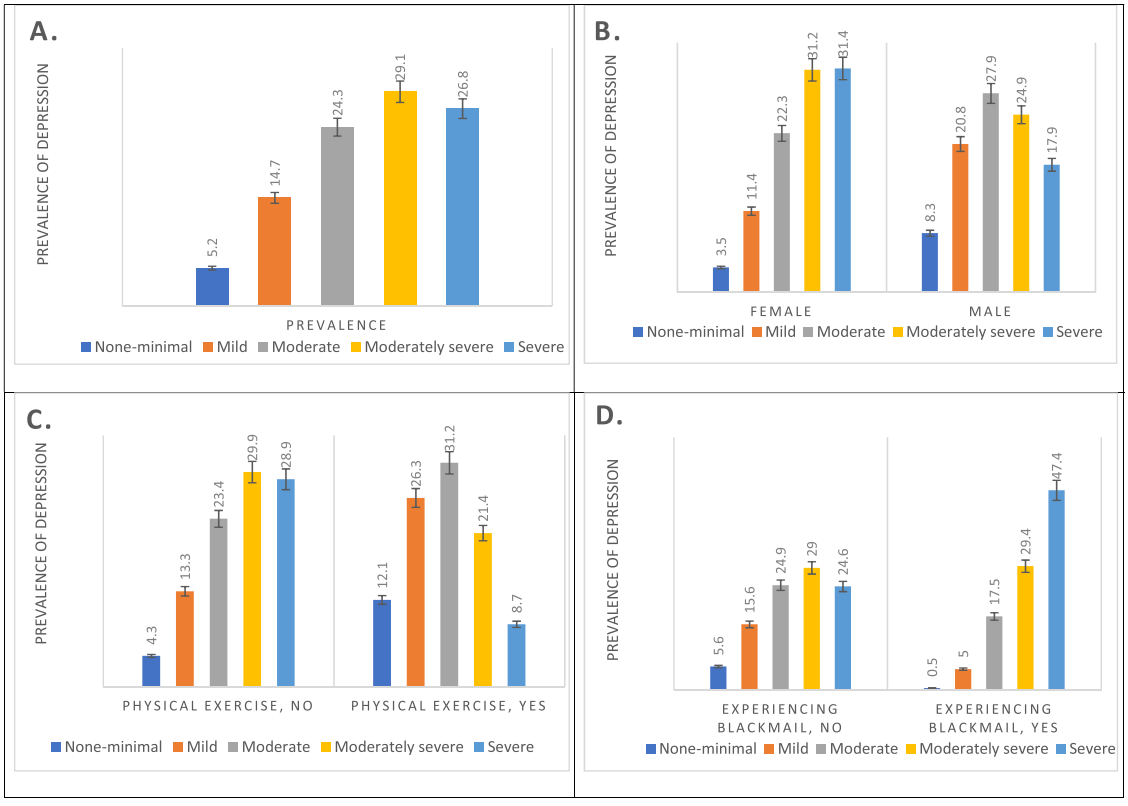

Fig. 1. Prevalence of depression among Bangladeshi College-Going Adolescents: a. Overall prevalence; b. Prevalence of depression by SEX; c. Prevalence of depression by practice of physical exercise; d. Prevalence of depression by experiencing blackmail.

Table 2
Multinomial logistic regression model summary to identify the degree of risk factors associated with depression.

Variables		Mild vs None-minimal Depression		Moderate vs None-minimal Depression		Moderately severe vs None-minimal Depression		Severe vs None-minimal Depression	
		AOR (95 % CI)	P-value	AOR (95 % CI)	P-value	AOR (95 % CI)	P-value	AOR (95 % CI)	P-value
Gender	Female	1.36 (0.81 −2.27)	0.25	1.91 (1.16 - 3.16)	0.01	3.36 (2.00 - 5.62)	0.001	4.85 (2.84- 8.31)	0.001
	Male	Reference category							
Social media	Yes	3.82 (1.79–8.18)	0.001	4.54 (2.20 - 9.36)	0.001	4.66 (2.22 - 9.80)	0.001	2.47 (1.19 −5.11)	0.01
	No	Reference category							
Exercise	No	1.12 (0.62 −2.03)	0.71	1.44 (0.80 - 2.61)	0.22	2.16 (1.14 - 4.10)	0.02	4.70 (2.23 - 10.14)	0.001
	Yes	Reference category							
Pre-marital relationship	Yes	4.62 (2.00 −10.66)	0.001	4.85 (2.13 −11.04)	0.001	7.74 (3.39 −17.64)	0.001	7.17 (3.12 −16.50)	0.001
	No	Reference category							
Practice religion	No	0.47 (0.19 −1.18)	0.11	0.65 (0.28 - 1.50)	0.31	0.85 (0.37 - 1.96)	0.70	0.96 (0.41–2.25)	0.93
	Yes	Reference category							
Experiencing blackmail	Yes	2.64(0.31–21.89)	0.37	5.43 (0.7 - 42.22)	0.11	6.89 (0.89–53.62)	0.07	11.10(1.54–93.32)	0.02
	No	Reference category							
Family unrest	Yes	3.06 (1.45 −6.46)	0.001	5.16 (2.50 - 10.66)	0.001	9.79 (4.74 −20.22)	0.001	15.50(7.43–32.29)	0.001
	No	Reference category							
Major Physical sickness	Yes	1.63 (0.58 −4.56)	0.35	1.78 (0.66 - 4.82)	0.26	2.61 (0.97 - 7.04)	0.06	3.89(1.44–10.53)	0.01
	No	Reference category							
Mental illness	Yes	0.72 (0.24 −2.18)	0.56	1.18 (0.42 - 3.28)	0.75	1.34 (0.48 - 3.72)	0.58	1.23 (0.44 −3.48)	0.69
	No	Reference category							

religious practices had a more than 0.85 [AOR: 0.85, 95 % CI: 0.37 - 1.96] and 0.96 [AOR: 0.96, 95 % CI: 0.41 – 2.25] times increased risk of suffering from moderately severe depression, severe depression, or non-minimal depression, respectively, in comparison to those who engaged in religious practices. Students who were experiencing blackmail were 6.89 [AOR: 6.89, 95 % CI: 0.89- 53.62] times more likely to have moderately severe depression and 11.10 [AOR: 11.10, 95 % CI: 1.54 - 93.32] times more likely to have severe depression than those who were not experiencing blackmail. Respondents with unrest in their family are 9.79 times (AOR: 9.79, 95 % CI: 4.74 −20.22) and 15.50 times (AOR: 15.50, 95 % CI: 7.43–32.29) more likely to suffer from moderately severe depression and severe depression than non-minimal depression, respectively. Respondents who had a major physical sickness are 2.61 times (AOR: 2.61, 95 % CI: 0.97 - 7.04) and 3.89 times (AOR: 3.89, 95 % CI: 1.44 - 10.53) more likely to suffer from moderately severe depression and severe depression than non-minimal depression, respectively (Table 2). Respondents who had a mental illness are 1.34 (AOR: 1.34, 95 % CI: 0.48 - 3.72) and 1.23 times (AOR: 1.23, 95 % CI: 0.44 −3.48) more likely to suffer from moderately severe depression and severe depression than non-minimal depression, respectively (Table 2).

4. Discussion

While one of the preliminary objectives of this research was to identify the potential prevalence of depression, it turned out that the correlation between all the possibilities of concern suggested in the study had a direct relation to depression. The research findings indicated that a significant proportion of college students, specifically 80 %, experienced symptoms of moderate to severe depression, with 26.8 % of them exhibiting severe depression. The female students exhibited a higher level of depression in comparison to their male counterparts. Individuals who engaged in social media usage, exhibited irregular exercise patterns, engaged in pre-marital relationships, and did not adhere to religious practices reported higher levels of depression compared to those who did not engage in those behaviors. Moreover, students who experienced blackmail or family unrest exhibited higher levels of depression compared to their peers who did not encounter such circumstances. Students who had any type of major physical or mental illness exhibited a higher level of depression.

Researchers had demonstrated that the global prevalence of depression among teenagers can vary from 17.2 % to 52.6 %, where these values are 25.8 % in India (Jha et al., 2017), 52.6 % in Iran (Roohafza et al., 2018), and 17.2 % in Pakistan (Khalid et al., 2019) respectively. According to two studies from Bangladesh, the rate was about 75 % and 70 % (Siddik et al., 2023b; Siddik et al., 2023a). In our study, we observed that 80.2 % of the participants were affected by depression which is comparatively higher than the other studies.

Our study revealed a noteworthy correlation between gender and depression, indicating that female students experience higher levels of depression compared to males. This aligns with previous research conducted among adolescents, where gender was identified as a predictor of depression (Bang et al., 2020; Patil et al., 2018). A study conducted in India specifically focused on school-going adolescents and similarly found that female students exhibited higher levels of depression than their male counterparts (Jha et al., 2017). These findings are consistent with much literature (Islam et al., 2021; Mridha et al., 2021).

The family has a great impact on the mental well-being of the human species. Our study has identified family unrest as a potential factor contributing to the increased prevalence of depression among participants. Individuals experiencing family problems are more susceptible to depression, with their risk being 6 to 10 times higher compared to those without such difficulties. Previous research conducted on adolescents has also shown a clear association between family conflict, strained parent-child relationships, and a higher incidence of depression in this age group (Consoli et al., 2013). Moreover, a meta-analysis conducted in Western countries has emphasized the influential role of the family environment in adolescents' depression (Gariépy et al., 2016). It is evident that family unrest significantly contributes to the risk of depression among adolescents (Thapar et al., 2012).

One study examined the relationship between physical activity and depression, concluding that there was no long-term correlation between the two (Toseeb et al., 2014). The research indicated that exercise does not appear to prevent adolescents from developing symptoms of depression. However, other studies have presented different findings, suggesting a connection between depression and physical activity (Field, 2012; Naderi et al., 2019). A meta-analysis further supported this notion, revealing a modest yet noteworthy overall impact of physical exercise on depression (Brown et al., 2013). Our research aligned with these findings, as we discovered a significant correlation between physical exercise and depression. Additionally, there is a growing body of evidence suggesting that frequent use of social media can have detrimental effects on individuals' mental health, particularly among younger generations (Glazzard and Stones, 2019). Other studies had demonstrated that adolescents who frequently use social media were at a higher risk of developing mental health issues such as low self-esteem, stress, anxiety, and depression (Seabrook et al., 2016). Importantly, our study also highlighted the significant role of social media usage in exacerbating depression among the participants.

A study conducted in England and Wales examined the latent religiosity among nonreligious adolescents aged thirteen to fifteen (Francis and Penny, 2016). The study focused on the attachment to Christian rituals as a form of implicit religion. The findings indicated that young individuals who remained committed to implicit religion experienced better psychological health, suggesting that implicit religion serves similar psychological functions as explicit religion. Importantly, this research highlighted the positive impact of practicing religion in reducing depression among participants. Notably, the study also identified a significant correlation between pre-marital relationships and depression, with this variable being a contributing factor to adolescent depression. This finding is consistent with previous studies that have also emphasized the role of pre-marital relationships as a key factor in adolescent depression (Roberts and Klein, 2003). This also increased suicidal behavior among adolescents (Roberts et al., 2003).

Adolescents who became victims of blackmail experienced a significant impact on their psychological well-being (Medrano et al., 2018). Researchers established a direct connection between blackmail and an increase in the levels of depression (Cao et al., 2020). This study further examined blackmail as a contributing factor to the development of depression among the participants. While some studies have identified smoking, age, and family income as potential factors that exacerbate depression (Bhandari, 2016; Tjora et al., 2014), this research did not find any significant interaction with these variables.

There are probably more aspects that contribute to the strengths and limitations of the research. The primary advantage of this study was its large sample size. Increasing the number of participants would enhance the research's accuracy in depicting the overall community. The primary limitation of the study is its use of a cross-sectional approach, hence precluding the establishment of causal relationships and subsequent consequences. The participants in this study submitted their pertinent data, which was gathered by self-reporting. Consequently, there is a potential for error or imprecision among the participants. This is an additional disadvantage of the study.

5. Conclusion

This study provides valuable insights into the prevalence and risk factors associated with depression among college-going adolescents in Bangladesh. Various factors were identified as significant contributors to the increased risk of depression, including being female, social media use, physical exercise, pre-marital relationships, religious practices, experiences of blackmail, family unrest, and major illness. These findings underscore the importance of comprehensive mental health support tailored to address these specific risk factors to promote the well-being and mental health of college-going adolescents in Bangladesh. To safeguard the well-being of adolescents, the stakeholders (e.g., parents, teachers, governments, etc.) should take the necessary steps. Adolescents should practice religion, do physical activities, avoid pre-marital relationships, and control their use of social media to be well-fitted mentally.

CRediT authorship contribution statement

Md Abu Bakkar Siddik: Writing – review & editing, Writing – original draft, Visualization, Validation, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Morioum Sarkar Munmun:** Writing – review & editing, Writing – original draft, Investigation, Data curation. **Nafiul Hasan:** Writing – review & editing, Visualization, Formal analysis. **Md. Khalid Syfullah:** Writing – review & editing, Writing – original draft, Investigation, Data curation. **Al Mahmud:** Writing – review & editing, Writing – original draft, Investigation, Data curation. **Akher Ali:** Writing – review & editing, Investigation, Data curation. **Liza Bosak:** Writing – review & editing, Writing – original draft, Funding acquisition. **Shanjida Chowdhury:** Writing – review & editing, Writing – original draft, Funding acquisition. **Anton Abdulbasah Kamil:** Writing – review & editing, Writing – original draft, Funding acquisition. **Mohammad Meshbahur Rahman:** Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Software, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization.

Declaration of competing interest

The authors declare no conflict of interest.

Ethical Consent and Permission to Data Collection

The protocol of this study was supported and permitted by the Department of Biostatistics, National Institute of Preventive and Social Medicine (NIPSOM), Mohakhali, Dhaka-1212, Bangladesh. By the standards of the Helsinki Declaration of 2000 (revised version), written informed consent was obtained from each of the participants before initiating the online data collection. Participants who agreed with the consent were finally included in the study.

Data availability statement

The datasets generated and/or analyzed during the current study are available from the corresponding author on reasonable request to meshbah037@gmail.com.

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The protocol of this study was supported and approved by the Department of Biostatistics, National Institute of Preventive and Social Medicine (NIPSOM), Mohakhali, Dhaka-1212, Bangladesh.

Patient Consent Statement

Written consent was taken from each participant before initiating the Google-based data collection. Participants who agreed with the consent were included further to join the interview.

Permission to Reproduce Material from Other Sources

None.

References

Adams, T.B., Wharton, C.M., Quilter, L., Hirsch, T., 2008. The association between mental health and acute infectious illness among a national sample of 18- to 24-year-old college students. J. Am. College Health 56 (6), 657–664. https://doi.org/10.3200/JACH.56.6.657-664.

Al Noman, A., Joarder, T., Islam, M.S., Hossain, S., Sadaf, S., Al Noman, M.A., Sakib, N., Ekra, J.E., Islam, M.S., Meem, R.I, 2021. Assessment of home health care seeking behaviors and socio-demographic impact on the recovery time of COVID-19 patients: a cross-sectional study in Bangladesh. South East Asia J. Public Health 11 (2), 1–13.

Alslman, E.T., Baker, N.A., Dalky, H., 2017. Mood and anxiety disorders among adolescent students in Jordan. Eastern Mediterr. Health J. 23 (9), 604–610. https://doi.org/10.26719/2017.23.9.604.

Ang, A.L., Wahab, S., Abd Rahman, F.N., Hazmi, H., Md Yusoff, R., 2019. Depressive symptoms in adolescents in Kuching, Malaysia: prevalence and associated factors. Pediatr. Int. 61 (4), 404–410. https://doi.org/10.1111/ped.13778.

Arafat, S.M.Y., Mamun, M.A., Uddin, Md.S., 2019. Depression literacy among first-year university students: a cross-sectional study in Bangladesh. Glob. Psychiatry 2 (1), 31–36. https://doi.org/10.2478/gp-2019-0002.

Bang, H., Won, D., Park, S., 2020. School engagement, self-esteem, and depression of adolescents: the role of sport participation and volunteering activity and gender differences. Child Youth Serv. Rev. 113, 105012 https://doi.org/10.1016/J.CHILDYOUTH.2020.105012.

Bhandari, M., 2016. Anxiety and depression among adolescent students at higher secondary school. BIBECHANA 14, 103–109. https://doi.org/10.3126/bibechana.v14i0.16019.

Brown, H.E., Pearson, N., Braithwaite, R.E., Brown, W.J., Biddle, S.J.H., 2013. Physical activity interventions and depression in children and adolescents: a systematic review and meta-analysis. Sports Med. 43 (3), 195–206. https://doi.org/10.1007/S40279-012-0015-8/TABLES/4.

Cao, R., Gao, T., Ren, H., Hu, Y., Qin, Z., Liang, L., & Mei, S. (2020). The relationship between bullying victimization and depression in adolescents: multiple mediating effects of internet addiction and sleep quality. 10.1080/13548506.2020.1770814, 26(5), 555–565. https://doi.org/10.1080/13548506.2020.1770814.

Chiu, A., Falk, A., Walkup, J.T., 2016. Anxiety disorders among children and adolescents. Focus 14 (1), 26–33. https://doi.org/10.1176/appi.focus.20150029.

Chowdhury, T., Deb, B.S., 2022, June 18. Bangladesh needs school-centric mental health policies. WhiteBoard. https://whiteboardmagazine.com/3186/bangladesh-needs-school-centric-mental-health-policies/.

Consoli, A., Peyre, H., Speranza, M., Hassler, C., Falissard, B., Touchette, E., Cohen, D., Moro, M.R., Révah-Lévy, A., 2013. Suicidal behaviors in depressed adolescents: role of perceived relationships in the family. Child Adolesc. Psychiatry Ment. Health 7 (1), 1–12. https://doi.org/10.1186/1753-2000-7-8.

Directorate General of Family Planning Ministry of Health and Family Welfare. (2016). National Plan of Action for adolescent health strategy 2017-2030. https://stage-adolescent-health.dnet.org.bd/uploads/policy_guideline/1614767588_National_Plan_of_Action_for_Adolescent_Health_Strategy_2017-2030_Final.pdf.

Field, T., 2012. Exercise research on children and adolescents. Complem. Ther. Clin. Pract. 18 (1), 54–59. https://doi.org/10.1016/j.ctcp.2011.04.002. Churchill Livingstone.

Francis, L.J., Penny, G., 2016. Implicit religion and psychological wellbeing: a study among adolescents without formal religious affiliation or practice. Implicit Religion 19 (1), 61–78. https://doi.org/10.1558/imre.v19i1.30009.

Gariépy, G., Honkaniemi, H., Quesnel-Vallée, A., 2016. Social support and protection from depression: systematic review of current findings in Western countries. Br. J. Psychiatry 209 (4), 284–293. https://doi.org/10.1192/BJP.BP.115.169094.

Glazzard, J., Stones, S., 2019. Social media and young people's mental health. In S. Stones, J. Glazzard, & M. R. Muzio (Eds.). Selected Topics in Child and Adolescent Mental Health. IntechOpen. https://doi.org/10.5772/intechopen.88569. Ch. 2.

Gleason, M.M., Thompson, L.A., 2022. Depression and anxiety disorder in children and adolescents. JAMA Pediatr. 176 (5), 532. https://doi.org/10.1001/jamapediatrics.2022.0052.

Haque, M.F., Rahman, M.M., Alif, S.M., Akter, E., Barua, S., Paul, G.K., Haider, H., 2021. Estimation and prediction of doubling time for COVID-19 epidemic in Bangladesh: a modelling study of first 14 month's daily confirmed new cases and deaths. Glob. Biosecur. 3 (2) https://doi.org/10.31646/gbio.91.

Hasan, M.T., Anwar, T., Christopher, E., Hossain, S., Hossain, M.M., Koly, K.N., Saif-Ur-Rahman, K.M., Ahmed, H.U., Arman, N., Hossain, S.W., 2021. The current state of mental healthcare in Bangladesh: part 1 – an updated country profile. BjPsych. Int. 18 (4), 78–82. https://doi.org/10.1192/bji.2021.41.

Hysenbegasi, A., Hass, S.L., Rowland, C.R., 2005. The impact of depression on the academic productivity of university students. J. Ment. Health Policy Econ. 8.

Ionescu, D.F., Niciu, M.J., Henter, I.D., Zarate, C.A., 2013. Defining anxious depression: a review of the literature. CNS Spectr. 18 (5), 252. https://doi.org/10.1017/S1092852913000114.

Islam, Md.S., Rahman, Md.E., Moonajilin, Mst.S., van Os, J., 2021. Prevalence of depression, anxiety and associated factors among school going adolescents in Bangladesh: findings from a cross-sectional study. PLoS One 16 (4), e0247898. https://doi.org/10.1371/journal.pone.0247898.

Jha, K.K., Singh, S.K., Nirala, S.K., Kumar, C., Kumar, P., Aggrawal, N., 2017. Prevalence of depression among school-going adolescents in an urban area of Bihar, India. Indian J. Psychol. Med. 39 (3), 287–292. https://doi.org/10.4103/0253-7176.207326.

Kenney, B.A., Holahan, C.J., 2008. Depressive symptoms and cigarette smoking in a college sample. J. Am. College Health 56 (4), 409–414. https://doi.org/10.3200/JACH.56.44.409-414.

Khalid, A., Qadir, F., Chan, S.W.Y., Schwannauer, M., 2019. Adolescents' mental health and well-being in developing countries: a cross-sectional survey from Pakistan. J. Mental Health 28 (4), 389–396. https://doi.org/10.1080/09638237.2018.1521919.

Khan, A., Ahmed, R., Burton, N.W., 2020a. Prevalence and correlates of depressive symptoms in secondary school children in Dhaka city, Bangladesh. Ethn. Health 25 (1), 34–46. https://doi.org/10.1080/13557858.2017.1398313.

Khan, M.A., Rahman, M., Islam, R., Karim, M., Hasan, M., Jesmin, S.S., 2020b. Suicidal behavior among school-going adolescents in Bangladesh: findings of the global school-based student health survey. Soc. Psychiatry Psychiatr. Epidemiol. 55 (11), 1491–1502. https://doi.org/10.1007/s00127-020-01867-z.

Kroenke, K., Spitzer, R.L., Williams, J.B.W., Löwe, B., 2010. The patient health questionnaire somatic, anxiety, and depressive symptom scales: a systematic review. Gen. Hosp. Psychiatry 32 (4), 345–359. https://doi.org/10.1016/j.genhosppsych.2010.03.006.

Medrano, J.L.J., Lopez Rosales, F., Gámez-Guadix, M., 2018. Assessing the links of sexting, cybervictimization, depression, and suicidal ideation among University students. Arch. Suicide Res. 22 (1), 153–164. https://doi.org/10.1080/13811118.2017.1304304.

Merikangas, K.R., Nakamura, E.F., Kessler, R.C., 2009. Epidemiology of mental disorders in children and adolescents. Dialogues Clin. Neurosci. 11 (1), 7–20. https://doi.org/10.31887/DCNS.2009.11.1/krmerikangas.

Moonajilin, Mst.S., Rahman, Md.E., Islam, Md.S., 2020. Relationship between overweight/obesity and mental health disorders among Bangladeshi adolescents: a cross-sectional survey. Obesity Med. 18, 100216 https://doi.org/10.1016/j.obmed.2020.100216.

Mridha, M.K., Hossain, M.M., Khan, M.S.A., Hanif, A.A.M., Hasan, M., Mitra, D., Hossaine, M., Ullah, M.A., Sarker, S.K., Rahman, S.M.M., Bulbul, M.M.I., Shamim, A. A., 2021. Prevalence and associated factors of depression among adolescent boys and girls in Bangladesh: findings from a nationwide survey. BMJ Open. 11 (1), e038954 https://doi.org/10.1136/bmjopen-2020-038954.

Naderi, S., Naderi, S., Delavar, A., Dortaj, F., 2019. The effect of physical exercise on anxiety among the victims of child abuse. Sport Sci. Health 15 (3), 519–525. https://doi.org/10.1007/s11332-019-00538-0.

Patil, P.A., Porche, M.V., Shippen, N.A., Dallenbach, N.T., Fortuna, L.R., 2018. Which girls, which boys? The intersectional risk for depression by race and ethnicity, and gender in the U.S. Clin. Psychol. Rev. 66, 51–68. https://doi.org/10.1016/J.CPR.2017.12.003.

Paul, G.K., Rahman, M.M., Naznin, S., Chowdhury, M., Uddin, M.J., 2022. Depression and anxiety among university students: a comparison between COVID-19 pandemic panic period and post-panic period in Bangladesh. Open Access Maced. J. Med. Sci. 10 (E SE-Public Health Epidemiology), 52–59. https://doi.org/10.3889/oamjms.2022.7559.

Polanczyk, G.V., Salum, G.A., Sugaya, L.S., Caye, A., Rohde, L.A., 2015. Annual research review: a meta-analysis of the worldwide prevalence of mental disorders in children and adolescents. J. Child Psychol.Psychiatry Allied Discipl. 56 (3), 345–365. https://doi.org/10.1111/jcpp.12381.

Ponnet, K., Wouters, E., Goedemé, T., Mortelmans, D., 2013. Family financial stress, parenting and problem behavior in adolescents: an actor-partner interdependence approach. J. Fam. Issues. 37 (4), 574–597. https://doi.org/10.1177/0192513X13514409.

Rahman, M.A., Dhira, T.A., Sarker, A.R., Mehareen, J., 2022. Validity and reliability of the Patient Health Questionnaire scale (PHQ-9) among university students of Bangladesh. PLoS One 17 (6), e0269634. https://doi.org/10.1371/JOURNAL.PONE.0269634.

Rahman, M.M., Bhattacharjee, B., Farhana, Z., Hamiduzzaman, M., Chowdhury, M.A.B., Hossain, M.S., Siddiqee, M.H., Islam, Md.Z., Raheem, E., Uddin, Md.J., 2021. Age-related risk factors and severity of SARS-CoV-2 infection: a systematic review and meta-analysis. J. Prev. Med. Hyg. 62 (2), E329. https://doi.org/10.15167/2421-4248/JPMH2021.62.2.1946.

Ridner, S.L., Staten, R.R., Danner, F.W., 2005. Smoking and depressive symptoms in a college population. J. School Nurs. 21 (4), 229–235. https://doi.org/10.1177/10594050050210040801.

Roberts, T.A., Klein, J., 2003. Intimate partner abuse and high-risk behavior in adolescents. Arch. Pediatr. Adolesc. Med. 157 (4), 375–380. https://doi.org/10.1001/archpedi.157.4.375.

Roberts, T.A., Klein, J.D., Fisher, S., 2003. Longitudinal effect of intimate partner abuse on high-risk behavior among adolescents. Arch. Pediatr. Adolesc. Med. 157 (9), 875–881. https://doi.org/10.1001/archpedi.157.9.875.

Roohafza, H., Omidi, R., Alinia, T., Heidari, K., Mohammad-Shafiee, G., Jaberifar, M., Sadeghi, M., Maziak, W., 2018. Factors associated with smoking contemplation and maintenance among iranian adolescents. Eastern Mediterr. Health J. 24 (8), 714–721. https://doi.org/10.26719/2018.24.8.714.

Rozario, L.G., Islam, S., 2022. Scenario of mental health in Bangladesh: a signature glimpse. Dhaka Univ. J. Biol. Sci. 405–416. https://doi.org/10.3329/dujbs.v30i3.59033.

Seabrook, E.M., Kern, M.L., Rickard, N.S., 2016. Social networking sites, depression, and anxiety: a systematic review. JMIR Ment. Health 2016 3 (4), e5842. https://doi.org/10.2196/MENTAL.5842. E50. https://Mental.Jmir.Org/2016/4/E50.

Siddik, A.B., Hasan, N., Mahmud, A., Munmun, M.S., Hasan, M., Id, M., Ali, A., Ahmed, Z., Uddin, J., 2023a. Prevalence of depression and its associated factors among undergraduate admission candidates in Bangladesh: a nation-wide cross-sectional study. PLoS One 18 (11), e0295143. https://doi.org/10.1371/JOURNAL.PONE.0295143.

Siddik, M.A.B., Ali, A., Miah, S., Hasan, M., Ahmed, M., Sunna, T.C., 2023b. Psychological disorders among college going students: a post covid-19 insight from Bangladesh. J. Affect. Disord. Rep., 100686 https://doi.org/10.1016/J.JADR.2023.100686.

Thapar, A., Collishaw, S., Pine, D.S., Thapar, A.K., 2012. Depression in adolescence. Lancet 379 (9820), 1056–1067. https://doi.org/10.1016/S0140-6736(11)60871-4.

Tjora, T., Hetland, J., Aarø, L.E., Wold, B., Wiium, N., Øverland, S., 2014. The association between smoking and depression from adolescence to adulthood. Addiction 109 (6), 1022–1030. https://doi.org/10.1111/add.12522.

Toseeb, U., Brage, S., Corder, K., Dunn, V.J., Jones, P.B., Owens, M., St Clair, M.C., Van Sluijs, E.M.F., Goodyer, I.M., 2014. Exercise and depressive symptoms in adolescents: a longitudinal cohort study. JAMA Pediatr. 168 (12), 1093–1100. https://doi.org/10.1001/jamapediatrics.2014.1794.

WHO, 2017. Mental health status of adolescents in South-East Asia : evidence for action. Searo. Issue April.

World Health Organization. (2020). *Statement – older people are at highest risk from COVID-19, but all must act to prevent community spread*. https://www.who.int/europe/news/item/03-04-2020-statement-older-people-are-at-highest-risk-from-covid-19-but-all-must-act-to-prevent-community-spread.

World Health Organization. (2021). *Mental health of adolescents*. https://www.who.int/news-room/fact-sheets/detail/adolescent-mental-health.