

Psychological Well-being of Late Adolescents in Urban Karnataka and Tamil Nadu during the COVID-19 Pandemic: A Cross-sectional Study

ANJALI MARIA AUGUSTINE¹, NIDHI KAMATH², KESHAVA PAI KOTA³

ABSTRACT

Introduction: The Coronavirus Disease-2019 (COVID-19) pandemic and prolonged lockdown had impacted the mental health of adolescents. Late adolescence is an age peculiarly vulnerable to mental health issues, and very few studies have exclusively focused on this age group during the pandemic.

Aim: To evaluate the presence and severity of anxiety and depression symptoms among late adolescents (15-18 years), taking into account their socio-demographic variables and additional stressors like board exams during the pandemic in India.

Materials and Methods: A cross-sectional questionnaire-based study was conducted in High schools in Urban Karnataka, India and Urban Tamil Nadu, India from October 2020 to December 2021 with snowball sampling. An online form was given to 104 students, which included socio-demographic data, the Patient Health Questionnaire (PHQ-9, adopted for adolescents), and the Generalised Anxiety Disorder Assessment (GAD-7) questionnaires. The participants were divided into two groups for subgroup analysis. Group-1 constituted standard X and XII and Group-2 constituted standard XI. Unpaired t-tests,

Spearman's correlation, and univariate analysis of variance were used for data analysis.

Results: A total of 104 late adolescents from an urban setting participated in the study. A total of 24% had significant clinical depression, and 20.2% had significant anxiety levels. Board exams did not influence the presence of depression or anxiety. Among the socio-demographic variables, presence or absence of pets caused significant differences in PHQ-9(A) levels between the two groups ($p=0.01$). The PHQ-9(A) scores for Group-1 ($p=0.031$) and Group-2 ($p=0.001$) showed a significant correlation with increased social media usage. GAD-7 scores also showed a significant correlation with increased social media usage in both groups (Group-1, $p<0.001$ and Group-2, $p=0.018$) and the presence of siblings in Group-2 ($p=0.010$). No other variable showed a significant correlation with PHQ-9(A) and GAD-7 scores in the groups. Suicide risk and ideation were seen in 17.7% of the cohort.

Conclusion: The study revealed the negative impact of the COVID-19 pandemic on the mental health of late adolescents. The increased usage of social media impacted depression and anxiety levels.

Keywords: Anxiety, Coronavirus disease-2019, Depression

INTRODUCTION

The World Health Organisation (WHO) has defined the age group of 10-19 years as adolescence [1]. They constitute 16% of the world's population. A total of 350 million of the world's adolescent population live in South Asia, of which 243 million live in India [2]. Adolescence is a period that is at high-risk for mental health issues, as it is situated in the transition period from childhood to adulthood. Late adolescence (15-19 years) is particularly stressful because of the multiple challenges in play; rapid physical development, heightened intellectual maturation, increased freedom of access to social media, and increased salience to peer interactions [3]. In addition, these individuals also have to undertake multiple scholastic challenges in preparation for higher education [4,5].

The COVID-19 pandemic has completely disrupted the physical and social milieu of young adolescents [6]. Like many countries worldwide, India has gone through a year of multiple lockdowns. Schools and colleges, by and large, have remained closed. Adolescents are closed at home with limited physical activity or contact with friends and peers. In addition, online classes have become the norm, with little interaction between teachers and students [6].

Of the few original studies, some have described anxiety and depression in different phases of adolescence [4,7,8]: however,

only one included late adolescence [4]. In other studies, all the age groups were studied together [8,9]. Hence, the mental health of late adolescents had not been examined separately. The authors hypothesised that if parents are in healthcare sector, it can cause increased depression or anxiety. Thus, the present study was conducted to analyse the prevalence of depression and anxiety in late adolescents during the COVID-19 pandemic while taking into account their socio-demographic variables and additional stressors like impending board exams.

MATERIALS AND METHODS

This was a cross-sectional questionnaire-based study conducted in high schools in Urban Karnataka, India and Urban Tamil Nadu, India from October 2020 to December 2021. Ethical clearance for the study (Protocol No: IECKMCMCLR-09/2020/269) was done by the Institutional Ethical Committee. Since the participants were below the age of 18 years, the link to the Google form was sent to 104 participants only after getting the parent consent form and a child assent form. The entire questionnaire was also enclosed in the parent consent forms.

Inclusion criteria: Children from Class X, XI, and XII who were willing to participate were included in the study.

Exclusion criteria: Subjects not willing to participate and whose parents denied permission were excluded from the study.

Sample size calculation: The sample size was calculated using the formula $n = zpq/d^2$ (sample size for proportion); $z = 1.96$ is a standard normal value at a 5% level of significance, $p = 20$ (prevalence), $q = 1 - p$ and d are at 8% (effective size). The sample size was calculated to be 91 with 80% power and a 95% confidence interval. The prevalence was considered 20% based on relevant literature [5]. Snowball sampling was used to acquire 104 participants for the study.

Study Procedure

Questionnaire: The questionnaire was sent to the participants that assessed the socio-demographic parameters of the student. Questionnaire was made keeping in mind the unique socio-demographic context of the population studied. The socio-demographic data included 14 questions on age, sex, class, information about the family (presence of pets, grandparents, and number of siblings), parents (working abroad or not, health care worker or not), information on education (number of hours of online classes a week, platform used for online classes, attending extra coaching classes, etc.) and number of hours of social media usage and TV viewing per day.

The forms included two mental health questionnaires, the PHQ-9 (A) [10,11] and the GAD-7 [12].

The PHQ-9 questionnaire consisting of nine questions is a self-report tool that is used to assess the presence and severity of depression in adults [10]. A modified version of the PHQ-9(A) has been specially adapted for adolescents [11]. This is a self-administered instrument that assesses anxiety, eating, mood, and substance use disorders among adolescents. This instrument has been validated for detecting and measuring depression in adolescents by clinical interviews (criterion validity) and SF-20 (Short form Health survey for construct validity) [11]. A psychometric analysis of the tool has further confirmed its reliability to assess the severity of depression [13]. PHQ-9(A) in adolescents has a good internal consistency, with a Cronbach's alpha coefficient between 0.80 and 0.90 [4].

For each of the nine questions, the study subject was asked to choose between:

Score 0-not at all

Score 1-several days

Score 2-more than half the days

Score 3-nearly every day.

The total scores were calculated by adding the item scores. The PHQ-9 (A) scores of a subject could range from 0-27 depending on the severity of anxiety. Cut-offs of 5, 10, 15, and 20, respectively, were taken to classify anxiety into mild, moderate, moderately severe, and severe categories of anxiety.

GAD-7 scoring: The GAD-7 is a seven-item response set for assessing and monitoring depression and validated for use as a screening tool in primary care patients [10]. GAD-7 performed well as a screener for GAD, Post-Traumatic Stress Disorder (PTSD), Social Anxiety Disorder (SAD), and Panic Disorder (PD) in primary care patients [12]. Its reliability, internal consistency, and validity have been studied and reported by many authors [12,14], and the Cronbach's alpha has been reported to be between 0.90 and 0.92 [4].

Similar scoring was carried out by participants, as was done in PHQ-9 questionnaire (Score 0, 1, 2 and 3). The total scores were calculated by adding the item scores. The GAD-7 score of a subject could range from 0-21. Cut-offs of 5, 10, and 15, respectively, were taken to classify the severity of depression into minimal, mild, and severe categories of depression. The two questionnaires were validated instruments in the public domain; hence no permission was taken for usage [15]. The participants were subdivided into two groups:

- **Group-1** belonged to Class X and XII and had to give board exams at the end of the academic year.
- **Group-2** belonged to Class XI and did not have board exams.

The PHQ 9(A) and GAD-7 scores for the entire group and between the two groups were analysed and compared. The variations of PHQ 9(A) and GAD-7 scores with changes in socio-demographic variables between the two groups were statistically compared. Within each group, the association, if any, between the anxiety and depression scores and the socio-demographic variables were analysed.

STATISTICAL ANALYSIS

The data was analysed using the Statistical Package for the Social Sciences (SPSS). The descriptive statistics were converted to categorical variables. The mean PHQ-9(A) and GAD scores of Group-1 and 2 were compared using unpaired t-tests. Intergroup comparison of PHQ and GAD scores with socio-demographic variables were done using univariate analysis of variance. The mean PHQ and GAD scores were correlated with the socio-demographic variables in Group-1 and 2 using the unpaired t-test (for continuous variables) and Spearman's correlation (for ordinal variables). The statistical significance level was set at p -value < 0.05 with a 95% confidence interval.

RESULTS

A total of 104 adolescents participated in the study (20 belonged to standard X, 36 belonged to Standard XI, and 48 belonged to standard XII). The mean age of the study group was 16.43 ± 0.87 years. The cohort had 65 females (62.5%) and 39 males (37.5%). On analysis, 76% of students ($n = 79$) had a PHQ-9 score < 10 , and 24% ($n = 25$) had a PHQ-9 score > 10 . The anxiety score measured using the GAD-7 scale showed that 79.8% ($n = 83$) of students had a GAD-7 score < 10 , and 20.2% ($n = 21$) had a GAD-7 score > 10 [Table/Fig-1].

Severity of depression and anxiety (range)		Count (N)	Column (N%)
PHQ-9(A)	Minimal 0-4	45	43.3
	Mild 5-9	34	32.7
	Moderate 10-14	14	13.5
	Moderately severe 15-19	10	9.6
	Severe 20-27	1	1.0
	Total	104	100.0
GAD-7	None 0-4	53	51.0
	Mild 5-9	30	28.8
	Moderate 10-14	14	13.5
	Severe 15-21	7	6.7
	Total	104	100.0

[Table/Fig-1]: Overall PHQ-9(A)* and GAD-7* scores of adolescents with table showing number and percentage of students with different degrees of depression and anxiety.

*PHQ-9(A): Patient health questionnaire adopted for adolescents

*GAD-7: Generalised anxiety disorder

The PHQ-9(A) and GAD scores did not differ significantly between exam going and non exam going groups ($p > 0.05$) [Table/Fig-2]. Intergroup Comparison of PHQ-9(A) and GAD scores across different variables [Table/Fig-3,4] was done. Presence or absence of pets caused significant differences in PHQ 9(A) levels between the two groups ($p = 0.01$). However, the variables did not cause significantly different levels of depression in the two groups.

Variable of comparison	Group	Mean	Std. Deviation	T, p-value
PHQ	Non exam going	6.17	4.58	$T = -0.92$
	Exam going	7.14	5.28	$p = 0.35$
GAD-7	Non exam going	5.72	5.01	$T = 0.405$
	Exam going	5.30	4.95	$p = 0.68$

[Table/Fig-2]: Comparison of PHQ 9(A) and GAD-7 scores between exam-going and non-exam going students using unpaired t-tests.

Variable of comparison	Categories	Group-1	Group-2	p-value
		Mean±SD	Mean±SD	
Age (years)	15-16 years	7.13±4.163	6.50±4.897	0.09
	17-18 years	4.25±4.957	7.33±5.474	
Gender	Female	4.53±4.565	5.90±4.756	0.65
	Male	7.33±4.328	7.72±5.466	
Grandparents	Present	6.25±4.187	7.82±6.029	0.68
	Absent	6.10±4.983	6.78±4.876	
Pets	Present	8.08±5.314	6.00±4.821	0.01
	Absent	5.09±3.825	8.18±5.537	
Parents being health care workers	Yes	6.80±3.114	6.82±6.493	0.70
	No	6.06±4.809	7.21±5.062	
Parents working in hospitals	Yes	6.86±2.610	7.10±6.773	0.74
	No	6.00±4.964	7.15±5.032	
Parents being abroad	Yes	6.00±5.447	8.17±3.371	0.66
	No	6.21±4.459	7.04±5.454	
Extra coaching	Yes	3.00±2.098	7.00±3.767	0.19
	No	6.80±4.701	7.40±5.943	
Platform used to attend classes	Laptop/tab/pc	7.50±5.021	6.88±5.638	0.10
	Smart phone	4.50±3.425	7.40±5.135	
Siblings	Absent	5.75±3.919	5.29±4.858	0.46
	Present	6.29±4.814	7.67±5.324	
Number of hours of online classes/week	1-30	5.63±4.545	6.77±5.292	0.52
	>30	8.83±4.119	8.21±5.423	
Number of hours spent on social media	<4 hours	5.46±4.501	6.62±4.904	0.94
	≥4 hours	8.67±4.213	9.64±6.485	
Number of hours spent on TV	<4 hours	6.15±4.764	6.89±5.138	0.09
	≥4 hours	6.33±2.082	15.00±4.243	

[Table/Fig-3]: Comparison of PHQ scores in Group-1 (non exam going) and 2 (exam-going) across different variables using univariate analysis of variance. Inter-group comparison of PHQ scores revealed a significant difference only with respect to the presence/absence of pets at home

Variable of comparison	Categories	Group-1	Group-2	p-value
		Mean±SD	Mean±SD	
Age	15-16 years	5.92±4.064	5.23±5.255	0.77
	17-18 years	5.33±6.733	5.28±4.888	
Gender	Female	4.40±4.372	4.85±4.171	0.45
	Male	6.67±5.332	5.51±5.307	
Grand parents	Present	5.25±3.416	4.77±4.375	0.98
	Absent	6.10±6.069	5.59±5.263	
Pets	Present	6.00±5.888	4.17±4.268	0.22
	Absent	5.57±4.591	6.33±5.354	
Parents being health care workers	Yes	6.80±3.114	4.27±4.541	0.39
	No	5.55±5.278	5.52±5.047	
Parents working in hospitals	Yes	6.14±3.132	4.00±4.830	0.44
	No	5.62±5.414	5.55±4.979	
Parents being abroad	Yes	5.43±3.207	6.50±5.206	0.57
	No	5.79±5.408	5.18±4.954	
Extra coaching	Yes	3.50±2.950	5.00±5.099	0.42
	No	6.17±5.259	5.58±4.935	
Platform used to attend classes	Laptop/tab/pc	7.20±5.791	4.77±4.283	0.05
	Smart phone	3.88±3.117	5.57±5.522	
Siblings	Absent	4.88±5.540	3.36±4.483	0.57
	Present	5.96±4.940	5.86±4.979	
Number of hours of online classes/ week	1-30	5.33±4.475	5.04±5.027	0.59
	>30	7.67±7.394	5.93±4.875	

Number of hours spent on social media	<4 hours	4.27±4.687	5.06±4.948	0.08
	≥4 hours	9.89±3.887	6.45±5.027	
Number of hours spent on TV	<4 hours	5.79±5.171	5.13±4.745	0.18
	≥4 hours	5.00±3.464	10.50±10.607	

[Table/Fig-4]: Comparison of GAD scores in Group-1 and 2 across different variables using univariate analysis of variance.

The mean of the scores were used for the comparison of PHQ-9(A) and GAD-7 scores with socio-demographic variables within the two groups, using unpaired t-tests and Spearman's correlations [Table/Fig-5,6]. The PHQ-9(A) scores for Group-1 (p=0.031) and Group-2 (p=0.001) showed a significant correlation with increased social media usage. GAD-7 scores also showed a significant correlation with increased social media usage in both groups (Group-1, p<0.001 and Group-2, p=0.018) and the presence of siblings in Group-2 (p=0.010). No other variable showed a significant correlation with PHQ-9(A) scores in the groups. However, for GAD-7 scores, the presence of siblings showed significant correlation for Group-2 (p=0.010).

Variable of comparison	Group	Categories	Mean±SD	T, p-value
Gender	Group-1	Female	4.36±4.618	T=-1.425
		Male	6.45±3.913	p=0.164
	Group-2	Female	5.83±5.228	T=-1.385
		Male	7.76±5.472	p=0.171
Grand parents	Group-1	Absent	5.24±4.697	T=-0.475
		Present	5.94±3.929	p=0.638
	Group-2	Absent	6.34±4.899	T=-1.602
		Present	8.62±6.241	p=0.114
Pets	Group-1	Absent	4.74±3.519	T=-1.722
		Present	7.36±5.297	p=0.095
	Group-2	Absent	8.12±5.504	T=1.594
		Present	6.00±5.212	p=0.116
Parents being health care workers	Group-1	No	5.30±4.606	T=-0.777
		Yes	6.71±2.628	p=0.443
	Group-2	No	7.25±5.047	T=0.502
		Yes	6.43±6.813	p=0.618
Parents working in hospitals	Group-1	No	5.27±4.695	T=-0.779
		Yes	6.63±2.446	p=0.442
	Group-2	No	7.19±5.018	T=0.340
		Yes	6.62±7.054	p=0.735
Parents being abroad	Group-1	No	5.54±4.111	T=-0.120
		Yes	5.75±5.092	p=0.905
	Group-2	No	6.98±5.591	T=-0.435
		Yes	8.00±3.633	p=0.665
Extra coaching	Group-1	No	5.97±4.452	T=1.249
		Yes	3.40±2.302	p=0.221
	Group-2	No	7.73±6.051	T=1.223
		Yes	6.04±4.148	p=0.226
Platform used to attend classes	Group-1	Laptop/tab/pc	6.87±5.125	T=1.583
		Smart phone	4.58±3.271	p=0.123
	Group-2	Laptop/tab/pc	6.92±5.664	T=-0.037
		Smart phone	6.97±5.234	p=0.971
Number of siblings ^a	Group-1	-	rho=-0.069	p=0.698
	Group-2	-	rho=0.208	p=0.096
Number of hours of online classes/week ^a	Group-1	-	rho=0.076	p=0.668
	Group-2	-	rho=0.129	p=0.309
Number of hours spent on social media ^a	Group-1	-	rho=0.370	p=0.031*
	Group-2	-	rho=0.391	p=0.001*

Number of hours spent on TV ^a	Group-1	-	rho=-0.014	p=0.938
	Group-2	-	rho=-0.034	p=0.787

[Table/Fig-5]: Comparison of PHQ scores with different variables within Group-1 and 2 using unpaired t-tests and Spearman's correlation.

^aAnalysed using Spearman's correlation for ordinal variables; *Significant at p<0.05, significant p-values in bold

- The ordinal variables were classified as follows:
- Number of siblings 0, 1, 2 and ≥3
- How many hours do you spend on social media every day? 0-<1 hour, 1- 1-2 hours, 2- 2-3 hours, 3- 3-4 hours, 4- > 4 hours
- How many hours of online classes do you have a week [†]1-0-10,2-10-20,3-20-30,4-30-40,5->40
- How many hours do you spend seeing TV every day 0-<1 hour, 1- 1-2 hours, 2- 2-3 hours, 3- 3-4 hours, 4- > 4 hours

Variable of comparison	Group	Categories	Mean±SD	T, p-value
Gender	Group-1	Female	4.50±4.816	T=-0.736
		Male	5.60±3.885	p=0.467
	Group-2	Female	5.09± 5.09	T=-0.429
		Male	5.60±4.701	p=0.670
Grandparents	Group-1	Absent	5.00±4.770	T=-0.198
		Present	5.29±3.820	p=0.844
	Group-2	Absent	5.20±4.683	T=-0.539
		Present	5.86±4.304	p=0.592
Pets	Group-1	Absent	5.22±3.753	T=0.137
		Present	5.00±5.367	p=0.892
	Group-2	Absent	6.27±4.706	T=1.563
		Present	4.53±4.258	p=0.123
Parents being health care workers	Group-1	No	4.67±4.506	T=-1.306
		Yes	7.00±2.582	p=0.201
	Group-2	No	5.6±4.542	T=0.850
		Yes	4.50±4.587	p=0.399
Parents working in hospitals	Group-1	No	4.77±4.563	T=-0.931
		Yes	6.38±2.973	p=0.359
	Group-2	No	5.69±4.474	T=0.983
		Yes	4.31±4.820	p=0.329
Parents being abroad	Group-1	No	5.23±4.563	T=0.204
		Yes	4.88±3.314	p=0.840
	Group-2	No	5.24±4.554	T=-0.991
		Yes	7.17±4.401	p=0.325
Extra coaching	Group-1	No	5.17±4.285	T=0.082
		Yes	5.00±4.583	p=0.935
	Group-2	No	5.98±4.671	T=1.263
		Yes	4.52±4.263	p=0.211
Platform used to attend classes	Group-1	Laptop/tab/pc	6.13±5.041	T=1.208
		Smart phone	4.37±3.467	p=0.236
	Group-2	Laptop/tab/pc	4.96±3.878	T=-0.253
		Smart phone	5.25±4.723	p=0.80
Number of siblings ^a	Group-1	-	rho=0.153	p=0.388
	Group-2	-	rho=0.316	p=0.010*
Number of hours of online classes/week ^a	Group-1	-	rho=-0.101	p=0.570
	Group-2	-	rho=0.104	p=0.415
Number of hours spent on social media ^a	Group-1	-	rho=0.596	p<0.001*
	Group-2	-	rho=0.293	p=0.018*
Number of hours spent on TV ^a	Group-1	-	rho=-0.057	p=0.749
	Group-2	-	rho=0.040	p=0.750

[Table/Fig-6]: Comparison of different variables with GAD scores within both groups using unpaired t-tests and Spearman's correlation.

^aAnalysed using Spearman's correlation for ordinal variables; *Significant at p<0.05, significant p-values in bold

- The ordinal variables were classified as follows: 7. Number of siblings 0, 1, 2 and ≥3; 8. How many hours do you spend on social media every day? 0-<1 hour, 1- 1-2 hours, 2- 2-3 hours, 3- 3-4 hours, 4- > 4 hours; 9. How many hours of online classes do you have a week [†]1-0-10, 2-10-20, 3-20-30, 4-30-40, 5->40; 10. How many hours do you spend seeing TV every day 0-<1 hour, 1- 1-2 hours, 2- 2-3 hours, 3- 3-4 hours, 4- > 4 hours

In the PHQ-9 scale, question nine was used to assess the risk of suicide. Out of the 102 responses received, suicide ideation and risk were found among 17.5% (no=18) of the cohort. A 10.7% of students had thoughts of suicide on several days, 4.9% on more than half the days and 1.9% had suicidal thoughts nearly every day. To analyse this data, the entire student population was considered as one cohort. Of the adolescents who had suicide ideation 50% of adolescents belonged to grade 11, and 50% of adolescents belonged to grade 12. The adolescents belonging to grade 10 did not have suicide ideation [Table/Fig-7].

PHQ-9 scale question 9	Not at all count %	Several days count %	More than half the days count %	Nearly every day count %
Thoughts that you would be better dead or of hurting yourself in some way*	84 82.3	11 10.7	5 4.9%	2 1.9%

[Table/Fig-7]: Suicide ideation in the student population.

*Only 102 participants answered this question

DISCUSSION

Adolescence is a time of personal growth and social development tempered by interactions with family, peers, and teachers [16]. The COVID-19 prevention protocol has had a profound impact on the lives of adolescents. One year into the pandemic, most countries have faced atleast two waves and multiple general lockdowns with shutdowns of schools and universities. The COVID-19 pandemic has disrupted the social fabric of adolescents by robbing them of social peer group activities, school discipline, and co-curricular events like sports [6].

The present study on older adolescents (15-18 years of age) revealed that 24% of adolescents showed significant clinical depression, and 20.2% had significant anxiety levels. These percentages were derived when a score of ≥10 was taken into consideration. A score of ≥10 for PHQ-9 (A) and GAD-7 indicate significant depression and anxiety requiring clinical attention [15]. However, if all forms of depression i.e., mild (32.7%), moderate (13.5%), moderately severe (9.6%), and severe (1%), are taken into account, then 56.8% of students suffered from depression. Similarly, when all grades of anxiety are taken together, i.e., mild- (28.8%), moderate (13.5%), and severe (6.7%), then 49% of students suffered from anxiety. These differences may also account for the wide variability in the prevalence figures for anxiety and depression quoted by different authors in similar studies [Table/Fig-8] [3,4,8,16-19].

Though there are many studies [3,6,4,16] on the mental health of children and adolescents during the pandemic, only a few have focused or have separately studied late adolescents (15-19 years). Most have focused on this group as a whole [3,6] a few have taken younger children (<11 years) as well [4,16,20]. The incidence of anxiety and depression in a few studies which have included late adolescents, have been tabulated in [Table/Fig-8] [4,5,9,16-19].

Many studies have attempted to correlate socio-demographic parameters with anxiety and depression in adolescents during the COVID-19 pandemic. These have been tabulated in [Table/Fig-9] [4,5,9,16-19]. The only socio-demographic factor which correlated with both increased depression and anxiety in the present study was increased social media usage.

Only very few original studies have explored the relationship between social media usage and mental health in adolescents during the pandemic. A study on college students by Chen F et al., positively correlated exposure to information regarding the pandemic with depression and anxiety [5]. Gao J et al., have analysed social media usage and the presence of anxiety and depression in the 18-85 age group during the pandemic times [21]. The questions regarding social media were restricted to exposure to pandemic-related news. The adjusted odds for social media exposure were high for anxiety

Study	Year	Place of study	Age group (years)	Measures studied	Anxiety (%)	Depression (%)
Ahmed MZ et al., [9]	2020	China	14-68	BDI [*] , BAI [†]	12.90	27.30
Ravens SU et al., [16]	2021	Germany	7-17	Kidscreen- 10, LES-DC [‡]	24.10	33.70
Islam MA et al., [17]	2020	Bangladesh	17-24	PHQ-9§, GAD-7 ^{**}	18.10	15
Kumar BP et al., [18]	2020	India	10-19	GAD-2 ^{**}		44
Zhou SJ et al., [4]	2020	China	12-18	PHQ-9, GAD-7	37	43
Chen F et al., [5]	2020	China	6-15	DSRS-C, ^{††} SCARED ^{††}	18.92	11.78
Jeelani A et al., [19]	2022	India	15-19	PHQ-9(A), GAD-7	20	16
Present study	2022	India	15-18	PHQ-9, GAD-7	20.2	24

[Table/Fig-8]: Studies done during the pandemic showing the prevalence of depression and anxiety in adolescents [4, 5,9,16-19].

^{*}Beck depression inventory; [†]Beck anxiety inventory; [‡]Centre for epidemiological studies-depression scale; [§]Patient health questionnaire-9; ^{**}Generalised anxiety disorder; ^{††}Depression self-rating scale for children; ^{‡‡}Screen for child anxiety related disorders

Name of the author and year of the study	Place of study	Age group (years)	Factors causing increased anxiety	Factors causing increased depression
Ahmed MZ et al., [9]	China, 2020	14-68	Living in Hubei province Age Group-21-30 years	
Ravens SU et al., [16]	Germany, 2021	7-17	Families with low income Families with low education Crowded living space Migration back ground	Families with low income Families with low education Crowded living space Migration background
Islam MA et al., [17]	Bangladesh, 2020	17-24	Students lagging behind in studies Students living with families	Students in financial difficulties Students lagging in studies Students living with families
Kumar BP et al., [18]	India, 2020	10-19	Age >18 yrs	
Zhou SJ et al., [4]	China, 2020	12-18	Female gender Living in Hubei province Impending Board Exams Decreased knowledge about COVID-19	Female gender Living in Hubei province Impending board exams Decreased knowledge about COVID-19
Chen F et al., [5]	China, 2020	6-15	Female gender Older adolescents Educational level of parents Lack of companion on weekends Lack of physical exercise	Female gender Lack of physical exercise Lack of companion on weekends
Jeelani A et al., [19]	India, 2022	15-19	Female gender Age <18 years Personal COVID-19 infection Family history of COVID-19 infection Admission of family member in hospital for COVID-19	History of personal COVID-19 infection
Present study	India, 2020	15-18	Social media usage	Social media usage

[Table/Fig-9]: Factors causing anxiety and depression in late adolescents in studies done during pandemic [4,5,9,16-19].

and combined depression and anxiety. The authors have concluded that though social media can convey a lot of information about the pandemic, it can relay false news and misinformation [21]. Moreover, people also use it as a tool to convey negative feelings like fear, worry, anxiety, and personal experiences [21]. A similar study on college students from China had concluded that depression and anxiety correlated positively with receiving negative information regarding the pandemic on social media [22].

During the pandemic's waves, adolescents depend on social media for peer interaction, entertainment, and access to news. Hence, in the present study, data was collected on total hours of social media usage with no particular attention to pandemic-related news, unlike the previous studies [21]. The present study has shown positive correlations between the time spent on social media usage and depression and anxiety within both groups. It also revealed the significant correlation between hours of social media usage and anxiety in Group-2 students (students not facing board exams).

However, this relationship between social media usage and mental health problems in adolescents is not new and has been reported extensively in pre-pandemic times [23-28]. A systematic review of the effect of social media on mental health problems in adolescents [24] revealed that the relationship can be complicated. Though many studies [23,28] have reported a

relationship between time spent on social media and depression and anxiety, few could not prove the association [25,26]. Moreover, an inverse relationship between the duration of social media usage and psychological distress has also been noted [27].

Among the socio-demographic variables, the authors did not find gender to have a significant association with depression or anxiety in our group of late adolescents. The female gender is more prone to depression and anxiety [4], and many studies [4,5,19] were able to prove this association during the pandemic. The authors explored the presence or absence of a companion in combating depression or anxiety in adolescents. In the urban milieu in India, companionship at home is provided by siblings, grandparents, or pets, especially when both parents are working and away from home. The present study found that the presence of siblings was associated with significantly less anxiety in the group facing board exams. However, in intergroup comparison, having pets caused significantly more depression in the group with board exams as opposed to the group without board exams. This could be explained by the fact that adolescents can ill afford to play or take care of their pets due to the scarcity of time exam. The results from other studies are similarly mixed; living at home was found to increase depression and anxiety in adolescents in Bangladesh [17], whereas the absence of a companion on

workdays significantly decreased mental health in adolescents in China [4].

Affliction with COVID-19 (personal and/or in the family) is known to cause increases in depression and anxiety in late adolescents [19]. The authors here tried to analyse the relationship between mental health parameters and having a parent or both parents in healthcare since parents in the healthcare sector are more prone for getting COVID-19 or bringing home the infection. Also, late adolescents have unrestricted access to morbidity and mortality data from all over the country. The authors in present study could not prove any significant association of parents in healthcare sector with increased stress and anxiety amongst adolescents, hence the hypothesis considered in the start of study, is denied.

An increased rise in suicide attempts and ideation has been seen in adults during the COVID-19 pandemic [29]. However, in adolescents, this has not been studied in detail, though the authors know that stressful life events increase suicide ideation in adolescents [21,30]. The ninth question of PHQ-9(A) is on suicide ideation and should be considered positive, if the answer is anything other than zero. A 17% of the present study population had answered with a positive response; they were equally distributed between the board exams and non board exams groups. However, it is also significant that no class X student gave an affirmative answer to this question.

Limitation(s)

The main limitation of the study was the small sample size. Also, the present study was limited to urban adolescents and does not reflect the mental health of adolescents living in rural areas.

CONCLUSION(S)

A 24% of adolescents in this age groups (15-18) had an anxiety score of more than 10 and 20. A 2% had a depression score of more than 10. Scores of more than 10 in PHQ 9(A) and GAD-7 represent clinically significant mental health issues that require further clinical evaluation. Suicide ideation was seen in 17% of adolescents. Impending board exams did not predispose adolescents to anxiety, depression, or suicide ideation. Late adolescents are negatively affected by the pandemic and are at high-risk for developing anxiety and depression. Self-reported questionnaires can be used to identify significant depression and anxiety in this age group, which can then culminate in timely intervention. Increased social media usage should be considered as a warning sign for the development of mental health problems in late adolescents.

Acknowledgement

The authors would like to acknowledge the help extended by Ms. Sucharitha Suresh and Ms. Vishnu Priya for statistical analysis.

REFERENCES

- Adolescent health [Internet]. Who.int. 2022 [cited 2022 March 25]. Available from: https://www.who.int/health-topics/adolescent-health#tab=tab_1.
- Kumar MM, Karpaga PP, Panigrahi SK, Raj U, Pathak VK. Impact of COVID-19 pandemic on adolescent health in India. *J Family Med Prim Care*. 2020;9(11):5484-89. Doi: 10.4103/jfmpc.jfmpc_1266_20.
- Blakemore SJ. The social brain in adolescence. *Nat Rev Neurosci*. 2008;9(4):267-77. Doi: 10.1258/jrsm.2011.110221.
- Zhou SJ, Zhang LG, Wang LL, Guo ZC, Wang JQ, Chen JC, et al. Prevalence and socio-demographic correlates of psychological health problems in Chinese adolescents during the outbreak of COVID-19. *Eur Child Adolesc Psychiatry*. 2020;29(6):749-58. Doi: 10.1007/s00787-020-01541-4.
- Chen F, Zheng D, Liu J, Gong Y, Guan Z, Lou D. Depression and anxiety among adolescents during COVID-19: A cross-sectional study. *Brain Behav Immun*. 2020;88:36-38. Doi:10.1016/j.bbi.2020.05.061.
- Singh S, Roy D, Sinha K, Parveen S, Sharma G, Joshi G. Impact of COVID-19 and lockdown on mental health of children and adolescents: A narrative review with recommendations. *Psychiatry Res*. 2020;293:1134294. Doi: 10.1016/j.psychres.2020.113429.
- Xie X, Xue Q, Zhou Y, Zhu K, Liu Q, Zhang J, et al. Mental health status among children in home confinement during the coronavirus disease outbreak in Hubei Province, China. *JAMA Pediatr*. 2020;174(9):898-900. Doi: 10.1001/jamapediatrics.2020.1619.
- Liu S, Liu Y, Liu Y. Somatic symptoms and concern regarding COVID-19 among Chinese college and primary school students: A cross-sectional survey. *Psychiatry Res*. 2020;289:113070 Doi: 10.1016/j.psychres.2020.113070.
- Ahmed MZ, Ahmed O, Aibao Z, Hanbin S, Siyu L, Ahmad A. Epidemic of COVID-19 in China and associated psychological problems. *Asian J Psychiatr*. 2020;51:102092. Doi: 10.1016/j.ajp.2020.102092.
- Kroenke K, Spitzer RL, Williams JBW. The PHQ-9: Validity of a brief depression severity measure. *J Gen Intern Med*. 2001;16(9):606-13. Doi: 10.1046/j.1525-1497.2001.016009606.x.
- Johnson JG, Harris ES, Spitzer RL, Williams JBW. The Patient Health Questionnaire for Adolescents: Validation of an instrument for the assessment of mental disorders among adolescent primary care patients. *J Adolescent Health*. 2002;30(3):196-204. Doi: 10.1016/s1054-139x(01)00333-0.
- Spitzer RL, Kroenke K, Williams JBW, Löwe B. A brief measure for assessing generalized anxiety disorder: the GAD-7. *Arch Intern Med*. 2006;166:1092-97. Doi: 10.1001/archinte.166.10.1092.
- Nandakumar AL, Vande Voort JL, Nakonezny PA, Orth SS, Romanowicz M, Sonmez AI, et al. Psychometric properties of the Patient Health Questionnaire-9 modified for major depressive disorder in adolescents. *J Child Adolesc Psychopharmacol*. 2019;29(1):34-40. Doi: 10.1089/cap.2018.0112.
- Johnson SU, Ulvenes PG, Øktedalen T, Hoffart A. Psychometric properties of the General Anxiety Disorder 7-Item (GAD-7) Scale in a heterogeneous psychiatric sample. *Front Psychol*. 2019;10:1713. Doi: 10.3389/fpsyg.2019.01713.
- Instructions for Patient Health Questionnaire (PHQ) and GAD-7 Measures. Internet. Available at: <https://www.ons.org/sites/default/files/PHQandGAD>.
- Ravens-Sieberer U, Kaman A, Erhart M, Devine J, Schlack Otto C. Impact of the COVID-19 pandemic on quality of life and mental health in children and adolescents in Germany. *Eur Child Adolesc Psychiatry* 2021;01-11. Doi: 10.1007/s00787-021-01726-5.
- Islam MA, Barna SD, Raihan H, Khan MN, Hossain MT. Depression and anxiety among university students during the COVID-19 pandemic in Bangladesh: A web-based cross-sectional survey. *PloS one*. 2020;15(8):e0238162. Doi: 10.1371/journal.pone.0238162.
- Kumar BP, Eregowda A, Giliyaru S. Impact of COVID-19 outbreak on the mental health of adolescents in India and their perceived causes of stress and anxiety. *International Journal of Community Medicine and Public Health*. 2020;7(12):5048-53. Doi: 10.18203/2394-6040.ijcmph20205183.
- Jeelani A, Dkhar SA, Quansar R, Khan SM. Prevalence of depression and anxiety among school-going adolescents in Indian Kashmir valley during COVID-19 pandemic. *Middle East Current Psychiatry*. 2022;29(1):01-07. Doi: 10.1186/s43045-022-00185-1.
- Marques de Miranda D, da Silva Athanasio B, Sena Oliveira AC, Simoes-E-Silva AC. How is COVID-19 pandemic impacting mental health of children and adolescents? *Int J Disaster Risk Reduct*. 2020;51:101845. Doi: 10.1016/j.ijdrr.2020.101845.
- Gao J, Zheng P, Jia Y, Chen H, Mao Y, Chen S, et al. Mental health problems and social media exposure during COVID-19 outbreak. *PLoS One*. 2020;15(4):e0231924. Doi: 10.1371/journal.pone.0231924.
- Chang J, Yuan Y, Wang D. Mental health status and its influencing factors among college students during the epidemic of COVID-19. *Nan Fang Yi Ke Da Xue Xue Bao*. 2020;40(2):171-76. Chinese. Doi: 10.12122/j.issn.1673-4254.2020.02.06.
- Tsitsika AK, Tzavela EC, Janikian M, Ólafsson K, Iordache A, Schoenmakers TM, et al. Online social networking in adolescence: Patterns of use in six European countries and links with psychosocial functioning. *J Adolesc Health*. 2014;55(1):141-47. Doi: 10.1016/j.jadohealth.2013.11.010.
- Keles B, McCrae N, Grealish A. A systematic review: the influence of social media on depression, anxiety and psychological distress in adolescents. *International Journal of Adolescence and Youth*. 2020;25(1):79-93. Doi: 10.1080/02673843.2019.1590851.
- Blomfield Neira CJ, Barber BL. Social networking site use: Linked to adolescents' social self-concept, self-esteem, and depressed mood. *Australian Journal of Psychology*. 2014;66(1):56-64. Doi: 10.1111/ajpy.12034.
- Banjanin N, Dimitrijevic I, Pantic I. Relationship between internet use and depression: Focus on physiological mood oscillations, social networking and online addictive behavior. *Computers in Human Behavior*. 2015;43:308-12. Doi: 10.1016/j.chb.2014.11.013.
- O'Dea B, Campbell A. Online social networking amongst teens: Friend or foe? *Annual Review of Cybertherapy and Telemedicine*. 2011;167(1):133-38. Doi: 10.3233/978-1-60750-766-6-133.
- Barry CT, Sidoti CL, Briggs SM, Reiter SR, Lindsey RA. Adolescent social media use and mental health from adolescent and parent perspectives. *J Adolesc*. 2017;61:01-11. Doi: 10.1016/j.adolescence.2017.08.005.

[29] McIntyre RS, Lee Y. Projected increases in suicide in Canada as a consequence of COVID-19. *Psychiatry Res.* 2020;290:113104. Doi: 10.1016/j.psychres.2020.113104.

[30] Guessoum SB, Lachal J, Radjack R, Carretier E, Minassian S, Benoit L, et al. Adolescent psychiatric disorders during the COVID-19 pandemic and lockdown. *Psychiatry Res.* 2020;291:113264. Doi: 10.1016/j.psychres.2020.113264.

PARTICULARS OF CONTRIBUTORS:

1. Undergraduate, Department of High School Student, The Lawrence School, Ootacamund, Tamil Nadu, India.
2. Postgraduate Student, Department of School of Public Health, Institute of Alberta, Edmonton, AB, Zipcode T6G2R3, Alberta, Canada.
3. Professor and Head, Department of Psychiatry, Kasturba Medical College, Manipal Academy of Higher Education, Manipal, Mangaluru, Karnataka, India.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:

Keshava Pai Kota,
Professor and Head, Department of Psychiatry, Kasturba Medical College, Attavar,
Manipal Academy of Higher Education, Manipal,
Mangaluru-575001, Karnataka, India.
E-mail: pai.keshava@manipal.edu

PLAGIARISM CHECKING METHODS: [Jain H et al.]

- Plagiarism X-checker: Feb 11, 2022
- Manual Googling: Mar 24, 2022
- iThenticate Software: Apr 04, 2023 (9%)

ETYMOLOGY: Author Origin

EMENDATIONS: 9

AUTHOR DECLARATION:

- Financial or Other Competing Interests: None
- Was Ethics Committee Approval obtained for this study? Yes
- Was informed consent obtained from the subjects involved in the study? Yes
- For any images presented appropriate consent has been obtained from the subjects. NA

Date of Submission: **Feb 07, 2022**

Date of Peer Review: **Mar 19, 2022**

Date of Acceptance: **Apr 07, 2023**

Date of Publishing: **Jul 01, 2023**