

# Depression, Perceived Stress and Socio-demographic Correlates among General Population during COVID-19 Pandemic: A Cross-sectional Survey from Southern India

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## ABSTRACT

**Introduction:** The Coronavirus Disease 2019 (COVID-19) pandemic and its socio-economic consequences have had a significant impact on mental health. A quantifiable data regarding increase of mental health problems as a result of the pandemic is required to take necessary steps in tackling the issue.

**Aim:** To estimate the prevalence of depression, perceived stress and its socio-demographic correlates among general population of South India during COVID-19.

**Materials and Methods:** This cross-sectional survey conducted from 25<sup>th</sup> August 2021 to 25<sup>th</sup> October 2021 among the general population of South India during COVID-19. A total of 600 subjects were enrolled into the study. Study subjects included people of either sex between 20-50 years of age who were able to read and understand English and with access to internet. Subjects responded to a questionnaire packet of Patient Health Questionnaire-9 (PHQ-9), Perceived Stress Scale 10 (PSS-10) and a proforma for socio-demographic data. Data was analysed using GNU PSPP version 1. One-way Analysis of Variance (ANOVA) and independent t-test were used to assess associations. A value of p-value <0.05 was considered to be statistically significant. Pearson's correlation coefficient was used to determine correlation.

**Results:** Of the 600 subjects who were enrolled into the study, 26.7%, 15.7%, 9.3% and 7.2% had mild, moderate, moderately severe and severe depression, respectively. About 62.7% had moderate and 17.5% had high perceived stress. Whereas, 28.7% had death wishes or thoughts to hurt themselves. Females (PHQ-9: p-value=0.006; PSS-10: p-value <0.001), 20-29 age group (PHQ-9: p-value <0.001; PSS-10: p-value <0.001), students (PHQ-9: p-value <0.001; PSS-10: p-value <0.001), those who were unmarried (PHQ-9: p-value <0.001; PSS-10: p-value <0.001), living with parents (PHQ-9: p-value <0.001; PSS-10: p-value <0.001), those who had a loss of income (PHQ-9: p-value <0.001; PSS-10: p-value=0.018) or job (PHQ-9: p-value <0.001; PSS-10: p-value <0.001) in the past one year, those with a history of psychiatry disorder (PHQ-9: p-value <0.001; PSS-10: p-value <0.001) had a significantly higher score in both depression and perceived stress. Correlation analysis showed a significant correlation between depression and perceived stress scores ( $r=0.691$ ).

**Conclusion:** The present study showed a high prevalence of depression and perceived stress and shows the need for strengthening mental health services to address the challenge.

**Keywords:** Anxiety, Coronavirus disease 2019, Epidemiology, Mental health, Psychological distress

## INTRODUCTION

The Coronavirus Disease 2019 (COVID-19) outbreak and the measures taken to contain it have had an immense impact on people all over the world. It was declared as a public health emergency of international concern on January 2020 and a pandemic on March 2020 [1]. A global event like the current COVID-19 pandemic and its social and economic consequences can have a significant impact on mental health. Exposure to large scale traumatic events following pandemics and disasters are associated with a heightened burden of mental illness in the affected population [2]. An increase in mental health problems have been noticed after past epidemics like the Ebola virus and Severe Acute Respiratory Syndrome (SARS) outbreak [3,4]. The negative impact on mental health worldwide as a result of the current pandemic is also significant. Uncertainty about when the virus spread could be brought under control, fear of contracting the disease, steps enforced to contain the spread like social distancing, lockdowns and the associated economic loss and disruptions in daily life are all factors that negatively impacted the mental health [5].

Previous studies done nationally during this pandemic have shown prevalence of depression and stress to be 25% and 11.6% and that there was a high level of anxiety in the study population [6,7].

Studies done in other countries also show a high prevalence of depression and anxiety [8-11]. The pooled prevalence estimates of depression and anxiety symptoms were shown to be 25.2% and 20.5% in children and adolescents respectively in a meta-analysis and this was higher compared to pre-pandemic estimates [12]. Incidents where people committed suicide as a result of mental stress were also reported [13,14].

Concerns have been expressed by experts around the world about the increasing mental health problems and the need for adequate mental health support [15]. Epidemiological studies need to be conducted nationwide to have a quantifiable information about increase in mental health problems as a result of the pandemic. This will help the policy makers to take adequate steps in tackling the issue and develop targeted strategies for vulnerable groups.

In India, only few studies have explored the impact of pandemic on mental health [6,7,16]. However, the studies were done during the first wave of COVID-19 and the impact of different socio-demographic correlates have not been adequately explored. The second wave of COVID-19 was much more disruptive compared to the first wave and the impact on mental health of population needs to be studied [17-19]. There is also a scarcity in studies from Southern India exploring the impact of pandemic on mental health.

Thus, the current study aimed to estimate the prevalence of depression and perceived stress in general public during the current COVID-19 pandemic and also to examine the socio-demographic correlates of depression and perceived stress.

## MATERIALS AND METHODS

This was a cross-sectional online based survey conducted from 25<sup>th</sup> August 2021 to 25<sup>th</sup> October 2021 among the general population in Southern India. Institutional Ethics Committee permission was taken before starting the study from Believers Church Medical College Hospital, Thiruvalla, Kerala (IEC No. IEC/2021/09/238).

**Sample size calculation:** The study by Huang Y and Zhao N, showed a 20.1% prevalence for depressive symptoms [8]. Sample size was calculated using the formula:

$$N = 4pq/d^2$$

where,  $p=20$ ,

$q=100-p=80$ ,

$d$  as 20% of  $p=4$ .

A minimum sample size of 400 was calculated, however, to increase the precision of study maximum responses were sought and a total of 600 participants completed the survey. The sampling technique used was snowball sampling starting from 25<sup>th</sup> August 2021.

**Inclusion and Exclusion criteria:** People of either sex between 20-50 years of age and having access to internet were included in the study. They should be able to read and understand English language. Those who refused to give informed consent were excluded from the study.

### Study Procedure

A google form link of the questionnaire with a consent form appended to it was shared to all the general contacts of investigators who were between 20-50 years from WhatsApp, Facebook and other instant messengers like Google chat and Telegram. Participants were then requested to share the link of questionnaire to as many of their general, personal and official contacts as possible who were between 20-50 years. On clicking the link, participants were directed to details about the study and informed consent. If the participant gave consent to take the survey they were redirected to the study forms which constituted of a specially designed pro forma for collecting relevant socio-demographic data, Patient Health Questionnaire-9 (PHQ-9) and Perceived Stress Scale-10 (PSS-10) [20-22].

**Socio-demographic data:** A proforma for collecting relevant socio-demographic data of subjects who enroll into the study was used. Data about age, gender, education, occupation, marital status, family structure, whether the subjects were staying in rural or urban area were collected. Details regarding whether there was any loss of income or job in past one year were also taken. Information about presence co-morbid chronic medical illness like diabetes mellitus, hypertension, dyslipidemia was taken. History of any major psychiatric disorders like bipolar disorder, major depressive disorder, any psychotic disorder was taken. Information whether the person used alcohol use in past 30 days was also collected.

**Patient Health Questionnaire-9 (PHQ-9):** The PHQ-9 is a self-administered questionnaire for measuring depression symptoms containing a total of 9 items which are scored from 0-3. PHQ-9 was developed by Kroenke K et al., in 2001 [20].

Depression symptoms were categorised as:

- None- score of 0-4,
- Mild- score of 5-9,
- Moderate- score of 10-14,
- Moderately severe- score of 15-19
- Severe- score  $\geq 20$

**Perceived Stress Scale-10 (PSS-10):** The PSS-10 is a self-administered questionnaire containing a total of 10 items and is

widely used for measuring perception of stress. The scale was developed by Cohen S et al., 1988 [21]. The questions are scored from 0 to 4 with the scores being reversed for questions 4,5,7 and 8. The total score ranges from 0-40 with a score of 0-13 being low stress, 14-26 being moderate stress and 27-40 being high stress. The PSS-10 has a Cronbach's  $\alpha$  of 0.78 [22].

## STATISTICAL ANALYSIS

Data was collected and analysed using GNU PSP version 1.0, which is a freely available software for statistical analysis. Mean and standard deviation were used to summarise numerical data. Categorical variables were represented as frequency and percentages. One-way Analysis of Variance (ANOVA) and independent t-test, were used to assess associations. A value of p-value  $<0.05$  was considered to be statistically significant. Pearson's correlation coefficient was used to determine correlations. An r-value between 0.5-1.0 was considered to be a significant positive correlation [23].

## RESULTS

Socio-demographic characteristics of the study subjects are shown in [Table/Fig-1]. The mean age of the study subjects was  $34.2 \pm 9.3$  years.

Variables	n (%)
<b>Gender</b>	
Male	254 (42.3%)
Female	346 (57.7%)
<b>Age group</b>	
20-29 years	287 (47.8%)
30-39 years	149 (24.8%)
>40 years	164 (27.4%)
<b>Education</b>	
Upto 12 <sup>th</sup> class	10 (1.7%)
Professional degree	288 (48.0%)
Non professional degree	73 (12.1%)
Postgraduate	229 (38.2%)
<b>Occupation</b>	
Medical Professionals/Non medical involved in COVID-19 duty	121(20.2%)
Non medical professionals working from home	108 (18%)
Non medical professionals with office work	112 (18.7%)
Not working	91 (15.2%)
Student	168 (28%)
<b>Marital status</b>	
Married	314 (52.3%)
Unmarried	269 (44.8%)
Widowed/Widower	5 (0.8%)
Separated	12 (2%)
<b>Family status</b>	
Living with spouse	196 (32.7%)
Living with parents	273 (45.5%)
Living with spouse and parents	83 (13.8%)
Living alone	48 (8%)
<b>Place of residence</b>	
Urban	417 (69.5%)
Rural	183 (30.5%)
<b>Loss of income in past one year</b>	
Yes	226 (37.7%)
No	374 (62.3%)
<b>Loss of job in past one year</b>	
Yes	80 (13.3%)
No	520 (86.7%)

<b>Alcohol use in past 30 days</b>	
Yes	63 (10.5%)
No	537 (89.5%)
<b>History of psychiatric disorder</b>	
Yes	51 (8.5%)
No	549 (91.5%)
<b>Medical co-morbidity (Diabetes mellitus, Hypertension, Dyslipidemia)</b>	
Yes	151 (25.2%)
No	449 (74.8%)
<b>Death wishes and thoughts to hurt oneself</b>	
Yes	172 (28.7%)
No	428 (71.3%)

[Table/Fig-1]: Socio-demographic characteristics of participants (N=600).

**Prevalence of depression and perceived stress:** Of the 600 study subjects 160 (26.7%) had mild depression, 94 (15.7%) had moderate depression, 56 (9.3%) had moderately severe depression and 43 (7.2%) had severe depression. The PSS-10 scores showed that 376 (62.7%) had moderate stress and 105 (17.5%) had high stress. The mean PHQ-9 score was 7.62±6.50 and the mean PSS-10 score was 19.48±7.1. Of the 600 subjects, 172 (28.7%) had death wishes or thoughts to hurt themselves.

**Socio-demographic correlates:** [Table/Fig-2,3] shows the association of socio-demographic variables with PHQ-9 and PSS-10 scores respectively.

Variables	PHQ-9 scores Mean±SD	t/F value	p-value
<b>Gender</b>			
Males	6.77±6.15	-2.742	0.006 <sup>a</sup>
Females	8.24±6.69		
<b>Age group</b>			
20-29 years	9.86±6.58	41.123	<0.001 <sup>**b</sup>
30-39 years	6.60±5.79		
>40 years	4.62±5.48		
<b>Education</b>			
Upto 12 <sup>th</sup> class	5.10±5.02	3.684	0.012 <sup>tb</sup>
Professional degree	7.62±6.35		
Non professional degree	9.73±7.31		
Postgraduate	7.05±6.36		
<b>Occupation</b>			
Medical Professionals/Non medical involved in COVID-19 duty	5.55±4.97	17.328	<0.001 <sup>**b</sup>
Non medical work from home	6.83±5.48		
Non medical office work	7.79±6.89		
Not working	5.37±5.64		
Studying	10.70±7.08		
<b>Marital status</b>			
Married	5.59±5.84	25.446	<0.001 <sup>**b</sup>
Unmarried	10.01±6.51		
Widow/Widower	4.8±2.95		
Separated	8.0±5.88		
<b>Family status</b>			
Living with spouse	5.14±5.76	23.325	<0.001 <sup>**b</sup>
Living with parents	9.75±6.58		
Living with spouse and parents	6.10±4.86		
Living alone	8.21±7.26		
<b>Place of residence</b>			
Urban	7.64±6.57	0.121	0.904 <sup>a</sup>
Rural	7.57±6.37		

<b>Loss of income in past one year</b>			
Yes	8.72±6.95	3.247	<0.001 <sup>**a</sup>
No	6.95±6.13		
<b>Loss of job in past one year</b>			
Yes	11.26±7.05	5.518	<0.001 <sup>**a</sup>
No	7.06±6.24		
<b>Alcohol use in past 30 days</b>			
Yes	6.62(5.94)	-1.288	0.198 <sup>a</sup>
No	7.73(6.56)		
<b>History of psychiatry disorder</b>			
Yes	13.39(7.24)	6.883	<0.001 <sup>**a</sup>
No	7.08(6.17)		
<b>Medical co-morbidity (Diabetes mellitus, Hypertension, Dyslipidemia)</b>			
Yes	8.45 (6.84)	1.825	0.069 <sup>a</sup>
No	7.34 (6.37)		

[Table/Fig-2]: Association between socio-demographic variables and PHQ-9 scores. a: Independent t-test; b: One-way ANOVA; \*p-value <0.05 was considered as significant; \*\*p-value <0.001 was considered as highly significant

Variables	PSS10 score Mean±SD	t/F value	p-value
<b>Gender</b>			
Males	17.52±7.19	-5.963	<0.001 <sup>**a</sup>
Females	20.92±6.69		
<b>Age group</b>			
20-29 years	21.92±6.57	39.153	<0.001 <sup>**b</sup>
30-39 years	18.11±6.42		
>40 years	16.45±7.11		
<b>Education</b>			
Upto 12 <sup>th</sup> class	16.80±5.33	3.180	0.024 <sup>tb</sup>
Professional degree	19.75±7.40		
Non-professional degree	21.27±6.82		
Postgraduate	18.68±6.75		
<b>Occupation</b>			
Medical Professionals/Non medical involved in COVID-19 duty	17.79±7.15	16.818	<0.001 <sup>**b</sup>
Non medical work from home	18.53±7.05		
Non medical office work	18.46±6.52		
Not working	17.48±6.99		
Studying	23.05±6.27		
<b>Marital status</b>			
Married	17.49±6.96	19.132	<0.001 <sup>**b</sup>
Unmarried	21.75±6.73		
Widow/Widower	19.40±2.19		
Separated	20.50±4.42		
<b>Family status</b>			
Living with spouse	16.79±7.16	18.610	<0.001 <sup>**b</sup>
Living with parents	21.52±6.51		
Living with spouse and parents	18.89±6.14		
Living alone	19.85±7.99		
<b>Place of residence</b>			
Urban	19.65±7.19	0.890	0.374 <sup>a</sup>
Rural	19.09±6.90		
<b>Loss of income during last one year</b>			
Yes	20.35±6.57	2.362	0.018 <sup>a</sup>
No	18.95±7.36		
<b>Loss of job during last one year</b>			
Yes	21.99±5.30	3.429	<0.001 <sup>**a</sup>
No	19.09±6.90		

Alcohol use in past 30 days			
Yes	17.22±8.22	-2.678	0.008 <sup>a</sup>
No	19.74±6.91		
History of psychiatry disorder			
Yes	24.76±5.95	5.706	<0.001 <sup>***</sup>
No	18.99±7.00		
Medical co-morbidity (Diabetes mellitus, Hypertension, Dyslipidemia)			
Yes	20.50 ±7.25	2.047	0.041 <sup>a</sup>
No	19.13±7.02		
Death wishes and thoughts to hurt oneself			
Yes	24.55±4.58	12.449	<0.001 <sup>***</sup>
No	17.44±6.91		

**[Table/Fig-3]:** Association between socio-demographic variables and PSS-10 scores.  
a: Independent t test; b: One-way ANOVA; <sup>a</sup>p-value <0.05 was considered as significant;  
<sup>\*\*\*</sup>p-value <0.001 was considered as highly significant

Statistically significant higher mean scores for both depression and perceived stress were seen in females (PHQ-9: p-value <0.05; PSS-10: p-value <0.001), 20-29 years, age group (PHQ-9: p-value <0.001; PSS-10: p-value <0.001), students (PHQ-9: p-value <0.001; PSS-10: p-value <0.001), those who were unmarried (PHQ-9: p-value <0.001; PSS-10: p-value <0.001), those who were living with parents (PHQ-9: p-value <0.001; PSS-10: p-value <0.001), those who had a loss of income (PHQ-9: p<0.001<sup>\*\*</sup>; PSS-10: p<0.05<sup>\*</sup>) or a loss of job (PHQ-9: p-value <0.001; PSS-10: p-value <0.001) in past one year. Those with a history of psychiatric disorders had a statistically significant higher mean scores for both depression and perceived stress (PHQ-9: p-value <0.001; PSS-10: p-value <0.001) whereas subjects with history of chronic medical co-morbidities had a higher mean scores in perceived stress (PSS-10: p-value=0.041). Subjects who reported death wishes or thoughts to hurt themselves had a statistically significant higher mean scores for perceived stress (PSS-10: p-value <0.001).

[Table/Fig-4] indicates correlation between depression and PSS-10 scores. Pearson's correlation analysis was done between depression and PSS-10 scores and a significant positive correlation was seen (r-value=0.691).

Depression	PSS-10 Total score
Pearson correlation	0.691 <sup>§</sup>
Sig. (2-tailed)	p-value <0.001 <sup>**</sup>

**[Table/Fig-4]:** Correlation between depression and PSS 10 scores.  
<sup>§</sup>Statistical test- Pearson's correlation coefficient; p-value <0.001 was considered as highly significant.

## DISCUSSION

The present study aimed to estimate the levels of depression and perceived stress among different sections of the Indian population. A previous study conducted in pre-pandemic periods showed a prevalence of depression of 3.3% in India [24]. The present study showed that 15.7%, 9.3% and 7.2% had moderate, moderate to severe and severe depression which is markedly higher compared to a previous study from pre-pandemic times [24]. A previous study by Verma S and Mishra A during the first COVID-19 wave in India showed a 25% prevalence of depression among general public [6]. The perceived stress measures in the current study were also high with 62.7% having moderate levels of perceived stress and 17.5% having high levels of perceived stress. Studies across the world have also shown a heightened prevalence of depression and stress in general population [6-11]. The period of data collection for the present study coincided with the second wave of COVID-19 in India and widespread lockdowns in most major cities. In India disruption during the second COVID-19 wave was much higher compared to first wave. The number of cases, death rate, shortage of oxygen and hospital beds were all much higher during the second wave [17-19]. These factors may have contributed to the higher prevalence of depression and perceived stress in the current study. These

findings emphasise the need of timely measures for prevention and treatment of mental health problems.

Examination of the socio-demographic correlates showed that depression and perceived stress scores were higher in female sex (PHQ-9: p<0.05<sup>\*</sup>; PSS-10: p-value <0.001). This is consistent with National Mental Health Survey 2015-16 which showed a higher prevalence for depression and stress related disorders in females [25]. Those who were unmarried (PHQ-9: p-value <0.001; PSS-10: p-value <0.001) and those who were living with parents (PHQ-9: p-value <0.001; PSS-10: p-value <0.001) had a higher mean scores in depression and perceived stress. Similar findings were seen in the study conducted by Moghanibashi-Mansourieh A, where depression scores were significantly higher in unmarried participants compared to married group [26].

The current study shows how students have faced the brunt of pandemic with the scores being high both in depression and perceived stress measures (PHQ-9: p-value <0.001; PSS-10: p-value <0.001). The 20-29 years, age group also showed a similar finding (PHQ-9: p-value <0.001, PSS-10: p-value <0.001). The study by Cao W et al., shows a similar finding of high levels of anxiety among college students [27]. The study done by Islam MA et al., in Bangladesh, showed that 82.4% students were having mild to severe depressive symptoms and 87.7% were having anxiety symptoms. The study also showed that students in early twenties showed higher depressive symptoms compared to other age groups [28]. Closure of academic Institutions in India as a part of lockdown and the demands placed on students to adapt to online classes often with limited resources may be the reason for high level of stress [16]. An interesting finding in the present study was that medical professionals (doctors, nursing staff) and others who were directly involved in COVID-19 duties had lowest mean PHQ-9 scores. Similar findings were seen in the study conducted by Rehman U et al., that mental health professionals reported only normal levels of depression and stress while other health professionals reported only mild levels of depression and stress [16]. These may indicate that medical professionals and others directly involved in field work were more resilient in dealing with negative impact of the pandemic.

In the present study, those with a decrease in income (PHQ-9: p-value <0.001; PSS-10: p-value <0.05) and loss of job (PHQ-9: p-value <0.001; PSS-10: p-value <0.001) during past one year was shown to have significantly higher scores in both depression and perceived stress. Linn MW et al., has reported in a prospective study that symptoms of depression, anxiety and somatisation were significantly greater in unemployed. Loss of work may affect self-esteem and limit the person's opportunity for satisfaction and feeling of accomplishment [29].

Alcohol use was taken as a categorical variable in the present study. Details of pattern of drinking were not enquired. The interesting finding is that those who used alcohol had a lower mean scores in perceived stress (PSS: p-value <0.05). Alcohol might have been used as a self-medication for stress and anxiety leading to a subjective relief in stress [30]. Alcohol has been shown to interfere with the initial perception of stress leading to impaired appraisal of stress and thereby, protecting the drinker from experiencing the stressor to a full impact [30,31]. Those with history of psychiatric disorders (bipolar affective disorder, psychosis, major depressive disorder) experienced a higher perceived stress and depressive symptoms (PHQ-9: p-value <0.001; PSS-10: p-value <0.001). The meta-analysis by Fleischmann E et al., shows that symptoms of anxiety, depression and stress were higher in those individuals with a history of serious mental illness (affective disorders and schizophrenia) compared to healthy controls [32]. This shows the necessity to strengthen the mental health services to provide more support to those individuals with serious mental illness. Encouraging the use of mediums like tele mental health services may help bridge the gap in providing adequate treatment to the vulnerable groups [14,32].



Death wishes and thoughts of hurting themselves were significantly higher in those with higher mean scores of perceived stress (PSS-10: p-value <0.001). This requires attention as multiple incidences where people had committed suicide due to mental stress were reported during the pandemic [13,14]. The fear of possible infection, quarantine processes, information overload about COVID-19 in the media may all contribute to increased stress. Targeted strategies to promote mental health like tele-psychiatry to increase the outreach, especially in vulnerable population like those confirmed with the infection, quarantined family members are recommended in the current scenario [14,15].

### Limitation(s)

As the investigators used online google forms to collect data, only those segments of population with internet availability and know how to use a mobile phone or computer could participate in the present study. This could have led to a selection bias and hence, the present study results cannot be generalised to all segments of the population.

### CONCLUSION(S)

The present study showed a high prevalence of depression (15.7% had moderate depression, 9.3% had moderately severe depression, 7.2% had severe depression) and perceived stress (62.7% had moderate stress, 17.5% had high stress) in the population reflecting the pervasive influence of COVID-19 and its socio-economic consequences. This challenging situation requires a strengthening of mental health services and increased efforts to reach out to the vulnerable segments of population where the brunt of the pandemic would be most. There is also a need for more nationwide epidemiological studies to determine the level of mental health burden in the population.

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