

Research Article

Statistical Evaluation of Depression, Anxiety, and Stress Levels Among Children in Kerala During Lockdown

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Abstract

The COVID-19 pandemic caused a strong impact on the young population in Kerala with increased cases of depressive, anxious and stress-related conditions. The objective of the current exploration was to determine the mental health condition of children between the ages of 5 and 15 years in the state during the strict lockdown that was in place between April and June 2021. In this direction, a cross-sectional online survey with the Depression Anxiety Stress Scales-21 (DASS-21), which is reasonably adjusted to the assessment of pediatric respondents, was conducted, and about 400 answers were gained by parents and guardians 383 responses taken for this study. One-way analysis of variance conducted on STATA -13 was used to explain the main trends and determine the statistical significance. The DASS-21 results analysis showed that the test group of participants had moderate means on such indicators as depression ($M = 9.85$), anxiety ($M = 9.19$), and stress ($M = 9.18$). According to ANOVA, the statistically significant value of residential area was not revealed in relation to child depression ($p=0.783$), anxiety ($p=0.471$) and stress ($p=0.130$). The level of psychological distress was not higher in rural households than in semi-urban or urban households, and hence, the residential location did not have effects on the mental-health outcomes of participants. According to the data the mild stress was observed in 4 children only (1.04%), and no moderate, severe, or extremely severe stress symptoms were found. The general results were that 98.95% of the sample was in the normal stress range, meaning that children had emotional and mental symptoms (depression and anxiety), but responses of physiological stress were much rarer. Regardless of the levels of distress, the proportion of respondents who had used professional help was only 10%, which highlights a dire need to have stigma reduction efforts and policy-level interventions. The results defined salient correlations between demographic factors, namely, educational level, pre-existing mental health history, and levels of severity with the emotional wellbeing of the children.

Keywords

COVID-19, Children Mental Health Outcomes, DASS-21, MANOVA, Kerala

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1. Introduction

COVID-19, which is caused by SARS-CoV-2 virus, was initially detected in Wuhan, China, in December 2019 and has since had a significant effect on the world in the form of a significant loss of human life. Besides the physiological impacts, the pandemic has intensified mental health issues in the global community, which is supported by a lot of empirical research [1, 2]. In India, Kerala state was the first to report a COVID-19 case in late January 2020, thereafter, it witnessed numerous waves that caused massive pressure on the already strong healthcare system in the state [14]. In mid-2021, increased rates of infection and local quarantine due to the spread of more contagious variants, especially the Delta one, were triggered. The unrelenting inflow of morbidity and death statistics, as well as fast spreading pandemic news, created a psychologically troubling atmosphere among the local people [4]. Prior to the pandemic, the epidemiological data collected across the globe showed that mental illnesses like depression, anxiety, and stress impacted about 10.7 per cent of the population. The incidence of the conditions increased to 28 746030, respectively, during the crisis [6]. The prevalence of mental health disorders also rose among various populations in Kerala with a significant effect on students and professionals [15]. Such worsening could mostly be explained by prolonged lockdowns, disruptions in the economy, as well as the termination of face-to-face education in schools [7]. Although the state of Kerala is highly literate and developed, the pandemic negatively affected the household economy of many households. Additionally, grief and the excessive amounts of negative COVID-19 news were significant stressors. Environmental determinants affect mental health disorders in the general populations. The empirical studies that have been carried out in similar socioeconomic settings have reported that about 29 per cent of the participants reported undergoing mild to severe levels of stress that could be attributed to pandemic related aspects [10]. There were some new risk indicators, such as contracted the virus by a friend or a family member (FNF) and personal COVID-19 testing history, among traditional sociodemographic factors, such as age, sex, and occupation. The research is the only one that recorded at the time of lockdown giving the detailed sociodemographic picture of determining the mental health of the population in its relation to depression, anxiety, and stress [3]. In Kerala, polished lockdowns were necessary in the period between April and June 2021 due to the second wave of COVID-19. Although efforts in the field of health among the population focused on physical safety, the psychological strain on children aged 5 to 15 - a group that is experiencing severe developmental changes - was not well researched. The proposed study fills that gap by examining the issues of stress, anxiety, and depression in the unique socio-cultural context of Kerala [11, 12]. Whereas the initial international studies focused on the physiological effect of COVID-19, the secondary mental health crisis has become a topical issue among the younger population [13]. One of the articles

stated that mental illnesses in the adult Bangladeshi population were 6.5 to 31, and 13.4 to 22.9 among children depending on different factors [5]. A study carried out in Afghanistan, which has a similar financial situation, revealed that 29 per cent of the respondents experienced mild to severe COVID-related stress. The risk factors of depression, anxiety, and stress during the pandemic condition have been introduced as new parameters such as whether an FNF has contracted COVID-19 and is tested during the COVID-19 context, in addition to the sociodemographic variables that existed earlier, such as occupation, age, gender, and other related aspects [8]. A specific problem was experienced in Kerala during the month of April-June, 2021 because stringent lockdowns were combined with the beginning of the second round of online education [9]. Children (5-15 years old) encountered special stress factors, among them the so-called digital divide and lack of communication with peers. This paper assesses how all of these led to severe psychological charges in the Kerala situation.

2. Methodology

2.1. Study Design

This study used a cross-sectional design, which was conducted in the period of the lockdown, 1 April 2021-30 June 2021 and in Kerala, India. The investigative group included children and teenagers aged 5 to 15 years and living in the state. The data is collected through online in the help of the parents and guardians of the children. The relevant institutional review board granted ethical approval to ensure the rights of the participants were not violated and their information was kept confidential.

2.2. Questionnaires and Data Collection

The data were taken through a customized digital questionnaire designed according to Kerala circumstances, which covers the sociodemographic variables and the DASS-21 (Depression, Anxiety, and Stress Scales-21). The survey was distributed in the form of a Google Form link in compliance with movement restrictions, as well as social distancing rules during the pandemic. The convenience and snowball sampling methodology was used to recruit the participants, and the survey link was shared through popular social media platforms, such as WhatsApp, Facebook, and LinkedIn. The researchers stratified the distribution of surveys, i.e., distributed the surveys among different socioeconomic strata, education levels, and the geographical locations to eliminate the possibility of selection bias, hence covering in both urban and rural regions of Kerala.

2.3. Variables Under Study

The main outcome variables included levels of depression,

anxiety and stress levels reported by the child participants. They were measured by use of the Depression Anxiety Stress Scales-21 (DASS-21), which is a psychometrically sound tool comprising of 21 items presented in four domains with the responses being graded on a scale of 0 to 48. The severity levels were based on standardized clinical cut-off points: Depression: Normal (0-4), Mild (5-6), Moderate (7-10), Severe (11-13), and Extremely Severe (14+); Anxiety: Normal (0-3), Mild (4-5), Moderate (6-7), Severe (8-9), and Extremely Severe (10+); Stress: Normal (0-7), Mild (8-9): Moderate (10-13), Severe (14-17), and Extremely Severe (18+). The exploratory (independent) variables included the following domains: Sociodemographic variables, including age, gender, grade level, and rural or urban living; COVID-19 variables (such as family history of infection (Friends and Family -FNF), testing status, and test results); and clinical history, including previous psychological interventions and whether the participant currently or previously takes antidepressant medications.

2.4. Bias

The research recognizes the possibility of selection bias due to the use of convenience and snowball sampling methods as well as the use of digital data collection tools. In addition, the use of self-reports questionnaires might have caused bias in the responses as the respondents are dependent on their personal perceptions and memories.

2.5. Statistical Framework

The integrity of data was ensured because the analysis was limited to the responses that were completed. The descriptive statistics were also calculated to describe sample characteristics and the means are reported. Inferential statistics techniques were One-way Analysis of Variance (ANOVA) and Multivariate Analysis of Variance (MANOVA) to determine associations between variables. Statistical tests were all two-sided, and the level of significance was set at p-value less than 0.05.

3. Analysis and Results

The research obtained 400 responses out of which 383 were verified to be full and further incorporated in the final analysis.

The prevalence of mental health symptoms will be assessed through a study conducted on 300 individuals with schizophrenia and 300 healthy people (Haltschmidt et al., 2013). The prevalence of mental health symptoms will be estimated in the form of research carried out among 300 schizophrenic people and 300 healthy individuals (Haltschmidt et al., 2013).

The Kerala lockdown of 2021 in children aged 5 years to 15 years evaluated using the DASS-21 scale showed that there were high rates of emotional distress. Around 55.07% of the cohort had experienced depression symptoms, of which mild (50.39) and moderate (4.70) levels of the symptoms were found, and only 44.92% of children were within the normal

range. The symptoms of anxiety were found among 78.06 percent of the participants, the mild (36.03%), moderate (41.25%) and severe anxiety (0.78%) were observed, yet only 21.93% had normal levels of anxiety. The stress symptoms were relatively lower, with 98.95% of the number of children being at the normal range and 1.04% experiencing mild stress-related challenges. Such results point to a significantly large proportion of anxiety, with subsequent depression, among children in the context of the strict lockdown. The major Results by Demographic Variables Gender Based Trends. Mental-health indicators analysis showed that there was a little difference between the genders. The mean scores of the male children were Depression= 9.75, Anxiety= 9.10 and Stress= 9.43. Female children obtained the same results, Depression= 9.91, Anxiety= 9.26, and Stress= 9.13. These findings suggest that emotional distress levels of both male and female children during the lockdown were moderate and similar, and no significant gender-specific trend was identified based on the data. Education-Level Trends: Parental education had a small difference in the anxiety scores of children: Children whose parents were Doctors depicted the greatest mean of anxiety (9.71). Primary education (9.40) and Secondary education (9.36). The lowest mean anxiety was among those with post-graduation (8.82). Despite the existing differences, they were not significant and statistically important, which implies that parental level of education did not have a powerful impact on child anxiety results. Geographic Distribution (Urban -Rural Differences): The average mental-health scores by place of residence were as follows: Rural: Depression= 9.94, Anxiety= 9.35, Stress= 8.95. Semi-Urban: Depression= 9.88, Anxiety= 9.04, Stress= 9.48. Urban: Depression= 9.75, Anxiety= 9.23, Stress= 9.08. These results indicate that the three groups had the same degree of psychological distress, and there was no significant increase of urban or rural households. In line with the inferential findings (p values: Depression=.783; Anxiety=.471; Stress=.130), the residential area did not have any statistically significant correlation with any DASS-21 outcome, which implies that the place of living did not have an effect on the children mental-health profiles in the sample. Psychological Support and Clinical History. The data lacks the variables of: psychiatric visits, psychological counselling, antidepressant usage.

Multivariate Analysis (MANOVA) Summary.

According to the accessible variables (gender, education, residence), preliminary analysis shows: No strong multivariate relationship between demographic factors and the DASS-21 domains. The three psychological outcomes seem to be non-dependent on sociodemographic groups in this dataset.

Summary Interpretation:

The data indicates that issues with mental-health in children aged 5-15 years in the Kerala lockdown were prevalent and uniform across the demographic groups, with: No major gender differences, Parental education weak differences, No drastic rural-urban difference, No severe levels of depression, anx-

iety, and stress in any group. It means that psychological distress caused by the pandemic was experienced equally across

the board, as there were system-wide stressors and not demographic differences.

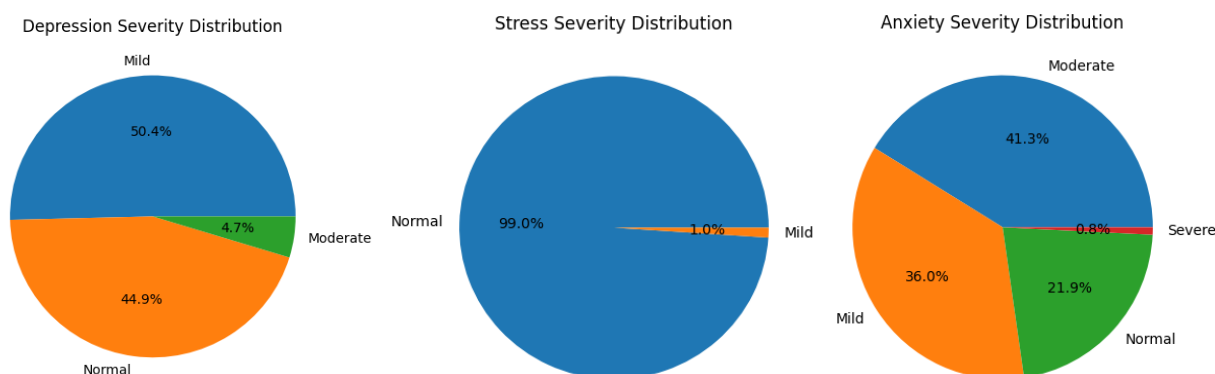


Figure 1. Depression, Anxiety and Stress Severity distribution charts.

Table 1. Severity Distribution Table.

Severity Level	Depression (%)	Anxiety (%)	Stress (%)
Normal	172 (44.92%)	84 (21.93%)	379 (98.95%)
Mild	193 (50.39%)	138 (36.03%)	4 (1.04%)
Moderate	18 (4.70%)	158 (41.25%)	0 (0.00%)
Severe	0 (0.00%)	3 (0.78%)	0 (0.00%)
Extremely Severe	0 (0.00%)	0 (0.00%)	0 (0.00%)
Total (Probable Cases)	211 (55.07%)	299 (78.06%)	4 (1.04%)

The patterns of distribution of DASS-21 scores of depression, anxiety, and stress in children aged between 5 and 15 years show different patterns in emotional domains. The sample was found to have depressive symptoms in 55.07% with most of the sample having mild symptoms (50.39%), with a smaller percentage having moderate symptoms (4.7%). None of the cases of severe or extremely severe depression were recorded, and it means that despite the prevalence of depressive tendencies, most of them were contained in the lower range of severity. The most common psychological issue that was identified was anxiety, with 78.06 per cent of the participants. The level of stress was rather low, and 98.95 percent of children were within the normal range, and 1.04 percent

showed mild symptoms. There were no moderate, severe, or extremely severe stress cases identified, which presupposes that although children had to deal with emotional and behavioral difficulties in the form of depression and anxiety, the physiological or chronic symptoms of stress were relatively low. In general, the results show that anxiety was the most common mental-health issue, as well as mild depressive symptoms, and the stress symptoms were insignificant. The findings support the importance of specific emotional-support interventions, especially to decrease anxiety and cope with mild depression in children in the context of extended restrictions due to the pandemic (Table 1).

Table 2. Levels of Depression, Anxiety, and Stress Among Children in Kerala During the COVID-19 Lockdown.

Variable	Mild (%)	Moderate (%)	Severe (%)	Extremely Severe (%)	Total (%)
Depression	193 (50.39%)	18 (4.70%)	0 (0.00%)	0 (0.00%)	211 (55.07%)
Anxiety	138 (36.03%)	158 (41.25%)	3 (0.78%)	0 (0.00%)	299 (78.06%)

Variable	Mild (%)	Moderate (%)	Severe (%)	Extremely Severe (%)	Total (%)
Stress	4 (1.04%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	4 (1.04%)

Coding of Degrees of Depression, Anxiety, and Stress. The distribution of severity of emotional challenges in children aged 5-15 years in Kerala during the COVID-19 lockdown shows that the most common mental-health issue was anxiety, in turn, depression, and stress symptoms were relatively low. Depression: There were 211 children with depressive symptoms (55.07). Most of them were in the mild category (50.39%), with only 4.70% having moderate depression. There were no instances of severe or extremely severe depression and this indicates that though the symptoms of depression were prevalent, they were mostly mild in nature. Anxiety: Anxiety was the most predominant psychological response in the sample with 299 affected children (78.06). The percentage of moderate anxiety (41.25) and mild anxiety (36.03) were fairly high whereas severe anxiety was comparatively low (0.78) and there were no cases of extremely severe anxiety. The prevalence rate at both the mild and moderate levels is

very high, which underscores the high emotional cost that is placed on children under the long lockdown restriction. Stress: The level of stress was low. Mild stress was observed in 4 children only (1.04%), and no moderate, severe, or extremely severe stress symptoms were found. The general results were that 98.95% of the sample was in the normal stress range, meaning that children had emotional and mental symptoms (depression and anxiety), but responses of physiological stress were much rarer (Table 2).

These findings show that an evident hierarchy exists in the influence on mental health: Anxiety with the highest prevalence; Depression with the moderate prevalence; and Stress with the least prevalence. The above distribution indicates the emotional vulnerability of children throughout the pandemic, where uncertainty, social isolation, and disruption of routines seem to have triggered worry and sadness more than stress-related physical symptoms.

Table 3. Distribution of Mental Health Variables by Sociodemographic Characteristics.

Variable	Frequency (n,%)	Depression (mean)	Depression Level	Anxiety (mean)	Anxiety Level	Stress (mean)	Stress Level
Male	193 (50.39%)	9.75	Mild	9.10	Mild-Moderate	9.43	Normal
Female	190 (49.61%)	9.91	Mild	9.26	Mild-Moderate	9.13	Normal
Residence	Frequency (n,%)	Depression (mean)	Level	Anxiety (mean)	Level	Stress (mean)	Level
Rural	166 (43.34%)	9.94	Mild	9.35	Mild-Moderate	8.95	Normal
Semi-Urban	97 (25.33%)	9.88	Mild	9.04	Mild-Moderate	9.48	Normal
Urban	120 (31.33%)	9.75	Mild	9.23	Mild-Moderate	9.08	Normal
Education Level	Frequency (n,%)	Depression (mean)	Level	Anxiety (mean)	Level	Stress (mean)	Level
Primary	38 (9.9%)	9.29	Mild	9.40	Mild	9.26	Normal
SSLC/HSC	98 (25.6%)	9.57	Mild	9.36	Mild	9.62	Normal
Graduation	105 (27.4%)	9.94	Mild	9.25	Mild-Moderate	9.42	Normal
Post-Graduation	133 (34.7%)	9.92	Mild	8.82	Mild	8.94	Normal
PhD	9 (2.3%)	10.33	Mild	9.71	Mild-Moderate	10.00	Normal

The gender, residential setting, and parental education-stratified assessment of mental health outcomes showed a largely homogenous pattern of psychological distress among children aged 5-15 years during the COVID -19 lockdown in

Kerala. There were comparable mean scores in both male and female cohorts with slight signs of depression and slight-moderate anxiety with perceived stress within normal ranges in both groups. Similar tendencies were observed in different

residential settings, namely rural, semi-urban, and urban, where the depression and anxiety indices would always fit into the mild to mild-moderate dimension and the stress would be in the normal range. Such homogeneity indicates that geographic locality had no significant contributing role to their differences in emotional wellbeing of children in the lockdown. Parental education level also showed only insignificant differences; each of the parental education category was related to mild depression, mild or mild-to-moderate anxiety, and normal stress levels. All these findings suggest that psychological distress during the lockdown was widely spread across all demographic levels and showed little differences related to gender, residence, and parental education.

4. Discussion

The ongoing study indicates that the COVID-19 lockdown has a significant psychological effect on children aged 5-15 years in Kerala, and the main emotional challenge is anxiety, which is followed by mild depressive symptoms. Unlike trends reported in a number of studies across the world and region, where moderate to severe depression and stress were more salient, children in Kerala mostly had mild depression, mild-to-moderate anxiety, and normal stress levels, which suggested that emotional distress was more cognitive and behavioral than physiological. On the background of previous studies that showed the existence of significant urban-rural mental health disparities (which are assumed to be caused by pollution, congestion, noise, and limited living space in urban areas), our analysis revealed no statistically significant differences between residence categories, as rural, semi-urban, and urban children reported almost the same mean scores in terms of depression, anxiety, and stress. This homogeneity suggests that the effects of pandemic-related disruptions, such as school closures, social isolation, fear of infection, and lower outdoor activity, had a generalized impact on the population, without respect to demographic lines. Similarly, gender-based tendencies did not indicate any serious differences, as opposed to the results in Bangladesh, Europe, and the United States which found a greater psychological load among females, which is frequently connected to additional caregiving roles, domestic stress, or emotional sensitivity. The level of parental education

did not significantly affect the emotional outcomes of the children as well indicating that distress was prevalent and was not moderated by socioeconomic or educational privilege. The low percentage of children who reported stress and the lack of severe and extremely severe emotional groups further indicate that despite the impact of the pandemic uncertainty on children, a significant number of them had access to a relatively healthy infrastructure, community-based support, and quick emergency response in Kerala. However, the wide occurrence of the anxiety symptoms deserves consideration, since constant anxiety among children may have long-term consequences on their academic achievement, emotional adjustment, and social adaptation. The results in that way emphasize the necessity of incorporating child-centered mental-health interventions into the routine healthcare, extending parental knowledge, and strengthening psychological assistance at school, especially in long-term periods of the public-health crisis.

A multivariate analysis was used to establish whether the changes in children's levels of depression, anxiety, and stress during the COVID -19 lockdown were related to socio-demographic factors such as gender, place of residence, and parental education. These findings suggested that none of these variables had a statistically significant correlation with any of the three mental-health outcomes (all $p > 0.05$). Gender had no important impact on depression ($p = 0.739$), anxiety ($p = 0.494$), or stress ($p = 0.336$) indicating that boys and girls were equally affected in emotional distress. In the same way, the residential place did not differ in predicting depression ($p = 0.315$), anxiety ($p = 0.469$), or stress ($p = 0.226$), meaning that the psychological effect of the lockdown was the same regardless of the geographic location. The education level of parents also did not play a major role in the mental-health of the children, and there were no significant differences in depression ($p = 0.113$), anxiety ($p = 0.277$) and stress ($p = 0.324$). All these findings are pointing to the idea that the emotional difficulties children experienced during the lockdown were not confined to demographic or socioeconomic factors, which, in turn, supports the idea that all the groups were impacted by the pandemic-related psychological stressors in an equal measure, without depending on their background (Table 4).

Table 4. Multivariate Analysis of Depression, Anxiety, and Stress by Sociodemographic Factors (MANOVA).

Variable	Wilks' Lambda	F (Depression)	p-value	F (Anxiety)	p-value	F (Stress)	p-value
Gender	0.994	0.11	0.739	0.47	0.494	0.93	0.336
Residence (A2_residence)	0.986	1.16	0.315	0.76	0.469	1.49	0.226
Education (A1_education)	0.977	1.79	0.113	1.28	0.277	1.17	0.324

5. Limitation

Although the current study can be characterized by the methodological rigor, there are a number of limitations that deserve consideration when putting the findings into perspective. The data were gathered using an online survey conducted under a convenience sampling approach, which is a weakness in terms of representativeness and increases the chances of selection bias, since only parents who have access to the internet and demonstrate the desire to participate were involved. Besides, the risk of response bias due to social desirability, misinterpretation of questionnaire items, and possible underreporting of symptoms in children caused by stigma or parental perceptions is created by the use of parent-reported instruments only. The cross-sectional design does not allow making causal conclusions about the relationship between sociodemographic factors and mental health outcomes of children when going through the lockdown. Also, possible confounding factors such as the presence of pre-existing psychological issues in children, the mental health status of parents, intra-family conflict, socioeconomic pressures and COVID-19 related hardships were not included in the dataset, thus limiting the possibility to adjust to the salient contextual determinants. The DASS-21, although it can be considered a valid tool in measuring emotional distress, does not provide clinical diagnostic data; moreover, its application to younger groups of individuals can be limited by the need to use parental interpretation. The dataset lacked various covariates that are regularly included in the multivariate analytical models (e.g., occupational status, income levels, COVID-19 testing results, the history of psychological interventions), which caused a relatively limited MANOVA model compared to the general guidelines. Moreover, assumptions to be used in MANOVA such as multivariate normality and homogeneity of covariance matrices could not be tested formally, and differences in group samples in the sociodemographic categories might invalidate the stability and robustness of multivariate results. Lastly, even though the sample size ($N = 383$) was sufficient to statistically analyse it, the extrapolation of the findings to the population of children in Kerala is to be undertaken with caution since it is possible that the sample did not sufficiently reflect the demographic diversity of the state. The current research needs to focus on longitudinal designs in the future, including a larger and more heterogeneous group of participants, as well as extensive psychosocial, economic, and clinical variables to outline the subtle mental health effects of pandemic-related disturbances in pediatric cohorts.

6. Conclusion

The current study explains the significant psychological consequences linked to the COVID -19 lockdown in children in Kerala, which are mostly characterized by increased anxiety and mild symptoms of depression. Though the general stress measures have mostly been maintained in the normative

ranges, the high prevalence of anxiety is an indicator of an eminent public-health issue that requires an immediate intervention. Pediatric mental -health conditions are often not detected and under-treated, especially in settings where emotional and behavioral challenges are overshadowed by the academic demands or cultural shame. In line with the trends in many areas, the discussion of child mental health in the public does not exist extensively, and the unwillingness of parents to seek help often has its basis in misunderstandings or fears of being judged. These obstacles must be overcome in order to prevent long-term emotional and developmental maladies. The awareness programmes must be incorporated in the school systems, primary healthcare centers, and the community level programmes to promote mental-health resilience in children. Digital platforms may also be used as a key to spreading credible information, encouraging positive parenting behaviors, and providing psychological support remotely. To ensure fair access to mental-health services, such as pediatric counselling, tele-psychology, and school-based screening programmes, governmental and non-governmental organizations are expected to work together. Interventions on policy, like integrating mental-health checks into regular pediatric check-ups or providing insurance coverage in psychological care, would also help in making sure that families can access care in a timely manner. Finally, raising awareness, making the access more accessible, and establishing early intervention will become an inseparable part of protecting the psychological wellbeing of children in the situation of the public-health crisis and in ordinary conditions.

Abbreviations

DASS	Depression Anxiety Stress Scales
ANOVA	Analysis of Variance
MANOVA	Multiple Analysis of Variance
FNF	Friend or a Family member

Conflicts of Interest

The authors declare no conflicts of interest.

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