ORIGINAL RESEARCH ARTICLE

Assessing Burden of Depressive Disorders Among School-Going Adolescents of a District in North Karnataka

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ABSTRACT

Background: Adolescents aged 10 to 19 years, is a growing age characterized by physical, emotional and social variations. India with the world's leading teenage population, has a substantial problem of undiagnosed and untreated cases of depression. This study hence aims to assess the prevalence and factors associated with depression amongst school-going adolescents in North Karnataka.

Methods: A cross-sectional study was conducted among 256 adolescents from schools of a District in North Karnataka. Students were assessed for depression through validated Patient Health Questionnaire-9 (PHQ-9).

Results: The adolescent depression prevalence was 26.6%, with the majority (86.7%) experiencing mild depression. Statistically significant associations ($p<0.05$) were observed between depression and socio demographic variables such as rural residence, school type(government), birth order (third or higher), parental or personal substance use, recent stressful events, and conflictual home or school environments.

Conclusion: The study reveals a concerning burden of depression among school going adolescents, particularly among those facing environmental and psychosocial stressors. There is a crucial necessity for school-based mental health interventions, awareness among teachers and parents and proactive identification and support mechanisms.

Key words: Adolescent, school going, depression, PHQ9

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INTRODUCTION

Adolescence, defined by the World Health Organization as the period between 10 and 19 years, represents the most dynamic and decisive stage of human development.[1] During this phase, young people acquire knowledge, socio-emotional competencies, and adaptive skills essential for constructive engagement with society. They simultaneously face complex social, cultural, and economic challenges, including displacement, migration, family instability, income inequality, and violence, all of which contribute to compromised mental health.[2] Globally, mental health disorders constitute a major disease burden in adolescents, with depression and anxiety together accounting for nearly 40% of cases, positioning depression as a contemporary epidemic.[3] Adolescent depression adversely impacts social relationships, disrupts academic achievement, and often initiates a vicious cycle of recurrent depressive episodes, psychosocial dysfunction, engagement in high-risk behaviors, self-harm, and suicide.[4]

India is home to the largest adolescent population worldwide, with approximately 243 million individuals nearly one-fifth of the national population. A meta-analysis has shown that 0.1% - 6.9% of adolescents in community samples and 3% - 68% in school-based samples present with significant mental health morbidity.[5] According to the *State of the World's Children 2021* report by UNICEF, depressive disorders rank among the top five causes of years lived with disability in adolescents, with a greater burden among girls, while self-harm remains a leading cause of mortality.[6] Poor mental health during adolescence is associated with high-risk behaviors such as self-harm, substance use, unsafe sexual practices, and violence, the repercussions of which often extend into adulthood.[7] Academic stress, rapid societal changes, evolving family structures, and limited awareness of mental health services further heighten vulnerability among Indian adolescents.

Although mental health problems have long been inherent to adolescence, socio-cultural stigma and neglect historically prevented adequate recognition. Recently, however, adolescent mental health has been increasingly acknowledged as a global health and development priority. The Sustainable Development Goals, particularly target 3.4, emphasize the promotion of mental health and well-being, underscoring its importance.[8] Despite this, major gaps persist in understanding the prevalence of adolescent depression and its risk factors in the Indian context, particularly in underrepresented regions such as North Karnataka.

The present article therefore aims to examine the burden of adolescent depression and its associated determinants, with the broader objective of fostering collaborative strategies to address this critical public health challenge.

METHODOLOGY

Study Design and Setting: A cross-sectional study was carried out over a six-month period (June 2023-December 2023) among school-going adolescents from both rural and urban areas of a district in North Karnataka.

Study Population: The study targeted students enrolled in 9th and 10th standard in selected schools of the district. These grades were chosen as the participants were expected to comprehend and respond reliably to a self-administered questionnaire on depression. Students who failed to complete the questionnaire or whose parents did not consent to participation were excluded from the analysis.

Sample Size and Sampling Strategy: The required sample size was calculated considering a reported prevalence of adolescent depression of 20% (Mohta A et al.[9]).

Using the formula: $n=Z^2pqD^{2;}$ where Z = 1.96, p = 0.20, q = 0.80, and D = 0.05, the minimum sample size was determined to be 246. Accounting for a 10% non-response rate, the final sample size was estimated at 271.

According to the Deputy District Public Instruction (DDPI) office, the district is administratively divided into seven blocks. By simple random sampling (lottery method), half of the blocks were selected. Within these, schools were further stratified into government and private institutions. From each stratum, a total of six schools (two from rural government, two from rural private, and two from urban settings) were chosen by stratified random sampling, proportional to the population size. Within each selected school, one class of either 9th or 10th grade was randomly chosen, and all students in that class were invited to participate to avoid bias or concerns about selective participation.

Data Collection Procedure: Prior to initiation, ethical approval was obtained from the Institutional Ethics Committee and formal permission was secured from the DDPI. School authorities and students were informed about the purpose of the study, and informed consent was taken from principals along with written assent from adolescents.

Each participant received an anonymous, self-administered questionnaire in English. No identifying information (e.g., names, roll numbers) was collected to ensure confidentiality. Data were gathered within classrooms under supervision, but with seating arrangements made to minimize peer influence. Although the questionnaire was developed in English, measures were taken to address potential language barriers. A trained data collector fluent in Kannada, English, and Hindi remained present throughout the data collection in both rural and urban schools. She introduced the study purpose and explained the questionnaire in Kannada, and where needed, in English or Hindi to support minority lan-

guage groups. Most adolescents were able to complete the questionnaire independently, and only when difficulties arose did the data collector provide clarification to ensure accurate understanding and consistent interpretation.

A semi-structured schedule collected basic sociodemographic information and perceived stressors over the preceding six months. Items were derived from existing literature and adapted to the local context, covering domains such as academic pressure, chronic illness or bereavement within the family, body image concerns, and exposure to parental or family quarrels. Participants were also asked to describe their perception of home and school environments, categorized as calm, with occasional conflicts, or with frequent/regular conflicts. Although no standardized questionnaires were used, the intent was to ensure cultural appropriateness, clarity for adolescents with varying language, and a focus on salient stressors most relevant to their experiences.

Depression was assessed using the nine-item Patient Health Questionnaire (PHQ-9)[10], which is validated for use among Indian adolescents. Students identified with depression were referred to a psychiatrist for further evaluation and counselling, facilitated by the class teacher and school principal. Of the 271 distributed questionnaires, 15 were incomplete and excluded, resulting in 256 valid responses (completion rate: 94.5%).

Study Tool: The PHQ-9 is a widely used self-administered instrument derived from the PRIME-MD diagnostic tool. It consists of nine items, each corresponding to DSM-IV criteria for depression, scored on a scale of 0 ("not at all") to 3 ("nearly every day"). Total scores were classified as follows: minimal (1-4), mild (5-9), moderate (10-14), moderately severe (15-19), and severe depression (20-27). The questionnaire has been validated for Indian adolescents and is widely used to estimate prevalence of depression. The severity of depression was classified depending on the final scores as Minimal (1-4); Mild (5-9), Moderate (10-14), Moderately severe (15-19) and 20 -27 (Severe Depression)[10] as in Table 1.

Table 1: Interpretation of Total Score:[10]

Total Score	Depression Severity
1-4	Minimal depression
5-9	Mild depression
10-14	Moderate depression
15-19	Moderately severe depression
20-27	Severe depression

Statistical Analysis: Data were entered in Microsoft Excel (Redmond, WA: Microsoft Corp.) and analyzed using IBM SPSS Statistics for Windows, Version 21.0 (Armonk, NY: IBM Corp.). Descriptive statistics are presented as frequencies and percentages for categorical variables. The association between socio demographic variables with the presence of depression was initially examined using the chi-square test (or Fischers's exact test where applicable) and p value <0.05 was considered statistically significant. To quantify the strength of associations, univariate logistic regression analysis was performed and unadjusted odds ratios (OR) with 95% confidence intervals (CI) were calculated. Variables with p-values <0.20 in univariate analysis were included in a multivariate logistic regression model to identify independent predictors of depression. Adjusted odds ratios (aOR) with 95% CI were reported. The goodness-of-fit of the multivariate model was assessed using the Hosmer-Lemeshow test, and overall model adequacy was further evaluated using the likelihood ratio test

Ethical Considerations: The study protocol was approved by the Institutional Ethics Committee of BLDE (Deemed to be University) [Approval No. BLDE(DU)/IEC/601/2022-23, dated 28 May 2022]. Administrative permission was also obtained from the DDPI and participating school principals. Written assent was taken from all adolescent participants prior to data collection.

RESULTS

The results obtained are analysed as prevalence of depression among the adolescents and the sociodemographic factors influencing the occurrence of depression. Among the 256 surveyed participants, half of them were boys with two thirds studying in government school and belonging to nuclear families and majority of them (95.6%) were Hindus. About 14% of the adolescents had single parent with majority of parents educated up to high school. About half of them had three or more siblings and were first born (43.4%). Since socio economic status cannot not be accurately elicited from students, government and private schools have been used as a proxy for their economic status. The Table 2 shows various socio demographic characters of the participants involved in study.

On enquiring about the history of substance use among participants and their parents, it was noted that most of the adolescents (96.1%) had no history of any substance use and about one third of the parents (35.9%) had history of consumption of a substance abuse in last 6 months (Table 3).

The participants were asked if they perceived any stress in the last 6 months and to cite the reasons for that. Multiple reasons were allowed to be given and it revealed that most of the mentions were that there was no stress but most common reason for stress was academic related, where students felt the idea of getting less marks or failing in exams was the reason for stress followed by body image issues, chronic illness of loved ones, death of loved ones and parental/family quarrels. (Figure 1)

The PHQ-9 administered to the participants determined the burden of depression among them. The prevalence of depression was 26.6% (n=68) and among them about 86.76% (n=59) had mild depress-

Table 2: Demographic characteristics of the study participants (N=256)

Characteristic	Participants (%)
Gender	
Male	144 (56.3)
Female	112 (43.8)
Religion	
Hindu	237 (92.6)
Muslim	19 (7.4)
Area of Residence	
Rural	133 (52)
Urban	123 (48)
School type	
Government	162 (63.3)
Private	94 (36.7)
Family Type	
Joint	82 (32)
Nuclear	174 (68)
Marital Status of Parents	
Married	220 (85.9)
Separated (Divorced/Died)	36 (14.1)
Siblings	
One	56 (21.9)
Two	77 (30.1)
Three or More	123 (48)
Birth Order	
1	111 (43.4)
2	87 (34)
3 or more	58 (22.7)
Father's Education	
Illiterate	43 (16.8)
Less than 10th Standard	32 (12.5)
10th-12th Standard	82 (32)
Degree or more	99 (38.7)
Mother's Education	
Illiterate	65 (25.4)
Less than 10th Standard	57 (22.3)
10th-12th Standard	66 (25.8)
Degree or more	68 (26.6)

Table 3: History of any substance use among the study participants in last 6 months (n=256)

Characteristic	Participants (%)
Use by participants	
Yes	1 (0.4)
No	246 (96.1)
May be	9 (3.5)
Use by parents/Caregivers	
Yes	92 (35.9)
No	155 (60.5)
May be	9 (3.6)

Table 4: Burden of depression among the study participants (n=256)

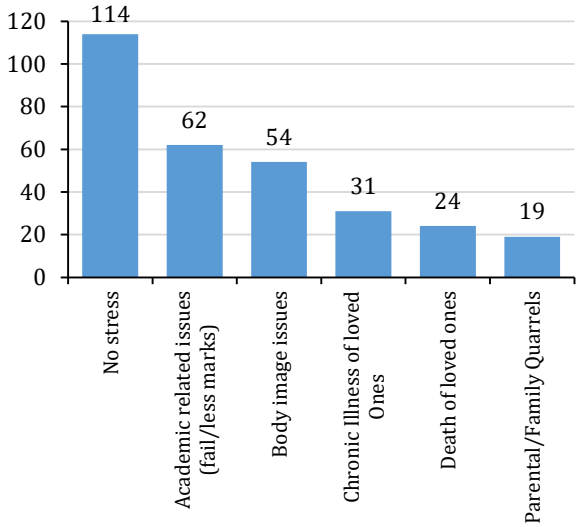
Characteristics	Participants (%)
Depression	
Present	68 (26.6)
Absent	188 (73.4)
Severity of depression (N=256)	
Mild	59 (23)
Moderate	7 (2.7)
Moderately Severe	2 (0.8)

sion, 10.3% (n=7) had moderate depression and 2.9%(n=2) had severe depression. Thus, majority of the sampled population (n=188,73.4%) had no depression, and among those with depression, most of them had mild depression (n=59, 23.0%) (Table 4).

The various socio demographic variables were tested for any association with presence of depression among adolescents. The chi square tests showed that depression was commonly present among rural adolescents, having three siblings, history of substance abuse in past 6 months by self or family and presence of a perceived stress condition in last 6 months. All these associations were found to be statistically significant ($p<0.05$). Depression was also found more commonly among male adolescents, belonging to nuclear family, nevertheless there was no statistical significance associated to these variables. (Table 5). The burden of depression was evaluated for association between religion and parents' education and there was no statistically significant association found between these variables.

The bivariate logistic regression analysis also showed that significant predictors of depression were residence, school type, number of siblings, birth-order, parental substance abuse, stressful life events, perceived home and school environment. A multivariate logistic regression analysis was done to variables with $p<0.02$ in univariate analysis and it indicated that independent predictors of depression were rural residence (OR=0.54, 95% CI: 0.33-0.89), government school attendance (OR=0.17, 95% CI: 0.07-0.41) and having three or more siblings (OR=1.82; 95% CI:1.25-2.66). The Hosmer-Lemeshow test indicated good model fit ($\chi^2=0.00$, $p=1.0$). (Table 6)

Variables with $p<0.20$ in univariate analysis were included in the multivariate model. Adjusted ORs, 95% CIs, and p-values are reported for all such variables.



*Multiple responses were allowed

Figure1: Self-reported causes of the perceived stress in last 6 months

Table 5: Association between Socio demographic variables and depression

Characteristics	Depression		Total	P value
	Present (n=68) (%)	Absent (n=188) (%)		
Gender				
Male	39 (27.1)	105 (72.9)	144	0.887
Female	29 (25.9)	83 (74.1)	112	
Residence				
Urban	19 (15.4)	104 (84.6)	123	<0.001*
Rural	49 (36.8)	84 (63.2)	133	
School Type				
Private	5 (5.3)	89 (94.7)	94	<0.001*
Government	63 (38.9)	99 (61.1)	162	
Family Type				
Nuclear	44 (25.3)	130 (74.7)	174	0.503
Joint	24 (29.3)	58 (70.7)	82	
Parental marital status				
Married	57 (25.9)	163 (74.1)	220	0.563
Separated	11 (30.6)	25 (69.4)	36	
Siblings				
One	2 (3.6)	54 (96.4)	56	<0.001*
Two	19 (24.7)	58 (75.3)	77	
Three or more	47 (38.2)	76 (61.8)	123	
Birth Order				
1	22 (19.8)	89 (80.2)	111	0.039*
2	24 (27.6)	63 (72.4)	87	
3 or more	22 (37.9)	36 (62.1)	58	
Substance Abuse in past 6 months				
Yes	1 (100.0)	0 (0.0)	1	0.005*
No	61 (24.8)	185 (75.2)	246	
Maybe	6 (66.7)	3 (33.3)	9	
Substance Abuse by parents in past 6 months				
Yes	37 (40.2)	55 (59.8)	92	0.001*
No	29 (18.7)	126 (81.3)	155	
Maybe	2 (22.2)	7 (77.8)	9	
Stressful event in past 6 months				
Yes	53 (37.3)	89 (62.7)	142	<0.001*
No	15 (13.2)	99 (86.8)	114	
Perceived Home Environment				
Calm	36 (20.0)	144 (80.0)	180	0.001*
Occasional Conflicts	29 (44.6)	36 (55.4)	65	
Regular conflicts	3 (27.3)	8 (72.7)	11	
Perceived School Environment				
Calm	44 (21.5)	161 (78.5)	205	0.001*
Occasional Conflicts	20 (45.5)	24 (54.5)	44	
Regular conflicts	4 (57.1)	3 (42.9)	7	

*Statistically significant ($p < 0.05$)

DISCUSSION

Depression during adolescence can significantly disrupt both social and personal functioning, with long-term adverse outcomes. Young people with depression are at increased risk of developing additional psychiatric conditions, including antisocial behaviors and substance use disorders.[11] This highlights the importance of documenting its prevalence among school-going adolescents.

In the present study, the prevalence of depression was 26.6%, aligning with findings from Mohta A et al[9] in Haryana and Trivedi D et al[12] in Mangalore, who reported prevalence levels between 20% and 22%. Other Indian studies have similarly documented prevalence rates ranging from 10% to 27%[13-15], corroborating our observations. Mild depression (23.0%) constituted the majority of cases in our study, followed by moderate (2.7%) and moderately severe depression (0.8%). Naushad S et al[16] (39.8%) and Malik M et al[17] (26.6%) reported comparable proportions of mild depression. However, Malik M et al[17] noted a much higher prevalence of moderate depression (41.2%) and severe depression (11.4%), likely attributable to their use of the Beck Depression Inventory rather than the PHQ-9. In contrast, severe depression in our study (0.8%) was consistent with rates reported by Naushad S et al[16] (1.8%) and Malik M et al[17].

Table 6: Univariate and Multivariate Logistic Regression Analysis of Factors Associated with Depression among Adolescents (N=256)

Characteristics	UOR (95% CI)	p-value	AOR (95% CI)	p-value
Female Gender (Ref Male)	1.06 (0.61-1.86)	0.887	-	-
Rural Residence (Ref Urban)	3.19 (1.75-5.83)	<0.001*	0.54 (0.33-0.89)	0.015*
Government School (Ref Private)	11.33 (4.36-29.42)	<0.001*	0.17 (0.07-0.41)	<0.001*
Joint Family (Ref Nuclear family)	1.22 (0.68-2.20)	0.503	-	-
Separated Parents (Ref Married)	0.79 (0.37-1.72)	0.563	-	-
Siblings (Ref One sibling)				
Two	0.11 (0.03-0.51)	0.002*	1.46 (0.81-2.62)	0.212
Three or more	0.06 (0.01-0.26)	<0.001*	1.82 (1.25-2.66)	0.002*
Birth Order (Ref First)				
Second	0.65 (0.33-1.26)	0.197	-	-
Third or more	0.40 (0.20-0.82)	0.039*	0.84 (0.47-1.53)	0.585
Substance Abuse in past 6 months (Ref Yes)				
No	6.07 (0.20-184.04)	0.005*	0.28 (0.02 - 4.12)	0.340
Maybe	3.42 (0.10 - 112.6)	0.089	-	-
Substance Abuse by parents in past 6 months (Ref Yes)				
No	2.92 (1.64-5.22)	0.001*	1.33 (0.69 - 2.55)	0.385
Maybe	1.64 (0.45 - 5.91)	0.456	-	-
No Stressful event in past 6 months (Ref Yes)	3.93 (2.07-7.46)	<0.001*	1.71 (0.86 - 3.38)	0.124
Perceived Home Environment (Ref Calm)				
Occasional Conflicts	0.31 (0.17-0.57)	0.001*	0.87 (0.45 - 1.68)	0.692
Regular conflicts	0.67 (0.17-2.64)	0.567		
Perceived School Environment (Ref Calm)				
Occasional Conflicts	0.33 (0.17-0.65)	0.001*	0.96 (0.49 - 1.88)	0.912
Regular conflicts	0.20 (0.04-0.95)	0.042*	0.81 (0.16 - 4.09)	0.894

UOR – Unadjusted Odds Ratio; AOR – Adjusted Odds Ratio; CI – Confidence interval
*Statistically significant ($p < 0.05$); Hosmer-Lemeshow test: $\chi^2 = 0.00$, $p = 1.0$ (good model fit)

Our findings indicated that depression was more common among rural adolescents, those with a birth order of three or more, students reporting stressful life events in the preceding six months, and those experiencing persistent conflicts at home or school. These associations were statistically significant similar to study conducted in Haryana, where depression was associated with presence of any long-standing illness in the past three months (AOR=3.0 (95%CI: 1.4-6.1), p<0.01) and perceived stressful events in the past six months (AOR=4.9 (95%CI: 2.8-8.6), p<0.01). Conversely, variables such as gender, religion, family type, and parental education were not significantly linked to depression.[9] This is consistent with findings from the study in Bihar[15], where similar non-significant associations were observed. However, gender differences have been reported elsewhere, with higher prevalence among girls, as seen in Haryana, (OR-1.2 (95% CI:0.8-1.8)[9] Mangalore[12] (p<0.05), Bihar[15] (p<0.001), and Puducherry[18]. In our study, although girls exhibited a slightly higher prevalence, the difference was not statistically significant. Depression was also more frequently observed in government school students, consistent with reports from Telangana, but contrary to findings from Bihar, where private school students were more affected.[19-20] It should be noted that stress and environmental influences in this study were assessed subjectively without standardized measurement tools.

Birth order showed a notable association with depression. Consistent with studies by Sidana S et al[21] and Mohta A et al[9], where birth order of four or more showed association with depression (Adjusted OR=3.0 (95%CI: 1.4-6.3), p<0.01),we observed higher prevalence of depression among adolescents of later birth order, with our study showing AOR= 0.40 95% CI:0.20-0.82; p<0.01). Results from a population based longitudinal study, conducted by applying multivariate logistic regression models with data from the Avon Longitudinal Study of Parents and Children (ALSPAC) also support this, showing a graded association between higher birth order and suicide attempts at age 15 (OR = 1.42, CI = 1.10-1.84).[22] Similarly, our study identified a significant link between depression and substance use in adolescents and their parents. Prior study in Uttar Pradesh and Bihar states have also demonstrated that male adolescents engaging in substance use were over twice as likely to experience moderate-to-severe depression (RR: 2.35; CI: 1.24-4.43).[23] Furthermore, parental substance use has been implicated in elevated depression risk among adolescents in Andhra Pradesh (p=0.031).[24] The multivariate analysis revealed that while several factors were associated with depression in univariate models, only rural residence (aOR = 0.54; 95% CI: 0.33-0.89), government school attendance (aOR = 0.17; 95% CI: 0.07-0.41), and having three or more siblings (aOR = 1.82; 95% CI: 1.25-2.66) remained significant after adjustment, indicating these as independent predictors. The attenuation of associations for birth order, parental substance use, stressful events, and perceived environments suggests confounding effects. These findings underscore the need to prioritize adoles-

cents from rural areas, government schools, and larger families for targeted screening and interventions, while also highlighting structural and family-level influences on mental health.

Globally, it is estimated that more than 70% of children with depression remain undiagnosed or untreated.[25] Increasing awareness among parents, teachers, and students, coupled with the availability of counselling support, is crucial. The present study contributes to evidence on prevalence and associated factors, underscoring the need for additional research using both quantitative and qualitative methodologies.

Limitations

Although this study utilized the validated PHQ-9 tool, certain methodological constraints must be acknowledged. First, reliance on self-reported data raises the possibility of response bias, including underreporting due to stigma and recall limitations related to the two-week symptom recall period. Second, the study was restricted to a single district, limiting the diversity of cultural, socioeconomic, and demographic contexts represented. These factors constrain the generalizability of the findings to wider populations across India.

Conclusion

Depression among adolescents is a pressing public health concern. The elevated prevalence identified in this study emphasizes the urgent need for interventions aimed at early detection, support, and treatment. Schools, families, and communities must play a central role in awareness-building and providing access to mental health services. Engagement of school counsellors in routine screening and support could substantially benefit at-risk students. Future research should incorporate larger, multi-center samples to better estimate the burden and identify contextual risk factors. Timely intervention remains critical to reducing the impact of adolescent depression on educational, social, and long-term health outcomes.

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Individual Authors' Contributions: CD: data collection, analysis, original draft preparation; **SP**: conceptualization, supervision, manuscript editing. **SC:** conceptualization, supervision. All authors reviewed and approved the final manuscript.

Availability of Data: Data supporting this study are available upon reasonable request from the corresponding author (chandrika.doddihal@bldedu.ac.in). Due to privacy restrictions, the dataset is not publicly accessible.

Declaration Of Non-Use of Generative AI: The authors confirm that no generative AI tools were employed in the study design, data collection, analysis, interpretation, or manuscript preparation. All content reflects the authors' original work.

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