Original Research Article

Mental health and nutritional issues: a dual burden among adolescent school going girls of urban and rural Jodhpur

Varsha Joshi¹, Naveen Kikkeri Hanumantha Setty², Nitin Kumar Joshi¹, Yogesh Kumar Jain¹*, Pankaj Bhardwaj², Kuldeep Singh¹

¹School of Public Health, ²Department of Community Medicine and Family Medicine, All India Institute of Medical Sciences (AIIMS) Jodhpur, Rajasthan, India

Received: 10 September 2021
Revised: 30 October 2021
Accepted: 15 November 2021

*Correspondence:
Dr. Yogesh Kumar Jain,
E-mail: dryogeshjain14@gmail.com

ABSTRACT

Background: Adolescents constitute 21% of the total population in India. Untreated mental disorders affect a person’s potential to live a fulfilling life and raises the possibility of conduct disorders. Moreover, malnutrition leads to growth retardation and sexual maturation in later life. Thus, this study was undertaken to understand the role of family size, socio-economic status, marital status on mental and nutritional health of adolescent girls in urban and rural Jodhpur.

Methods: A descriptive cross-sectional study in three schools each from rural and urban Jodhpur was conducted to include adolescent girls aged 10-19 years. Semi-structured questionnaire was administered to collect demographic and socio-economic data along with DASS-21 and SMFQ for mental health assessment and BMI, waist-hip ratio collected for nutritional health.

Results: Depression score ≥10 was observed in 34.3% girls (significantly associated with monthly attendance), anxiety score ≥10 observed in 64.8% (associated with socio-economic class and monthly attendance) and stress score ≥10 observed in 26.2% (associated with monthly attendance). Th e17.4% were thin while 4.7% overweight, significantly associated with location, age group and socio-economic class. The 5% were at increased metabolic risk, associated with non-participation in extra-curricular activities.

Conclusions: The study indicated high prevalence of depression, anxiety and stress, nutritional imbalance and risk of metabolic disorders at an early age, that were significantly associated with the low monthly attendance indicating negative impact of such factors on regular education and academic growth. The findings highlight a greater emphasis needed on mental health and nutritional components during the active growth years of adolescent females.

Keywords: Adolescent, Female, Cross-sectional study, Mental health, Nutritional status, Malnutrition

INTRODUCTION

The world health organization (WHO) defines people living between the age groups of 10 and 19 years as adolescents.¹ It is a period of rapid physiological, psychological and social growth in which a person gains nearly 25% of the adult height and up to 50% of the adult weight. With roughly 1.2 billion adolescents worldwide, it is estimated that one in every five people of the world is an adolescent.²

Over 85% of the total adolescent population of the world live in developing countries and further makes up for 20% of the total population of the South-East Asian region.³ In India, this corresponds to 21% of the total population of country or in other words, a staggering 287 million Indians. Rajasthan is the second state after Uttar
Pradesh in the country with highest percentage of adolescent population with 22.9% population in adolescent age group.4

Worldwide, 10-20% of the children and adolescents experience mental disorders, half of which begin by the age of 14 years and three quarters by mid-20s. More than 33% of the disease burden and almost 60% of premature deaths among the adults can be associated with behaviors or conditions that can be attributed to have begun during the age of 10-19 years.3,8 Studies have shown that untreated mental disorders severely influence a child’s development, educational attainments and potential to live a fulfilling and productive life. Children with mental disorders face major challenges with stigma, isolation and discrimination, as well as lack of access to health care and education facilities, in violation of their fundamental human rights. Further, mental disorders in such early stages of development raises the possibility of conduct disorders, and risky behaviors related to sexual activity, violence and substance abuse later in life.3,9,10

According to the national mental health survey, 13.7% of the Indians suffer from varying degrees of mental disorders and 10.6% out of them require immediate interventions. The NMHS states that the urban areas are the worst affected and 1.9% of all affected fall under the category of severe mental disorders. Recent studies have identified depression in particular as the single largest cause of the burden of disease among young people in terms of disability adjusted life years (DALYs).11,12

Another major debilitating issue in the adolescent age group is Malnutrition, which refers to deficient, excess or imbalanced intake of nutrients by a person. Malnutrition addresses three broad groups of conditions, namely, under nutrition, micro-nutrient related malnutrition and overweight and obesity.13 Two-fifths of the females in India are either too thin or obese. Owing to the high growth requirements in adolescent years in females, there is a general nutritional vulnerability in these age groups.14 Inadequate or over nutrition can have many detrimental effects that appear later in life in form of growth retardation and sexual maturation.15 Moreover the incidence of over-nutrition in form of overweight and obesity in the current times tend to appear simultaneously with underweight in form of stunting and wasting.16,17

Due to the resulting rise in such “Double burden of malnutrition” and mental disorders amongst the adolescent girls, and to understand the role of factors such as family size, socio-economic status, marital status, the current study was undertaken with the objectives of assessing mental health and nutritional status of school going adolescent girls in rural and urban areas of Jodhpur.

METHODS

A descriptive cross-sectional study was planned in the months of March to June 2018, in the rural and urban areas of Jodhpur after due permissions from the IEC of AIIMS Jodhpur, the district education officer (DEO) of Jodhpur and the heads of respective schools. Based on the feasibility, three government schools each from rural and urban areas of Jodhpur were selected from the list procured from DEO of Jodhpur.

Adolescent girls of classes 8th to 12th (aged between 10 and 19 years), willing to participate in the study were included as study participants after due approval from the school principal/headmaster/headmistress and after obtaining due informed consent from their parents/guardians. Girls fulfilling the inclusion criteria but not present during the day of data collection and those who were not willing to participate were excluded.

Sample size was calculated considering the prevalence of depression among adolescent girls as 55% with 95% confidence interval, 10% precision and 20% non-response rate. 205 girls from each urban and rural area were planned to be included to meet the sample size of 409 and finally, 238 girls from urban and 205 girls from rural area were selected.

After explaining the study objectives to teachers and students, a pre-tested semi-structured questionnaire was self-administered, to collect data regarding socio-demographic profile, parents’ income and occupation, students’ attendance in previous month and participation in extracurricular activities/sports. Anthropometric measurements were also recorded in the same visit.

For mental health status, pre-validated depression, anxiety, stress scales-21 items (DASS-21) and short version moods and feelings questionnaire (SMFQ) for child self-reporting (translated to Hindi and back translated) were used. DASS-21 is a 21-item scale set to measure depression, anxiety and stress through self-report and categorize as Normal, mild, moderate, severe and very severe. While, SMFQ is a 13-item self-reporting instrument to screen depressive symptoms and moods and feelings in the respondents.

For nutritional status, body mass index (BMI) calculation using height and weight measurements and Waist-hip ratio calculation was done. To assess the nutritional status, BMI for age was calculated using WHO growth reference standards for girls.

Waist-hip ratio was calculated using waist and hip circumference (using WHO steps protocol) and the risk of metabolic complication were opined to increase at a ratio of ≥ 0.85 as per WHO guidelines.

The collected data was analyzed using SPSS v19, proportions for categorical variables and mean, standard deviation and standard error were calculated for numerical variables. Chi square test was used as a test of significance for categorical variables and independent t
test was used for numerical variables considering \( p < 0.05 \) to be significant.

**RESULTS**

Out of the 3 schools of urban and 3 schools of rural Jodhpur, a total of 443 school going adolescent girls were included in the study. Among them, 238 (53.7\%) were from urban and 205 (46.3\%) were from rural areas. The mean age of the participants was 15.32±1.39, ranging from 12 to 18 years. The 24 girls (8 from urban and 16 from rural area) were married at the time of the study and were below 18 years of age.

As per the modified BG Prasad socioeconomic classification, majority of the participants (n=173, 39\%) were from lower middle class followed by lower class (n=142, 32\%), middle class (n=72, 16\%), upper middle class (n=44, 10\%) and upper class (n=12, 3\%). Distribution of the participants according to socioeconomic status and other detailed demographic findings are mentioned in Table 1.

**Mental health status assessment**

Among the participants for urban area, 14.7\% had mild depression, 12.2\% had moderate depression, 5.5\% had severe depression and 1.3\% had very severe depression. Whereas, in rural area, 16.6\% of the participants had mild depression, 29.9\% had moderate depression, 2.9\% had severe depression and 0.5\% had very severe depression. Overall, 152 (34.3\%) out of the total 443 adolescent girls were having depression score ≥10, including 80 (18.1\%) girls from urban and 72 (16.2\%) girls from rural area. Moreover, 50 (11.3\%) such girls were early adolescents and 102 (23\%) were late adolescents. Presence and absence of depression was found to be significantly associated with mean monthly attendance amongst the students (t=2.6; \( p < 0.001 \)).

Mild anxiety was observed in 10.1\% girls, moderate anxiety in 12.2\% in urban areas. Whereas, in rural area, anxiety in 32.8\%, severe anxiety in 9.2\% and very severe anxiety in 12.2\% in urban areas. Whereas, in rural area, 10.2\% of the participants had mild anxiety, 12.7\% had severe anxiety and 11.7\% had very severe anxiety. Overall, 287 (64.8\%) out of the total 443 adolescent girls were having anxiety score ≥10. Presence and absence of anxiety was found to be significantly associated with socio economic class (\( \chi^2 = 4.89; p < 0.03 \)) and mean monthly attendance amongst the students (t=2.6; \( p < 0.001 \)).

Mild stress was observed in 11.8\% girls, moderate stress in 8.4\%, severe stress in 4.2\% and very severe stress in 0.4\% in urban areas. Whereas, in rural area, 10.2\% of the participants had mild stress, 12.2\% had moderate stress, 3.9\% had severe stress and 1.5\% had very severe stress. Overall, 116 (26.2\%) out of the total 443 adolescent girls were having stress score ≥10. Presence and absence of stress was found to be significantly associated with mean monthly attendance amongst the students (t=2.4; \( p = 0.02 \)).

Nearly 10\% of the participants were found to have depressive symptoms as per the SMFQ. However, depressive symptoms assessed by mood and feeling questionnaire were not found to be associated with study area, age group, marital status, family size, number of siblings, socioeconomic status, participation in extracurricular activity or percentage of monthly attendance (Table 3).

**Nutritional status assessment**

Amongst the study participants, 17.4\% adolescent girls were found to be thin and 4.7\% were found to fall under the category of overweight or obese. The BMI status was found to be significantly associated with rural and urban location (\( \chi^2 = 12.13; p = 0.002 \)), age groups of early and late adolescence (\( \chi^2 = 7.59; p = 0.02 \)) and socioeconomic class (\( \chi^2 = 6.46; p = 0.04 \)) as described in Table 4.

As per the waist-hip ratio 22 girls (5\%) were found to be at an increased risk of metabolic complication, i.e., waist-hip ratio>0.85. WHR was found to be significantly associated with participation in extra-curricular activities (\( \chi^2 = 12.13; p = 0.002 \)) by study participants.

**Table 1: Demographic distribution and characteristics of the study population.**

| Variables          | Demographic distribution characteristics of the study population |
|--------------------|---------------------------------------------------------------|
|                    | N               | Percentage (%) | N               | Percentage (%) | N               | Percentage (%) |
| **Age group (Years)** |                 |                |                 |                |                 |                |
| Urban              | 71              | 29.8           | 167             | 70.2           | 238             | 53.7           |
| Rural              | 52              | 25.4           | 153             | 74.6           | 205             | 46.3           |
| Total              | 123             | 27.8           | 320             | 72.2           | 443             | 100            |
| \( \chi^2=1.095 \) |                 |                | \( \chi^2=6.46 \) |                | \( \chi^2=7.59 \) |                |
| **Marital status** |                 |                |                 |                |                 |                |
| Married            | 8               | 3.4            | 230             | 96.6           | 238             | 100            |
| Unmarried          | 16              | 7.8            | 189             | 92.2           | 205             | 100            |
| Total              | 24              | 5.4            | 419             | 94.6           | 443             | 100            |
| \( \chi^2=4.244 \) |                 |                | \( \chi^2=12.13 \) |                | \( \chi^2=4.89 \) |                |

Continued.
Table 2: Distribution of adolescent girls based on DASS-21 scale with univariate analysis.

| Variables                  | Distribution of adolescent girls based on DASS-21 scale with univariate analysis | P value |
|----------------------------|----------------------------------------------------------------------------------|---------|
| **Depression**             |                                                                                  |         |
| Location                   | Normal, n (%) | Mild, n (%) | Moderate, n (%) | Severe, n (%) | Very severe, n (%) | Total, n (%) |
| Urban                      | 158 (66.4)    | 35 (14.7)   | 29 (12.2)      | 13 (5.5)     | 3 (1.3)             | 238 (100) |
| Rural                      | 133 (64.9)    | 34 (16.6)   | 31 (15.1)      | 6 (2.9)      | 1 (0.5)             | 205 (100) |
| **Age groups (Years)**     |                                                                                  |         |
| Early adolescent           | 73 (59.3)     | 29 (23.6)   | 16 (13)        | 3 (2.4)      | 2 (1.6)             | 123 (100) |
| Late adolescent            | 218 (68.1)    | 40 (12.5)   | 44 (13.8)      | 16 (5)       | 2 (0.6)             | 320 (100) |
| **Married**                |                                                                                  |         |
| Yes                        | 14 (58.3)     | 5 (20.8)    | 3 (12.5)       | 1 (4.2)      | 1 (4.2)             | 24 (100)  |
| No                         | 277 (66.1)    | 64 (15.3)   | 57 (13.6)      | 18 (4.3)     | 3 (0.7)             | 419 (100) |
| **Family size**            |                                                                                  |         |
| ≤5 members                 | 93 (67.6)     | 20 (14.5)   | 22 (15.9)      | 3 (2.2)      | 0 (0.0)             | 138 (100) |
| >5 members                 | 198 (64.9)    | 49 (16.1)   | 38 (12.5)      | 16 (5.2)     | 4 (1.3)             | 305 (100) |
| **Siblings**               |                                                                                  |         |
| ≤2 siblings                | 46 (76.3)     | 9 (15.3)    | 5 (8.5)        | 1 (1.7)      | 0 (0.0)             | 60 (100)  |
| >2 siblings                | 246 (64.2)    | 60 (15.7)   | 55 (14.4)      | 18 (4.7)     | 4 (1.0)             | 383 (100) |
| **Socio-economic class**   |                                                                                  |         |
| Lower class                | 104 (73.2)    | 17 (12)     | 13 (9.2)       | 7 (4.9)      | 1 (0.7)             | 142 (100) |
| Lower middle class         | 109 (63.0)    | 26 (15)     | 29 (16.8)      | 7 (4)        | 2 (1.2)             | 173 (100) |
| Middle class               | 42 (58.3)     | 16 (22.2)   | 10 (13.9)      | 4 (5.6)      | 0 (0)               | 72 (100)  |
| Upper middle class         | 28 (63.6)     | 8 (18.2)    | 7 (15.9)       | 0 (0)        | 1 (2.3)             | 44 (100)  |
| Upper class                | 8 (66.7)      | 2 (16.7)    | 1 (8.3)        | 1 (8.3)      | 0 (0)               | 12 (100)  |
| Lower class                | 213 (67.6)    | 102 (32.4)  | 315 (100)      |              |                    |         |
| Mid-upper class            | 78 (60.9)     | 50 (39.1)   | 128 (100)      |              |                    |         |
| **Extra-curricular participation** |                                                                                  |         |
| Yes                        | 174 (64.9)    | 40 (14.9)   | 37 (13.8)      | 13 (4.9)     | 4 (1.5)             | 268 (100) |
| No                         | 115 (67.3)    | 28 (16.4)   | 22 (12.9)      | 6 (3.5)      | 0 (0)               | 171 (100) |
| **Monthly attendance**     |                                                                                  |         |
| >80%                       | 88 (78.6)     | 8 (7.1)     | 11 (9.8)       | 4 (3.6)      | 1 (0.9)             | 112 (100) |
| <80%                       | 203 (61.3)    | 61 (18.4)   | 49 (14.8)      | 15 (4.5)     | 3 (0.9)             | 331 (100) |
| Total                      | 291 (65.7)    | 69 (15.6)   | 60 (13.5)      | 19 (4.3)     | 4 (0.9)             | 443 (100) |

*In the socio-economic classification, Lower and lower middle classes of modified BG Prasad socioeconomic classification were clubbed into lower class. Similarly, middle, upper middle and upper class were grouped in to middle and upper class.

**Table 2: Distribution of adolescent girls based on DASS-21 scale with univariate analysis.**
| Variables                        | Distribution of adolescent girls based on DASS-21 scale univariate analysis | P value |
|---------------------------------|-----------------------------------------------------------------------------|---------|
| **Anxiety**                     |                                                                             |         |
| **Location**                    |                                                                             |         |
| Urban                           | 85 (35.7)                                                                   | 24 (10.1)| 78 (32.8) | 22 (9.2) | 29 (12.2) | 238 (100) | 0.81 |
| Rural                           | 71 (34.6)                                                                   | 27 (13.2)| 57 (27.8) | 26 (12.7)| 24 (11.7) | 205 (100) |       |
| **Age groups (years)**          |                                                                             |         |
| Early adolescent                | 42 (34.1)                                                                   | 20 (16.3)| 32 (26)  | 12 (9.8) | 17 (13.8)| 123 (100) | 0.77 |
| Late adolescent                 | 114 (35.6)                                                                  | 31 (9.7) | 103 (32.2)| 36 (11.3)| 36 (11.3)| 320 (100) |       |
| **Married**                     |                                                                             |         |
| Yes                             | 8 (33.3)                                                                    | 1 (4.2) | 6 (25)  | 6 (25)  | 3 (12.5) | 24 (100)  | 0.84 |
| No                              | 148 (35.3)                                                                  | 50 (11.9)| 129 (30.8)| 42 (10) | 50 (11.9)| 419 (100) |       |
| **Family size**                 |                                                                             |         |
| < 5 members                     | 45 (32.6)                                                                   | 16 (11.6)| 51 (37)  | 14 (10.1)| 12 (8.7) | 138 (100) | 0.44 |
| > 5 members                     | 111 (36.4)                                                                  | 35 (11.5)| 84 (27.5)| 34 (11.1)| 41 (13.4)| 305 (100) |       |
| **Siblings**                    |                                                                             |         |
| < 2 siblings                    | 23 (37.3)                                                                   | 8 (13.6) | 20 (33.9)| 4 (6.8) | 5 (8.5)  | 60 (100)  | 0.70 |
| > 2 siblings                    | 133 (34.7)                                                                  | 43 (11.2)| 115 (30) | 44 (11.5)| 48 (12.5)| 383 (100) |       |
| **Socio-economic class**        |                                                                             |         |
| Lower class                     | 58 (40.8)                                                                   | 17 (12) | 41 (28.9)| 12 (8.5) | 14 (9.9) | 142 (100) |       |
| Lower middle class              | 63 (36.4)                                                                   | 21 (12.1)| 47 (27.2)| 19 (11) | 23 (13.3)| 173 (100) |       |
| Middle class                    | 18 (25)                                                                     | 5 (6.9) | 26 (36.1)| 12 (16.7)| 11 (15.3)| 72 (100)  |       |
| Upper middle class              | 12 (27.3)                                                                   | 7 (15.9) | 16 (36.4)| 5 (11.4)| 4 (9.1)  | 44 (100)  |       |
| Upper class                     | 5 (41.7)                                                                    | 1 (8.3) | 5 (41.7) | 0 (0)   | 1 (8.3)  | 12 (100)  |       |
| Lower class                     | 121 (38.4)                                                                  | 194 (61.6)| 85 (27.3)| 128 (100)|         |           | 0.03 |
| Mid-upper class                 | 35 (27.3)                                                                   | 93 (72.7)|         |         |           |           |       |
| **Extra-curricular participation** |                                                                             |         |
| Yes                             | 91 (34)                                                                     | 31 (11.6)| 88 (32.8)| 28 (10.4)| 30 (11.2)| 268 (100) | 0.46 |
| No                              | 64 (37.4)                                                                   | 20 (11.7)| 44 (25.7)| 20 (11.7)| 23 (13.5)| 171 (100) |       |
| **Monthly attendance**          |                                                                             |         |
| >80%                            | 48 (42.9)                                                                   | 15 (13.4)| 29 (25.9)| 8 (7.1) | 12 (10.7)| 112 (100) | 0.05 |
| <80%                            | 108 (32.6)                                                                  | 36 (10.9)| 106 (32.0)| 40 (12.1)| 41 (12.4)| 331 (100) |       |
| Total                           | 156 (35.2)                                                                  | 51 (11.5)| 135 (30.5)| 48 (10.8)| 53 (12) | 443 (100) |       |
| **Stress**                      |                                                                             |         |
| **Location**                    |                                                                             |         |
| Urban                           | 179 (75.2)                                                                  | 28 (11.8)| 20 (8.4) | 10 (4.2) | 1 (0.4) | 238 (100) | 0.47 |
| Rural                           | 148 (72.2)                                                                  | 21 (10.2)| 25 (12.2)| 8 (3.9) | 3 (1.5) | 205 (100) |       |
| **Age groups (years)**          |                                                                             |         |
| Early adolescent                | 92 (74.8)                                                                   | 14 (11.4)| 12 (9.8) | 4 (3.3) | 1 (0.8) | 123 (100) | 0.77 |
| Late adolescent                 | 235 (73.4)                                                                  | 35 (10.9)| 33 (10.3)| 14 (4.4) | 3 (0.9) | 320 (100) |       |
| **Married**                     |                                                                             |         |
| Yes                             | 14 (58.3)                                                                   | 4 (16.7) | 4 (16.7) | 2 (8.3) | 0 (0)   | 24 (100)  | 0.08 |
| No                              | 313 (74.7)                                                                  | 45 (10.7)| 41 (9.8) | 16 (3.8)| 4 (1.0) | 419 (100) |       |
| **Family size**                 |                                                                             |         |
| < 5 members                     | 103 (74.6)                                                                  | 15 (10.9)| 12 (8.7) | 5 (3.6) | 3 (2.2) | 138 (100) | 0.79 |
| > 5 members                     | 224 (73.4)                                                                  | 34 (11.1)| 33 (10.8)| 13 (4.3)| 1 (0.3) | 305 (100) |       |
| **Siblings**                    |                                                                             |         |
| < 2 siblings                    | 46 (76.3)                                                                   | 7 (11.9) | 3 (5.1)  | 2 (3.4) | 2 (3.4) | 60 (100)  | 0.64 |
| > 2 siblings                    | 281 (73.4)                                                                  | 42 (11)  | 42 (11)  | 16 (4.2)| 2 (0.5) | 383 (100) |       |
| **Socio-economic class**        |                                                                             |         |
| Lower class                     | 113 (79.6)                                                                  | 15 (10.6)| 10 (7)  | 3 (2.1) | 1 (0.7) | 142 (100) |       |
| Lower middle class              | 127 (73.4)                                                                  | 18 (10.4)| 20 (11.6)| 7 (4)  | 1 (0.6) | 173 (100) |       |
| Middle class                    | 47 (65.3)                                                                   | 8 (11.1) | 9 (12.5) | 6 (8.3) | 2 (2.8) | 72 (100)  |       |
| Upper middle class              | 29 (65.9)                                                                   | 7 (15.9) | 6 (13.6) | 2 (4.5) | 0 (0)  | 44 (100)  |       |
| Upper class                     | 11 (91.7)                                                                   | 1 (8.3) | 0 (0)    | 0 (0)   | 0 (0)  | 12 (100)  |       |
| Lower class                     | 240 (76.2)                                                                  | 75 (23.8)|         |         |         | 315 (100) |       |
| Mid-upper class                 | 87 (68)                                                                     | 41 (32) |         |         |         | 128 (100) |       |

Continued.
### Table 3: Depression distribution and characteristics assessed by mood and feeling questionnaire.

| Variables                          | Absent | Present | Total | P value |
|------------------------------------|--------|---------|-------|---------|
|                                   | N      | Percentage (%) | N      | Percentage (%) | N      | Percentage (%) |
| **Location**                      |        |          |       |         |        |          |
| Urban                             | 216    | 90.8    | 22    | 9.2     | 238    | 100      |
| Rural                             | 183    | 89.3    | 22    | 10.7    | 205    | 100      |
| **Age groups (years)**            |        |          |       |         |        |          |
| Early adolescent                  | 115    | 93.5    | 8     | 6.5     | 123    | 100      |
| Late adolescent                   | 284    | 88.8    | 36    | 11.3    | 320    | 100      |
| **Married**                       |        |          |       |         |        |          |
| Yes                               | 19     | 79.2    | 5     | 20.8    | 24     | 100      |
| No                                | 380    | 90.7    | 39    | 9.3     | 419    | 100      |
| **Family size**                   |        |          |       |         |        |          |
| <5 members                        | 122    | 88.4    | 16    | 11.6    | 138    | 100.0    |
| >5 members                        | 277    | 90.8    | 28    | 9.2     | 305    | 100.0    |
| **Siblings**                      |        |          |       |         |        |          |
| <2 siblings                       | 50     | 83.3    | 10    | 16.7    | 60     | 100.0    |
| >2 siblings                       | 348    | 90.9    | 35    | 9.1     | 383    | 100.0    |
| **Socio-economic class**          |        |          |       |         |        |          |
| Lower class                       | 286    | 90.8    | 29    | 9.2     | 315    | 100      |
| Mid-upper class                   | 113    | 88.3    | 15    | 11.7    | 128    | 100      |
| **Extra-curricular participation**|        |          |       |         |        |          |
| Yes                               | 244    | 91      | 24    | 9       | 268    | 100      |
| No                                | 152    | 88.9    | 19    | 11.1    | 171    | 100      |
| **Monthly attendance**            |        |          |       |         |        |          |
| >80%                              | 103    | 92      | 9     | 8       | 112    | 100.0    |
| <80%                              | 296    | 89.4    | 35    | 10.6    | 331    | 100.0    |
| Total                             | 399    | 90.1    | 44    | 9.9     | 443    | 100.0    |

*4 participants did not respond to the question on participation in extra-curricular activities. **For numerical data on monthly attendance, independent t tests were conducted to obtain p value.

### Table 4: Distribution of BMI status amongst study participants

| Variables                      | Normal | Percentage (%) | Thin | Percentage (%) | Overweight/ obese | Percentage (%) | Total | Percentage (%) |
|--------------------------------|--------|----------------|------|----------------|-------------------|----------------|-------|----------------|
| **Location**                   |        |                |      |                |                   |                |       |                |
| Urban                          | 190    | 79.8           | 31   | 13.6           | 17                | 7.1            | 238   | 100            |
| Rural                          | 155    | 75.6           | 46   | 22.4           | 4                 | 2              | 205   | 100            |
| **Age groups (years)**         |        |                |      |                |                   |                |       |                |
| Early adolescent              | 95     | 77.2           | 17   | 13.8           | 11                | 8.9            | 123   | 100            |
| Late adolescent               | 250    | 78.1           | 60   | 18.8           | 10                | 3.1            | 320   | 100            |

*4 participants did not respond to the question on participation in extra-curricular activities.
### Table 5: Univariate analysis of factors associated with Waist-Hip Ratio

| Variables                          | Normal | Increased risk | Total | P value |
|------------------------------------|--------|----------------|-------|---------|
|                                   | N      | Percentage (%) | N     | Percentage (%) | N     | Percentage (%) |
| **Variables**                      | N      | Percentage (%) | N     | Percentage (%) | N     | Percentage (%) |
| **Married**                        |        |                |       |               |       |                |
| Yes                                | 20     | 83.3           | 3     | 12.5          | 1     | 4.2            | 24    | 100     | 0.794 |
| No                                 | 325    | 77.6           | 74    | 17.7          | 20    | 4.8            | 419   | 100     |       |
| **Family size**                    |        |                |       |               |       |                |
| <5 members                         | 100    | 72.5           | 29    | 21            | 9     | 6.5            | 138   | 100.0   | 0.164 |
| >5 members                         | 245    | 80.3           | 48    | 15.7          | 12    | 3.9            | 307   | 100.0   |       |
| **Siblings**                       |        |                |       |               |       |                |
| <2 siblings                        | 48     | 80.0           | 8     | 13.3          | 4     | 6.7            | 60    | 100.0   | 0.696 |
| >2 siblings                        | 297    | 77.5           | 69    | 18.0          | 17    | 4.4            | 383   | 100.0   |       |
| **Socio-economic class**           |        |                |       |               |       |                |
| Lower class                        | 252    | 80             | 46    | 14.6          | 17    | 5.4            | 315   | 100.0   | 0.039 |
| Mid-upper class                   | 93     | 72.7           | 31    | 24.2          | 4     | 3.1            | 128   | 100.0   |       |
| **Extra-curricular participation**|        |                |       |               |       |                |
| Yes                                | 205    | 76.5           | 52    | 19.4          | 11    | 4.1            | 268   | 100.0   | 0.276 |
| No                                 | 137    | 80.1           | 24    | 14.0          | 10    | 5.8            | 171   | 100.0   |       |
| **Monthly attendance**             |        |                |       |               |       |                |
| >80%                               | 260    | 78.5           | 58    | 17.5          | 13    | 3.9            | 331   | 100.0   | 0.384 |
| <80%                               | 85     | 75.9           | 19    | 17.0          | 8     | 7.1            | 112   | 100.0   |       |
| **Total**                          | 345    | 77.9           | 77    | 17.4          | 21    | 4.7            | 443   | 100.0   |       |

*4 participants did not respond to the question on participation in extra-curricular activities.
DISCUSSION

From the study conducted, it was observed that more than a third of urban and rural school going adolescent girls were found to be suffering from various grades of depression as per DASS-21 scale and 10% of the study subjects were found to be having depressive symptoms as per the SMF questionnaire. The prevalence thus observed was lower than the prevalence of 55% in Patna (Bihar) as observed by Jha et al and higher than the prevalence of 23% amongst adolescents in South India observed by Trivedi et al. Nearly two-thirds adolescent girls in both rural and urban areas were found to be having anxiety which was higher than the previously known value of 22.7% for adolescent girls in North India, as determined by Madasu et al 30% for adolescent school going girls in Karachi as determined by Farooq et al and similar to the findings of Wahab et al who observed a prevalence of 67% in schools of Kuala Lumpur. More than one-fourth of the school going adolescent girls of urban and rural areas were found to be having stress in the study. This prevalence was lower than the previous values obtained in the studies of Wahab et al and Watode et al. Such difference in observations across geographical locations may be due to regional variations in literacy rates, cultural practices and levels of development.

Results for nutritional status indicated that 17.4% adolescents were thin and 4.7% were either overweight or obese and nearly 7% of the urban and 3% of rural school going adolescent girls were having high risk of metabolic complications as indicated by the waist-hip ratio. Such findings were in contrast with the findings of previous studies such as those of Deshmukh et al where majority (53.8%) adolescent girls were thin and only 2.2% were overweight/obese, Choudhary et al with 69% prevalence of undernutrition and Shahabuddin et al with prevalence of thinness amongst 59% of the adolescent girls. Such variations can be attributed to differences in socio-cultural practices, level of development, value attached to girl child and dietary practices across different settings.

Further, it was found that the presence depression, anxiety and stress were independently significantly associated with lower mean monthly attendance indicating that poor mental health may lead to academic loss of the students. While anxiety was also found to be significantly associated with socioeconomic class of the family, no significant associations were observed with urban or rural location, early or late adolescence, marital status, family size or participation in extracurricular activities.

On the other hand, BMI status of the participants were found to be significantly associated with rural and urban locality, early and late adolescent and socio-economic status of the family, while increased waist-hip ratio was found to be significantly associated with lesser participation in extra-curricular activities.

Limitations

The study was conducted using convenient sampling which has its own limitations in terms of the possibility of sampling error and lack of representation of population.

CONCLUSION

The study indicated a high prevalence of depression, anxiety and stress was observed among school going adolescent girls that were significantly associated with the low monthly attendance which indicates a negative impact of such factors on regular education and academic growth of the students. Over 17% of the adolescent girls were found to be thin and nearly 5% were obese/overweight which was significantly associated with locality age group and socio-economic status, while 5% were at increased risk of metabolic complication with waist hip ratio more than 0.85. Waist hip ratio was significantly associated with participation in extracurricular activity which indicates a positive impact of such activities in reduction of risk of metabolic disorders.

The findings highlight a greater emphasis needed on mental health as well as nutritional components during the active growth years of adolescent females.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee of AIIMS Jodhpur vide IEC Certificate Number: AIIMS/IEC/2018/1138

REFERENCES

1. WHO South-East Asia. World Health Organization. Summary. World Health Organization. 2014. Available at: https://apps.who.int/iris/handle/10665/112750. Accessed on 4 September 2021.
2. WHO South-East Asia. World Health Organization. Available at: http://www.searo.who.int/child_adolescent/topics/adolescent_health/en/. Accessed on 4 September 2021.
3. World Health Organization. Health for the world's adolescents: a second chance in the second decade: summary. World Health Organization. 2014. Available at: http://www.searo.who.int/child_adolescent/documents/sea_nut_163/en/. Accessed on 4 September 2021.
4. RBSK Strategy Handbook. 1st ed. Ministry of Health and Family Welfare; 2014. Available at: http://4dj7dt2ychlw3310xlowzop2.wpengine.netdna-cdn.com/wp-content/uploads/2016/09/RBSK_Strategy_Handbook.pdf. Accessed on 4 September 2021.
5. Jain YK, Joshi NK, Bhardwaj P, Singh K, Suthar P, Joshi V. Developing a health-promoting school using knowledge to action framework. J Edu Health Promot. 2021;10:306.
6. Jain YK, Joshi NK, Bhardwaj P, Suthar P. Health-promoting school in India: Approaches and challenges. J Family Med Prim Care. 2019;8:3114-9.

7. Child and adolescent mental and brain health. Who.int. Available at: https://www.who.int/activities/improving-the-mental-and-brain-health-of-children-and-adolescents. Accessed on 4 September 2021.

8. UNICEF DATA - Child Statistics. UNICEF DATA. Available at: https://data.unicef.org/topic/adolescents/demographic/. Accessed on 4 September 2021.

9. Adolescent mental health. Who.int. 2020. Available at: https://www.who.int/news-room/fact-sheets/detail/adolescent-mental-health. Accessed on 4 September 2021.

10. Mukolo A, Heflinger CA, Wallston KA. The stigma of childhood mental disorders: a conceptual framework. J Am Acad Child Adolesc Psychiatry. 2010;49(2):92-103.

11. National Mental Health Survey. Indianmhs.nimhans.ac.in. 2016. Available at: http://indianmhs.nimhans.ac.in/. Accessed on 4 September 2021.

12. Murthy RS. National Mental Health Survey of India 2015-2016. Indian J Psychiatry. 2017;59(1):21-6.

13. Malnutrition. Who.int. 2020. Available at: https://www.who.int/news-room/q-a-detail/malnutrition. Accessed on 4 September 2021.

14. UNICEF in India. Unicef.in. Available at: http://unicef.in/Whatwedo/33/Adolescents-Nutrition. Accessed on 4 September 2021.

15. Bhattachar S, Bhual CK. Prevalence and associated factors of malnutrition among school going adolescents of Dang district, Nepal. AIMS Public Health. 2019;6(3):291-306.

16. Sivagurunathan C, Umadevi R, Rama R, Gopalakrishnan S. Adolescent Health: Present Status and Its Related Programmes in India. Are We in the Right Direction? J Clin Diagn Res JCDR. 2015;9(3):LE01-6.

17. Adolescent Demographics-UNICEF DATA. UNICEF DATA. 2019. Available at: https://data.unicef.org/topic/adolescents/demographic-s/. Accessed on 4 September 2021.

18. Jha KK, Singh SK, Nirala SK, Kumar C, Kumar P. Aggrawal N. Prevalence of Depression among School-going Adolescents in an Urban Area of Bihar, India. Indian J Psychol Med. 2017;39(3):287-92.

19. Trivedi D, Dhakappa N, Ghildiyal P, Deekonda S, Subramaniam S, Iyer JS et al. Depression among adolescent students in South India: How serious is the issue? Indian J Psychiatry. 2016;58(3):349-50.

20. Madasu S, Malhotra S, Kant S, Sagar R, Mishra AK, Misra P et al. anxiety disorders among adolescents in a rural area of northern India using Screen for Child Anxiety-Related Emotional Disorders tool: A Community-based Study. Indian J Community Med. 2019;44:317-21.

21. Farooq SA, Muneeb A, Ajmal W. Quality of Life Perceptions in School-Going Adolescents with Social Anxiety. J Child Dev Disord. 2017;3:2.

22. Wahab S, Rahman FNA, Hasan WMHW, Zamani IZ, Arbaie NC, Khor SL et al. Stressors in secondary boarding school students: Association with stress, anxiety and depressive symptoms. Asia-Pac Psychiatry. 2019;5(S1):82-9.

23. Watode BK, Kishore J, Kohli C. Prevalence of Stress among School Adolescents in Delhi. 2015;2:4-9.

24. Deshmukh PR, Gupta SS, Bharame MS, Dongre AR, Maliye C, Kaur S et al. Nutritional status of adolescents in rural Wardha. Indian J Pediatr. 2006;73(2):139-41.

25. Choudhary S, Mishra CP, Shakla KP. Nutritional status of adolescent girls in rural area of varanasi. 2005;34:9.

26. Shahabuddin AK, Talukder K, Talukder MK, Hassan M, Seal A, Rahman Q et al. Adolescent nutrition in a rural community in Bangladesh. Indian J Pediatr. 2000;67(2):93-8.