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Original Research Article

Nutritional status and common morbidities among school-going adolescents of rural areas of Vadodara, Gujarat: a cross sectional study

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ABSTRACT

Background: Abnormal nutritional status i.e. underweight, overweight and obesity is increasing rapidly amongst adolescents irrespective of socioeconomic status and geography. This study was carried out to assess prevalence of abnormal nutritional status and common associated morbidities among school going adolescent of rural areas of Vadodara, Gujarat, India.
Methods: A cross sectional observational study was done among school going adolescents of rural areas of Vadodara, Gujarat. A predesigned and pretested semi-structured proforma was used to get relevant clinical details of study participants. Total 474 students aged 12-17 years participated in our study.
Results: Out of 474 enrolled adolescents, 16.67% were underweight, where as 3.8% and 2.95% were obese and overweight respectively. The prevalence of overweight and obesity were almost similar in both genders. Out of total 16.24% were stunted with predominance in boys compared to girls (p value: 0.039). Hypertension was found in 5.0% of participants with 3 times more prevalent in girls than boys (p value 0.011). Similarly, anemia was affecting both genders equally.
Conclusions: Although underweight is a known nutritional problem of adolescents from rural areas, overweight and obesity are also rapidly growing health issues among them now a days. With keeping in mind this increasing burden of abnormal nutritional status and associated morbidities, regular health check-up, education of parents and adolescents on healthy lifestyle and inclusion of adolescents in existing government programmes are essential measures to reduce these problems.

Keywords: Anemia, Hypertension, Obesity, Rural areas, School going adolescents, Underweight

INTRODUCTION

The term 'Adolescence', origin from the Latin word 'adolescere', means "to grow, to mature". Adolescents are the future generation of any country and their nutritional needs are main essence of well-being of the society.[1]

Adolescents (age 10-19 years) account for 17.3% (1.19 billion) of the world's population (6.91 billion). In India, this age group forms 19.6 percent (236.5 million) of the total population.[2] Traditionally, mortality rates are the main health indicator used by health planners. Due to lowest mortality rates among this age groups, adolescents have therefore received lowest priority.[3] In most developing countries, nutrition initiatives have been

focusing on children and women, thus neglecting adolescents. However, recent studies have shown high prevalence rates of malnutrition and anaemia in these age groups.[4]

Poor nutrition among adolescents resulting in short stature and low lean body mass is associated with many concurrent and future adverse health outcomes like decreased work capacity as well as poor development and cognitive functions. The NFHS-3 survey data suggests that anemia is widely prevalent among all age group in India and in the age group 15-19 years, 56% girls and 30% boys were anemic.[5]

Overweight and obesity during adolescent age are associated with risk factors for non-communicable diseases in adulthood. According to Global Health Observatory (GHO) data 2016 prevalence of thinness in India was 26.7% (21.9-31.6%) of children between 10-19 years and across gender 31.1% (23.8-38.6%) boys and 21.7% (15.7- 28.6%) girls were thin.[6] Similarly, 6.3% (4.5-8.3%) of children between 10-19 years in India were overweight with 5.8% (3.7-8.5%) of girls and 6.7% (4.1-9.9%) of boys were overweight.[7]

There is a limited data available on prevalence of anemia, undernutrition, obesity, stunting and prevalence of common morbidities like high blood pressure, dental caries, and refractive errors amongst adolescents in India. Most of available data on young people comprises 15-24 years of age group. More importantly data on 10-14 years old is practically very less, which is a major limitation for designing any programs targeting young adolescents as their needs differ from 15-19 years.[8]

In view of above points this study was undertaken with the objective of assessing the nutritional status and morbidity pattern among school-going adolescents in government/semi government schools of rural areas of Waghodia, Vadodara district, Gujarat. Such efforts of documentation of nutritional status and other common morbidities among adolescents will not only provide insights on prevalence of anemia, stunting, under nutrition, obesity, high blood pressure etc., but will also give opportunity to understand the impact of existing programs on nutritional status and overall health status of adolescents, hence will be helpful for future direction of existing programs.

METHODS

It was a school-based observational descriptive cross-sectional study. It was conducted from June 2016 to August 2017 in three randomly selected primary and secondary schools of rural areas of Waghodia district, Vadodara, Gujarat, India.

All adolescents, of both sexes, aged 12-17 years were included as per inclusion criteria i.e. (i) Not seriously ill, (ii) Present in school on the day of visit, and (iii) With informed written consent from parents as well as informed written assent from participant (which were obtained prior to visit day). Rest were excluded from the study.

Tools used in study were

- A predesigned and pretested semi-structured Proforma (prepared in consultation with experts of community medicine) which includes basic details, anthropometry, physical examination findings, and co-morbidities'(like hypertension, anemia, skin disease, dental caries and diagnosed cases of refractory error) detail if any,
- Digital weighing scale,
- Wall mounted screw held stadiometer,
- Digital blood pressure monitor (Omron HEM 7120 automatic blood pressure monitor),
- Torch and tongue depressor.

Age, sex, study class, anthropometric measurements (height and weight), blood pressure, clinical history and clinical signs on examination were the study variables.

The sample size was calculated using the formula,

$n = Z^2_{(1-\alpha/2)}\ pq/d^2$ (where $Z_{(1-\alpha/2)} = 1.96$ at 95% confidence level, p = prevalence of morbidity, q = 1-p, and d = allowable error). With assumption of 50% prevalence of morbidity (undernutrition or underweight) in this study; hence, p=0.5, q=0.5, and d=5%. The sample size counted was 385. After 10-15% non-responders taken in account final sample size decided was 443.

Total 474 students were enrolled for the study after obtaining clearance from the Institutional Ethics Committee (IEC) as well as permission from the school authorities. The informed written consent of the parents of the study population was obtained with assurance of about confidentiality of the information and anonymity of the participants.

A separate room in each school was arranged for examination purpose with provision of a female intern especially for examination of a girl child. Clinical information of participants were collected as per proforma. Anthropometry parameters were assessed by using standard methods and participants were categorized into underweight, overweight, obese and stunted as per the revised Indian Academy of Pediatrics growth charts and defining criteria.[9] Study participants were labelled as normotensive, pre-hypertensive and hypertensive by using standard age and sex specific blood pressure centile charts.[10]

Statistical analysis

Data was entered in Microsoft Office Excel and analysed with 'Systat software-version 23' for windows. Results were expressed as a proportion. Unpaired t test and Chi-

square test were applied as test of significance and P <0.05 was taken as statistically significant.

RESULTS

A total 474 adolescents comprising 54.22% (257) boys and 45.78% (217) girls participated in the study. Whereas 39% (185) and 61% (289) were belonging to early adolescents group (age 12-14 years) and late adolescent group (age 15-17 years), respectively.

Table 1: Characteristics of adolescents.

Variables	Boys (n=257)	Girls (n=217)
Early adolescents (n=185)	101 (39%)	84 (39%)
Late adolescents (n=289)	156 (61%)	133 (61%)
Mean age in years (range)	14.94 (11-17)	14.92 (11-17)
Mean weight in Kg (range)	42.26 (23-75)	39.53 (22-97.8)
Mean height in cm (range)	154.22 (110- 175)	148.82 (129.3- 164.4)
Mean BMI in Kg/m^2 (range)	17.74 (11.21- 57.85)	17.76 (9.77- 47.15)

Mean age of boys and girls was almost same and that was 14.9 (11-17) years. Mean weight of boys was 42.26 (23-75) Kgs and of girls was 39.53 (22-97.8) Kgs. Mean height of boys was 154.22 cm and that of girls was 148.82 cm respectively. There was no difference in mean BMI across gender, which was 17.7 Kg/m^2 (Table 1).

Table 2: Nutritional status of participants.

Morbidities	Boys (n=257)	Girls (n=217)	P value
Underweight (n= 79)	44 (17.12%)	35 (16.13%)	0.77
Overweight (n= 18)	8 (3.11%)	10 (4.61%)	0.39
Obese (n= 14)	8 (3.11%)	6 (2.76%)	0.82
Stunted (n= 77)	50 (19.54%)	27 (12.44%)	0.039

Nearly 16.67% (79) students were underweight; whereas 3.8% (18) and 2.95% (14) were overweight and obese respectively. Among 257 boys the prevalence of underweight, overweight and obesity was 17.12% (44), 3.11% (8) and 3.11% (8) respectively. While among 217 girls the prevalence of underweight, overweight and obese was 16.13% (35), 4.61% (10) and 2.76% (6) respectively, with no statistical difference (Table 2).

Amongst 77 stunted adolescents, 64.94% (50) had normal BMI. While, 28.57% (22) and 6.49% (5) of stunted were underweight and overweight and obese, respectively (Table 3).

Amongst 474 participants prevalence of common morbidities in descending order was anemia 50.63% (240), dental caries 23.62% (112), skin disorders 10.12% (48), refractory error 5.90% (28), hypertension 5.06% (24), respiratory tract infection 3.58% (17), pre-hypertension 1.26% (6), insomnia 0.63% (3) and constipation 0.63% (3). There was no statistical difference in prevalence of associated morbidities across gender except for that of hypertension and refractive error, which is more common in girls (Table 4).

Table 3: All adolescents BMI versus linear growth.

Nutritional status (n=474)	Normal BMI (n=363)	Underweight (n=79)	Overweight and obesity (n=32)
Normal height (n=397)	313 (78.84)	57 (14.36%)	27 (6.8%)
Stunted (n=77)	50 (64.94%)	22 (28.57%)	5 (6.49%)

Table 4: Common morbidities among participants.

Morbidities	Boys (n=257)	Girls (n=217)	P value
Pre-hypertensive (n=6)	2 (0.78%)	4 (1.84%)	0.301
Hypertensive (n=24)	7 (2.72%)	17 (7.83%)	0.011
Anemia (n=240)	125 (48.63%)	115 (52.99%)	0.358
Dental caries (n=112)	63 (24.51%)	49 (22.58%)	0.665
Skin disorders (n=48)	26 (10.11%)	22 (10.13%)	0.955
Refractory error (n=28)	9 (3.5%)	19 (8.75%)	0.019
URTI (n=17)	10 (3.89%)	7 (3.22%)	0.697
Insomnia (n=3)	2 (0.78%)	1 (0.46%)	NA
Constipation (n=3)	1 (0.38%)	2 (0.92%)	NA

Table 5: Relation between hypertension and overnutrition.

Morbidities	Overweight and obese (n=32)	Non-obese (n=442)	P value
Hypertension (n=24)	5	19	0.004
Normotension (n=450)	27	423	

Mean SBP was 110.07 mmHg (SD- 14.91) among boys and 111.18 mmHg (SD-11.33) among girls; whereas mean DBP was 70.67 mmHg (SD-7.35) and 71.51 mmHg (SD- 8.19) among boys and girls, respectively. The study prevalence of hypertension was 5.06%. Out of 257 boys

2.72% (7) and out of 217 girls 7.83% (17) were hypertensive; which was statistically significant (P value 0.011). Pre-hypertensive adolescents were 6 (2 boys and 4 girls) (P value 0.301).

The prevalence of hypertension amongst obese and overweight adolescents was 15.62% (5/32), while amongst non-obese adolescents was 4.29% (19/442); which was statistically significant (P value= 0.004) (Table 5).

DISCUSSION

In this study the nutritional status, incidence of hypertension and morbidity pattern among participants were evaluated. In current study 54.22% were boys and 45.78% were girls. Whereas in Sanghamitra P et al, study 35% were boys and 65% were girls.[11]

The study prevalence of overweight and obesity was 3.80% and 2.95% respectively with combined prevalence was found to be 6.75%. In the similar study done in suburban area of Odisha by Sanghamitra P et al, the prevalence of overweight and obesity was 4.5% and 7.6% respectively and combined prevalence of overweight and obesity was 12.2%.[11]. Whereas Pathak S et al, study done in rural area of India found prevalence of overweight and obese was 6.7% and 2.2%, respectively with combined prevalence of overweight and obesity was 8.98%.[12]

Another similar study by Prashanth SV et al, done in high schools of rural and urban areas of Davangere, Karnataka, India mentioned combined prevalence of overweight and obesity in high schools of rural areas was 7.1%.[13] A systematic review on Epidemiology of childhood overweight and obesity in India done by Harish R et al, described overall prevalence of overweight and obesity ranges between 3 to 24.7% and 1.5 to 14% in India.[14]

In current study the prevalence of overweight and obesity across gender was 6.22% in boys and 7.37% in girls. In Sanghamitra P et al, study the prevalence of same was 11.91% and 12.32% in girls.[11] Whereas Pathak S et al, study the same was 15.78% in boys and 3.92% in girls.[12]

In present study the prevalence of underweight was 17.12% in boys and 16.13% in girls with overall prevalence was 16.66%. In contrast, Sanghamitra P et al, study same was 5.18% in boys and 1.12% in girls with overall underweight prevalence was 2.54%.[11] In Pathak S et al, study overall prevalence of underweight amongst adolescent from rural area was also 6.7%.[12]

Stunting may be consequence of chronic undernutrition with or without chronic systemic illness. Present study had found that 16.24% participants were stunted, which was very low on comparing with Bhattacharya A et al, study and Pal A et al, study, both studies were from rural areas of West Bengal, reporting the prevalence of stunting was 47.41% and 54% respectively.[15,16] In present study 19.45% of boys and 12.44% of girls were stunted (P value 0.039), while in Pal A et al, study 48.75% of boys and 58.36% of girls were stunted.[16] In Bhattacharya A et al, study 51.91% of boys and 40.13% of girls were stunted.[15]

On comparing BMI with linear growth of participants, the prevalence of high BMI (obesity and overweight) with short stature found 1.05% (5/474); which was less but chances of having significant underlying disease are high. This group needs detailed evaluation for early diagnosis and treatment.

The prevalence of underweight and short statured adolescents was 4.64% (22/474). This group also needs detailed evaluation to address mainly nutritional as well as systemic problems. While last short statured group with normal BMI, having prevalence of 10.55% (50/474), also require nutritional education and regular growth monitoring.

Looking at common morbidities, in present study the prevalence of anemia was 50.63% which was consistent with other studies having results of high prevalence of anemia like Bhattacharya A et al, had 55.18% prevalence and Joice S et al, study had 39.4%.[15,17]

Another major morbidity was dental caries. Present study has prevalence of 23.63%. which was nearly same to prevalence found in other studies in different part of India like Kulkarni M et al, Bhattacharya A et al, and Dambhare DG et al, had prevalence of dental caries among adolescents were 10.41%, 33.49% and 13.79% respectively.[15,18,19]

The prevalence of pre-hypertensive and hypertensive adolescents in this study was 1.27% (6/474) and 5.06% (24/474), respectively. In Reddy et al, study and Buch et al, study the reported prevalence of hypertension among school going adolescents was 4.4% and 6.48% respectively.[20,21] In present study 1.47% boys and 3.58% girls were hypertensive (P value 0.01), while in Reddy et al study 5.1% boys and 3.5% girls were hypertensive.[20]

The present study shown 15.6% of overweight and obese adolescents had hypertension in contrast to 4.29% of non-obese adolescents (P value 0.004). In Sundar JS et al, study 21.5% of study adolescents were hypertensive with prevalence of overweight and obesity was 15%.[22]

CONCLUSION

Abnormal nutrition including under- as well as over-nutrition is a major emerging problem among school going adolescents of rural area. Stunting is a separate major problem apart from obesity and thinness. It may be only or early manifestation of many chronic underlying illness. Routine Blood pressure monitoring in all adolescents is an important tool to identify asymptomatic

pre-hypertensive and hypertensive individual. Strengthening of existing government programmes, Education about healthy life style, Monitoring of weight & height and Regular blood pressure assessment are crucial for prevention as well as for early detection of certain diseases.

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