

Received: 22<sup>nd</sup> May-2013Revised: 29<sup>th</sup> May-2013Accepted: 31<sup>st</sup> May-2013**Research article****TO ASSESS NUTRITIONAL STATUS OF ADOLESCENTS (10-12 YEARS) FROM NON GOVERNMENT FUNDED SCHOOLS (PRIVATE) OF AN URBAN INDIAN CITY & KAP OF PARENTS/ TEACHERS REGARDING HEALTHY DIETARY AND LIFESTYLE BEHAVIORS FOR ADOLESCENTS.**

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**ABSTRACT:** To assess nutritional status of adolescents (10-12 years) from non government funded schools (private) of Gujarat, India. Teachers & parents of adolescent children were assessed regarding their knowledge, attitude and practices of healthy dietary & lifestyle behaviours. School canteen services were also critically evaluated. Parent's willingness, to start a nutrition program in the school was also assessed. A cross sectional study was conducted on adolescents (10-12 years) from two selected private schools. Anthropometric, biophysical and hemoglobin estimations were done on all children. Lipid and glucose profile was conducted only on over weight (including obese) children. Results reveal that canteen offered unhealthy food. Teachers and parents had insufficient knowledge about healthy behaviors. Most (53.5%) of the parents agreed to the changes proposed for canteen menus. About 3/4<sup>th</sup> of the subjects were malnourished (78.9%), with more (53.7%) being under weight than over weight and obese (25.2%). Similarly, more than half (55.1%) of the subjects were anemic. Central obesity as indicated by WHtR & WC was 21.6% and 9.0% respectively. The burden of sub optimal blood pressure was very high (26.3%) among adolescents (Pre hypertension 13.7% and hypertension 12.6%). Hence, malnutrition along with anemia and high blood pressure were significant problems in private schools. Schools being the best setting to approach adolescents and parents, multi disciplinary programs should be part of school policies to prevent and manage triple burden of malnutrition and its adverse consequences among the adolescents from private schools.

**Key words:** school health policies, adolescents, triple burden of malnutrition, non government funded schools.

**INTRODUCTION**

Worldwide, the global population comprises of 1.2 billion of adolescents (10-19 years) and around 243 million (20%) of them live in India (UNICEF, 2011). Adolescence is the last window of opportunity for attaining optimum growth and development after infancy and early childhood, therefore, good nutrition during this period can be critical for achieving adult weight and height (Adolescent, 2006). Malnutrition in adolescence encompasses under nutrition as well as over nutrition. Along with anemia, it frequently goes unrecognized where it compromises their capacity to learn, due to reduced cognitive ability, poor school attendance thereby affecting optimal productivity (FAO 2007). Strong linkages between underweight and overweight have been demonstrated leading to double burden of malnutrition (Srihari, et. al., 2007). Central obesity and high blood pressure are also the risk factors for most of the diet related non- communicable diseases among adolescents (Kelishadi, et. al., 2007; McCarthy and Ashwell, 2006). Globally, anaemia affects 1.62 billion people, which corresponds to 24.8% of the population. Similarly, 25.4 % of school aged children globally are anemic. (WHO, 2008) In India 56% of ever married women, 15-45 years were reported to be anemic according to NFHS-III (NFHS 2005-2006). Presence of anemia, along with under nutrition and over nutrition leads to triple burden of malnutrition. The universality of the school setting for gaining access to children makes it highly relevant to global efforts to combat the increasing public health problems of the double burden of malnutrition (WHO, 2006). Improving the health and nutritional status of school-age children/ adolescents is an effective investment for the future generation and is ultimately a contribution for the nation.

Pre-schools and schools offer many opportunities to promote healthy dietary and physical activity patterns for children and are also a potential access point for engaging parents and community members in preventing child malnutrition in all its forms.

Existence of under weight, over weight and obesity, iron deficiency anemia, central obesity and hypertension together has not been reported. In the Indian sub continent, studies conducted on adolescents belonging to non government funded schools, are reporting double burden of malnutrition (Srihari, et.al., 2007; Jeemon, et. al., 2009; Iyer, et.al., 2009). Therefore, further studies need to be conducted to confirm the presence of triple burden of malnutrition along with other NCD risk factors (central obesity, sub optimal high blood pressure including hypertension etc) among adolescents from non government funded schools. Thus, the present study was conducted with the following objectives:

1. To evaluate school canteen services in the school and assess KAP of parents and teachers regarding healthy dietary and lifestyle behaviours for adolescents.
2. To assess the triple burden of malnutrition, central obesity and sub optimal blood pressure including hypertension among adolescents belonging to non government funded schools.

## METHODS AND MATERIALS

A cross sectional cohort study was carried out in pre-selected non government funded co-education schools (2) of urban Indian city after obtaining permission from the school authorities. Ethical Clearance (F.C.Sc./FND/ME/NO 80) for the study was obtained from the Departmental Medical Ethical Committee before the commencement of the study. Written informed consent was obtained from adolescents (10-12 years of age) as well as from their parents to enroll the subjects for the study.

### Canteen services and Knowledge Attitude and Practices (KAP) of Teachers & Parents

Survey of existing canteen services was carried out regarding the type of food available to students and consumption trends using pretested, standardized questionnaire. For evaluation of knowledge, attitude and practices (KAP) of teachers and parents regarding healthy dietary & lifestyle behaviors, structured, pretested questionnaire was used to interview 5 teachers who dealt with subjects related to health (Science, Physical Activity and Counseling). Similarly parents (n=60) of adolescents were also interviewed & their responses were also recorded for initiating nutritious breakfast and lunch programme in the school. A written information was taken by sending them official letters from the parents by the researcher, to know their willingness to initiate various programmes (school meal program, changes in the school canteen etc) in school.

### Anthropometric measurements

Anthropometric measurements such as height, weight, and waist circumference (WC) were recorded using standard procedures by the researchers. Body mass index (BMI) and waist to height ratios (WHtR) were calculated by the standard formulae. BMI classification was based on WHO, 2007 growth references (de Onis, et.al, 2007). Central obesity was identified by high WC using IDF classification and by high WHtR ratio using  $\geq 0.5$  cut off (Fernández, et.al., 2004; Ashwell and Browning, 2011). Blood Pressure was taken after obtaining 15 days training from university chief medical officer (CMO), who certified the researcher's ability to take apt B.P readings. The Blood pressure measurement was done by sphygmomanometer, after resting the child for 10 minutes. Two consecutive readings after an interval of 5 minutes were taken and then averaged. Since the measurements were done in school setting, it was not possible to take three separate readings due to school permissions. The fourth report on diagnosis, evaluation, and treatment of high blood pressure in children and adolescents (National Institute of Health, 2005) was used to classify pre hypertension & hypertension amongst adolescents.

### Biochemical Parameters

Hemoglobin estimation was carried out by Cyanmethaemoglobin method for all the subjects and anemia classification (WHO 2007) was used to classify the study subjects. For overweight and obese subjects, fasting venous blood samples (12 hour fasting) were collected by standard collection techniques for the estimation of glucose intolerance and dyslipidemia & was classified based on ATP III and AHA guidelines (NIH 2002).

Data was analyzed with the help of SPSS 11 package.

## RESULTS

### Canteen evaluation

The school canteen, run by a contractor was the only source of food in the school which offered precooked and pre packed snacks, high in trans fats, and sugars. A study of sales trends of these snacks showed high sales of unhealthy, high calorie, trans-fat containing snack items such as puff (192 pieces/day), samosa (137 pieces/day) and vegetable roll (47 piece/day) as well as sweetened beverages such as pepsi (60 glasses/day), fruity (8 tetra packs/day) and appy fizz (1 tetra pack/day). School authorities had no role in planning canteen menu (or other foods available in canteen) and the nutritional aspect of the foods being sold on the school campus was not at all considered. The school had no nutrition policies and services in place.

### Knowledge Attitude and Practices (KAP) of Teachers/Parents & Willingness of Parents to Initiate Nutrition Health Promotion Programmes in School.

Knowledge of teachers pertaining to 'healthy diet' was found to be in appropriate. Though they correctly identified faulty behavior patterns which could lead to obesity in children and also supported teaching about these in school, their outlook regarding the same was limited. Their main concern was on scholastic performance of children with no thought about the health consequences. It was also found that in spite of teachers being able to distinguish unhealthy behaviors from healthy ones, they depicted insufficient knowledge about reasons for the same. For example, though all teachers agreed that sweetened carbonated beverages did not impart any health benefit, none were able to give reasons for the same other than suggest that, they were 'chemicals' and 'toxins'. The problem of under nutrition and micronutrient deficiencies and their adverse outcomes on health and scholastic performance of adolescents remain largely unrecognized by the teachers.

Regarding knowledge attitude and practices of parents, we observed from Figure 1, that only 55% of the parents could correctly identify the age range of adolescents (10-19 years). However, 82% of the parents understood the importance of adequate nutrition during adolescence for growth and development. Coming to the awareness level of parents, regarding malnutrition, very few (25%) knew about what is malnutrition while only 33.3% could understand the importance of addressing malnutrition during adolescence. Figure 1, also shows that although 80% of parents agreed to the importance of assessing nutritional status of their children regularly, nobody had knowledge about how to assess their child's nutritional status and BMI, Looking into the awareness level of parent's regarding causes of malnutrition, very few parent's could identify unhealthy dietary practices (36.7%), unhealthy home tiffin (33.3%), skipping breakfast (27%) and consumption of aerated drinks (25%). Hence, the following results indicate an importance of parent's participation in a school nutrition promotion programmes, as they are the people who can reinforce the healthy messages to children outside schools also. To initiate any school program in the school, about 53.5% agreed for a change in the school canteen while only 31.3% agreed for school meal program, indicating that counseling sessions should be organized for parents also to make them aware about the causes and consequences of malnutrition.

### Anthropometric and Biochemical Profile

Almost 3/4<sup>th</sup> of the study subjects were malnourished (78.9%), with only 21.1% of the subjects having normal weight. It is surprising to note that, subjects belonging to private school were more under weight (53.7%) than over weight and obese (25.2%). Table 1, also reveals that more than half (55.1%) of the subjects were anemic. This indicates presence of Triple burden of malnutrition. No significant difference was observed in the prevalence of malnutrition between girls and boys, although boys (26.9%) were found to be more over weight (including obesity), while more (58.5%) girls were under weight. More than half of the subjects were anemic, with girls being more anemic (58.2%) than boys (53.6%).

Central obesity as indicated by WC (9.0%) and WHtR (21.6%) was also observed to be high (Table 1). Almost same proportion of girls (8.9%) and boys (9.1%) had high waist circumference. However, high WHtR was present more in boys (24.0%) than in girls (17.1%). The results from Table 1, also revealed high percentage of adolescents being pre hypertensive (13.7%) and hypertensive (12.6%). No significant difference was observed in the prevalence of pre-hypertension and hypertension between girls and boys. More pre-hypertension was observed in boys (15.3%) while more girls (14.6%) were found to be hypertensive. Fasting blood glucose and lipid profile estimations were carried out for diagnosed overweight and obese subjects (n=62). Elevated fasting blood sugar (> 100 mg/dl) was detected in 6.5% of the study subjects (Figure 2). With respect to lipid profile, subjects who had at least one parameter altered were classified as dyslipidemic. According to ATP III and AHA classification for lipid profile, prevalence of dyslipidemia was 51.6% and 32.3% respectively (Figure 2). Though most subjects who were dyslipidemic had just one parameter altered (35.5% by ATP III and 25.8% by AHA), there were a few (16.1% by ATP III and 6.5% by AHA) with more than 1 parameter altered (Table 3). By both classifications, a higher percentage of adolescent girls compared to boys (59.1% v/s. 47.5% by ATP III and 45.5% v/s. 25.0% by AHA) were found to be dyslipidemic (Table 2).

**Table 1: Percent prevalence of malnutrition, central obesity and sub optimal blood pressures in adolescents of private schools of an Indian city.**

Nutritional status	Girls (n=123) % (n)	Boys n=242) % (n)	Total (N=365) % (n)
Normal weight	19.5 (24)	21.9 (53)	21.1 (77)
Over weight + Obesity	22.0 (27)	26.9 (65)	25.2 (92)
Under weight	58.5 (72)	51.2 (124)	53.7 (196)
Anemia	58.2 (71)	53.6 (128)	55.1 (199)
High WC	8.9 (11)	9.1 (22)	9.0 (33)
High WHtR	17.1 (21)	24.0 (58)	21.6 (79)
Prehypertension	10.6 (13)	15.3 (37)	13.7 (50)
Hyper tension	14.6 (18)	11.6 (28)	12.6 (46)
Sub optimal high blood pressure	25.2 (31)	26.6 (65)	26.3 (96)

**Table 2: Percent prevalence of dyslipidaemia in overweight and obese adolescent subjects of private schools of an Indian city.**

Parameter	GIRLS (n=22) % (n)	BOYS (n=40) % (n)	TOTAL (N=62) % (n)
ATP-III	59.1 (13)	47.5 (19)	51.6 (32)
AHA	45.5 (10)	25.0 (10)	32.3 (20)

According to Figure 3, irrespective of the nutritional status, anemia was present in more than half of the subjects. On the other hand, significant relationship was observed between central obesity and nutritional status (Figure 4). Over weight (including obesity) adolescents had significantly ( $p \leq 0.001$ ) higher central obesity as compared to normal subjects. Further, it was also observed, that subjects identified as over weight and obese were 17 & 14 times at risk of developing high WC & high WHtR respectively, than normal subjects.

Significant relationships were observed between sub optimal blood pressure and nutritional status (Figure 5). The prevalence of sub optimal blood pressure including hypertension was very high ( $p \leq 0.001$ ) in over weight (including) subjects as compared to normal weight subjects. However, only significant difference ( $p \leq 0.05$ ) was observed in the prevalence of pre -hypertension between normal and over weight (including obese) subjects. Further, comparing over weight (including obese) and under weight subjects, very high significant differences ( $p \leq 0.001$ ) were observed in the prevalence on sub optimal blood pressure, hypertension and pre – hypertension. Over weight (including obese) subjects were 12, 13 and 5 times at risk of developing sub optimal high blood pressure, hypertension and pre hypertension respectively than under weight subjects (Figure 5).

**Table 3: Percent prevalence of dyslipidemia as per the number of parameters altered in the overweight and obese adolescent subjects of private schools of an Indian city (n=62).**

NUMBER OF PARAMETERS ALTERED	ATP III		AHA	
	n	%	n	%
N	62			
1	22	35.5	16	25.8
2	9	14.5	3	4.8
3	1	1.6	1	1.6
TOTAL	32	51.6	20	32.3

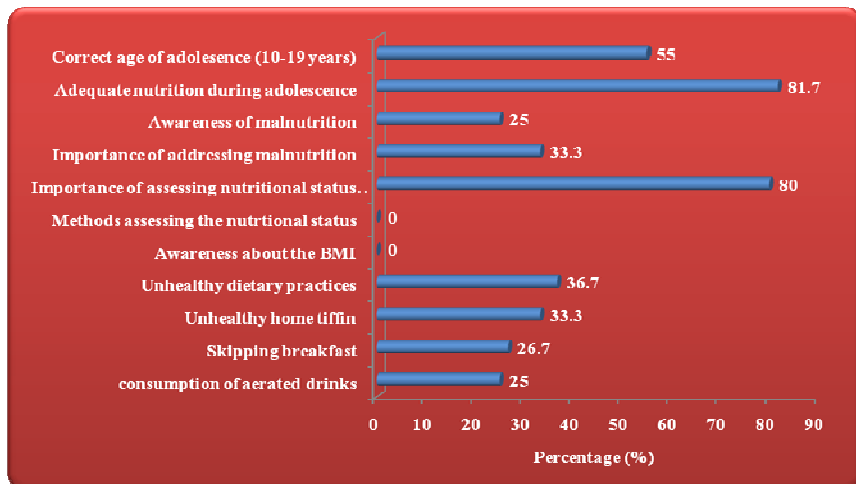


Figure 1: Knowledge Attitude and Practice of Parents Of The Study Subjects Of Private Schools Of An Indian City.

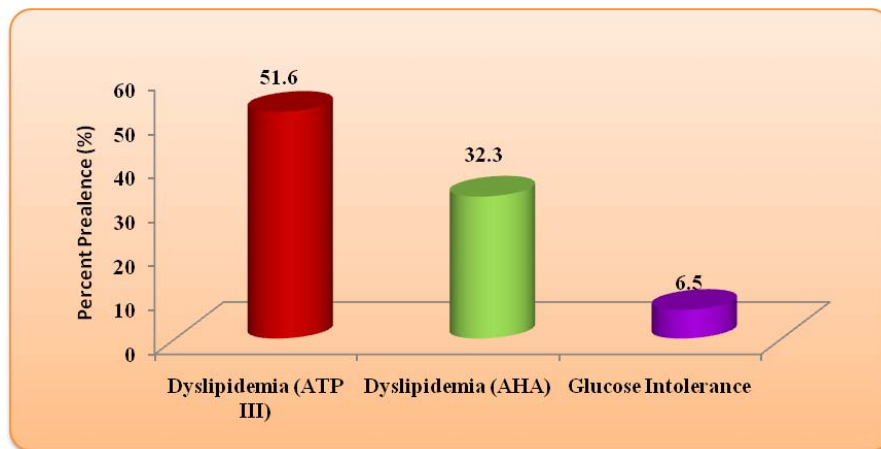


Figure 2: Percent prevalence of Dyslipidemia and Glucose Intolerance in over weight and obese adolescent subjects of private schools of an Indian city.

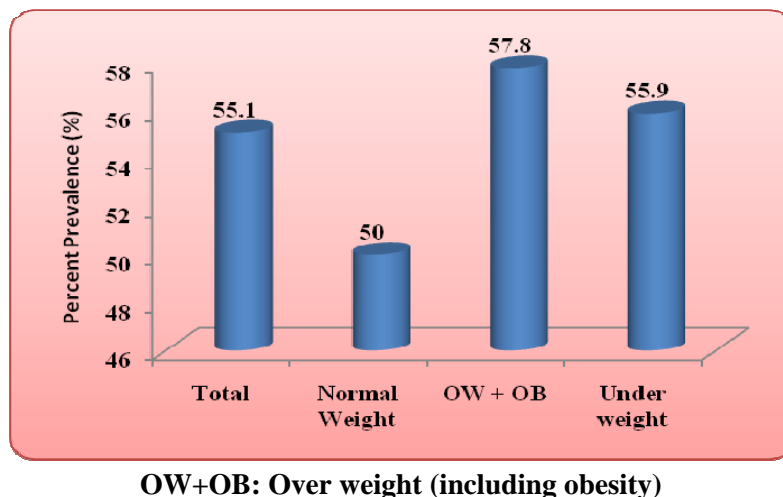
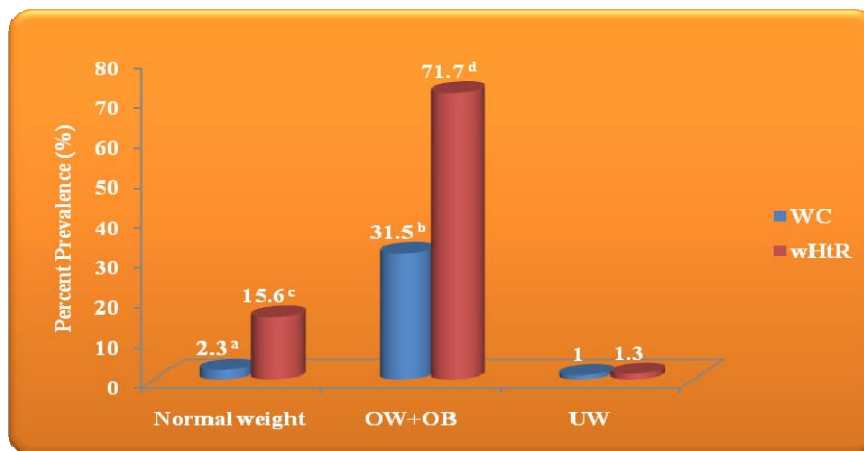


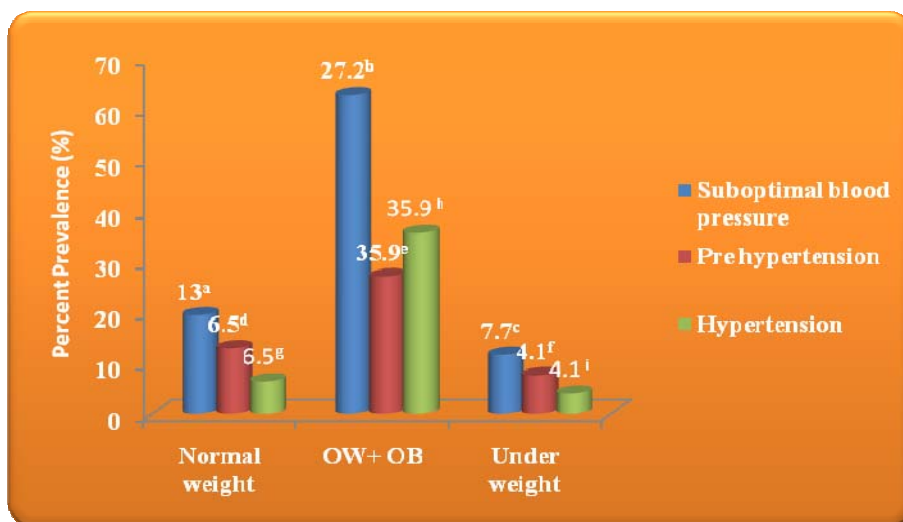
Figure 3: Relationship between presence of anemia and nutritional status of adolescent study subjects



OW+OB: Over weight (including obesity)

a vs b= 23.41 \*\*\* [OR: 17.26]; c vs d= 53.19 \*\*\* [OR: 13.75], \*\*\* p ≤ 0.001

Figure 4: Relationship between central obesity and nutritional status of adolescent study subjects



OW+OB: Over weight (including obesity) Cut off values for hypertension in children and adolescents:

Normal: <90<sup>th</sup> percentile, Pre hypertension: ≥ 90<sup>th</sup> to <95<sup>th</sup> percentile, Stage I: ≥95<sup>th</sup> to 99<sup>th</sup> percentile, Stage II: >99<sup>th</sup> percentile

a vs b: 32.42\*\* \*, b vs c: 81.54 \*\*\* (OR: 12.83), a vs c: 2.77, d vs e: 5.14\*, e vs f:19.95 \*\*\*, d vs f: 1.89, g vs h: 20.75 \*\*\*, h vs i: 51.82\*\*\* (OR: 13.14), g vs i: 0.71 \* p ≤ 0.05 \*\* p ≤ 0.01 \*\*\* p < 0.001

Figure 5: Relationship between sub optimal blood pressure and nutritional status of the study subjects

**DISCUSSION**

The observations made in the present study showed that, the school authorities did not have a say in the canteen menu, resulting in rampant and unchecked consumption of unhealthy, high energy dense foods and beverages as corroborated by the sales trend data from sales trend data in results section of the school canteen. Similar results of consumption of unhealthy, energy dense foods by the school children on the school campus was also reported by various studies (Marwah, et. al., 2012; Laxmaiah, et.al., 2007).

Considering that a school canteen is one of the first places outside home which largely influences a child's food choices, a healthier approach here might become a primary step towards eliminating the danger of children getting used to high trans-fat, sugary and pre packed foods – the main pre disposers to malnutrition in this age group. Also since teachers and peers can influence adolescent food choices, probably a planned nutritious school meal program may help adolescents to follow healthy food choices. However, the parent's response for such activities in school was not very good as only 30% agreed to initiate a noon meal program, suggesting that probably mandatory healthy school meal programme may be necessary.

Teachers remain the primary providers of information to children who can effectively impart nutritional education. In the present study, knowledge of teachers, pertaining to "healthy diet" particularly, was found to be inadequate and hence they were likely to pass-on incorrect information or model unhealthy dietary behaviours probably unintentionally. However, since their own knowledge about healthy dietary and lifestyle behaviours is limited, it will be prudent to build capacity of teachers in these areas or have these included in the science curriculum for them to become role model for students (Evans, et.al., 2005). However, since their own knowledge about healthy dietary and lifestyle behaviours was very limited, it will be necessary to build capacity of both teachers and parents in the area of prevention and control of malnutrition or have them included in the science curriculum. Surprisingly, the study revealed that, less than a quarter (21.1%) of the adolescents, from private schools, had normal BMI, indicating large percentage of adolescents being malnourished (either under weight or over weight including obesity). Also it was very surprising to find that more than half (53.7%) of adolescents from private schools were under weight than over weight (25.2%), contrary to the hypothesis that under weight is prevalent in underprivileged children. Hence, we observed coexistence of under weight and over weight (including obesity) and iron deficiency anemia irrespective of nutritional status among adolescents in the same population from private schools. This finding substantiates with other studies reported on coexistence of dual burden of malnutrition existing among adolescents from private schools (Jeemon, et. al., 2009; Iyer, et. al., 2009).

Although, no significant difference in the prevalence of malnutrition between the two genders was observed, boys were more over weight and obese than girls, who were found to be more under weight than boys, which corroborates well with other findings also (Goyal, et. al., 2010; Opara, et. al., 2010). WHO recommends that above 40% prevalence of anemia in population should be considered as a public health problem. In this study very high (55.1%) percentage of adolescents were found to be anemic. This prevalence of anemia corresponds to the national prevalence of 56% as indicated by NFHS III data and is higher than the prevalence (52.8%) among adolescents from government aided school. Anemia prevalence was higher in girls than boys and was supported by another study also (Sugandhani et. al., 2011). Addressing central obesity issues to prevent the occurrence of NCD risk factors so early in life is also extremely important as, it was present in 9.0 % to 22% of the adolescents as indicated by WC and WHtR in the present study. A high central obesity in school children has earlier been reported (7.1%) by Mishra, 2011.

A very high percentage of sub optimal high blood pressure (26.3% ) in adolescents as shown in the present study is disheartening, although bigger trials on assessing the burden of sub optimal blood pressure in school children, especially adolescents is required. However, high burden of sub optimal blood pressure in adolescents has been reported earlier though at lower levels (3-10%) than the present study (Durrani & Wasim, 2011; Verma & Singh, 2012; Narayanappa, et. al., 2012; Khan, et. al., 2010).

It is an alarm bell for school authorities and parents as unhealthy diets and stress of achieving high grades probably take a toll on young minds who find it difficult to cope up with school pressure, parental & teacher expectations etc. Also the study showed that overweight and obesity was a significant risk factor for developing sub optimal high blood pressures, it is important that low salt and higher intake of fruits and vegetables with promotion of physical activity is promoted in all settings including schools and has been recommended by WHO 2012 for controlling NCD in populations (Mehan, et.al., 2012). The role of teachers and parents in shaping healthy behaviours in their children especially adolescents can not be undermined, their sensitization and modeling of healthy behaviours is also necessary. For this it is important to initiate media programs and probably include health and nutrition guidelines in all teaching curriculums of schools and universities as it is important to make our population as a whole nutrition & health literate, if we want to tackle the huge burden of non communicable diseases affecting our nation.

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