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Original Research Article

Association of Body Mass Index and Lifestyle Variables among Adolescent in Urban Jammu

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ABSTRACT

Background: Lifestyle diseases among adolescents have both immediate and long term harmful consequences that have been identified as a major health concern for disease control and prevention. Lifestyle factors especially eating habits, physical activity and body mass index appear to influence the accumulation of fat, which in turn relates to the development of major and conditional NCD risk factors.
Objectives: Determine the physical activity, dietary intake and BMI and compare with standardised values for any deviation.
Methods: Sample of the study comprised 400 school going adolescents (divided equally across gender) of urban area of Jammu city. Multistage sampling technique was used to select the sample. The tools used for the study included anthropometric measurements, 24 hour dietary recall method , seven day Global physical activity questionnaire developed by WHO and socio economic status scale.
Results: The sample adolescents were short in their height when compared with standard height for age. Even when compared for weight, majority among sample adolescents were underweight. Respondents were consuming less calories than standard recommended dietary allowances and skipped one of their basic meal especially breakfast.
Conclusion: The high prevalence of sedentary lifestyle, physical inactivity and unhealthy eating habits among adolescents is a major public health concern. There is an urgent need for national policy promoting active living and healthy eating and reducing sedentary behaviours among children and adolescents at national, state and school level.

Keywords: adolescent, urbanisation, lifestyle change, food habits, BMI, peer pressure

INTRODUCTION

Adolescents are a nutritionally at risk group for a number of causes, including their requirements for growth and metabolism, their eating patterns and lifestyles and their susceptibility to environmental factors. In the fast changing social scenario, characterized by globalization, major changes in family structure and increased access to technology, health status of young population is a matter of concern in the present times. Sedentary lifestyle coupled with inappropriate eating habits are largely responsible for this state of affairs among young children. Non Communicable Diseases are related with lifestyle and behavioral patterns, which largely are result of practices adopted from young age itself. Unhealthy diets and physical inactivity are key risk factors in development of non communicable diseases (Waxman, 2004). Dietary habits have been reported to be associated with development of

hypertension (Appel *et al*., 1997). Studies have also shown that cardiovascular diseases accounted for 14.5% of all deaths in 2005 (Pechere-Bertschi et al., 2005). It is well known that non communicable diseases especially cardio vascular diseases develop from cardiovascular risk factors such as unhealthy BMI, hyperglycemia, hypertension and hyperlipidemia (Pechere-Bertschi et al., 2005). These lifestyle-related risk factors and their correlation with various lifestyles non communicable diseases has been reported by several studies (Nakanishi et al., 2005). Even irregularity of meals, such as breakfast skipping, is associated with overweight and obesity in kids and teens (Rampersaud et al., 2005). Non communicable diseases (NCDs) and their associated risk factors have emerged rapidly and are becoming a major public health challenges worldwide (WHO.,2013). It is well established that the co-existence of two or more risk factors is associated with increased risk of developing NCDs than would be expected on the basis of the sum of the separate effects (Khawaja et al., 2011). The world health organization has already warned of increasing NCDs among adolescents as a major public health problem (Michaud et al., 2007). The importance of this age group also lies in the fact that many serious diseases in adulthood have their roots in adolescence (WHO, 2010). High fat convenience foods such as French fries and inexpensive high calorie foods such as muffins and potato chips are thought to contribute to the increased prevalence of overweight status in youth (Yensel et al., 2004). Furthermore, there are few opportunities and little encouragement for youth to be physically active to counterbalance the excess calories and fat consumed from foods and beverages. Fewer students are attending daily physical education classes, and walking or cycling to schools (Lowry et al., 2005). Youth today are largely physically inactive and aerobically unfit. Earlier, increased prevalence of NCDs was experienced in developed countries but now it is increasing in developing countries like India because of the epidemiological transition and adoption of western life-style like low physical activity, high energy food consumption and substance abuse even among rural population (Gupta and Gupta, 1996).

The present research has been undertaken to study interrelation between body mass index and selected lifestyle variable among adolescents residing in Jammu city of J&K state. This study is expected to provide data regarding the health risks and associated risk factors among adolescents of Jammu and suggest viable solutions for the problems being faced by them. The research is also envisaged to provide requisite data for ICMR –WHO collaborative initiative on NCD risk factor surveillance, to develop the strategy and modules for undertaking NCD risk factor surveillance at Jammu district level.

RESEARCH METHODOLOGY

The sample of the study comprised of 400 adolescents (divided across the gender) falling in age group of 16-18yrs and residing in urban Jammu. Sample adolescents were selected from various CBSE schools of urban areas of Jammu city through multistage sampling.

The following criteria were considered for the sample selection:

1. Only respondents from urban areas of Jammu district were selected for the study.
2. Respondents between the age group of 16-18years were included in the sample.

Respondents who fall in the SES group (high and middle income) were selected.

Tools used

1. Assessment of body mass index

- Anthropometric measurements including height, weight and BMI (Qutlet index). The calculations were compared with WHO (2010) standard.

2. Assessment of selected lifestyle variables

- 24 hour recall method (dietary intake) – An informal, qualitative method in which you ask to recall all of the foods and beverages that were consumed in the last 24 hours, including the quantities and methods of preparation. An advantage of this method is that dietary information is easily obtained. It is also good during a first encounter with new subjects in which there is no other nutritional data. Subjects should be able to recall all that they have consumed in the last 24 hours.
- 7-day global physical activity questionnaire developed by WHO (2002) – The global physical questionnaire was developed by WHO for physical activity surveillance in countries. It collects information on physical activity participation three settings or domains and sedentary behavior.

RESULTS AND DISCUSSION

The data collected from sample adolescents (16-18yrs) of Jammu district was analyzed and presented with the help of tables under the following headings:

1. Anthropometric measurements of the sample group
2. Eating Habits among sample group
3. Level of Physical activity among sample adolescents
4. Association of BMI and lifestyle variables

Anthropometric measurements of the sample group

Anthropometry term is derived from greek word 'anthropos' means human and 'metron' means measure (https://en.wikipedia.org/wiki/Anthropometry#cite_note-1, retrieved on 28-3-16). Anthropometry involves the systematic measurement of the physical properties of the human body, primarily dimensional descriptors of body size and shape (Ariful et al., 2001). Modification in lifestyles, nutrition, and ethnic composition of populations lead to changes in the distribution of body dimensions, and require regular anthropometric checkups.

Table 1: Anthropometric Characteristics of Sample Adolescents

Anthropometric Measurements	**Pooled group (400)**	
	Girls With regard to Std values $\bar{x}\pm\sigma$	Boys With regard to Std values $\bar{x}\pm\sigma$
Height (NCHS Average Value , 2010) G:163cms B: 176cms	**160±8.73 t:259.11** p: 0.00**	**172±8.00 t:303.45** p: 0.00**
Weight (NCHS Average Value) G:64kgs B: 74kgs	**55.54±11.70 t:60.31** p:0.00**	**62±10.61 t:82.97** p:0.00**
BMI (ICMR) 18-24.9	21.74±4.10	21.08±3.03

Table 1 reveals anthropometric characteristics of sample adolescents and shows their comparison with National Center for Health Statistics (NCHS, 2010). It was evident from the obtained data that the sample (pooled group) adolescent girls and boys were having mean height as 160cms and 172cms respectively, which was less than their standard height as per age (NCHS norms). Even with regard to standard weight, the sample girls and boys were having less weight as per age. The results were found highly significant when analyzed statistically. The mean BMI was 21.74 and 21.08 for girls and boys respectively, which was under normal BMI category (18-25).

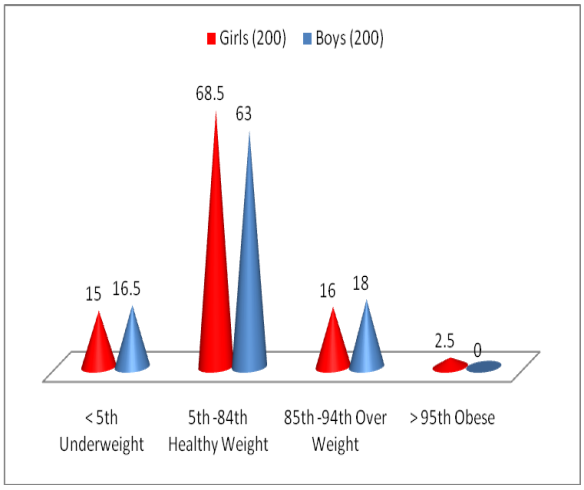

Figure 1: Body Mass Index (percentiles) for Age among Sample Adolescents

Figure 1 throws light on BMI percentiles of sample adolescents. It was observed that 15% of girls and 16.5% of sample boys were underweight. Even 18% sample boys and 16% girls were found to be overweight. It was seen that 2.5% sample were girls were obese. No sample boy was found to be obese.

Eating Habits among sample group

Daily macro nutritional intake

In India, the first attempt to define nutrient requirements and desirable dietary intakes of nutrients for Indians to maintain good health was made by the Nutrition Advisory Committee of the Indian Research Fund Association [Now Indian Council of Medical Research (ICMR)] in 1944 (National Academy of Science, 1989 cited from Misra et al., 2011). It is well recognized that nutritional status is a key determinant of health among youngster and there is no doubt regarding the importance of the study of nutritional status (NFHS2, 2000). This section presents macro nutrient intake per day by sample groups.

Table 2: Comparison of daily macro nutritional intake of sample adolescents with standard ICMR norms

Nutritional intake per day (kcals)	**Pooled group (400)**	
	Girls With regard to Std values $\bar{x}\pm\sigma$	Boys With regard to Std values $\bar{x}\pm\sigma$
Calories RDA Girls : 2440 Boys : 3020 (ICMR, 2011)	**1694.68±429.95 t-24.51** p-0.00**	**1715±381.75 t-48.32** p-0.00**
Carbohydrates (CHO) RDA Girls :475.75g Boys : 581g (ICMR, 2011)	**232.08±66.02 t-52.19** p-0.00**	**254.86± 48.72 t-94.65** p-0.00**
Proteins RDA Girls : 55.5g Boys : 61.5g (ICMR, 2011)	**96.75± 30.22 t-19.30** p-0.00**	**106.19± 18.85 t-33.53** p-0.00**
Fat (visible) RDA Girls : 35g Boys : 50g (ICMR, 2011)	**41.46± 16.49 t-5.54** p-0.00**	**39.44± 10.02 t-14.88** p-0.00**

Table 2 depicts the comparison of macronutrient intake of sample teens on daily basis with Indian Council of Medical Research (ICMR, 2011) norms. It was observed that sample boys and girls were consuming less calories and carbohydrates than RDA where as intake of protein and fat was more in sample adolescents. This could be because of more intake of junk food and protein drinks (especially in boys). Overall boys consumed more calories, carbohydrates and proteins than sample girls whereas sample girls consumed more fats than sample boys from pooled group. Statistically significant difference was found for macro nutritional intake among sample adolescents when compared with standard RDA values.

Level of Physical activity among sample adolescents

Table 3: Frequency Distribution of Sample Adolescents according to their Physical activity levels (PALs)

PAL/WEEK	**Pooled group (400)**	
	Girls n	Boys n
Vigorous	5 (2.5%)	14 (7%)
Moderate	38 (19%)	91 (45.5%)
Sedentary	157 (78.5%)	95 (47.5%)

Inter gender difference

χ^2:41.29, p-value: 0.00**

Table 3 throws light on physical activity levels (PALs) per week among sample adolescents. It was observed that more than half of the sample girls (pooled group) were following sedentary lifestyle. Girls from both the groups were predominately less physically active than their boys counterparts. 19% sample girls were involved in some type of physical activities like cycling, walking, recreational activities, domestic activities on regular basis. Only few sample girls (2.5%) were involved in sports activities which demands regular practice and workout. It was seen that 47.5% sample boys (pooled group) were less physically active where as 45.5% sample boys were having moderate activity levels. Very few adolescents were involved in vigorous physical activities. 7% sample boys were going to gym regularly and involved in sports activities. There was

significant difference in PALs between sample boys and sample girls from pooled group. This may be attributed to more involvement of boys in sports and gym activities and confinement of girls to indoor premises.

Association of BMI and lifestyle variables

Nutritional status is an important element of physical and mental health for all age groups (WHO, 2000). Non communicable diseases have been linked with poor nutritional status in the elderly which have its roots in childhood and adolescent stage (Payette et al., 1995).

(a) BMI and Eating habits

Good nutrition and dietary habits are most potent lifestyle factors affecting health and wellness of an individual. Food habits are largely result of food choices, peer group pressure, cultural factors and beliefs as well as geographical location and climatic changes of the area. The trend has been seen to be transmitted from one generation to another (Serra et al., 2003).

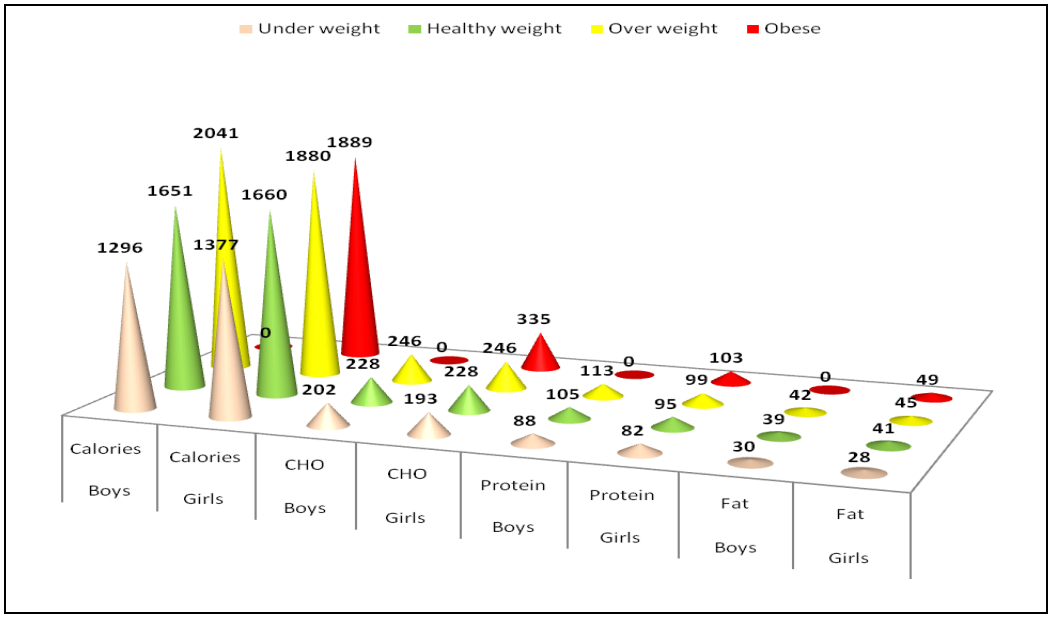

Figure 2: BMI and eating habits among adolescents

Table 4: Overall Association of BMI and Macro nutritional intake among adolescents (pooled group)

BMI	Calories r/p value	CHO r/p value	Protein r/p value	Fat r/p value
Girls (200)	**0.40**/0.00**	**0.62**/0.00**	0.11/0.24	**0.24*/0.02**
Boys (200)	**0.42**/0.00**	**0.43**/0.00**	**0.23*/0.02**	**0.41**/0.00**

Figure 2 represents BMI and macro nutritional intake among pooled group. It was observed from the figure that diet intake increased with increase in BMI. It was also evident from the figure that girls under healthy weight category were consuming approximately equal calories than boys in that category but in other categories of BMI boys were consuming more calories than girls. Statistically (table 4) it was found that correlation between nutritional status and nutrient intake (macronutrients) was significant among both girls and boys.

(b) BMI and Physical activity levels

Physical activity is a key factor in maintaining healthy weight status because of its potentially major impact on body composition, metabolism, and increasing energy expenditure (Nowicka, and Flodmark, 2007). Participating in regular physical activity has many beneficial physiological outcomes like increased bone mineral density, cardiorespiratory capacity, muscular strength and endurance, as well as flexibility (Fraser-Thomas et al., 2005). Decrease in physical activity has been associated with an unhealthy weight status in adolescents. Increased sedentary behaviors, like television watching and

computer/video game time, have been hypothesized to have a positive relationship with overweight and obesity in adolescents (Shields, 2006).

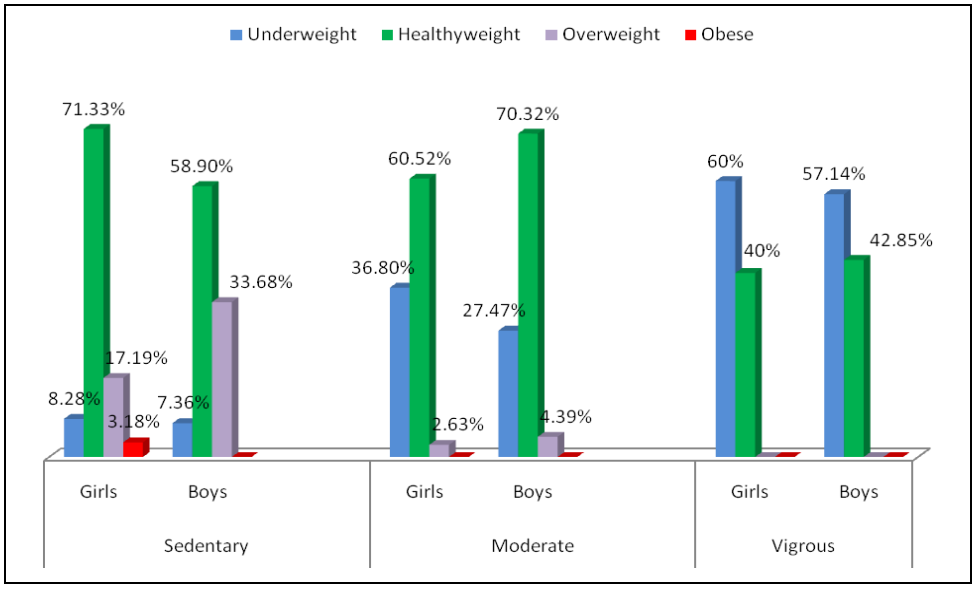

Figure 3: Association of BMI and Physical activity levels (PALs) among Sample adolescents (Pooled group)
BMI and PAL among sample girls(Pooled group) r: -0.29, p: 0.00**
BMI and PAL among sample boys(Pooled group) r: -0.40, p: 0.00**

Table 5: Comparison of present findings with other studies

Present research	Previous researches		
	Author	Place of study	Findings
Association of BMI and Eating Habits among adolescents Correlation was found positive and significant between BMI and eating habits, which indicated that BMI was influenced by eating habits among sample adolescents.	Sabeta and Wein (2010)		Studies exploring the risk of overweight due to food groups and dietary patterns indicate that a plant-based diet seems to have positive approach for the prevention of obesity in children.
	Choudhary et al. (2010)	Varanasi, India	In one study done on dietary pattern and nutrition related knowledge of adolescent girls, it was found that majority of girls were vegetarians and consuming diet less than RDA.
	Perry et al. (2001)	Minnesota	Only 6% of sample adolescent boys were found to be vegetarians.
Association of BMI and Macro nutritional intake It was observed that underweight and healthy weight sample teens from both the groups across gender were found to consume less calories than teens from overweight and obese group. It was observed from data that with increase in calories, carbohydrate intake, fat and protein intake, BMI was found to increase.	Pinho et al. (2014)	Brazil	Study showed that adolescents (11-17 yrs), who consumed more junk food and unhealthy diets were either overweight or obese.
	Vaida (2013)	Kashmir	The main causes of obesity found among school children were decreased physical activity, increased levels of calorie intake and sedentary life style. Mostly the children from high socio-economic group were found to be more obese because of their sedentary life style and increased food intake levels.
Association of BMI and physical activity levels Majority of sample girls in healthy weight category, all obese and overweight girls were having sedentary lifestyle whereas few girls in healthy weight category and majority of girls in underweight category were active in their lifestyle. Sample boys were also following the same trend but were more active in all categories of BMI against sample girls of their age. Statistically, it was also evident that correlation between BMI and physical activity levels was found significant.	Kimani-Murage et al. (2011)	Kenya	It was shown that the increase in female sedentary time with age, especially during adolescence, increases the chances of obesity
	Hallal et al . (2006)	Brazil	There was high prevalence of physical inactivity among adolescents, 58.2% of them reported practicing fewer than 300 minutes/week of physical activity.
	Koezuka et al. (2006); Shields (2006)	Canada California	Studies reported that there is a positive relationship between sedentary lifestyle especially low physical activity and more sitting hours (i.e. time spent watching television, playing video games, and/or using the computer) and BMI

Figure 4.4.3 reveals BMI and over all physical activity levels of sample adolescents (Pooled group). It was evident from the bar graph that majority of sample girls in healthy weight category, all obese and overweight girls were having sedentary lifestyle whereas few girls in healthy weight category and majority of girls in underweight category were active in their lifestyle. Same trend was observed in sample boys of both groups. Contrary to sample girls, sample boys were more active in all categories of BMI. Statistically, correlation between BMI and activity levels was found significant but negative for both boys and girls (from pooled group) which indicated inverse relationship between the two variables.

Concluding Comments

The increase in the burden of lifestyle disease associated with dietary and physical activity changes is of growing concern. The BMI has been found to be an indicator of nutritional status. The table 5 provides details of major findings of present paper and other previous data available.

SUGGESTIONS AND IMPLICATIONS

The following broad based suggestions were evolved on the basis of the present study:

- Health education regarding dietary habits and sedentary life style should be given to adolescents, parents and teachers.
- More school based intervention programs should be made to make students aware of NCDs and healthy lifestyle. Curricular changes should be made to inculcate Regular exercise or games. Awareness activities focusing on health risks should be part of school curriculum.
- More intervention modules should be developed focusing on healthy lifestyle.
- Mass media should get involved in educating people about healthy lifestyle and health risks associated with unhealthy lifestyle.
- More health programmes focusing on health risks and lifestyle among adolescents should be done by Government agencies and NGOs.

The change in lifestyle should be taken under small steps so that the family could accommodate and appreciate them .The provision of additional clinical services should be provided which includes access to dieticians family, psychologist who specialized in nutrition, physical activity and health.

Implications of the study

- Data can be used by Policy makers and policy planners for framing health related policies.
- As research is focused on lifestyle variables and health status, results obtained in study can be used by different Government agencies and NGOs for suitable welfare measures.
- Data can be utilized for future research on the different parameters (like eating habits, physical activity and health status, prevention of UTI symptoms in adolescents) of study.

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