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PREVALENCE OF OBESITY AMONG ADOLESCENT BENGALI GIRLS AGE RANGED BETWEEN 12 AND 14 YEARS

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ABSTRACT ■ The prevalence of obesity has been increased dramatically in past few decades in both developed and developing countries. Obesity turned into epidemic and became a public health challenge throughout the world. According to WHO reports, 340 million children and adolescent aged 5-19 were overweight or obese in 2016. In developing countries such as India, especially in urban populations, childhood obesity is an emerging context. Indian data regarding current trends in childhood obesity are emerging. A study conducted among 24,000 school children in South India showed that the proportion of overweight children increased of the total students in 2001 to 2005 demonstrating the time trend of this rapidly growing epidemic (Chhatwal et al., 2004). Another study from northern part of India reported a childhood obesity prevalence of obesity in the higher socio economic strata compared to the lower socio economic strata (Marwaha et al.,2006). Studies from metropolitan cities in India have reported a high prevalence of obesity among affluent school children (12 to 14 years). Despite National representative data for childhood obesity in India being unavailable, some studies carried out in some metropolitan cities has shown that the prevalence of obesity is significant. The children in developing countries like India are presently suffering from the double jeopardy of malnutrition – urban children are afflicted with the problems of over nutrition and the slum children from under nutrition (Information provided by the "Central of dieses control & prevention") (Marwaha et al., 2006). For this present context the present study participants who were invited from the selected two schools, were in the grade between 7th and 9th standard and between the age range 12 and 14 years. Many studies document that children from certain ethnic groups are more likely than other children to be overweight. As noted, data from National Health and Nutrition Examination Surveys showed that developing countries and lower-income children have a higher incidence of obesity than children overall. Using data from the National Longitudinal Survey of Youth, Strauss and Pollack (2001) demonstrates that ethnic group and family income affected the overweight tendency as well as also documents regional differences. The Avon Longitudinal (Reilly et al., 2005) study demonstrated that the odds of children aged 7 becoming obese because of heredity. For this context as it is the hometown, the readily available Bengali population and urban population were selected. In view of these following contexts, the present study was undertaken to estimate the prevalence of obesity among a group of urban living adolescent girls who were Bengali by ethnicity and its associated factors, which includes socio-demographic variables and anthropometric measurements. The present study influenced by all these studies aimed to see if there is really a connection exists between obesity and other selected factors such as, age of the participants at the time of interview, monthly family income to categorize the family and father's occupational type and anthropometric measurements such as: anthropometric measurements were taken on the participants following standard protocol (Lohman et al., 1998) - height

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(cm), weight (kg), waist circumference (WC) (cm), and hip circumference (HC) (cm). Weight was measured by the weighing machine (the weight of dress is neglected), standing height was measured by the anthropometric rod. BMI for each participant was calculated using the formula (kg/m ^ 2). Waist circumference (WC) and hip circumference (HC) were measured using a non-stretchable measuring tape. WC was measured at the minimum circumference between the iliac crest and the rib cage. HC was recorded at the maximum circumference over the buttocks.

The authorities of all the educational institutes from the selected area (Barasat, N 24 PGS) were approached to apprise them about the nature and objective of this research project. A sample questionnaire was provided to all the institutional heads for their perusal and consent. Finally, the authorities of two (2) senior secondary schools (Bengali medium) allowed me to conduct the field work in their institutes. The schools were 'Barasat Girls' High School and 'Pranabananda Ashrom Balika Vidyalaya'. Study participants who were invited from the schools, were in the grade between 7th and 9th standard and between the age range 12 and 14 years. Objectives of the study were explained and written consent was taken from all the participants who volunteered to participate in this study and after that the total sample size for this study was 202 girls from these two schools. The data were collected during the month of May 2016. The information was collected with standard questionnaires. Out of 202 participants, 49 were of age 12 year old, 43 were of 13 year old and rest was of 14 year old. The study participant shows that there were 83.87 % were non-obese and only 16.13 % were obese when 12 years old girls were considered. Similarly 83.71% girls of age 13 years were observed non-obese and the rest were obese (16.27%). Very similar trait was observed when 14 years old girls were considered where 84.15% were non-obese and 15.84 % were obese. The mean and SE of BMI for 12 years old girls was 22.8 (±5.4) kg.m^{-2}, for 13 years old; it was 21.3 (±2.8) kg.m^{-2} which was very similar with 14 years old girls of 21.4 (±2.5) kg.m$^{-2.}$ The frequency of central obesity (on the basis of Waist-Hip ratio) increases according to age of the participants. The present study provides information on the prevalence of general and central obesity among participants aged between 12 to 14 years. Age, fathers' occupation and monthly family income may have played a role on prevalence of obesity among the participants. Obesity in adolescents and children has raised to significant levels globally with serious public health consequences. In addition to emotional and social issues, it poses a serious hazard to the basic health care delivery system. Unless this epidemic is contained at a war footing, the implications of this global phenomenon on future generations will be serious. The reversibility of this disease with suitable intervention strategies should be seen as an opportunity and efforts pursued with vigor.

Key words: Adolescent girls, Obese, Non-Obese, BMI, Waist-Hip ratio

INTRODUCTION

Obesity turned into epidemic and became a public health challenge throughout the world. In past few years, the prevalence of obesity has been increased significantly across the world no matter whether it is a developed or developing or underdeveloped country. According to World health Organization, more than 1.9 billion adults aged 18 or older were reported overweight. Of these, over 650 million were obese. 39% of adults aged 18 year and over were overweight and 13 % were obese in 2016 according to WHO report. 41 million children under the age of 5 were overweight or obese, whereas 340 million children and adolescent aged 5-19 were overweight or obese in 2016. Once considered to be a high-income country problem, overweight and obesity are now on the rise in low and middle income countries also, particularly in urban settings (William 2008, WHO 2012, 2016, Adhikari 2014, Anthony et al., 2001).

Worldwide, obesity has become a serious public health concern. It is well documented that obesity is an independent risk factor for various cardiovascular health problems like, hyperlipidemia, hyperinsulinemia and hypertension, thereby significantly increasing the risk of morbidity and mortality. Many co-morbid conditions like metabolic, cardiovascular, psychological, orthopedic,

neurological, hepatic, pulmonary and renal disorders are seen to be associated with childhood obesity. Thus, the last two decades have witnessed an increase in health care costs due to obesity and related issues among children and adolescents (Kosti and Panagiotakos, 2006). The treatment of overweight and obesity in children and adolescents requires a multidisciplinary, multi-phase approach, which includes dietary management, physical activity enhancement, and restriction of sedentary behavior, pharmacotherapy and bariatric surgery (Manu and Krishna, 2010).Over the past two decades, the share of children who are considered overweight or obese has doubled, from 15 percent in the 1970s to nearly 30 percent today, while the share of children who are considered obese has tripled (Jeffrey et al., 2005). In developing countries such as India, especially in urban populations, childhood obesity is an emerging context. Indian data regarding current trends in childhood obesity are emerging. A study conducted among 24,000 school children in South India showed that the proportion of overweight children increased from 4.94% of the total students in 2001 to 6.57% in 2005 demonstrating the time trend of this rapidly growing epidemic (Chhatwal et al., 2004). Another study from northern part of India reported a childhood obesity prevalence of 5.59% in the higher socio economic strata compared to 0.42% in the lower socio economic strata (Marwaha et al., 2006). Studies from metropolitan cities in India have reported a high prevalence of obesity among affluent school children (12 to 14 years). Despite National representative data for childhood obesity in India being unavailable, some studies carried out in Chennai and Delhi has shown that the prevalence of obesity is 6.2% & 7.4% respectively. The children in developing countries are presently suffering from the double jeopardy of malnutrition – urban children are afflicted with the problems of over nutrition and the slum children from under nutrition (Information provided by the "Central of dieses control & prevention") (Marwaha et al., 2006).

In 2004, the Institute of Medicine released a report calling the prevention of childhood obesity a national priority. The 'epidemic' of childhood obesity has been attributed to various factors by different researchers: increase time in television viewing and computer game use that have led to a new generation of "couch potatoes"; the explosive proliferation of fast-food restaurants, many of which market their products to children through media campaigns that tout tie-ins to children's movies and TV shows; increase in sugary and fat-laden foods displayed at children's eye level in supermarkets and advertised on TV; schools that offer children junk food and soda while scaling back physical education classes and recess; working parents who are unable to find the time or energy to cook nutritious meals or supervise outdoor playtime; the exodus of grocery stores from urban centers, sharply reducing access to affordable fresh fruits and vegetables; and suburban sprawl and urban crime, both of which keep children away from outdoor activities (Yancey et al., 2007). Consumption of fast food is one of the common factors of childhood obesity. Cross-sectional studies have established that individuals consuming fast-food can cause childhood obesity. Such a finding, however, does not guarantee that children consuming more fast food will be more likely to be overweight (Lin et al., 2007). Studies show that (Phillips et al., 2004) individual consuming fast-food meals may contribute to childhood overweight. In a simple cross-sectional study comparing obese

and non-obese adolescents, Bandini and several colleagues (2000) find that energy intake from snacks is similar for both obese and non-obese groups. They conclude that obese adolescents eat no more 'junk' foods than non-obese adolescents, and thus the former's source of energy imbalance must lie elsewhere. A recent long-term study by Phillips and colleagues (2004) comes to a similar conclusion.

The other, equally important side of the energy balance equation is energy expenditures, both through physical activity and through dietary thermogenesis and the basal metabolic rate (BMR). Dietary thermogenesis refers to the energy required to digest meals and basal metabolic rate refers to maintain the resting body functions. The basic physiology of weight change is well understood and it states that weight is gained when energy intake exceeds energy expenditure. So the sedentary lifestyle in urban children e.g. lack of physical activity may have taken a toll on their health as the energy intake exceeds the energy expenditure and BMR plays a vital role in that (60% of energy in human body used for BMR). Several studies examine whether a low BMR is responsible for overweight in children (Leanne L. Birch, 1986).

One reason why researchers have difficulty proving that physical activity affects BMI may be that BMI is a potentially poor measure of adiposity in the presence of significant lean muscle mass. A study of twelve-year-old French children bears out this hypothesis (Klein-Platte et al., 2005). Looking at both BMI and waist circumference, researchers found that physical activity is linked with smaller waist circumference for both boys and girls but with lower BMI only for girls (Berkley et al., 2003).

Researchers have found much stronger links between sedentary activities, especially television viewing, and overweight and obesity (Ghosh and Nag 2015). Television watching may affect body weight in several ways; 1st it may squeeze out the physical activity, 2nd television advertises may increase children's desire for and ultimately their consumption of energy dense snack and less physical activity. So, this entire process may lead to obesity.

Interestingly, it has been observed that computer use, reading, and homework time are associated with higher levels of physical activity (William and Gortmaker, 1985). For example, Dietz and Gortmaker(1985) produced the canonical study on television's role in childhood obesity, finding that each additional hour of television viewing per day increased the prevalence of obesity by 2 percent. Klesges et al. (1993) even concluded that children's metabolic rate was lower while watching television than while at rest.

Many studies document that children from certain ethnic groups are more likely than other children to be overweight. As noted, data from National Health and Nutrition Examination Surveys showed that African American and lower-income children have a higher incidence of obesity than children overall. Using data from the National Longitudinal Survey of Youth, Strauss and Pollack(2001)demonstrates that both African-American and Hispanic children are more likely to be overweight than white non-Hispanic children. They also found a negative relationship between income and rates of overweight among whites only; the relationship for Hispanics is insignificant; and for African Americans, slightly positive. The study also documents regional differences, with children in the South and the West most likely to be overweight. There was no significant difference between rural and urban children, although a recent study in

Pennsylvania found nearly 20 percent of seventh graders from rural districts to be overweight compared to just 16 percent from urban districts.

One other repeatedly analyzed characteristic—having been breast-fed as an infant—does not clearly line up with the energy balance equation. Beginning with Kramer's (2003) work, many cross-sectional studies have found that older children are more likely to be lean if they were breast-fed. Dietz (2001) shows that infant breast-feeding may affect weight at later ages are not certain, but Nelson et al. (2005) show that it have been found to be negatively associated with risk of obesity in later childhood.

Obesity clearly demonstrates a familial tendency. The Avon Longitudinal (Reilly et al., 2005) study demonstrated that the odds of children aged 7 becoming obese if the father and mother or both had obesity. Observation also suggests that up to 80% of overweight adolescents will become obese adults.

Objective

In view of this context, the present study was undertaken to estimate the prevalence of obesity among a group of urban living adolescent girls and its associated factors

MATERIALS AND METHODS

Study Area

The present study was conducted on a group of adolescent girls of the North 24 Parganas, district of West Bengal. The township of Barasat, a suburban locale that fall under the Barasat Municipality was chosen for this study because that is the hometown of author and the language barrier problem could be solved by this selection as the author and the volunteer participants speak the same language. There are a number of vernacular medium schools in this township. Following are the names of some of the educational institutes located in Barasat, such as: 1. Barasat Girls' High School; 2. Barasat Kali krishna Girls' High School; 3. Barasat Peary Charan Sarkar Government High School; 4. Nabapally High School; 5. Barasat Mahatma Gandhi Memorial High School; 6. Madam Montessori School; 7. Knowledge Home; 8. Ramakrishna Mission Institution; 9. Indira Gandhi Memorial; 10. Delhi Public School; 11. Purba Barasat Adarsha Vidyapith; 12. Aditya Academy (Secondary); 13. Nabapally Jogendranath Balika Vidyamandir; 14. Adamas World School; 15. Barasat Satya Bharati Vidya Pith; 16. Auxilium Convent; 17. St. Jude's High School; 18. Julien Day; 19. Kalyani Public School etc.

Study settings and study population

The authorities of all the educational institutes were approached to apprise them about the nature and objective of this research project. A sample questionnaire was provided to all the institutional heads for their perusal and consent. Finally, the authorities of two (2) senior secondary schools (Bengali medium) allowed me to conduct the field work in their institutes. The schools were 'Barasat Girls' High School and 'Pranabananda Ashrom Balika Vidyalaya'. Study participants who were invited from the schools, were in the grade between 7^{th} and 9^{th} standard and between the age range 12 and 14 years. Objectives and benefits of the study were explained and written consent was taken from all the participants who volunteered to participate in this study. The total sample size for this study was 202 girls from these two schools. The data were collected during the month of May 2016. The information was collected with standard questionnaires.

Data types

It includes socio-demographic variables and anthropometric measurements.

Socio demographic variables

Socio demographic variables include age of

the participants (at time of interview), monthly family income (in Indian rupees), and fathers' occupational type.

Anthropometric measurements

Anthropometric measurements were taken on the participants following standard protocol (Lohman et al., 1998) - height (cm), weight (kg), waist circumference (WC) (cm), and hip circumference (HC) (cm). Weight was measured by the manual weighing machine (LIBXA)(the weight of dress is neglected), standing height was measured by the anthropometric rod. BMI for each participant was calculated using the formula (kg/m ^ 2). Waist circumference (WC) and hip circumference (HC) were measured using a non-stretchable measuring tape. Waist circumference was taken at the narrowest part of abdomen at its narrowest point between the lower costal (10th rib) border and the top of the iliac crest, perpendicular to the long axis of the trunk using a measuring tape. Hip circumference was taken at the level of greatest posterior protuberance of buttock, perpendicular to the long axis of the trunk in cm. For children and adolescents, overweight and obesity were defined using age and sex specific normograms for body mass index (BMI). Children with BMI equal to or exceeding the age gender specific 95th percentile were defined as obese; those with BMI equal to or exceeding the 85th percentile were defined as overweight and are at risk for related co-morbidities (Centre For disease control and prevention, 2015).

The Centre for Disease Control and Prevention Growth Charts are the most commonly used indicator to measure the size and growth patterns of children and teens. BMI-for-age weight status categories and the corresponding percentiles were based on expert committee recommendations and are shown in the following table.

The underweight girls (with less than the 5th percentile) were combined with normal weight girls (5th percentile to less than the 85th percentile) and were categorized as 'non-obese group' whereas, the overweight girls (85th to less than the 95th percentile) were combined with obese girls (95th percentile or greater) and were categorized as 'obese group'. Despite National representative data for childhood obesity in India being unavailable, some studies carried out in Chennai and Delhi has shown that the prevalence of obesity is 6.2% & 7.4% respectively. The children in developing countries are presently suffering from the double jeopardy of malnutrition – urban children are afflicted with the problems of over nutrition and the slum children from under nutrition (Information provided by the "Central of dieses control & prevention") (Marwaha et al., 2006). The waist hip ratio standard is taken into consideration on the basis of the cut off points as proposed by the WHO; as the ratio resulting normal <0.80 and at risk=0.80 in females (WHO, 2008).

Table 1: BMI-for-age weight status categories and the corresponding percentiles

Weight Status Category	Percentile Range
Underweight	Less than the 5th percentile
Normal or Healthy Weight	5th percentile to less than the 85th percentile
Overweight	85th to less than the 95th percentile
Obese	95th percentile or greater

Data analysis

Data analyses were done using the software Microsoft Excel. Frequency distribution was calculated for the data analysis.

RESULTS

Table 2: Socio-demographic characteristics of the study participants

Group	Participants (%)
Age (in years)	
12 years	49 (24.25)
13 years	43 (21.28)
14 years	110 (54.45)
Grade of participants	
Grade VII	49 (24.25)
Grade VIII	43 (21.28)
Grade IX	110 (54.45)
Religion	
Hindu	197 (97.52)
Muslim	5 (2.47)
Father's Occupation	
Service	145 (71.78)
Business	40 (19.80)
Factory worker	10 (4.95)
Shop owner	7 (3.46)
Monthly family Income (Father's income in Indian rupees)	
20,000 to 40,000	79 (39.50)
41,000 to 60,000	99 (48.80)
61,000 to 80,000	24 (11.70)

*Figures in the parenthesis indicate percentages

Table 2: shows the socio-demographic characteristics of the participants. Above half of the participants were 14 years of old and from grade IX. Overwhelming majority of them by religion were Hind (97.52%). Participants' fathers were mostly in service (71.78%), followed by business (19.80%). The participants were mainly belonged to the household with monthly family income (fathers' income only) between 41,000 to 60,000 in INR (48.80%).

Table 3: shows distribution of general obesity (on the basis of BMI) according to age of the participants. There is no such relationship between frequency of obesity and age of the participants.

Table 3: Distribution of subjects on the basis of BMI and according to age group

Age (in years)	Non-obese N (%)	Obese N (%)
12 years(N= 49)	41 (83.87)	8 (16.13)
13 years(N=43)	36 (83.71)	7 (16.27)
14 years(N=110)	93 (84.54)	17 (16.45)
Total (N = 202)	157 (84.15)	32 (15.84)

*Figures in the parenthesis indicate percentages

Table 4: Distribution of general obesity (on the basis of BMI) according to fathers' occupation of the participants

Father's Occupation	Non-obese N (%)	Obese N (%)
Service (N=145)	121 (83.36)	24(16.54)
Business (N=40)	36 (90.00)	4 (10.00)
Factory worker (N=10)	8 (80.00)	2(20.00)
Shop owner (N=7)	5 (71.35)	2(28.50)

*Figures in the parenthesis indicate percentages

Table 4: depicts the frequency distribution of general obesity according to fathers' occupation of the participants. The frequency of obesity was found to be high among the participants whose fathers were shop owners (28.50%), followed by factory worker (20.00%).

Table 5: Distribution of general obesity according to monthly family income (fathers' income only)

Family Income (INR)	Non-obese N (%)	Obese N (%)
20,000 – 40,000 (N=79)	65 (82.27)	14 (17.72)
41,000 - 60,000 (N=99)	86(86.11)	13 (13.13)
61,000 - 80,000 (N=24)	19(79.16)	5 (20.84)

*Figures in the parenthesis indicate percentages

Table 5: describes the frequency distribution of general obesity according to monthly family

income (fathers' income only). The frequency of obesity was found to high among the participants who belonged to the household with monthly family income 61,000 - 80,000 (INR) (20.84%), followed by 20,000-40,000 (INR) (17.72%).

Table 6: Distribution of central obesity (on the basis of WHR) according to age of the participants

Age (in years)	Non-obese N (%)	Obese N (%)
12 years(N= 49)	43 (87.70)	6 (12.24)
13 years (N=43)	35 (81.39)	8 (18.60)
14 years (N=110)	93 (84.54)	17 (15.45)
Total (N = 202)	171 (84.65)	31 (15.34)

*Figures in the parenthesis indicate percentages

Table 6: describes the frequency of central obesity (on the basis of WHR) according to age of the participants It is notable that the frequency of central obesity increased with increase in age.

Table 7: Distribution of central obesity (on the basis of WHR) according to fathers' occupation of the participants

Father's Occupation	Non-obese N (%)	Obese N (%)
Service (N=145)	131 (90.30)	14 (9.65)
Business (N=40)	29(72.50)	11 (27.50)
Factory worker (N=10)	6(60.00)	4 (40.00)
Shop owner (N=7)	5(71.40)	2 (28.50)

*Figures in the parenthesis indicate percentages

Table 7: shows the frequency of central obesity (on the basis of WHR) according to fathers' occupation of the participants. The frequency of central obesity was found to be high among the participants whose fathers were mostly factory worker (40.00%), followed by shop-owner (28.50%).

Table 8: Frequency distribution of central obesity (on the basis of WHR) according to monthly family income (fathers' income only)

Family Income (INR)	Non-obese N (%)	Obese N (%)
20,000 - 40,000 (N=79)	65 (82.20)	14 (17.70)
41,000 - 60,000 (N=99)	88 (88.80)	11 (11.10)
61,000 - 80,000 (N=24)	18(75.00)	6 (25.00)

*Figures in the parenthesis indicate percentages

Table 8: describes the frequency of central obesity (on the basis of WHR) according to monthly family income (fathers' income only). The frequency of central obesity was found to be high among the participants who belonged to the household with monthly family income 61,000-80,000 (INR) (25.00%), followed by 20,000-40,000 (INR) (17.70%).

Table 9: Association between general obesity and central obesity of the participants

BMI	WHR	
	Non-obese N (%)	Obese N (%)
Non-obese N (%)	170 (84.15)	1 (0.49)
Obese N (%)	1 (0.49)	30 (14.85)

*Figures in the parenthesis indicate percentages

Table 9: shows the association between general obesity and central obesity of the participants. An overwhelming majority of the participants showed both central and general obesity. Only one (0.49%) non-obese participant has central obesity, whereas, only one obese participant was normal by waist-hip ratio.

DISCUSSION

Overweight and obesity are defined as abnormal or excessive fat accumulation that may impair health. Body mass index (BMI) is a simple index of weight-for-height that is commonly used to classify overweight and obesity in adults. It is defined as a person's

weight in kilograms divided by the square of his height in meters (kg/m^2). The present study was subjects were adolescent girls and their age range between 12 year and 14 years. So over weight and obesity were defined with percentile value of BMI (WHO, 2016). Overweight and obesity have reached epidemic levels in adolescent minority females (12–19 years of age) Public health and practitioner interventions to modify teens' diet and exercise behaviors have not yet proven effective in reversing this epidemic (Bose et al., 2007, Bisai et al., 2010). It is very difficult to change an individual's lifestyle, developed over a lifetime of choices based on family and personal preferences, and reinforced by habit and culture). This epidemic among teens is particularly troubling because adolescent girls who become obese are more likely to remain obese as adults and experience a higher level of morbidity and mortality than the general population). This increased risk and its negative consequences could be counteracted by lifestyle changes during the adolescent years (Ramachandran et al., 2002, Nelson et al., 2005, Reilly et al., 2005, Klein, 2005).

In the present study average height and weight of 12 yrs old girls were 149.4±5.9 cm and 50.1±13.9 kg respectively whereas those of 14 year old girls were 151.2 ±5.3 cm and 48.6±6.2 kg. The 14 year old girls were with taller by average 153 .0± 4.4 cm with an average body weight of 50.1 ±6.0 kg. The average BMI for 12 year old girls was 21.3±2.8 kg.m-2, which was very similar with 21.3±2.8 kg.m-2 and 21.4±2.5 kg.m-2 for 13 and 14 years respectively. The association between general obesity and central obesity of the participants is described by the overlapping result of BMI and WHR. An overwhelming majority of the participants showed both central and general obesity. Only one (0.49%) non-obese participant has central obesity, whereas, only one obese participant was normal by waist-hip ratio. The frequency of general and central obesity among the participants increased with increase in age. The frequency of general and central obesity was found to be high among the participants whose fathers were factory workers, followed by shop owner. The frequency of general and central obesity was found to high among the participants who belonged to the household with monthly family income 61,000 - 80,000 (INR), followed by 20,000-40,000 (INR). An overwhelming majority of the participants showed both central and general obesity. It is interesting to note that participants who were categorized under central obesity also fall in the general obesity category.

CONCLUSION:

The present study provides information on the prevalence of general and central obesity among participants aged between 12 to 14 years. Age, fathers' occupation and monthly family income may have played a role on prevalence of obesity among the participants. Obesity in adolescents and children has raised to significant levels globally with serious public health consequences. In addition to emotional and social issues, it poses a serious hazard to the basic health care delivery system. Unless this epidemic is contained at a war footing, the implications of this global phenomenon on future generations will be serious. The reversibility of this disease with suitable intervention strategies should be seen as an opportunity and efforts pursued with vigor.

A holistic approach to tackle the childhood obesity epidemic needs a collection of activities including influencing policy makers and legislation, mobilizing communities, restructuring organizational practices, establishing coalitions and networks,

empowering providers, imparting community education as well as enriching and reinforcing individual awareness and skills. The implications of this global phenomenon on future generations will be serious unless appropriate action is taken (Katz et al 2005).

Limitations of the study

There are several limitations in the present study. First, there is limited sample size which may not provide the estimate of the general population. Inclusion of parents' education, dietary behavior and physical activity could have presented a better picture of obesity prevalence among the adolescent girls.

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