Impact of Sports & physical activities on the obesity of school-going children

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Abstract:
Weight that is higher than the healthy weight for a given height is known as overweight or obese. Body Mass Index (BMI) is considered a screening tool for overweight or obesity. If BMI of a person is less than 18.5 it will be underweight range. If BMI is 18.5 to <25, it will be considered normal. If BMI is 25.0 to <30, it will be within overweight range and If BMI is 30.0 or higher, it will be within obese range. At an individual level, BMI can be used as a screening tool but is not diagnostic of the body fatness or the health of an individual. A trained healthcare provider should perform appropriate health assessments in order to evaluate an individual's health status and risks. Factors such as food habits, family history, increased BMI, environmental conditions etc., are responsible for the obesity in children. Issue of children obesity is world spread phenomenon. This study was conducted in two districts in Pakistan with sample size of 600 respondents. Schools were categorized as Elite Private Schools, Government schools and rural areas schools. The obtained data then was analyzed by using descriptive statistics, bivariate analysis and multivariate to find the relative significance of independent variables in explaining dependent variable. The obesity of the children was affecting students' academic performance, physical health and psychological health. A strong inverses relationship was found among sports facilities in schools, physical activities, participation in sport and obesity of the children. All possible measures should be taken by all concerned to address children obesity as this epidemic may make our future assets as sick and sluggish.

Keywords: Physical activities, BMI, Overweight, Obese, Elite Private Schools, Sports facilities

1. Introduction

Alleyne and Lapoint (2004) indicated that obesity is the result of energy intake surpassing energy expenditure over a substantial period of time. Kiess et al. (2004) defines obesity as "an abnormal accumulation of fat in adipose tissue to the extent that impairs the health". Campbell and Haslam (2005) agree that state of excess adiposity is "Obesity" that leads to an augmented threat of emerging a co-morbid disease. Pignone and McPhee (2007) also agree that obesity is a state of excess adiposity. De Garine and Pollock (1995) found that obesity is an aspect of body image that is measured against an acceptable body size in a particular society. It can, therefore, be examined from an anthropometric or physical, a sociological and a psychological perspective. Body fat mass depends on certain factors such as age, ethnic background, developmental stage and gender. Besides these factors, Body Mass Index is now commonly acknowledged as a clinical definition of obesity during childhood and adolescence. Body Mass Index (BMI) is derived from a person's weight in pounds divided by the square of a person's height in inches and multiplied by a factor of 703. Campbell and Haslam (2005) indicated that obesity simply can be defined by calculating Body Mass Index (BMI) of any person and if it is greater or equal to 30 (BMI≥30) the individual will be declared obese and if it is over 25 it will be overweight. Obesity is frequently subdivided into categories, Class 1: BMI of 30 to < 35, Class 2: BMI of 35 to < 40 and Class 3: BMI of 40 or higher. Class 3 obesity is sometimes categorized as "extreme" or "severe" obesity.

Physical activity is a type of body movement which requires spending of energy and includes aerobic and muscle strengthening activity. The intensity and the recommendation for the amount of physical activity differ in adults and children. The Centers for Disease Control and Prevention recommends that children and adolescents should do one hour of physical activity each day. American Academy of Pediatrics indicated that adolescents groups having overweight stigma have around 80 percent chance of having obesity when they will become adults and if overweight begins before the age of 8 years adulthood is likely to see severe obesity repercussions (Centers for Disease Control and Prevention, 2011).

One of the reasons for childhood obesity being a global epidemic is substantial reduction in physical activity in children whether they are in schools or at homes. They are least concerned for the health benefits of physical activities (Wang, 2006). The concept of habitual physical activities and exercise was at the decline in young population and

consequently there was huge reduction in energy expenses. Low level of physical activity has become a new norm of young generation that affects their weight and obesity (Hills, 2009).

Provision of physical activities out of school time was felt to be important for healthy lives of children. Accessibility to organized physical activities in terms of location, timing, cost, and range in terms of cultural acceptability and interests are important for school-going children. There is mixed opinions on the feasibility of delivering out of school physical activities; low acceptability of sportswear, especially swimwear for women and girls from the Islamic faith is identified (Pallan *et al.* 2010).

Physical activities for children are important to overcome obesity related diseases. Physical activities bring upon discipline in children and keep them physically and mentally fit. Regretfully, despite all the efforts, there has not been an increase in physical activities of all aged groups. Resultantly, obesity and its related diseases are increasing in the world (Kaleef *et al.* 2011).

Study on the obesity of primary school going children in Pakistan was done and a random sample of 1860 between the age band of 5 to 12 years was selected that included 20 percent children from one to five classes and 25 percent from rural and urban area. Study indicated that 17% children were overweight and 7.5% were obese. Relationship of dietary behaviors, physical activity and sedentary lifestyle with obesity was found positive. The food behaviors of the children and their families, physical activities and sedentary lifestyles were affecting the weight, obesity and higher body mass index scores of primary school going kids in Pakistan (Mushtaq *et al.* 2011).

Another reason for the decrease in physical activity among children is the increase in the vehicles miles driven per person, thus, resulting in fewer children walking to school or to other locations (Corless & Ohland, 2005). A study indicated that 53% of children were driven to school by their parents, 38% children went to school by bus and only 17% of children walked to school, while 5% of children rode their bikes. This increase in car trips has resulted in substantially fewer trips by foot or bicycle, which is also attributed to the complex physical structure of the communities such as greater sub-urbanization and absence of sidewalks, as mentioned earlier (Russonello & Stewart Research and Communications, 2003).

The general school environment plays important role in educating children regarding nutrition and physical exercise. Schools could adopt two things by virtue of which school environment could impact children; one is imparting of health and physical education and second the health and diet in school environment. First one is important to improve the physical activity levels of and energy expenditure of the children and the latter could impact food consumption and energy intake of children (Sandberg, 2001).

1.1 Research Questions

- To explore socio-economic and demographic characteristics of the respondents
- To identify the level of obesity among respondents
- To identify the school characteristics of the respondents
- To study the sports facilities in schools and respondents participation in sports
- To explore the significance of sports and physical activities on the obesity of the respondents
- To explore the health implications of obesity in school-going children

1.2 Methodology

A cross sectional research method was adopted to explore the objectives of the study. The study was conducted in two districts of Punjab namely Faisalabad and Rawalpindi. A total 12 schools were selected randomly from each district considering the area i.e. Elite Private Schools, Public Schools and Rural Schools. Respondents were male students from grade 5 to 8 in each school. Total sample size of the study was 600 respondents, 300 from each district. A sample of 25 respondents was carefully and randomly selected from each school. The data was collected through a well-structured (including open and close ended questions) pre-tested interviewing schedule. In addition, the height and weight of each student was measured using calibrated scales. Body Mass Index (BMI = weight (kg)/height2 (m2) was calculated for each student. The obtained data for the study was analyzed by using descriptive statistics such as frequency distribution, mean and standard deviation for summarizing purpose; and inferential statistics such as Chi-square, Lambda Statistics and Pearson's Correlation were applied to find the association between independent and

dependent variables. The Multivariate analysis was used to find out the relative significance of independent variables in explaining and predicting dependent variable.

Body Mass Index (BMI):

Following are the two formulas for measuring obesity:

$$BMI = \frac{\text{Weight (Kg)}}{(\text{Height (m)})^2} \quad \text{or} \quad \frac{\text{Weight in Pounds} * 703}{(\text{Height in inches}) * (\text{Height in inches})}$$

In Adults (both for men and women) BMI score greater than 30 is obesity for all ages. For children, as they still have to grow, there is no global standard for determining childhood obesity. It is accepted to use age and sex specific BMI, or BMI-for-age, as guide (Centers for Disease Control and Prevention, 2009).

1.3 Result and Discussion

Table 1.3.1 Percentage Distribution of the respondents according to their socio-economic and demographic characteristics

Age of the respondents (years)	**Frequency**	**Percentage**
Up to 12	218	36.3
13-14	222	37.0
More than 14	160	26.7
Total Mean = 13.11 Std. Dev. = 2.57	**600**	**100.0**
Birth order of the respondents		
1st	167	27.8
2nd	164	27.3
3rd	129	21.5
4th and above	140	23.3
Total Mean = 2.55 Std. Dev. = 1.40	**600**	**100.0**
Monthly family income (Rs.) of the respondents		
Up to 20000	304	50.7
20001- 30000	114	19.0
Above 30000	182	30.3
Total Mean = 54198.33 Std. Dev. = 87758.62	**600**	**100.0**

Age is a very strong determinant and a demographic factor that directly and indirectly links with social and economic phenomenon in a society. In the present study, three categories were established to ascertain the mean age of the respondents along with the standard deviation. Table data indicates that 36.3% respondents were aged up to 12 years, 37.0% were aged 13-14 years and 26.7% were older than 14 years. Mean age was 13.11 and standard deviation 2.57. Age is predictor that is important in obesity related studies. The obesity in children increases with the growing of age. It was observed that children over 14 years were more in weight and obesity than those whose age was less than 13 years. Elder children in our society enjoy more privileges from parents. They get more pocket money and accompany their parents in markets and eat the food items of their choice and accordingly gain more weight. Mean birth order came to 2.55 and standard deviation is 1.40.

Income is always a vital background variable that affects various phenomena in the society. The results indicate that monthly family income of 50.7% respondents was up to Rs. 20,000/- , 19.0% reported their monthly family income in between Rs. 20,001/- to Rs. 30,000/- and 30.3% respondents reported that their monthly family income over Rs. 30,000/-. Mean family income was Rs. 54,198.33 and standard deviation Rs. 57758.62 as per the results. The income categories were accordingly kept maximum in excess of Rs. 30,000/-. The socioeconomic status is an important indicator which has relationship with obesity. The relationship is positive or inverse from society to society. Income is a part of socioeconomic status. In the study income was taken an independent variable in explaining the obesity of the children. Chhatwalet *et al.* (2004) stated that socioeconomic status affects obesity of children and adolescents as an independent variable which shows that children's obesity is linked with socioeconomic status of the families in developing countries. This also supports that family income is an essential variable in explaining the obesity of the children.

Table 1.3.2 Percentage Distribution of the respondents according to their school related characteristics

School Class of the respondents	**Frequency**	**Percentage**
5th	95	15.8
6th	126	21.0
7th	132	22.0
8th	209	34.8
9th	38	6.3
Total	**600**	**100.0**
School distance (km)		
Up to 2	338	56.3
2.1-4.5	138	23.0
4.51+	124	20.7
Total Mean = 2.98 Std. Dev. = 2.96	**600**	**100.0**
Mode of traveling of the respondents		
Public transport	46	7.7
School van	20	3.3
Cycle	185	30.8
Bike	148	24.7
On foot	108	18.0
Car	91	15.2
Rickshaw	2	0.3
Total	**600**	**100.0**

In the present study, it was observed that children studying in grade 8 and 9 were very well informed about their family trends, economic status of their parents, obesity related issues and different junk foods.

Most of the schools in urban areas are a bit far away from children's home whereas in rural areas schools are quite near to homes. Subsequently in urban areas school-going children covers more distance and in rural areas less. It was observed during the interviews that in urban areas school-going children used various modes of traveling and in rural areas children go either on foot or use bicycles. How school distance is covered has relationship with weight and obesity of the children. Mean of school distance was 2.98 and Standard Deviation 2.96 as per the univariate analysis.

Mode of transport is pivotal in drawing inferences in weight and obesity related studies. In older times the people went to offices, schools, colleges and universities either on cycles, public transports or on foot. Now the trend has been changed due to industrialization and over all law and order situation of our country. Table data show that 7.7% respondents used Public Transport, 3.3% School Vans, 30.8% cycles, 24.7% Bikes, 18.0% used to come on foot, 15.2% used Cars and 0.32% used Rickshaws for coming to schools. Results indicates that cycle, Bikes and Cars were the main modes of traveling to schools in children respondents. Wen *et al.* (2010) depicted that 36% school-going children used cars. They were dropped and picked either by parents or drivers. They did not exert during these hours and were obese comparing with those children who went to schools on foot. Their research concluded that the children who took more than two hours to reach school had the chances of being obese than those who took less than an hour. Sallis et al. (2000) indicated that there lied a great significance between the amount of time children spend outside of their home and a higher level of physical activities. (Norman et al. 2006);(Sallis and Glanz, 2006) revealed that the link between neighborhood-built environment and childhood obesity is still inconclusive.

Table 1.3.3 Percentage Distribution of the respondents according their BMI related characteristics

Height of the respondents (feet)	**Frequency**	**Percentage**
Up to 4	221	36.8
4.1-4.9	197	32.8
5.00+	182	30.3
Total Mean = 4.43 Std. Dev. = 0.52	**600**	**100.0**
		Continue…

Weight of the respondents (Kgs)	**Frequency**	**Percentage**
Up to 40	110	18.3
41-50	143	23.8
51-60	239	39.8
More than 60	108	18.0
Total Mean = 51.70 Std. Dev. = 11.33	**600**	**100.0**
Waist Size (inches) of the respondents		
Up to 30	187	31.2
31-32	185	30.8
33-34	123	20.5
35+	105	17.5
Total Mean = 32.05 Std. Dev. = 2.77	**600**	**100.0**
Body Mass Index (BMI) of the respondents		
Normal (Less than 25)	233	38.8
Over weight (25.1 to 30)	99	16.5
Obese (More than 30)	268	44.7
Total **Mean = 29.60, Std. Dev. = 10.16**	**600**	**100.0**

Height is great significance in calculating the BMI scores and predictor of obesity. The univariate result shows that 36.8% respondents children' height was falling in the category of up to 4 feet. Mean height was 4.43 feet with standard deviation 0.52 feet. Central obesity is more prominent in children having low heights.

Table data depicts that 39.8% children' weight was in the range of 51-60 kg, while 18.0% weighed more than 60 Kg. The mean weight came as 51.70 Kg which is an indicator of average weight of the respondents included in sample population with a standard deviation of 11.33 kg. Weight is second important component of our body after height which helps in determining the Body Mass Index of the children and adults.

Waist measurement is also an important variable in health-related studies, especially those relating to overweight, underweight and obesity. Table data indicates that 31.2% respondents' waist size was up to 30 inches.. Respondents with a waist between 31-32 inches were 30.8%. The mean of waist size was 32.05 inches with standard deviation 2.77 inches.

As per BMI scores 233 children were in the normal range, 99 were overweight and 268 obese. Mean score of BMI was 29.60 and Standard deviation 10.16 as per univariate analysis. CDC, (2009) reported that a body mass index (BMI) score greater than 30 is obesity in all age groups. Walker, (2001) revealed that the prevalence of obesity in adolescents in Pakistan was quite significant from childhood period to adolescence and up to adulthood. Being developing country obesity is a real potential threat in Pakistan. If proper measures are not taken for the prevention of obesity, its control in Pakistan may become out of the reach. Phillip *et al.* (2001) indicated that BMI score more than 25kg/m2 is considered obese which has health implications on work performance of children.

Table 1.3.4 Percentage Distribution of the respondents according to their responses regarding playing and sports related characteristics

Playing & sports related characteristics	**Frequency**	**Percentage**
Playing facilities at school		
Yes	349	58.2
No	251	41.8
Total	**600**	**100.0**
Playing games in school by the respondents		
Cricket	233	66.8
Football	101	28.9
Tennis	15	4.3
Total	**349**	**100.0**
Participation and membership of respondents in school team		
Yes	83	23.8
No	266	76.2
Total	**349**	**100.0**
Respondents still members of school team	**Frequency**	**Percentage**
Yes	31	37.3
No	52	62.7
Total	**83**	**100.0**
Respondents' reason for dropping from school team		
Inappropriate playing facilities	27	51.92
Team conflicts	9	17.3
No interest of school management	16	30.8
Total	**52**	**100.0**

As far as sports facilities in school are concerned, 58.2% respondents had sports facilities in their schools whereas 41.8% respondents did not have these facilities in their schools. Sports facilities in schools motivate the children to engage themselves in physical exertion. When sports facilities prevail in school, children use it that brings about healthy changes in them, both mental and physical. It was also observed that insufficient playing and sports facilities were prevailing in schools particularly in Elite Schools.

A majority of 66.8% respondents used to play cricket, 28.9% respondents used to play football and 4.3% used to play tennis in school time. It was observed that in urban areas playing facilities in school were almost not available but in rural areas children used to get playing ground and open areas to play during school time. Children of urban areas were obese as compared to rural areas.

Out of 349 respondents, only 83 respondents were members of the school teams, whereas 266 respondents were not the members of the school teams. It shows that majority of the respondents used to play just for time passing and were not seriously participating in sports. Children used internet, played video games and watched TV for long hours. Children were least bothered about the benefit of physical activities and participation in sports.

Out of 83 children respondents who used to play in school teams in various sports, 31 respondents were still playing for school team and were active members. In contrast, a majority of 62.7% respondents were no longer members. This means that there was a lack of consistency in sports on respondents' parts due to their sluggish attitudes. Children are not interested to becoming leading sportsmen in the country. They just pass the leisure time by merely participating in sports.

Playing for school teams and getting dropped willingly or due to any other reason should be a serious concern for the school management. This coming in and going out phenomena is the main obstacle which is not strengthening school sports and in our country, players are not coming to national level from these grassroots levels.

It was also revealed that 51.92% respondents had left playing for school team due to inadequate playing facilities in school. These facilities may include lack of playing items, like kits, shoes, drinking water, net, ground with no grass etc. Out of 52 respondents, 17.3% gave the justification of conflicts in school teams that became the reason for their leaving the

school team. In our sports culture whether these are schools, colleges, universities, districts, divisions, provincial or even Pakistan level; conflicts, dirty politics and leg pulling is very common and many youngsters who could be future stars leave playing for these very reasons. Same happened in the current study with 17.3% students. Remaining 30.8% left playing for school team due to non-receipt of due care, attention and interest of the school management. These results catch the attention and ask for appropriate due attention by the concerned so that sports culture in schools could be flourished.

Table 1.3.5 Values of Chi-Square, Gamma and Pearson's Correlation Coefficient of different independent variables with dependent variable (Obesity) for both rural and urban areas

Variables	Chi-square value	Gamma	Pearson's Correlation Coefficient value
Income	18.01**	.139*	.093*
Mother's education	68.70**	-.336**	-.264**
Family type	9.62**	.217**	.192**
Age	17.83**	.023	-.034
Family size	14.74**	.222**	.162**
Mode of traveling	39.79**	.420**	.198**
Waist	65.99**	.359**	.675**
School distance	23.46**	-.261**	-.173**
Playing facility in school	19.94**	-.305**	-.262**
Exercise habits	177.82**	-.670**	-.828**
Eating pattern	15.66**	.203**	.106**
TV & Internet	57.51**	.390**	.316**
Junk food	179.62**	.847**	.435**
Mutton and beef	27.15**	.371**	.128**
Weekly Time spent in sports	23.10**	-.228**	-.099*
Weekly Time spent in walking	74.46**	-.337**	-.174**
Family History	65.21**	.508**	.300**
Residence type	17.73**	.220**	.162**

Dependent variable: BMI

* = Significant at 5% level of significance

** = Significant at 1% level of significance

NS = Non-significant

Table 1.3.6 Implications of obesity (overall rural & urban areas)

Pearson correlation values of BMI with academic, physical and psychological implications N=600

Variables	Pearson correlation coefficient values
Academic	-.185**
Physical	-.038
Psychological	.221**

Dependent variable: BMI

The statistical analysis shows that obesity has bearing upon children's academic performance, physical health and psychological health. The Pearson's Correlation Coefficient values of academic, physical and psychological variables in overall model are -.185**, -.038 and .221** which depicts an inverse but high level relationship between academic performance and obesity and physical health and obesity. This is a significance relationship at one percent level of significant. Higher obesity will result in low academic performance and vice versa. High levels of obesity result in bad physical health of the children. With regard to psychological health, the relationship is highly significant at one percent level of significant; high obesity more psychological issues and less obesity will less psychological issues in children in the rural and urban areas. Li (1994) revealed that full scale IQ and Performance IQ of obese children was significantly lower than the normal weight students. It clearly indicates that obese children face the socio-psychological implications in their lives.

Table 1.3.7 Results of Regression Analysis: un-standardized, standardized regression coefficient values of independent variables regressed on BMI of the children for both rural and urban areas.

	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	T	Sig.
Monthly income	-6.620E-6	.000	-.055	-1.540	.124
Father's education level	.034	.087	.015	.396	.692
Mother's education level	-1.892	.369	-.183	-5.133	.000
Age of respondent	.708	.523	.055	1.353	.176
Family type	2.775	.716	.131	3.875	.000
Weight of respondents	1.637	.298	.173	5.485	.000
School distance	-1.122	.390	-.089	-2.873	.004
Sports facility at school	-3.921	.854	-.190	-4.591	.000
TV & Internet	1.977	.334	.219	5.913	.000
Weekly Time spent in sports	-.924	.286	-.107	-3.233	.001
Weekly Time spent in walking	-.929	.307	-.100	-3.028	.003
Mode of traveling	2.714	.642	.134	4.227	.000
Junk food	6.722	.727	.302	9.248	.000
Mutton and beef taken	1.143	.856	.048	1.335	.182
Family history	2.219	.653	.109	3.397	.001

Dependent Variable: BMI

In table 1.3.7 un-standardized and standardized regression coefficients of each independent variable are represented accordingly for both rural and urban areas. Besides these calculations, standard errors and significant levels of the predictor variables have also been presented and shown in the table.

1.3.7.1: Regression coefficients of socio-economic and demographic characteristics

Monthly income and mother's education were found to be significant at 5% and 1% levels as the Beta values came to -.055 and -.183 respectively which indicates that these two variables were relatively important in explaining the obesity and BMI of the children. Higher income levels were associated with higher obesities and higher education levels of mother's were associated with lower levels of obesities of the children in both rural and urban areas.

Similarly family type (nuclear/joint), age of the respondents was significant at 5% level, weight of the respondents was significant at one percent level and father's education levels also had the significant relationship with BMI of the children at 5% level of significant.

1.3.7.2: Regression coefficients of physical characteristics

Physical characteristics which were taken as predictors in the study were school distance, sports facility at school, TV watching and internet use, weekly time spent in sports, weekly time spent in walking and mode of traveling adopted by the respondents. Beta values of school distance, playing facility at school, TV watching and internet use, weekly time spent in sports, weekly time spent in walking and mode of traveling were calculated as -.089, -190, .219, -.107, -.100 and .134 that showed a positive and inverse relationship with obesity of the children in both rural and urban areas and were significant at one percent level of significant except school distance which was significant at 5% level.

1.3.7.4: Regression coefficients of eating characteristics

Eating characteristics that were converted into independent variables to check the association of these variables with obesity of the children were Junk food, and mutton and beef taken by the respondents. Beta values of these variables are calculated in table 1.7.3 which is .302 and .048 indicating that both in rural and urban areas eating habits had significance on BMI of the children at one percent level of significant and 5% level respectively.

1.3.7.5: Regression coefficients of health characteristics

Health characteristic could be current diseases of the respondents and their disease history in the families. In the study family health history was taken as an intervening variable that later on proved to be a right selected variable which was affecting the obesity of the children. Its Beta value came as .109 for both urban and rural areas indicating its impact on dependent variable – BMI of the children. It shows a positive relationship with BMI at one percent level of significance.

1.4 Conclusion

Children studying in Elite schools were more obese as compared to children studying in government and rural schools. Children living in urban areas and studying in Elite schools were found of junk food and cold drinks. Elite private schools did not have the sports facilities in their schools. In urban areas, especially in Elite schools, children used to come on cars or school vans and very few used to come on public transport or cycles. Mode of traveling had significant effect on the obesity of the children in urban areas. Children

having obesity history in the families were more obese than to those who did not have the obesity history in the family. Obese children were not doing weekly walking and exercise, they were also not habitual of playing sports. They were more interested in playing video games, watching TV and using Internet. These sedentary habits were making them more obese and they were not feeling the obesity, though they were having symptoms of fatigue due to obesity.

Children's obesity was higher in families with higher was the socio-economic status. Children from rich families were obese as they brought pocket money and went to junk food outlets with their parents and had traveling facilities. Children whose mothers had a high level of education were less obese in comparison with those whose mothers' education levels were low. Fathers' education was found to be non significant with obesity epidemic in children. Family eating patterns, frequent use of mutton and beef, taking soft drinks, sleeping late, watching TV for long hours, using Internet for late hours, awakening late in the morning and doing no sports activities were the reasons of obesity in the children.

1.5 Recommendations

In light of the findings of the present study, following are the recommendations:

- Obesity is an emerging problem in Pakistan and it should be studied in greater detail with larger, randomized, well-funded generalized studies. With both underweight and overweight co-existing, any public health intervention should incorporate measures to alleviate both. Using schools to teach children better dietary practices and the benefits of physical activity would go a long way in helping developing countries such as Pakistan to overcome the double burden of disease. Integrated approaches that promote intake of a balanced diet and increased physical activity to both underweight and overweight children would be more cost-effective than separate strategies for underweight and overweight children.
- Government should start National Childhood Obesity Prevention Program and cascade it to all Provinces, Divisions, Districts, Tehsils and Union councils. A separate dedicated management team should run this program and all reports should be shared with all stakeholders and the general public.

- A comprehensive strategy has to be devised so that sedentary behavior could be decreased in young people and young generation could be stimulated to participate more in physical activities and stop doing minimum physical activity and bring positive and healthy change in their life styles which will eventually help a lot to fight against the obesity epidemic. In this process parents would be performing a pivotal role by becoming role models for children by doing their life styles changed because children follow their parents in all spheres of life
- Schools and other educational institutions should come forward and start intervention programs and should invite experts and consultants to teach children about healthy eating habits and physical activities.
- No school could get registered until it has proper school infrastructure; playing grounds, exercise and playing facilities and regular sports for children. Sports period should be made compulsory at all levels in the schools and annual sports festivals should be made mandatory for school managements. Providing infrastructure and policies, through school based techniques that increase access to and encourage physical activity for all students.
- School cafeteria staff should be trained enough about healthy food combinations to be offered to children at breaks. There should be minimum junk foods items. It is recommended that health experts should preach and work hard to eliminate soft drinks from the school premises, speak and train to school to administrators and teachers the ways how nutrition in school foods programs could be done better. They should be goal oriented and should come forward and keep them involved themselves in nutrition related activities and decision done at school advisory board.
- Media' role could be very pivotal for prevention of childhood obesity. Studies have shown that children adapt the things and habits which they see on media. Media should send social messages through advertisements which show the problems of obesity and the chronic diseases it carries in future lives of children. Media could restrain children from unhealthy foods. Media should organize period talk shows in which doctors and experts should come and tell the public about healthy life styles and eating habits.

- Maintaining strong physical education (PE) programs that engage students in moderate to vigorous physical activity for at least 50% of PE class time;
- Providing a variety of activities and specific skills so that students can be physically active not just during class but throughout the day and year; and
- Providing qualified school professionals who are trained in teaching methods to engage students in PE, including for students who face greater barriers to activity.
- Government should make amendments in rules and regulations in media policy of marketing companies and should ensure that promotion of such food items which are injurious for children should not be promoted on print media and electronic media.

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