

Prevalence of Obesity in Young Males and Females in Rural Punjab

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INTRODUCTION : *Obesity has numerous health implications. Increasing rates of overweight and obesity has reached epidemic proportions throughout the world especially in developed countries and is rapidly increasing in many middle-income and less-developed countries. Most of the studies on prevalence of obesity are conducted in urban population, so we conducted this study to evaluate prevalence of obesity in rural population in Punjab.*

AIMS AND OBJECTIVES : *The present study was conducted to evaluate the prevalence of obesity and overweight in apparently healthy young population both males & females in rural areas around Bathinda in Punjab.*

MATERIAL AND METHODS : *We studied the young population both males (5-20 years) and females (5-30 years) from rural areas during the health check up camps and medical check up of healthy attendants accompanying patients.*

RESULTS : *We studied 4320 subjects including 3099 females and 1221 males. Among all subjects 80.5% had low BMI, 8.9% normal BMI, 6.4% had high BMI, 3.5% were obese BMI and 0.7% had morbid BMI. Among all (n-3099) age group females, low BMI was present in 80.4%, normal BMI in 9.3%, high BMI in 6.6%, obese BMI in 2.9% and morbid obese BMI was recorded in 0.8%. Similarly in all (n-1221) age group males low BMI was found in 81.1%, normal BMI in 7.7%, high BMI in 5.8%, obese BMI in 4.8% and morbid obese BMI was present in 0.6%.*

CONCLUSION : *We conclude that prevalence of overweight and obesity is less in rural Punjab as compared to the prevalence documented in other studies and prevalence was almost similar in males and female groups, but prevalence increased with increasing age, the increasing socioeconomic status and decreasing activity profile.*

Key Words: *Prevalence, Obesity, Males, Females, Rural.*

INTRODUCTION

For thousands of years obesity was rarely seen¹ and it was not until 20th century that obesity became common, so much so that in 1997 the World Health Organization (WHO) formally designated obesity as a 'Global Epidemic' that too with a tag of one of the most important and the most neglected public health problems.² Obesity was identified as a disease 36 years ago when WHO listed obesity as a disease condition in its International Classification of Diseases in 1979.³ Dietary deficits, excesses and the lifestyle changes that accompany industrialization and urbanization with economic development have made a significant contribution to the most globally pervasive change of the rising burden of obesity which is seen as the first wave of a defined cluster and growing prevalence of new age epidemics of non-communicable diseases (NCDs) called "New World Syndrome" creating an enormous socioeconomic and public health burden in poorer countries.

Increasing rates of overweight and obesity has reached epidemic proportions throughout the world especially in developed countries and is rapidly increasing in many middle-income and less-developed countries.³ ⁴The worldwide prevalence of obesity has more than doubled between 1980 and 2014. In 2014 WHO global estimates show that, more than 1.9 billion adults (> 18 years) were overweight including more than 600 million obese adults. Estimated about 13% of the world's adult population (11% of men and 15% of women) were obese and 39% of adults (38% of men and 40% of women) were overweight. Once considered a high-income country problem, overweight and obesity are now on the rise in low- and middle-income countries, particularly in urban population.⁵

Obesity has reached epidemic proportions in India in the 21st century, with morbid obesity affecting 5% of India's population. In Northern India obesity was most prevalent in urban populations (male 5.5%, female 12.6%), followed by the urban slums (male 1.9%, female 7.2%) and is lowest in rural populations (male 1.6%, female 3.8%).⁶ Socioeconomic class also had an effect on the rate of obesity with increased prevalence of 10.4% in high socioeconomic group females as opposed to 0.9% in low socioeconomic group.⁷ The epidemic of rapid nutritional transition and its adverse health consequences in the Asian region are now beginning to get noticed which can spell disaster for the nation unless immediate remedial measures are instituted.⁸ Obesity,

a worldwide epidemic in recent years has numerous health implications and is currently estimated to be the second leading cause of preventable death.⁹ In general population, elevated BMI is an independent risk factor for increased all-cause mortality.¹⁰ Overweight and obesity are associated with increased risk of developing cardiovascular diseases (CVDs) and in cohorts of patients 50% overweight or obese had ischemic heart disease or acute coronary events.¹¹

Higher morbidity in association with overweight and obesity has been observed for hypertension (HTN), Diabetes (DM), coronary heart disease (CHD), stroke, gallbladder disease, osteoarthritis, sleep apnea and respiratory problems and some types of cancer (endometrial, breast, prostate, and colon). Obesity is also associated with complications of pregnancy, menstrual irregularities, hirsutism, stress incontinence, and psychological disorders (depression).¹² Evidence show weight reduction is associated with improved risk factor profile and the guidelines for primary prevention of CVD recommend weight loss in overweight and obese individuals¹³ and this recommendation has also been extended to the guidelines for secondary prevention of coronary artery disease (CAD)¹⁴ and HF.¹⁵ Most of the studies on prevalence of obesity are conducted in urban population, so we conducted this study to evaluate prevalence of obesity in rural population in Punjab.

AIMS AND OBJECTIVES

The present study was conducted to evaluate the prevalence of overweight, obesity and morbid obesity in apparently healthy young population both males and females in rural areas around Bathinda in Punjab and its prevalence in different socioeconomic and activity groups.

MATERIAL AND METHODS

We studied the young population both males (5-20 years) and females (5-30 years) from rural areas during the health check up camps in villages around Bathinda in Punjab and from the medical check up of healthy attendants accompanying patients visiting the hospital for treatment. Permission of Institutional Ethical Committee of Kishori Ram Hospital and Diabetes Care centre was taken and informed consent was taken from all the study subjects. Only healthy subjects were included in the study. Those subjects suffering from any chronic disease

like diabetes, hypertension, arthritis, renal disease or any gastrointestinal disease, on some medication whether desi or allopathic were excluded from study. Subjects belonging to an area governed by panchayats were categorized as rural subjects. Our studied included 4320 subjects (3099 females and 1221 males).

Body mass index (BMI): All individuals had their height and weight measured. BMI was calculated as weight in kilograms divided by square of height in meters. BMI was further categorized into low (<18.5 kg/m²), normal (18.5-22.9 kg/m²) overweight (23-24.9 kg/m²), obese (25-29.9 kg/m²) and morbid Obesity (>30Kg/m²) according to WHO criteria revised for Asian population.¹⁶

Socioeconomic status (SES): Socioeconomic status was represented by approximate monthly family income. Three groups were constituted and subjects were

categorized into either low SES (<5000), middle SES (5000-15000), and high SES (15000 and above).

Physical activity: The individuals were asked about about habitual physical activity. The questionnaire was interviewer administered focusing on classifying individuals as having low-moderate- and high-activity level based on activities performed. According to The Netherlands Nutrition Council¹⁷ the low level for occupations such as, clerical work, driving, shop keeping, teaching, studying, housework and all other light occupations; the middle level for occupations such as, factory work, plumbing, carpentry, and farming and the high level for occupations such as, manual worker, rickshaw pullers, construction work, and regular sport. The results were analyzed on percentage scale.

Table 1. Prevalence of Obesity in Rural Punjab

BMI	Total study Population (n-4320)				
	Low (<18.5)	Normal (18.5-22.9)	Over Weight (23-24.9)	Obese (25-29.9)	Morbid Obese (> 30)
Age Group					
5 - 30yrs (n-4320)	80.5(3480)	8.9 (384)	6.4 (276)	3.5 (150)	0.7 (30)
5-10 yrs (n-1629)	89.5 (1458)	4.7 (76)	3.1 (50)	2.5 (41)	0.2 (4)
11-20 yrs (n-1824)	80.0 (1458)	8.9 (163)	7.0 (128)	3.3 (61)	0.8 (14)
21 -30yrs (n-867)	65.1 (564)	16.7 (145)	11.3 (98)	5.5 (48)	1.4 (12)
Activity					
Sedentary (n-1041)	76.0 (791)	8.4 (87)	7.5 (78)	6.3 (66)	1.8 (19)
Moderate (n-2922)	82.9 (2422)	8.9 (261)	5.3 (154)	2.6 (76)	0.3 (9)
Active (n-357)	74.8 (267)	20.2 (72)	2.2 (8)	2.2 (8)	0.6 (2)
SES					
Low (n-903)	83.9 (758)	10.3 (93)	3.4 (30)	2.0 (18)	0.4 (4)
Middle (n-3231)	80.7 (2609)	9.9 (316)	5.7 (186)	3.4 (110)	0.3 (10)
High (n-186)	56.5 (105)	14.0 (26)	9.1 (17)	11.8 (22)	8.6 (16)

Table 2. Prevalence of Obesity in Males in Rural Punjab

BMI	Low (<18.5)	Normal (18.5-22.9)	Over Weight (23-24.9)	Obese (25-29.9)	Morbid Obese (> 30)
Age					
5 - 20yrs(n-1221)	81.1 (990)	7.7 (94)	5.8 (71)	4.8(59)	0.6 (7)
5-10 yrs (n-822)	85.4(702)	6.1 (50)	3.7 (31)	4.6 (37)	0.2 (2)
11-20 y (n-399)	72.1(288)	11.1 (44)	10.0 (40)	5.5 (22)	1.3 (5)
Activity					
Sed. (n-417)	74.3(310)	7.2 (30)	8.9 (37)	8.4(35)	1.2(5)
Mod. (n-681)	85.5(582)	6.7(45)	4.5 (31)	3.2(22)	0.1(1)
Active (n-123)	79.7 (98)	15.5(19)	2.4 (3)	1.6(2)	0.8(1)
SES					
Low (n-402)	84.1(338)	10.5(42)	2.3 (9)	2.9(12)	0.2(1)
Middle (n-780)	81.0(632)	6.8 (53)	6.4 (50)	5.4 (42)	0.4(3)
High (n-39)	51.2(20)	16.6(6)	12.8 (5)	12.8(5)	7.6(3)

BMI	Low (<18.5)	Normal (18.5-22.9)	Overweight (23-24.9)	Obese (25-29.9)	Morbid Obesity (> 30)
Age Group					
5 - 30yrs (n-3099)	80.4 (2490)	9.3 (290)	6.6 (205)	2.9(91)	0.8 (23)
5-10 yrs (n-807)	93.7 (756)	3.3 (26)	2.3 (19)	0.5 (4)	0.2 (2)
11-20 yrs (n-1425)	82.2 (1170)	10.3 (119)	6.1 (88)	2.8 (39)	0.6 (9)
21-30 yrs (n-867)	65.0 (564)	16.9 (145)	11.3 (98)	.6 (48)	1.2 (12)
Activity					
Sedentary (n-624)	77.1(481)	9.1(57)	6.6 (41)	4.9(31)	2.3(14)
Moderate (n-2241)	82.1(1840)	9.7(216)	5.4 (123)	2.4 (54)	0.4(8)
Active (n-234)	72.2(169)	22.7(53)	2.1 (5)	2.6(6)	0.4(1)
SES					
Low (n-501)	83.8(420)	10.2 (51)	4.2 (21)	1.2 (6)	0.6 (3)
Middle (n-2451)	80.7(1977)	10.8 (263)	5.5 (136)	2.7 (68)	0.3(7)
High (n-147)	57.8 (85)	13.6 (20)	8.1 (12)	11.7(17)	8.8(13)

RESULTS

We studied 4320 subjects including 3099 females, 26.2% females in age group of 5-10 years, 45.9% in 11-20years and 27.9% in 21-30 years age group and 1221 males, 67.3% in age group of 5-10 years, 32.7% in 11-20 years age group. Among all subjects 80.5% had low BMI (<18.5), 8.9% normal BMI (18.5- 22.9), 6.4% had high BMI (23-24.9), 3.5% had obese BMI (25-29.9) and 0.7% were having morbid obese BMI (>30).

Among all (n-3099) age group females, low BMI was present in 80.4%, normal BMI in 9.3%, high BMI in 6.6%, obese BMI in 2.9% and morbid obese BMI in 0.8%. Similarly in all (n-1221) age group males low BMI was found in 81.1%, normal BMI in 7.7%, high BMI in 5.8%, obese BMI in 4.8% and morbid obese BMI in 0.6%. Prevalence of obesity according to age, the activity profile and socio economic status among all subjects, in female subjects and male subjects is shown in table 1, table 2 and table 3 respectively.

DISCUSSION

In our study among all subjects (4320), 80.5% had low BMI (<18.5), 8.9% normal BMI (18.5- 22.9), 6.4% had high BMI (23-24.9), 3.5% had obese BMI (25-29.9) and 0.7% were having morbid obese BMI (>30).

Varghese et al¹⁸ in their study found overall prevalence of obese and overweight as 5.5% and 24.8% respectively which was relatively high prevalence as compared to our study. In a study conducted by Venkatramana et al¹⁹ overall prevalence of obesity was 1.91 % (1.03% males and 2.79% females) and prevalence of overweight persons

was 11.48% (13.33% males and 9.74% females). In a study Bishav et al found 4.7% students to be overweight and 3.63% obese in rural population of students and in urban students 11.63% were overweight and 2.55% were obese.²⁰ In a study Jackson et al²¹ in a rural US population documented 23% overall prevalence of obesity. On using the lower cut-off values of BMI recommended by WHO¹⁶ for Asians, prevalence of obesity becomes 55.8% in urban and 36.4% in rural males, which was quite high as compared to our study as well as studies from other parts of India.²² Available data on prevalence of obesity from different published studies suggest that the prevalence ranged from 10 to 50%²³ and there are several reports from various parts of India mostly urban which provide some insight into the problem. A study from Bombay revealed that the prevalence of obesity among young adult males varied from 10.7% to 53.1%.²⁴ A report from Kashmir showed prevalence of obesity to be 15.0%, with 23.7% females and 7% males.²⁵ In a study by Reddy, et al., >28% of adult males and 47% of adult females in urban Delhi were overweight by WHO standards.²⁶

In Northern India obesity was most prevalent in urban populations (5.5% males, 12.6% females), followed by the urban slums (1.9% males, 7.2% females). Obesity rates were the lowest in rural populations (1.6% males, 3.8% females).²⁷ Prevalence of obesity in our study is quite less as compared to the prevalence documented by studies from India and abroad.

Our data showed prevalence of overweight to be 6.4% (5.8% males, 6.6% females), prevalence of obesity 3.5% (4.8% males, 2.9% females) prevalence of morbid obesity 0.7% (0.6% males, 0.8% females) in rural population.

Zhang et al²⁸ documented prevalence of overweight as 18.6% and obesity as 1.7%, significantly higher among women than men in Chinese rural population.

In a study²⁶ from rural Haryana prevalence of overweight was 7% in males and 9% in females, which again was higher as compared to prevalence of overweight in our study. Conversely, as many as 38% of males and 36% of females in the rural area were actually 'underweight' by BMI standards.

Large national study National Family Health Survey -3 (NFHS-3)²⁹ revealed obesity as a substantial problem among several groups of women in India particularly older women, urban, well educated, women from households with high standard of living and among Sikhs. Data from NFHS-3 showed that 12.6% of Indian women were obese (23.5% urban, 7.4% rural) and 9.7% men were obese (15.9% urban, 5.6% rural). The percentage of ever-married women age 15-49 who are overweight or obese increased from 11% in NFHS-2 data to 15% in NFHS-3 data. The prevalence overweight or obesity among women was highest in Punjab (30%), followed by Kerala (28%) and Delhi (26%), all of which are relatively richer states.²⁹ Similar variations were seen by state in the percentage of men who are overweight and obese. Further analysis of data showed that out of 12.6% obese women, 9.8% were overweight (BMI of 25-29.9) and 2.8% were obese (BMI of > 30). Similarly among 9.7% obese men, 8.4% were overweight and 1.3% was obese. NFHS-3 reported higher prevalence of overweight (BMI >25) among the well-off (23.6% men, 30.5% women) as compared to the poor (1.4% men, 1.8% women).²⁹ The Nutrition Foundation of India (NFI), a food-policy NGO, estimated that about 45% of women and 29% of men in urban areas were overweight. The prevalence of abdominal obesity is 29% among middle-class men and 46% among women.³⁰

As regards the physical activity, in current study significantly more number of overweight, obese and morbid obese subjects were found in sedentary activity group (7.5% overweight, 6.3% obese and 1.8% morbid obese) when compared to moderate activity group (5.3% overweight, 2.6% obese and 0.3% morbid obese) and heavy activity groups (2.2% overweight, 2.2 % obese and 0.6% morbid obese), showing more prevalence of obesity, overweight and morbid obesity in sedentary group as compared to the moderate or active activity groups. Same trend was seen in males and female groups and in all age groups. Results of our study are in

accordance with other studies showing less prevalence of obesity in active group as compared to sedentary groups. The surgeon general's report on physical activity and health³¹ mentioned that "low levels of activity, resulting in fewer calories used than consumed, contribute to the high prevalence of obesity". In a study conducted by Patrick et al³² insufficient vigorous physical activity was found to be the only risk factor for higher BMI for adolescent boys and girls. Lowry et al³³ mentioned that obesity results from an energy imbalance created by factors that increase energy intake or reduce energy expenditure. Television viewing may promote obesity both by displacing participation in physical activity, and by increasing dietary energy intake. Physical inactivity and inappropriate nutrition are directly reflected in the growing burden of overweight in the Indian population predominantly in the urban areas. Almost 30-65% of adult urban Indians are reported to be either overweight (BMI >25) or obese (BMI >30) or have central obesity.³⁴ In our study the prevalence of overweight, obesity and morbid obesity was 6.4%, 3.5% and 0.7% respectively in all age groups. Prevalence of overweight, obesity and morbid obesity was 3.1%, 2.5% and 0.2% respectively in 5-10 years age group, 7.0%, 3.3% and 0.2% respectively in 11-20 years age group and 11.3%, 5.5% and 1.4% respectively in 21-30 years age group showing increasing prevalence of overweight, obesity and morbid obesity with increasing age.

Similar increasing trend of overweight and obesity with increasing age was observed in male and females in all age groups in our study. Results of our study are in accordance of other studies showing increased overweight and obesity with increasing age, but the prevalence of overweight and obesity was comparatively less in our study.

A study found an increase in prevalence of obese or overweight with age from "20-29yrs" to "50 -59yrs"; showing a decline thereafter.¹⁸ The prevalence of overweight and obesity in children aged between 6 to 17 years in all ethnic groups is reported to be between 5 - 30%.³⁵ Kapil et al. reported prevalence of obesity and overweight in adolescent school going children of affluent families to the tune of 7.4% and 23.1% respectively.³⁶ Gupta and Ahmad reported prevalence of obesity to the tune of 7.5%.³⁷ The United States National Center for Health Statistics suggests that nearly 15% adolescents are overweight or obese and obesity in children is associated with an increased incidence of hypertension, diabetes,

CAD, osteoarthritis and overall increase in morbidity and mortality during adult life.³⁸

There is evidence that children and adolescents of affluent families are more overweight possibly because of decreased physical activities, sedentary lifestyle, altered eating pattern and increased fat content of diet.^{37,38} A report from Nutrition Foundation of India Suggested that the prevalence of obesity varies with socio economic status in urban India, with those in upper strata having higher prevalence rates (32.2% males, 50% females) than middle class (16.2% males, 30.3% females) followed by the lower socio economic group (7% males, 27.8% females) and the poor in urban slums with the lowest prevalence (1% males, 4% females).³⁹ Analysis of our data showed similar trends where prevalence of overweight, obesity and morbid obesity increased with increased socioeconomic status. Overall prevalence of overweight, obesity and morbid obesity was 9.1%, 11.8% and 8.6% respectively in high socioeconomic group, 5.7%, 3.4% and 0.3% in middle income group and lowest of 3.4%, 2.0% and 0.4% respectively in low socioeconomic group and this trend persisted in male and female groups also. Prevalence of overweight, obesity and morbid obesity was directly related to the socio economic status where only 4.2%, 2.1% and 0.6% females with lowest wealth index were overweight, obesity and morbid obesity respectively as compared to 8.1%, 11.7% and 8.8% in highest wealth index. Similarly among men with lowest wealth index, prevalence of overweight, obesity and morbid obesity was 2.3%, 2.9% and 0.2% as compared to 12.8%, 12.8% and 7.6% respectively among highest wealth index. In another study 10.4% women were obese in high socioeconomic class as opposed to 0.9% in women of low socioeconomic class.⁷

In India, undernutrition attracted the focus of health workers, as childhood obesity was rarely seen. But over the past decade, childhood obesity is increasingly being observed with rapidly urbanizing, demonstrate life style changes resulting increase in energy intake, dramatic increase in fat intake along with the changing lifestyle of families with increased purchasing power, increased level of sedentarianism due to television, video games and computers which has replaced outdoor games and other social activities.⁴⁰ 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% in 2003 to 6.57% in 2005 demonstrating the time

trend of this rapidly growing epidemic.⁴¹ Socio-economic influence in childhood obesity was shown in a study from northern India reporting 5.59% childhood obesity in the higher socio-economic strata and 0.42% in the lower socio-economic strata.⁴² National representative data for childhood obesity in India is best represented by NFHS -3 data showing 1.7% male children and 1.4% female children being overweight (+ 2SD), 2.5% belonged to urban and 1.2% belonged to rural areas. Prevalence of childhood obesity increased with increase in socio economic status of the family being 1.0% in low wealth index group and 2.7% in high wealth index group. Conversely NFHS-3 data also revealed greater prevalence of underweight or malnourished (%age below -3SD and below -2 SD) child population which was more in males, rural and poor population.²⁹ In children, the difference between the rich and the poor is fairly evident in study by Ramachandran, et al. from six schools in Chennai, two each from high, middle and lower income groups.⁴³ The prevalence of overweight (including obese) adolescents ranged from 22% in better off schools to 4.5% in lower income group schools. In a Delhi school with tuition fees more than Rs. 2,500 per month, the prevalence of overweight was 31%, of which 7.5% were frankly obese.³⁶ Other studies from Chennai and Delhi have shown that prevalence of obesity being 6.2% and 7.4% respectively.⁴⁴ In our study prevalence of overweight, obesity and morbid obesity in childhood (5-10 years) was 3.1%, 2.5% and 0.2% where as in males prevalence was 3.7%, 4.6% and 0.2% respectively. In female children (5-10 years) prevalence of overweight, obesity and morbid obesity was 2.3%, 0.5% and 0.2% respectively. Projection studies show that prevalence of overweight is expected to rise from 12.9% (134.8 million) in 2005 to 27.8% (290.7 million) and obesity from 4.0% (42.2 million) in 2005 to 5.0% (52.1 million) by the year 2030.⁴⁵

We analyzed the results of our study carefully and more startling fact emerged other than prevalence of overweight and obesity. The prevalence of underweight which was in the tune of 80.5% in all subjects, 80.4% in females and 81.1% in males in rural Punjab is really disturbing especially in one of the most prospers states on India. At the other end of the malnutrition scale, obesity is one of today's most blatantly visible – yet most neglected – public health problems. Paradoxically coexisting with under nutrition, an escalating global epidemic of overweight and obesity – “globesity” – is taking over many parts of the world. If immediate action

is not taken, millions will suffer from an array of serious health disorders.⁴⁶ India is gaining weight. Traditionally known for malnutrition, Indians now report more and more frequently with overweight, obesity and their consequences. Indians exhibit unique features of obesity. Urbanization and modernization has been associated with obesity.⁴⁷ With people moving into urban centers and wealth increasing, concerns about an obesity epidemic in India are growing. Undernutrition is more prevalent in rural areas, whereas overweight and obesity are more than three times higher in urban areas. This may be due to lesser physical activity in the urban areas. Furthermore, undernutrition and overweight/obesity are both higher for women than men.²⁹

CONCLUSION

We conclude that prevalence of overweight, obesity and morbid obesity is less in rural Punjab as compared to the prevalence documented in other studies. In our study prevalence of overweight, obesity and morbid obesity was almost similar in males and female groups, but prevalence increased with increasing age, the increasing socioeconomic status and decreasing activity profile. The trend toward higher prevalence of overweight and obesity in children and young adults which reflects the changing scenario of cardiovascular diseases, diabetes and insulin resistance in current era due to the changing lifestyle, dietary pattern and decreased physical activity is limited to urban population. On the other hand underweight and malnutrition is more prevalent in rural areas as compared to overweight and obesity. We have to devise different strategies to control overweight and obesity in urban areas and underweight and malnutrition in rural areas. More extensive epidemiological studies are needed to assess the amount of real problem in turn help to devise effective preventive strategies. It would be logical to advise families with obese children to change their lifestyle with respect to diet, exercise and reduced salt intake to get their children accustomed to lifestyle which are favorable for maintenance of various risk factors. The potential pay off by way of prevention is enormous in terms of later cardiovascular and metabolic disease and allows the provision of more comprehensive care to the young population. Malnutrition affects all age groups, but it is especially common among the poor and those with inadequate access to health education and to clean water and good sanitation especially in rural areas. The strategies are totally opposite of that of

prevention of obesity. One important common feature of health education, motivation and awareness is crucial in preventive measures for both obesity and malnutrition.

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