

Calculation of Body Mass Index: Proxy for Prevention of Multiple Disease Syndrome

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Introduction: A mini health survey was conducted to assess the Body Mass Index (BMI) score among 240 respondents who had attended Golden Jubilee Celebration of Maharajgunj Nursing Campus (2006).

Materials and Methods: Along with structured interview schedule, health histories, anthropometric measurement (height and weight), and blood pressure were checked among the respondents.

Result: The study findings revealed that majority of the respondents were current nursing students below 40 years of age, among them 56 % of them had normal BMI score (18.5 - 24.9); while 44 % had abnormal BMI score (> 18 ; and above 25.0). Among the respondents who had BMI score, 29 % were overweight ($> 25.0 - 29.9$), and 4 % were obese (> 30); while remaining 11 % had less than normal BMI score (< 18). Among the overweight respondents who were above 40 years of age, 17 % had hypertension and 4 % had diabetic mellitus. Majority of the respondents who were above 40 years of age had multiple diseases particularly hypertension and diabetes mellitus than those below 40 years of age with normal BMI scores.

Conclusion: This study finding highlights the need of launching awareness raising programmes for the prevention and early detection of multiple diseases among the aged population particularly with high BHI score. It is also recommended to schedule regular health screening programmes incorporating calculation of BMI among the adult population.

Key words: Body Mass Index (BMI), Multiple Disease Syndrome, Hypertension, Diabetes Mellitus

Introduction

Body mass index (BMI) is a measure of your weight relative to your height and waist circumference measures abdominal fat. Combining these with information about your additional risk factors yields your risk for developing obesity-associated diseases. While measuring BMI, waist circumference is also measured placing a tape a measuring tape around your waist. It is a good indicator of your abdominal fat which is another predictor of your risk for developing risk factors for heart disease and other diseases. This risk increases with a waist measurement of over 40 inches in men and over 35 inches in women. According to the National Heart Lungs Blood Institute (NHLBI)¹ guidelines, assessment of overweight involves using three key measures: body mass index (BMI), waist circumference, and risk factors for diseases and conditions associated with obesity.

The BMI is a measure of your weight relative to your height and waist circumference which measures abdominal fat. Combining these with information about your additional risk factors yields your risk for developing obesity-associated diseases. This index classifies weight relative to height squared, which is expressed in units of BMI ≥ 25 kg/m² or obese (BMI ≥ 30). Lower BMI is associated with lower ischemic heart disease (IHD) risk among people in the normal range of BMI values (20-25 kg/m²). As measurement of BMI is one of the economic and easiest methods of detecting potential health risks among the adults, it is often used in conducting epidemiological studies for community diagnosis in the field.

Obesity is believed to be due to an imbalance between dietary intake and physical activities, but exact reason for this imbalance among children is yet unclear (as cited by Chatterjee et. al.)². In the same way, although less physical

Calculation of Body Mass Index

activities were found to be the main reason but national guidelines for physical activities have not been able to prove it³. It is reported that the prevalence of overweight and obesity has increased sharply in adults and children particularly in developed countries. Center for Disease Control and Prevention, in United States of America declared obesity as a national epidemic and projected to be worsening over time^{4,5}. Similarly, the National Health and Nutrition Examination Survey and National Center for Health Statistics (2002) reported that 64 % of adults are considered to be overweight or obese having the BMI greater than 25. Currently, 2 out of 3 American adults are classified as overweight or obese, compared to 1 in 4 in early 1960s⁶.

The National Heart, Lung, and Blood Institute, in cooperation with the National Institute of Diabetes and Digestive and Kidney Diseases, have outlined the first clinical guidelines for the identification, evaluation, and treatment of overweight and obesity⁷. About 97 million adults in the United States are overweight or obese. Obesity and overweight substantially increase the risk of morbidity from hypertension; dyslipidemia; type 2 diabetes; coronary heart disease; stroke; gallbladder disease; osteoarthritis; sleep apnea and respiratory problems; and endometrial, breast, prostate, and colon cancers. Higher body weights are also associated with increases in all-cause mortality

World Health Organization (WHO) has recommended the cut offs of BMI have commonly been used as indicators of obesity⁸. However, Asian populations have a higher body fat percentage for a given body mass index (BMI) than Caucasians. The increased BMI score is known to be related to ischemic heart disease (IHD) in populations where many are overweight (BMI ≥ 25 kg/m²) or obese (BMI ≥ 30)⁹, whereas, lower BMI is associated with lower IHD risk among people in the normal range of BMI values (20-25 kg/m²)¹⁰.

Obesity is not only a predisposing risk factor for the development of dyslipidemia, hypertension and diabetes mellitus. It is also a significant predictor for IHD. Furthermore, studies have confirmed that weight control can be a strong tool for preventing hypertension. A study conducted in New Zealand confirmed that higher mortality mainly related to diabetes and IHD with higher BMI¹¹. Although, obesity is a preventable risk factor for chronic degenerative diseases, the prevalence of overweight and obesity has increased sharply. In the past, it was the major public health problem of developed countries but the studies suggest that obesity has increased in developing countries as well¹².

Overweight and obesity among adults also has become a problem in the developing countries including Nepal¹³,

among the overweight and obese people there has been a rapid increase in the prevalence of multiple non-communicable diseases like hypertension, diabetes mellitus and IHD leading to increased mortality related to these diseases. The increasing rates of BMI indicates being overweight or obesity, which singles for deteriorating health conditions and increases the risk of degenerative diseases such as cardiac diseases - coronary heart disease; diabetes mellitus; high blood pressure - stroke / cerebro vascular accidents; dyslipidemia (for example, high total cholesterol or high levels of triglycerides); diseases of gallbladder; osteoarthritis; sleep apnea and respiratory problems; some cancers (endometrial, breast, and colon). Hence, the the investigators were interested to know the health status of the adult population of the kathmandu valley, so that awareness raising programmes can be launched for prevention and early delectation of multiple disease syndrome among high risk population.

Materials and Methods

A mini health survey was conducted in the Maharajgunj Nursing Campus as a part of academic session during Golden Jubilee Celebration (2006). The investigators were the students of Masters in Nursing Programme (Adult Nursing Group). Necessary information were collected among 240 participants by using to structured mini survey format - consisting of demographic (age, sex, ethnicity) anthropometry (height, weight); blood pressure, and health related information (health problems / medication used, if any). Before proceeding data collection, verbal inform consent was taken from the participants by explaining the purposes of the study.

Data was collected during two days period on 28th and 29th. Mangshir 2063. Standardized SECA Road Rod Stadiometer was used (a) to measure height and weight and (b) sphygmomanometer including stethoscope were used for the measuring blood pressure. Before initiation of the survey, instruments were checked and calibrated for correct reading. Height was measured to the nearest 0.1 cm using a Road Rod Stadiometer and weight was also measured to the nearest 0.1 Kg. Height and weight were measured by keeping them erect on their heels, buttocks and head against the height measuring Stadiometer, and weight was measured with light clothes without shoes. The BMI was calculated by using the standard formula of weight in kilogram (kg/m²), divided by height in meter squared. The calculated data was analyzed and presented in tables and graphs.

Results

The findings of the survey revealed that majority of the respondents were students and academic as well as

administrative staff of IOM particularly from Maharajgunj Nursing Campus. Majority of the respondents were female below 25 years of age (data not shown). Figure 1 revealed that just above half of respondents (56.3 %) had normal BMI score (18.5 - 24.9), indicating well nourished. While remaining 43.7 % had abnormal BMI score (<18.0; and >25.0) reflecting malnourished, posing to risk of multiple disease syndrome. Among them 33.0 % were overweight (25.0 – 29.9), 4.2 % were obese (> 30.0); and remaining 10.8 % respondents were under weight (< 18.0).

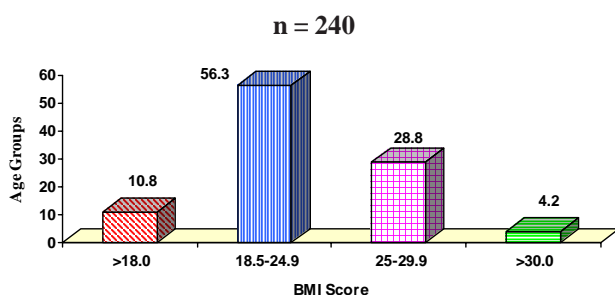


Fig. 1: Respondents Age and BMI score

Regarding gender aggregation, there were high participation of female respondents in all the categories (refer figure 2). Among those who had normal BMI score (18.5 to 24.9), 46.2 % were female and 10 % were male, while 19.5 % female and 9 % of male were overweight, and remaining 3.3 % females and 0.8 % males were obese.

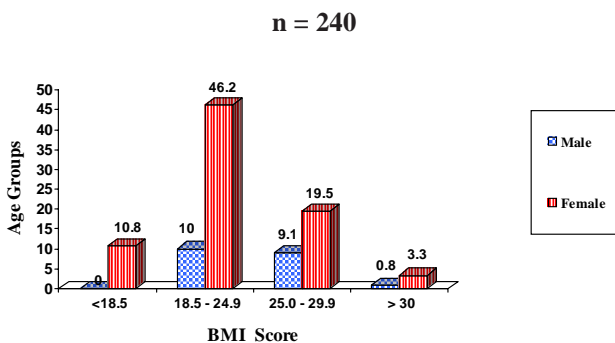


Fig. 2: Distributions of BMI Score by Gender

Among the studied respondents, 57 % had normal BMI score i.e. 17.9 %, 24.6 %, 10.8 % and 2.9 % respectively, and none of them below 20 years of age were overweight /obese. When further analysis was done, it was also noted that among the surveyed respondents, the BMI score was highest among the extreme age groups (Table 1). While among 20 – 40 years of age, 8.3 % high BMI score above normal score (25.0 – 29.9), which found to be increased up to 17 % among the age group of 40 – 60 years of age. Similarly, among 20 – 40 years of age 0.8 % was obese and found to

be increased to 2.0 % among 40 – 60 years of age. It could be due to less representation of above 60 years of age, 3.3 % were overweight and 1.3 % was obese.

Among less than 40 years of age, 8.3 % were overweight (25.0 -29.9), 17.0 % between 40 – 60 years and above 60 years, while none of the respondents less than 20 years were overweight/obese, indicating overweight is not the problem among the female students of Maharajgunj Nursing Campus. However, among 20 - 40 years, 40 – 60 years, and above 60 years of age, the BMI scores were increased to 0.8; 2.0; and 1.3 respectively; indicating that around forties to above 60 years of age the prevalence obesity is much higher than the younger age groups. A study conducted in by Australian Diabetes, Obesity and Lifestyle estimated that 67 % of adult men and 52 % of women to be overweight or obese in 2000. Males were more likely than females to be overweight, with almost half (48 %) of adult males estimated to be overweight compared to 30 % of females.

Table 1: BMI Score by Age of the Respondents
n = 240

BMI Score	Below 20 Yrs. No.	Below 20 Yrs. %	20 – 40 Yrs. No.	20 – 40 Yrs. %	40 – 60 Yrs. No.	40 – 60 Yrs. %	Above 60 Yrs. No.	Above 60 Yrs. %
<18.5	19	7.9	7	2.9	-	-	-	-
18.5 - 24.9	43	17.9	59	24.6	26	10.8	5	2.9
25.0 – 29.9	-	-	20	8.3	41	17.0	8	3.3
> 30.0	-	-	2	0.8	5	2.0	3	1.3
Total	62	25.8	88	36.7	72	29.8	16	7.5

Based on the verbal report of respondents, those who had BMI above 25.0 - 29.9, had more degenerative health diseases and majority of them were under treatment of hypertension and diabetes mellitus. Almost similar findings were presented by Acharya et. al. (2005)¹⁴, in a recent retrospective observational study (464 records) conducted in TUTH among the patients attending general health check up clinic 52. 2 % had normal BMI score, 38 % were overweight, 4 % found to be obese and remaining 6 % were underweight. When further analysis was done, out of these 19 obese cases, 74 % had hypertension, 10.5 % had diabetes mellitus and 5% had IHD. Similarly, out of 176 overweight cases 46 % had hypertension, 7 % had diabetes mellitus and 3 % had IHD; the reported rates of diseases were higher due to difference in sample selection (attendants' medical clinics).

Table 2: Distribution of BMI by HTN and DM
n = 240

BMI	No.	Hypertension No.	Hypertension %	Diabetes No.	Diabetes %
< 18.5	26	-	-	-	-
18.5 - 24.9	135	8	5.9	3	2.2
25.0 - 29.9	69	12	17.3	3	4.3
> 30.0	10	3	30	-	-

Calculation of Body Mass Index

Discussion

This mini health survey indicated that those who had higher BMI scores had multiple disease syndromes than those who had normal BMI score (5.9 % and 2.2 %). Table 2 indicated that hypertension as well as diabetes mellitus were more common among the high BMI score i.e. 17.3 % had hypertension and 4.3 % diabetic mellitus. Similarly among high BMI score >30.0, 30 % of them had hypertension but none of them had clinical symptoms of diabetes.

This survey findings also demonstrated that the prevalence of chronic disease such as hypertension and diabetes were prevalent among those respondents who had high BMI above 25.0. This finding has also supported some other studies: someone with a BMI of 26-27 is about 20 %, which is generally believed to carry moderate health risks. A BMI 30 and above is considered obese. Higher the score of BMI, the greater the risk of developing additional health problems, while a low BMI of less than 18.0 is also associated with higher mortality rates due to infections. Studies conducted by Gambassi et al., (1999) & Landi et al., (2000) demonstrated that among the hospitalized patients, and community dwellers, they had low BMI score.

In this present study, among the respondents who were obese, had remarkably high incidence of hypertension; but it could be due to small sample, none of them had history of diabetes mellitus during the survey; however, the respondents were advised to seek blood test for sugar so that prompt treatment can be started. While, among the cases with normal BMI score and less than 18 BMI scores had significantly lower incidence of these diseases. Out of 242 normal cases, 21 % had hypertension, 5 % had diabetes mellitus and 3 % had IHD. Out of 27 underweight cases, 4 % had hypertension, 4 % had diabetes mellitus and none of them had IHD.

Conclusion

Overweight and obesity is not the problem among young females below twenty five years of age. However, overweight as well as obesity is steadily increased among the adult population giving rise to risk factor for multiple disease syndrome particularly hypertension and diabetic mellitus. As there is higher tendency of developing multiple disease syndromes among obese population than in other aged groups with normal BMI, this study highlights the need of launching awareness raising programmes for the prevention and early detection of multiple diseases among the aged population. Hence, it is recommended to schedule regular health screening programmes incorporating calculation of BMI among the adult population.

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