

FACTORS AFFECTING BMI

Assessment of the effect of sociodemographic factors on BMI In the population of Ghulam Mohammad Abad Faisalabad.

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ABSTRACT... Objective: To examine the effect of different sociodemographic factors on the BMI. **Study Design:** Descriptive Cross Sectional Study. **Place and Duration of Study:** People of Ghulam Mohammadabad and Marzi Pura attending OPD at Independent University Hospital Ghulam Mohammadabad and Marzi Pura Faisalabad. One Month of duration extending from July to August 2012. **Patients and Methods:** 493 respondents were selected by convenient sampling. A semi structured questionnaire was used to collect the information from the sample. First of all, an informed consent was obtained from the respondents under study and secrecy of the information was ensured. By data analysis through SPSS Version 17, frequency tables were prepared. **Results:** The result of this study shows that BMI is less than 18.5 in 25.4% of the males as compared to 11.5% in females. 22.9% married persons were having BMI above 30 as compared to 6.6 percent unmarried. This study also shows 21.1% of the smokers were having BMI above 30 as compared to 18.3% in non smokers. Similarly 18.2% of the respondents sleeping less than 10 hours per day were having BMI above 30 as compare to 15.4% sleeping more than 10 hours per day. Result also shows 25.8% diabetics having 18.5 to 24 BMI while 21.5% in non diabetics. There was family history of obesity in 22.4% only. **Conclusions:** Males are more underweight as compared to females and that females are always on higher side of BMI. Married persons were more obese as compared to unmarried. Per month income, background history of diabetes mellitus and family history of obesity found to have a profound effect on BMI.

Key words: BMI, Diabetes Mellitus, Physical Exercise, Sleeping, Background.

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INTRODUCTION

Body Mass Index (BMI) is a number calculated from a person's weight and height. BMI is a fairly reliable indicator of body fatness for most people. BMI does not measure body fat directly, but research has shown that BMI correlates to direct measures of body fat, such as underwater weighing and dual energy x-ray absorptiometry (DXA).^{1, 2} BMI can be considered an alternative for direct measures of body fat. Additionally, BMI is an inexpensive and easy-to-perform method of screening for weight categories that may lead to health problems¹.

BMI is used as a screening tool to identify possible weight problems for adults. However, BMI is not a diagnostic tool. For example, a person may have a high BMI. However, to determine if excess weight is a health risk, a healthcare provider would need to perform further assessments. These assessments might include skin fold thickness measurements, evaluations of diet, physical activity, family history,

and other appropriate health screenings.

BMI is calculated the same way for both adults and children. The calculation is based on the following formulae:

Measurement Units	Formula and Calculation
Kilograms and meters (or centimeters)	Formula: weight (kg) / [height (m)] ² Example: Weight = 68 kg, Height = 165 cm (1.65 m) Calculation: 68 ÷ (1.65) ² = 24.98
Pounds and inches	Formula: weight (lb) / [height (in)] ² x 703 Example: Weight = 150 lbs, Height = 5'5" (65") Calculation: [150 ÷ (65) ²] x 703 = 24.96

Table-I

For adults 20 years old and above. BMI is interpreted using standard weight status categories that are the same for all ages and for both men and women. For children and teens, on the other hand, the interpretation of BMI is both age- and sex-specific.

The standard weight status categories ranges associated with BMI for adults are shown in the following table.

BMI	Weight Status
Below 18.5	Underweight
18.5 – 24.9	Normal
25.0 – 29.9	Overweight
30.0 and Above	Obese

Table-II.

The correlation between the BMI amount and body fat is fairly strong; however the correlation varies by sex, race, and age. These variations include the following examples:^{3,4}

At the same BMI, women tend to have more body fat than men.

Highly trained athletes may have a high BMI because of increased muscularity rather than increased body fat.

It is also important to remember that BMI is only one factor related to risk for disease. For assessing someone's likelihood of developing overweight- or obesity-related diseases, the National Heart, Lung, and Blood Institute guidelines recommend to look for two other predictors:

The individual's waist circumference (because abdominal fat is a predictor of risk for obesity-related diseases).

Other risks, the individual has, for diseases and conditions associated with obesity are high blood pressure or physical inactivity.

If your BMI is below 20:

This indicates a lean BMI, which means you have a low amount of body fat. If you are an athlete, this can be desirable. If you are not an athlete, a lean BMI can indicate that your weight may be too low which may lower your immunity. If your BMI and body weight are low, you should consider gaining weight through good diet and exercise habits, to increase your muscle mass.

If your BMI is between 20 and 22:

This indicates the ideal, healthy amount of body fat, which is associated with living the longest, and the lowest incidence of serious illness. Coincidentally, it seems that this ratio is what many individuals perceive to be the most aesthetically attractive.

If your BMI is between 22 and 25:

This is still considered an acceptable range, and is associated with good health.

If your BMI is between 25 and 30:

You are considered “Hefty” and should find ways to lower your weight, through diet and exercise. You are at increased risk for a variety of illnesses at your present weight.

If your BMI is over 30:

This indicates an unhealthy condition, your excess “Prosperity” is putting you at risk for heart disease, diabetes, high blood pressure, gall bladder disease and some cancers. You should lose weight by changing your diet.

MATERIAL AND METHODS

STUDY DESIGN

Descriptive Cross Sectional Study

SETTING

People of Ghulam Mohammadabad and Marzi Pura attending OPD at Independent University Hospital Faisalabad.

DURATION OF STUDY

Two Months (July 2012 to August 2012)

SAMPLING TECHNIQUE

Convenient sampling

SAMPLE SIZE

493 individuals

DATA COLLECTION INSTRUMENTS

A semi structured questionnaire

DATA COLLECTION PROCEDURE

The investigator himself collected the information from the sample under study. First of all, an informed consent was obtained from the respondents under study and secrecy of the information was ensured.

DATA ANALYSIS PROCEDURE

Data was analyzed through SPSS Version 17. Frequency tables were prepared.

RESULTS

The results of this study showed that BMI is less than 18.5 in 25.4% of males as compared to 11.5% in females which indicates that males are more underweight as compared to females while 19.4% females are having BMI more than 30 as compared to 13.4% males meaning thereby that females are always on the higher side of BMI.

As far as the age is concerned it is found that BMI increases with age. BMI above 30 in 17.19% of individuals with age group 20-40 and 29.2% of age group 40-60. After 60 years of age it declines to 16.1% in 60-80 age group.

This study also showed that 22.9% married persons are having BMI above 30 as compared to 6.6% unmarried.

Per month income of the respondents also showed impact on BMI as 25% of the persons belonging to high income group were having BMI > 30 as compared to 17.5% in low income group.

Results also showed that 12.9% of the respondents belonging to rural area were having BMI less than 18.5 as compared to 16.6% in urban respondents while 20.3% of the rural respondents were having BMI more than 30 as compared to 16.2% in urban respondents meaning thereby rural respondents are on higher side in both conditions.

This study also showed that 21.1% of the smokers having BMI above 30 as compared to 18.3% non smoker and 7.4% former smokers meaning thereby smokers are on higher side in both condition.

No alcoholic was found in this study.

The results of this study also showed difference of BMI with regard to dietary habits and found BMI above 30 in the respondents having meals more than 3 times/day as compared to 21.3% among persons eating two meals/day.

The study revealed the effect of physical activity on BMI, 23% persons having intense physical activity has BMI above 30 while 19.6% in moderate activity, 16.5% in light activity and 85% in sedentary life style.

It is found that 17.6% of the respondents working less than 10 hrs per day were having BMI above 30 and 20.0% respondents having working hours more than 10 Hrs were having BMI above 30.

18.2% of respondents sleeping less than 10 hrs/day were having BMI above 30 as compared to 15.4% in

BMI VARIABLES	FACTORS	<18.5	18.5-24.9	18.5-24.9	>30	P - value
SEX	FEMALE	42 (11.5%)	171 (46.7%)	82 (22.4%)	71 (19.4%)	.002
	MALE	32 (25.4%)	51 (40.5%)	26 (20.6%)	17 (13.5%)	
MARITAL STATUS	Married	30 (8.8%)	138 (40.6%)	94 (27.6%)	76 (22.9%)	0.000
	Single	44 (28.9%)	84 (55.3%)	14 (9.2%)	10 (6.6%)	
SALARY	<10000	38 (12.9%)	134 (45.4%)	72 (24.4%)	51 (17.3%)	0.437
	10000-30000	32 (18.9%)	77 (45.6%)	30 (17.8%)	30 (17.8%)	
	>30000	4 (14.3%)	11 (29.3%)	6 (21.4%)	7 (25.0%)	
LOCATION	RURAL	26 (12.9%)	87 (43.1%)	48 (23.8%)	41 (20.3%)	0.389
	URBAN	48 (16.6%)	135 (46.6%)	60 (20.7%)	47 (16.2%)	
AGE GROUP	<20	35 (32.7%)	57 (53.3%)	10 (9.3%)	5 (4.7%)	0.000
	20-40	25 (11.2%)	104 (46.4%)	55 (24.6%)	40 (17.19%)	
	40-60	13 (10.0%)	43 (33.1%)	36 (27.7%)	38 (29.2%)	
	60-80	1 (3.2%)	18 (58.1%)	7 (22.6%)	5 (16.1%)	

Table-III. Sociodemographic factors and BMI

VARIABLES	FACTORS	<18.5	18.5-24.9	18.5-24.9	>30	P -value
DIABETIC STATUS	IDDM	9 (14.5%)	25 (40.3%)	16 (25.8%)	12 (19.4%)	0.662
	IMPAIRED	6 (18.8%)	16 (50.0%)	8 (25.0%)	2 (6.3%)	
	NIDDM	59 (14.8%)	181 (45.5%)	34 (21.1%)	74 (18.6%)	
GENETIC	OBESE	9 (15.5%)	22 (37.5%)	14 (24.1%)	13 (22.4%)	0.646
	NON-OBESE	65 (15.0%)	200 (46.1%)	94 (21.7%)	75 (17.3%)	

Table-IV. Diabetes and BMI

VARIABLES		<18.5	18.5-24.9	18.5-24.9	>30	P - value
SMOKING	FORMER SMOKER	4 (14.8%)	10 (37.0%)	11(40.7%)	2(7.4%)	0.139
	NON-SMOKER	67 (15.7%)	196 (45.9%)	86(20.1%)	76(18.3%)	
	SMOKER	3 (7.9%)	16 (42.1%)	11(28.9%)	8(21.1%)	
ALCOHIL	NO	74 (15.2%)	218 (44.9%)	106(21.8%)	88(18.1%)	0.394
	YES	0 (0%)	4 (66.7%)	2(33.3%)	0(0%)	
DIETARY HABITS	>3 MEALS ADAY	7 (14.9%)	18 (38.3%)	7(14.9%)	15(31.9%)	0.000
	2 MEALS A DAY	23 (14.8%)	63 (40.6%)	36(23.2%)	33(21.3%)	
	3 MEALS A DAY	44 (15.2%)	141(48.6%)	65(22.4%)	40(13.8%)	
PHYCICAL ACTIVITY	SEDENTARY	13 (18.3%)	34(47.9%)	18(25.4%)	6(8.5%)	0.463
	LIGHT	26 (14.8%)	81(46.0%)	40(22.7%)	29(16.5%)	
	MODERATE	16 (16.5%)	40(41.2)	22(22.7%)	19(19.6%)	
	INTENSIVE	19 (12.8%)	67(45.3%)	28(18.9%)	34(23.0%)	
WORKING HOURS	<10	64 (14.8%)	198(45.8%)	94(21.8%)	76(17.6%)	0.862
	>10	10 (16.7%)	24(40.0%)	14(23.3%)	12(20.0%)	
SLEEPING HOURS	<10	61 (13.9%)	196(44.5%)	103(23.4%)	80(18.2%)	0.039
	>10	13 (25.0%)	26(50.0%)	5(9.6%)	8(15.4%)	

Table-V. Life style and BMI

FATHER	OBESE	9 (15.5%)	22 (37.5%)	14 (24.1%)	13 (22.4%)	0.646
	NON-OBESE	65 (15.0%)	200 (46.1%)	94 (21.7%)	75 (17.3%)	
MOTHER	OBESE	65 (14.9%)	192 (44.1%)	97 (22.3%)	81 (18.6%)	0.538
	NON-OBESE	9 (15.8%)	30 (52.6%)	11 (19.3%)	7 (12.3%)	

Table-VI. Family History of Obesity and BMI

persons sleeping more than 10 hrs per day.

The results of this study showed that 25.8% diabetics were having 18.5 – 24.0 BMI while 21.1% in non diabetics. Similarly the 19.4% diabetics were obese (BMI >30) as compared to 18.6% non diabetics.

Results of this study also showed that 22.4% of respondents were having history of obesity in their parents.

DISCUSSION

The results of this study showed that males are more underweight as compared to females so that females are always on the higher side of BMI. In a questionnaire survey conducted by BMC Public Health in 2007 on body mass index, physical activity, and dietary behaviors among members of an urban community fitness center also found that females had lower BMI as compared to the males⁷. There have been numerous large population surveys that measured Body mass index using the median BMI values, which are somewhat representative of "average" people.

These studies always showed that median men have higher BMI values than median women. But the "gap" between men and women's median BMI changes with age because fatness generally increases with age, to a greater extent in women than men.

So far as the age is concerned it is found that BMI increases with age and declines after 60 years of age to 16.1% which is also proved by another study conducted to assess the association between BMI, Blood Pressure, and Age among Tangkhul Naga Tribal Males of Northeast India in which maximum value for mean BMI was 22.3 kg/m², among 40–49 yr age group and declined thereafter with the mean value for BMI of all the age groups was found to be 20.9 kg/m²⁶.

This study also showed that 22.9% married persons

were having BMI above 30 as compared to 6.6% unmarried. This also examined the association between different marital transitions and changes in body mass index (BMI) and body weight in a systematic literature search which was conducted for peer-reviewed articles published between January 1990 and December 2011 found that transitions into marriage were associated with weight gain, whereas transitions out of marriage were associated with weight loss. No major differences were observed between genders or across specific marital transition states¹⁷.

Per month income of the respondents also showed impact on BMI as 25% of the persons belonging to higher income group were having BMI > 30 as compared to 17.5 % in low income group. One of the common myths that exists is that all or virtually all low-income people are far more likely to be obese. A significant difference in father's BMI was found between middle, low and high-income groups: 10.5% of fathers in middle-low-income municipalities were obese, compared with 3.8% in high-income areas. However, middle-low-income children were not isolated and were surrounded by a wider social network than high-income children (80.4% vs 69% had more than three friends).

Significant differences were found in the distribution of obesogenic behaviours between middle-low-and high-income municipalities, suggesting that social factors as well as the physical environment should be considered in the development of health policies and interventions to reduce childhood obesity¹⁸.

Results also showed that 12.9% of the respondents belonging to rural area were having BMI less than 18.5 as compared to 16.6% in urban respondents while 20.3% of the rural respondents were having BMI more than 30 as compared to 16.2 % in urban respondents. It was further augmented by another study which found obesity prevalence 39.6% among rural adults

compared to 33.4% among urban adults. Obesity is markedly higher among adults from rural versus urban areas of the United States, with estimates that are much higher than the rates suggested by studies with self-reported data. Obesity deserves greater attention in rural America¹⁶.

This study also showed that 21.1% of the smokers have BMI above 30 as compared to 18.3% in non smoker and 7.4% in former smokers. It is different from another community-based study in the population in Delhi, that showed smoking negatively associated with BMI. The median BMI was higher in non-smokers as compared to smokers. The proportion of overweight and obese subjects was greater among non-smokers as compared to smokers while underweight subjects were in higher proportions among smokers as compared to nonsmokers¹³.

The results of this study also showed difference of BMI with regard to dietary habits and found BMI above 30 in the respondents having meals more than 3 times/day as compared to 21.3% among persons eating two meals/day. Another study was conducted to assess the associations and impact of increased meal frequency, physical activity and 'skipping' breakfast on obesity levels in a sample of urban adolescents, aged 13–17 years old, from Porto, Portugal and found that the proportion of overweight/obese girls and boys that consumed fewer than three meals was significantly higher than those reported from normal-weight counterparts indicating that increased meal frequency may have a beneficial effect on a reduced BMI¹⁴.

Eating three or fewer meals per day was also associated with increased likelihood of general and central obesity in men when adjusting for total energy intake, lifestyle and dietary factors. However, results did not reach statistical significance among women. The present study suggests that a high daily eating frequency is associated with a healthy lifestyle and dietary pattern in both men and women, and a reduced

likelihood of general and central obesity in men. There is a need for prospective studies investigating the association between eating frequency, diet and body composition¹⁵.

Most studies indicate an inverse relationship between physical activity and body mass index (BMI). However, the impact of obesity on this relationship is still unclear. On the other hand physical activity also inversely associated with age and education. This study revealed the inverse effect of physical activity on BMI as 23% person having intense physical activity has BMI above 30 while 19.6% in moderate activity, 16.5% in light activity and 8.5% in sedentary life style which is different from another study showing that the weak association between physical activity and BMI in non-obese individuals but significantly associated with physical activity in obese individuals. Longitudinal studies are needed to tease out the direction of association between PA and BMI across BMI categories, as the cross-sectional associations seem to be dependent on obesity status¹⁰.

The effect of working hours on BMI were also studied and found that the respondents working more than 10 hours have more BMI as compared to those respondents working less than 10 hrs per day which indicate a positive association between hours of working and BMI.

A cross-sectional population-based survey was conducted among working Australians in the state of Victoria for psychosocial and other working conditions in relation to body mass index in a representative sample of Australian workers and found among men and women differing patterns of both exposures to psychosocial working conditions and associations with BMI. Among men, working long hours was positively associated with higher BMI and this association was partly independent of job stress. Among men physical demand was negatively associated with BMI and this association was

independent of job stress. However these limitations must be taken into account. First, the cross-sectional design of our study cannot support causal inferences between occupational factors and BMI¹².

The effect of sleeping on the BMI was also taken into account and found that respondents sleeping less than 10 hrs/day were having BMI above 30 as compared to those sleeping more than 10 hrs per day. No matter what other factors are concerned, sleeping time seems to be the most important factor to affect BMI because this result was further augmented by a study showing that people who sleep less than 5 or more than 9 hours will have an average BMI greater than those who sleep for 6-9 hours. As we see that age and eating habit will affect the BMI, sleeping time will affect the BMI too. Best sleeping time is 6-9 hours. Avoid sleeping too little (less than 5 hours) or too much (above 9 hours). It will lead to a high Body Mass Index and also many other diseases or even lead to death¹¹.

The effect of diabetes mellitus on BMI was also studied in this study and found an increase of 4% of BMI in the respondents having diabetics mellitus as compared to non-diabetics. Similarly 19.4% diabetics were obese (BMI >30) as compared to 18.6% non diabetics. The relationship of body mass index to diabetes mellitus, hypertension and dyslipidaemia were also studied with the comparison of the data from two national surveys SHIELD and NHANES in 2007. Both surveys showed that an increase in BMI is generally associated with a significant increase in prevalence of diabetes mellitus, hypertension and dyslipidaemia. The prevalence of diabetes mellitus and hypertension increased in an observable, linear fashion as BMI levels increased. The prevalence of diabetes mellitus was highest among morbidly obese individuals (BMI \geq 40), with rates of 25% (SHIELD) and 27% (NHANES)⁸.

Results of this study also showed that 22.4% of respondents were having history of obesity in their

parents.

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