

# Age-Related Association Between Body Mass Index and Blood Pressure in Normal Adult Males

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## SUMMARY

To see age related association between body mass index and blood pressure. One hundred and fifty normal adult males were included in the study. According to age, they were divided into five groups, each having thirty subjects. Complete medical history was taken. General physical examination done. Height and weight were measured and body mass index calculated, Average of three blood pressure readings was taken as basal blood pressure. Statistical analysis of the data showed, stronger relationship between body mass index and blood pressure in older age groups than younger age groups. In our subjects the increase in mean blood pressure for a 1 unit increase in body mass index ( $\text{kg/m}^2$ ) was 0.41, 0.47, 0.72, 0.80 mmHg in the 18-30, 31-43, 44-56 and 57-69 and above 69 years age group respectively, Age modifies the relation between body mass index and blood pressure. As age advances, blood pressure rises but accelerated rise in blood pressure in later age groups is due to increase in body mass index. So individuals in later age groups should avoid to become overweight and also avoid all possible causes leading to obesity.

## INTRODUCTION

People with excessive body fat have long concerned epidemiologists, as a number of chronic diseases that frequently appear in the middle and older age such as diabetes mellitus, atheromatosis and hypertension are evidently associated with obesity<sup>1</sup>. Although one should keep in mind the difference between causation and association, the evidence showing that blood pressure and body weight are positively inter related in adult western population is both over whelming and irrefutable<sup>2</sup>.

In the available data from industrialized countries, an association between age, blood pressure and body weight in adults has been confirmed by a large number of researches<sup>3</sup>.

Staessen et al (1983) have shown. that each 10 Kg increase in body weight was associated with a 2mm higher systolic blood pressure (SBP) and diastolic blood pressure (DBP) in men, aged 20 or more, and with a 3 mmHg higher SBP and DBP in females of similar age.

By contrast to the affluent western population, several under privileged societies have been described where blood pressure rises little or not at all with age where hypertension is almost non-existent<sup>4,5,6</sup>.

Weight as such is a poor reflector of body composition and to more accurately delineate the level of adiposity, a relationship of body weight to height has been used.

$$\text{Body mass index (BMI)} = \frac{\text{Weight (kg)}}{\text{Height (meters}^2\text{)}}$$

This equation gives us ideal body weight for height<sup>7</sup>.

Individuals have been classified as over weight and obese, if they have BMI of 27  $\text{Kg/m}^2$  and 30  $\text{Kg/m}^2$  respectively<sup>8</sup>. In adolescence, blood pressure rises steeply with age for some yet undetermined reasons. In youth, body weight independently accounts for the major fraction of the explained variant in systolic and diastolic blood

**Table 1: Relationship between age, BMI, SBP and DBP among 150 normal adult males.**

Variable	Regression equation $Y = a + bx$	Correlation coefficient (r)	SE <sub>r</sub>	SE <sub>b</sub>	SE <sub>y<sub>x</sub></sub>	P-value
BMI	BMI = 10.99 + 0.25 (Age)	0.67	0.04	0.023	3.65	P<0.01
SBP	SBP = 84.98 + 1.84 (BMI)	0.66	0.04	0.175	10.26	P<0.01
DBP	DBP = 54.07 + 0.96 (BMI)	0.57	0.05	0.114	2.78	P<0.01

**Table 2:**

Age (Years)	Number	BMI kg/m <sup>2</sup> (Mean±SD)	SBP mmHg (Mean±SD)	DBP mmHg (Mean±SD)
18-30	30	12.5±2.5	100.0±10.0	52.7±3.0
31-43	30	17.0±2.0	114.6±5.0	58.5±2.0
44-56	30	21.0±2.0	124.6±5.0	65.5±4.0
57-69	30	25.6±2.5	135.3±5.0	73.0±2.0
Above 69	30	28.0±1.5	145.3±5.0	78.0±2.0

pressure, where as chronological age is less important. After controlling for weight, the association between chronological age and blood pressure may even disappear in the young<sup>9,10</sup>. We plan this study in order to see how age modifies the relation between body mass and blood pressure.

### SUBJECT AND METHOD

One hundred and fifty normal adult males aged 18-70 years were included in the study. Subjects were selected from the staff of Sheikh Zayed Hospital and University of the Punjab.

According to age, they were divided into five groups, each group having 30 subjects. Height and weight were measured and BMI was calculated.

All healthy subjects were included in the study by taking history, doing clinical examination.

#### Protocol for Examination<sup>11</sup>

1. 10 minutes were given to the subjects for taking rest.
2. Subjects included had already taken food/break/fast.
3. Standing weight was taken with light clothes and shoes off
4. Height was measured by height scale.
5. Proper Blood Pressure cuffs were used. The subjects having arm circumference less than 46. cm, cuff measuring 12 x 22 cm was used,

6. but a subject having arm circumference:> 46 cm a cuff measuring 15 x 39 cm was used. Blood Pressure was taken in both sitting and lying position. While sitting arm was supported on cushion. Both systolic and diastolic blood pressure were measured. The diastolic pressure was recorded at the disappearance of Korotkoff sound phase V. Three blood pressure readings were obtained with time interval of 15 minutes, and average of three readings was taken as basal blood pressure.

### RESULTS

Effects of age on body mass index and blood pressure in one hundred and Fifty normal adult males was studied.

Relationship between age, BMI, SBI, and DBI was shown in Table 1. Significant co-relation ( $p<0.010$ ) was observed between age and body mass index meaning that with advancement of age, body mass index had increased in 150 normal subjects.

Similarly statistically significant correlation was found between BMI and SBP, BMI and DBP indicating that as BMI had increased, SBP and DBP had tendency to increase (Table 2)

Figure 1 showed that body mass index had tendency to increase with age, Figures 2 and 3 showed that systolic and diastolic blood pressure

increased significantly with body mass index,

We concluded from the results that age had significant effect on BMI and blood pressure. As age advances, BMI increases, and along with it blood pressure rises.

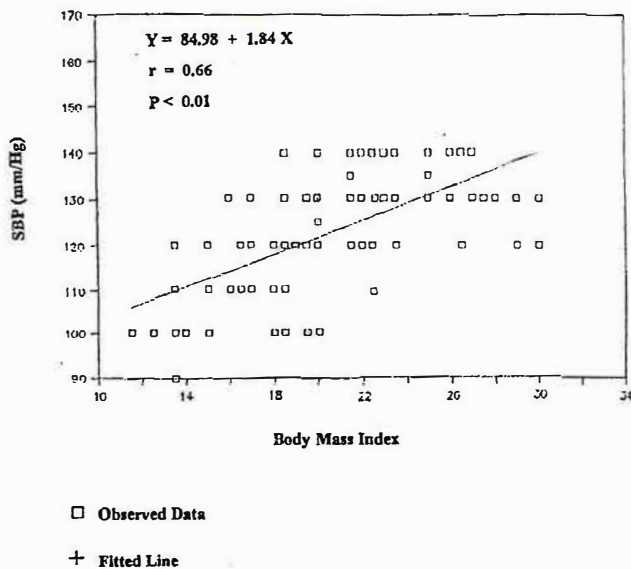


Fig. 1. Relationship between age and BMI.

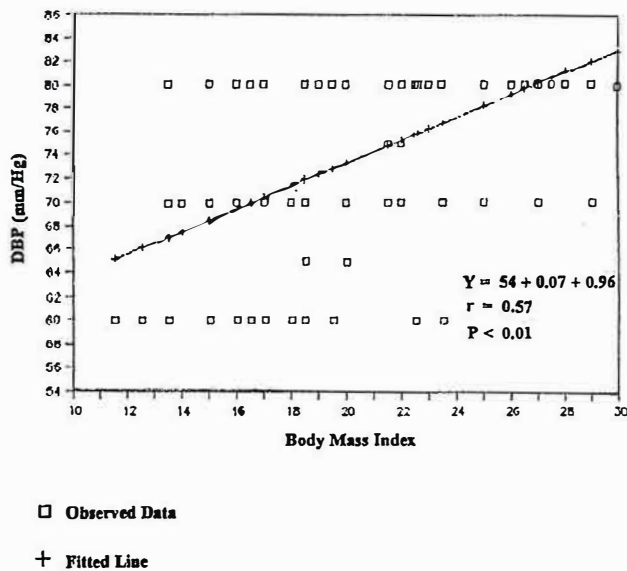


Fig. 2. Relationship between BMI and SBP.

## DISCUSSION

In our study, we concluded that with increasing age, body mass index increases and like wise systolic blood pressure rises.

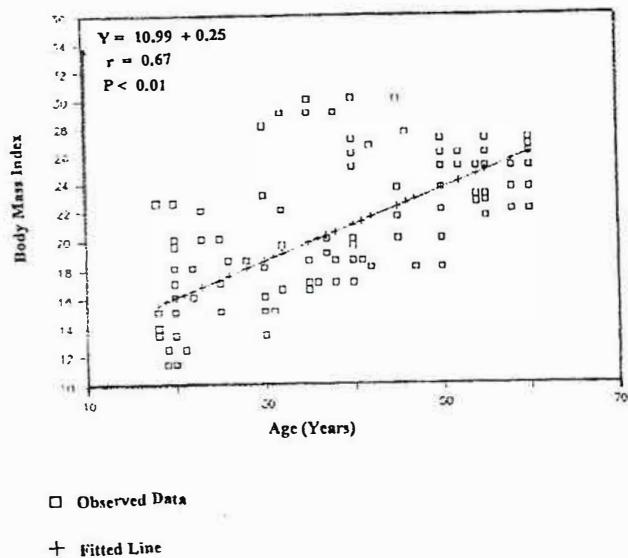


Fig. 3. Relationship between BMI and DBP.

In western population, the largest gain in the BMI is between 10 and 29 years of age. The increase is steepest in males aged 10-25 years<sup>12</sup>. While in our study the maximum gain in BMI is between 50 and 70 years of age. Similarly in western society the positive relationship between blood pressure and body weight has been demonstrated. This co-relation is stronger in early adulthood<sup>9</sup>. In our study the strong positive relationship between age, blood pressure and body weight has been demonstrated and this correlation is more in late adulthood. Increase in blood pressure which develops in later age group in our normal individuals is due to increase in BMI and haemodynamic pattern.

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