



Original Research Article

Differential Influence of Age on Body Mass Index and Blood Pressure in Healthy Male and Female Subjects

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Received: 29/05/2014

Revised: 17/06/2014

Accepted: 24/06/2014

ABSTRACT

Introduction: There are conflicting reports on influence of ageing and gender on body mass index (BMI) and blood pressure (BP) in different population. This study evaluated the influence of ageing on these parameters in healthy subjects.

Materials and Methods: BP, heart rate and BMI was measured in 140 apparently healthy subjects. They were divided into four groups. Group A: males \leq 50 years of age; Group B: males above 50 years; Group C= females \leq 50 years; Group D= females above 50 years. Data was analysed using unpaired t test and Mann-Whitney 'U' test.

Result: BMI of group B was significantly lower compared to group A ($p = 0.004$). Diastolic blood pressure was significantly higher in group D compared to group C ($p = 0.016$). Heart rate was significantly lower in group D compared to group C ($p = 0.03$)

Conclusion: There is differential influence of ageing in males and females on body mass index and diastolic blood pressure.

Key words: gender difference, ageing, body mass index, diastolic blood pressure

INTRODUCTION

Cardiovascular disease (CVD) is one of the leading causes of mortality globally.

[1] Elevation of blood pressure is one of the most important preventable causes of CVD.

[2] Obesity has also been shown to be associated with risk factors for CVD, hypertension and diabetes. [3,4] Age is the most important determinant of CVD and mortality. Body mass index (BMI) calculated as weight in kg/height in meters squared, is most widely used to estimate the prevalence of obesity or underweight within

a population. Similarly blood pressure and heart rate are key regulated variables in cardiovascular system. Since both age and gender have a profound influence on the risk of cardiovascular disease and death, it is important to understand the effects of healthy ageing on key variables in cardiovascular system and BMI. Thus this study was undertaken to compare the influence of age on BMI, arterial blood pressure and heart rate in apparently healthy male and female subjects.

MATERIALS AND METHODS

140 healthy subjects were studied. They were free from CVD, hypertension and diabetes mellitus. They were of either sex and unselected with regard to age. In them height and weight was measured. BMI was then calculated as weight in kg/height in meters squared. Systolic and diastolic blood pressure was measured using sphygmomanometer in sitting position. Two readings were taken 5 minutes apart in the sitting position. The mean of the two was recorded as blood pressure. Pulse was counted for one minute as a measure of heart rate per minute.

Male and female subjects were divided into four subgroups in the following way : Group A(n = 38) : Males below or equal to 50 years of age ; Group B (n = 48): Males above fifty years of age ; Group C(n = 26): Females below or equal to fifty years of age ; Group D (n = 28): Females above fifty years of age.

Statistical analysis: Unpaired t test was applied to unpaired data of independent observations made in two separate groups. Whenever the standard deviation between the groups was not comparable non-parametric equivalent, Mann-Whitney 'U' test was applied.

RESULT

There were 86 males and 54 females. Among the males 38 were 50 years or less than 50 years of age (group A). 48 were more than 50 years old (group B). Among the females 26 were 50 years or less than 50 years of age (group C). 28 females were aged more than 50 years (group D). Data on BMI, blood pressure and heart rate is presented as mean \pm SD. Data on comparison of BMI, blood pressure and heart rate between group A and group B is presented in table 1. Comparison of BMI, blood pressure and heart rate between group C and group D is presented in table 2.

Table 1. Comparison of body mass index, blood pressure and heart rate between below and above fifty years of age in healthy male subjects.

Variables	Group A (Below 50 years,n=38)	Group B (Above 50 years , n = 48)	p value
Body mass index (Kg/m ²)	23.87 \pm 2.19	22.47 \pm 2.18	0.004
SBP(mm Hg)	123.43 \pm 7.72	125.66 \pm 10.04	0.26
DBP (mmHg)	81.23 \pm 2.54	80.83 \pm 3.59	0.56
Heart rate (beats/sec)	79.29 \pm 9.41	77.75 \pm 7.85	0.41

SBP = Systolic blood pressure; DBP = diastolic blood pressure

Table 2. Comparison of body mass index, blood pressure and heart rate between below and above fifty years of age in healthy female subjects.

Variables	Group C (Below 50 years, n = 26)	Group D Above 50 years, n = 28)	P value
Body mass index(Kg/m ²)	21.37 \pm 1.63	21.70 \pm 2.54	NS
SBP (mmHg)	119.03 \pm 3.47	119.75 \pm 10.96	NS
DBP (mmHg)	79.42 \pm 1.40	81.42 \pm 3.90	0.016
Heart rate (beats/minute)	84.23 \pm 8.49	79.84 \pm 6.57	0.03

SBP = Systolic blood pressure; DBP = Diastolic blood pressure

In males BMI was significantly lower in group B compared to group A (table 1). In males blood pressure and heart rate did not differ significantly between group A and group B (table 1).

In females diastolic blood pressure was significantly higher in group D compared to

group C and heart rate was significantly lower in group D compared to group C (table 2). BMI and systolic blood pressure did not differ significantly between group C and group D (table 2).

DISCUSSION

The results of present study demonstrate sex dependent influence of ageing on BMI, diastolic blood pressure and heart rate.

In the present study BMI was significantly lower in males above fifty years of age compared to males of 50 years of age and below. But in females BMI was comparable between below and above 50 years of age groups. Some previous longitudinal studies have observed an apparent decrease in body weight or BMI after age 55–65 years. [5,6] Ogden c et al have shown that mean BMI declines after the age of 60 years. [7] Seideell et al have observed decline in BMI in men aged 70 or more. [8] Our study findings along with previous studies suggest that body mass declines with ageing. Astrid CJ et al have observed negative correlation between free testosterone level and ageing. [9] At the same time their study did not find any correlation between BMI and testosterone level. [9] Thus we hypothesize that weight loss observed with ageing in different population may be independent of testosterone level. However, Stevens J et al and Barone BB et al have observed no change in BMI with ageing. [10,11]

In the present study, among females but not among men, significantly higher mean diastolic blood pressure and significantly lower heart rate was observed in above 50 years of age group compared to 50 years and below 50 years age group. Blood pressure is reported to increase more steeply around the menopause. [12-14] However, a number of other studies have reported no significant difference [15-17] and a few studies have even reported a lower BP with the menopause. [18] Thus lack of female hormones alone may not be the cause of rise in blood pressure. Total peripheral resistance is the major determinant of diastolic blood pressure. Heart rate on the other hand is inversely proportional to the blood pressure

owing to baroreceptor reflex mediated alteration in vagal activity. Thus we speculate that with ageing total peripheral resistance increases in females leading to rise in diastolic blood pressure followed by lowered heart rate. However, arterial alteration, increased responsiveness to sympathetic nervous stimuli, altered renal and sodium metabolism and an altered renin-aldosterone relationship are the other factors reported to affect arterial blood pressure with ageing. [19] Thus we hypothesize that any one of these or all of these factors might have collectively contributed to elevated diastolic blood pressure in our females with ageing.

CONCLUSION

Based on our study findings it could be concluded that there is differential influence of ageing in males and females on body mass index and diastolic blood pressure.

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How to cite this article: Subbalakshmi NK, Suman VB, Sheila RP. Differential influence of age on body mass index and blood pressure in healthy male and female subjects. *Int J Health Sci Res.* 2014;4(7):128-131.
