STUDY OF ASSOCIATION BETWEEN BODY MASS INDEX AND HYPERTENSION IN ELDERLY IN A RURAL TEACHING HOSPITAL.

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ABSTRACT

Background: Increased blood pressure and body mass index (BMI) has a direct correlation with increased cardiovascular and cerebrovascular mortality and morbidity, especially in elderly individuals. More BMI has been shown to be an independent risk factor because of its effect on hypertension, diabetes, and dyslipidaemia. We have done this study to assess the effect of BMI on systolic and diastolic blood pressures in elderly individuals.

Materials and Methods: This is a prospective observational study carried out in all patients above 60 years who attended the geriatric camp for 2 months in the study centre. The Chi-square test was applied to correlate systolic and diastolic blood pressure with BMI. Result and Observation: A total of 100 patients were included in the study. Our study showed a strong correlation between systolic blood pressures and BMI. However, the influence of sex on hypertension was statistically not significant for both systolic and diastolic blood pressure (p > 0.05) in our study.

Conclusion: The association between BMI and both systolic and diastolic pressures remained highly statistically significant in these analyses. These results show that as BMI increases blood pressure rises even in old age and suggest that it may be possible to modify rates of hypertension by changes in body weight.

KEYWORDS: body mass index, blood pressure, association, elderly.

INTRODUCTION

Elderly population contributed to 7% of the total population in India in 2001 & it will rise to 9% by 2016, a majority of this population will be living in rural areas. According to an estimate they will constitute one third of the total population of the world of 2050 AD.1 Life expectancy in India has increased from 37 years (1951) to 67 years (2011) due to overall socioeconomic and health care developments, so is the co-morbidity like overweight and obesity. Body mass index is positively and independently associated with morbidity and mortality from hypertension, cardiovascular disease, diabetes mellitus, and other chronic diseases. Not much data is available regarding the association between obesity and hypertension in the elderly. Few studies have shown a correlation between body mass index (BMI) and systolic and diastolic blood pressures in the elderly.2 Hypertension has been reported in 40-48% geriatric patients in India.3 Hypertension is a threat to life at all ages and in both sexes. It is one of the leading cardiovascular disorder and an important risk factor for coronary artery disease, cerebrovascular diseases and cardiac failure in elderly subjects.4

Unfortunately, studies in India regarding the correlation between blood pressure and BMI in elderly people are lacking. The knowledge of the effect of increased BMI especially obesity on hypertension is very important as it is a modifiable risk factor. Our aim of this study is to find out the association between body mass index and blood pressure in the elderly population. The specific research questions for this study was that among cases aged 60 years or more a) does correlation exists between body mass index and systolic and diastolic blood pressure; b) do those who were in the highest group of BMI as compared to those within the lowest group, have a higher prevalence of hypertension.

MATERIAL AND METHOD

Study Design
A Prospective observational study.
Settings
The study was done in August-September, 2014 at Acharya Vinoba Bhave Rural teaching hospital attached to Jawahar Lal Nehru Medical College, Wardha in rural central India. All the subjects attending geriatric camp
for general check-up and aged above 60 years were included in the study. Subjects who were known cases of hypertension, diabetes, coronary heart disease, stroke, chronic kidney disease chronic alcoholic was excluded from the study. These individuals were then briefed about the study and an informed consent was taken. All the eligible case was subjected to one time clinical examination, which included a detailed history regarding any addictions, e.g., smoking and its duration, pack per year and alcohol, and subsequent study procedures. The study was approved by the institutional review committee of the institute.

Study procedures
Primary study variables and their collection
All anthropometric measurements like weight and height was performed according to WHO guide lines. Weight was measured in to the nearest 100 grams using calibrated spring balance without heavy clothing and bare footed with a same standardized weighing machine for all patients. Height was measured to the nearest centimeter, barefooted using a stadiometer. Blood pressure was recorded in the sitting position after 5 minutes of rest using standard mercury manometer.

Derived variables and their calculation
Hypertension was diagnosed when systolic BP > 140 mm Hg and/or diastolic BP > 90 mm Hg or a known hypertensive patient. BMI (weight in Kg / (height in meters²) was calculated and divided in four groups like group I (<20 ), group II (20.1 - 22.5), group III (22.6-25), and group IV (> 25.1).

Statistical analysis
The patients were divided into four groups based on their BMI group I (<20), group II (20.1 - 22.5), group III (22.6-25), and group IV (> 25.1). The mean systolic and diastolic blood pressure for both the male and female categories of patients was compared in the three categories of patients with students t-test. The mean blood pressure recordings between both the genders was also analyzed using students t-test. The software used for statistical analysis was strata version 11.

RESULTS AND OBSERVATION
Altogether, 100 patients more than 60 years attending geriatric camp for general check-up were included in the study. Among them 80% were male, their mean age was 67.73 ± 6.11 in male and 66.75 ± 5.83 in female. Mean BMI were 19.61±3.84 kg/m². Baseline comparison of characteristics of study subjects is shown in Table 1. More cases (n=57) were in BMI less than 20. Body mass quintile with different variable like age, sex, BMI, blood pressures, and smoking are shown in Table 2. Blood pressure and BMI in 5years age group are shown in table 3. The blood pressures were found to increase progressively with the increase in BMI in both sexes. There was a statistically significant increase in the systolic blood pressure R value 0.2214, p < 0.05 as well as diastolic blood pressure R value 0.2967, p < 0.05. There were also statistically significant relation between smokers and blood pressures shown in Table 4.
**Table 3: Mean BMI, SBP and DBP across 5 years age groups.**

<table>
<thead>
<tr>
<th>Variable</th>
<th>60-65 (n=50)</th>
<th>66-70 (n=23)</th>
<th>71-75 (n=15)</th>
<th>&gt;76 (n=12)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean BMI</td>
<td>19.66+0.98</td>
<td>21.10+1.98</td>
<td>18.42+1.72</td>
<td>17.98+1.80</td>
</tr>
<tr>
<td>Mean SBP</td>
<td>126.2+5.46</td>
<td>129.21+8.96</td>
<td>127.73+8.66</td>
<td>131.83+9.94</td>
</tr>
<tr>
<td>Mean DBP</td>
<td>79.88+5.06</td>
<td>81.21+6.06</td>
<td>73.6+7.76</td>
<td>73.66+5.24</td>
</tr>
</tbody>
</table>

**Table 4: Correlation of BMI, Number duration of smoking and pack years with systolic and diastolic blood pressure.**

<table>
<thead>
<tr>
<th>Variables</th>
<th>Systolic blood pressure</th>
<th>Diastolic blood pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>R value</td>
<td>P value</td>
</tr>
<tr>
<td>BMI</td>
<td>0.2214</td>
<td>&lt; 0.05</td>
</tr>
<tr>
<td>Cigarette smoking per day</td>
<td>0.6226*</td>
<td>&lt; 0.05</td>
</tr>
<tr>
<td>Duration of smoking</td>
<td>0.6431*</td>
<td>&lt; 0.05</td>
</tr>
<tr>
<td>Pack years</td>
<td>0.6440*</td>
<td>&lt; 0.05</td>
</tr>
</tbody>
</table>

**DISCUSSION**

Our study showed that BMI is significantly and independently associated with both SBP and DBP in elderly in rural teaching hospital. Several studies revealed the close relationship between BMI and systolic and diastolic blood pressures in elderly.[5,6,7] Few study have shown relation between BMI and blood pressure was stronger in females than males.[8] However, in our study, the influence of sex on hypertension was statistically not significant for both systolic and diastolic blood pressure (p > 0.05).

Hypertension is one of the most common chronic conditions seen in the elderly population. If control of weight in the elderly helps in reduction of blood pressure, active lifestyle and a healthy diet are cost effective measures in improving the quality of life in the elderly. When the mean systolic and diastolic blood pressures among different BMI categories were evaluated, it was found that mean systolic and diastolic blood pressure increased with increasing BMI from lowest BMI to the highest BMI category. Both systolic and diastolic BP increased with increase in BMI level. Positive associations between BMI and BP have also been reported in other Indian populations.[9]

Few studies have emphasized the synergism of smoking with hypertension. The pathogenetic mechanism by which smoking contributes to this is endothelial dysfunction. Nicotine damages endothelium and tobacco smoke increases smooth muscle cell proliferation and adhesion, leading to atherosclerosis and blood pressure.[10] The data obtained from our study for the association of BMI and blood pressure is limited. Further studies in a larger scale are warranted to establish the correlation between them.

**REFERENCES**


7. Amador LF, AL Snih S, Markides KS, Goodwin IS. Body mass index and change in blood pressure over a 7-year period in older Mexican Americans.

