Epidemiology of Hypertension in a North Indian Population

Based on Rural-Urban Community Surveys

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SUMMARY

The epidemiology of hypertension was studied on the basis of total community surveys in defined urban (mostly non-agricultural) and rural (agricultural) populations of Haryana, using WHO criteria. A total of 4,068 subjects, comprising 95% of the eligible populations, were examined. Hypertension was found to be almost twice as common in the urban (64.3/1,000) as in the rural group (35.7/1,000). The prevalence of hypertension as well as the mean pressures were greater in men than in women in the 3rd and 4th decades, after which the pattern was reversed in all the subsequent age groups. The regression lines intersected at approximately 45 years of age. However, there was no appreciable sex difference in either group in the overall prevalence of hypertension.

The mean systolic and diastolic pressures rose significantly with increasing age. These were generally lower in rural than in urban subjects and there was a difference of almost one decade group. Only one out of every four hypertensives detected during the survey was aware of his disease, and even among these three-fourths were either untreated or inadequately controlled.

The lower prevalence of hypertension was associated with lesser mean pressures in the rural community, and both these observations are ascribed to a much larger proportion of rural people (compared to city dwellers) being thinner in size, engaging in hard physical activity, and belonging to a lower socio-economic group. The data have also been compared with other studies from India and abroad and the possible reasons for the observed differences discussed.

Additional Indexing Words:
Epidemiology    Hypertension    Prevalence
THERE is now ample evidence to show that the awful burden of disability and untimely death from hypertension can be greatly reduced. This requires a multipronged approach, in which the first step consists of epidemiological surveys to detect as early as possible those subjects who would benefit from lowered blood pressure.

Since WHO's commitment in 1958 to promote control of hypertension, several excellent studies from Western countries are now available on various facets of the disease. There are many studies from India as well, but their planning and methodology leave much to be desired. Most of these studies lack proper diagnostic criteria and have been conducted in selective population groups and hence do not reflect the epidemiology of the disease in its true perspective. In this paper we present our data on the prevalence and some related aspects of hypertension from this northern part of India, studied on the basis of total community surveys.

**Materials and Methods**

The study was carried out in the State of Haryana, located in the northern part of India. The climate of the area is very hot in summers (maximum temperature 45-50°C) and cold in winters (15-20°C). Two ethnically identical population groups, one rural and the other urban were studied. The rural group was studied in the village of Tosham situated in the interior of Haryana, approximately 70 Km north-west of Rohtak. Until a decade ago there was no school (except a small primary school) or dispensary in the village, nor any water supply, the only source of drinking water being two wells located about 2 Km away from the village. Recently, however, the village has been electrified and provided with good roads connecting it with neighbouring towns, and middle level schools have started. Socio-economically a large majority of the community is very poor, and not a single family owns an automobile, though many have recently acquired transistor radios and a few even own television sets. The main occupation is agriculture and nearly all men are engaged in heavy physical activity. The women perform all the house work and also provide considerable assistance with field work.

The second population type studied was an urban group in Rohtak city which is situated 75 Km north-west of New Delhi and has a population of 125,000. The city has half a dozen degree colleges, an affiliating university with a Medical College, a radio station and about a dozen cinema halls. It is divided into 13 municipal wards of which one representative ward was selected for the present study. The residents of this ward include in-
dustrialists, doctors, lawyers, college and school teachers, bank and insurance employees, petty shopkeepers, rickshaw pullers, and hawkers. Most of the women are engaged only in house work which is fairly strenuous since they have no mechanical aids to help them. However, many women in the upper and upper-middle social classes have domestic assistance in the form of house maids/servants.

The study was restricted to subjects aged 20–69 years. Thus 2,120 subjects out of a total population of 6,775 in the defined urban area and 2,133 out of total rural population of 6,216 were eligible for the study. Of these, 2,023 subjects in the urban and 2,045 in the rural group (comprising more than 95% of the eligible population) were actually contacted and included in the survey.

The methodology employed strictly followed WHO\textsuperscript{2} guidelines so that subjects with systolic pressures 160 mmHg or above and/or diastolic pressures 95 mmHg or above were defined as hypertensives, irrespective of their age. Blood pressure measurements were made in each subject from his/her right arm (supine position) by the same doctor and with the same mercury Baumanometer throughout the survey. The accuracy of the blood pressure apparatus, especially the zero level, was frequently checked and compared with the personal Baumanometer of the senior author. A mean of two readings, one recorded at the beginning of the interview and the other 10 min after the interview, was taken as the actual blood pressure of the subject. Details of smoking habits, exact nature of work, diet, and socio-economic status were assessed by the doctor in the actual setting of the subjects’ homes and recorded on a specially designed form. The data thus collected were submitted to the Indian Council of Medical Research (Statistical Wing), New Delhi, for computerisation, and some of the results obtained are described below.

Observations

Population distribution and characteristics

i) Distribution: There was almost an equal number of subjects in the 2 groups with nearly similar age and sex distribution (Table I). The majority of the subjects were in the 3rd–5th decades in both the urban (82.5%) and rural (85.6%) groups. This is in keeping with the frequency distribution of other populations studied. The male-female ratio was 1.3:1 in both population groups.

ii) Characteristics: Population characteristics such as height, weight, socio-economic status, and physical activity of the two communities studied are shown in Table II. Rural subjects were, by and large, taller and thinner,
belonged to lower socio-economic group and indulged in heavier physical activity in comparison to their urban counterparts.

**Urban-rural trends**

i) **Prevalence of hypertension:** Hypertension was found to be significantly
Table III. Age Related Prevalence of Hypertension

<table>
<thead>
<tr>
<th>Age group</th>
<th>Men</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total No. of subjects studied</td>
<td>Total No. of hypertensives detected</td>
<td>Prevalence of hypertension (%)</td>
<td>Total No. of subjects studied</td>
<td>Total No. of hypertensives detected</td>
<td>Prevalence of hypertension (%)</td>
<td></td>
</tr>
<tr>
<td>20-24</td>
<td>477</td>
<td>10</td>
<td>2.12</td>
<td>343</td>
<td>5</td>
<td>1.46</td>
</tr>
<tr>
<td>25-34</td>
<td>765</td>
<td>16</td>
<td>2.15</td>
<td>578</td>
<td>10</td>
<td>1.7</td>
</tr>
<tr>
<td>35-44</td>
<td>470</td>
<td>24</td>
<td>5.10</td>
<td>395</td>
<td>15</td>
<td>3.8</td>
</tr>
<tr>
<td>45-54</td>
<td>316</td>
<td>25</td>
<td>7.91</td>
<td>220</td>
<td>28</td>
<td>12.7</td>
</tr>
<tr>
<td>55-64</td>
<td>203</td>
<td>24</td>
<td>11.8</td>
<td>174</td>
<td>26</td>
<td>15.0</td>
</tr>
<tr>
<td>65-∞</td>
<td>74</td>
<td>13</td>
<td>17.6</td>
<td>53</td>
<td>12</td>
<td>22.6</td>
</tr>
</tbody>
</table>

Fig. 2. Blood pressure levels decade wise in both population groups and in either sex.

(p<0.01) more common (64.3/1,000) in the urban as compared to the rural (35.7/1,000) population, and this was true for all age groups (Fig. 1). There was no significant difference (p>0.05) in the overall prevalence of hypertension in the two sex groups. However, the age matched comparisons showed that the disease was more common in men than in women up to the 4th decade in the urban and 5th decade in the rural population. At this age the prevalence of hypertension increased steeply in women so as to exceed that in men, and stayed so in all subsequent age groups (Table III).

ii) Mean blood pressure levels (Fig. 2): A significant rise in both systolic and diastolic pressures with increasing age was observed in both men and women and in both rural and urban population groups. The mean systolic and diastolic pressures were comparatively lower in the rural than in the urban group at all age levels. There was a difference of almost one decade group in the systolic pressure between the two populations, i.e., the systolic
MEAN SYSTOLIC & DIASTOLIC PRESSURES IN DIFFERENT AGE GROUPS.

Fig. 3. Mean systolic and diastolic pressures in different age groups.

Table IV. Degree of Awareness of Hypertension and Adequacy of Treatment

<table>
<thead>
<tr>
<th></th>
<th>Urban</th>
<th>Rural</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total number of cases detected</td>
<td>130</td>
<td>73</td>
</tr>
<tr>
<td>Known hypertensives</td>
<td>23.8%</td>
<td>16.4%</td>
</tr>
<tr>
<td>Known and under proper treatment</td>
<td>6.2%</td>
<td>4.1%</td>
</tr>
<tr>
<td>Unknown hypertensives</td>
<td>76.2%</td>
<td>83.6%</td>
</tr>
<tr>
<td>Unknown or inadequately treated cases</td>
<td>93.8%</td>
<td>95.9%</td>
</tr>
</tbody>
</table>

pressure in a given age group in the rural population paralleled that in the urban group a decade younger. A similar trend, though to a lesser degree, was observed with diastolic pressure. As with the prevalence of hypertension, the mean blood pressure levels were also somewhat lower in women than in men in the 3rd and 4th decades. In the 5th decade however, a reversal of this trend occurred which was maintained in all the subsequent decades (Fig. 3).

Known versus latent hypertension (Table IV)

More than three-fourth of the hypertensives detected during the survey were unaware of their illness. Even among those who knew, only a few were receiving regular and proper treatment. As many as 93–95% of the subjects were either unaware of their hypertension or were untreated or inadequately treated. The situation was only slightly better in the urban group.
**DISCUSSION**

The overall prevalence of hypertension in a community will vary, among other factors, according to the age range of the population included in the survey and the demographic characteristics of the community studied. Prevalence rates of hypertension are thus likely to be higher in Western countries where 10–20% of the population is aged 60 years or above compared to India which has only about 5% of its population in this age range. Comparison of the prevalence rates among countries with different demographic characteristics is therefore likely to be more meaningful when studied in an age adjusted fashion. This is given in Table V.

A perusal of this table shows that the prevalence rate of hypertension in the present study is much lower at all age levels as compared to those reported in important foreign studies. This may be related, at least in part, to some racial/genetic factors determining the blood pressure characteristics of various population groups as suggested by Platt and accepted by Pickering. Of greater interest, however, is the finding that the prevalence of hypertension is about twice as common in our urban as in our rural group. Since both communities have the same ethnic origin and share a common geographical background, such a difference can be related only to differences in environmental factors.
Several well conducted studies have clearly established that the prevalence of hypertension and the level of blood pressure are related directly to body build\(^{16}\) and socio-economic\(^{17}\) status and indirectly to physical activity.\(^{18}\) It is noteworthy that our rural population is generally thinner, engages in heavier physical activity and has lower socio-economic status. It is also possible that the rural men and women engaged as they are in hard agricultural work (which is done manually without the assistance of any modern agricultural implements) lose more salt in their sweat. All these factors operating simultaneously probably account for the lower prevalence of hypertension seen in the rural group. These findings are in contrast with those of Mial et al\(^{19}\) who noticed a higher prevalence rate and higher mean pressures in rural than in urban women. However, several other reports (Padmavati,\(^{6}\) Tseng,\(^{3}\) and Akinkugbe\(^{20}\)) support our observations on urban-rural differences in the prevalence of hypertension, suggesting an association between blood pressure and various environmental factors such as physical activity, weight and body build, socio-economic status, and perhaps salt loss and intake.

It appears that all these environmental factors and possibly some others not yet known, are the chief determinants of blood pressure and hypertension in a given community. A higher incidence of the disease, around 10%, has been recently reported from two cosmopolitan cities in India,\(^{21},^{22}\) compared to a prevalence rate of 6.4% in our urban group. In this context it should be stated that even the urban population studied by us can at best be described as only semi-urban, living still in a bicycle era.

In conclusion, we feel that the prevalence of hypertension varies directly with the degree of urbanisation (and the various environmental factors which go with it) of a community, the disease being least common in rural and semi-urban areas (such as those investigated in the present study) increasing in cosmopolitan cities in developing countries, and being most common in the industrialized countries in the western hemisphere.

**References**

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