

Hypertension in a Primary Care Practice

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The charts of 554 consecutive hypertensive patients seen at a primary care office were reviewed. The highest recorded blood pressure of hypertensive male patients averaged 177/113 mmHg. The most recent blood pressure of males under treatment for hypertension averaged 144/92 mmHg. For female patients the corresponding figures were 179/112 mmHg and 146/91 mmHg. The average yearly cost of treatment was \$80. In theory, if these reductions were maintained in one hundred 55-year-old hypertensives for six years, coronary events would decrease by 4.3 events in men and 2.2 events in women. The cost per event prevented would be \$11,000 in men and \$21,000 in women. Diastolic blood pressures showed a greater correlation to the morbidity pattern found in coronary heart disease (a greater prevalence and severity in men than in women, especially under age 55 years) than did the systolic blood pressures. These findings suggest that for prevention of coronary heart disease, emphasis should be placed on the diagnosis and treatment of males under the age of 55 years who have diastolic hypertension.

Very little information is available on the characteristics of patients with hypertension who are seen in the usual office practice. Physicians are forced to base their decisions on data from studies of hypertensive patients who are seen in specialty clinics or in county, veterans, or university hospitals. Such populations may not be representative of the general population in that they are usually drawn from a low socioeconomic group, have an atypical prevalence of hypertension, may contain a large number of alcoholics, tend to contain a disproportionate number of complicated or non-compliant patients, and often do not include representative numbers of women.

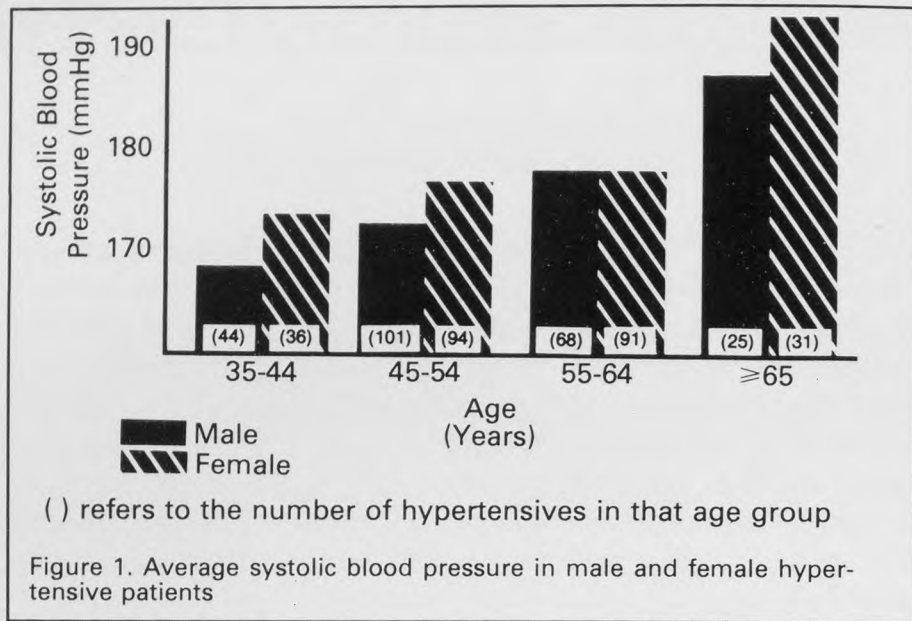
The data compiled in this study were obtained from a population mix similar to that encountered

in many office practices. It relates to the type of patient for whom antihypertensive therapy is generally recommended—the sustained hypertensive (systolic blood pressure \geq 160 mmHg or diastolic blood pressure \geq 95 mmHg), not the borderline hypertensive (systolic blood pressure 142 to 158 mmHg or diastolic blood pressure 92 to 94 mmHg). The identification of the characteristics of the office patient with hypertension should lead to improved diagnosis and management.

Methods

Nine family physicians at a primary care office in the Los Angeles metropolitan area were asked to record data on all individuals with current or previously documented hypertension who were seen at the office over a period of six months. Data collection was facilitated by the use of flow sheets for hypertension and by color coding the charts of hypertensives in order to facilitate retrieval.¹

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The study population was drawn from individuals enrolled in a prepaid insurance plan. The majority of the participants were in the lower middle income range. Two percent of the study population were black, six percent were oriental.

The standard procedure in the office was to measure the seated individual's blood pressure on the right arm. Blood pressure was measured at the beginning and end of each visit. The lower of the two pressures was recorded on the flow sheet.

At the end of six months, the charts were reviewed by the author to assess the severity of the individuals' hypertension and their response to medication. Only those individuals who had three recordings in which either the systolic blood pressure exceeded 159 mmHg or the diastolic exceeded 94 mmHg were included in the study. Data were collected on 554 individuals (289 males and 265 females). Three females and 24 males were below the age of 35 years. They were not included in the study because their number was too small to permit valid comparisons. Ten women and 27 men were excluded due to histories of prior cardiovascular disease. This study reports on the remaining 238 men and 252 women.

As the majority of the patients were on medication, current recordings of blood pressures would have been an inaccurate measure of the severity of the individual's hypertension. The most accurate approach to measurement would have required discontinuance of treatment for two or three

months. This approach was not ethically possible because of the dangers of untreated hypertension.^{2,3} Therefore, severity was estimated by recording the highest systolic blood pressure and the associated diastolic blood pressure found on each patient's chart. This was retrospective data since it included blood pressures taken in months or years past. This approach usually made it possible to obtain a blood pressure which was taken before the patient started on medication or while the patient was off medication and was therefore representative of his/her untreated blood pressure.

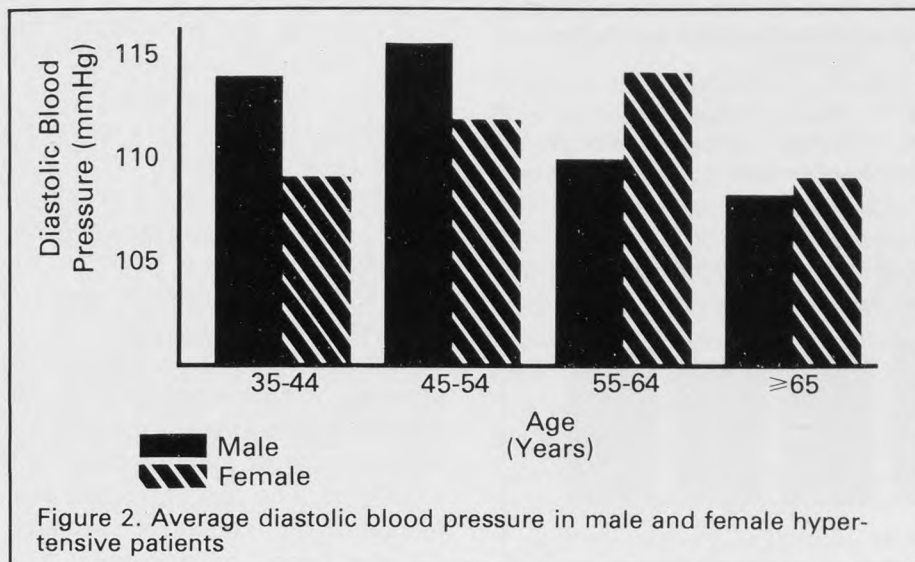
Similarly, the individuals' current blood pressures were not necessarily indicative of their response to medication since not all patients were compliant at the time of their last visit. Therefore, the magnitude of an individual's response to medication was estimated by recording the most recent blood pressure which was taken while the individual was on medication. That medication was recorded as being the individual's current therapy.

The difference between the maximum pressures and the latest pressures obtained while the individual was on medication was used to measure the magnitude of the response to therapy.

Results

Systolic Blood Pressure

When all age groups are considered, the average systolic blood pressure was 177 mmHg in men



and 179 mmHg in women. The average systolic blood pressures of all hypertensive patients rose with age. When compared on the basis of age groups, the average systolic blood pressure was higher in females at all ages except at ages 55 to 64 years where the pressures were equal. These figures are shown in Figure 1.

Diastolic Blood Pressure

The average diastolic blood pressure for all age groups was 113 mmHg in men and 112 mmHg in women. The average for male hypertensives rose until age 54 years, then fell; the average for females rose until age 64 years, then fell. Maximum diastolic pressure in women (114 mmHg) never reached that of men (116 mmHg). At ages 55 to 64 years, maximum diastolic blood pressure in women was equal to that of males aged 35 to 44 years.

The following classification was used to assess the severity of diastolic hypertension: 96 to 114 mmHg was termed mild, 115 to 129 mmHg was termed moderate, and over 130 mmHg was termed severe. On that basis, 15.9 percent of men and 19.4 percent of women were in the moderate category, and 9.7 percent of men and 3.6 percent of women were in the severe category. An elevated diastolic blood pressure in the presence of a normal systolic blood pressure occurred in 10.4 percent of men and 7.0 percent of women (Figure 2).

Medication

The usual approach to the treatment of a patient with hypertension was to start the patient with milder hypertension on a low-salt diet (and weight reduction where appropriate), progress to diuretics if control was not achieved with this approach, then add other medication based on the physician's preferences, the patient's response, and the side effects of medication. Diuretics were used in 88.6 percent of males and 95.0 percent of females. Reserpine and methyldopa were the most common second-step drugs in use at the time of this study. Hydralazine was generally a third-step drug, and guanethidine was generally a fourth-step drug. Propranolol and clonidine were used as either second- or third-step therapy in most instances, but occasionally were used alone. Table 1 shows the percent of the patients who received single, double, triple, and quadruple therapy. Based on the average dosages and the prevailing costs, the average cost of medication for one year was \$80.

Response to Treatment

The reductions in systolic blood pressures which are shown in Figure 3 are an average which includes persons who had attained the desired reduction in blood pressure and were on a stable regimen, persons whose therapy was in the process of adjustment and had not yet achieved the maximum reduction possible, poor compliers, and

	One Drug	Two Drugs	Three Drugs	Four Drugs
Male	38	52	9	1
Female	38	48	12	2

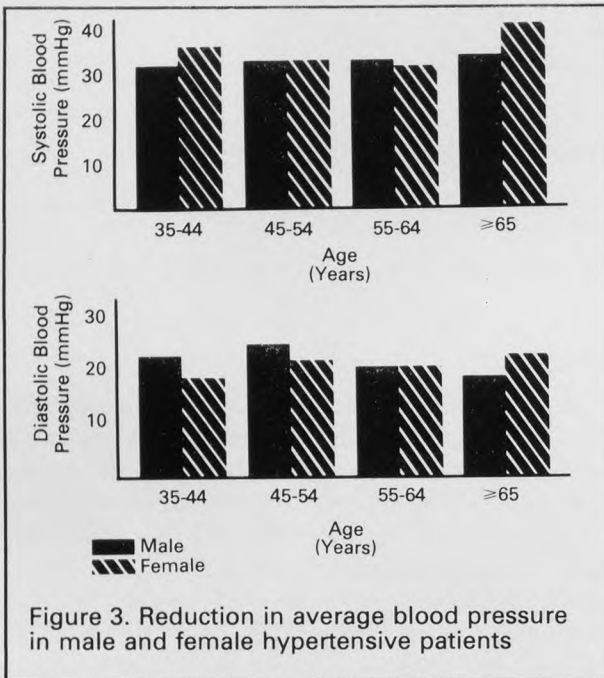


Figure 3. Reduction in average blood pressure in male and female hypertensive patients

persons with normosystolic (diastolic) hypertension whose systolic blood pressures did not change appreciably with therapy. Consequently, the reduction shown represents what can be expected from an unselected population and does not reflect the maximum reduction that is possible with therapy. In discussing the effectiveness of treatment of a general population, this figure is more meaningful than a figure which includes only compliant individuals or individuals with a specified severity of hypertension. When all age groups are considered, blood pressures in treated hypertensive patients declined to 144/92 mmHg in men and 146/91 mmHg in women.

According to the risk tables derived from the Framingham Study,⁴ the average reduction in systolic blood pressure which occurred should theoretically result in a decrease in the individual's risk of having a coronary event. The anticipated decrease in coronary events in a population of treated

hypertensives can be estimated from these tables by assuming that one hundred 55-year-old hypertensives would maintain a reduction of 33 mmHg in systolic blood pressure for six years. According to the tables, coronary events should decline by 4.3 events in men and 2.2 events in women. These figures assume an average cholesterol level and an average prevalence of diabetes, smoking, and left ventricular hypertrophy by electrocardiography.

From the average cost of antihypertensive therapy for one year and the average reduction in coronary events which is associated with the reduction in blood pressure which occurred, the cost effectiveness of antihypertensive therapy can be calculated. The cost of treating enough individuals to reduce the number of coronary events over a six-year period by one event would be approximately \$11,000 in men ($\$80/\text{year} \times 100 \text{ hypertensives} \times 6 \text{ years} \div 4.3 \text{ coronary events}/100 \text{ men}/6 \text{ years}$) at age 55 years. In women, it would be approximately \$21,000 ($\$80 \times 100 \times 6 \div 2.2$).

Discussion

Because the number and the age distribution of the undiagnosed hypertensive individuals in the population are unknown, the results of this study cannot provide a precise epidemiological survey of hypertension. This caveat notwithstanding, the results indicate a difference in the age distribution of hypertension in men and women. The age group 55 to 64 years contained 32 percent of the female hypertensive patients over 35 years of age and 26 percent of the male (ie, hypertension was 23 percent more frequent in females at this age). For the age group 45 to 54 years, hypertension was more frequent in males than in females (45 vs 39 percent). At 35 to 44 years of age, the male predominance increased to 33 percent (20 vs 15 percent). Under age 35 years, hypertension was recorded eight times more often in males than in females (24/289 vs 3/265). If these figures are adjusted for differences in the size of the populations at different ages, the overall ratio of hypertension in males to that in females was 1.09 to 1.00.

The fact that hypertension begins earlier in the man than in the woman is consistent with the fact that cardiovascular disease is of earlier onset in the man. Similarly, the greater frequency of hypertension in the man correlates with the greater frequency of cardiovascular disease in men.

Another finding in this study is the marked difference in the patterns of systolic and diastolic blood pressures. A comparison of systolic and diastolic blood pressures by age groups and sex indicates that changes in diastolic blood pressures have a better correlation with changes in an individual's risk of having a coronary event than do changes in systolic blood pressures. For example, in the age group 35 to 44 years, the percentage difference between males and females in their risk of developing coronary heart disease is higher than in succeeding age groups.⁴ Similarly, male diastolic blood pressure is higher with respect to female diastolic blood pressure in this than in succeeding age groups. As the average male diastolic blood pressure falls and the average female diastolic blood pressure rises, the percentage difference in the risk of coronary events in males and females narrows. In contrast, there is no change in systolic blood pressure which parallels the change in the ratio of coronary heart disease in men to coronary heart disease in women.

Other correlations between coronary heart disease and diastolic blood pressure are evident. Coronary heart disease occurs at an earlier age in men as compared to women and is more prevalent in men than in women. Similarly, the diastolic blood pressure reaches its highest level at an earlier age in men than in women. The level reached in men is higher than that reached in women. Again, this correlation did not exist for systolic blood pressure.

If the severity of hypertension is based on diastolic blood pressure, hypertension is severe in men more often than in women (9.7 vs 3.2 percent). The percentage of hypertensive individuals with normal systolic blood pressures and elevated diastolic blood pressures is also higher in males than in females (10.4 vs 7.0 percent). Finally, if hypertension increases mortality, the average blood pressure should fall with age as the duration of the hypertension results in an increase in mortality for hypertensive individuals. The average diastolic blood pressure does fall with age. In contrast, the average systolic blood pressure rises with age. While these findings are not conclusive, they do suggest that the diastolic blood pressure is of greater importance than the systolic in predicting a coronary event.

An unexpected finding in this study was the greater use of triple or quadruple therapy in

women as compared to men (14 vs 10 percent). The difference could be simply due to statistical variation or to a tendency in men to avoid taking multiple medications. Two other possibilities should be mentioned. First, if response to therapy is monitored by systolic blood pressures, women will tend to receive more potent therapy since their average systolic blood pressure is higher than that of males. Secondly, since blood pressures in the obese tend to be inappropriately high and the prevalence of obesity is higher in women than in men, obesity could account for the more frequent use of multiple combinations in women. To the extent that either of these possibilities is true, women may be receiving inappropriately potent antihypertensive medication.

In summary, by examining an unselected sample of the hypertensive population seen in a primary care practice in a metropolitan area, differences were found between men and women in the age of onset of hypertension, the prevalence of hypertension, the changes in systolic and diastolic blood pressures which occur with age, and the response to treatment. These differences demonstrate that early hypertension is much more prevalent and severe in males than in females, that diastolic blood pressure is more important than systolic blood pressure, and that there may be a tendency to overtreat women.

On the basis of these findings it would seem appropriate to recommend that (1) in screening a young population for hypertension, greater emphasis be placed on males than on females; (2) the level of the diastolic blood pressure receive primary consideration when a determination is made as to whether or not an individual should be treated; (3) the diastolic blood pressure be used to monitor the response to medication; and (4) the use of triple or quadruple therapy be critically evaluated.

References

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