A COMMUNITY BASED STUDY ON THE EPIDEMIOLOGY OF HYPERTENSION IN SELANGOR

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INTRODUCTION

CARDIOVASCULAR diseases are a major health problem not only in the developed countries but also in developing countries such as Malaysia. The WHO Expert Committee on Arterial Hypertension found that 8% - 18% of the adult population in most countries have hypertension (WHO, 1978). "Hypertension is a silent secret threat to the health of people around the world. As the blood pressure rises, so does the risk of stroke and coronary heart disease" (Mahler, 1978). The review on the significance of stroke for the health of population at a WHO seminar in 1970 showed that many cases of stroke could be prevented if hypertension was treated with great vigour and attention (WHO, 1970). Elevated blood pressure has been repeatedly shown to be among the leading "Risk Factor" for the development of coronary heart disease and cerebrovascular accidents (Kannel *et al.*, 1969 and Gordon, 1972). The higher the arterial pressure, the greater is the risk of coronary heart disease (Dawber *et al.*, 1962). Hypertension is a key contributing cause for at least one third of premature deaths due to heart attacks and even a higher proportion of premature deaths due to stroke. The Framingham's study on the role of blood pressure in the development of congestive heart failure showed that the dominant aetiological precursor was hypertension in 75% of the cases (Kannel *et al.*, 1972). There is increasing evidence that control of hypertension will reduce the incidence of coronary heart disease and cerebrovascular accidents (Vet. Adm. gp., 1970). These facts show the importance of hypertension as a cause of morbidity and mortality in any country. Extensive surveys of blood pressure have been carried out in countries like U.S.A., Japan, Australia, New Zealand and in some European countries. Volp (1976) did a study on hypertension in the Parit subdistrict in Malaysia on patients attending health clinics. In most developing countries including Malaysia very few community based studies have been done.

In America and some European countries there has been a decline in the mortality from hypertension but in Malaysia there is a rising incidence of cardiovascular diseases. The deaths from cardiovascular diseases have increased from 3% of total deaths in 1965 to approximately 20% in 1976 (Medically certified and inspected deaths - Vital Statistics, Peninsular Malaysia). In 1977 heart diseases ranked second and cardiovascular diseases fourth among the 10 principal causes of deaths in government hospitals.

OBJECTIVES

To study the epidemiology of hypertension in the community, with particular reference to the distribution of blood pressure values, prevalence

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and mean values. To study the relationship between hypertension and smoking, physical activities, drinking habits and the common symptoms associated with hypertension.

METHODOLOGY

In this study 3 of the 8 districts in Selangor were selected. Each of these 3 districts was divided into 4 strata:-

i) Metropolitan towns with population above 75,000;

ii) Urban large towns with population 10,000 - 74,999;

iii) Urban small towns with population 1,000 - 9,999; and

iv) Rural with population less than 1,000.

These population figures were based on the 1970 housing and population census and the definitions of town boundaries, and districts were taken as at 1970.

The frame used for the rural areas (urban small towns and rural) is the same as the Primary Sampling Unit frame of households used by the Department of Statistics, Malaysia. Each Primary Sampling Unit (P.S.U.) consists of about 250 living quarters. Primary Sampling Units were selected at random from each district. For each selected P.S.U., the living quarters were selected at random. Similarly, the frame used for the urban areas (metropolitan and urban large) is the Department of Statistics Enumeration Block frame. Each enumeration block (E.B.) on the average consisted of about 100 living quarters. The selection of enumeration blocks and living quarters were similarly done at random. The selected sample was in proportion to the urban/rural ratio in the 3 districts.

All members 15 years of age and above in the sampled living quarters were individually interviewed using a predesigned questionnaire. Heights, weights and blood pressures were measured. The Royal College of Physicians (1976) has shown that a single blood pressure reading is a powerful indicator of the risk of coronary heart disease and the presence of even moderately elevated blood pressure is of prognostic significance. Many records have shown that a casual blood pressure reading has prognostic value in life expectancy (Little, 1972).

For blood pressure measurements, standardized mercury sphygmomanometers with a cuff of 14 cm wide were used. The meniscus of the mercury sphygmomanometer was at zero when the cuff was deflated. The deflated cuffs were applied snugly around the upper arm with its lower edge about one inch above the ante-cubital space leaving the ante-cubital fossa free. The systolic blood pressure was noted as the point of appearance of the first regular tapping sound which appeared during deflation of cuff. The diastolic blood pressure was taken as the point of disappearance of all sounds (Korotkoff's sounds-phase-5). Both pressures were measured to the nearest even number. Only one reading was noted for all subjects with blood pressures of below 140/90 mmHg. For subjects with a systolic pressure of 140 mmHg or more and a diastolic of 90 mmHg or more, 5 readings were taken and their mean was recorded as the actual pressure. The observer's eye was at level with the mercury meniscus. The readings were taken with the subject sitting comfortably and relaxed with forearm on the table and arm at heart level for at least 5 minutes prior to the measuring of blood pressure. The bias within the survey was neutralised by random allocation of the subjects to the observers. According to WHO standards a blood pressure reading of equal and less than 140/90 is considered as normal adult blood pressure, 140/90 - 159/94 mmHg as borderline hypertension and any reading of systolic pressure of 160 mmHg and or a diastolic pressure of 95 mmHg and above is taken as hypertension, irrespective of age (WHO, 1978). The working criteria for hypertension set by us for this study was a systolic pressure of greater than 140 mmHg and or diastolic pressure of above 90 mmHg regardless of age. The borderline as well as the definite hypertensives according to the WHO standards are considered as hypertensives in our study. Blood and urine were taken from 1 in 5 of the normotensive subjects and from every hypertensive subject. Their serum cholesterol, triglycerides, high density lipoproteins, urinary sodium and potassium levels determined.

The results of this study were analysed with the help of a computer service. Mean blood pressures and the prevalence of hypertension were calculat-

ed by age, sex, ethnic group and strata. Evaluation of factors like smoking, drinking of tea, coffee, alcohol, physical activities, among hypertensives and normotensives was done. The percentage of hypertensives who were aware of their condition and those who were under treatment was calculated. The rest of the data obtained in this study will be presented at a later date.

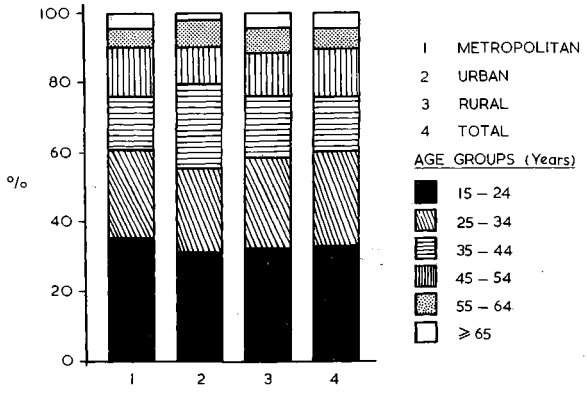
RESULTS AND DISCUSSION

Out of 435 households selected, 312 (72%) households were surveyed. Among the remaining 28%, many were found to be away on two successive attempts and a small percentage of these houses were found to be vacant, demolished or non-residential. The percentage who refused to be interviewed was very small. The reasons of the non-response are similar to those observed by the Singapore Hypertension Study Group (Lee *et al.*, 1977).

The successfully surveyed households (312) accommodated a total of 1,030 persons aged 15 and above, of whom 390 (38%) were from metropolitan and urban areas and 640 (62%) were from rural areas. Out of 1,030, 963 (94%) were interviewed and blood pressure measurements were taken from 957 (93%) respondents. There were 449 males and 508 females giving a sex ratio of 1.0:1.13. Figure 1 shows the age composition of survey population by strata. Most of the results are expressed by combining metropolitan and urban areas for the purpose of statistical analysis.

Figure 1

Age composition of survey population by strata



Prevalence

Table I shows the prevalence of hypertension by strata. Out of 963 respondents examined, 135 (14.0%) were found to be hypertensive. Of the hypertensives, 16.8% were from the urban areas and 12.3% from rural areas. There was no significant difference at 95% confidence level in the prevalence between those staying in the urban areas and those from the rural areas. Volp (1976) found that 16.8% of those attending a town clinic and between 24.9 - 63.4% of those attending rural clinics in Parit subdistrict, Malaysia, had a blood pressure of equal or greater than 140/90 mmHg. Our study shows a similar prevalence rate in urban areas but a much lower prevalence rate in the rural areas. Volp's study was based on patients coming to the clinics. Yik *et al.*, (1976) found that 20.2% of the population examined in Singapore had a systolic blood pressure of 150 mmHg and above and a diastolic blood pressure of 90 mmHg and above. It appears that the prevalence of hypertension in Malaysia is lower than in Singapore.

14.1% of the males and 13.9% of the females were hypertensive. Figure 2 shows the age specific prevalence rates of hypertension. There was a significant rise in the prevalence rates with age. The rates rose from 1.6% in the 15 - 24 years, 7.4% in 25 - 34 years, 20.0% in 35 - 44 years, 26.0% in 45 - 54 years and 37.5% in the 55 - 64 years age groups. In the age group of 55 years and above the increase was much higher but it should be interpreted with caution as the number of cases examined in this age group was low. The prevalence was higher in the males compared to females in the 35-54 years age group, while it was reversed in the 15 - 34 years group and 55 years and above group. Figure 3 shows the prevalence of hypertension by age and ethnic group. The Malays have the highest prevalence 14.7% followed by Chinese 14.5% and Indians 10.8%. There was no significant difference between the

various ethnic groups. Volp (1976) found that Malays had the highest prevalence, followed by Chinese and Indians who had the same prevalence rates. Ooi *et al.*, (1972) in a survey of hospital patients also found no significant difference in ethnic group.

5.4% had a systolic pressure of equal and more than 160 mmHg and 4.7% had a diastolic pressure of equal and more than 95 mmHg. Lee *et al.*, (1977) found that 14% of the population examined in Singapore had a systolic pressure of equal and more than 160 mmHg and a diastolic pressure of equal and more than 90 mmHg. A study of blood pressure levels in U.S.A. showed that 18.1% had definite hypertension (NCHS, 1975). Volp (1976) showed that 6.6% of those attending a rural clinic had a blood pressure of equal and more than 160/100 mmHg.

TABLE I

Prevalence of Hypertension by Strata

Strata	Number Examined	Hypertension	
		Number	Percentage
Metropolitan	291	50	17.2
Urban	72	11	15.3
Rural	600	74	12.3
Total	963	135	14.0

Figure 2

Age specific prevalence rates of hypertension

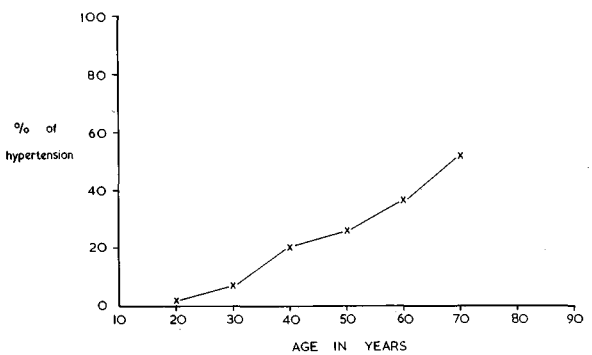
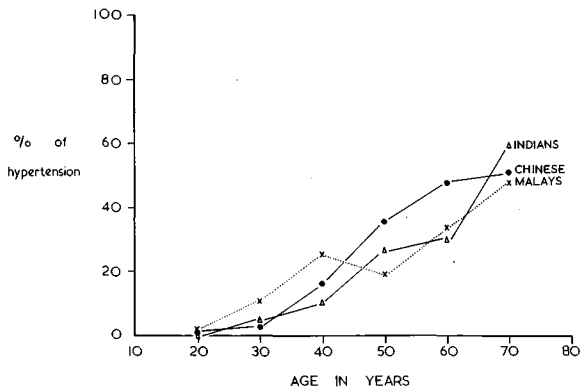


Figure 3

Prevalance of hypertension by age and ethnic groups



4% - 10% of European population examined had definite hypertension (Richard 1976). Our findings fall within this range. Figures 4a and 4b show the percentage prevalence of hypertension by age and sex in Malaysia, London and Bergen. Findings in London and Bergen in Scandinavia showed that the prevalence of hypertension among males in Malaysia is not much lower than that of London males up to the age of 60 years. For the females up to 50 years, the prevalence was not much lower than the London females but in Bergen the prevalence seems to be much higher than Malaysia but the results cannot be compared as the study population varied in the 3 areas.

In a cross sectional population study of men 50 - 64 years of age in some places like Czechoslavakia, Japan, Sweden and USSR, 10 - 33% of men had a systolic pressure of 160 mmHg and above (WHO, 1969). Our findings in this age group also fell within this range. 5.7% of the respondents in our study had a systolic pressure of between 140 - 159 mmHg and 3.9% had a diastolic pressure of between 90 - 94 mmHg, i.e. borderline hypertension.

Mean Blood Pressure

Figure 5 shows the mean systolic and diastolic blood pressures by age and sex. Both the systolic and diastolic blood pressures increased with age. The increase in systolic pressure was more marked than the increase in diastolic both in

Figure 4a

% Prevalence of hypertension by Age and Sex in Malaysia and some European Populations [Prevalence per 100]

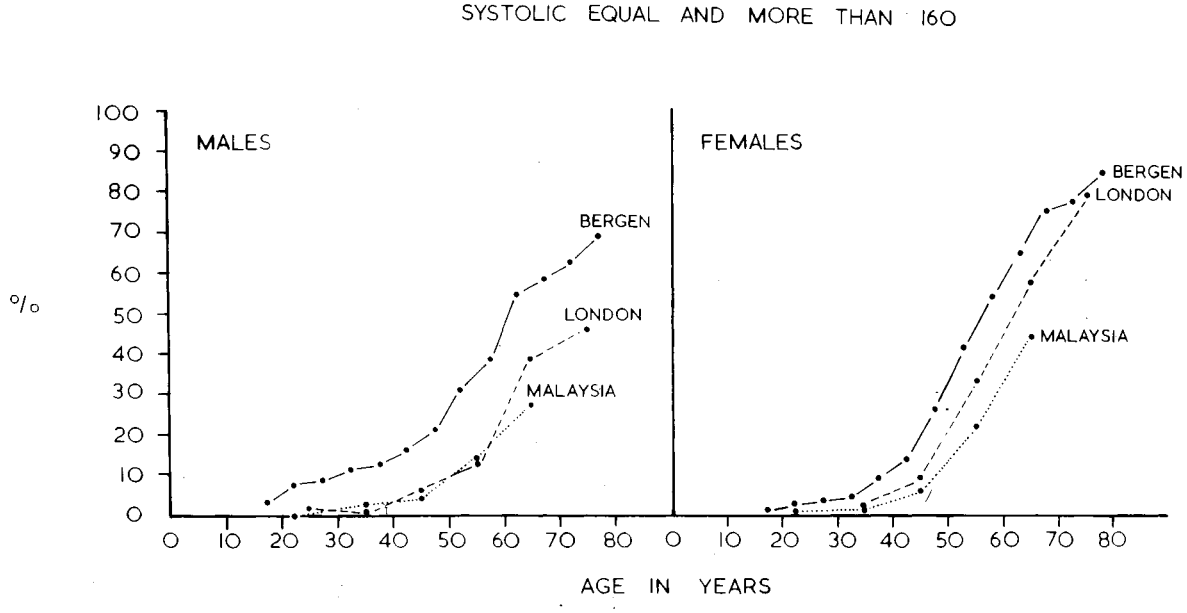
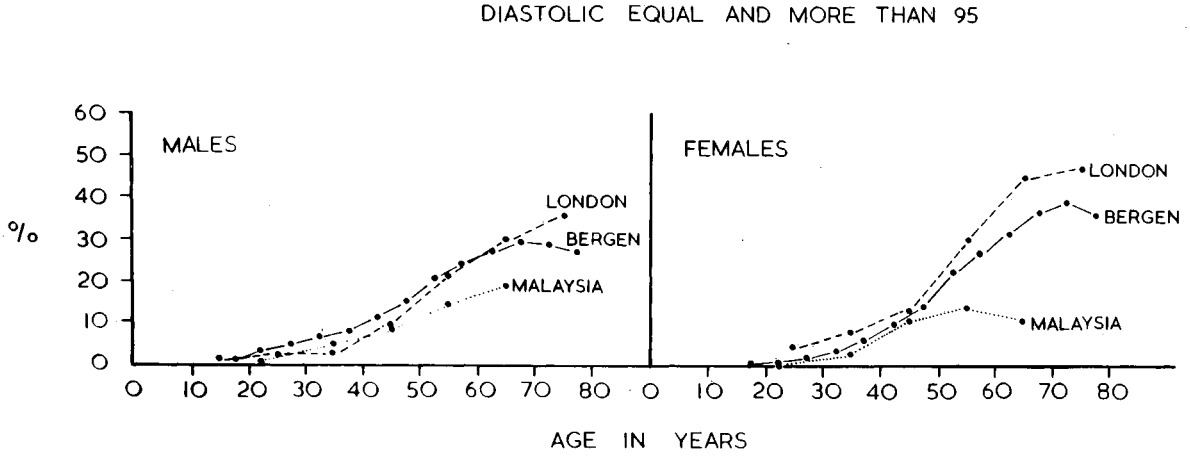


Figure 4b

% Prevalence of hypertension by Age and Sex in Malaysia and some European Populations [Prevalence per 100]

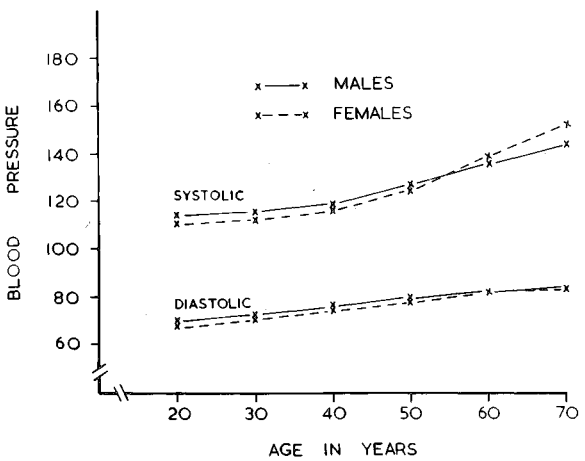


males and females, but the increase is not significant at the 95% confidence level.

The diastolic pressure seemed to level off at the age of 45 - 54 years in both sexes. Gordon (1964) had reported that systolic blood pressure continues to increase with age and diastolic pressure levels off at 55 - 60 years. Most surveys including those from Africa, Latin America, Oceanic and India, have shown a rise in blood pressure with age in both men and women (McFate Smith, 1977). Cardiovascular studies in the Samburu tribe of Northern Kenya showed that the mean systolic pressure increases with age with a sharp increase after 60 years whereas the diastolic pressure increases up to 49 years and then falls significantly (Shaper, 1962). Our study shows that the mean systolic pressure were higher in males than females up to 54 years but it is reversed after 55 years. For diastolic pressures, there was not much difference between the two sexes but females had slightly lower pressures up to 54 years.

Figure 5

Mean Systolic & Diastolic Blood Pressure by Age & Sex

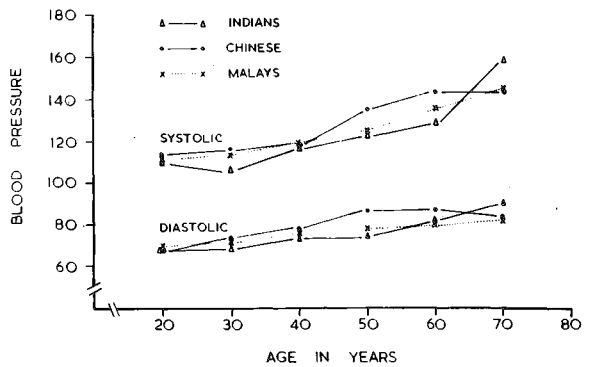


The interesting feature of reversal between sexes for mean blood pressures was indicated by Symonds (1923). A study done in U.S.A. (NCHS, 1975) showed that the mean systolic blood pressure for age group 18 - 24 was 119.0 mmHg and for 65 - 74 was 150.1 mmHg. Our figures of 112 mmHg and 147.0 mmHg in the same age groups are not much lower compared to this. In Japan (Kobayashi 1971) showed that the mean systolic blood pressure ranged from 120 - 129 mmHg and the diastolic pressure from 80 - 89 mmHg among people of above 30 years. Our study showed an overall mean of 125.8 mmHg of systolic with a range of 112 - 147 mmHg and 76.8 mmHg diastolic pressure with a range of 69 - 83 mmHg. The mean age of the males was 34 and females was 32. Cruz (1964) and Prior *et al.*, (1966) have found that in several isolated primitive communities there was little or no increase in systolic or diastolic pressures with age. These were small isolated communities with high physical activity and low salt intake, frequent food shortage with little or no monetary involvement. Lowenstein (1961) also considered that the increase in blood pressure with age is a consequence of civilisation or the process of accultration.

Figure 6 shows the mean systolic and diastolic pressures by age and ethnic groups. The Chinese had slightly higher overall mean values for both systolic and diastolic pressures compared to the Malays and Indians although the difference is not significant.

Figure 6

Mean Systolic & Diastolic blood pressure by age & ethnic group



Symptoms

Considering the percentage distribution of hypertensives by symptoms, 23.4% with eyesight problems and 11.9% without such problems had hypertension. 22.0% with pain in calves and 12.5% without pain in calves had hypertension. 19.4% with headache and giddiness and 11.4% without such complaints had hypertension. Using the Chi-square test of significance, the symptoms of headache and giddiness, eyesight problems and pain in calves were found to be significantly more common hypertensives than normotensives. The symptoms of chest pain and breathlessness were not higher among hypertensives. In a Singapore study, shortness of breath, nocturia, polyuria and palpitations were found significantly more common among hypertensives than in non-hypertensives (Ping *et al.*, 1976).

Physical Activity

Physical activities were arbitrarily defined as mild, moderate and severe. 13.5% of the 929 respondents with activity and 34.8% of 23 without activity had hypertension. This difference was statistically significant. Majority of the respondents (844) were taking moderate/light activity and 14.7% of them had hypertension whereas among those with heavy activity (85) only 3.5% had hypertension. This difference is statistically significant but the number of cases with heavy activity is rather low and hence should be interpreted with caution. This was the direct result of operational difficulty of classifying certain types of activities which included 23.5% of the cases. Morris *et al.*, (1953) showed that myocardial infarction was more common in bus drivers and in post office clerks who have sedentary jobs compared with bus conductors and postmen who have comparatively more active jobs.

Smoking

There were significantly more hypertensives among smokers than non-smokers. Out of the 277 smokers, 50 (18.1%) had hypertension while only 85 (12.4%) of the 686 non-smokers had hypertension. Earlier studies have shown that the risk of cardiovascular mortality more than doubles above 161 mmHg systolic pressure in the 55 - 64 years age group and would double again in a smoker. The combined risk of multiple risk factors is multiplicative rather than additive. Doll (1956) has shown that the greater the number of cigarettes smoked per day, the greater is the risk of myocardial infarction.

Drinking

14.1% of the 723 tea drinkers, 14.0% of the 757 coffee drinkers and 20.2% of the 104 alcohol consumers were hypertensives. Among the tea, coffee and alcohol consumers and non-consumers, the difference in the prevalence of hypertension was not significant.

Previous Diagnosis and Under Treatment

Table II shows the number and percentage of

TABLE II

Number and Percentage of Hypertensives by Sex Who Have Been Previously Diagnosed as Hypertensives and Under Treatment

Number of people in the selected households	Persons Examined		Hypertensives		Aware of being Hypertensives		Under Treatment	
	No.	%	No.	%	No.	%	No.	%
Males 492	452	91.9	64	14.1	39	60.9	14	46.7
Females 538	511	94.9	71	13.9	51	72.0	12	28.6
Total 1030	963	93.5	135	14.0	90	66.7	26	36.1

hypertensives by sex who have been previously diagnosed as hypertensives and are under treatment. Out of the total 135 hypertensives, 90 (67%) were previously diagnosed as hypertensives and thus were aware of being hypertensives. Among those aware only 26 (36.1%) were under treatment. Similar data obtained by the WHO hypertensive programme up to August 1977 showed that between 4.7 - 32.7% of the hypertensives were aware of their condition and 50.2% were receiving medical care for hypertension (WHO, 1977). Our study showed a higher percentage of subjects aware of being hypertensive but a lower percentage under treatment.

Table III shows the percentage distribution of subjects receiving medical care for hypertension by age and strata. 40.0% of hypertensives living in rural areas and 32.4% living in urban areas were under treatment. 60.9% of males and 72% of females were aware of being hypertensive. 46.7% of males were under treatment compared to 28.6% females. There was no significant urban-rural difference in the proportion of those aware of their illness and those under treatment.

The percentages expressed in Tables II and III do not correspond with the numbers shown as the numbers with non specified answers have been eliminated in actual calculations.

SUMMARY

A pilot study on the epidemiology of hypertension was carried out in 3 out of the 8 districts in the state of Selangor, namely Klang, Sabak Bernam and Ulu Langat. By stratified random sampling, 435 households were selected for the study. Eventually 312 (72%) households were surveyed. 963 (94%) out of the 1,030 persons aged 15 years and above living in the selected households were interviewed, and 957 of them were examined. The mean age of the respondents was 33 years. Taking a systolic pressure of more than 140 mmHg and/or diastolic pressure of more than 90 mmHg as hypertension, 1 in every 7 of those equal and more than 15 years of age had hypertension, i.e. 14%. 5.4% had a systolic pressure of equal and more than 160 mmHg, and 4.7% had a diastolic pressure of equal and more than 95 mmHg. The study showed that there was a significant rise in the prevalence rates with age in both sexes. There was no significant difference in the prevalence rates among the sexes, ethnic groups (Malays, Chinese and Indians) and urban and rural areas. The mean systolic pressure ranged from 112 - 147 mmHg and diastolic from 69 - 73 mmHg. Hypertension was significantly more common among smokers (18.1%) than non-smokers. There was no significant relationship between hypertension and tea, coffee and alcohol

TABLE III

Percentage Distribution of Subjects Receiving Medical Care for Hypertension by Age and Strata

Strata	Urban			Rural			Total		
No. & % Ages	Hypertensives	medical care		Hypertensives	medical care		Hypertensives	medical care	
		No.	%		No.	%		No.	%
15 — 24	3	1	33.3	1	1	100.0	4	2	50.0
25 — 34	6	0	0	10	1	14.3	16	1	7.7
35 — 44	6	1	20.0	18	5	35.7	24	6	31.6
45 — 54	13	5	55.5	9	4	50.0	22	9	52.9
55 — 64	10	3	37.5	7	2	50.0	17	5	41.7
65	6	2	33.3	1	1	100.0	7	3	42.9
Total	44	12	32.4	46	14	40.0	90	26	36.1

consumption. Hypertension was significantly more common among those with no physical activity (34.8%) as compared with those with physical activity (13.5%). 67% of the hypertensives were aware of their illness but only 36.1% of them were under treatment.

CONCLUSION

Hypertension is a public health problem both in the rural and urban areas of Selangor. A national survey is required to study the epidemiology of hypertension in the country. A simultaneous study to identify the role of the paramedical staff in community control programme for hypertension should also be undertaken. There is a need for a national cardiovascular disease control programme in Malaysia.

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