Prevalence of hypertension in south-western Saudi Arabia

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انتشار ارتفاع ضغط الدم وخصائصه في جنوب غرب المملكة العربية السعودية

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خلاصة : أجري مسح لتحديد معدل انتشار ارتفاع ضغط الدم في جنوب غرب المملكة العربية السعودية . وتم التحقق من ارتفاع ضغط الدم عن طريق قياس ضغط الدم في ظروف معيارية واستجواب الأفراد بحثا عن تاريخ إيجابي . ولقد وجد أن معدل الانتشار الإجمالي 11,1% ، ومعدل الانتشار المصحح بحسب العمر 10,6% في الرجال و11,4% في النساء . ولوحظ ارتفاع معدل الانتشار ارتفاعا جوهريا مع طول العمر . ومن بين الحالات التي كانت معروفة سلفاً ، كان 76% منهم يتلقون العلاج ، ولكن حالة 20% فقط منهم كانت تحت السيطره . ويستخلص من ذلك أن ارتفاع ضغط الدم يصيب نسبة كبيرة من المجتمعات السعودية . ويتعين بذل مزيد من الجهود لتحسين السيطرة على هذا المرض .

ABSTRACT Prevalence of hypertension was surveyed in south-western Saudi Arabia. Hypertension was ascertained by measuring blood pressure under standard conditions and by interview for positive history. The overall prevalence was 11.1%, and the age-adjusted prevalence was 10.6% in men and 11.4% in women. Prevalence increased significantly by age. Among previously known cases, 76% were receiving treatment, but only 20% were found controlled. It is concluded that hypertension affects a sizeable proportion of Saudi communities. Further efforts are needed to improve control of the disease.

La prévalence de l'hypertension dans le sud-ouest de l'Arabie saoudite

RESUME Une enquête a été réalisée dans le sud-ouest de l'Arabie saoudite afin de déterminer la prévalence de l'hypertension artérielle. L'hypertension a été déterminée en mesurant la tension artérielle dans des conditions standardisées et en interrogeant les sujets à propos de leurs antécédents. La prévalence globale s'élevait à 11,1%, et la prévalence corrigée selon l'âge était de 10,6% chez les hommes et de 11,4% chez les femmes. La prévalence augmente considérablement avec l'âge. Parmi les cas qui étaient connus avant l'enquête, 76% étaient sous traitement mais on a constaté que l'hypertension artérielle n'était contrôlée que dans 20% de ces cas. En conclusion, l'hypertension affecte une proportion non négligeable de communautés saoudiennes. Il est nécessaire de renforcer les efforts déployés pour améliorer la lutte contre cette affection.

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Introduction

Hypertension is a common health problem in developed countries, and its prevalence is probably also increasing in nations of the developing world. Known as "the silent killer", it may exist for prolonged periods in the individual without symptoms and may manifest only after causing serious irreversible pathology and complications.

Despite these features, the magnitude and epidemiological characteristics of this disease have been rarely studied in Saudi Arabia [*1*,*2*]. To fill this gap, a survey was conducted in semi-urban and rural communities in south-western Saudi Arabia to study the prevalence of hypertension, among a number of other important health conditions.

Methods

The region of Sir, with a population of 1 200 000, covers more than 80 000 km^2 in south-western Saudi Arabia. Sharing its border with Yemen, the area extends from the high Asir mountains almost 3200 m above sea level down to the Red Sea. Forty-four semi-urban and rural small villages and areas spread around Abha, the capital of the region, were surveyed in clusters. Selection and inclusion of communities in the survey were based on geographical distribution around Abha, on being a catchment area served by a primary health care centre and on the cooperation of the people and health authorities.

The communities are typical semi-urban and rural populations in the region who nevertheless enjoy many of the facilities of modern life, such as electricity and cars, while retaining their basic dietary and social habits. Houses are generally of lower hygienic standards compared to those of urban communities. The predominant source of drinking-water is wells. All houses dispose of sewage in septic tanks just outside the houses. House refuse is collected in plastic bags and placed in plastic barrels outside houses for collection by municipal trucks. Meat, chicken and rice constitute the major dietary items. Health services are provided by primary health care centres.

Three public primary health care centres in different geographic locations were the main source of health care for the clusters under study. The centres maintain up-to-date census information, from which lists of families and family members were obtained. A letter describing the importance of the survey and inviting the family to participate was delivered to the head of each family following campaign efforts involving primary health care centres, public, religious and community leaders.

The target population for the hypertension survey was all subjects aged 10 years and above in the clusters under study. These constituted 4769 subjects from the overall total population of 7069. Subjects were approached as family units. The family head was interviewed at home using a structured questionnaire to collect basic and socioeconomic data, to identify family members known to have been diagnosed with hypertension and to collect data needed to assess other health conditions under investigation (not addressed in this report). For those with a positive history of hypertension, further information was obtained on the duration of the disease, source of diagnosis, whether treatment was being received at the time of the survey and type of treatment.

The target subjects were invited to come to the primary health care centre the day after the interview to have their blood pressure measured under standard conditions. The subject was seated for at least five min-

utes, an appropriate sphygmomanometer cuff was applied to the right arm, and blood pressure was measured using a standard mercury sphygmomanometer. Diastolic blood pressure (DBP) was recorded at phase 5 (disappearance of Korotkoff's sound). The mean of two measurements for all participants was taken.

Hypertension was defined according to the fifth report of the Joint National Committee on Detection, Evaluation and Treatment of High Blood Pressure (JNC V) as: systolic blood pressure (SBP) ≥140 mmHg and/or DBP ≥90 mmHg, or if there was a positive history of hypertension supported by other information such as treatment and duration of the disease [3]. Isolated systolic hypertension was defined as SBP of 140 mmHg or more but with a DBP < 90 mmHg, while isolated diastolic hypertension was defined as a DBP of 90 mmHg or more and SBP < 140 mmHg.

Pre-final year medical students in Abha College of Medicine were trained to conduct the interview and to measure blood pressure. Student batches in successive semesters over the period 1989–1993 participated in the field data collection during phases lasting one month each and coinciding with the students' field training programme in community medicine. Accuracy of blood pressure measurements was assured by practical training sessions for students using a double earpiece training stethoscope and repeated spot checks of normal and abnormal blood pressure values. Factors affecting apparatus reliability were reduced by having the mercury sphygmomanometers checked according to standards [4].

Field data collection was supervised by faculty members of the Department of Family and Community Medicine at the Abha College of Medicine to ensure adequate following of procedures. Daily meeting sessions were held between the students and field supervisors following field activities to solve problems, to check accuracy and completeness of the data collection forms and to emphasize standardization of procedures.

Statistical analysis was done using the SPSS software program [5] for frequency distribution and cross tabulations. Test for statistical significance were done by the chi-square test for categorical data and the Student *t*-test for quantitative data.

Results

A total of 3969 subjects out of the target population of 4769 responded to the survey (response rate 83.2%). Non-response was higher among men (19.9%) than among women (13.5%) and was mostly among students attending school in nearby cities who were not available at the time of the survey.

There were 442 cases of hypertension among the 3969 respondent subjects (11.1%). Of these cases, 104 (23.5%) had been previously diagnosed with positive history and 338 (76.5%) were newly diagnosed by the blood pressure measurement during the survey. Table 1 shows some distinct characteristics of such cases. The male:female ratio was higher, though not significantly, among the newly diagnosed cases (1.2:1) than among the previously known cases (1:1.3). The newly diagnosed cases were significantly younger (mean age = 33.5 ± 15.8 years) than those previously diagnosed (53.5 ± 16.2 years). With regard to blood pressure measurements, a significantly higher mean SBP was detected for the previously diagnosed cases (150.8 ± 23.5 mmHg) than that for the newly diagnosed cases (141.5 ± 18.2 mmHg).

Table 1 **Some characteristics of previously known cases and newly diagnosed cases of hypertension**

Characteristic	Previously known (n = 104)	Newly diagnosed (n = 338)	Statistical difference
Sex (M:F)	45/59 (1:1.3)	181/157 (1.2:1)	$P > 0.05$
Mean age (years)	53.5 ± 16.2	33.5 ± 15.8	$P < 0.01$
Mean SBP (mmHg)	150.8 ± 23.5	141.5 ± 18.2	$P < 0.01$
Mean DBP (mmHg)	90.5 ± 11.5	91.6 ± 10.6	$P > 0.05$

Table 2 **Distribution of previously known cases of hypertension according to some aspects of management**

Variable	No.	%
Duration of hypertension (years)[a]		
< 3	40	40.0
3 to < 6	38	38.0
6 to < 10	12	12.0
≥10	10	10.0
Total	100	100
Currently under treatment[b]		
Yes	76	76.0
No	24	24.0
Total	100	100
Source of treatment[b]		
PHC centres	43	58.9
Hospital	21	28.8
Others	9	12.3
Total	73	100
Type of treatment[b]		
Salt restriction	11	15.3
Diuretics	4	5.6
Antihypertensives	17	23.6
Combinations	40	55.5
Total	72	100
BP control		
Yes	21	20.2
No	83	79.8
Total	104	100

[a] *Data were not available for four cases*
[b] *For those under treatment at time of survey*

Table 2 shows the distribution of the previously known hypertensive cases according to duration, treatment, type and source of treatment and control of the disease. The range of disease duration was 0–14 years with a mean ot 4.3 ± 4.1 years. Seventy-six per cent (76%) of cases were receiving treatment at the time of the survey, but blood pressure was not controlled in 79.8% of these (SBP ≥ 140 mmHg and/or DBP ≥ 90 mmHg). Treatment was mostly provided by primary health care centres and to a lesser extent by hospitals. Over half of the known cases (55.5%) were receiving some sort of combined treatment of diet, diuretics and antihypertensives.

Table 3 shows the prevalence of hypertension by age and sex. Overall prevalence was 11.1%. The age-adjusted prevalence rate was 10.6% among men and 11.5% among women, the difference by sex was not significant ($P > 0.05$). Prevalence increased consistently and significantly by age ($P < 0.005$) in both men and women and was evidently high after the age of 45 years.

Table 4 shows the distribution of all hypertensive cases by type of hypertension. Isolated diastolic hypertension amounted to 58.8% of all cases, while isolated systolic hypertension amounted to only 21.3%. Cases with both diastolic and systolic high

Table 3 **Prevalence of hypertension[a] by age and sex among the respondent target population**

Age group (years)	Men			Women			Men and women		
	No. Pop.	No. Cases	Prev. (%)	No. Pop.	No. Cases	Prev. (%)	No. Pop.	No. Cases	Prev. (%)
10 to < 30	1053	24	2.3	1177	42	3.6	2230	66	3.0
30 to < 45	344	24	7.0	416	39	9.4	760	63	8.3
45 to < 60	287	73	25.4	272	76	27.9	559	149	26.7
≥60	252	105	41.7	168	59	35.1	420	164	39.0
Total[b]	1936	226	10.6	2033	216	11.5	3969	442	11.1

[a] *SBP ≥140 mmHg and/or DBP ≥90 mmHg, or positive history*
[b] *Age-adjusted prevalence rate*

Table 4 **Distribution of all hypertension cases (old and new) according to type of hypertension**

Type of hypertension	Previously known (*n* = 104)		Newly diagnosed (*n* = 338)		Total (*n* = 442)	
	No.	%	No.	%	No.	%
Isolated systolic (SBP ≥ 140 and DBP < 90)	18	17.3	76	22.5	94	21.3
Isolated diastolic (SBP < 140 and DBP ≥ 90)	68	65.4	192	56.8	260	58.8
Both systolic and diastolic (SBP ≥140 and DPB ≥ 90)	18	17.3	70	20.7	88	19.9

blood pressure amounted to 20%. This trend was consistent for both the previously known and newly diagnosed cases.

Discussion

A community-based study design was chosen for this survey rather than sample cluster in order to avoid random error. Selection bias may be a possible source of error in this study. However, the relatively high response rate to the survey (83.2%) and efforts to ensure standardized measurements tend to minimize this type of error. The non-respondents were mostly young men in whom hypertension prevalence would be expected to be low. This might have lead to slight overestimation of the overall prevalence.

The certainty of diagnosis of previously known cases based on positive history in this study is supported by some considerations. First, it has been shown that there was good agreement between self-reporting of high blood pressure and actual blood pressure measurement [6]. Second, it would be very unlikely for a subject to re-

port positive history without being told so by a health care provider after reaching diagnosis. Third, obtaining additional information about duration and treatment validated further the diagnosis in most of the cases.

When comparing prevalence from these data with those from other studies, other factors that might contribute to any observed differences should be taken into consideration. Prominent among these are the age difference between studied subjects, variability in definition of hypertension (and cut-off level of blood pressure beyond which the disease is diagnosed), time of the study, and urban versus rural characteristics of the population. Lack of standardization in methodology between different studies creates difficulties for making proper comparisons between different populations. Generally, the overall 11.1% prevalence of hypertension found in this study indicate that the disease affects a sizeable enough proportion of the population. However, such prevalence is low as compared to prevalence in industrialized countries. A prevalence of 24% was found in populations in the United States of America aged 18 years and older studied in a recent national survey [*7*]. Also, a study of middle-aged populations in Mexico City and in San Antonio, Texas [*8*], found hypertension prevalence of 17.1% in Mexican men and 17.4% in Mexican women. The overall prevalence in the Saudi communities is lower than that in the two studies cited above, although the limited age differences between the compared populations may reduce the gap to some extent. Also, higher prevalence (21.1%) was reported in a Chinese study population aged 30 years and above [*9*], where hypertension was defined as SBP $\geq$ 160 mmHg, DBP $\geq$ 95 mmHg, or if the subject was receiving treatment for hypertension.

The behaviour of systolic blood pressure at high altitude was reviewed; findings varied considerably. It has been reported by Ruiz and Penaloza [*10*] that diastolic hypertension tends to be more common than systolic hypertension at high altitude than at sea level. This may explain the significantly higher proportion of isolated diastolic hypertension (about 59%) than isolated systolic hypertension (about 21%) in the present study. This supports the findings of previous studies on a link between high altitude and increased diastolic hypertension.

The increasing prevalence of hypertension with age observed is in agreement with findings from other studies [*11*]. However, differences in prevalence by sex were not always consistent. In these data no significant difference in the prevalence of hypertension between men and women was found, but the age-adjusted prevalence was slightly higher among women (11.5% compared to 10.6%). Likewise, in the Farasan Islands [*12*] and in Medina al-Munawara [*1*] in Saudi Arabia, the prevalence was higher among women. However, higher rates among men have been reported by others [*13*]. Men and women in Saudi Arabia vary markedly in social, cultural, religious and many other lifestyle aspects from their counterparts in other countries. Differences in these features might also exist between countries and explain the contrasts in prevalence by sex.

Of the total 442 cases of hypertension, 338 (76.5%) were newly detected by the survey and were not aware of having the disease. This highlights the importance and potentially high yield from screening for hypertension. The majority of the new cases (95%) were mild (with DBP < 100 mmHg) and young, and might need only nonaggressive treatment and follow-up.

One prominent problem regarding hypertension in these Saudi communities is

that the disease is not being successfully controlled. In spite of the fact that 76% of the known cases had a positive history of treatment at the time of the survey, only 20% were controlled. Patient noncompliance with treatment is common in hypertension and could be a factor in these communities.

Conclusion and recommendations

Although the prevalence of hypertension in the Saudi communities examined in this study indicates that the disease is not as common as in industrialized countries, it does indicate that the disease affects a sizeable enough proportion of the population to warrant further attention. Also, in view of the remarkable socioeconomic development and rapid changes towards urbanization in Saudi Arabia over the past two decades, hypertension might be more prevalent in urban communities. Further studies are needed to clarify whether the disease is altitude-dependent. More attention should be directed towards better control of the disease and towards studying and enhancing compliance. While the effective role of patient education about the disease for improving compliance is debatable [*14*], other approaches such as behaviour modification techniques [*15*] and physician education [*16*] seem promising.

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