Epidemiological aspects and cost of managlng hypertension in Saudi Arabian primary health care centres

M. Al-Shahri[1], A.M.A. Mandil[2], A.G. Elzubier[2] and M. Hanif[2]

الجوانب الوبائية لمعالجة ضغط الدم المرتفع وتكلفتها في مراكز الرعاية الصحية الأولية بالمملكة العربية السعودية

محمد عبد الله الشهري وأحمد محمد منديل وأحمد قاسم الزبير ومحمد حنيف

خلاصة: تم بحث الملامح الوبائية الرئيسية والتكلفة المباشرة لمعالجة ضغط الدم المرتفع في عينة من المرضى المسجلين لدى مراكز الرعاية الصحية الأولية بمدينة الخبر بالمملكة العربية السعودية. فجمعت الملامح الوبائية من خلال مقابلات مع المرضى فضلاً عن السجلات الطبية، بينما تم الحصول على التكاليف المباشرة للمعالجة باستعمال معادلة معيارية. ووجد أن الاستشارات كان لها النصيب الأكبر من التكاليف المباشرة للمعالجة (67%)، وأن الفحوص والأدوية كانت مسؤولة عن 16% و17%، من التكاليف على التوالي. كما تبين أن عدد الزيارات، وتواتر المتابعة، واستعمال أدوية إضافية، كانت مصحوبة، إلى حد كبير، بارتفاع التكاليف الإجمالية المباشرة وارتفاع تكلفة الاستشارة. وتوصي الدراسة بتثقيف الأطباء حول احتواء التكاليف والاحتفاظ بوثائق مكتملة عن المعالجة الطبية.

ARSTRACT The main epidemiological features and the direct cost of management of hypertension for a sample of registered patients in primary health care centres in Al-Khobar, Saudi Arabia were examined. Epidemiological features were gathered through patient interviews and from medical records, while direct cost of management was obtained using a standard formula. Consultation accounted for the highest direct cost of disease management (67%); investigations and drugs were responsible for 16% and 17%, respectively. Number of visits, frequency of follow-up and use of additional drugs were significantly associated with higher total direct cost and higher cost of consultation. Medical education for physicians regarding cost containment and the complete documentation of medical treatment is advised.

Prise en charge de l'hypertension dans les centres de soins de santé primaires en Arabie saoudite: aspects épidémiologiques et coût

RESUME Les principales caractéristiques épidémiologiques et le coût direct de la prise en charge de l'hypertension ont été examinés dans un échantillon de patients enregistrés dans les centres de soins de santé primaires de la ville d'Al-Khobar (Arabie saoudite). Des données épidémiologiques ont été recueillies en interviewant les patients et en consultant leur dossier médical, tandis que le coût direct de la prise en charge a été évalué en utilisant une formule standard. Les consultations représentaient le coût direct le plus élevé de la prise en charge de la maladie (67%); les examens et les médicaments comptaient pour 16% et 17% respectivement. Le nombre des visites, la fréquence du suivi et l'utilisation de médicaments supplémentaires étaient associés de manière significative à un coût total direct ainsi qu'à un coût de la consultation plus élevés. Il est conseillé de former les médecins à la maîtrise des coûts et à la documentation complète du traitement médical.

[1]*Al-Hada Military Hospital, Taif, Saudi Arabia.*
[2]*Family and Community Medicine Department, College of Medicine and Medical Sciences, King Faisal University, Dammam, Saudi Arabia.*
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Introduction

Hypertension is considered one of the leading noncommunicable diseases facing mankind. Various population-based studies conducted in developing countries have shown that its prevalence ranges from 9% to 30% among adults aged 40–55 years [*1*]. In the Eastern Mediterranean Region, hypertension is estimated to affect 20%–26% of the population above 35 years of age [*2,3*]. In Saudi Arabia, studies have estimated its prevalence among adults to range from 4% to 15% [*4–7*]. However, a recent nationwide study [*8*] using blood pressure (BP) ≥ 140/90 as the definition of hypertension estimated that among adults over 40 years of age, it may be as high as 20.4% for systolic hypertension and 25.9% for diastolic hypertension.

Such prevalence is expected to have strong economic implications for the cost of health care, especially with respect to drugs and consultation. Studies conducted in Sweden [*9*], England [*10*] and the United States of America [*11*] showed that 30%–35% of the cost of management of hypertension goes to consultation alone, while 20%–59% goes to drugs.

Rapid growth in anti-hypertensive drug treatments and an increasing trend towards use of more expensive drugs have been observed among primary health care (PHC) physicians in Saudi Arabia [*12*] and elsewhere [*13*]. In addition, the initial work-up and follow-up of patients involves costly investigations.

Taking into account the increasing importance of PHC physicians in the management of hypertension in Saudi Arabia and the prevalence of the disease among adults, the present study was conducted with the aim of examining the main epidemiological features of a sample of registered hypertensive patients, as well as estimating the direct cost of management of hypertension in PHC centres in Al-Khobar, Eastern Province, Saudi Arabia.

Methods

The study design was cross-sectional, based on data collected with a specially designed questionnaire completed by a sample of registered hypertensive patients in the selected PHC centres of Al-Khobar, through personal interviews and from their medical records. A two-stage random sampling technique was used. In the first stage, a systematic sampling procedure was used to select five (out of nine) PHC centres. In the second stage, a systematic sampling of one-in-four was used to select hypertensive patients through their records, within each selected PHC centre. The total number of registered hypertensive patients in Al-Khobar during 1996 was 1246, of whom 25% (311 patients) were included in the study sample. This sample size was proportionally allocated from the five chosen PHC centres.

The questionnaire comprised two parts. The first part, completed by patient interview, focused on sociodemographic data (e.g. age, gender, education, occupation, nationality), duration of hypertension, drug treatment, ability to pay for drugs, use of other drugs and follow-up locations other than PHC centres. The second part, abstracted from the patients' medical records, included duration of hypertension, presence and type of hypertensive complications, number of visits during the last year, the last three blood pressure readings recorded in the file, duration of follow-up and a list of investigations performed, as well as a list of drugs prescribed during the last year.

Information regarding the prices of drugs was obtained from the Ministry of

Health drug list, while the costs of reference laboratory investigations were obtained from King Faisal University Hospital, the main teaching hospital in Al-Khobar, which is also a reference hospital.

The total direct cost for management of hypertension was calculated by summing the costs of consultation, drugs and investigations. The consultation cost per person (in Saudi riyals) was estimated by dividing the total sum of doctors' and nurses' annual salaries and benefits plus cost of annual rent for PHC centres plus cost of annual water, electricity and telephone services by the total number of patient visits during the same year [*9,14*].

Total consultation cost was calculated as cost per visit multiplied by the number of visits for each patient during the study year. Drug cost was based on the latest prescribed drug and dosage, while investigation cost was based on investigations done for each patient according to his or her medical record.

Data collection took place over 3 months. The interviews of hypertensive patients were conducted in the chosen PHC centres in Arabic and other languages as necessary, after explanation.

Collected data were coded, checked and entered into a computer. SPSS (version 6) was used for data entry and analysis. Total cost, cost of investigations and cost of consultations were expressed as mean cost ± 1 standard error. Differences between two or more means were tested using Student's *t*-test for unequal samples and one-way analysis of variance (ANOVA), respectively. Variables that were significant using univariate analysis were re-tested using multiple linear regression. For this purpose, total cost, cost of drugs, cost of consultation and cost of investigation were treated as dependent variables sequentially.

In order to estimate the expected number of hypertensives in Al-Khobar, the following process was adopted. The last census of Saudi Arabia (1992) estimated the population of Al-Khobar at 341 024, inclusive of non-Saudis [*15*]. Using an estimated annual population growth rate of 3.7% [*16*] and the assumption that the Al-Khobar growth rate is the same as that for the whole country, its total population in 1996 would be estimated at 394 366. The population aged 15 years or above was estimated at 50% of the total population [*17*]. Consequently, the corresponding population in Al-Khobar (15 years and above) would be about 197 183. Assuming that the prevalence of hypertension is 10%, using BP 160/95 as a definition of hypertension, then the expected number of hypertensives in Al-Khobar would be 19 718 (although usually only half are aware of their hypertensive status). Using BP 140/90 as the definition would almost double this estimate [*8*].

Results

The sociodemographic characteristics and hypertension status of the sampled cases are shown in Table 1. The mean age of sampled cases was 53.2 ± 0.65 years, two-thirds of whom (64%) were female. The response rate of selected patients in the sample was 100%. The majority were of Saudi nationality (81%), of low socioeconomic status (76%) and illiterate (58%). The mean systolic (SBP) and diastolic (DBP) blood pressures of sampled patients were 140 ± 1.83 and 84 ± 1.05 mmHg, respectively. The mean duration of hypertension and of treatment were 101.4 ± 3.8 and 84.1 ± 3.5 months, respectively. Most hypertensive patients (75%) had their DBP controlled (i.e. DBP ≤ 90 mmHg), while only about one-third (38%) had both systol-

Table 1 **Sociodemographic characteristics and hypertension status of patients in PHC centres, Al-Khobar, 1996**

Characteristic	No.	% cases (n = 311)
Age (mean ± 1$s_{\bar{x}}$)	53.2 ± 0.65	
Sex		
Males	111	35.7
Females	200	64.3
Nationality		
Saudis	253	81.4
Other	58	18.6
Socioeconomic status		
Low	236	75.9
Average/High	75	24.1
Education		
Illiterate	181	58.2
Read and write	45	14.5
Primary	38	12.2
Preparatory	16	5.1
Secondary	16	5.1
University	15	4.8
Mean SBP ±1 $s_{\bar{x}}$ (mmHg)		140 ± 1.83
Mean DBP ± 1 $s_{\bar{x}}$ (mmHg)		84 ± 1.05
Mean duration of hypertension (in months)		101.4 ± 3.6
Mean duration of treatment (in months)		84.1 ± 3.5
SBP ≤ 140 mmHg / DBP ≤ 90 mmHg		
Controlled	117	37.6
Uncontrolled	194	62.4

$s_{\bar{x}}$ = *standard error of the mean*

ic and diastolic blood pressure controlled (i.e. DBP ≤ 90 mmHg and SBP ≤ 140 mmHg). The majority of cases used one anti-hypertensive drug only (80.4%) and received their treatment free of charge (90%). Nearly half (46.0%) used drugs for other associated diseases.

The estimated direct mean cost of management of hypertension per case is shown in Table 2. Consultation accounted for the highest mean direct cost of the disease management (67%), while investigations and drugs were responsible for 16% and 17%, respectively. Thus, the total cost of care for registered patients is estimated to be SR 957 028, while the total cost of managing the expected number of hypertensive cases in Al-Khobar is estimated at SR 15 145 002.

Results of multiple linear regression analyses to detect variables that might affect direct total cost, cost of consultation, cost of drugs and cost of investigations are given in Table 3. The number of visits, frequency of follow-up and use of other drugs

Table 2 **Estimated mean annual cost of treatment of hypertensive cases in PHC centres, Al-Khobar, 1996 (in Saudi riyals)**

Item	Direct cost		
	Per case in study sample (n = 311)	For total registered cases (n = 1246)	For total expected cases (n = 10 718)
Investigations	121.04	150 816	2 386 667
Drugs	132.65	165 282	2 615 593
Consultation	514.39	640 930	10 142 742
Total	768.07	957 028	15 145 001

US$1 = SR 3.75

Table 3 **Analysis of cost by study variable**

Variable	β	$s_{\bar{x}}(\beta)$	95% CI	*P* value
Total cost				
Number of visits	343.79	37.19	270.62–416.97	0.00001
Frequency of follow-up	132.34	34.00	65.45–199.23	0.0001
Use of other drugs	165.25	34.56	97.24–233.25	0.00001
Constant	–519.95	72.71		0.00001
(R^2 – 0 .620)				
Cost of consultation				
Number of visits	263.03	18.87	225.90–300.16	0.00001
Frequency of follow-up	65.55	17.29	31.53–99.56	0.0002
Use of other drugs	52.19	22.86	7.20–97.18	0.0231
Constant	–300.34	36.58		0.00001
(R^2 = 0.738)				
Cost of drugs				
Education	44.83	17.47	10.47–79.20	0.0107
Coronary artery disease	90.23	44.85	1.97–178.49	0.0451
Number of visits	84.85	14.69	55.95–113.75	0.00001
Constant	–113.00	42.49		0.0041
(R^2 = 0.122)				
Cost of investigations				
Diabetes mellitus	123.14	18.18	87.35–158.91	0.00001
Age	1.159	0.59	2.6 – –0.31	0.0132
Frequency of follow-up	27.51	13.01	1.91–53.11	0.0353
Use of other drugs	41.91	18.04	6.43–77.41	0.0208
Number of visits	32.54	14.19	4.61–60.47	0.0226
Constant	–35.99	40.61		0.3762
(R^2 = 0.394)				

$s_{\bar{x}}$ = *standard error of the mean*

were found to be significantly associated with higher total direct cost, and with higher cost of consultation in hypertension treatment. The squared regression coefficient (R^2) was 0.620 and 0.738, respectively, implying that 62%–74% of the variation in the mean total cost and the cost of consultation could be explained by the variables included.

With regard to the mean cost of drugs, it was found that higher educational level, presence of coronary heart disease and number of visits to PHC centres were positively and significantly associated with the high cost of drugs. The squared regression coefficient, however, implies that only 12% of the variation in the cost of drugs could be explained by the variables included.

With regard to the cost of investigations, it was found that the presence of diabetes mellitus, frequency of follow-up, use of other drugs and number of visits were positively associated variables, while patient's age was negatively associated. The squared regression coefficient was 0.394 which implies that 39% of the variation in the cost of investigations could be explained by the variables included.

Discussion

Hypertension is a very prevalent condition affecting the adult population globally. Furthermore, a rapid rise in health care costs has been observed in the last few decades [*18*]. The estimated cost or impact of hypertension can be defined as the benefits that could be realized if a totally effective strategy was developed [*19*]. The magnitude and sociodemographic factors associated with hypertension in Saudi Arabia may place an enormous strain on the resources of the health care system. It may be possible to reduce the costs of anti-hypertensive treatment without reducing quality [*20*]. The results of this study provide some insight into the direct cost of hypertension management in PHC centres in Al-Khobar, as well as the factors that may affect that cost.

The age range of the studied cases was 35–65 years, with a mean of 53.2 ± 0.65 years, similar to that reported by Khaleel [*21*] and Al-Dharrab [*22*]. The fact that two-thirds of the cases were female may be an unavoidable bias characteristic of institution-based studies (females, as compared to males, may be more frequent users of PHC services). Most cases were Saudi Arabian nationals (81%) which may be explained by the fact that eligibility for treatment in PHC centres is limited to Saudis and government-employed non-Saudis [*22*]. Only slightly more than one-third of the patients (37.2%) had both their SBP and DBP controlled, a figure higher than that quoted by Al-Dharrab although the same BP level of control was used [*22*]. The prevalence of diabetes mellitus in addition to hypertension in nearly 40% of our sample agrees with reported figures regarding the association of the two diseases [*22*]. Almost all hypertensive patients (91%) were followed up only in their PHC centres and had their anti-hypertensive drugs free of charge as per national policy. The mean cost of anti-hypertensive drugs accounted for about one-sixth (17%) of the total mean direct cost of hypertension treatment in this study. This is similar to that reported by Menard et al. [*23*] and Elliot [*11*], but less than was found by Johannesson [*9*]. The contribution of consultation cost to total costs in this study (67%) is higher than the range of 20%–59% reported by other studies [*9–11*] and may be attributed to the inclusion of costs for rent of PHC facilities, utilities (water and electricity) and telecommunications in its estimation. This also resulted in a low-

er proportion of total cost being attributed to the cost of drugs in our calculations.

While the educational level of patients was positively associated with cost of drugs, this finding is probably related to the importance of health education in PHC centres for such patients. The use of other, non-antihypertensive drugs by patients was found to be positively associated with total direct cost, cost of investigations and consultation cost. This is due to the presence of other chronic conditions among hypertensive patients and their increased attendance at PHC centres. The presence of coronary artery disease in addition to hypertension among patients was positively associated with the high cost of drugs. This is an expected finding in such cases resulting from the use of expensive drugs. Similarly, the presence of diabetes mellitus was positively associated with the cost of investigations as PHC physicians tend to request blood sugar tests at each visit and to follow their patients on a monthly basis.

The frequency of follow-up and the number of visits by patients was positively associated with the total direct cost of hypertension care, cost of investigations and cost of consultation. The number of visits was also positively associated with the cost of drugs in that patients were given anti-hypertensive drugs at each visit to a PHC centre in excess of need because of a defect in the registration of drugs for these patients in their medical records. In this study, the percentage of hypertensive patients among the Al-Khobar population registered in PHC centres was found to be 0.63%. This figure was calculated by dividing the total registered hypertensives during 1996 (1246 patients) by the estimated adult population 197 183. This is similar to the figure in Dammam as reported by Al-Dharrab [*22*]. However, this figure is lower than might be expected and is not comparable with national or regional figures [*2–8*]. This actually reflects under-utilization of PHC centres in management of hypertension. Many hypertensives are managed by health care-providers other than PHC centres. That the role of PHCs in managing hypertension may not be known to some hypertensives may explain this.

This study reveals that the total direct cost of hypertension care for PHC registered patients represents only 6.32% of the estimated cost of treating the expected number of patients. This means that most hypertensive patients use other health facilities in Al-Khobar; this conclusion is similar to that reported by Al-Shehri in his study on the direct cost of care of diabetes mellitus [*24*]. However, our study shows that the direct cost of hypertension care for expected hypertensive cases exceeds the direct cost of diabetes mellitus care in Al-Khobar.

We recommend that the PHC recording system Saudi Arabia be computerized in order to ensure accuracy and completeness of data, to improve patient follow-up and appointments and to help in future evaluation studies. We also recommend continuing medical education for physicians regarding hypertension management with emphasis on cost containment and the importance of complete documentation of medical records. Furthermore, it is necessary to organize an effective information campaign to inform hypertensive patients about the effectiveness of primary health care centres in managing their cases. A large-scale national study may be advisable to investigate health care costs, especially for chronic conditions such as hypertension, throughout Saudi Arabia. This would undoubtedly benefit planning and implementation of intervention programmes for the cost containment of hypertension management

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