BLOOD PRESSURE PATTERNS, OBESITY AND LIPID PROFILE AMONG AMBULATORY DIABETICS IN SOUTHERN SAUDI ARABIA

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Objectives: To study risks for ischaemic heart disease, namely, blood pressure, obesity and lipid profile in ambulatory Saudi diabetics.

Design: Retrospective study (1992-1994).

Setting: A hospital outpatient diabetes clinic.

Patients: 306 ambulatory Saudi diabetics.

Results: There were 175 (57.2 %) males and 78.4% had NIDDM. The mean age was 47 years (SD ± 15). Average BP were higher than non-diabetic Saudis living in the same area and 10.1 % had BP ≥ 160/95. There was a high prevalence of obesity (55.6%) and dyslipidaemia among NIDDM patients. The majority of patients were poorly controlled (61 % $HbAC_1$>8).

Conclusion: Saudis with NIDDM are at a higher risk of developing coronary artery disease because of a high prevalence of obesity, hypertension and hyperlipidaemia. Measures such as strict control of Diabetes Mellitus (DM), education targeted to reduce obesity and hyperlipidaemia should be urgently adopted.

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The prevalence of non-communicable chronic diseases such as DM, hypertension and ischaemic heart disease has risen remarkably in some developing countries which experienced general improvement in socioeconomic and living standards[1,2]. Among those, the Kingdom of Saudi Arabia (KSA) has witnessed remarkable western-like change in lifestyles due to the rapidly developing economy which resulted in an increasing prevalence of DM and ischaemic heart disease (IHD)[3-5]. On the other hand, it has been demostrated that about 70% of diabetic mortality is caused by cardiovascular diseases, notably hypertension and ischaemic heart disease[6-9].

Because of the emerging importance of IHD in KSA and the importance of hypertension and obesity as risk factors for it, we aimed at retrospectively studying the pattern of blood pressure and other risk factors among ambulatory Saudi diabetics attending a diabetic clinic in Abha City, Southern KSA.

METHODS

Three hundred and six consecutive Saudi diabetics attending the Diabetes Clinic in Abha city, Southern Saudi Arabia between 1992-1994 were studied retrospectively. All patients were Saudi Arabs with similar lifestyle, dietary habits and social background. DM was defined according to WHO criteria[10]. The following variables were analysed: age, sex, body weight, body mass index (BMI), blood pressures (BP), fasting plasma sugar, total plasma cholesterol, triglycerides and glycosylated haemoglobin HbA_1C. Blood pressures were measured in the sitting position by a trained nurse; the average of 3 readings in 3 separate visits was recorded. Ischaemic heart disease was diagnosed if there was typical history of angina or myocardial infarction and ECG changes. Hypertension was defined as BP ≥ 160/95 according to WHO criteria or if the patient was taking hypotensive medications. Obesity was defined as BMI (weight in kg. divided by height in squared meteres) of ≥ 30 kg/m² for males and a BMI of ≥ 27.5 kg/m² for females[11]. Poor diabetic control was considered when HbA_1C was > 8 (normal 5.5-7.5%). The mean BPs and the prevalence of hypertension were compared to the age-matched non-diabetic populations with similar social and ethnic background living in the same area (n=499). Statistical analysis was performed using SPSS package. The chi-square was used to find significant differences between groups and the t-test for the differences between means, otherwise simple descriptive statistics were used.

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RESULTS

Of the 306 consecutive ambulatory diabetics in this study there were 175 (57.2 %) males and 131 (42.8%) females. There were 66 (21.6%) patients with IDDM (36 men) and the majority (240 patients - 78.4%) had NIDDM (139 men). Table 1 shows the mean demographic characteristics, weight, BMI, BP, fasting blood sugar and lipid profile among men and women separately, while Table 2 shows the mean values for the same variables among IDDM and NIDDM according to sex. Both systolic

Table 1. Mean values (SD) of blood pressures and other variables in 306 Saudi diabetics

Variable	*All*	*Men (n=175)*	*Women (n=131)*	*P value*
Age (y)	47 (15)	51 (14)	44 (14)	
Weight (Kg)	71.2 (16.7)	70.9 (14.7)	71.7 (18.7)	0.675
BMI	29 (7)	26 (5)	32 (7)	0.0001
Sys.BP (mmHg)*	120 (17)*	121 (19)	120 (18)	0.641
Dias. BP*	78 910)*	79 (9)	78 (9)	0.337
Fasting blood sugar (mg/dl)	222 (93)	212 980)	233(75)	0.020
Total cholesterol (mg/dl)	204 (52)	202 (59)	206 (44)	0.514
Triglycerides (mg/dl)	170 (81)	173 (79)	166 (90)	0.470
HbA_1C	10.6 (2.9)	10 (2)	10.6 (5)	0.150

** Non-diabetic population living in the same area (Ref.15) (N=499). Mean systolic BP 111 mmHG (SD 14) (P=0.002). Mean diastolic BP 74 mmHG (SD 8) (P=0.018).*

(P=0.002) and diastolic BP (P=0.018) were significantly different between the diabetic group (120 sys., 78 mm Hg dias) and the age-matched normal population (111 mm Hg sys., 74 mm Hg dias) living in the same area. Thirty one (10.1%) patients were identified as having hypertension (BP $\geq$ 160/95), the majority of them (88%) were having NIDDM. There was clinical or ECG evidence of IHD in only 8 patients (2.6%) but microscopic proteinuria using dip sticks was detected in 8% of all patients (3.3% of them were hypertensive). Obesity was observed in 28.5% of IDDM patients (men 7.1 %, women 21.4%) and 55.6% of the NIDDM group (men 21.5%, women 34.1%). Females in both groups had higher prevalence of obesity than males. Total cholesterol levels between 200 to 239 mg/dl were found in 14.3% of the NIDDM group, while total cholesterol levels of $\geq$ 240 mg/dl were detected in 25.7% of those patients. On the other hand, 25% of the NIDDM patients had triglyceride levels of more than 200 mg/dl (normal values: total cholesterol 200 mg/dl and triglycerides 190).

DISCUSSION

Of the non-communicable diseases, DM (especially NIDDM) has been identified as a major health problem in the Kingdom of Saudi Arabia[3] as well as many other developing countries[2,12]. Furthermore, a number of studies have confirmed the increasing prevalence of hypertension and IHD in developing countries[6,13,14]. The current retrospective study describes the blood pressure patterns and other risk factors for IHD among Saudi ambulatory diabetics. The average systolic and diastolic BP especially in females and NIDDM patients were significantly higher than those reported among non-diabetic subjects of similar age groups residing in the same area[15] but lower than the average BP observed in Sudanese diabetics[16]. However, the prevalence of hypertension (sys BP $\geq$ 160 and/or diast.$\geq$ 95) among our diabetic patients is much lower than what was reported among diabetics from Sudan (38%)[16] and Saudi diabetics in Riyadh area (25.6%)[17]; as well as other African countries[9] but is higher than the prevalence of hypertension reported in non-diabetic Saudis living in the same area (1.4%)[15]. This lower prevalence of hypertension among diabetics in Southern Saudi Arabia compared to their counterparts in Riyadh is possibly due to the fact that Southern Saudi Arabia is less urbanised and has a less Western lifestyle compared to Riyadh, the capital of Kingdom of Saudi Arabia. Nevertheless, this reported rise in BP among Saudi diabetics will certainly contribute to the development of ischaemic heart disease, a fact that has been well documented[7,18].

A striking finding demonstrated by this study is the high occurrence of overweight and obesity among Saudi diabetics especially females. About one-half (53%) of our NIDDM patients were obese, a trend which was also observed in Riyadh area[17], in contrast, the prevalence of obesity among non-diabetic subjects in Southern Saudi Arabia is 31% in women and 12% in men[19]. The adverse implications of high prevalence of obesity on the incidence of cardiovascular diseases, namely, hypertension and ischaemic heart disease are well known[20-22]. Furthermore, about 40% of NIDDM patients in this study have total cholesterol or triglycerides over 200 mg/dl, out of those 26% had

Table 2. Mean values (SD) of blood pressures and other variables in IDDM (N=66) and NIDDM (N=240)

Variable	*IDDM (n=66)*			*NIDDM (n=240)*			*P*
	All	*Men (n=36)*	*Women (n=30)*	*All*	*Men (n=139)*	*Women (n=101)*	*value*
Age (y)	31(13)	33(13)	29(14)	52(12)	54(12)	49(10)	<0.0001
Weight (Kg)	66(25)	62(14)	69(31)	72(14)	73(14)	72(15)	0.0114
BMI	26(10)	23(4)	31(13)	29(6)	27(5)	32(6)	0.002
Sys.BP	114(5)	115(16)	114(15)	122(17)	122(15)	123(18)	0.0002
Dias.BP	75(8)	77(9)	74(7)	81(10)	79(9)	80(10)	<0.0001
FBS	193(99)	210(88)	180(90)	232(86)	212(79)	258(92)	0.001
HBA_1C	11.2(3.8)	10.3(1)	11.6(4.5)	10.6(3)	10.6(2.5)	10.5(2.8)	0.176
Cholesterol	193(53)	164(53)	211(47)	208(52)	206(58)	205(44)	0.039
Triglycerides	197(91)	207(82)	203(84)	166(92)	171(89)	150(82)	0.015

total cholesterol over 240 mg/dl. This trend was more pronounced among females and obese diabetics. Such high prevalence of dyslipidaemia among NIDDM was also previously reported from Saudi Arabia[23] and elsewhere[24] and is much higher than what was reported among non-diabetic Saudis[25]. The association of hyperlipidaemia with cardiovascular disease is well-established[26,27] and thus effective interventional methods to reduce lipid levels among Saudi diabetics in particular and the general population in general will be of paramount significance since the reported prevalence of IHD among Saudi diabetics is increasing although not reaching that of Western countries[28,29].

It is disappointing to discover that a high percentage of the diabetics are poorly controlled (61 %). This worrying observation was also reported from other regions of Saudi Arabia[17] and warrant every possible effort to correct it since poor glycaemic control is associated with increased risk of diabetic microvascular complications[30,31]. In addition, attention to the other potentially modifiable risk factors such as smoking and hypertension will also lead to the reduction of diabetic complications[32]. We regret that smoking habits could not be identified in our patients because of the limitations of the retrospective nature of this study.

CONCLUSION

Patient care in the primary health care settings and in the diabetes clinics all over KSA should be improved so that optimal control of diabetes is achieved. These diabetes centres should be regularly supplied with supportive services to improve patient education towards better weight control and reduction of serum lipids. Since diabetics attending hospital diabetes centres represent the tip of the iceberg, the control of DM, obesity and dyslipidaemia should be extended to the primary health facilities to benefit the majority of the diabetic populations.

REFERENCES

1. World Health Organization. WHO Statistical Annual, 1988. Geneva: WHO, 1988.
2. Hagley K. Chronic non-communicable diseases and their impact on Caribbean women. West Indian Med J 1990;39:4-11.
3. Bacchus RA, Bell JL, Madkour M, et al. The preva lence of diabetes mellitus in male Saudi Arabs. Diabetologia 1982;23:330-2.
4. Al Gindan YM, Al Qurain A, Ibrahim EM, et al. Acute myocardial infarction in the Eastern province of Saudi Arabia: retrospective analysis of 264 patients. Ann Saud Med 1990;10:129-36.
5. Fatani HH, Mikra SA, El-Zubier AG. Prevalence of diabetes mellitus in rural Saudi Arabia. Diabetes Care 1987;10:180-3.
6. American Diabetes Association. Detection and management of lipid disorders in diabetes. Consenses statement. Diabetes Care 1993;16[suppl 2]:106-12.
7. Foster C, Rotmi C, Fraser H, et al. Hypertension, diabetes and obesity in Barbados: Findings from a recent population-based survey. Ethnicity Dis 1993;3:404-12.
8. Kannel WB, McGee DL. Diabetes and cardiovascular risk factors: The Framongham study. Circulation 1979;59:8- 13.
9. Oli JM, Ikeh VO. Diabetes mellitus and hypertension in an African population. JR College Phy 1986;20:32-38.
10. WHO Study Group. Diabetes Mellitus: Report of WHO Study Group. Technical Series 1985;727:20-5.
11. Bray GA. Obesity. In: King RA, Rotter JI, Motulsky AG, eds. The Genetic Basis of Common Diseases. New York, NY: Oxford University Press, 1992:507-28.
12. King H, Rewers M. WHO Ad Hoc diabetes reporting group. Global estimates for prevalence of diabetes and impaired glucose tolerance in adults. Diabetes Care 1993;16:157-77.
13. Ghali K. Should cardiovascular disease be a health priority for developing countries ? A brief overview of mortality data. Ethnicity Dis 1991;1:295-99.
14. Cooper RS, Rotimi C. Establishing the epidemiological basis for prevention of cardiovascular diseases in Africa. Ethnicity Dis 1993;3[suppl]:S13-S22.
15. Khalid MEM, Ali ME, El Bagir AM, et al. Pattern of blood pressures among high and low altitude residents of southern Saudi Arabia. J Human Hypt 1994;8:765-9.
16. El Bagir AM, Elmahadi EM. Pattern of blood pressure in African diabetes: Report from Sudan. J Human Hypt [in press].
17. Famujiwa OO, Sulimani RA, Loajam MA, et al. Diabetes mellitus in Saudi ARabia: The clinical pattern and complications in 1,000 patients. Ann Saudi Med 1992;12:1410-151.
18. Janka HV, Dirchedl P. Systolic blood pressure as a predictor of cardiovascular disease in diabetics. Hypertension 1985;7:91-4
19. El Bagir AM, Khalid MEM, El Karib AO, et al. Body composition and blood pressure: Which indices of fatness show the strongest correlation ? J Human Hypert 1995;10:365-8.
20. Feinleib M. Epidemiology of obesity in relation to health hazards. Ann Intern Med 1985;103:1019-24.
21. Kannel WB, Levauer EJ, Dawber TR, et al. Relation of body weight to development of coronary heart disease. Circulation 1967;35:734-44.
22. Pi-sunyer FX. Health implications of obesity. Am J Clin Nutr 1991;53[suppl 6]:595-603.
23. Al Nuaim A, Famuiwa O, Greer W. Hyperlipidaemia among Saudi diabetic patients. Ann Saudi Med 1995;15:240-3.
24. Reavem GM. Non-insulin dependent mellitus, abnormal lipoprotein metabolism and atherosclerosis. Metabolism 1987;36:1-8.
25. Inam S, Cumberbatch M, Judzeqitsch R. Importance of cholesterol screening in Saudi Arabia. Saudi Med J 1991;12:215-20.
26. The Canadian Consensus Conference on Cholesterol: Final Report: Can Med Assoc J 1988;139[suppl 1]:1-8.
27. Castelli WP, Garrison RJ, Wilson PW, et al. Incidence of coronary heart disease and lipoprotein levels: The Framingham study. JAMA 1986;256:2835-8.
28. Kingston M, Skoog WC. Diabetes in Saudi Arabia. Saudi Med J 1986;7:130-42.
29. Fatani HH, Mira SA, Al Zubier AG. The pattern of complications in Saudi diabetics. Ann Saudi Med 1989;9:44-7.
30. The Diabetes Control and Complications Trial Re search Group. The effect of intensive treatment of diabetes on the development and progression of long-term complications in insulin-dependent diabetes mellitus. N Engl J Med 1993;329:977-86.
31. Klein R, Klein BEK, Moss SE. Relation of glycaemic control to diabetic microvascular complications in diabetes mellitus. Ann Intern Med 1996;124:90-6.
32. Orchard TJ. From diagnosis and classification to complications and therapy. Part II. Diabetes Care 1994;17:326-38.