J. Phys. Ther. Sci.
27: 1727–1730, 2015

Original Article

Incidence of diabetes mellitus type 2 complications among Saudi adult patients at primary health care center

Samira Alsenany[1)*], Amer Al Saif[2)]

[1)] *Public Health Department, Faculty of Nursing, King Abdulaziz University: Jeddah, Saudi Arabia*
[2)] *Physical Therapy Department, Faculty of Applied Medical Sciences, King Abdulaziz University, Saudi Arabia*

Abstract. [Purpose] This study analyzed type 2 diabetes and its role in complications among adult Saudi patients. [Subjects] Patients attending four primary health care centers in Jeddah were enrolled. [Methods] A cross-sectional design study among Saudi patients attending Ministry of Health primary health care centers in Jeddah was selected for use by the Primary Health Care administration. Patients were interviewed with structured questionnaires to determine the presence of diabetes and risk factors using questions about the history of any disease. [Results] Diabetes mellitus was present in 234 subjects during the data collection period (March–June 2014). Mean patient age was 58 years; diabetes prevalence was 42% in males and 58% in females. The mean age for diabetes onset in males and females was 34 and 39 years, respectively. There was a higher incidence of obesity (75%) associated with a sedentary lifestyle (body mass index ≥25) in females (N= 96; 40%) compared with males (N= 87; 36%). In this study, >44% of individuals aged 55 or older had severe to uncontrolled diabetes with long-term complications. The age-adjusted incidence of hypertension and coronary heart disease was 38% and 24%, respectively, showing a clear incidence of diabetes associated with cardiovascular disease in Saudi Arabia. [Conclusion] This study found that a multifactorial approach to managing diabetes complication risks is needed.
Key words: Diabetes, Risk, Elderly

(This article was submitted Jan. 13, 2015, and was accepted Feb. 14, 2015)

INTRODUCTION

Diabetes mellitus type 2 (DMT2), or adult-onset diabetes, is characterized by high blood glucose levels resulting from a metabolic disorder that often can initially be controlled by diet and exercise. When the disease presents, medication may be important. Control over nutrition, continued activity, maintenance of body weight, and avoiding smoking can reduce or delay the onset of DMT2. However, according to the World Health Organization (WHO) statistical projections for health care expenditure in 2030, diabetes imposes a large economic burden on national health care systems. As the condition progresses, medications may be needed. Long-term complications from high blood glucose levels can include increased risk of heart attack, stroke, amputation, and kidney failure[1, 2)]. Worldwide, the incidence of diabetes mellitus (DM) was 2–8% in 2000 and is projected to be 4–10 in 2030 for all age groups[3)]. Diabetes incidence is common in males, but more common in females. In developing countries in 2000 and 2030, the urban population has increased and is projected to continue increasing. The most important demographic change to diabetes prevalence across the world has occurred in people aged 65 years or more[4)]. Globally, expenditures on diabetes will account for 5–14% of countries' total health care budget.

In Saudi Arabia alone, diabetes accounts for 20% of the country's total health expenditures. In 2004, a national survey showed that in Saudi Arabia, the percentage of DM in adults was 23.7%[5)]. The prevalence in women and men was 26.2% and 21.5%, respectively. DM was more common among urban Saudis (25.5%) compared with rural Saudis (19.5%). In 1998 in Saudi Arabia, WHO criteria for diagnosis were applied in a national survey of diabetes, in which 25,337 Saudis were screened for DM. The prevalence of non-insulin-dependent DM in the total male Saudi population was 5.63%[6)]. In 1987, in the western area of Saudi Arabia, study results reported an overall prevalence of 4.3%[7)]. The Ministry of Health of Saudi Arabia in its health preview report for 2009 showed that outpatient visits to diabetes clinics accounted for 88.4% of all visits to primary health care centers in Jeddah[8)]. One positive feature of DMT2 is that it is a preventable disease, and morbidity and mortality can be minimized by secondary prevention through early detection via screening and accurate treatment. To control this disease, it is essential to determine the risk factors behind it; policy makers, general practitioners, specialists, workers

*Corresponding author. Samira Alsenany (E-mail: Salsenany@kau.edu.sa)

in the medical field, and those at risk for DMT2 would all benefit from this. Depending on the conclusion of this research, a practical strategy for the prevention of DMT2 and a screening program for those at risk and in the prediabetic stage can be devised that will make it possible to control and prevent—or reduce—the complications of the disease. More specifically, we aim to improve our training approach to improve our health professionals' education training in the community module.

SUBJECTS AND METHODS

A cross-sectional design study among Saudi patients attending Ministry of Health primary health care centers in Jeddah was selected for use by the Primary Health Care administration. The Ministry of Health divided Jeddah into four geographical sectors (north, south, east, and west) for the study, which lasted from March to October 2014. Four primary health care centers were selected using a simple random sampling technique. Each center was a referral center with specialized diabetes care clinics. Sampling was carried out in two stages. A simple random sample was selected from all Saudis with DMT2 at the four primary health care centers in each sector. Patients were interviewed with structured questionnaires to determine the presence of diabetes and risk factors using questions about the history of any disease (e.g., cardiovascular disease), and charts were reviewed to document any diabetic therapies the patients may have undergone or were currently undergoing. This questionnaire was developed, pretested, and validated in a pilot study. Informed written consent was obtained from all patients before they were included in the study. Then, in the second stage, participants were selected by the days on which diabetes clinics were scheduled and the days the clinics were open for patients' follow-up appointments. The study focused on adult Saudis, both males and females (Table 1). Diagnosis of DMT2 and obesity were based on WHO definitions. DMT2 was associated with a fasting plasma glucose level ≥7.0 mmol/L (126 mg/dL)[8]. Mean systolic and diastolic blood pressure readings were taken using appropriate cuffs (in mmHg; average of two readings). Body mass index (BMI) was calculated as body weight in kilograms divided by height in square meters. Overweight was defined as a BMI of 25–29.9 kg/m^2, and obesity was defined as a BMI ≥30[9]. Coronary heart disease patients were defined as known cases based on a medical history of angiography and intake of antiarrhythmic drugs. Exclusion criteria were withdrawal from the interview and pregnancy. Data were analyzed using SPSS software package, version 16 (Table 2).

Table 1. Characteristics of diabetic patients

Parameters	Diabetic patients
Gender	
Male	(96) 42%
Female	(135) 58%
Age groups (years)	
30–39	(45) 19.23%
40–49	(58) 24.78%
50–59	(64) 27.35%
60–69	(67) 28.63%
Total	234

RESULTS

DM was present in 234 subjects during the study period. The mean age of the patients was 58 years. The prevalence of diabetes was 42% in males and 58% in females. The mean (SD) age for the onset of diabetes in males and females was 32 and 37 years, respectively. There was a higher incidence of obesity (75%) resulting from a sedentary lifestyle (BMI ≥25) in females (N=96; 40%) compared with males (N= 87; 36%). The age-adjusted incidence of hypertension and coronary heart disease was (N=89) 38% and (N=56) 24%, respectively. In this study, patients with diabetes indicated a lack of exercise because of a sedentary lifestyle (54%), 1 hour of exercise per week (19.5%), or more than 1 hour per week (17.3%). Furthermore, 67.3% of patients were taking more than two medications, 23.9% were taking two types of medication, and 8.8% were taking no medication. Sensory impairments, either visual 76.0% or auditory 23.9%, were observed among the diabetes patients.

DISCUSSION

Health status is an important factor that has a significant impact on the quality of life of a population. The main objec-

Table 2. Incidence of risk factors diseases among diabetic patients

Age group (years)	DMT2	Low activity	Obese (BMI)	HPN	CHD
30–39	9.53 (8.72–10.34)	31	30.54 (33.25–27.8)	13	6
40–49	12.2 (11.14–13.18)	27	33.4 (31.9–34.8)	25	10
50–59	14.7 (14.37–15.03)	41	31.5 (30.2–32.8)	22	19
60–69	13.6 (12.9–14.4)	49	34.5 (31.4–37.6)	29	21

BMI: body mass index; CHD: coronary heart disease; DMT2: diabetes mellitus type 2; HPN: hypertension

tive of this study was to determine the most common risk factors associated with DMT2 and its role in the development of complications among adult Saudi patients in Jeddah. Obesity and DMT2 are chronic conditions, and long-term management strategies are needed. Obesity is defined as excess body fat and is now recognized as a disease in its own right[6]. There is a strong relationship between obesity and diabetes in this study. Indeed, there is a higher incidence of obesity in people with diabetes, with 80–90% of people diagnosed with DMT2 also diagnosed as obese[7, 8]. In the Saudi community, the prevalence of obesity has been increasing and is now considered a common problem resulting from a sedentary lifestyle that includes excessive television viewing, insufficient physical activity, and the high consumption of fatty foods, which this study confirmed.

A patient with diabetes needs to undertake sufficient exercise to increase total energy expenditure to 160–180% of his or her resting metabolic rate[9, 10]. Exercise plays an important role in controlling blood glucose levels and increasing overall fitness. Medication is central to effective diabetes management to control metabolic abnormalities and manage the complications of diabetes and other concomitant conditions[11]. Significantly, many diabetes patients (67%) in this study reported taking many types of medications. Even when medications are required, lifestyle factors, improved diet, increased exercise, and smoking cessation are necessary to achieve an optimal level of health[12, 13].

Globally, diabetes prevalence is similar in males and females, but it is slightly higher in men <60 years of age and in females at older ages[5]. This study found a higher incidence among females (58%) than among males (42%). We found also that aging is a major risk factor for DM because it is a disorder of the elderly. In this study, more than 44% of individuals aged 55 or older had severe to uncontrolled diabetes and long-term complications. Researchers from Saudi Arabia have shown different age-specific prevalence rates[13–15]; this study found an increased prevalence of DM in people aged 58.5 years or older. Similarly, another study noted that the incidence of diabetes increases with age[16]. The aging process is a progressive deterioration of bodily functions over an individual's lifespan, and is destructive, progressive, intrinsically determined, and universal. Aging occurs at different rates among individuals and among individual organs and tissues in the body. Advancing age is associated with glucose intolerance and changes in bodily functions[17]; thus, actively screening older people in hospitals and care facilities for diabetic complications is warranted.

Furthermore, our study showed that diabetes is a significant risk factor for cardiovascular disease, such as hypertension (38%) and coronary heart disease (24%). Cardiac disease accounts for more than 50% of deaths in DMT2, and half of these patients will die before they reach a hospital[17, 18]. The mortality rate has not been reduced despite new therapeutic measures and preventive health programs. This study also reports that sensory impairments, either visual (76.0%) or auditory (23.9%), are significant and linked with a high risk of DMT2. In addition, they play a role in developing complications among adult Saudi patients. Visual impairment and blindness are significant complications of diabetes. People with diabetic eye disease are at a greater risk of developing other diabetes-related complications unless they are screened regularly and take appropriate preventive action and receive treatment[19]. This study concludes there is a need for a diabetes education program in the Saudi community as an integral part of diabetes management.

However, the rate of exercise therapy implementation is lower than that of other treatment methods[20–22]. Factors affecting physical activity in DM patients include physical factors[23, 24] such as age, sex, and BMI; psychosocial factors[25]; and life-related environmental factors[26]. Among these, psychosocial factors, self-efficacy[27], behavior modification, and social support to deal with barriers to physical activity are considered particularly important to exercise therapy intervention[28, 29]. The overall goal of diabetes education for the Saudi community is to modify Saudis' lifestyle as a means of reducing these risk factors and achieve and maintain an integrated sense of self-care, a balanced diet, and optimum diabetes control. The beneficiaries of the results of this study in Saudi Arabia are the policy makers, general practitioners, specialists, workers in the medical field, and of course those susceptible to DMT2. This research provides a practical suggestion regarding the need for a strategy for the prevention of DMT2: a screening program to identify those at risk and in the prediabetic stage and to control and prevent or reduce complications linked to the disease. More specifically, we aim to improve our training approach to educate health care workers in their health training in the community module.

ACKNOWLEDGEMENTS

This project was funded by the Deanship of Scientific Research (DSR), King Abdulaziz University, Jeddah, under grant no. (13/668/1434). The authors, therefore, acknowledge, with thanks, DSR technical and financial support.

REFERENCES

1) Welch BJ, Zib I: Case study: diabetic ketoacidosis in type 2 diabetes: "look under the sheets. Clin Diabetes, 2004, 22: 198–200. [CrossRef]
2) Kumar V: Fausto, et al.: Robbins and Cotran Pathologic Basis of Disease, 7th ed. Philadelphia: Saunders, 2005, pp 1194–1195.
3) Ekoe JM: Recent trends in prevalence and incidence of diabetes mellitus syndrome in the world. Diabetes Res Clin Pract, 1985–1986, 1: 249–264. [Medline] [CrossRef]
4) Wild S, Roglic G, Green A, et al.: Global prevalence of diabetes: estimates for the year 2000 and projections for 2030. Diabetes Care, 2004, 27: 1047–1053. [Medline] [CrossRef]
5) Al-Nozha MM, Al-Maatouq MA, Al-Mazrou YY, et al.: Diabetes mellitus in Saudi Arabia. Saudi Med J, 2004, 25: 1603–1610. [Medline]
6) Fatani HH, Mira SA, el-Zubier AG: Prevalence of diabetes mellitus in rural Saudi Arabia. Diabetes Care, 1987, 10: 180–183. [Medline] [CrossRef]
7) Mohsen AF, El-Hazmi MA, Warsy AS, et al.: Diabetes mellitus as a health problem in Saudi Arabia. East Mediterr Health J, 1998, 4: 58–67.
8) World Health Organization: Diabetes. Fact sheet N°312. http://www.who.int/mediacentre/factsheets/fs312/en/.
9) Flegal KM, Carroll MD, Ogden CL, et al.: Prevalence and trends in obesity among US adults, 1999–2000. JAMA, 2002, 288: 1723–1727. [Medline] [CrossRef]
10) Mokdad AH, Ford ES, Bowman BA, et al.: Prevalence of obesity, diabetes, and obesity-related health risk factors, 2001. JAMA, 2003, 289: 76–79. [Medline] [CrossRef]
11) Daousi C, Casson IF, Gill GV, et al.: Prevalence of obesity in type 2 diabetes in secondary care: association with cardiovascular risk factors. Postgrad Med J, 2006, 82: 280–284. [Medline] [CrossRef]

12) Wells JC: A Hattori chart analysis of body mass index in infants and children. Int J Obes Relat Metab Disord, 2000, 24: 325–329. [Medline] [CrossRef]
13) Sattar N, Gaw A, Scherbakova O, et al.: Metabolic syndrome with and without C-reactive protein as a predictor of coronary heart disease and diabetes in the West of Scotland Coronary Prevention Study. Circulation, 2003, 108: 414–419. [Medline] [CrossRef]
14) Williams PT, Hoffman K, La I: Weight-related increases in hypertension, hypercholesterolemia, and diabetes risk in normal weight male and female runners. Arterioscler Thromb Vasc Biol, 2007, 27: 1811–1819. [Medline] [CrossRef]
15) Al-Turki YA: The prevalence of overweight and obesity amongst hypertensive and diabetic adult patients in primary health care. Saudi Med J, 2000, 21: 340–343. [Medline]
16) el-Hazmi MA, Warsy AS: Prevalence of overweight and obesity in diabetic and non-diabetic Saudis. East Mediterr Health J, 2000, 6: 276–282. [Medline]
17) Tuomilehto J, Lindström J, Eriksson JG, et al. Finnish Diabetes Prevention Study Group: Prevention of type 2 diabetes mellitus by changes in lifestyle among subjects with impaired glucose tolerance. N Engl J Med, 2001, 344: 1343–1350. [Medline] [CrossRef]
18) Knowler WC, Barrett-Connor E, Fowler SE, et al. Diabetes Prevention Program Research Group: Reduction in the incidence of type 2 diabetes with lifestyle intervention or metformin. N Engl J Med, 2002, 346: 393–403. [Medline] [CrossRef]
19) Al-Riyami AA, Afifi MM: Accuracy of self-reporting of diabetes mellitus and hypertension and its determinants among Omani adults. Saudi Med J, 2003, 24: 1025–1026. [Medline]
20) Kamiya A, Ohsawa I, Fujii T, et al.: A clinical survey on the compliance of exercise therapy for diabetic outpatients. Diabetes Res Clin Pract, 1995, 27: 141–145 [Medline] [CrossRef]. [Medline] [CrossRef]
21) Arnold-Wörner N, Holle R, Rathmann W, et al.: The importance of specialist treatment, treatment satisfaction and diabetes education for the compliance of subjects with type 2 diabetes - results from a population-based survey. Exp Clin Endocrinol Diabetes, 2008, 116: 123–128 [Medline] [CrossRef]. [Medline] [CrossRef]
22) Albright A, Franz M, Hornsby G, et al.: American College of Sports Medicine position stand. Exercise and type 2 diabetes. Med Sci Sports Exerc, 2000, 32: 1345–1360 [Medline] [CrossRef]. [Medline] [CrossRef]
23) Plotnikoff RC, Taylor LM, Wilson PM, et al.: Factors associated with physical activity in Canadian adults with diabetes. Med Sci Sports Exerc, 2006, 38: 1526–1534 [Medline] [CrossRef]. [Medline] [CrossRef]
24) Delahanty LM, Conroy MB, Nathan DM: The diabetes prevention program research group psychological predictors of physical activity in the diabetes prevention program. J Am Diabetic Assoc, 2006, 106: 698–705. [CrossRef].
25) Korkiakangas EE, Alahuhta MA, Laitinen JH: Barriers to regular exercise among adults at high risk or diagnosed with type 2 diabetes: a systematic review. Health Promot Int, 2009, 24: 416–427 [Medline] [CrossRef]. [Medline] [CrossRef]
26) De Greef K, Van Dyck D, Deforche B, et al.: Physical environmental correlates of self-reported and objectively assessed physical activity in Belgian type 2 diabetes patients. Health Soc Care Community, 2011, 19: 178–188 [Medline]. [Medline]
27) Bandura A: Self-efficacy: toward a unifying theory of behavioral change. Psychol Rev, 1977, 84: 191–215 [Medline] [CrossRef]. [Medline] [CrossRef]
28) Van Dyck D, De Greef K, Deforche B, et al.: Mediators of physical activity change in a behavioral modification program for type 2 diabetes patients. Int J Behav Nutr Phys Act, 2011, 8: 105 [Medline] [CrossRef]. [Medline] [CrossRef]
29) Murano I, Asakawa Y, Mizukami M, et al.: Factors increasing physical activity levels in diabetes mellitus: a survey of patients after an inpatient diabetes education program. J Phys Ther Sci, 2014, 26: 695–699. [Medline] [CrossRef]