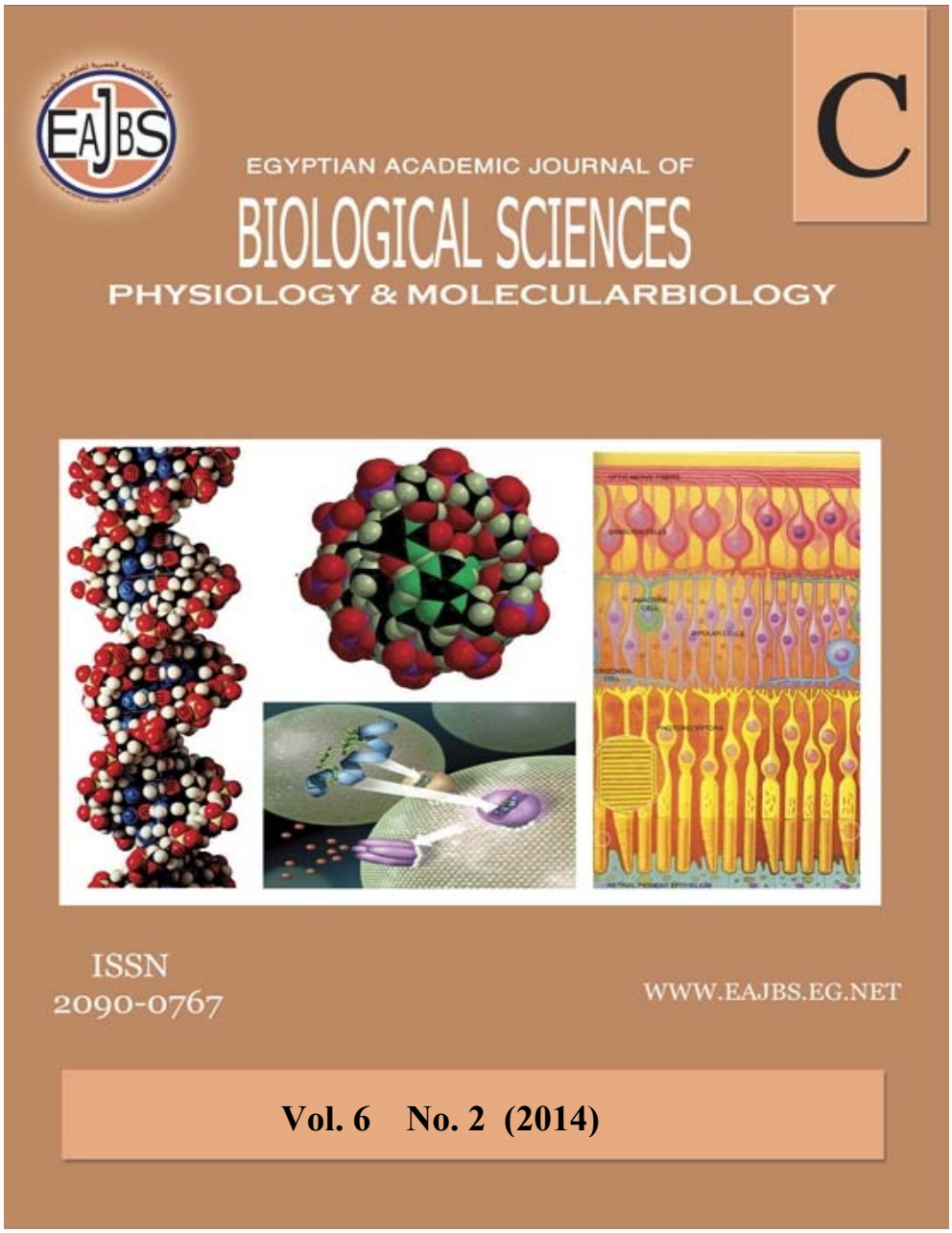

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Current Burden of diabetes in Kingdom of Saudi Arabia in an epidemiological survey

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ABSTRACT

Objective: The purpose of this study was to estimate the prevalence of diabetes In Hail Region, Kingdom of Saudi Arabia (KSA). **Methodology:** Data were collected during a cross-sectional survey included 5000 Saudi selected from 30 primary health care centers (PHCs) in Hail Region. **Results**: The overall prevalence of diabetes in Hail was 31.1%. The prevalence of male was 32.6% and female was 29.6% (P <0.0001). The risk of diabetes increases with the increase of age, as well as, with increasing body mass index (BMI) and this was found to be statistically significant p < 0.0001. **Conclusion**: These results indicate that diabetes is prevalent in Hail Region that requires strict strategies for prevention and overall management.

INTRODUCTION

Diabetes is a metabolic condition in which the body fails to produce enough insulin (Porte, *et al.* 2003). Diabetes mellitus (DM) is a chronic disorder of glucose metabolism with serious clinical consequences. The prevalence of diabetes has been rising in the recent decades, due to the global changes in lifestyle (Nita, *et al*. 2010).Globally, it is estimated that 382 million persons suffer from diabetes for a prevalence of 8.3%. North America and the Caribbean is the region with the higher prevalence, 36,755 people with diabetes (11%) followed by the Middle East and North Africa with 34,571 people with diabetes (9.2%). Western Pacific regions, with 138,195 people with diabetes, is the region with higher number of people with diabetes, however its prevalence is 8.6%, close to the prevalence of the World (Health intelligence, 2031). In 2004, an estimated 3.4 million people died from diabetes. A similar number of deaths was estimated in 2010(Global health risks, 2009). More than 80% of diabetes deaths occur in low- and middle-income countries (Mathers and Loncar, 2006). WHO expected that, diabetes will be the 7th leading cause of death in 2030 (WHO, 2010).

Over time, diabetes can damage the heart, blood vessels, eyes, kidneys, and nerves. Diabetes increases the risk of heart disease and stroke.

About 50% of diabetic patientsfrom cardiovascular disease (CVD) (Morrish, *et al.* 2001). Combined with reduced blood flow, neuropathy (nerve damage) in the feet increases the chance of foot ulcers, infection and eventual need for limb amputation. Diabetic retinopathy is an important cause of blindness, and occurs as a result of long-term accumulated damage to the small blood vessels in the retina. One percent of global blindness can be attributed to diabetes (WHO, 2012). Diabetes is among the leading causes of kidney failure (WHO, 2011). The overall risk of dying among diabetic patients is at least double the risk of their peers without diabetes (Roglic, *et al.* 2000).

Simple lifestyle measures have been shown to be effective in preventing or delaying the onset of type 2 diabetes. Maintain healthy body weight, being physically active, eat a healthy diet, reduce sugar and saturated fats intake, and avoid tobacco use are the most preventive measures (Elizabeth, *et al.* 2013).

Previous studies have shown that, the prevalence of diabetes is high (30%) among the Saudi population and represents a major clinical and public health problem. The prevalence of diabetes was 34.1% in males and 27.6% in females (Khalid, *et al*. 2011). The dramatically growing shift in lifestyle to more inert daily activity with higher-fat diets and resultant obesity apparently underlies much of the increased prevalence of diabetes mellitus. These facts clarify the important of providing up to date data about the prevalence of diabetes in different parts of the country. Therefore, this study is aiming at providing updated data regarding prevalence of diabetes in Hail region, to promote more measures for control and suitable interventions.

MATERIALS AND METHODS

During 2013, data were collected from 5000 Saudi civilians living inHail region Northern Saudi Arabia, during a comprehensive cross-sectional survey. During the survey participants were interviewed at PHC or home and invited to a mobile examination center to undergo various examinations and laboratory measurements. Data were collected by the doctors of the team utilizing a standard questionnaire, which included demographic information, previously diagnosed diseases (hypertension, diabetes and others) and familial history of hypertension, diabetes. Blood pressure was measured and blood sample was taken to estimate glucose level.

Diagnosis of hypertension was based on observation of blood pressure levels >140/90 mmHg. Mean blood pressure was calculated from up to three blood pressure readings taken from participants in a seated position. Hypertension was defined as a mean blood pressure ≥140/90 or current use of medication for hypertension.

Diagnosis of diabetes in this survey was based on the information provided by the participant of being under treatment for diabetes due to a previous well-established diagnosis then confirmed with new blood glucose estimation. We considered as suspicious of having diabetes those subjects with non-fasting results of blood glucose >200 mg/dL.

BMI was calculated from measured height and weight and classified as normal weight (<25 kg/m2); overweight (25 -30 kg/m2); and obese (30-35 kg/m2), morbid obesity (>36 kg/m2).

RESULTS

The mean age of the study population was 43.5 ± 18.7 years with 50.8% males and 49.2% females. The overall prevalence of diabetes in Hail was 31.1% using patients' history and 31.3% using blood glucose test. Moreover, the prevalence of males was 32.6% and females were 29.6%. First degree family history was available for 1203 participants of whom 778/1203 (64.7%) declared as having a family history of diabetes.

Table 1, Fig.1 summarizes the relationship between diabetes and age. Of the 1408 diabetic patients, 36,153,462,547 and 210 were at age ranges, <25 years, 26-40,41-55, 56-70, and 71+, respectively. However, when comparing within the entire age group, it was found that the risk of diabetes increased with the increase of age and this was found to be statistically significant p < 0.0001, as indicated in Fig1.

Table 1: Distribution of the study population by diabetes and age

Age	Diabetic	Non-diabetic	Total
<25 years	36	980	1016
26-40	153	986	1139
41-55	462	617	1079
56-70	547	342	889
71+	210	192	402
Total	1408	3117	4525

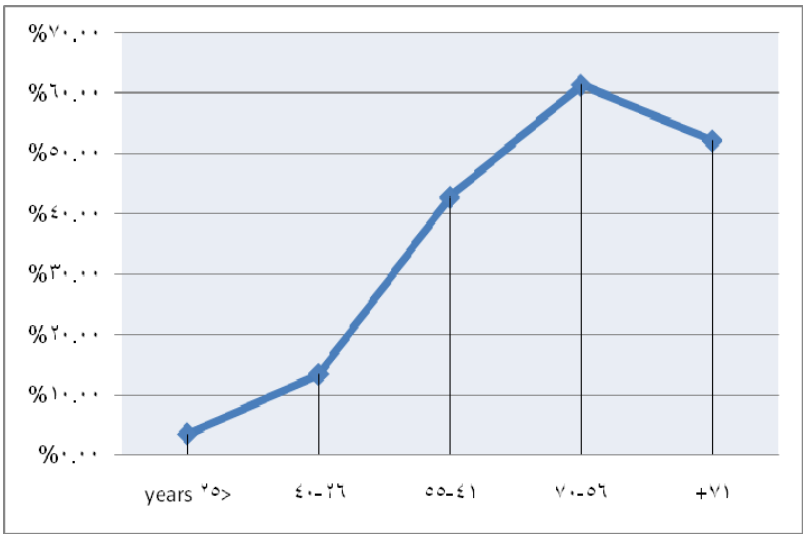

Fig. 1: Description of the proportions of diabetic patients by age ranges

Furthermore, of the 1408 diabetic patients, measurement of blood pressure was available for 1200 (86%) patients, among whom 383/1200(32%) were found with pre-hypertension and 483/1200 (40%) with hypertension. These findings showing strong association between diabetes and hypertension, which showing statistically significant difference (P <0.001).

Additionally, the BMI was available for 1099/1402 (78%) of the diabetic patients. The mean BMI was 31.4± 1.4. Of the 1099 calculated BMI, 317/1099 (29%) were with normal weight, but 428/1099(39%), 219/1099 (20%) and 135/1099(12%) were classified as overweight, obese and with morbid obesity, in this order, as shown in Fig. 2. Accordingly, the relationship between diabetes and getting overweight is very strong, which was found to be statistically significant (P <0.0001).

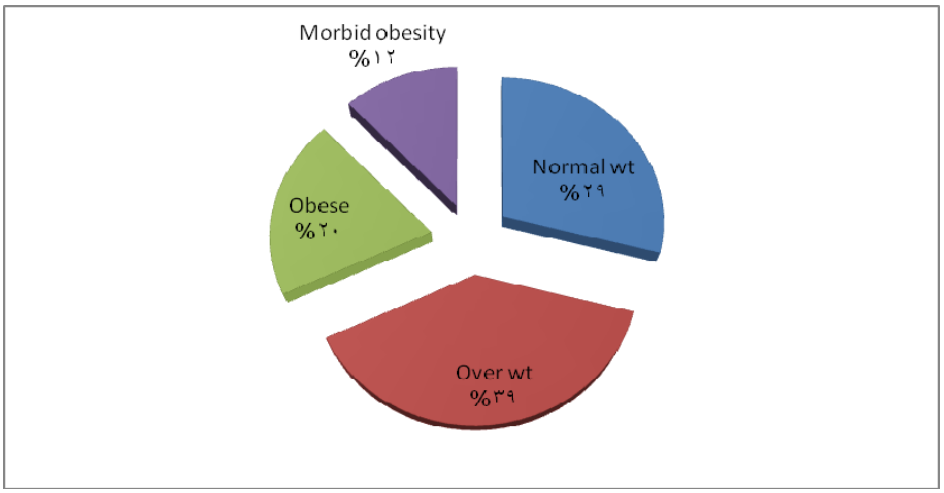

Fig. 2: Description of diabetic patients with BMI.

DISCUSSION

Hail is a province of Saudi Arabia, located in the north of the country. It has an area of 103,887 km² and a population of 527,033 (2004) census). This study showed a high prevalence of diabetes in Hail area, which exceeded the prevalence rates in some previous reports from Saudi. A community based study reported an overall prevalence of DM of 23.7% in KSA. The study have shown that the highest prevalence rates were among the Northern Saudi population of 27.9% followed by the Eastern region of 26.4%, then Saudis from the Western region of 24.7%, and from the Central region of 23.7%, whereas the lowest prevalence was from the Southern region of 18.2% (Mansour, *et al*. 2004). Since this study was done before 10 years, the high prevalence rates in our study is expected, which is with ongoing global increase in the prevalence rates of diabetes. Another recent study from Saudi has shown relatively close results to our findings. The study showed that the prevalence of diabetes in general Saudi population was 30%. The prevalence of diabetes was 34.1% in males and 27.6% in females (P<.0001). The mean (SD) age for onset of diabetes in males and females was 57.5 (13.1) and 53.4 (13.1) years, respectively (P<.0001) (Elizabeth, *et al.* 2013). Although, the overall prevalence of diabetes in our study is higher than in this study, but males prevalence rate was higher than in our study, and this might be attributed to the older age range in the previous study. Regarding age, it was well established that the risk for development of diabetes increases with age (Van Eersel, *et al*. 2013; Nooyens, *et al.* 2010). Furthermore, men seem more susceptible than women to the diabetes, possibly due to differences in insulin sensitivity and regional fat deposition. Women are, however, more likely to transmit Type II diabetes to their offspring (Panat, *et al.* 2013;Gale and Gillespie, 2001).

Globally, the top 10 countries with higher prevalence of diabetes are Tokelau (37.5%), Federated States of Micronesia (35%), Marshall Islands (34.9%), Kiribati (28.8%), Cook Islands (25.7%), Vanuatu (24%), Saudi Arabia (23.9%), Nauru (23.3%), Kuwait (23.1%) and Qatar (22.9%) [3]. The magnitude and geographic distribution of the prevalence of diabetes mellitus in the World is heterogeneous, having Tokelau with a prevalence of 37.9%, almost 24 times higher than the prevalence of Mali (1.6%), the country with the lower prevalence of diabetes. This information indicate that diabetes is one of the fastest-growing health problem in the World, which is reaching epidemic proportion in some regions, as consequence of life-style, lack of

exercise, unhealthy diet, obesity and overweight.

The mean BMI in the present study was 31.4± 1.4. Overweight or obesity results in a wide range of elevated risk factors and many fatal and nonfatal conditions (Haslam and James, 2005). The increase in diabetes can largely be attributed to weight gain, (Ford, et al. 1997; Banerjee, *et al*. 2004) and it threatens the enormous advances in disease prevention we have seen (Passaro, *et al.* 2005; Engelgau, *et al.* 2005; Flegal, *et al*. 2002). Numerous studies have shown that attention to lifestyle modification can dramatically reduce progression to type 2 diabetes (Knowler, *et al.* 2002; Wadden, *et al.* 2005). Weight loss of as little as 7% of body weight during the 1st year of intervention, with lesser amounts to follow, is tremendouslyuseful and fit within the capability of most patients (Robert, *et al*. 2006). Diabetes can be prevented or delayed in high-risk adults through lifestyle modifications, including dietary changes, moderate-intensity exercise, and modest weight loss. Detection and awareness of people at high risk (eg. obesity) for diabetes may be an important step in initiating successful lifestyle based prevention. Knowledge of pre-diabetic changes is important useful factor in planning effective lifestyle interventions.

In the present study, the proportion of hypertension is high among diabetic patients. Hypertension frequently coexists with type 2 diabetes (DM), and increases the risk of cardiovascular outcomes (Luciana, *et al.* 2013). The pathogenesis of hypertension in patients with diabetes is complex, involving a range of biological and environmental factors and genetic predisposition; as a result, hypertension in diabetic patients incurs higher associated risks and adverse events. Mortality and morbidity are heightened in diabetic patient who do not achieveblood pressure (BP) control (Stamler, *et al*. 1997). Detecting and managing hypertension in people with diabetes is one of the most effective measures to prevent adverse events (Sonak, *et al*. 2013), and pharmacotherapy is one of the most effective ways to maintain target BP levels in primary care (Richard, *et al.* 2011).

In conclusion: Diabetes is prevalent in Hail region, and this increase the need for urgent programs aiming at encouraging people to learn about risks and warning signs of diabetes, to take actions to prevent the disease and seek healthcare in case they develop diabetes. Diagnosis of diabetes is both a personal and health system and services responsibility. Diabetes risk measurement must be incorporated into primary health care with general health coverage.

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ARABIC SUMMARY

العبء الحالي لمرض السكري في المملكة العربية السعودية في المسح الوبائي

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الهدف: الغرض من هذه الدراسة تقدير معدل انتشار مرض السكر يفيم نطقة حائل، المملكة العربية السعودية.

طرق القياس: تمجمع البيانات من خلال مسحمس تعرضة شملت٥٠٠٠ سعوديا ختيرت من ٣٠ مركز اللرعاية الصحية الأولية في منطقة حائل.

النتائج: كانمعدل انتشار مرض السكر يفي حائل ٣١.١٪. كان انتشاره فى الذكور ٣٢.٦٪ والإناث ٢٩.٦٪ (P <0.0001). خطرمرض السكر يزيد مع زيادة العمر، وكذلك، مع زيادة مؤشر كتلة الجسم (BMI) وجدد تدلالة إحصائية (P <0.0001).

الاستنتاج: هذه النتائج تشير إلى أن مرض السكر يم نتشر في منطقة حائل التي تتطلب استراتيجيا تصارمة للوقاية والإدارة العامة