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Prevalence of Diabetes Mellitus among Non-Bahraini Workers Registered in Primary Health Care in Bahrain

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Background: Diabetes mellitus (DM) is a major public concern in Bahrain and throughout the World. It is an important health problem because of its high morbidity and mortality. Although its complications are partially preventable, yet the impact of the increased cost of the disease and its complications is a burden on the health system and the national economy.

Objectives: To estimate the prevalence of abnormal glucose tolerance (DM and IGT) among Non-Bahraini workers (labour force) in Bahrain and its associated risk factors.

Methods: The study was limited to non-Bahraini workers using the recent WHO diagnostically criteria which are the same as ADA criteria for 1997. The population sample was selected randomly (stratified sample). An overnight 12-16 hour fasting blood sample was collected for sugar and cholesterol measurements.

Results: A total of 528 cases were selected with 98.5% response rate. The prevalence rate of diabetes was 10.6% of which 3.3% were already previously diagnosed, and 7.3% newly diagnosed. The prevalence of impaired fasting glucose tolerance was 6.3%, making total glucose intolerance 16.9%. The associated risk factors with their correlation with diabetes were also studied.

Conclusions: Two thirds (66.6%) of the diabetic subjects were aged 40-49, and 91.7% of the subjects who had an abnormal glucose tolerance were in the age group 35-54 together with the high prevalence of DM and IGT among these workers. The majority of the affected subjects are in the productive age group, which may affect their productivity and its impact on the health services and economy. This necessitates focusing on health promotion among workers and early intervention to insure better health status of the labour force.

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The World Health Organization is warning that the number of people with diabetes is rapidly increasing. It is estimated that there are now 150 million people in the world with diabetes. This figure

is expected to double over the next 25 years[1]. A WHO study group on the prevention of diabetes is predicting that the major part of the increase will occur in developing countries[2, 3].

This could be due to the most dramatic changes in living conditions as a result of urbanization and demographic changes. The rapid socioeconomic development, which started in 1970s, induced rapid proliferation, which led to an exodus of labourers to the Gulf countries, mainly the unskilled and low class workers in the field of construction. The educational parameters of the non-Bahraini population include 33.3% illiterate, with 5.3% above school level[4].

In developing countries compared to developed countries the prevalence of diabetes in relation to age group starts to rise at an earlier age, with an overall higher total prevalence rates. For example, in a study carried out in Shikarpur in the Sindh Province of Pakistan, 21.3% of the population above the age of 25 were found to have diabetes. The study revealed that 6.1% of the population surveyed had already been known diabetics, 7.4 % were new cases, and 7.7% had Impaired Glucose Tolerance (IGT)[5] In northwestern Europe the prevalence of DM is less than half.

The theme of World Diabetes day for 1999 was on the cost of Diabetes, to focus on the increase of direct and indirect costs of diabetes[2]. Early identification of people having diabetes will reduce the cost, giving better chance of proper management; reduce the number of lost school and work days, hospitalization and emergency visits[6].

Studies in Egypt, China, Tanzania, Finland and Sweden proved that lifestyle modification could slow the development of diabetes in high-risk groups[1].

A study on the global burden of disease, carried out jointly by WHO, World Bank and Harvard University, to estimate cause-specific mortality, showed that diabetes and its complications were predicted to be among the leading causes of death worldwide by 2010.

The objective of this study was to find out the prevalence of abnormal glucose tolerance among workers registered in the Primary Health Care in Bahrain, taking into account the proportion (fraction) of known (already diagnosed) and unknown diabetes (newly discovered during the survey) and other associated risk factors such as hypercholesterolaemia, obesity, high blood pressure, family history, and smoking, besides age and gender.

METHODS

Target group

The target group was all Non-Bahraini workers (labour force) registered in the Primary Health Care system in the Ministry of Health in Bahrain.

The Sample

Assuming that the prevalence rate is 5% (±2), and the population is 95,000 and choosing a confident level of 95%, the sample size is 454 (Epi Info software statistical programme)[7]. Since the expected response rate was high (about 90%), 528 cases were selected from the population registered at Al-Razi HC. The sample was randomly selected on two stages. The companies were chosen according to the number of workers enrolled in their firms; then a sample of their staff were selected randomly according to the percentage of workers registered. A computer generated simple random list from the labourers list was used to ensure obtaining the required sample randomly.

Site of the Study

The selected cases were instructed to attend next day morning. Some of them were called to Al-Razi HC; others were seen at their sites.

Technique and Criteria for Diagnosis

The diagnosis was based on WHO 1999 criteria [8,9], adopted from the American Diabetes Association (ADA) recommendations put by Expert Committee on Diagnosis and Classification of Diabetes Mellitus, 1997[10,11]. Also, the new criteria of WHO suggests that for epidemiological studies of incidence and prevalence, a fasting plasma, whole venous or capillary blood, can be used. The concentration values for the whole capillary blood glucose of $\geq$ 6.1 mmol/L (110 milligrams per deciliter) is considered as diabetes, and a level between $\geq$ 5.6 mmol/L ($\geq$ 100 mg/dL) and $\leq$ 6.1 mmol/L ($\leq$ 110 mg/dL) as Impaired Fasting Glycaemia (IFG) could be used as suggested by WHO for diagnosis of diabetes intolerance. The same criteria and recommendations were, also, adopted by WHO[2,12].

Figure 1. Criteria used for diagnosing diabetes in the epidemiological study based on overnight fasting sample

State of Diabetes	**Whole Capillary Blood Glucose Concentration**
Diabetes Mellitus	$\geq$ 6.1 mmol/L ($\geq$ 110 mg/dL)
Impaired Fasting Glycaemia	$\geq$ 5.6 mmol/L ($\geq$ 100 mg/dL) and $\leq$ 6.1 mmol/L ($\leq$ 110 mg/dL)

Report of a WHO Consultation, Part 1: Diagnosis and Classification of Diabetes Mellitus, WHO/NCD/NCS/99.2: Geneva, World Health Organization. 1999.

The selected subjects were instructed to keep overnight fast and to attend the health center on a given appointment or to gather at their sites. An overnight 12-16 hour fasting whole capillary blood was tested for blood glucose and blood cholesterol. Acutrend GC Reflolux (Boehringer Mannheim) meter was used to estimate the fasting blood glucose levels and cholesterol[8]. Blood pressure was measured using mercury sphygmomanometer.

The latest criterion of WHO (revised criteria by WHO Expert Group in Geneva 1994) for diagnosing hypertension was considered. Hypertension was defined and classified if the systolic blood pressure was $\geq$ over 140 mmHg or the diastolic blood pressure $\geq$ 90 mmHg or the subject was on treatment for hypertension[13].

The weight and height were, also, measured to calculate the body mass index (BMI) as an indicator of the risk factor to diabetes. The Clinical Guidelines on the Identification, and Treatment of Overweight and Obesity in Adults was adopted for the classification of BMI *(a report was released by the National Heart and Blood Institute (NHLBI)).* It is as follows – Underweight <18.5 kg/m^2, Normal weight 18.5 – 24.9 kg/m^2, Over weight 25 – 29.9 kg/m^2, Obesity (Class 1), 30 – 34.9 kg/m^2, Obesity (Class 2) 35 – 39.9 kg/m^2, Extreme obesity (Class 3) $\geq$ 40 kg/m^2.

Age, gender, family history of diabetes in the first and second degree, history of smoking and whether he/she was previously diagnosed as diabetic or not were recorded.

RESULTS

A total of 528 cases were selected with 98.5% (520) completing the study.

The age and gender distribution of the studied cases excluding the defaulters (n=8) because of small number (1 had car accident, 2 could not be reached, 5 were not fasting) are shown in **Table 1**. The ***age*** of the studied cases (n= 520) ranged between 20 and 60 years with a mean age 35.5 $\pm$ 7.34 (SD); for men it was 35.5 $\pm$ 7.4 (SD) and women 35 $\pm$ 6.9 (SD). The defaulters were from the younger age group. The ratio of males to females was 16.9:1 in all studied cases. The prevalence rate of different proportion of diabetes and IFG among different age groups and gender is shown in **Table 2.**

The ***prevalence rates of known diabetes*** (previously diagnosed) was found to be 3.3%, and of unknown diabetes (newly diagnosed) was 7.3% making the total diabetes among all cases as 10.6%. The prevalence rate of impaired fasting glucose (IFG) was 6.3%, making a total abnormal glucose tolerance as 16.9%, of which 71.6% where in the age group of 35-49 **(Table 2).**

A blood cholesterol level of $\geq$ 5.2 mmol/L were found in 47.3% and 33.3% among diabetics and IFG subjects respectively, compared to 25.5% among normal subjects **(Table 3)**.

The frequency of diabetes and IFG among hypertensive subjects was 14.5% and 7% respectively, compared to 7.2% and 5.8% among normotensives. The prevalence of hypertension among the whole studied group was 46.5% **(Table 3).**

Diabetes was found in 28.8% among subjects having positive family history, compared to 8.1% among those with no family history. It was also observed that 58% of the diabetic subjects with positive family history were known diabetics prior to the survey. This indicates that people with positive family history may be more aware of the problem of diabetes **(Table 3)**.

Smoking - 15% of the smoker group had diabetes compared to 9.2% of the non-smoking group. At the same time only 34.5% of the diabetic subjects were smoking, compared to 77.2% of the non-diabetics. This may indicate an increased awareness of the danger of smoking on diabetes **(Table 3)**.

Obesity - Among all the studied cases it was found that 69.4% had a BMI < 25, and 30.6% had a BMI > 25. 18.2% of later overweight group had diabetes, compared to 7.9% of the cases with normal weight. The same observation was also found among cases with IFG. It was also observed that the subjects with weight above normal were twice likely to have IFG compared to the normal weight group (9.4% vs. 5.0%) **(Table 4)**.

DISCUSSION

Although the prevalence rates of diabetes (10.6%) and total glucose intolerance (diabetes and impaired glucose tolerance combined) (16.9%) were high, they did not reach the higher levels mentioned in other studies [14] among migrant Indians and others. This could be due to the fact that the majority of the non-Bahrainis are labourers and are supposed to be healthy and physical fit, because they had been exposed to medical check up and selection before leaving their countries.

The proportion of the previously diagnosed diabetes to the newly detected diabetes was 1:2.2 (30.9% and 69.1% respectively). This result is exceeding what is known in most communities, where about 50% may be previously undiagnosed[15].

Moreover, although all the Non-Bahrainis are under the umbrella of primary care, and comprehensive health services are provided by the Ministry of Health to all of them with easy access to health services, the ratio of unknown cases among non-Bahraini is not quite as high as compared to the Bahraini population[16,17].

The explanation could be that these workers are afraid to disclose their problems, although having diabetes does not deprive anyone from his work rights in Bahrain. This might need to be emphasized in health education and health promotion among the non-Bahrainis.

Age and Gender - The maximum prevalence rate of diabetes was observed among the age group of 35-49. This means that 60.4% of the total diabetic subjects fall among the 86% of the workers age group.

Although the age of the sample was of younger group, this matches with the age distribution of the non-Bahraini population **(Table 5).**

Ethnic variations were found. The prevalence rates of diabetes among workers of Bangladesh and India (11.9%, 10.67% respectively) were similar. This could be due to common ethnic factors in this subcontinent, compared to low among Pakistani workers (7.1%) which could be either due to small number of cases studied or better social status or both. The high prevalence of diabetes among Nepali group could be due to small number of the studied cases **(Table 6)**. Although it was observed that 77.7% of the sample was Indians, it correlates with the actual percentage of the Indian labour force manpower in Bahrain that mainly constitutes the field of construction[4].

It was observed that the peak of diabetics was in the age group 40-45, which gives an indication for periodic blood sugar measurement after age 40.

In this study, diabetes was highly associated with the common risk factors of DM i.e., hypertension, hypercholesterolaemia, obesity and family history of diabetes.

Many people with diabetes also had other risk factors coexisting. It was observed that when more than one risk factor exists, the possibility of having diabetes increases. For example the presence of high blood pressure with positive family history raised the prevalence of DM to 34.5%. This fact becomes even more serious if considering that the presence of several risk factors has a multiplicative and not just an additive effect, and this may increase the possibility of complications.

Hypertension was at least twice as common in people with diabetes as it is in the general population. It is also more frequent in people with impaired glucose tolerance. This necessitates taking positive measures for protecting against end organ damage to reduce the cost of diabetes and improve the economy outcome of the manpower.

The low BMI observed among all the groups could be attributed to the fact that the majority of them were manual workers with low income, and low calorie consumption.

The frequency of hypertension among diabetic patients was found to be high compared to the non-diabetic subjects although both groups are subjected to the stress of work and homesickness.

It was observed that the prevalence of diabetes among the workers in Bahrain was less than that of immigrants from India and other countries as published in some studies[5,14,15]. This could be attributed to the fact that workers in Bahrain are supposed to be fit, being subjected to fitness examination before or just after joining their work.

CONCLUSION

Seventy-one point six percent (71.6%) of the diabetic subjects were aged 35-49, with 16.9% of the total sample had an abnormal glucose tolerance. 91.7% of the diabetic subjects were in the productive age group of 25-54 (96.7% of the total sample). This definitely will affect the outcome.

Many deaths due to complications are potentially preventable in both people with and without diabetes if we can systematically address known risk factors. Since diabetes frequency is relatively high among workers as the study shows, promoting awareness of diabetes among workers and improving the competency of the health care providers, focusing on communication skills are needed in order to build up an efficient team to promote health among the labour force, and prevent, slow or stop complications among the diabetic group, which in turn will reduce the cost of diabetes and improve the outcome at the economy level.

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