Modelling of Risk Factors of Diabetes in United Arab Emirates (UAE)

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Abstract
Objectives: The aim of this study was to model and determine factors influencing the risk of diabetes mellitus (DM) in the United Arab Emirates and to analyze data related to the topic.
Methods: The study was carried out in UAE, using a questionnaire to out-patients in a medical clinic that contained socio-demographic characteristics and risk factors were used for data collection. Sample survey data analyzed using descriptive techniques, correlations, and binary logistic regression models. Binary logistic regression were performed to find the crude and adjusted odds ratio (OR) and 95% confidence interval (CI) was calculated to find the significance of the observed OR. A p-value ≤ 0.05 was considered statistically significant All Analysis was performed using SPSS and Microsoft excels.
Results: study results showed that six main factors influence the risk of diabetes in UAE, which are, blood glucose, blood pressure, physical activity, waist size, gender and family history of diabetes. Marital status, smoking, and intake of fresh vegetables and fruits did not show any statistically significant association with risk of diabetes in UAE. Blood glucose is observed as the most statistically significant factor (for every one unit increase in blood glucose, the study expect a 5.422 increase in the risk of developing diabetes), at the meantime gender observed as the lowest statistically significant factor (if the respondent is male the probability of being diabetic is 0.809 percent) holding all other independent variables constant.
Conclusion: Results of the present study will be one of use in planning primordial, primary and secondary measures of prevention at the community. Encouraging physical activity, controlling blood pressure and blood glucose may significantly decrease the risk of diabetes mortality; effective health education programs promoting regular exercise and effective advices may needed to reduce the burden of diabetes in UAE.

I. INTRODUCTION

Diabetes is a chronic disease that is present when the amount of glucose (sugar) in the blood is too high for the body to use it properly, it can affect anyone at any age and happens when the gland in the body called the pancreas is unable to produce sufficient amount of the hormone known as insulin which allows glucose to enter the body's cells to be used as a fuel for energy (ICLDC). When one has diabetes, one's body either does not make enough insulin or cannot use its own insulin as well as it should. This causes sugar to build up in the blood. No one fully knows what causes diabetes but genetic factor, weight, lifestyle environment and viruses have a part to play (ICLDC). The World Health Organization (WHO) and the International Diabetes Federation (IDF) call diabetes the 21st century's leading healthcare challenge. Diabetes complications and mortality create social and economic challenges that affect individuals, families, businesses, and society as a whole. Six Middle East North Africa (MENA) region countries – Bahrain, Egypt, Kuwait, Oman, Saudi Arabia, and the United Arab Emirates (UAE) – are among the world's 10 highest for prevalence of diabetes and impaired glucose tolerance. By 2020, 32% of the adult UAE population (age 20-79) may have diabetes or pre-diabetes, while other data indicate that the adult UAE population (ages 18 and above) has already reached a diabetes or pre-diabetes rate of 44%. If trends continue, the IDF projects that by 2030, the number of people with diabetes in the Middle East North Africa (MENA) region will almost double, reaching 59.7 million. The main objective of this study is to model the risk factors of diabetes in UAE. We believe this information will guide health education programs for prevention and control of diabetes in UAE.

II. MATERIALS AND METHODS

The study conducted a questionnaire study from August to December 2014 in a medical clinic centre in Al ain district, testing different risk of factors to find the correlations and cross tabulations significances and develop a model for risk factors of diabetes. The research population comprised of outdoor patients visiting a medical clinic centre in Al ain district of UAE. Male and female of nationals and non-national of UAE 18-75 years of age were eligible to participate. Five hundred and twenty four cases were recruited for the study. Cases were randomly selected among out-patients. The questionnaire contained data pertaining to socio-demographic characteristics and various risk factors associated with the occurrence of DM. Collected data were analyzed using SPSS version 20 and Microsoft excels. Frequencies, percentage, mean and standard deviation were calculated and associations between variables were assessed using chi-square test for qualitative variables and the correlations for quantitative variables. In addition to the above statistical tools, binary logistic regression was performed to find crude and adjusted odds ratio (OR). The 95% confidence interval (CI) was calculated to find the significance of observed OR. In all cases, $p \leq 0.05$ was considered statistically significant. The standard high risk of waist size according to World health organization (WHO) is reported as (> 102 cm) for men, and (> 88 cm) for women, for broad mass index BMI the risk is reports as (> 25 kg). Finnish Diabetes assessment from Finnish Diabetes association was followed in the study to decide the status of risk of diabetes or the pre-diabetics for all respondents.

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III. RESULTS

Gender distribution of sample showed that 60.3% of cases are male, and 39.7% are female. Nationalities distribution are; 25.2% UAE nationals, 39.9% Arab, 31.7% Asians and 3.2% for others. Marital status showed that 77.5% are married and 22.5% are single. Educational distribution showed that 5% are illiterate, 6.7% are primary level, 55.7% are primary level, 30.2% are graduates and 2.5% are post graduates. For employment distribution; 69.7% are employed and 30.3% are unemployment. The sample survey showed that 26% are diabetics and 74% are non-diabetics. A statistically significant association was found between cases ($p \leq 0.05$). A statistical significant relationship ($p \leq 0.05$) found between nationalities and respondent's waist size, the highest rate of waist size risk found between Arab (38%) followed by local (34%). A statistical significant relationship found between gender and physical activity ($p \leq 0.05$) with a higher rate in male (62%) and (52%) for female. A statistical significant relationship found also between gender and high risk of waist size ($p \leq 0.05$) with a higher rate in female (51%) and (18%) for male.

The study assigned a group of risk factors related to diabetes in UAE which are; gender, age, marital status, years of education, employment status, weekly working hours, broad mass index (BMI), waist size, intake of fresh vegetables and fruits, blood pressure, blood glucose, physical activity, family history of diabetes and smoking. A significant association was found between risk of having diabetes and BMI, waist size, weekly working hours, years of education and age with ($p \leq 0.05$), and correlation coefficient (r= .477), (r= .525),(r= -.300), (r = -.213) and (r = .543) respectively. The study found that there is no statistical significant association between years of education and weekly working hours, as well as between waist size and weekly working hours. A statistical significant relationship found between diabetes and relative history of diabetes ($p \leq 0.05$). From a total of 135 diabetics, the study found that (71%) have a family history of diabetes where from 389 non-diabetics; the study found that (52%) have a family history of diabetes. A detailed study of the family history of diabetes showed that within diabetics; 63% were first degree relationship, 8.1% were second degree relationship and 28.9% with no history of relationship found, within non-diabetics; 47% were first degree relationship, 5.7% were second degree relationship and 47.3% with no history of relationship found.

A logistic regression model was fitted using level of risk (Diabetes) as dependent with several independent variables i.e. physical activity, marital status, blood pressure, sugar glucose, family history of diabetes, gender, intake of fresh vegetables and fruits, smoking, and waist size to assess the relationship /impact, where the dependent variable is on the logit scale. Results can be seen in **Table 2;** the odds ratio for blood glucose is 226.35 (very high risk), family positive history 25.954, blood pressure 11.9, waist size 5.7; indicating their high impact on outcome. The independent variables which are not significant are marital status, gender, intake of fresh vegetable & fruits and smoking. For every one-unit increase in physical activity the study expects a -1.892 increase in the log-odds of risk of diabetes holding all other independent variables constant. For every one-unit increase in blood pressure (so , for every additional point on the blood pressure) the study expect a 2.474 increase in the log-odds of risk of diabetes holding all other independent variables constant. For every one-unit increase in blood glucose, (so, for every additional point on the blood glucose) the study expects a 5.422 increase in the log-odds of risk of diabetes, holding all other independent variables constant. For every one-unit increase in family history of diabetes, the study expects 3.256 increase in the log-odds of risk of diabetes, holding all other variables constant.

For every one-unit increase in waist size, (so, for every additional point on the waist size) the study expects a 1.731 increase in the log-odds of risk of diabetes, holding all other variables consta

Table 1: Assessment of some diabetes risk of factors

Indicator	N	Mean	Std. Deviation
Age	524	39.21	12.53
Weekly Work Hours	524	38.29	27.69
Patient Weight	524	74.34	16.64
Patient Height	524	1.67	0.086
Patient Waist	524	93.61	13.06
Study duration (years)	524	11.60	4.05
Patient's BMI	524	26.62	5.32

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Table 2: Summarizes categorical demographic variables

Summarizes categorical demographic variables		
Gender	*Frequency*	*Percent*
Females	208	39.7
Males	316	60.3
Nationality		
Local	132	25.2
Expatriate Arab middle east	209	39.9
Expatriate Asia	166	31.7
Others	17	3.2
Marital status		
Single	406	77.5
Married	118	22.5
Education level		
None	26	5
Primary	35	6.7
High school	292	55.7
University	158	30.2
Graduate	13	2.5
Employment status?		
Unemployed	365	69.7
Employed	159	30.3
Waist high Risk		
No waist risk	164	31.3
High waist risk	360	68.7

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Table 3: Logistic regression Coefficient's and Odds ratios

							95% C.I. for EXP(B)	
Risk Factors	**B**	**S.E.**	**Wald**	**df**	**Sig.**	**Exp(B)**	**Lower**	**Upper**
Gender(1)	.009	.242	.001	1	.969	1.009	.629	1.620
Waist	**.039**	.009	17.254	1	**.000**	1.040	1.021	**1.060**
Sport(1)	.360	.238	2.279	1	.131	1.433	.898	2.285
Veg(1)	-.626	.246	6.500	1	**.011**	.535	.330	.865
Blood_pre(1)	**-.935**	.259	13.037	1	**.000**	**.393**	**.236**	**.652**
Rel(1)	**-.970**	.247	15.385	1	**.000**	**.379**	**.233**	**.615**
Smook(1)	-.253	.285	.786	1	.375	.777	.444	1.358
Constant	-3.787	.994	14.528	1	.000	.023		

IV. DISCUSSION

Type 2 diabetes mellitus is one of the most important public health problems in the developed and developing countries. Age, gender, marital status, occupations, education, physical activity, blood pressure, blood sugar, obesity, waist size, family history of diabetes, diet, smoking were investigated in this study. It was observed that those who previously diagnosed by blood glucose had a fivefold chance to get diabetes. The study found that from a total of 389 non-diabetics, 20% are at risk of having diabetes using the Finnish diabetes assessment carried out by Finnish Diabetes Association, this assessment is calculated by having scores for each respondent's answer, total scores of more than 12 points is represents a risk of having diabetes status. This study show that six main factors can construct the frame work of factors that increase the risk of developing diabetes which are physical activity, blood pressure, blood glucose, family history of diabetes, gender and waist size. In a study of T2DM risk factor of diabetes in north Kerala, India, Valliyot et. al found that risk factors of diabetes can be modelled by physical activity, blood pressure, and family history, while gender and religion did not show any statistical significance.

This study found that age is not significantly associated with the risk of having diabetes. Valliyot et. al. found that age factor is a highly associated with risk factor of diabetes and had fivefold chance to get diabetes. In the present study, gender was found to be a statistically significant risk factor but Valliyot et. al. found that gender is not a significant risk factor. This study results showed that physical activity is a protective factor for the development of DM, the same result found by Valliyot et. al. Accmoglue et. al. report that physical activity alone is not a factor, but leisure time activity is also as important in the development of T2DM.

This study shows that physical activity is statistically significant to the risk of having diabetes, Kokiware et. al. also found that diabetes among hard working group to be lower as compared with sedentary. Grill and Cooper also support the fact that physical activity has a protective role in the development of T2DM. Rimm et.al showed that tobacco use may increase the risk of developing diabetes and the relative risk for men was 1.94-fold. The finding of the present study indicates that smoking is not significantly related to the risk of developing diabetes. The finding of this study is very important in planning preventive strategy and will help identify the potential candidates who have a high chance to develop diabetes.

The risk of T2DM has regional and ethnic variations. The results of the present study suggested a positive relationship of physical activity, blood sugar, blood sugar, family history, and waist size with the incidence of diabetes, however, with no BMI, marital status, diet, and smoking significance in the development of DM. Those who do regular physical activity have a less chance to develop diabetes than those with sedentary habits. This also proves the protective effect of physical activity in the prevention of T2DM. Those with a family history of diabetes have three times greater chance to get

V. CONCLUSION

T2DM compared to those without it. Dietary factors were not found to be a statistically significant risk factor in the development of T2DM. Blood pressure and blood glucose are significant risk factors in the development of T2DM. Many factors like obesity, smoking, marital status, diet which are considered more important in the western and urban studies, were not found to be significant in this rural area, whereas strong genetic factors, over waist size, less physical activity blood pressure and blood glucose emerged as strong risk factors.

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