Risk Factors of Diabetes Mellitus Type 2

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Abstract: **Background: DM is a metabolic disorder that threatens life. It occurs when there is insulin resistance or impaired insulin secretion.**

Aim: To study the association between DM type 2 and risk factors as obesity, physical activity, family history, diet, job stress smoking and age.

Methods: A case control study was conducted in Al Mubarak hospital. 28 cases and 42 controls was interviewed. Data were collected by administering a questionnaire, which was analyzed using SPSS.

Results: The results showed that 53.6% of cases were 50 years old or above compared to 83.3% of controls, which was statistically significant. In the gender, 57% of the cases were male while they were 86% of controls. In gender, was statistically significant. More females 86% were affected in comparison to males 57%, sibling was carried 50% of cases and 16.7% of controls there were a significant difference in family history between cases and control. Physical activity was showing a statistical difference between cases and controls were cases are living a sedentary life 78.5%.

Conclusion: A considerable of DM type 2 was detected among people in Al Mubarak hospital. Age, gender, family history, and physical activity showed statistically significant difference between diabetes and non-diabetic personnel.

Keywords: **Diabetes Mellitus.**

1. INTRODUCTION

Type 2 diabetes mellitus (DM) is defined as a chronic metabolic disease, characterized by a disorder in the metabolism of carbohydrates, lipids and amino acids, either as a result of decreased insulin secretion, or due to a reduction to insulin sensitivity of the body cells. It is diagnosed when the fasting blood glucose level > 126 ml/dl. Diabetes mellitus is a disease that has acquired epidemic form, as its prevalence has increased to fivefold during the last fifteen years; it constitutes one of the major threats to human health in 21st century. Long standing DM increases risk of cardiovascular diseases (such as hypertension, coronary artery disease, etc.), nephropathy, peripheral neuropathy, retinopathy, and foot ulcer. DM is the eighth leading cause of death worldwide. In 2011-it resulted in 1.4 million deaths and the number is increasing. The advantages of studying the risk factors associated with it, is to increase awareness and alert people of the risk factors in order to decrease the number of new cases of type 2 DM. The aims of this research is to study the association between diabetes mellitus type 2 and risk factors such as age, obesity , decreased physical activity , family history , diet , job stress , and smoking.

2. REVIEW OF LITERATURE

A case control study was conducted in KSA in 2009 to test the hypothesis that dietary practices and physical activity modify the risk of type 2 diabetes regardless of family history. The sample included 283 cases (T2DM patients) and 215 non-diabetic controls. There are strong association between diabetes and maternal history of diabetes, education, lack of exercise, and dietary habits. They concluded that healthy diet and active lifestyle might significantly decrease the risk of T2DM in spite of having a family history of diabetes.

A community-based national epidemiological health survey study in KSA in 2004 conducted by examining Saudi subjects were analysed to classify individuals as diabetic, impaired fasting glucose and normal to provide prevalence of DM. 17232 Saudi subjects were selected in the study, and 16917 participated. Four thousand and four subjects, out of 16917 were diagnosed to have DM. The study recommends a longitudinal study to demonstrate the importance of modifying risk factors for the development of DM and reducing its prevalence in KSA.

Another research done in Canada during the period from (1966 to 2007), the sample were patients with risk of impaired fasting glucose, impaired glucose tolerance, or type 2 diabetes in relationship to smoking status at baseline. The aim was to prove the association between heavy smoking and type 2 diabetes mellitus. They found that the risk of diabetes was greater for heavy smokers. Active smoking has a great association with an increased risk of type 2 diabetes.

Another study performed in England during the period from (1980 to 1996), which examined individual dietary and lifestyle factors in relation to type 2 diabetes. They followed up 84,941 female nurses not known to be diabetic, and discovered 3300 new cases of type 2 diabetes. Obesity was the single most important predictor of diabetes. The majority of cases of type 2 diabetes could be prevented by the adoption of a healthier lifestyle.

A study was done in USA in 2001 to estimate the prevalence of obesity and diabetes among adults. The prevalence of obesity increased in 2001 to 7.9%, accordingly, the prevalence of diabetes also increased to 20.9%. Obesity was significantly associated with diabetes.

Another study was performed in USA in 2006, where they randomly assigned 3234 non-diabetic individuals with elevated fasting and post prandial glucose, to metformin or a lifestyle modification program. The results were that the lifestyle intervention reduced the incidence of DM by 58 % and metformin by 31 %. Therefore, lifestyle modification reduces the incidence of diabetes more than metformin.

In a study conducted in Germany between 1984 and 1995 aiming to study the association between cigarette smoking and developing diabetes mellitus There was no significant increase risk of diabetes for regular smokers, ex-smokers- and occasional smokers and the incidence of the disease was not significantly associated with smoking in women. They concluded that the association between type 2 DM and smoking is very low.

A cohort study was done in Sweden in 2008 about diabetes mellitus named (Clinical Risk Factors, DNA Variants, and the Development of Type 2 Diabetes). They examined whether clinical or genetic factors or both could predict progression to diabetes in two prospective cohorts. They also studied the effect of genetic variants on changes in insulin secretion and action over time. The discriminative power of genetic risk factors improved with an increasing duration of follow-up, whereas that of clinical risk factors decreased.

A study was performed in Japan between 1990 and 1993 testing the association between calcium and vit. D intake and diabetes mellitus type II. The study showed statistically significant inverse association between dietary calcium intake and the risk of type 2 diabetes in women while there was no association between calcium intake and the risk of diabetes in men. Vitamin D intake alone was not appreciably associated with the risk of type 2 diabetes either in men or in women. Overall, calcium and vitamin D intake were not associated with a significantly lower risk of type 2 diabetes.

A study was conducted in USA in 1992 studying the relationship of physical Activity vs. body mass index with type 2 diabetes in women. Participants were from the women's health study (WHS), prospective cohort study of 37878 women free of cardiovascular disease, cancer, and diabetes with 6.9 years of mean follow-up .The aim was to examine the relative contributions and joint association of physical activity and BMI with diabetes. Although BMI and physical inactivity are independent predictors of incident diabetes, the magnitude of the association with BMI was greater than with physical activity in combined analyses. These findings underscore the critical importance of adiposity as a determinant of diabetes.

A study was conducted in Nigeria in 2009. A control group (without a history of DM) matched for age (±2 years); sex and educational status were recruited from the staff of three local government areas. The aim was to determine the prevalence of depression and identify its socio- demographic or clinical correlates among patients with diabetes mellitus attending an outpatient clinic in Nigeria, they found Depression is associated with diabetes mellitus and affects treatment goals negatively. Finally, they found that the depression is highly co-morbid with diabetes mellitus.

In USA, in 2012. A study was conducted about lifestyle changes and mobility in obese adults with type 2 diabetes. It includes 5145 participants. They found that an intensive lifestyle intervention that produces weight loss and improves

fitness could slow down the loss of mobility in such patients. They concluded that weight loss and improved fitness slowed the decline in mobility in overweight adults with type 2 diabetes.

A study was published in the New England Journal of Medicine, in 1996. A low-risk group was defined according to a combination of five variables: a body mass index of less than 25; a diet high in cereal fiber and polyunsaturated fat and low in trans-fat and glycemic load. They found that during 16 years of follow-up, they documented 3300 new cases of type 2 diabetes. Overweight or obesity was the single most important predictor of diabetes. Lack of exercise, a poor diet, current smoking, were all associated with a significantly increased risk of diabetes, even after adjustment for the body-mass index. Finally, there findings support the hypothesis that the majority of cases of type 2 diabetes could be prevented by the adoption of a healthier lifestyle.

Another study was conducted in USA between 1980 to 1996.This study was about diet, lifestyle, and the risk of type 2 diabetes mellitus in women. It includes 84,941 participants .They found that overweight or obesity was the single most important predictor of diabetes. Lack of exercise, poor diet and current smoking, were all associated with a significantly increased risk of diabetes. They concluded that type 2 diabetes could be prevented by weight loss, regular exercise, modification of diet, abstinence from smoking.

A study was conducted in the USA on a search of MEDLINE (1966 to May 2007) and EMBASE (1980 to May 2007) databases was supplemented by manual searches of bibliographies of key Retrieved articles, reviews of abstracts from scientific meetings, and contact with experts. The Objective was to conduct a systematic review with meta-analysis of studies assessing the association between active smoking and incidence of type 2 diabetes. They reported 45 844-incident cases of diabetes during the study follow-up period ranging from 5 to 30 years. The study concluded that active smoking is associated with an increased risk of type 2 diabetes. Future research should attempt to establish whether this association is causal and to clarify its mechanisms.

A cluster-design study was done in USA in 2010 about the diabetes mellitus named (A School-Based Intervention for Diabetes Risk Reduction), they examined the effects of a multicomponent, school-based program addressing risk factors for diabetes among children whose race or ethnic group and socioeconomic status placed them at high risk for obesity and type 2 diabetes. Finally, the proportions were nearly equivalent in the intervention and control schools.

3.   METHODOLOGY

Study design: Case control study

Study area: Riyadh, AL-Mubarak hospital, King Faisal Street, outpatient department.

Definition of case: A case is a diabetes mellitus patient diagnosed and followed up in Al Mubarak hospital as indicated in patient file for at least 6 months.

Definition of control: A Control is a patient not suffering from diabetes mellitus and hypertension in the same hospital.

BMI, which is a measure of relative weight, based on an individual's height and weight, (specifically weight/ (height) ^{2}.

Time of study: from 19/01/2014   to   05/06/2014

Sample: convenient sampling method was used so that the first 28 patients who satisfied `` case `` criteria were taken as cases. The other 42 who satisfied control criteria were taken as controls.

Tool: questionnaire.

Method of data collection: the data was gathered by interview using a specially designed, questionnaire, which include close end questions. It covered personal information and risk factors associated with diabetes mellitus.

Data analysis: after data collection and excluding unclear and incomplete questionnaire, coding, entry was done, and then analysis using SPSS.

4.   RESULTS

At the end of the assigned data collection period, 28 cases and 42 controls were interviewed. Of the cases 53.6% were $\geq$ 50 years old compared to 60% of controls. The difference in age distribution between cases and controls was statistically significant (P=0.0026) (Table 1).In the gender distribution 57% of the cases were male, while they were 86% of controls. The difference in gender distribution was statistically significant (P=0.0074) (Table 2). The BMI distribution between cases and controls shows 57.1% of the cases and 36% of the controls were obese. In addition, it showed that 21.4% of

cases and 42% of controls are over-weight. There is no significant difference between cases and controls (Table 3). It has found 64.2% of the cases have affected mothers and 30.95% of the controls. The difference in family history distribution between cases and controls in mother was statistically significant (p=0.0059). The sibling was carried 50% of cases and 16.7% of controls. The difference in family history distribution between cases and controls in sibling was statistically significant (p=0.0029).There is no statistical significance in the affected fathers (Table 4). According to meals, those who take ≥ 3 meals were 64% of cases and 52% of controls. There is no significant difference regarding the number and meals per day (Table 5). In type of diet, those who take deserts, fruits and salad were 39%, 37% and 21% in cases, and 31%, 45% and 43% in controls respectively. This variation did not reach statistical significance (Table 6). According to the study of physical activities, it was compared between the cases and controls and it was found that, 78.5% of cases are living a sedentary life. In controls those with sedentary lifestyle, were 40.5%. This difference was statistically significant (P=0.0017) (Table 7). According to smoking distribution there were 57.14 % of cases were non-smoker and 69% of controls were non-smoker. The different in smoking distributions between cases controls was not statistically significant (Table 8). The job stress was divided into four groups' .Those that work more than 8 hours and take less than two days per week were 20% control and 20% case. Job stressed was not statistically different between case and control (Table 9).

Table 1: age distribution of case type 2 diabetes mellitus of the case and control.

Age	Case	Control	Total
< 30	1	14	15
30 - 39	6	7	13
40 - 49	6	14	20
50 - 59	9	4	13
≥ 60	6	3	9
Total	28	42	70

(P=0.0026)

Table 2: gender distribution of case type 2 diabetes mellitus of the case and control.

Gender	Case	Control	Total
Male	16	36	52
Female	12	6	18
Total	28	42	70

(P=0.0074)

Table 3: BMI distribution of case type 2 diabetes mellitus of the case and control.

BMI	Case	Control	Total
Underweight	0	2	2
Normal	6	8	16
Overweight	6	18	24
Obese	16	15	31
Total	28	42	70

Table 4: family history distribution of case type 2 diabetes mellitus of the case and control.

Family history	Case	Control	Total
Father	15	14	29
Mother	18	13	31
Siblings	14	7	21
Total	47	34	81

(p=0.0029)

Table 5: meals distribution of case type 2 diabetes mellitus of the case and control.

Meals	Case	Control	Total
<3	10	20	30
3	13	21	34
>3	5	1	6
Total	28	42	70

Table 6: diet distribution of case type 2 diabetes mellitus of the case and control.

Diet	Case	Control	Total
Fast food	4	8	12
Soft drink	4	6	10
Dessert	11	13	24
Fruits	11	19	30
Salad	6	18	24
Total	36	64	100

Table 7: physical activity distribution of case type 2 diabetes mellitus of the case and control.

Exercise	Case	Control	Total
Active	6	25	31
Not active	22	17	39
Total	28	42	70

(P=0.0017)

Table 8: smoking distribution of case type 2 diabetes mellitus of the case and control.

Smoking	Case	Control	Total
Smoker	6	9	15
Passive smoker	2	2	4
Occasional smoker	0	1	1
Ex-smoker	1	1	2
Non-smoker	16	29	45
Total	26	41	67

Table 9: job stress distribution of case type 2 diabetes mellitus of the case and control.

Job stress		Case	Control	Total
<8	<2	3	3	6
<8	2	6	9	15
≥8	<2	4	7	11
≥8	2	7	16	23
total		20	35	55

5. DISCUSSION

The data obtained from this study based on questionnaire collection. The cases being older than controls was expected because DM type 2 is a chronic disease that progress for a long time, and several studies showed that there is a strong association between type 2 diabetes and age where it is more common among older age. The female cases being more than the control was not expected. It might be due to the difference in the life style between male and female. This study provides insight into the risk factors of diabetes type 2. Obesity is one of the risk factors of diabetes type 2.The body mass index (BMI) which is measure of relative weight based on an individual's height and weight. Studies found that BMI is the best proxy for body fat percentage among ratios of weight and height. Our study showed that most of the cases were obese. Obesity was a strong risk factor for future diabetes. A similar study was done in Sweden in 2008 showed the same result about the obesity. The cases being more related to affected mothers than the controls but no statistical significance with the affected fathers, while siblings show an association. However, studies was successful in identifying the specific

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dietary patterns that are responsible for increasing the incidence of type 2 diabetes in KSA, findings show that these food items are the most important determinants of T2DM among study population. There is no significant difference regarding the number and meals per day. In general it was found that the type of diet in cases is better compared to controls, so it supposes that the cases obviously have more awareness in what type of food they eat than controls, maybe because that the cases need to control their sugar level in blood, other opinion is that the cases maybe more aware of the relation between their health and type of food. It was found that the majority of cases are not physically active, and in relation to the controls in our study it was found that the majority of controls are physically active. Physical activity decreases the risk of having diabetes mellitus type 2 . Regarding smoking whether being smokers and non-smokers as the study shows that the control and the cases had the same findings. The study shows there is no relation between smoking and diabetes.The job stressed group were divided into 4 different categories from the least stressed group to the most stressed .The difference were not significant between the case and control as it shows similar properties.

6. CONCLUSION

A considerable type 2 diabetes mellitus were detected among people in Al Mubarak hospital. Age, gender, family history, and physical activity showed statistically significant difference between diabetes and non-diabetic personnel. Cases 53.6% were $\geq$ 50 years old compared to 60% of controls. The difference in age distribution between cases and controls was statistically significant (P=0.0026)).In the gender distribution 57% of the cases were male, while they were 86% of controls. The difference in gender distribution was statistically significant (P=0.0074). It has found 64.2% of the cases have affected mothers and 30.95% of the controls. The difference in family history distribution between cases and controls in mother was statistically significant (p=0.0059). The sibling was carried 50% of cases and 16.7% of controls. The difference in family history distribution between cases and controls in sibling was statistically significant (p=0.0029). According to the study of physical activities, it were compared between the cases and controls and it were found that, 78.5% of cases are living a sedentary life. In controls those with sedentary lifestyle, were 40.5%. This difference was statistically significant (P value = 0.0017).

RECOMMENDATION

Increasing awareness about the advantages of physical activity among people in Kingdom of Saudi Arabia is an urgent need. Use of the media and health education sessions in schools, workplaces are possible approaches.

Further researches are needed to study the diabetes mellitus and the risk factors associated with it is necessary for prevention.

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