Original Article

An investigation into the prevalence of diabetes in the Northwest of Iran: The case study of Maragheh City

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Abstract

Background: Diabetes is a type of metabolic diseases whose common characteristic is the increase in blood sugar. The prevalence of diabetes worldwide has progressively reached epidemic proportions. Its complications are microvascular and macrovascular complications, gastrointestinal and genitourinary disorders, infection and glaucoma. This study was designed to examine the incidence of diabetes in case of gender and age differences, and to investigate its complications .to better understand related etiology. **Materials and Methods:** This research was a cross-sectional study undertaken on 380 diabetic patients referred to Amir-al-Momenin Hospital in Maragheh. The data were collected using patient records and analysed using SPSS software. The frequency and frequency percent of the qualitative data and the mean of the quantitative data were reported. **Results:** The analysis suggested that among 380 diabetic patients, 248 were female and 132 were male, and 95.3% of those surveyed were married. The mean age of the patients under investigation was 57.66. 303 patients (79.7%) of the participants had a history of drug use, and the drugs are mainly cardiovascular drugs (35.8%), metformin (33.9%), and glibenclamide (28.2%). Over 50% of the participants had a history of illness, particularly cardiovascular disease (48.2%), while the least number of the participant had seizures. The highest and lowest number of patients had the blood sugar range of 424-325 (84 patients, 22.1%) and the blood sugar range of 622-523 (17 patients, 4.5%) , respectively. Moreover, the largest number of subjects (65 patients, 17.1%) had the blood cholesterol in the range of 325-271. About 75 participants had too much LDL. Besides, no statistically significant relationship was found between diabetes and white blood cells . 172 subjects developed complications. 70 patients, 68 patients, 55 patients, 51 patients, 14 patients, 13 patients, and 5 patients had renal, gastrointestinal, cutaneous, respiratory, cardiovascular, ocular complications, and amputations, respectively. About 110 subjects had various habits such as special diet (n = 44), smoking (n = 39), addiction (n=26) and drinking (n=3). Among 11 subjects of gestational diabetes mellitus (GDM), most had a high body mass index (BMI), the protein in the urine of about 18 percent of the subjects was positive, and regarding glucose disposal in the urine, 53 subjects were +, 64 subjects were +, 42 subjects were +++, 1 subject was ++++. Seventy participants had ketone disposal, which indicates kidney disorder. **Conclusion:** The results revealed a higher prevalence of disease among middle-aged and older people in the society. The mean of B.M.I is 27.28 showing overweight in our population. The results also indicated a higher prevalence of hyperglycemia compared to hypoglycemia that may be due to very close relationship between diabetes and cardiovascular disorders, high levels of blood sugar in most of the diabetic patients. In addition, in a large number of fat people or people with hyperlipidemia were diabetic. In order to decrease mortality, and to diminish direct and indirect costs of diabetes, it is required to take essential measures. Such measures can include effective approaches to inform people for importance of nutrition education programs in controlling blood sugar and fat in diabetic patients via mass media and different programs.

Keywords: diabetes, prevalence, diabetes complications, SPSS.

Introduction

Diabetes Mellitus is a kind of metabolic diseases whose common feature is hyperglycemia [1]. Two main types of diabetes are type 1 and type 2. Type 1 diabetes occurs due to an autoimmune destruction of pancreatic beta cells. Type 2 diabetes develops owing to the variable degrees of insulin resistance, the impairement of insulin secretion, or the increase in glucose production [2]. The prevalence of diabetes becomes epidemic worldwide, and the increase in obesity and the popularity of sedentary lifestyle are among the main reasons [3]. Compare to normal people, diabetic patients are more at risk to develop micro-vascular diseases including ocular diseases such as blindness, macular edema, and motor and sensory neuropathy, and macrovascular diseases such as coronary artery, peripheral vascular, and cerebrovascular diseases, as well as gastrointestinal and genitourinary disorders, cutaneous problems, glaucoma, and infection [4]. In the United States, the main cause of ESRD (end-stage renal disease), non-traumatic lower limb amputation, and blindness is diabetes mellitus [2]. Researches indicate that the global prevelnce of diabetes in the last two decades increased from 30 million in 1985 to 177 million in 2000, and it is predcited that this will reach 320 million in the age range of 45-64 in 2030 [2]. Due to its rapid prevalence, many studies have been undertaken on this disease. In a study conducted by M. Afkhami [5], it was stated that in addition to environmental factors, genetic inheritance also exerted an influence on the development of diabetes, and there is greater likelihood to take the inheritance from the mother's side. In their study, H. Ghavami and collegues [6] conclude that obesity and excess fat in the upper body, a family history of diabetes, and generally increase in body mass index (BMI) can be some factors leading to diabetes; therefore, it is essential to use successful models effective in controlling excess weight and fat mass gain in order to prevent this disease. The pervasivness of specific weight control methods, disorders in eating behaviour, BMI, family functions, metabolic control, among the male and female adolescnces with type 1 diabetes suggested that 37% of the females and 15% of the males

followed unhealthy weight control behaviour methods[7]. Besides, drawing specific attention to those adolesnces who did not have a coherent family would help develop healthy behaviours of diabetetes management.

It is declared [8] that secondary hyperparathyroidism have rapid progression in chronic kidney diseases. In fact, this is regarded as a type of decrease in kidney function. the effect of diabetes on the Parathyroid function in 60 Hemodialysis patients was investigated and the results showed that in the serum of diabetics, parathormone and alkaline phosphatase were significantly lower than those in the serum of non-diabetic hemodialysis patients[8] .Moreover, the low parathyroid activity in the diabetic patients undergoing dialysis may be the reason of the prevalence of bone disease in old diabetic hemodialysis patients. However, further study on bone diseases in this group of patients is needed in order to explore its effect on the results and different therapeutic interventions. In another article, the relationship between blood groups of ABO / Rhesus and diabetes among the Turkish population was investigated. The cross-sectional group of the study included 421 patients with type 1 diabetes, 484 patients with type 2 diabetes, and 432 subjects in the control group.In case of blood analysis, results a significant relationship between the blood groups and diabetes mellitus group was found; in other words, the frequency of the blood group AB was greater in the patients with Type 1 diabetes, the frequency of the blood group A was greater in the patients with type 2 diabetes, and negative Rh was mostly found in type 2 diabetic patients [9]. The aim of this study was to evaluate the incidence of diabetes in terms of gender and age differences, and to examine the complications of this disease for finding treatment, providing proper diet, and taking necessary measures.

Methods

In this study which was undertaken in AmiralMomenin Hospital in Maragheh, the medical records of 30 diabetic patients within one year was investigated and the variables related to these records were extracted. The relevant variables are as follows: first name, last name, gender, age, marital status,

address, type of admission, insurance type, any history of drug use, discharge status, BMI, any history of illness, early diagnosis, urine color, urine pH, blood in urine, ketone in urine, protein in urine, glucose in urine, blood sugar, blood cholesterol, LDL, creatinine, sodium, potassium, hematocrit, hemoglobin, MCV, MCH, MCHC, platelets, WBC, diabetic complications, habits, amputation. After being collected, the data and its variables were processed, and then analysed via SPSS software, and the results are provided in the next section.

Results

For data analysis, the statistical approaches were utilized. The purpose of descriptive statistics is to display and summarize data, and in this way, the attention would be drawn to important features of the data and unnecessary details would be ignored. The basic phase of data description includes summarizing, describing the overall pattern, and estimating statistical measures. The description of the overall pattern of the data in tables and graphs is displayed based on the types of variables. For the calculation of statistical measures, the measures of dispersion and central tendency are used. Studies by Shahshahani and colleagues indicated that the prevalence of diabetes would be increasing over the next 15 years; besides, based on the obtained statistics on the epidemiology of diabetes in this article, the percent of the prevalence of high blood sugar in the world is 10.35%. The highest and the lowest percent of the diabetes prevalence are in the Eastern Mediterranean region (12.34%) and the South East Asian region (8.5%), respectively. The percent of diabetes prevalence is 10.5% for women and 9.3% for men in Iran. The diabetes prevalence and impaired glucose tolerance are greater in women, while impaired fasting glucose is greater in men [10]. In the current study, 380 medical records were selected from Maragheh Amiralmomenin Ali (AS) Hospital. Among these 380 diabetic patients, 248 were women and 132 were men, which shows the greater prevalence of diabetes among women than among men. 95.3% of people under study were married, which can be related to the greater prevalence of type 2 diabetes compared to that of type 1 diabetes since the age mean of developing type 2 diabetes was mostly around their marriage age. The age range of most people (about 262 people) in this study were 73-43 (Table 1).As shown in Table 2, 303 patients (79.7%) of the subjects had a history of drug use, mainly included cardiovascular drugs (35.8%), metformin (33.9%), glibenclamide (28.2%) because the use of insulin among diabetics in Iran have not been popular yet, and they mainly took oral drugs used for lowering blood sugar such as metformin and glibenclamide, while in their paper, M.E. Khamseh and colleagues [11] investigated the effectiveness of insulin therapy in diabetics and the reduction of the side effects of using insulin instead of oral drugs used to lower blood sugar. They reported a positive relationship. It should be noted that in several cases, no information was provided regarding the history of drug use.

Table1: The frequency distribution of diabetics in terms of gender, age, and marital status

Variables		Frequency	Percent
Gender	Female	248	65/3 %
	Male	132	34/7 %
Age range	43>	62	16/4 %
	53-43	66	17/4 %
	63-53	100	26/3%
	73-63	96	25/3 %
	72<	56	14/7 %
Marital status	Married	362	95/3 %
	Single	18	4/7 %

Table2: Frequency distribution of different variables in the incidence of diabetes

Variable		Frequency	percent
Any history of drug use	Cardiovascular	136	35.8%
	Insulin	73	19.2%
	Glibenclamide	107	28.2%
	Aspirin	44	11.6%
	Metformin	129	33.9%
	Specific drug	88	23.2%
	No history	27	7.1%
Any history of Illness	Cardiovascular	183	48.2%
	Respiratory	18	4.7%
	seizure	8	2.1%
	Other diseases	68	17.9%
	No history	78	20.5%
Blood sugar	28-127	0	0%
	127-226	22	5.8%
	226-325	31	8.2%
	325-424	84	22.1%
	424-523	57	15%
	523-622	17	4.5%
	622-721	40	10.5%
	721-820	31	8.2%
	820-919	35	9.2%
blood cholesterol	109-163	54	14.2%
	271-325	65	17.1%
Blood L.D.L	13-19	1	0.3%
	39-65	6	1.6%
	65-91	24	6.3%
	91-117	36	9.5%
	117-143	16	4.2%
	143-169	13	3.4%
	169-195	23	6.1%
	195-221	22	5.8%
	221-247	17	4.5%
W.B.C	1200-9067	368	96.8%
	9067-16943	1	0.3%
platelets	59623-114046	3	0.8%
	168469-222892	107	28.2%
	222892-277315	87	22.9%
complications	Cardiovascular	14	3.7%
	Renal	70	18.4%
	Respiratory	51	13.4%
	Gastrointestinal	68	17.9%
	Cutaneous	55	14.5%
	Ocular	13	3.4%
	Nasal	0	0
	Amputation	5	1.3%
	No complication	148	38.9%
habits	Smoking	39	10.3%
	Alcoholic	3	0.8%
	Addicted	26	6.8%
	Special diet	44	11.6%
	No habit	180	47.4%

Most Patients (99.7% of patients) referred to the hospital for hospitalization were admitted as it was impossible to provide outpatient treatment for diabetes-related complications, the patients were required hospitalization, and even sometimes the treatment took several weeks. Among all patient insurance types, the most used types were Social Security Insurance, rural Insurance and armed forces Insurance. Their discharge status was mainly reported as improvement (44.1%) and relative improvement (25.5%), since a majority of patients referred to the hospital had hypoglycemia, and after a decrease in their blood sugar with the help of the medical staff, their discharge status was considered as improvement in their records. Of course, some demises were also reported, but the number of them was very few, because via early diagnosis of diabetes complications and quick action for its treatment, it is possible to prevent patients' death caused by the complications of diabetes.

Over 50% of the patients had a history of illness, especially a history of cardiovascular diseases (48.2%), while seizures had the lowest number of patients, and probably this was because of the close relationship between cardiovascular diseases and diabetes. This finding was algined with Elkeles and colleagues' study which examined the cardiovascular complications as the leading cause of premature death in diabettic patients [12]. The blood glucose range of 424-325 with 84 subjects (22.1%) and the blood glucose range of 622-523 with 17 patients (4.5%) included the highest and lowest number of the patients, respectively. If random blood sugar level is more than 200 mg per dL, the person is regarded as diabetic. Of course, other factors such as fasting blood sugar and A1C hemoglobin, etc. are also used to diagnose diabetes [13]. So, the number of people with very high blood sugar was high, and given that the higher blood sugar levels, the worse the complications of diabetes, essential measures should be taken to alert people. Based on the data obtained, it can be stated that the largest number of subjects (65 patients) had blood cholesterol in the range of 325-271 (17.1%), while the normal blood cholesterol range is 70-200.

Based on the undertaken investigation and given that the normal amount of L.D.L as harmful blood fat is 0-150, about 75 subjects had L.D.L more than the normal range; of course, there was missing data as well. In their study [14], Karamaty and colleagues declared that impaired lipid metabolism due to inadequate control of blood sugar increase in diabetic patients played a role in the development of cardiovascular complications. Besides, for preventing vascular complications, glycemic control is more important than the treatment of dyslipidemia in diabetic patients. Compared to the people without diabetes, diabetics often have an atherogenic lipid profile (increased triglycerides, decreased HDL as useful blood fat, and subsequent increase in LDL as harmful blood fat), which enhances the risk of cardiovascular diseases to a considerable degree. The platelets of 51.1% of the subjects (the maximum number of the patients) were between 277315-168469, while the normal range of platelets is 150000-400000. The normal range of W.B.C in adults is 5000-10000 m3. W.B.C of 96.8% of the patenits were between 9067-1200; therefore, no significant relationship between diabetes and white blood cells which guarantees the immunity of the body was found. 172 patients suffered from complications, including 70 patients from renal complications, 68 from gastrointestinal complications, 55 from cutaneous complications, 51 from respiratory complications, 14 from cardiovascular complications, 13 from ocular complications, and 5 from amputations each year. Due to the danger of renal complications, the prevalence of this complication among 70 patients was controversial, and the relevant factors should be studied in greater depth. Given that cardiovascular complications is the leading cause of premature death in diabetic patients and the percent of patients suffering from cardiovascular complications in Iran is 27.7%, the number of subjects suffered from this complication in this study, compared to the national statistics reported, was very low, which can be promising, However, each year, 5 patients have done amputation, which, compared to the 7.9% national statistics, can be worrying since amputation is costly both for the patient and the society economically, and has irreparable emotional and psychological consequences, especially for the patient. Proper

education of the patients is highly recommended in order to prevent amputation or to treat the disease early [15, 16].It is worth noting that no nasal complication was observed in the patients, which revealed that there was no relationship between diabetes and complications related to nose. Regarding habits, there was missing data for about 100 patients, and about 110 patients have different habits such as special diet (n = 44), smoking (n = 39), addiction (n=26), and drinking (n=3). Dietary habits mostly related to DD (diabetic diet), which was the positive aspect of the habits of diabetic patients, but 68 patients had improper habits such as smoking, drinking, drug addiction, etc., indicating the existence of a relationship between these habits and diabetes. This finding is consistent with the results of Shojaeizadeh and colleagues' study [17]. Among 11 patients with gestational diabetes milllius (GDM), most of them had a high body mass index (BMI). Based on Afghamy Ardakani and his colleagues' study, diagnosing GDM during pregnancy is essential for the health of mother and fetus. Research has shown that the extreme complications due to GDM occur as a result of hyperglycemia. Glucose intolerance with changeable degrees that commenced or is diagnosed for the first time during pregnancy is called gestational diabetes [18]. Normally, protein in urine should be negative, the presence of protein in urine is an indication of a disease or renal failure. In this study, the results of urine protein testing for 150 patients (39.5%) was negative, for 44 patients +, for 20 patients ++, for 6 patients +++, for 1 patient ++++; in other words, about 18% of patients had positive results for urine protein testing, which provides evidence for their kidney disorder. Moreover, like protein, the presence of glucose in urine indicates a problem in kidneys because of their glucose disposal. Based on the information of 380 patients of this study, the results of 61 patients were negative, those of 53 patients were +, those of 64 patients were +, those of 42 patients were +++, that of 1 patient was ++++. Normally, ketone disposal should not occur in kidneys, and the results indicated that 203 patients did not have ketone disposal, while 17 patients (a few number) had ketone disposal.

Table3: Statistical measures

Variable	Mean
age	57.66
B.M.I	27.28
PH urine	5.28
Blood in the urine	51.2
Blood sugar	283.08
blood cholesterol	168.12
Blood L.D.L	97.83
Creatinine	1.42
Blood Sodium	140.75
Blood potassium	4.47
Hematocrit	39.26
hemoglobin	13.19
M.C.V	84.55
M.C.H	28.48
M.C.H.C	33.02
Platelets	240718.28

Discussion

The mean age of the patients under study was 57.66, indicating a higher prevalence of the disease among middle-aged and older people, which is promising, compared to the decrease in the age onset of diabetes to less than 20 years old in the country. The mean of BMI was 27.28. Compared to the BMI classification which regards the range of 25-30 as overweight, this value is dangerous and controversial, because despite the fact that diabetes and obesity affect each other and body fat is higher in subjects with diabetes than people without diabetes, [19], having both diabetes and obesity has irreparable consequences; consequently, modifications in their lifestyle are required. The normal amount of urine PH is 8-6.4 and the PH average of the patients was 5.28, which indicates that PH decreases in people with diabetes and urine becomes acidic. Diabetes occur in two forms, namely, hypoglycemia and hyperglycemia. The mean of blood sugar in these people was 283.08, indicating the higher prevalence of hyperglycemia compared to hypoglycemia. Considering the fact that diabetes is the most common diseases in the world and Iran, in order to reduce mortality caused by diabetes as well as the direct and indirect cost of diabetes, which has been reported to be more than $ 100 million every year in America [10], basic measures should be taken, and planning on this issue should be among the priorities of Medical Sciences and Health of Iran. Some measures can be the adoption of proper

approaches to inform diabetic patients about the importance of the use of Nutrition Education Program in blood sugar and fat control via mass media and programs, etc. This finding is consistent with the Dostan and the colleagues' study [20]. Based on the information achieved from F. Zare Farashbandi and colleagues [21], it is required to pass on health information about diabetes to the diabetics inactively and through the databases mostly used by them. In this way, it is possible to play an effective role in increasing their knowledge on diabetes, control approaches, and its prevention.

Conflicts of Interest

There is no conflict of interest among authors.

Acknowledgment

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