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Research Article

RATE OF OCCURRENCE OF IMPAIRED FASTING GLUCOSE IN 1ST DEGREE RELATIVES OF THE PATIENTS SUFFERING FROM TYPE-2 DIABETES MELLITUS AND ITS CORRELATION WITH BMI

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Abstract:

Objectives: The aim of this study is to find out the rate of occurrence of impaired fasting glucose in the 1st degree relatives of the patients suffering from Type-2 DM (Diabetes Mellitus) and its correlation with BMI (Body Mass Index).

Methodology: This transverse research work was carried out at DHQ Hospital Faisalabad from August 2019 to February 2020. People with \geq thirty-five years of age, 1st degree relatives of the patients suffering from Type-2 DM, got recruitment in this research work and we checked their levels of FBS 2 times a week apart. We divided the participants of this research work into three groups. Group-1 comprised the persons with normal fasting blood glucose (FBS: <100.0 mg/dl), Group-2 contained the patients with impaired fasting glucose (100.0-125.0 mg/dl), thought to be with high risk and Group-3 contained the patients who turned out to be present with frank diabetes (FBS: ≥ 126.0 mg/dl). The patients with known DM and having pregnancy were not included in this research work. We used the Chi square method for the comparison of the proportions of levels of impaired fasting glucose versus body mass index. P value of <0.0010 considered as significant.

Results: A sum of total one hundred patients got inclusion in this research work with average age of 44.27 years. Total 60.0% patients were present with normal FBS, 31.0% patients appeared with impaired FBS and nine percent patients were present with frank diabetes ($P < 0.0010$). There was a significant correlation between impaired fasting glucose and body mass index. There was increase in the rate of occurrence of impaired fasting glucose with the increase in body mass index.

Conclusion: 1st degree relatives of persons suffering from Type-2 DM showed high rate of occurrence of impaired fasting glucose and most important risk factor was obesity.

KEYWORDS: Fasting Glucose, Impaired, Body Mass Index, Occurrence, Type-2 DM, Pregnancy.

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INTRODUCTION:

DM is a disease of metabolism which is characterized by hyperglycemia causing from abnormalities in secretion of insulin or insulin action or both [1]. Type-2 DM is an issue of health in whole world and its incidence is increasing in both developed as well as developing regions of the world [2]. Now, Pakistan is in top ten countries for absolute rise in the prevalence of diabetes. The prevalence rate of diabetes in our country, Pakistan is very high. Overall prevalence of diabetes is 26.30%, of which 19.20% are present with known diabetes and 7.10% are newly detected patients of diabetes. The rate of prevalence of impaired fasting glucose is about 14.40% [3]. There is estimation that in the year of 2019, over nineteen million adults in our country Pakistan were present with diabetes, putting all these patients at risk of life-threatening problems [4].

There are very few researches in the whole world which evaluated the incidence of insulin resistance in 1st degree relatives of the patients suffering from Type-2 DM, who are present with enhanced risk to develop the Type-2 DM in near future. The persons present with impaired levels of fasting glucose levels have a 20.0% to 30.0% chance for the development of diabetes over the next five to ten years [5]. Risk factors for developing the Type-2 DM include the past history of DM in the family, enhanced body mass index, enhanced circumference of waist, ethnicity, previously diagnosed impaired fasting glucose, past history of GDM (Gestational Diabetes Mellitus), HTN (Hypertension), HDL-C level <0.9mmol/L (35.0 mg/dl) and/or level of triglycerides >2.820mmol/L (250.0mg/dl) and high incidence of cigarette smoking in the countries of South Asia [6-8]. There is a strong relationship between the past history of DM in the family and high BMI with the Type-2 DM [9]. Persons present with the impaired glucose tolerance can decrease the risk of DM by changing their life styles as well as decreasing their body weight [10]. So, levels of impaired blood glucose in the persons with the strong past history of diabetes in family, especially in 1st degree relatives, should be identified and there should be modification in their lifestyles and it will reduce the burden of DM as well as its complications. Main rationale of this research work was to examine the rate of incidence of impaired fasting glucose in 1st degree relatives of patients suffering from Type-2 DM and its correlation with BMI.

METHODOLOGY:

This study is an observational research work. In this research work, the evaluation of the fasting plasma glucose in one hundred persons from parentage suffering from Type-2 DM coming to DHQ Hospital Faisalabad from August 2019 to

February 2020, got recruitment. In this research work, 1st degree relatives particularly siblings and children of patients suffering from Type-2 DM were included. The age of the subjects was thirty years or more. A cut-off age of thirty-five years at diagnosis for Type-2 DM was commonly utilized to separate Type-1&Type-2 DM in different research works [11]. The subjects of this research work were from both genders. We excluded the subjects present with confirmed diagnosis of DM, present with symptoms suggestive for DM like polyuria, loss of weight and polydipsia, females with pregnancy because placental hormones induce the insulin resistance. We also excluded the patients suffering from diseases of liver and kidneys [6]. All the persons present with endocrinopathies that rise the blood sugar like thyrotoxicosis and Cushing's syndrome [7]. We collected the following information on a well-organized Performa as age of the person, gender, profession, lifestyle, past history of Type-2 DM in family, HTN and obesity. We measured the weight of the participants in kilograms in light clothing and without shoes. As measured the height of the subjects in centimeters in standing position without shoes. We calculated BMI from the formula $BMI = \frac{Weight}{height^2}$. The normal range of BMI is from 18.50 to 24.90 Kg/m². Overweight BMI is ≥ 25.0 Kg/m², pre-obese BMI is between 25.0-29.99Kg/m² and obese if BMI is ≥ 30.0 Kg/m².

ADA considers a level of fasting blood glucose of 100.0 mg/dl or higher to be diagnostic of the impaired glucose tolerance. Fasting blood glucose between 100.0 to 125.0mg/dl is known impaired FBG and FBG of 126.0 mg/dl or higher is considered as frank DM. We presented the numerical data in averages and standard deviations. We used the X² test for the analysis of the nominal variables. P value of 0.050 was the significant value for analysis. SPSS V.20 was in use for the statistical analysis of the collected information.

RESULTS:

There were total one hundred subjects recruited in this current research work. We separated the participants into 3 different groups on the basis of the levels of fasting blood glucose.

Group-1 included sixty subjects with FBS level of <100.0mg/dl on different occasions.

Group-2 included total thirty-one subjects with FBS between 100.0 to 125.0 mg/dl on 2 different occasions.

Group-3 contained the patients who were present with FBS ≥ 126.0 mg/dl on 2 separate occasions.

There were twenty-nine male and thirty-one female subjects in the Group-1 with an average age of 43.50 years. In the Group-2, there were total twenty-one male and ten female subjects with an average age of 45.90 years. In the Group-3, there

were 7 male and 2 female subjects with an average age of 43.40 years. We calculated the P value as

0.4520, which is not statistically significant (Table-1).

Table-I: Baseline Characteristics of Three Groups

Characteristics		Group-1 (n=60)	Group-2 (n=31)	Group-3 (n=9)	P-Value
Age	Mean	43.5	45.9	43.4	0.452
	SD	8.34	9.7	6.36	
Gender	Male	29	21	7	
	Female	31	10	2	
Family History	Obesity	17 (28.33%)	12 (38.7%)	7 (77.7%)	
	Smoking	21 (35%)	15 (48.3%)	7 (77.7%)	
Sedentary Life Style		21 (35%)	11 (35.4%)	3 (33.3%)	
BMI	Mean	24.76	27.53	29.05	0.001
	SD	3.44	4.98	4.24	

There was a positive past history of obesity in 28.330% subjects of Group-1, 38.7% subjects of Group-2 and 77.770% subjects of Group-3 correspondingly. There was presence of a sedentary lifestyle in 35.0% subjects of Group-1, 35.480% subjects of Group-2 and 33.330% subjects of Group-3. There was presence of a positive history of cigarette smoking in 35.0% subjects of Group-1, 48.380% subjects of Group-2 and 77.770% subjects of Group-3. As elaborated in Table-1, past history of obesity was higher in the subjects of Group-2 in comparison with the subjects of Group-1.

In the same manner, the positive history of smoking was also higher in the subjects of Group-2 as compared to the subjects of Group-1. About the sedentary lifestyle, the Group-2 subjects displayed a slightly higher frequency as compared to the subjects of Group-1. These all are the important risk factors in the determination of the enhanced chances of the development of DM in near future. Average BMI in the subjects of Group-1, Group-2 and Group-3 were 24.760 ± 3.440 , 27.530 ± 4.980 and 29.050 ± 4.240 respectively with a P-value of 0.0010, which is significant statistically (Table-1). There was significant association between the level of impaired fasting glucose and body mass index. There was increase in the risk of acquiring impaired glucose level or diabetes with the increase in the body mass index.

Table-II: Association of Impaired Fasting Blood Sugar With BMI

	Normal FBS		Impaired FBS		Diabetes Mellitus		Total	
	Count	Row N%	Count	Row N%	Count	Row N%	Count	Row N%
BMI normal	34	77.30%	9	20.50%	1	23%	44	100.00%
Overweight	23	60.50%	13	34.20%	2	53%	38	100.00%
Obese	3	16.70%	9	50.50%	6	33.30%	18	100.00%
Total	60	60.00%	31	31.00%	9	9.00%	100	100.00%

P-value of <0.001 with Chi sq.=24.42.

DISCUSSION:

In this current research work, we observed the high rate of occurrence of impaired fasting glucose in 1st degree relatives of the patients suffering from Type-2 DM. Out of 100 persons with family history of Type-2 DM; impaired FBS was present in 31.0% subjects and frank diabetes in 9.0% subjects (Table-1). One research work performed by Bock G noticed that persons with impaired levels of FBS have a 20.0% to 30.0% chance for

the development of the diabetes over the next five to ten years [5]. Similarly, Shaikh MA carried out a research which showed that subjects with strong history of Type-2 DM in family are at high risk for the development of the impaired FBS leading to many other complications [12]. One other research work conducted by Kumar A displayed that there was presence of insulin resistance with high incidence in the 1st degree relatives of the patients of Type-2. This incidence increases with the

increase of the development of disease in the relatives of the patients of Type-2 DM [13]. Rodríguez-Moran stated that the presence of positive family history of DM in 1st degree relatives has association with the level of impaired fasting glucose, even in non-obese subjects [14].

This research work stated that past history of smoking, obesity and sedentary lifestyle has a strong influence on the subjects developing impaired FBS in future (Table-1). Increased BMI, gain of body weight, dyslipidemia, HTN (Hypertension) and increase fasting plasma glucose are the main indicators of development to Type-2 DM [15]. With the increase in the fat of body, there is always increase in the diabetes incidence. There was much high incidence of impaired FBS and diabetes in the subjects who were obese. So, there is a strong risk for the development of the DM in the obese subjects of the 1st degree relatives of the patients suffering from Type-2 DM. This current research work also stated a strong correlation between higher body mass index and increased FBS (Table-2). In this current research work, there were increased values of BMI in the diabetic group as compared to the other groups. So, there was association between DM and increased body mass index. Park YW stated related risk factors with Type-2 DM that include the past history of DM in family and increased body mass index [6]. Banerjee S also stated that there was significant association between high body mass index and past history of DM in family. The proper management of obesity can reduce the progression of Type-2 DM [16]. Research works have showed that lifestyle intervention and counselling should be treatment options for the improvement of glycemic control and reduce the prospect of development of Type-2 DM.

CONCLUSION:

Results of this research work concluded that there was very high rate of occurrence of impaired fasting glucose in 1st degree relatives of the patients suffering from Type-2 DM; therefore, timely screening and early intervention like modification in the life style of such persons can be helpful in the prevention of the incidence of DM in near future. It is also helpful in the reduction of the national diabetic burden. A strong correlation between the impaired fasting glucose and high BMI suggested that the most important priority is the maintenance of healthy weight and prevention from obesity. There should be counselling of all the 1st degree relatives of the patients suffering from Type-2 DM who are obese, regardless of the value of level of blood glucose, about the modifications in the lifestyle.

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