

## Type 2 Diabetes Mellitus and Associated Major Risk Factors

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### ABSTRACT

**Objective:** To determine association of T2DM with depression, Covid-19, hypertension, junk food, weight, age, physical activity, smoking, family history, education and income.

**Study Design:** Cross-sectional, multicenter study

**Duration and Place of Study:** Family Health Clinic, Mehmoodabad, Ahmad Medical Centre, FB Area Karachi, Al-khidmat Hospital North Karachi, Rafah-E-Aam Hospital FB Area Karachi, from 1<sup>st</sup> November 2020 to 30<sup>th</sup> April 2021.

**Methodology:** Pre-tested, researcher administered questionnaire was used through medics and paramedics. Information was collected from general patients and care givers. Non-diabetics and non-hypertensives were tested/checked on the spot.

**Results:** Mean age of the participants was 35 years with minimum 18 and maximum 70 years. Males were 279 (95%). In males 30 (11%) were diabetic and in females 7 (47%) were diabetic. 168 (57%) of the participants got above matric education. Low-income group consisted of 271 (92%) participants. Diabetes was present in 37 (13%). Forty six percent diabetics were diagnosed incidentally. Most (24; 65%) were diagnosed by general practitioner, six (16%) by Family Physician, four (11%) by specialist and one (3%) by self.

**Conclusions:** General practitioners play a pivotal role in diagnosing and managing diabetes mellitus. To reduce the burden of diabetes in Pakistan, modifiable risk factors like low education and high inflation have to be addressed. More over marriages between first cousins need to be discouraged.

**Keywords:** Diabetes mellitus, Junk food, Lifestyle, Obesity

### INTRODUCTION

Diabetes mellitus is a chronic disease that occurs when the pancreas is no longer able to make insulin or when the body cannot make good use of the Insulin it produces<sup>1</sup>. Insulin pushes glucose into the body cells where it is used as a source of energy. Due to the deficiency of insulin glucose cannot enter the cells and the level of glucose increases in blood. Diabetes Mellitus and Diabetes Insipidus are two different entities. In both the cases there is increase production of urine. However, in diabetes mellitus, glucose passes in urine and makes it sweet. In Diabetes care, life style management is fundamental. It includes Diabetes self-management and social support (DSMES), medication nutrition therapy (MNT), physical activity, smoking cessation counselling and psychosocial care<sup>2</sup>. Diabetes self-management education and support needs to be evaluated by medical care provider at the time of diagnosis, yearly and when developing complications. People who are involved in DSMES need to have specialized knowledge and behaviour change principles in diabetes. In addition to that there is very important role of community health workers and lay leaders in this regard. Increased use of DSMES is associated with increased use of primary care and preventive services and there is less need of inpatient hospital services. More participation in DSMES leads to less insurance claim costs as less and less complications develop thereby not only reducing the risk of dangerous diabetes related complications but also reducing the cost incurred on treating these complications. Patients with Diabetes face a lot of difficulty in following diabetic meal plan. Therefore, it should not be stereotyped and must be individualized.

Prevalence of DM in Pakistan is 16.98%<sup>3</sup>. In the eastern Mediterranean region prevalence of infectious diseases is progressively declining while that of non-communicable disease (NCD) like heart diseases, cancer and DM is moving up<sup>4</sup>. Unfortunately, Pakistan, being in this region, is facing double burden of diseases i.e., prevalence of both communicable diseases like Hep-C, HIV and non-communicable diseases like DM, hypertension is increasing<sup>5</sup>. Environmental factors like less physical activity, obesity, high saturated fat and low fibre diet could be leading factors for the development of T2DM. In addition to that depression, Covid-19, income and junk food could also be the significant factors for the development of the disease, locally and

globally. In this regard, the studies conducted in Pakistan are scarce.

In one study, conducted in Lahore<sup>6</sup>, factors associated with DM are socioeconomic, marital status, family history, body mass index (BMI), lipids and hypertension. In the DM national survey conducted in Pakistan<sup>7</sup>, the factors associated with DM are age, family history, hypertension, obesity and dyslipidemia. Another study conducted in Karachi<sup>8</sup> in 2003 revealed factors for uncontrolled DM and included place of diagnosis, source of information and high tea consumption. In the present scenario, more DM associated factors could be studied in Pakistan; most important being Covid-19, junk food, depression, income and education. The researchers tried to explore such factors associated with development of DM.

### MATERIALS AND METHODS

It was a comparative cross-sectional study conducted at Family Health Clinic, Mehmoodabad Karachi; Ahmad Medical Centre, F.B. Area Karachi; Al-Khidmat Hospital, Nazimabad Karachi and Rafah-E-Aam Hospital, FB Area Karachi. It was five-month study from the date of approval of synopsis by ERB. Sampling was non probability convenience. Keeping the prevalence of DM in Pakistan<sup>6</sup> 16.98% and the margin of error 0.05, the required sample size came out 217 through WHO sample size software. Age more than 20 years, either gender, Pakistani and opted for answering questions were included. Patients with severe co morbidities like cancer, unable to spare time for answering questions and with cognitive impairment were excluded.

The instrument used was pre tested, researcher administered questionnaire. First part consisted of demographic information and the second one, study related independent variables. Paramedics were requested to interview the participants. Sample was collected from general OPD. In addition to patients, healthy care givers were also selected for sample. If someone claims non-diabetic, his or her RBS was checked on the spot. Similarly, strategy was adopted for hypertension. Ethical approval was obtained from Ethical Review Committee of College of Family Medicine Pakistan. The study was conducted as per guidelines of Declaration of Helsinki and Pakistan Medical Commission. Informed consent was taken from the participant. Their Autonomy, Anonymity and Confidentiality were strictly maintained. Data were

entered into SPSS 16. Chi-square test of significance was applied to determine association between each of the independent variables and the outcome of interest. P-value was considered significant if came out <0.05.

## RESULTS

Mean age of the participants was 35 years with minimum 18 and maximum 70 years. Male were 279 (95%). In males 30 (11%) were diabetic where as in females the number was 7 (47%). 168 (57%) of the participants got above matric education. Low-income group consisted of 271 (92%) participants. Diabetes was present in 37 (13%). Forty six percent diabetics were diagnosed incidentally. Mostly 24 (65%) were diagnosed by general practitioner, six (16%) by family physician, 4 (11%) by specialist and 1 (3%) by self (Table 1, Figs. 1-2).

Table 1: Association between diabetes and risk factors

Variable	Diabetes mellitus		Total	P value
	Yes	No		
<b>Income</b>				
≤50,000 Rs. /Month	24	246	270	0.00
>50,000 Rs. /Month	5	6	11	
<b>Life style</b>				
Sedentary	34	219	253	0.61
Physically active/regular exercise	3	14	17	
<b>Body mass index</b>				
≤25	18	142	160	0.39
>25	19	111	130	
<b>Smoking</b>				
Yes	1	13	14	0.523
No	35	235	270	
<b>Junk food</b>				
Yes	7	67	74	0.324
No	30	186	216	
<b>Family History of DM</b>				
Yes	29	34	63	0.00
No	8	212	220	
<b>Education</b>				
< Matric	8	106	114	0.05
> Matric	24	143	167	
<b>Age (years)</b>				
≤40	6	200	206	0.00
> 40	31	45	76	
<b>Hypertension</b>				
Yes	21	23	44	0.00
No	16	230	246	

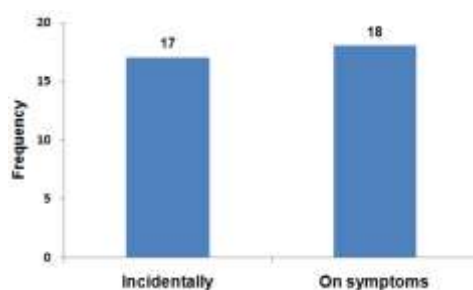


Fig. 1: How the diagnosis of DM was made

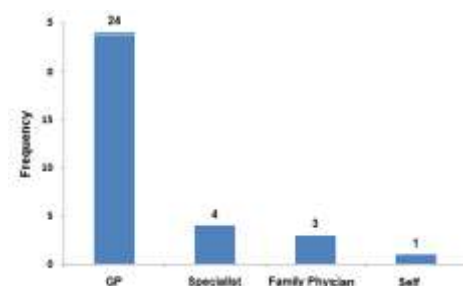


Fig. 2: Who diagnosed DM

## DISCUSSION

The study was conducted in difficult situation of Covid-19. Less number of patients was attending hospital and it took more than the stipulated time to collect the sample. Depression can make diabetes worse and difficult to treat. In this study none of the participants was positive for Covid-19 and depression. Mean age of male was 34 years while that of female was 41 years. In male 30 (11%) were diabetic where as in female the number was 7 (47%). In this study prevalence of diabetes was 13% while that in the population-based survey conducted in Pakistan in 2019<sup>2</sup> it is 17%. The difference in prevalence could be due to the fact that 2019 survey catered large population, nearly 18000 all over Pakistan with multistage cluster sampling and good representative sample of different geographic pockets in Pakistan. On the other hand, in this study only very few areas of Karachi were selected with sample size nearly 300. The sample might be representing area with low prevalence of diabetes.

Sedentary life style and physical inactivity are the significant risk factors for diabetes. People eat more and walk less. Covid-19 intensified this trend. Increasing trend of junk food delivery at doorstep in this period also worsened the situation. More and more people were house bound and were inclined to sedentary life style. There is now a need to take robust step to produce awareness of people about physical activity. To become role model, health care professionals need to perform regular physical activity thereby preventing the development of diabetes not among themselves only but also in other people. Obesity is the mother of chronic diseases. It may lead to Diabetes, Hypertension, osteoarthritis etc. It makes worse quality of life, which is the main culprit in the development of chronic diseases.<sup>3,4</sup>

In this study, overweight and obese participants constituted significantly (130; 45%) while prevailing overweight/obesity in Pakistani population according to survey conducted by WHO<sup>9</sup> in 2020 is 58%. It means nearly half of the population of Pakistan is overweight/obese. This significant number of overweight/obese could be explained when one sees life style of Pakistani people. In this study, 253 (93%) had sedentary life style whereas only 17 (7%) were physically active/take regular exercise. Obesity means excessive amount of body fat and is a serious medical concern. It increases the risk of cardiovascular disease, hypertension, diabetes, cancer etc. Prevalence of overweight/obesity in diabetic group was 51% while that in non-diabetic group it was 43%. These figures are significantly higher than those found in a study conducted in Baluchistan<sup>10</sup> where these are 22% and 16% respectively. Low prevalence of overweight/obesity in Baluchistan could be due to better life style, simple food and excessive manual work in that area. A cross sectional study conducted in Mumbai, India<sup>11</sup> in 2020 concludes overweight/obesity 42%. This finding is similar to that found in this study as both Mumbai and Karachi are densely populated with similar socioeconomic profile and similar life style.

Income was found significantly associated with diabetes. Only eight percent of low-income group (270) had diabetes while mid/high income group had 11(45%) diabetes (p=0.00). In a study conducted in Canada<sup>11</sup> in 2011 the prevalence of T2DM in the lowest income group is 4.14 times higher than in the highest income group. This is contradictory to our finding and could be attributed to more health-oriented behaviour of this group. The findings in International Diabetes Federation<sup>12</sup> atlas 2016, indicate higher prevalence of diabetes in middle income compared with low-income countries. In a study conducted in India<sup>13</sup> the prevalence of diabetes is found low in low-income group than in high income group (12.6% vs 24.6%). This is similar to our finding and could be related to strenuous physical activity of this group at work.

In this study 46% of diabetes was diagnosed incidentally without symptoms. It is serious matter and shows huge chunk of the disease without symptoms. To find out such hidden cases screening of high-risk population is a must. Also, pre diabetes would be found out through screening. In a study conducted in

Swat<sup>14</sup> in 2018 pre diabetes is found in 21.4 % of the subjects. As defined by WHO<sup>15</sup> pre-diabetes is a state of intermediate hyperglycemia using two specific parameters, impaired fasting glucose (FBS 110-125mg/dl) and impaired glucose tolerance (2hr P glucose 140-200 mg/dl) after ingestion of 75 gm of glucose. Life style modifications and Metformin are the two proven modalities of treatment for pre diabetes. In a study conducted in India<sup>16</sup> in 2020 prevalence of diabetes is found 17.4% while that of pre diabetes 29.7%.

The study in hand shows 24 (65%) of the diabetics were diagnosed by General Practitioner (GP), six (16%) by Family Physicians (FP), four (11%) by specialist and 1 (3%) by self. This shows the importance of primary care physicians in the diagnosis of not only diabetes but also other chronic diseases like Hypertension. Vast majority of our population seeks medical care from GPs and chronic diseases can be picked early by them thereby lessening the risk of development of associated complications. In our population there is no trend of routine medical check-up, therefore, most of the time the disease is diagnosed incidentally. If routine check-up system is developed, we can catch people at prediabetes stage. Preventing the disease is cost effective and much less expensive than treatment of frank Diabetes. In case of multiple risk factors, more frequent screening is needed. This pertains to routine immunization of children also. A study conducted in Indonesia<sup>17</sup> in 2012 shows that 383 (89%) of the GPs are aware of the existence of T2DM guide lines. However, this does not necessarily mean that they also practice those guidelines. To strengthen the capacity of primary care physicians in prevention and control of diabetes a training program is conducted in Tamil Nadu, India.<sup>18</sup> After six months of the program, significant improvement is observed in primary care program to deliver patients affectively.

Family history is a non-modifiable and independent risk factor for development of diabetes. It is also positively associated with risk awareness and risk relating behaviour. In a study conducted in India<sup>19</sup> in 2015 family history of diabetes is positive in 11.9% of the diabetics compared to 7.4% in non-diabetics ( $p=0.001$ ). It is observed that nearly every family has diabetic patients meaning that concept of abstaining from consanguineous marriages does not hold very true.

In this study hypertension and diabetes were strongly associated ( $p=0.00$ ). Forty eight percent of hypertensives and 7% of normotensives had diabetes. In a study conducted in India<sup>19</sup> 8.3% of hypertensives have diabetes whereas 8.4% of normotensives have diabetes ( $p=0.96$ ). Life style measures like regular exercise, low calorie and salt diet and increase leisure activities prevents not only from Diabetes but also from hypertension.

Nine percent of junk food users developed diabetes whereas 14% of non-junk food eaters had diabetes ( $p=0.3$ ). A study conducted in Lahore<sup>20</sup> in 2020 reveals junk food consumption in teenagers is 87%. Such huge proportion of junk food consumption could be one reason for increasing prevalence of diabetes in Pakistan. Additional hazardous factor could be increasing trend of junk food supply at door step. There has been observed high prevalence of diabetes in Covid-19 patients and diabetes is a determinant of severity and mortality. This could be due to impaired immunological response.<sup>21</sup> Covid-19 virus increases stress level that then increases the level of hyperglycaemic hormones. In this study none of the patients had Covid-19 or depression.

As far as limitations of the study are concerned, it was conducted in only some areas of Karachi due to resource limitations. The researchers did not find any case of Covid-19 or depression in the sample. Therefore, to find out association of

these factors with Diabetes, sample size has to be increased along with representation of more areas of Karachi. To reduce the burden of diabetes in Pakistan, modifiable risk factors like increasing inflation and low education have to be addressed. More over marriages between first cousins need to be discouraged, however not applicable so much.

## CONCLUSION

Forty-six percent of diabetics were diagnosed incidentally on routine examination with no signs and symptoms of diabetes mellitus and 65% were diagnosed by general physicians. This shows the hidden nature of the disease and the extreme importance of primary health care physician in diagnosing diabetes mellitus early and thereby preventing or delaying associated complications.

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