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PREVALENCE OF DIABETES MELLITUS AND ITS ASSOCIATION WITH RISK FACTORS AMONG FEMALES IN DISTRICT MARDAN, PAKISTAN

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Abstract

Background: *The prevalence of diabetes mellitus is rising worldwide, especially among women, making it a serious public health concern. Among District Mardan, Pakistan, this study sought to ascertain the prevalence of diabetes mellitus and identify risk variables among females.*

Method: *In District Mardan, 150 randomly chosen female participants participated in a cross-sectional study. A standardized questionnaire covering demographics, anthropometric measurements (Body Mass Index, or BMI), self-reported levels of physical activity, stress, residential area, and personal and family history of diabetes was used to gather data. Using SPSS version 22, statistical analysis was conducted to determine the prevalence of diabetes and the relationship between possible risk variables and diabetes status.*

Results: *It was discovered that 59.3% (n=89) of the study sample had diabetes mellitus. Significant correlations between diabetes and a number of risk variables have been found through statistical research. Compared to participants without diabetes, those with diabetes had a considerably higher mean BMI and a higher percentage of those who were overweight (33.7%) and obese (38.2%).Diabetes became more common as people aged, with women over 40 having the highest prevalence (81.3%). Lastly, the diabetes group had a considerably higher prevalence of high stress levels (46.0%) than the non-diabetic group (21.3%).*

Conclusion: *A high prevalence of 59.3% was found in this study, which examined the risk factors and prevalence of diabetes mellitus in 150 women from District Mardan, Pakistan. Diabetes was found to be significantly correlated with greater BMI, less physical activity, aging (particularly over 40), living in an urban area, and higher levels of stress*

INTRODUCTION

Diabetes mellitus, a long-lasting metabolic condition that cause high levels of blood sugar, is caused by an inappropriate insulin activity or poor insulin performance in the body. Pancreatic β cells build insulin, an amino acid hormone. The human pancreas contains between 1 - 2 million pancreatic islets which comprise numerous endocrine cells (1).These islets have two basic cell types β cells that emit insulin and α cells that create glucagon. Usually, insulin is released upon sugar ingestion, via a process known as glucose-induced insulin stimulation (2).The Egyptians first recognized diabetes and its signs and symptoms, which included losing weight and increased urinating. Later, Aertaeus, a Greek scientist, introduced the idea of "Diabetes mellitus." "Diabetes" from Greek indicates "to go through," and "mellitus" implies "sweets.", suggesting the sweet taste associated with the illness (3).Females with diabetes have an increased likelihood of developing cardiovascular diseases, strokes, kidney issues, and polycystic ovary syndrome. These health problems further compound the impact on their overall well-being and quality of life (4).

Diabetes mellitus is classified into 3 major ways: type 1 the second is type 2, and the other one is Gestational diabetes.

Type 1 diabetes mellitus (T1DM) is a common term used to describe autoimmune diabetes. Type 1 diabetes usually first appears in childhood and is brought on by autoimmune destruction of the pancreatic islet cells (5). Primary characteristic of T1DM, alternatively regard to as insulin-dependent or premature diabetes, is the ineffectiveness of insulin. Individuals diagnosed with this form of diabetes must constantly rely on insulin supplementation and face the potential for mass loss (6).In the initial phases of Type 1 Diabetes Mellitus (T1DM), some patients may produce sufficient insulin, eliminating the need for external insulin administration and reducing the likelihood of ketoacidosis (7).

The utmost common diabetes is type 2 diabetes mellitus, often known as non-insulin-dependent diabetes. It is caused by low insulin levels, excessive blood sugar, and resistance to insulin (8).The body's primary energy source, sugar, is negatively impacted by this condition over time in terms of absorption and usage. Because their systems either don't make enough insulin or don't adjust to its effects, person with T2DM have inadequate sugar control. Despite the pancreas continuing to produce insulin, the amount is insufficient to meet the body's needs, and cells frequently develop resistance to insulin. The majority of people with this kind of diabetes are elderly, especially those over 40. Since untreated conditions can lead to adverse impacts, proper treatment is essential (9). This tendency has raised demand for more potent T2DM drugs in order to control the expanding patient population and the ensuing financial burden worldwide (10).

Gestational diabetes mellitus (GDM) is a condition that causes significant abnormalities during pregnancy and is often defined as an intolerance to glucose that raises blood sugar levels (11).In addition to age, family history, being overweight or obese, and not exercising, other risk factors for gestational diabetes include gaining too much weight while pregnant (12).

Numerous health difficulties may be significantly more likely to arise anytime blood glucose levels are elevated, impacting many physiological systems such as cardiovascular diseases, neurological disorders, nephropathy or kidney damage, ocular troubles (retinopathy), and foot problems. Gestational diabetes can endanger the mother and the fetus with risks like, failure Stillbirth Birth (13).

Diabetes prevalence is on the rise in Pakistan. The World Health Organization (WHO) reports that more than 6.5 million more people in the nation have diabetes. By 2025, the disease is expected to impact 11.5 million people if appropriate preventive measures are not put in place, with grave implications (14). Pakistan faces a significant challenge with diabetes. Studies conducted in area such as Baluchistan, Khyber Pakhtunkhwa (KPK), and Sindh investigate diabetes occurrence ratio of 8.6%, 11.7%, and 13.9%. These figures are comparable to those observed in other Asian countries (15). According to researchers, diabetes will be the sixth leading cause of death globally by 2030 (16). The global prevalence of diabetes is on the rise, influenced by factors such as population growth, an aging demographic, increased

urbanization. Accurately measuring the incidence of diabetes, both now and in the future, is crucial for efficient planning and resource allocation. Diabetes has become a global disease that affects a large number of people. According to current projections, this figure is expected to rise significantly over the next several years. According to projections, the number of people with diabetes worldwide is expected to climb dramatically by 2030, and by 2035, additional increases are expected (17). The determination of this study is to investigate the prevalence and risk factors for diabetes mellitus in women in Mardan, Pakistan, particularly those who are between the ages of 20 and 40.

METHODOLOGY

This study is a cross sectional questionnaire-based study. This cross-sectional study aims to evaluate the prevalence and risk factors associated with diabetes mellitus among women in Mardan, Pakistan. Data collection involve structured interviews, anthropometric measurements, from a randomly chosen group of adult females aged 18 and older. The study was conducted in Mardan, Khyber Pakhtunkhwa, Pakistan, The study was take place over a five-month period, from January 1, 2025, to May 31, 2025. Planning and preparation take place in February 2025, data collecting takes place from March 2025, data analysis takes place in April 2025, and the report is written and completed in May 2025. Sample sized was calculated through OpenEpi version 25.

Confidence: 95%.

Margin of error is 5%.

Design Effect: 1.

Using these characteristics, a sample size of 150 was determined, ensuring sufficient statistical power to identify important risk factors and produce valid diabetes prevalence estimations.

A sample of 150 adult women, all of whom are 18 years of age or older, were selected at random from the Mardan, Pakistan, community for the study. We collect data from those females whose blood was first collected using proper sterile technique. Trained professionals used standard aseptic venipuncture techniques to obtain blood samples. Blood was collected in gel tube. After collection blood was kept for 30 minutes to clot after clotting blood centrifugation was performed on 3000rpm after centrifugation serum was collected then take 3 glass tubes one for blank, one for standard, and third for sample then they add 1000ul reagent in all tubes. Then add 10 microliter standards in 2nd tube and 10 microliters in 3rd tube. Then add appropriate serum or plasma sample. Mix well and incubate for 10 minutes on 37 degree as shown in. Perform glucose assay using spectrophotometer or chromatograph. Measure the absorbance and florescence of the sample. Calculate the concentration using the test kit calibration curve e.g. as shown in. Perform quality control checks using calibrators and controls report the result in mg/dl. The data collected through questionnaire from 150 females of district mardan Pakistan participants' analyzed using SPSS 22 version.in which we performed chi square test, independent T test and other statistical descriptive.

RESULTS

This chapter present the findings that is pointed out from the study investigating prevalence and risk factors of diabetic mellitus in females in district mardan. The data collected through questionnaire from 150 females of district mardan Pakistan participants' analyzed using SPSS 22 version.

Prevalence of Diabetic Mellitus in Females of Mardan

Among 150 participants 89 were positive and 61 were negative. This indicate a prevalence of 59.3% in the study sample. Figure 1 indicate the distribution of diabetes based on their diabetes status.

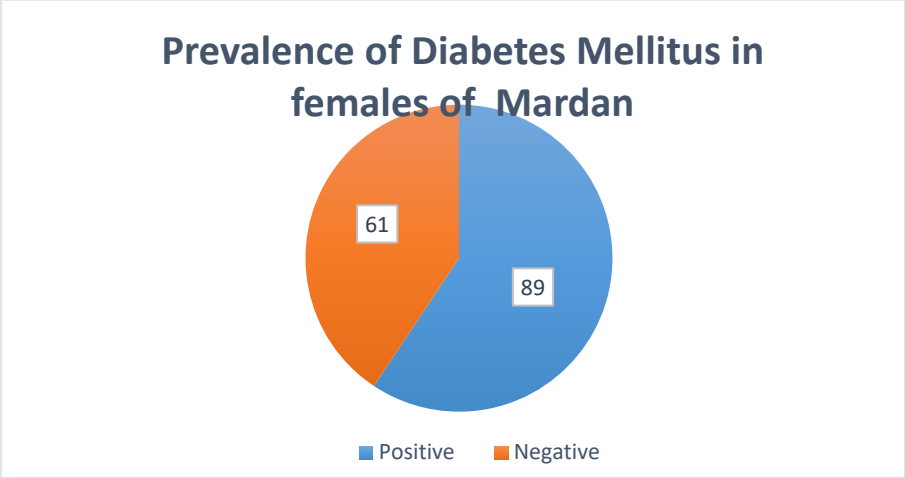

Figure 1: Occurrence of Diabetes in females of Mardan

Bio Mass index and Diabetes in Females

Participants with a positive diabetes test tended to have a higher Body Mass Index (BMI) than those with a negative test, according to the study. The mean BMI of the two groups was compared using statistical investigation. First, we need to define BMI categories.

Table 1: BMI Categories

Category	BMI kg/m^2
Underweight	< 18.5 kg/m^2
Normal	18.5-24.9kg/m^2
Overweight	25.0 – 29.9 kg/m^2
Obessed	≥30 kg/m^2

The BMI categories for female participants with and without diabetes are distributed as shown in (Table 2). Comparing the diabetic group with the non-diabetic group, a larger percentage difference can be seen the overweight 30(33.7%) and obese 34(38.2%) normal 20(22.5%) and underweight 5(5.6%). On the other hand, the proportion of participants without diabetes who had a BMI within the normal range was 35(57.4%) and overweight were 10(16.4%) and obese were only 6(9.8%).

Table 2: Comparison of BMI between diabetic and non-diabetic participants

BMI Category	Diabetic Group (n=89)	Non-Diabetic Group (n=61)	Total Sample (n=150)
Underweight	5 (5.6%)	10 (16.4%)	15 (10.0%)
Normal	20 (22.5%)	35 (57.4%)	55 (36.6%)
Overweight	30 (33.7%)	10 (16.4%)	40 (26.7%)
Obese	34 (38.2%)	6 (9.8%)	40 (26.7%)

Diabetes Mellitus and physical activity in females

The distribution of the female study participants with and without diabetes in terms of self-reported levels of physical activity is shown in (Table 3). The levels of physical activity were divided into four

categories: >5 times per week (daily vigorous activity), 3–4 times per week (often active), 1-2 times per week (infrequently active), and Never. The table indicates that the two groups' patterns of physical activity differed significantly. The percentage of people with diabetes (n=89) who reported being physically active more than five times a week was lower 20(22.5%) than the percentage of people without diabetes (n=61), who reported being physically active more than five times a week 62(68.9%).On the other hand, a greater proportion of participants in the diabetes group reported engaging in less physical exercise. In particular, 9(10.1%) of diabetics said they never exercised, 25(28.1%) were only infrequently active (1-2 times per week), and 35(39.3%) were active three to four times per week. The non-diabetic group, on the other hand, had significantly lower percentages in these less active categories: 2(3.3%) reported being active three to four times a week, 17(27.9%) reported being active infrequently, and 0(0%) reported never being physically active.

Table 3: Showing physical activity relationship between diabetic and non-diabetic group

Physical Activity Level	Diabetic Group (n=89)	Non-Diabetic Group (n=61)	Total Sample (n=150)
>5 (Daily Vigorous)	20 (22.5%)	42 (68.9%)	62 (41.3%)
3-4 (Few Times in a Week)	35 (39.3%)	2 (3.3%)	37 (24.7%)
1-2 (Rarely Active)	25 (28.1%)	17 (27.9%)	42 (28.0%)
Never	9 (10.1%)	0 (0.0%)	9 (6.0%)
Total	89 (100%)	61 (100%)	150 (100%)

Age wise comparison of Diabetes in females

According to our study we find out that increase in age is also related with the risk of diabetes in females of mardan as shown in (Table 4) positive diabetes among 89 participants 65(73.3%) were above >40 and as compared to normal among participants >40 age were only 14(22%) and as age decreases as 30-40 were 20(22.47%) and in negative there were 32(52.4%) as usual 20-30 ages in positive participants were 3(3.37%) and in negative its ratio is 15(24%).

Table 4: Age wise Diabetes prevalence in females of Mardan

Age Group (Years)	Total in Age Group (n)	Diabetes Positive	)iabetes Positive (%) in Total	Diabetes Negative	Diabetes Negative (%)in Total
(20-30)	(18)	3(3.37%)	(2%)	15(24%)	(2%)
(30-40)	(42)	20(22.47%)	(13.3%)	32(52.4%)	(21.3%)
(>40)	(80)	65(73.03%)	(43.3%)	14(22%)	(10%)
Total	150	89(100%)	(59.3%)	61(100%)	(40.7%)

Area of residence and Diabetes status in females

The region of residence distribution for female participants with and without diabetes is shown in (Table 5). This suggests that there were notable differences in the distribution of residents in rural and urban areas between the two groups. Our results find out that among diabetic 89 participants 54(60.6%) were from urban area and 35(39.3%) from rural and among 61 non-diabetic participants only 13(21.3%) were from urban and 78.6(78.6%) were from rural. These findings imply that the prevalence of diabetes is higher in urban population.

Table: 5 Area wise status of Diabetes comparison in females of Mardan

Area of Residence	Diabetic Group (n = 89)	Non-Diabetic Group (n = 61)	Total (n = 150)
Rural	35(39.3%)	48 (78.6%)	62 (41.3%)
Urban	54 (60.6%)	13 (21.3%)	41 (27.3%)
Total	89 (100%)	61 (100%)	150 (100%)

Stress level and Diabetes status in females of Mardan

Our study found out that stress level is also related with the risk of diabetes mostly in females as shown in (Table 6). High Stress Imagine feeling extremely tight and under strain much of the time. We found that compared to women without diabetes about 13 (21.3%) out of 61, a significantly larger percentage of women
with diabetes about 41(46.0%) out of 89) reported experiencing this high degree of stress. There is a significant difference! According to this study, women with diabetes may be more likely to experience significant levels of stress. Feeling stressed occasionally but not always is known as moderate stress. Compared to women with diabetes, who were only approximately 30(33.7%) out of 89 likely to report this medium level of stress, women without diabetes were more likely to do so (about 22 (36.0%) out of 61). Low tension. This refers to feeling generally at ease and rarely under tension. This study revealed that participants with diabetes were found 18 (20.2%) out of 89 and participants without diabetes were found 26 (42.6%) out of 61.

Table: 6 stress level and Diabetes status in females

Stress Level	Diabetic Group (n = 89)	Non-Diabetic Group (n = 61)	Total (n = 150)
High	41 (46.0%)	13 (21.3%)	54 (36%)
Moderate	30 (33.7%)	22 (36.0%)	52 (34.6%)
Low	18 (20.2%)	26 (42.6%)	44(29.3%)

Family history and Diabetes status in females of Mardan

(Figure 7) presents the distribution of participants' responses in the "History Category" across non-diabetic (n = 61) and diabetic (n = 89) groups. The responses were classified into three categories: Yes, No, and Not Sure.

Among the non-diabetic group, 16 participants (26.2%) reported a history, 15 (24.5%) reported no history, and 30 (49.1%) were unsure. In contrast, within the diabetic group, a significantly higher proportion, 55 participants (61.7%), reported a history, while 11 (12.35%) reported no history, and 23 (25.8%) were unsure. This implies that people with diabetes report a history more frequently than people without the disease, most likely referring to a particular medical or familial history associated with diabetes or similar illnesses.

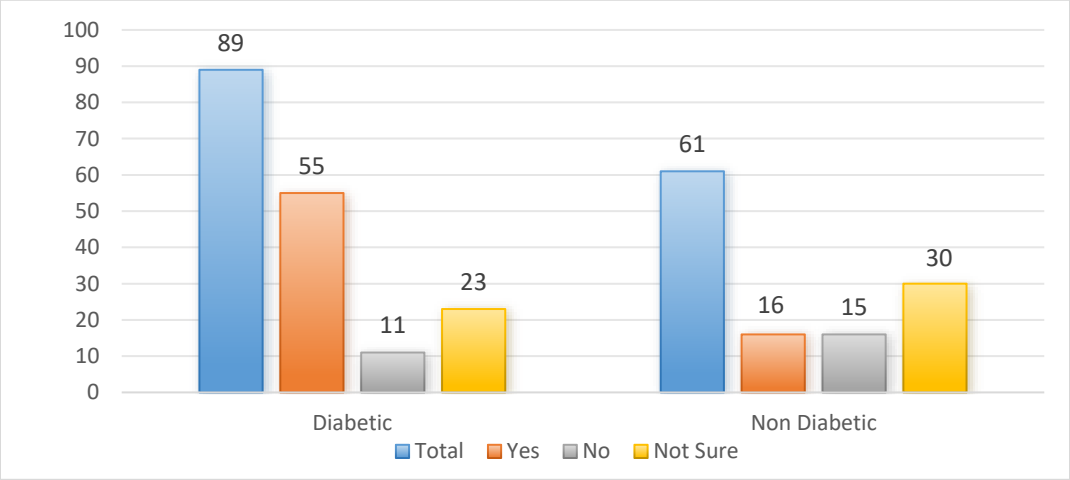

Figure 2: Showing family history wise incidence in Diabetic and non-Diabetic group in females of Mardan

DISCUSSION

This chapter highlighted the important findings from a study that looked at the prevalence and risk factors for diabetes mellitus in 150 females in District Mardan. The analysis found a high prevalence of diabetes (59.3%) in the study sample. Furthermore, some characteristics showed strong correlations with diabetes status. Participants with diabetes had a higher Body Mass Index (BMI), with a greater proportion falling into the overweight and obese categories than their non-diabetic counterparts. Physical activity levels varied significantly, with a lower number of diabetics reporting regular, strenuous activity. Age was another noticeable factor, with a significantly greater frequency of diabetes seen in women over 40 years of age. Furthermore, a greater percentage of people with diabetes lived in metropolitan regions, suggesting that residence area may also be important. Lastly, it was shown that there was a substantial correlation between diabetes and self-reported stress levels, with a higher proportion of diabetic women expressing high stress. Together, these results offer a critical understanding of the prevalence of diabetes and its possible associations in this particular Pakistani female community.

A study was performed by gray N in which high BMIs were linked to an increasingly increased risk of negative outcomes in those with diabetes mellitus. The risk ratio (HR) for insulin dependency in women varied from 1.77 at BMI ≤ 27.49 to 3.57 at BMI ≥ 40. (18)comparable to our research Table 1 displays the distribution of BMI categories for female participants with and without diabetes. A higher proportion of the diabetes group fell into the overweight (33.7%), obese (34%), normal (22.5%), and underweight (5.6%) categories than the non-diabetic group. Conversely, the percentage of individuals without diabetes who were overweight was 16.4% and those with a BMI in the normal range was 57.4%. This indicate that high BMI is also linked with increasing risk of diabetes in females of district mardan.

In study from each tehsil, a total of 300 participants were randomly selected. The study found that the overall incidence of diabetes was 56% in urban regions and 37% in rural ones. Overall, diabetes was found to affect 54% of men and 58% of women in urban regions, while it was found to affect 20.66% of men and 53.33% of women in rural areas. Our research indicates that the urban region of Babozai in district SWAT has a greater frequency of diabetes mellitus. Diabetes was shown to be more common in older age groups in this analysis. The highest prevalence was found in the age groups of 51–60, 61–70, and 71–80 in both urban and rural locations (17).Comparable to our research (See table 4) displays the distribution of residence regions for female participants with and without diabetes.). This implies that the distribution of people living in rural and urban areas differed significantly between the two groups. According to our findings, 89 individuals with diabetes lived in urban areas 36%

of the time and in rural areas 23.3% of the time, while 61 people without diabetes lived in urban areas only 21.3% of the time and in rural areas 78.6% of the time. These results suggest that the urban population has a greater prevalence of diabetes.

In study, 9.88% of people with diabetes mellitus were diagnosed. The prevalence of diabetes increased significantly with age ($P < 0.05$, rates were 1.66% for those aged 20–34, 7.53% for those aged 35–49, and 15.66% for those aged ≥50).(19) Similarly according to our study, the risk of diabetes in female Mardan participants increases with age. (See Table 4) shows that among 89 participants, 43.3% had positive diabetes and that among 61 participants, the proportion of participants over 40 was only 10%. As age decreases, the percentage of participants in the 30–40 age range was 13.3%, and in the negative, it was 21.3%. In the positive participants, the ratio was 2%, while in the negative, it was 2%.Although our study provides a useful overview of current events, it was unable to provide the information. Because we just examined one point in time, we are unable to determine if, for instance, obesity causes diabetes or whether there is another reason why the two conditions frequently coexist. We would have to follow people over time in order to know that. We recommend that keeping normal weight, stress level and early detection for older women is must to maintain female health concerns.

CONCLUSION

This study examined the prevalence of diabetes mellitus and its major risk variables in a sample of 150 women in Pakistan's District Mardan. According to the results, 59.3% of this population had diabetes, which indicates a high prevalence of the condition in this area. The examination of possible risk factors revealed a number of noteworthy correlations. Diabetes was closely associated with a higher Body Mass Index (BMI), with a higher percentage of patients with diabetes being overweight or obese. Additionally, compared to their peers without diabetes, women with diabetes tended to be less physically active. Another important component was age, with a significant rise in the prevalence of diabetes seen in women over 40. The survey also revealed that a greater percentage of people with diabetes lived in metropolitan areas, suggesting that location may have an impact. Lastly, women with diabetes were substantially more likely to self-report high levels of stress.

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