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PREVALENCE OF DIABETES MELLITUS IN DISTRICT MARDAN KP PAKISTAN

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ABSTRACT

Diabetes mellitus (DM), commonly called diabetes, is a metabolic disorder characterized by high blood sugar levels for a prolonged period. In this study, low blood glucose levels are studied in different areas of district Mardan in the province of Khyber Pakhtunkhwa, Pakistan. The purpose of this study is to determine the prevalence of diabetes mellitus in district Mardan, Khyber Pakhtunkhwa (KP), Pakistan. It provided a comprehensive overview of the diabetes prevalence in different regions and age groups The total of 556 samples were collected from 5 hospitals, with Mardan medical complex (MMC) having the highest prevalence value (29.13%) and Tehsil Head Quarter (THQ) Lundkhwar having the lowest prevalence value (10.97%). Males had a prevalence of diabetes mellitus of 5.1%, while females had a prevalence of 10.44%. The overall rate of the diabetes mellitus disease was high in urban areas 7.52% as matched to the rural areas 6.75%. Diabetes mellitus prevalence was higher overall in married individuals (70%), compared to lower levels in unmarried people (30%). The prevalence of diabetes mellitus was highest in the age range 61-100 (11.25%), and lowest in the age range from 1-20 (4.68%). In this study we identified the total prevalence in district Mardan is 7.01%. The results shows a high prevalence in this area as per previous record. In this area, necessary

steps for the control of the disease should be agreed upon diabetes mellitus. In the beginning, lifestyle changes such as dietary modifications, exercise, and weight management may be recommended. This study's objectives were to ascertain the prevalence of diabetes mellitus and to inform people about its negative effects.

Keywords: DM, Age range, District Mardan, THQ, MMC, KP, Gender, Pakistan, Prevalence.

INTRODUCTION

Diabetes Mellitus, generally known as diabetes, is a habitual medical condition characterized by elevated blood sugar situations. It's associated with an adverse impact on the body's metabolic rate due to increased situations of glucose in the blood. This condition arises when the body fails to regulate blood sugar adequately, either due to inadequate insulin product or the incapability of the body's cells to respond effectively to insulin. preliminarily known as insulin-dependent diabetes mellitus(IDDM) or juvenile- onset diabetes, adult- onset diabetes or non-insulin-dependent diabetes mellitus (NIDDM), and bloodied glucose forbearance or bloodied fasting glucose, diabetes mellitus poses a significant global health concern affecting millions of individualities worldwide. Its frequency spans across colorful age groups, backgrounds, and cultures, making it a critical issue for healthcare systems, individualities, and societies as a whole (Balaji *et al*., 2019).

Even in developed countries like USA, UK and France etc a large number people are victims of this disease and their health care systems are paying huge expenses on its management. Therefore, in Pakistan being a developing country where per capita income is very low; hence majority of people are living in extreme poverty which increases their vulnerability to develop diabetes mellitus. Besides this imbalance diet, sedentary life style, poor hygienic conditions, lack of proper medical knowledge and suffering from certain infectious diseases are also the leading factors of increase in number of diabetes mellitus cases. The frequency of diabetes varies by region and country. It's more common in high- income countries but is also adding fleetly in low- and middle- income nations due to urbanization, changing dietary habits, and reduced physical activity. Diabetes has been on the rise globally over the past few decades (Ribbe *et al*., 1997).

The World Health Organization (WHO) estimates that the number of people with diabetes has nearly quadrupled since 1980. Moment, worldwide nearly 10 percent of the population has diabetes, according to the American Diabetes Association (ADA). That is 29.1 million Americans, and further than a quarter of these people don't know they've it. The ADA reports worldwide that the number of people who have diabetes increased by 382 percent from 1988 to 2014. In Pakistan the overall weighted frequency of diabetes was 26.3 percent, with 19.2 percent having preliminarily been diagnosed and 7.1 percent recently diagnosed. Diabetes was set up in 25.3 percent of pastoral Pakistanis population and 28.3 percent of civic population, independently (Hunt *et al*., 2021).

The primary symptoms of diabetes include increased thirst, frequent urination, unexplained weight loss, fatigue, and blurred vision. If left untreated, it can lead to serious complications, such as heart diseases like stroke, myocardial infarction (MI), coronary artery diseases (CAD), congestive heart failure (CHF) and valvular diseases, kidney diseases like nephritis, pyelonephritis and cystitis and nerve diseases like neuropathy, peripheral neuropathy, vision loss and numbness are also caused by diabetes. Also liver damage and poor wounds healing are caused by diabetes mellitus. However, it is noteworthy that the above symptoms and conditions should be properly ruled out as these are not necessarily be the ultimate outcomes of diabetes (Dwivedi *et al*., 2020).

There are several types of diabetes, with the two most common being, type 1 Diabetes (T1D).This form of diabetes is an autoimmune disease in which the immune system mistakenly attacks and destroys the insulin-producing beta cells in the pancreas. People with Type 1 diabetes require lifelong insulin therapy through injections or an insulin pump to maintain their blood sugar levels within a healthy range. It typically develops in childhood or adolescence, but it can occur at any stage of life. Its prevalence is relatively stable across different age groups. Type 1 diabetes accounts for a smaller percentage of all diabetes cases compared to Type 2 diabetes. It is estimated that approximately 510% of all diabetes cases are Type 1 (Rathod *et al*., 2022).

Type 2 Diabetes (T2D) is the most prevalent form of diabetes and is often associated with lifestyle factors such as obesity, physical inactivity, and poor diet. Type 2 diabetes is the most prevalent form of diabetes, accounting for the majority of cases worldwide. Around 90-95% of all diabetes cases are Type 2. Type 2 diabetes is more common in adults, particularly in those over the age of 45. However, due to increasing rates of obesity and sedentary lifestyles, it is increasingly being diagnosed in younger individuals, including adolescents. In Type 2 diabetes, the body's cells become resistant to insulin, and the pancreas may not be able to produce enough insulin to compensate. Initially, lifestyle changes, including dietary modifications, exercise, and weight management, may be recommended. Medications or insulin therapy may be necessary as the disease progresses (Hamasaki *et al*., 2016).

Many people have prediabetes, a condition in which blood sugar levels are elevated but not high enough to be classified as diabetes. Without intervention, many individuals with prediabetes will go on to develop Type 2 diabetes. The prevalence of prediabetes is also increasing globally. It is estimated that more than 470 million people worldwide have prediabetes. Glucose-6-phosphate dehydrogenase (G6PD) is the deficiency which is not directly related to diabetes, but it is an enzyme deficiency that can have an impact on glucose metabolism. G6PD deficiency is a genetic condition that affects the red blood cells and can lead to a condition called hemolytic anemia, where the red blood cells break down more easily than they should (Tuso *et al*., 2014).

The exact cause of Type 1 diabetes is not fully understood, but it is believed to involve a combination of genetic and environmental factors. It is thought to be an autoimmune condition where the body's immune system mistakenly attacks and destroys the insulin-producing beta cells in the pancreas. The primary causes of Type 2 diabetes are genetics and lifestyle factors. Genetics can make some individuals more susceptible to developing the condition. Lifestyle factors such as poor diet, sedentary behavior, obesity, and high stress levels can contribute to the development of insulin resistance and impaired insulin production. The exact cause of gestational diabetes is not fully understood, but it is believed to result from a combination of hormonal changes and underlying factors such as hormonal changes, preexisting insulin resistance, family history, age, obesity and previous large baby (Katsarou *et al*., 2017).

If diabetes is not properly managed, it can lead to various long-term complications, like cardiovascular disease, kidney disease, neuropathy, retinopathy, foot problems, skin complications, gastrointestinal issues, mental health problems, hypoglycemia and hyperglycemia. It's crucial for individuals with diabetes to work closely with healthcare professionals to develop a personalized management plan that includes monitoring blood sugar levels at different intervals of time, taking medications as prescribed, ensuring dietary and lifestyle changes, and addressing any complications to reduce the risk of any emergency condition arising due to diabetes so as to improve overall quality of life. Diabetes management is a lifelong procedure, and early intervention and proactive care are essential tools for maintaining good health (Papatheodorou *et al*., 2016).

Several risk factors increase the likelihood of developing Type 2 diabetes, including obesity, physical inactivity, poor diet (high in sugar and processed foods), family history of diabetes, age (risk increases with age, especially after 45), and certain ethnic backgrounds (such as African American, Hispanic, Native American, and Asian). There are several factors for diabetes mellitus which are mostly heredity like (Family History, Genetic Variants, Ethnic Background, Polygenic Risk and Epigenetics). Glucose tolerance is indeed a significant risk factor for developing diabetes mellitus, particularly Type 2 diabetes (T2D). Glucose tolerance refers to how well your body can regulate blood sugar (glucose) levels after consuming carbohydrates, typically assessed through an oral glucose tolerance test (OGTT). Normal Glucose Tolerance, Impaired Glucose Tolerance (IGT) and Impaired Fasting Glucose (IFG) are glucose factors for diabetes mellitus. Certain medical conditions can increase the risk of developing diabetes mellitus. These conditions can either contribute to insulin resistance or affect the functioning of the pancreas, leading to an increased likelihood of diabetes. Here are some medical conditions that are recognized as risk factors for diabetes mellitus such as polycystic ovary syndrome (PCOS), metabolic syndrome, chronic pancreatitis, acromegaly, sleep apnea, autoimmune diseases and high cholesterol level. Diagnosis of diabetes is typically based on blood tests that measure blood glucose levels. A fasting blood sugar test, oral glucose tolerance test,

or hemoglobin A1C test are common diagnostic tools. The blood samples are usually collected at medical laboratories which is neither costly nor more invasive. Normal range for fasting blood glucose sugar level is usually from 70-100mg/dl and 100-160mg/dl for random blood sugar (Wild *et al*., 2006).

Certainly, here is some additional information about the prevalence of diabetes mellitus, its impact on public health which is considered as a major public health issue globally. It not only affects individuals but also places a significant burden on healthcare systems and economies. The complications of diabetes, such as heart disease, stroke, kidney disease, blindness, and lower limb amputations, contribute to a reduced quality of life and increased mortality rates. Diabetes-related healthcare costs, including medication, hospitalizations, and management of complications, are substantial. These costs can strain healthcare budgets and limit access to care for those with diabetes. The disease can result in productivity losses due to absenteeism from work, reduced work capacity, and disability, impacting both individuals and society (Kim *et al*., 2006).

The prevalence of diabetes increases with age, particularly for Type 2 diabetes. However, as mentioned earlier, there is a concerning trend of an increasing number of younger individuals being diagnosed with Type 2 diabetes due to lifestyle factors. Historically, diabetes was more common in men, but the gender gap has been narrowing. Today, the prevalence of diabetes is relatively similar among men and women.

The prevalence of diabetes varies among different ethnic groups. Some populations, such as Indigenous peoples, certain Asian groups, and certain minority populations in high-income countries, have a higher risk of diabetes. Diabetes prevalence also varies by region and country. It is more common in some regions of the world, including the Middle East, North America, and certain Pacific Island nations. Addressing the rising prevalence of diabetes is a public health priority. Preventive measures, such as promoting healthy lifestyles, early detection and management of diabetes and prediabetes, and improved access to healthcare, are essential in reducing the burden of this chronic condition and its associated complications on individuals and healthcare systems worldwide. Public health initiatives and education campaigns are crucial in raising awareness and promoting healthier behaviors to combat diabetes. Preventing diabetes mellitus, particularly type 2 diabetes, involves adopting a healthy lifestyle and managing risk factors. While some risk factors, like genetics, can't be changed (Alberti *et al*., 2007).

The several precautionary measures you can take to reduce your risk of developing diabetes mellitus is the obesity which is a significant risk factor for type 2 diabetes. Adipose tissue can disrupt insulin sensitivity. A more detailed approach involves assessing your Body Mass Index (BMI), waist circumference, and body composition. Work with a healthcare provider or dietitian to develop a personalized weight management plan. Implement a nuanced approach to nutrition. Focus on the glycemic index (GI) of foods, which measures their impact on blood sugar. Low-GI foods, like whole grains, legumes, and non-starchy vegetables, can help stabilize blood sugar levels. Consider consulting with a registered dietitian for personalized meal planning. Beyond the recommended exercise guidelines, consider incorporating resistance training into your routine. Building lean muscle mass can improve insulin sensitivity. Additionally, high-intensity interval training (HIIT) has shown promise in managing blood sugar levels. Understand the complex relationship between smoking and diabetes. Smoking not only increases the risk of type 2 diabetes but also makes it more challenging to manage. Seek professional help, like smoking cessation programs or therapies, to quit successfully. When discussing alcohol, consider factors such as the type of alcohol and its carbohydrate content. Opt for drinks with lower sugar content and choose wine or spirits over sugary cocktails. Monitor your blood sugar levels when consuming alcohol to understand its individual impact on your body. Focus on staying hydrated with water, herbal teas, and unsweetened beverages. Be vigilant about hidden sugars in beverages, even seemingly healthy ones like fruit juices and flavored water. Check labels for added sugars and opt for alternatives with no or minimal added sugars (Wu *et al*., 2014).

Explore advanced stress management techniques, including biofeedback, cognitive-behavioral therapy (CBT), or mindfulness-based stress reduction (MBSR). These methods can help you develop a more profound understanding of your stress responses and how to mitigate them effectively. Delve

into the science of sleep hygiene. Create a sleep-friendly environment, establish a regular sleep schedule, and consider techniques such as cognitive-behavioral therapy for insomnia (CBT-I) if sleep disturbances persist. Take a comprehensive approach to regular check-ups. Besides blood sugar monitoring, discuss with your healthcare provider other risk factors such as blood pressure, cholesterol levels, and kidney function. Addressing these factors can contribute to better diabetes prevention and management. In some cases, individuals at high risk may benefit from medications such as GLP-1 receptor agonists, SGLT2 inhibitors, or even bariatric surgery. These interventions should be carefully considered and prescribed by healthcare professionals. Genetic testing and counseling can provide deeper insights into your genetic susceptibility to diabetes. This information can help guide your preventive strategies, including personalized dietary and lifestyle modifications. Consider the role of behavioral economics and social determinants of health. Behavioral economics principles can help you make healthier choices by understanding the psychology of decision-making. Addressing social determinants like access to nutritious food and safe environments is crucial for long-term prevention efforts. In short, preventing diabetes mellitus is a multifaceted endeavor that involves personalized approaches, advanced lifestyle modifications, and a thorough understanding of individual risk factors. Collaborate closely with healthcare providers, specialists, and dietitians to develop a comprehensive plan that suits your unique circumstances and risk profile. Diabetes prevention is not one-size-fits-all, and a tailored approach is often the most effective (Chiesa *et al*., 2009).

Considering the current diabetes situation in Khyber Pakhtunkhwa, this study was conducted to find out the average prevalence in district Mardan, Khyber Pakhtunkhwa, Pakistan.

AIMS AND OBJECTIVES

The following are the aims and objectives of the current study:

1. To determine the prevalence of diabetes Miletus type 1 and type 2 in district Mardan.
2. To ascertain the degree to which obesity, body mass index, age, and gender influence prevalence rates.
3. To lower the incidence of diabetes mellitus and enhance people's and communities' general health and well-being.

MATERIALS AND METHODS

Study Area

This study is being carried out in various parts of Pakistan's Khyber Pakhtunkhwa province's district Mardan. With a population of 2.7 million, district Mardan is the 19th largest city in Pakistan and spans an area of 1632 square kilometers (from 34° 05' to 34° 32' in north latitude and 71" 48' to 72° 25' in east longitude). It is bordered on the north by the Buner and Malakand protected areas; on the east by the Swabi and Buner districts; on the south by the Nowshera district; and on the west by the Charsadda and Malakand protected areas. Mardan known as the city of hospitality, is a city and headquarters of Mardan District in Khyber Pakhtunkhwa Province, Pakistan. Summer time brings with the intense heat. In June, the mercury rises to higher than 43.50°C. On the other hand, a sharp drop in temperature has been noted starting in October. The months of July, August, December, and January see the most rainfall. August has the highest recorded rainfall of 125.85 mm, making it the rainiest month.

Figure 1 Study Area

Figure 1: Study area and data collection center for Mardan District (figures were altered using Google.com)

The population of the Mardan region has grown by approximately four times since 1951. There are 1.46 million people, up from 357,000 in 1951, according to 1998 figures, representing an approximate 3% annual rate increase. The total area is 1632 square kilometers, and there are 894.7 people living there per square kilometer.

Study design

The present study is a cross sectional survey based study in which the data is collected from local survey throughout the main hospitals in district from random population. The data were collected from March 1 to October 31, 2023, in Mardan, Katlang and Takht Bhai tehsils in district Mardan.

Data collection

The information on suspected diabetic patients was gathered from a variety of sources, including the Mardan Medical Complex, the district headquarter hospital Mardan, the tehsil headquarter Katlang, the tehsil headquarter Takht Bhai, and the tehsil headquarter Lundkhwar.

Inclusion criteria

All HBA1c positive individuals were taken into account, whether they were healthy carriers or had diseases such as type 1 diabetes, type 2 diabetes, or prediabetes. **Exclusion criteria**

Patients with diabetes who also had other kind of diabetes like G6PD were not included in the analysis.

Laboratory Diagnosis

The information was gathered based on the outcomes of the subsequent test, which was carried out by the lab technicians.

Statistical Analyzation

Statistical techniques were applied to the collected data analysis such as Descriptive statistics, for example numerical summations, graphs and tables. Microsoft Excel 2016 was used to conduct the statistical analysis of the data.

RESULTS

The purpose of this study was to ascertain the general population's prevalence of diabetes mellitus (DM) in district Mardan. The information was gathered from March 2023 to October 2023. The data was collected through local survey from the selected area. A total of 556 samples were gathered from several hospitals in District Mardan, including Tehsil Head Quarter Lundkhwar, Tehsil Head Quarter Katlang, Tehsil Head Quarter Takht Bhai, and Mardan Medical Complex.

The overall prevalence of DM in general population of District Mardan is 7.01. The prevalence of diabetes mellitus disease in both male and female sex is summarized in Table 1.

Table: 4.1: Shows the total prevalence along with positive HBA1c and Percentage.

Sr. No.	Gender	Total number	Positive HBA1c	Negative HBA1c	Positive HBA1c %age	Negative HBA1c %age	Total P-Value
1	Male	355	18	337	5.1	94.9	
2	Female	201	21	180	10.44	89.56	7.01

A combination of 355 blood samples was obtained from male, with 18 of them being positive with a frequency of 5.1 %, and 201 samples from female with 21 being positive with a prevalence of 10.44%.

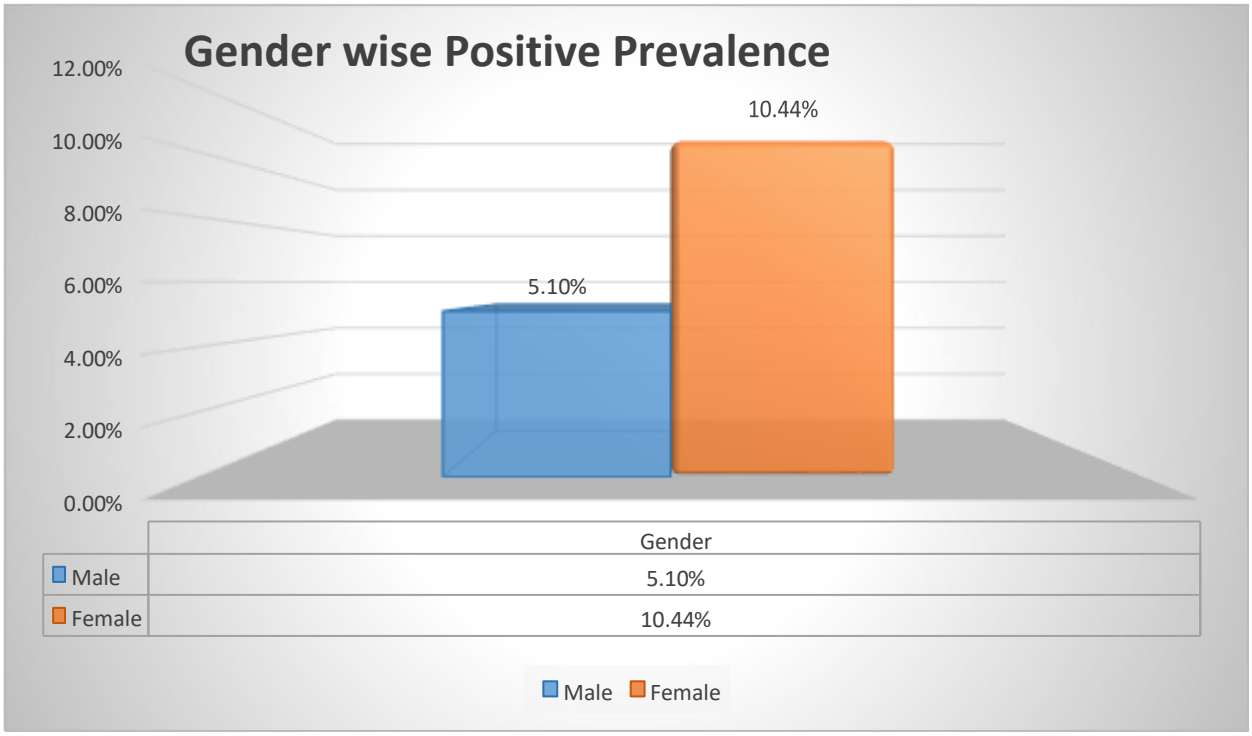


Figure 2: Gender wise Positive Samples

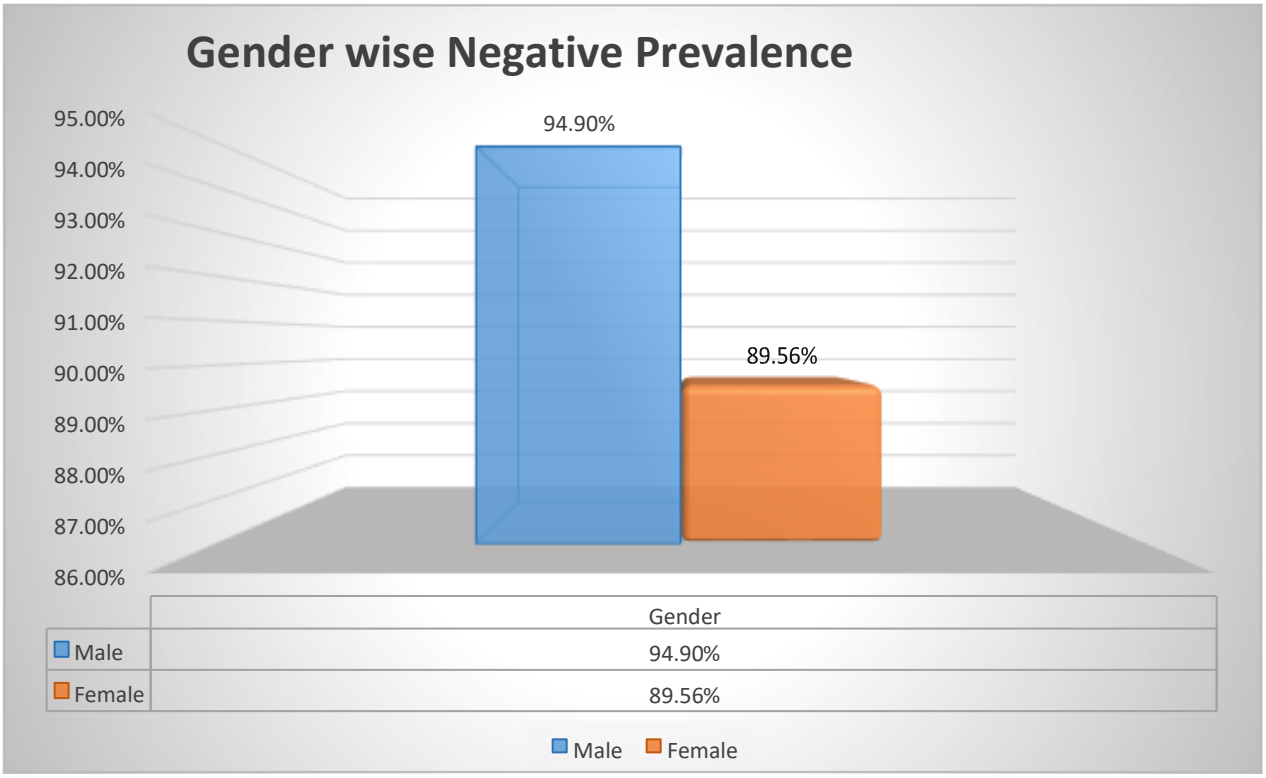


Figure 3: Gender wise Negative Samples

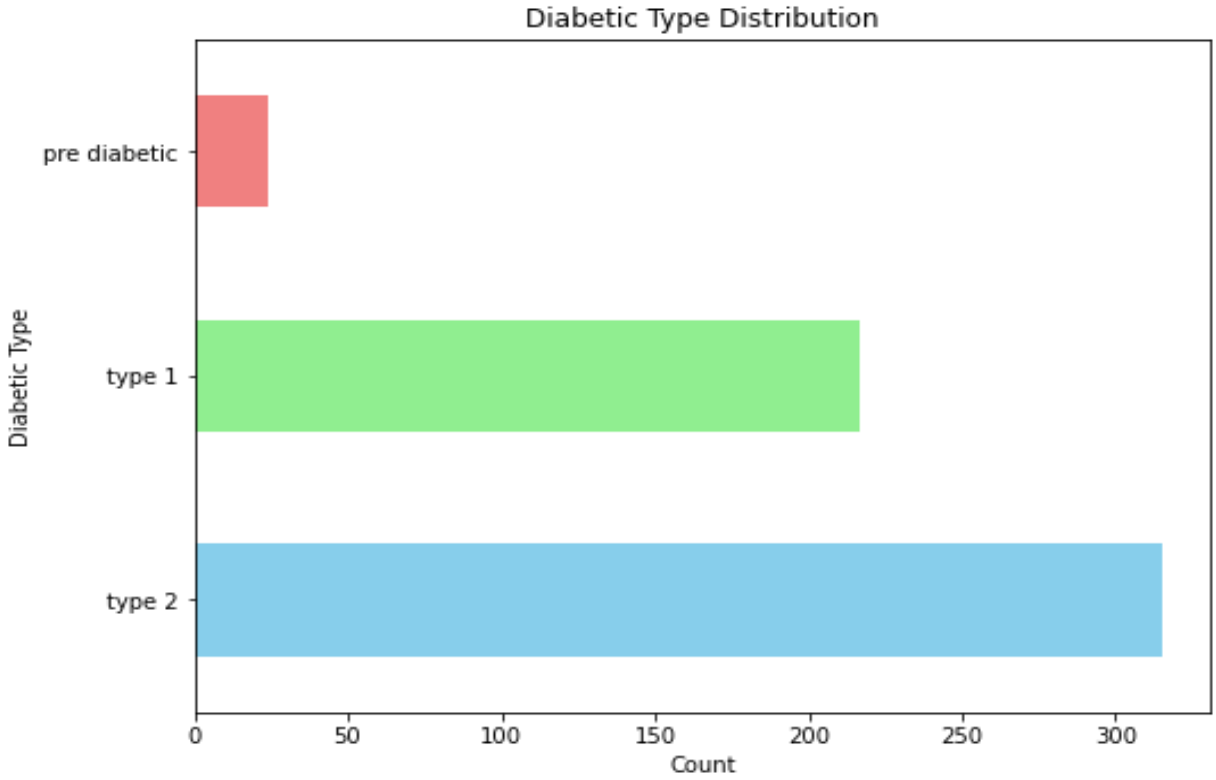


Figure 4: Diabetic Type Distribution

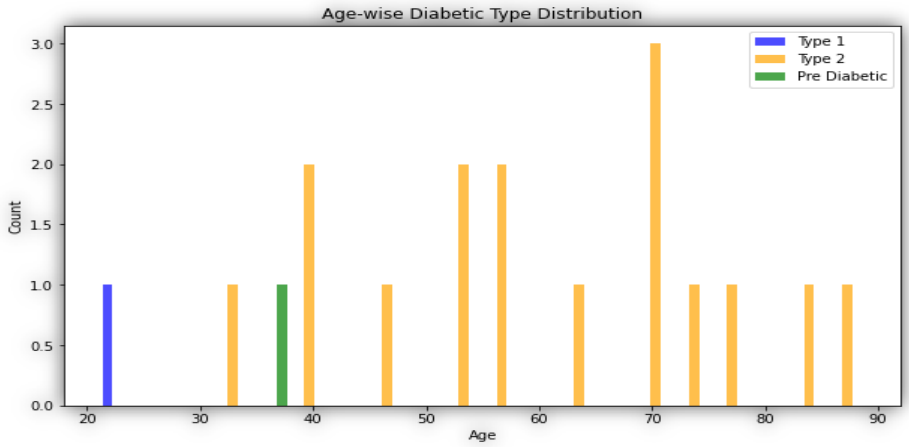


Figure 5: Age-wise Diabetic Type Distribution

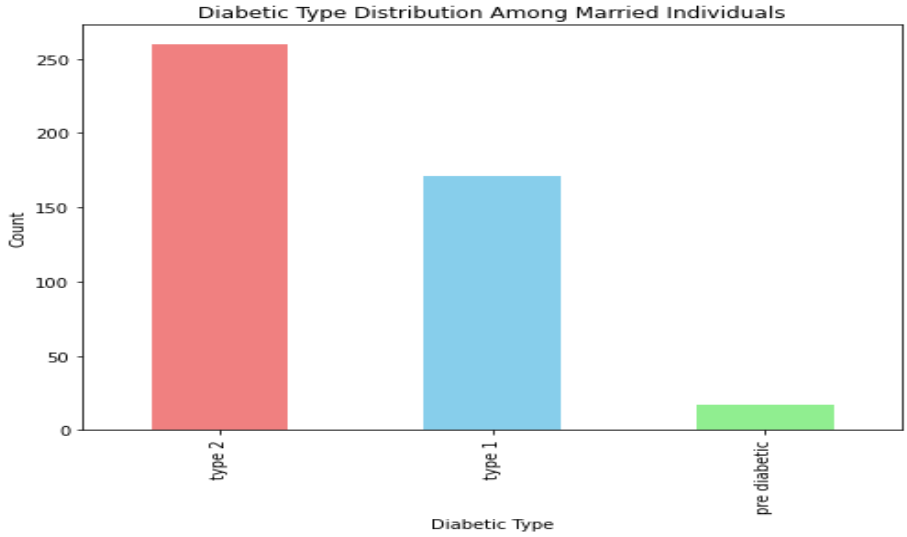


Figure 6: Diabetic Type Distribution among Married Individuals

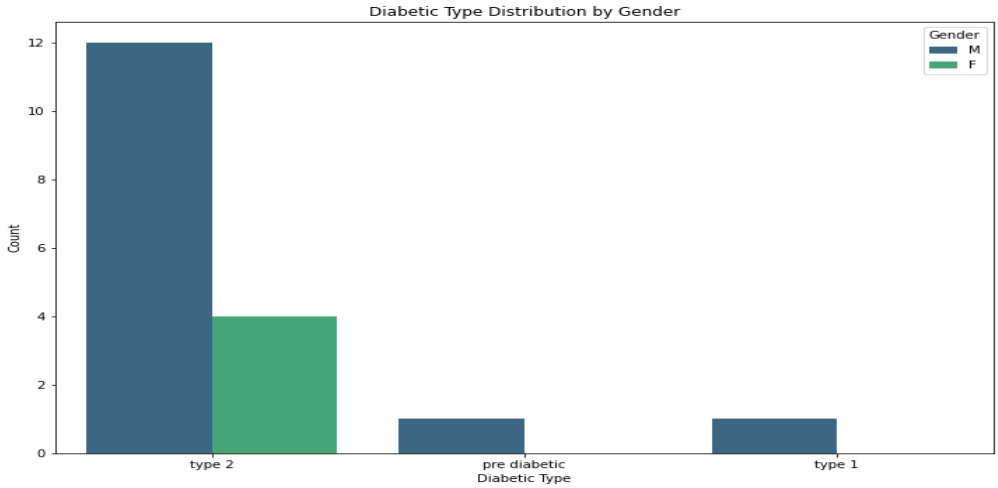


Figure 7: Diabetic Type Distribution by Gender

In a rural region, 370 samples were gathered, out of which 22 tested positive with percentage of 3.45% while 186 samples were collected from urban area in 19 were positive having the percentage of 4.55%.

Table 4.2: DM Prevalence by region

Area	Total	Positive	Prevalence of positive	Negative	Prevalence of negative
Rural	370	25	6.75	345	93.24
Urban	186	14	7.52	172	92.47

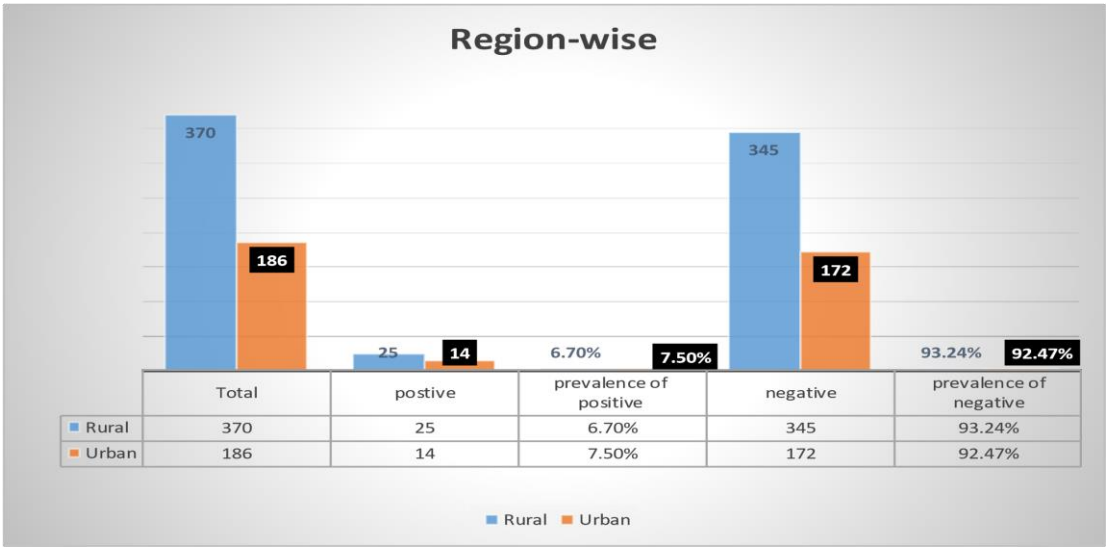


Figure 8: DM Prevalence by region

The following figure and table shows marital status of respondents that the majorities 389 of the respondents in the percent of 70% were married and the remaining 167 of the respondents which is 30 % were unmarried.

Table 4.3: shows the prevalence by marital status

Sr. No	Status	Samples	Percent
1	Married	389	70%
2	Un Married	167	30%
3	Total	556	

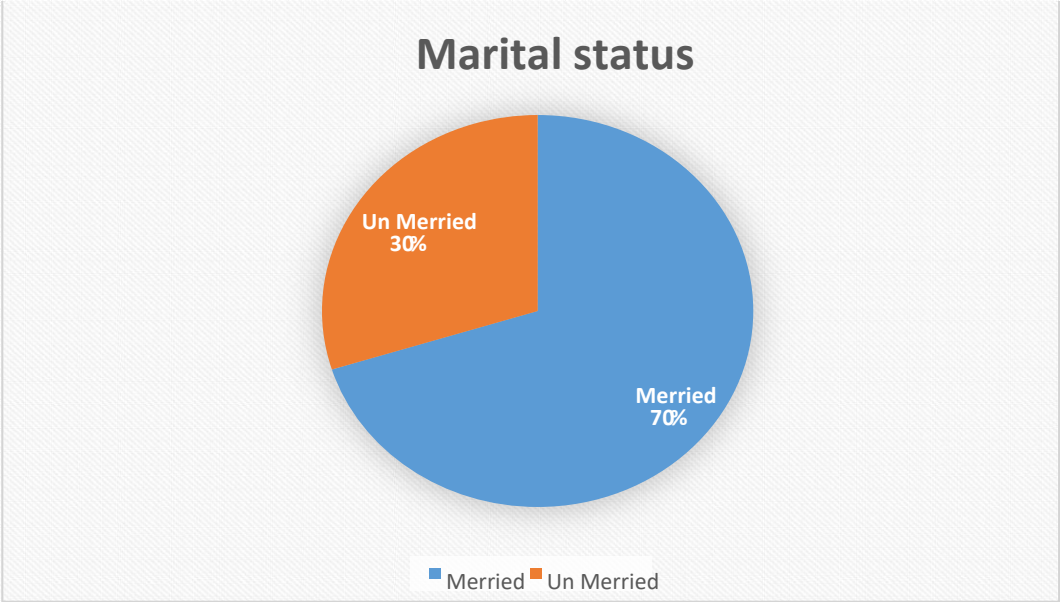


Figure 9 Diabetic Distribution by Marital Status

A total of 556 samples were collected from different hospitals, 162 samples were collected from MMC Mardan, 104 from DHQ Mardan, 122 from THQ Takht Bhai, 107 from THQ Katlang and 61 were collected from THQ Lundkhwar.

Table: 4.4: DM Prevalence by Hospital wise

Sr. No	Hospitals	Number of Collected Samples	Prevalence value
1	Mardan Medical Complex	162	29.13
2	District Head Quarter Hospital Mardan	104	18.70
3	Tehsil Head Quarter Hospital Takhtbhai	122	21.94
4	Tehsil Head Quarter Hospital Katlang	107	19.24
5	Tehsil Head Quarter Hospital Lundkhwar	61	10.97

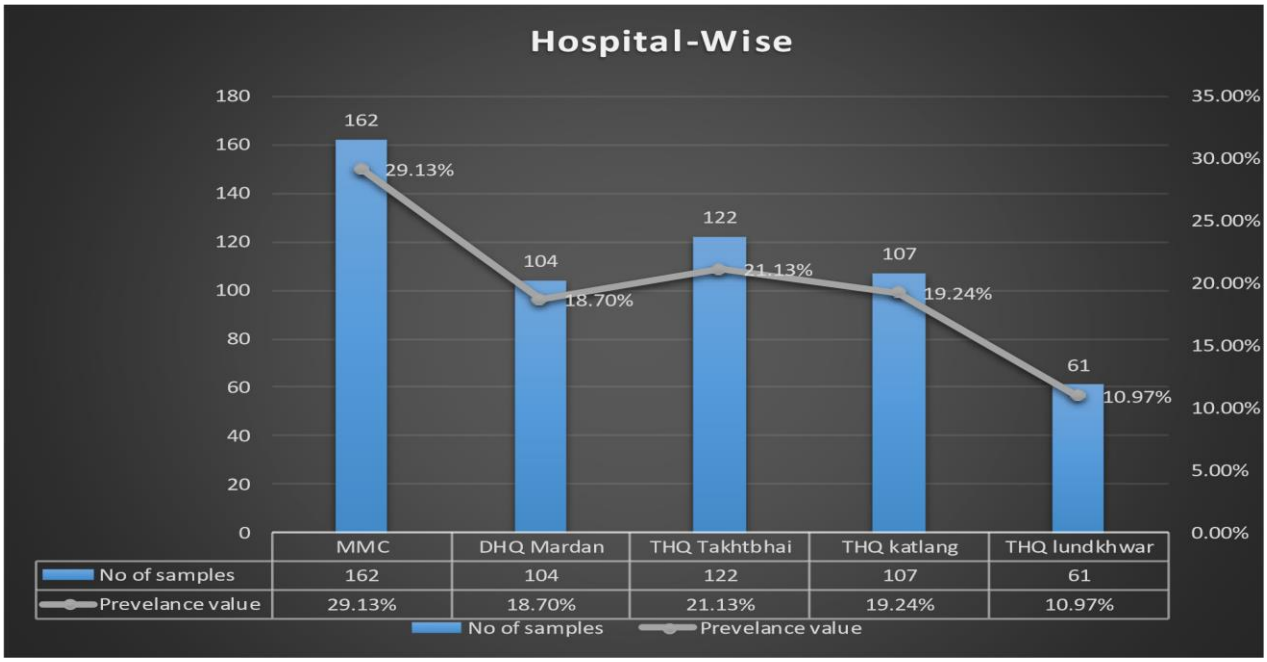
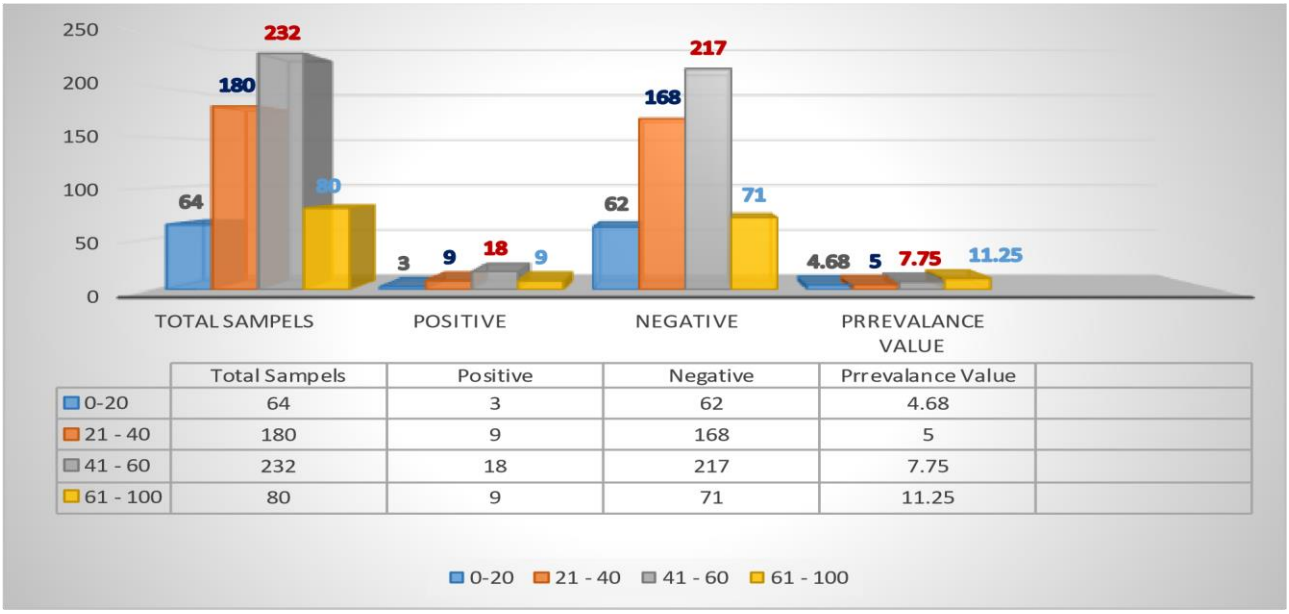


Figure 10: DM Prevalence by Hospital wise

From 1-20, a maximum of 64 samples were taken, 3 of which were positive at 4.68%. From 21-40, 180 samples were taken, and 9 of them were positive, which means it's 5.0%. There were 232 samples collected from 41-60, and 18 of them were positive, which means that 7.75 percent were positive. There were 80 samples taken from 61-100, and 9 were positive, which means that their prevalence value is 11.25%.

Table 4.5: Age wise distribution of males, females and their prevalence value

Sr. No	Age	Total Samples	Positive	Negative	Prevalence value
1	1-20	64	3	61	4.68
2	21-40	180	9	168	5.0
3	41-60	232	18	217	7.75
4	61-100	80	9	71	11.25



	Total Sampels	Positive	Negative	Prrevalance Value
0-20	64	3	62	4.68
21 - 40	180	9	168	5
41 - 60	232	18	217	7.75
61 - 100	80	9	71	11.25

Figure 11: Age wise distribution of males, females and their prevalence value

DISCUSSION

Diabetes mellitus (DM) is a chronic metabolic disorder characterized by elevated blood glucose levels (hyperglycemia) because of inadequate insulin synthesis or the body's inefficiency in utilizing insulin. The study is conducted to evaluate the prevalence of DM in district Mardan.

The study was performed by collecting 556 samples from different hospitals of district Mardan in which 39 samples having 7.01% are diabetic positive and 517 samples with the prevalence of 92.98% are diabetic negative. The prevalence of diabetes was found higher in females 10.44% as compared to males 5.1%. The recently published study by Meo *et al*., 2022 sheds light on some intriguing results regarding the prevalence of a specific condition in the Mardan region. While analyzing the data, it was discovered that there seems to be a contradicting difference in prevalence rates among men and women. Overall, the report states that the entire prevalence within the region stands at 6.9%.

When broken down by gender, however, it becomes apparent that females experience a significantly higher rate of incidence than males - 11.60% compared to 9.2%. This notable discrepancy demands further investigation to identify potential factors contributing to these disparate findings. Possible explanations for this variation may hinge upon biological distinctions between the sexes, sociocultural influences, or accessibility to healthcare services. Ultimately, understanding the underlying causal elements responsible for this disparity is crucial in the development of effective prevention and treatment strategies tailored specifically towards these varying populations.

In an area-wise comparison between rural and urban regions, it has been observed that urban areas experience a higher infection rate of 7.52% compared to 6.75% in rural areas. This significant difference can be attributed to the densely populated nature of urban centers, along with extensive population movement due to commercial interactions and trade with other cities.

To conduct a thorough study on this subject, a total of 556 samples were collected from various hospitals in the region. Among these samples, 162 were obtained from MMC Mardan, 104 from DHQ Mardan, 107 from THQ Katlang, 122 from THQ Takht Bhai, and the remaining 61 samples were collected from THQ Lundkhwar.

By analyzing these samples in greater depth, researchers hope to better understand the specific factors contributing to the disparity in infection rates between urban and rural areas and potentially inform public health policies aimed at mitigating the spread of diseases in both settings. A similar result was observed by Jawad *et al*., (2018), which found that the prevalence was higher in urban areas than in rural areas, suggesting that lifestyle factors such as diet and physical activity may have contributed to the increase in prevalence.

There was a major difference in marriage status of respondents in our study because 389 out of the respondents were married in the percentage of 70% while 167 out of them, which is 30%, were single. According to our study, 389 of the respondents were married and 167 were single. While Kazmi *et al*., (2022) concluded that the prevalence of diabetes was same for male and female participants. In other studies, the prevalence of diabetes ranged from 4.6% to 15%. In general, the prevalence of diabetes was higher in married older respondents.

However, diabetes was most commonly seen among women. In this study, patients were divided into four different age groups: ages 1 to 20 years, 21 to 40 years, 41 to 60 years, and 61 to 100 years. The outcome of this study indicates that the highest prevalence value (11.25%) was observed in group 60 to 100 years, and the lowest prevalence value (4.68%) was found in group 1 to 20 years. A study conducted by Huma *et al*., 2022, found that the prevalence rate of diabetes mellitus in individuals between the ages of 30 and 40 years was 50.4%, while the prevalence rate of diabetes mellitus in children between the ages of 1 and 20 years was 31.21 percent. According to the current study, diabetes mellitus is more common in people between the ages of 61 and 100. The reason is that Fasting Blood Sugar (FBS) levels were high in children aged 1 to 20 years old and Random Blood Sugar (RBS) levels were very high in those over 60 years of age.

The focus of our research was to determine the prevalence of diabetes mellitus among patients, taking into account factors such as gender, residence, location, age group, and marital status.

FINDINGS

The research study was carried out with the objective of determining the prevalence of diabetes mellitus among various demographics, specifically in relation to gender, geographic location, marital status, and age brackets. The overall prevalence rate of diabetes mellitus in the general populace of District Mardan was found to be 7.01%. A notable finding from the study is the higher prevalence of the condition among women (10.44%) as opposed to men (5.1%). Furthermore, it was observed that married individuals have a higher likelihood of being affected by diabetes mellitus compared to their unmarried counterparts. In addition, a higher prevalence rate was seen in urban areas (7.52%) as opposed to rural areas (6.75%). A particularly striking result was the significantly elevated prevalence value (11.25%) found in the age group spanning 60 to 100 years, while the lowest prevalence value (4.68%) was discovered among individuals aged 1 to 20 years. This extended description provides an in-depth analysis of the key findings from the study and highlights important demographic correlations with diabetes mellitus prevalence.

CONCLUSION

The most pervasive illness in our society is diabetes mellitus. The district of Mardan has a 7.01% overall prevalence of diabetes mellitus. According to this study's findings, Females have a higher probability of developing diabetes mellitus compared to males (5.1 % vs. 10.44%). Women are more effected because there are certain factors that may make women more susceptible to the condition or affect them differently like hormonal changes, weight distribution, limited physical activities, access to healthcare and psychosocial factors (stress, depression, and other psychosocial factors can impact eating habits and exercise routines). The high rate of this illness's prevalence in urban settings is largely due to pollution. Unproductive knowledge about diabetes mellitus disease, its transmission methods, and methods for prevention is prevalent in rural regions. In order to change people's attitudes of the diabetes mellitus, academic institutions and the media are crucial.

RECOMMENDATIONS:

Following are some of the recommendations for the diabetes mellitus disease; o It is important to raise the public awareness of this disease, particularly among individuals who live in rural regions. Diabetes mellitus can thus be reduced by taking such courses.

- Regularly consult a healthcare provider who specializes in diabetes management, such as an endocrinologist or a diabetologist. o Consistently check your blood sugar levels as recommended

by your medical professional. This enables you to comprehend how your body reacts to various foods, physical activities, and medications.

- For those who are overweight, even a minor weight loss can enhance insulin sensitivity and regulate blood sugar levels.
- Take prescribed medications or insulin as directed by your healthcare provider. o Understand how your medications work, their side effects, and how to administer insulin if prescribed.
- Limit alcohol consumption or avoid it altogether. o Educate yourself about diabetes and its management. Knowledge empowers you to make informed decisions.

LIST OF FIGURES

ABBREVIATIONS

- DM: Diabetes Mellitus
- WHO: World Health Organization
- IDDM: Insulin-dependent diabetes mellitus
- NIDDM: Non-insulin-dependent diabetes mellitus
- USA: united states of America
- UK : United kingdom
- ADA: American Diabetes Association
- MI: myocardial infarction
- CAD: coronary artery diseases
- CHF: congestive heart failure
- T1D: Type 1 diabetes
- T2D: Type 2 diabetes
- G6PD: Glucose-6-phosphate dehydrogenase

- IGT: Impaired Glucose Tolerance
- OGTT: oral glucose tolerance test
- IFG: Impaired Fasting Glucose
- PCOS: polycystic ovary syndrome
- HITT: high-intensity interval training
- BMI: Body mass index
- MBSR: mindfulness-based stress reduction
- GI: glycemic index
- CBT: cognitive-behavioral therapy
- THQ: Tehsil Head Quarter
- FBS: Fasting Blood Sugar
- RBS: Resting Blood Sugar
- PVD: Peripheral Vascular Disease

REFERENCES

1. Ribbe, Miel W., *et al*. "Nursing homes in 10 nations: a comparison between countries and settings." Age and ageing 26.suppl_2 (1997): 3-12.
2. Samad Shera, Abdul Basit, Asher Fawwad, Rubina Hakeem, Muhammad Yakoob Ahmedani 1998.
3. Shah, S. M., Luby, S., Rahbar, M. H., & Khan, A. W. (2001). Prevalence of diabetes among urban and rural population with health-related quality of life. International Journal of Diabetes in Developing Countries, 21(4), 227-234.
4. Wild, Sarah H., and Christopher D. Byrne. "Risk factors for diabetes and coronary heart disease." Bmj 333.7576 (2006): 1009-1011.
5. Kim, Soowon, and Barry M. Popkin. "Commentary: Understanding the epidemiology of overweight and obesity—a real global public health concern." International journal of epidemiology 35.1 (2006): 60-67.
6. Alberti, Kurt George Matthew Mayer, Paul Zimmet, and Johnathon Shaw. "International Diabetes Federation: a consensus on Type 2 diabetes prevention." Diabetic Medicine 24.5 (2007): 451463.
7. Saquib, N., Saquib, J., & Ahmed, T. (2008). Seroprevalences of hepatitis B and C among type 2 diabetics: A case–control study in a teaching hospital in Karachi, Pakistan. Journal of Infection in Developing Countries, 2(5), 373-377.
8. Gillett, Melissa J. "International expert committee report on the role of the A1C assay in the diagnosis of diabetes: diabetes care 2009; 32 (7): 1327–1334." The Clinical Biochemist Reviews 30.4 (2009): 197.
9. Chiesa, Alberto, and Alessandro Serretti. "Mindfulness-based stress reduction for stress management in healthy people: a review and meta-analysis." The journal of alternative and complementary medicine 15.5 (2009): 593-600.
10. Shamim, K., Rahman, M. U., & Luby, S. (2010). Understanding the social and cultural context of diabetes in rural Pakistan. Diabetic Medicine, 27(5), 574-579.
11. Zafar, Jamal, *et al*. "Prevalence and risk factors for diabetes mellitus in a selected urban population of a city in Punjab." JPMA-Journal of the Pakistan Medical Association 61.1 (2011): 40.

12. Tuso, Phillip. "Prediabetes and lifestyle modification: time to prevent a preventable disease." The Permanente Journal 18.3 (2014): 88.
13. Wu, Yanling, *et al*. "Risk factors contributing to type 2 diabetes and recent advances in the treatment and prevention." International journal of medical sciences 11.11 (2014): 1185.
14. Ullah, Fahim, *et al*. "Knowledge of diabetic complications in patients with diabetes mellitus." Journal of Ayub Medical College Abbottabad 27.2 (2015): 360-363.
15. Fawwad, A., Alvi, S. F., Basit, A., & Ahmedani, M. Y. (2015). HbA1c for diagnosis of type 2 diabetes. Pakistan Journal of Medical Sciences, 31(2), 422-426.
16. Shera, A. S., Jawad, F., & Maqsood, A. (2016). Prevalence of diabetes in Pakistan. Diabetes Research and Clinical Practice, 114, e10-e12.
17. Meo, Sultan Ayoub, *et al*. "Type 2 diabetes mellitus in Pakistan: Current prevalence and future forecast." JPMA. The Journal of the Pakistan Medical Association 66.12 (2016): 1637-1642.
18. sHamasaki, Hidetaka. "Daily physical activity and type 2 diabetes: A review." World journal of diabetes 7.12 (2016): 243.
19. Zia, Asima, *et al*. "Prevalence of type 2 diabetes–associated complications in Pakistan." International Journal of Diabetes in Developing Countries 36 (2016): 179-188.
20. Zafar, Jamal, et al. "Prevalence of diabetes and its correlates in urban population of Pakistan: A Crosssectional survey." J Pak Med Assoc 66.8 (2016): 922-927.
21. Papatheodorou, Konstantinos, et al. "Complications of diabetes 2016." Journal of diabetes research 2016 (2016).
22. Saleh, F., Mumu, S. J., Ara, F., Begum, H. A., & Ali, L. (2017). Knowledge and self-care practices regarding diabetes among newly diagnosed type 2 diabetes mellitus patients in Bangladesh: A cross-sectional study. BMC Public Health, 17(1), 1-10.
23. Katsarou, Anastasia, *et al*. "Type 1 diabetes mellitus." Nature reviews Disease primers 3.1 (2017): 117.
24. Baig, M., & Gazzaz, Z. J. (2017). Self-care among patients with diabetes in Pakistan. International Journal of Diabetes in Developing Countries, 37(4), 422-427.
25. Rahman, M. U., Shamim, K., Shaheen, F., Tariq, A., & Zafar, J. (2017). Prevalence of diabetes in Pakistan: A systematic review and meta-analysis. Pakistan Journal of Medical Sciences, 33(4), 1012-1017.
26. Jawad, F., Shahid, S. S., Zafar, A., & Riaz, M. (2018). Prevalence of type 2 diabetes mellitus among urban and rural population of Pakistan: A study from tertiary care hospital. Journal of Pakistan Medical Association, 68(3), 444-447.
27. Basit, Abdul, *et al*. "Prevalence of diabetes, pre-diabetes and associated risk factors: second National Diabetes Survey of Pakistan (NDSP), 2016–2017." BMJ open 8.8 (2018): e020961.
28. Cho, Nam H., *et al*. "IDF Diabetes Atlas: Global estimates of diabetes prevalence for 2017 and projections for 2045." Diabetes research and clinical practice 138 (2018): 271-281.
29. Khan, A., & Latif, A. (2018). Prevalence, risk factors, and awareness of type 2 diabetes mellitus among academic staff in two universities of Karachi, Pakistan. Diabetes, Metabolic Syndrome and Obesity: Targets and Therapy, 11, 355-361.
30. Balaji, R., Revathi Duraisamy, and M. P. Kumar. "Complications of diabetes mellitus: A review." Drug Invention Today 12.1 (2019).
31. Aamir, Azizul Hasan, *et al*. "Diabetes Prevalence Survey of Pakistan (DPS-PAK): prevalence of type 2 diabetes mellitus and prediabetes using HbA1c: a population-based survey from Pakistan." BMJ open 9.2 (2019): e025300.
32. Padmanabha, Usha Rani S., et al. "A study to assess the treatment adherence among patients with type 2 diabetes mellitus in rural and urban population of Bengaluru, South India." Int J Community Med Public Health 7 (2020): 3105-10.
33. Dwivedi, Mahendra, and Aadya Raj Pandey. "Diabetes mellitus and its treatment: an overview." J Adv Pharmacol 1.1 (2020): 48-58.
34. Hunt, Daniel, *et al.* "The WHO Global Diabetes Compact: a new initiative to support people living with diabetes." *The Lancet Diabetes & Endocrinology* 9.6 (2021): 325-327.

35. Huma F, Ayesha B, Asma A, Nargis S, Laiba and Fawad Ali. Occurrence and Distribution of Diabetes Mellitus in Mardan, Pakistan 5 May 2022.
36. Naseer, Shafia, *et al*. "Prevalence of diabetic complications in urban and rural population of Punjab." Pakistan Journal of Medical & Health Sciences 16.03 (2022): 69-69.
37. Rathod, Sanjay. "Novel insights into the immunotherapy-based treatment strategy for autoimmune type 1 diabetes." Diabetology 3.1 (2022): 79-96.
38. Kazmi T; Nagi MLF; Razzaq S; Hussnain S; Shahid N; Athar U. Burden of noncommunicable diseases in Pakistan. East Mediterr Health J. 2022; 28(11):798–804.