Original Article

Prevalence of Diabetes Mellitus and Chronic Complications of Diabetes Mellitus in District Buner Khyber Pakhtunkhwa, Pakistan

Imad Ali Khan[1], Samiyah Tasleem[2], Muhammad Razaq[3], Amina Rahat[4], Yasin Kayani[5], Tahir Azeem[6], Hasnain Zafar[7], Hameed Ur Rehman[8], Kausar Saeed[1]*

[1]Department of Zoology University of Buner Khyber Pakhtunkhwa, Pakistan.
[2]Department of Biotechnology & Hafiz Muhammad Ilyas Institute of Pharmacology & Herbal Science, Hamdard University, Pakistan.
[3]Assistant Professor Biochemistry, Rehman Medical College Peshawar, Pakistan.
[4]Department of Food & Nutrition, College of Home Economics, University of Peshawar, Pakistan.
[5]Staff Nurse Cardiac ICU, Hameed Latif Hospital Lahore, Pakistan.
[6]Department of Zoology, Kohat University of Science & Technology, KUST, Kohat, KP, Pakistan.
[7]M.Phil. Zoology, Institute of Zoology, Bahauddin Zakariya University Multan, Pakistan.
[8]Physical Education Teacher, Department of Elementary & Secondary Education, Government High School Teri, Karak KP, Pakistan.
Corresponding Author: Kausar Saeed, Physical Education Teacher; Email: kausarsaeed@yahoo.com
Conflict of Interest: None.

ABSTRACT

Background: Diabetes Mellitus (DM) is a significant global public health concern, particularly in developing countries like Pakistan. The Buner District of Khyber Pakhtunkhwa, Pakistan, presents a unique demographic and geographical setting for studying the prevalence and chronic complications of DM.

Objective: This study aimed to assess the prevalence of diabetes mellitus and its chronic complications in the Buner District, Khyber Pakhtunkhwa, Pakistan, and to understand the demographic distribution of the disease.

Methods: A comprehensive, area-specific study was conducted from March 2022 to August 2022, involving 753 patients across eight localities in the Buner District. Data were collected using questionnaires, interviews, and observations at various medical centers. Participants included individuals from both rural and urban areas, with a demographic split of 486 males (64.54%) and 267 females (35.45%). The study also investigated six types of chronic complications associated with DM. Data analysis was performed using Microsoft Excel 2016 and SPSS version 25.

Results: The study found that the prevalence of diabetes mellitus in the Buner District was significantly high, with a higher incidence in urban areas compared to rural ones. The prevalence of chronic complications of DM varied, with cardiovascular conditions being the most prominent, followed by neuropathy, nephropathy, ocular conditions, and foot diseases.

Conclusion: The study highlights a high prevalence of diabetes mellitus and its chronic complications in the Buner District, with urban areas showing a higher incidence. The findings underscore the need for targeted healthcare strategies and interventions in this region to address the growing burden of DM.

Keywords: Diabetes Mellitus, Prevalence, Chronic Complications, Buner District, Khyber Pakhtunkhwa, Pakistan, Public Health.

INTRODUCTION

Diabetes mellitus (DM), recognized as the most common endocrine disorder globally, affects over 100 million individuals, accounting for approximately 6% of the world's population (1). This metabolic condition, characterized by either a deficiency or ineffectiveness in insulin production by the pancreas, leads to fluctuations in blood glucose levels. These alterations can cause significant damage to various body systems, notably affecting the blood vessels, eyes, kidneys, heart, and nerves. DM stands out as a critical public health issue worldwide, primarily due to its chronic nature and the way it disrupts carbohydrate metabolism, leading to persistently elevated blood glucose levels. This disruption is attributed to compromised insulin secretion or action.

Two primary forms of DM are recognized: Type 1 DM, typically emerging in childhood and often associated with immune mechanisms, and Type 2 DM, which generally manifests later in life, particularly in the context of pancreatic diseases (2-4). The rise

in DM prevalence and its associated mortality rate not only places emotional and economic strain on patients but also imposes a considerable socioeconomic burden on national economies. The disease is a leading cause of cardiac-related deaths, blindness, renal failure, depression, and suicide. Additionally, diabetic foot amputations have become increasingly prevalent as the disease progresses (5). Diabetes mellitus is categorized into insulin-dependent diabetes mellitus (IDDM, Type I) and non-insulin dependent diabetes mellitus (NIDDM, Type II), with Type I being an autoimmune disease characterized by inflammation and destruction of insulin-secreting cells, and Type II marked by peripheral insulin resistance and impaired insulin secretion (6).

In 2011, an estimated 366 million people were living with DM, a figure projected to rise to 552 million by 2030. Notably, 80% of individuals with DM reside in low- and middle-income countries, and the disease was responsible for 4.6 million deaths in 2011 (7). The incidence of Type 2 DM, in particular, varies significantly across different geographical regions, influenced by environmental and lifestyle risk factors (8). Forecasts suggest that DM prevalence, especially Type 2, will continue to increase over the next two decades, with a significant proportion of this rise occurring in developing countries, predominantly affecting individuals aged between 45 and 64 years (9). Epidemiological studies on DM have provided invaluable insights into its natural history, prevalence, incidence, morbidity, and mortality across various populations globally.

The World Health Organization has noted an escalating trend of DM in developing countries. This study aimed to explore the prevalence of diabetes mellitus and its chronic complications in District Buner, Khyber Pakhtunkhwa, Pakistan, thereby contributing to a broader understanding of the disease's impact in this specific region (10-13). The findings from this study not only illuminate the prevalence of DM in District Buner but also highlight the urgent need for targeted interventions and policies to address this growing public health concern.

MATERIAL AND METHODS

The study examining the prevalence of Diabetes Mellitus and its chronic complications was conducted in the District Buner, located within the Malakand Division of Khyber Pakhtunkhwa (KPK), Pakistan. Encompassing an area of 1865 km2, this district is home to approximately 506,048 individuals. Geographically, it is bordered by the Hazara division to the east, Mardan district to the south, Malakand agency to the west, and Swat district to the north, situated between latitudes 34°11′ and 34°43′ North, and longitudes 72°13′ and 72°45′ East (11, 14-17).

The primary data for this study were collected using diverse methods, including questionnaires, interviews, focus group discussions, observation, case studies, and diaries. The questionnaires comprised a series of questions pertaining to Diabetes and its chronic complications. Data collection occurred across various union councils and hospitals in the District Buner, including Buner Medical Complex, DHQ Daggar, and Buner Medical Center Daggar Buner. The data encompassed a wide range of risk factors such as age, gender, family history, and dietary habits.

For the analysis of the collected data, a rigorous statistical approach was employed. The data on Diabetes Mellitus and its chronic complications were processed and analyzed using Microsoft Excel 2016. To enhance the study's robustness and analytical depth, data analysis was also conducted using the Statistical Package for the Social Sciences (SPSS) version 25. This allowed for a comprehensive examination of the data, facilitating the identification of significant patterns and relationships.

An essential aspect of the study was adhering to ethical standards. The research protocol, including the methods of data collection and analysis, was reviewed and approved by an appropriate ethics committee. Participants were informed about the purpose of the study and their participation was voluntary, with informed consent obtained from each participant. Confidentiality and privacy of participant data were maintained throughout the study.

This study, conducted in the District Buner of Pakistan, utilized a multifaceted data collection approach, and employed advanced statistical analysis techniques to explore the prevalence and risk factors associated with Diabetes Mellitus and its chronic complications. The adherence to ethical standards ensured the integrity and reliability of the research findings.

RESULTS

In the study conducted in District Buner, a total of 753 cases of diabetes mellitus and its chronic complications were reported across various age groups ranging from 10 to 70 years and among both males and females. The gender breakdown revealed 486 male (64.54%) and 267 female (35.45%) patients. Age-wise, the highest prevalence (53%) was observed in individuals aged 30 to 50 years, followed by those aged 50 to 70 years (29%), and the lowest prevalence (18%) in the 10 to 30 years age group.

The study also examined the prevalence of diabetes in different localities of Buner district, finding varying rates: Jowar (20.31%, 153 cases), Torwarsak (15.13%, 114 cases), Barkaly (12.88%, 97 cases), Nagray (11.42%, 86 cases), Malka (10.49%, 79 cases), Chenglay (9.69%, 73 cases), Pirbaba (14.20%, 107 cases), and the lowest in Chagarzee (5.84%, 44 cases), totaling 753 cases.
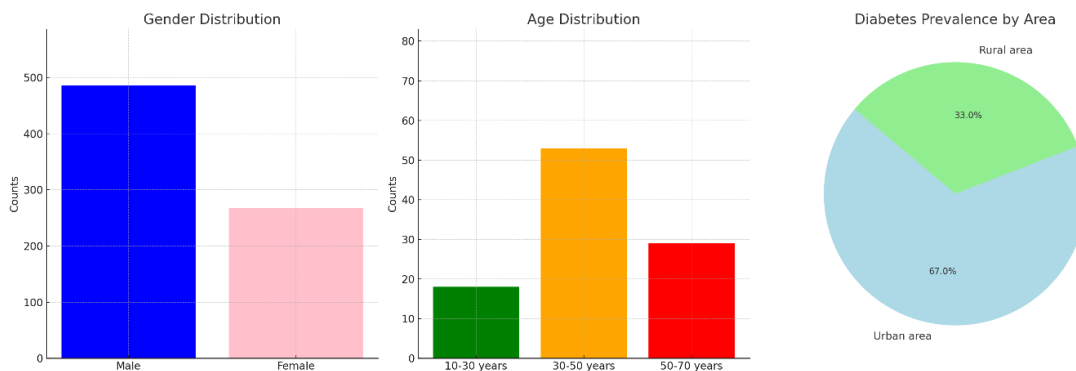
Figure 1 Demographic Characteristics

Additionally, the study differentiated between urban and rural areas, noting a higher prevalence of diabetes in urban regions. Over a six-month period, the month-wise prevalence was highest in April and lowest in August.

The study further identified six chronic complications of diabetes mellitus: foot diseases, ocular conditions, nephropathy, neuropathy, cerebrovascular, and cardiovascular conditions, highlighting the diverse impacts of diabetes on patient health in District Buner.

Table 1 Locality and Percentage

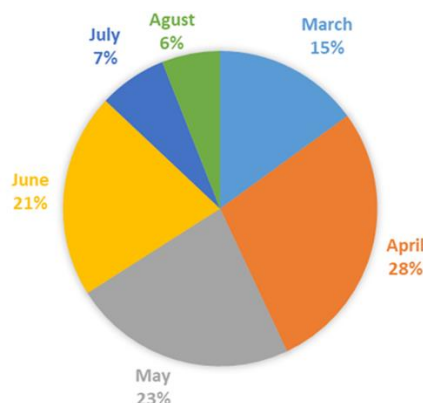| S. No	Locality	Number of Samples	Percentage
1	Jowar	153	20.31%
2	Torwarsak	114	15.13%
3	Barkaly	97	12.88%
4	Nagray	86	11.42%
5	Malka	79	10.49%
6	Chagarzee	44	5.84%
7	Pirbaba	107	14.20%
8	Chenglay	73	9.69%
	Total	753	100%

Figure 2 Month wise reported prevalence

DISCUSSION

The study conducted in the Buner District of Pakistan, spanning from March 2022 to August 2022, offers significant insights into the prevalence and chronic complications of diabetes mellitus. This area-specific research, involving 753 patients across eight localities including Jowar, Barkaly, Nagray, Malka, Chagarzee, Chenglay, Pirbaba, and Torwarsak, provides a detailed view of the diabetes landscape in this region. The methodology involved the use of questionnaires administered by surgeons, medical specialists, and physicians, alongside daily visits to various medical centers and DHQ Daggar in Buner. The demographic split of the participants was 64.54% male (486) and 35.45% female (267). Chronic complications of diabetes mellitus, such as foot diseases, ocular conditions, nephropathy, neuropathy, cerebrovascular, and cardiovascular conditions were also investigated in this study (18-20).

Comparatively, the World Health Organization has reported an increase in diabetes mellitus in developing countries, with the current prevalence of type 2 diabetes mellitus in Pakistan being 11.77%—11.20% in males and 9.19% in females. Notably, the prevalence varied across provinces, with the highest in Sindh (16.2% in males and 11.70% in females) and the lowest in Khyber Pakhtunkhwa (9.2% in males and 11.60% in females). Urban areas showed a higher prevalence (14.81%) compared to rural areas (10.34%) in Pakistan (21-24). Our study corroborated these findings, observing a higher prevalence of diabetes mellitus in urban areas of Buner District compared to rural areas.

The prevalence of chronic diabetes complications in Pakistan ranged from 8.1% to 41.5% for retinopathy, 21% to 22% for albuminuria, 6.7% to 46.3% for nephropathy, and 21.9% to 60% for neuropathy. However, our study identified six different types of chronic

complications, with cardiovascular conditions being more prominent, and foot diseases showing the lowest range. This highlights the diverse impact of diabetes mellitus in Buner District compared to the broader national context (25-28).

The strength of this study lies in its comprehensive approach to understanding diabetes mellitus in a specific region, providing valuable data for local healthcare planning. However, there are limitations to consider. The study's regional focus may limit the generalizability of the findings to other areas. Additionally, the reliance on self-reported data could introduce bias.

Future research should aim to expand the geographical scope and incorporate longitudinal data to better understand the progression of diabetes and its complications. Further investigation into the underlying causes of the regional differences in diabetes prevalence and complications could also be beneficial. This would provide a more nuanced understanding of the disease and aid in the development of targeted interventions.

CONCLUSION

In conclusion, this study offers a detailed examination of diabetes mellitus and its chronic complications in the Buner District of KPK, Pakistan. It contributes significantly to our understanding of the prevalence and nature of diabetes in this specific region, and underscores the need for region-specific healthcare strategies to address this growing public health concern.

REFERENCES

1.   Ismail MYM, Yaheya M. Clinical evaluation of antidiabetic activity of Trigonella seeds and Aegle marmelos leaves. World Applied Sciences Journal. 2009;7(10):1231-4.

2.   Azeem S, Khan U, Liaquat A. The increasing rate of diabetes in Pakistan: A silent killer. Annals of Medicine and Surgery. 2022;79.

3.   Mukhtar Y, Galalain A, Yunusa U. A modern overview on diabetes mellitus: a chronic endocrine disorder. European Journal of Biology. 2020;5(2):1-14.

4.   Redondo MJ, Hagopian WA, Oram R, Steck AK, Vehik K, Weedon M, et al. The clinical consequences of heterogeneity within and between different diabetes types. Diabetologia. 2020;63:2040-8.

5.   Qidwai W, Ashfaq T. Imminent epidemic of diabetes mellitus in Pakistan: issues and challenges for health care providers. 2010.

6.   Arora S, Ojha SK, Vohora D. Characterisation of streptozotocin induced diabetes mellitus in swiss albino mice. Global Journal of Pharmacology. 2009;3(2):81-4.

7.   Olokoba AB, Obateru OA, Olokoba LB. Type 2 diabetes mellitus: a review of current trends. Oman medical journal. 2012;27(4):269.

8.   Zimmet P, Alberti K, Shaw J. Global and societal implications of the diabetes epidemic. Nature. 2001;414(6865):782-7.

9.   Wild S, Roglic G, Green A, Sicree R, King H. Global prevalence of diabetes: estimates for the year 2000 and projections for 2030. Diabetes care. 2004;27(5):1047-53.

10.   Abdullah S, Sarwar N, Khan MB, Khan FU, Afridi M. DETERMINANTS OF POOR ADHERENCE TO ANTIDIABETIC MEDICINE AMONG ADULT PATIENTS OF TYPE 2 DIABETES MELLITUS IN DISTRICT PESHAWAR, PAKISTAN: A CROSS-SECTIONAL STUDY.

11.   Magliano DJ, Sacre JW, Harding JL, Gregg EW, Zimmet PZ, Shaw JE. Young-onset type 2 diabetes mellitus—Implications for morbidity and mortality. Nature Reviews Endocrinology. 2020;16(6):321-31.

12.   Mekala KC, Bertoni AG. Epidemiology of diabetes mellitus. Transplantation, bioengineering, and regeneration of the endocrine pancreas: Elsevier; 2020. p. 49-58.

13.   Metwally AA, Mehta P, Johnson BS, Nagarjuna A, Snyder MP. COVID-19–induced new-onset diabetes: trends and technologies. Diabetes. 2021;70(12):2733-44.

14.   Akhtar N, Ilyas M, Muhammad K, Shams S, Saeed K, Asadullah A. Prevalence of Hepatitis C virus infections among the general population of Buner, Khyber Pakhtunkhwa, Pakistan. Biomedical Research and Therapy. 2016;3(12):1003-17.

15.   Group TS. Long-term complications in youth-onset type 2 diabetes. New England Journal of Medicine. 2021;385(5):416-26.

16.   Liu J, Ren Z-H, Qiang H, Wu J, Shen M, Zhang L, et al. Trends in the incidence of diabetes mellitus: results from the Global Burden of Disease Study 2017 and implications for diabetes mellitus prevention. BMC public health. 2020;20:1-12.

17.   Lovic D, Piperidou A, Zografou I, Grassos H, Pittaras A, Manolis A. The growing epidemic of diabetes mellitus. Current vascular pharmacology. 2020;18(2):104-9.

18.   Dżygało K, Nowaczyk J, Szwilling A, Kowalska A. Increased frequency of severe diabetic ketoacidosis at type 1 diabetes onset among children during COVID-19 pandemic lockdown: an observational cohort study. Pediatric Endocrinology Diabetes and Metabolism. 2020;26(4):167-75.

19.   Faselis C, Katsimardou A, Imprialos K, Deligkaris P, Kallistratos M, Dimitriadis K. Microvascular complications of type 2 diabetes mellitus. Current vascular pharmacology. 2020;18(2):117-24.

20.   Genco RJ, Graziani F, Hasturk H. Effects of periodontal disease on glycemic control, complications, and incidence of diabetes mellitus. Periodontology 2000. 2020;83(1):59-65.

21.   Abdul Basit K, Fawwad A, Mustafa N, Davey T, Tahir B, Basit A. Changes in the prevalence of diabetes, prediabetes and associated risk factors in rural Baluchistan; a secondary analysis from repeated surveys (2002–2017). Plos one. 2023;18(4):e0284441.

22.   Ahlqvist E, Prasad RB, Groop L. Subtypes of type 2 diabetes determined from clinical parameters. Diabetes. 2020;69(10):2086-93.

23.   Alam S, Hasan MK, Neaz S, Hussain N, Hossain MF, Rahman T. Diabetes Mellitus: insights from epidemiology, biochemistry, risk factors, diagnosis, complications and comprehensive management. Diabetology. 2021;2(2):36-50.

24.   Amidei CB, Fayosse A, Dumurgier J, Machado-Fragua MD, Tabak AG, van Sloten T, et al. Association between age at diabetes onset and subsequent risk of dementia. Jama. 2021;325(16):1640-9.

25.   Bos M, Agyemang C. Prevalence and complications of diabetes mellitus in Northern Africa, a systematic review. BMC public health. 2013;13(1):1-7.

26.   Bello-Chavolla OY, Bahena-López JP, Vargas-Vázquez A, Antonio-Villa NE, Márquez-Salinas A, Fermín-Martínez CA, et al. Clinical characterization of data-driven diabetes subgroups in Mexicans using a reproducible machine learning approach. BMJ Open Diabetes Research and Care. 2020;8(1):e001550.

27.   Cloete L. Diabetes mellitus: an overview of the types, symptoms, complications and management. Nursing Standard (Royal College of Nursing (Great Britain): 1987). 2021;37(1):61-6.

28.   Cole JB, Florez JC. Genetics of diabetes mellitus and diabetes complications. Nature reviews nephrology. 2020;16(7):377-90.