DOI: https://doi.org/10.53350/pjmhs020231712470

ORIGINAL ARTICLE

Inadequate Care during the Management of Type-2 Diabetes Mellitus: Prevalence and Associated Characteristics

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ABSTRACT

Introduction: Type-2 diabetes mellitus (T2DM) is a chronic metabolic disorder marked by insulin resistance, progressive beta-cell dysfunction, and hyperglycemia, representing one of the most prevalent non-communicable diseases worldwide.

Objective: The main objective of the study is to find inadequate care during the management of type-2 diabetes mellitus: prevalence and associated characteristics.

Methodology: This cross-sectional study was conducted at Hayatabad Medical Complex, Peshawar, Pakistan during March 2022 to June 2023. Data include 220 patients suffering from type II DM. Demographic data included age, gender, education level, occupation, and socioeconomic status. Demographic and clinical variables included the duration of diabetes, co-morbid conditions like hypertension, dyslipidemia, HbA1c levels, and complications of diabetes were documented.

Results: A total of 220 patients with type-2 diabetes mellitus (T2DM) participated in the study. The mean age of participants was 52.4 years (SD ± 10.6), with 55% being female and 45% male. The majority of patients (62%) were from middle-income households, and 48% had completed secondary education or higher. The average duration of diabetes was 8.3 years (SD ± 5.1), and 72% of patients reported at least one comorbidity, such as hypertension (54%) or dyslipidemia (39%). Poor dietary practices were the most prevalent issue, affecting 64% of patients, followed by low medication adherence at 57%. Systemic barriers also played a significant role, with 45% experiencing difficulty accessing healthcare, 22% facing financial barriers, and 18% reporting limited availability of medications.

Conclusion: It is concluded that inadequate care in type-2 diabetes mellitus management remains a significant challenge, driven by poor glycemic control, behavioral and psychosocial barriers, and systemic limitations in healthcare access.

Keywords: Patients, Type II DM, Dietary, Medication, Demographic, Hypertension

INTRODUCTION

Type-2 diabetes mellitus (T2DM) is a chronic metabolic disorder marked by insulin resistance, progressive beta-cell dysfunction, and hyperglycemia, representing one of the most prevalent non-communicable diseases worldwide. T2DM cases increased significantly over the past decades affecting more than 500 million people today mainly because of modifiable lifestyle factors, increased life span, and obesity[1]. Although there are discoveries about T2DM, days' care remains to be suboptimal making it a prevalent issue, leading to new medical complications that can be averted. Working hard permeates the management process and requires interrelated approaches that would include changes to living habits, medication, and constant checks on blood sugar. However, reaching and maintaining these targets remains rather difficult because there are numerous barriers at the patient, provider, and healthcare system levels[2].

Imprecise care involves failure to diagnose T2DM early enough, failure to educate patients about the disease and how to live with it, failure to maintain optimal blood sugar levels, and failure to adhere to standard treatment protocols[3]. They risk non-achievement of personalized glycemic goals, lack of diligence in performing screening for complications, and inadequate utilization of agents demonstrated to decrease cardiovascular and renal risks. In addition, they concluded that poor care widens the cost of diabetes, which consequently absorbs the overall standard of living of the diagnosed people[4]. As a consequence, the deficiency of adequate care is not consistent worldwide depending only on the population and the healthcare industry services they need sometimes owing to the lack of attention and the healthcare industry breakdown and culture relating to disease management globally[5]. Challenges are higher in LMICs such as inadequate health human resources, overall poor access to major classes of medicines, and cost barriers. When it comes to high-income countries, minorities face inequalities and access disparities, insufficient health literacy, and system issues. Type 2 Diabetes mellitus is a relatively prevalent disease as one in eleven persons in the United States is diagnosed with this disease every year[6].T2DM is also a disabling chronic disease that needs vigorous management because otherwise severe complications from diabetes may be expected. If T2DM management is suboptimal, a patient is at risk for microvascular complications such as neuropathy, nephropathy, retinopathy, and macrovascular effects, including stroke, ischemic heart disease, and amputation[7]. Therefore, another important task of T2DM care is the control of complications resulting from the disease. The ADA in its annually updated Standards of Medical Care in Diabetes provides guidance on evaluating and managing T2DM. Due to this, ADA guidelines recommend tighter control of T2DM to avoid the disease state worsening[8].This has called for the following yearly management plan; managing complications of diabetes, proper use of antihyperglycemic agents, implementation of lifestyle changes, performing and encouraging appropriate screening tests of T2DM, poor care is still a persistent problem and leads to overall inferior quality of life with additional preventable complications[9]. Reasonable management of the condition requires the use of lifestyle alterations, drug treatments, and continual blood glucose level monitoring. Despite it, attaining and sustaining such goals is not always easy because of different hurdles at the patient, provider, and healthcare organization levels[10].Lack of proper care in T2DM management basically has many facets including diagnostic delay, lack of patient information, suboptimal glycemic control and irregular compliance to printed directives[11]. They have attributed it to poor attainment of personal glycemic goals, lack of regular screening for complications, inadequate use of therapies known to decrease cardiovascular and renal morbidity. Second, neglect also increases the cost of diabetes contributing to higher levels of healthcare spending and decreased quality of life for patients[12].Globally, the prevalence of inadequate care varies across populations and healthcare settings, reflecting disparities in access to resources, cultural attitudes toward disease management, and the quality of healthcare infrastructure. Low- and middle-income countries (LMICs) face disproportionate challenges, including insufficient healthcare workforce, limited

Received on 19-07-2023
Accepted on 17-11-2023

availability of essential medications, and financial barriers to care. Even in high-income countries, underserved populations often experience gaps in care due to socioeconomic inequities, health literacy deficits, and systemic inefficiencies[13].

Objective: The main objective of the study is to find inadequate care during the management of type-2 diabetes mellitus: prevalence and associated characteristics.

METHODOLOGY

This cross-sectional study was conducted at Hayatabad Medical Complex, Peshawar, Pakistan during March 2022 to June 2023. Data include 220 patients suffering from type-II DM.

Inclusion Criteria:

- Adults aged 18 years or older.
- Diagnosed with T2DM for at least one year.
- Currently undergoing treatment for diabetes, including lifestyle modifications, oral hypoglycemic agents, or insulin therapy.

Exclusion Criteria:

- Patients with type-1 diabetes mellitus, gestational diabetes, or secondary forms of diabetes.
- Individuals with severe comorbidities requiring palliative care.
- Patients unwilling to provide informed consent.

Data Collection: Data were collected through systematically designed questionnaire and from medical records. A standardized questionnaire, pre-tested for clarity and reliability, was used to gather detailed information from patients about their demographic, clinical, behavioral, and healthcare-related factors. Demographic data included age, gender, education level, occupation, and socioeconomic status. Demographic and clinical variables included the duration of the diabetes, co-morbid conditions like hypertension, dyslipidemia, HbA1c levels, and complications of diabetes were documented. Healthy behavioral data addressed such aspects as and compliance with the prescribed medications and doctor's orders, diet and physical activity, use of tobacco products and alcohol. Healthcare utilization was captured with regard to follow-up visits, affordability of drugs/frequency of obtaining drugs, and utilization of aggressive diabetes regimes. Diabetes-related stress, depression, and health literacy were assessed using the respective self-reporting questionnaires and standardized cut-off scores. Further, anthropometric measurements consisted of weight, height, and blood pressure in conjunction with foot examinations for complications such as diabetic neuropathy or ulcer. Glycemic and metabolic control were evaluated using fasting blood glucose, HbA1c, and lipid profile collected from the medical records in the laboratory respectively. This comprehensive data collection process made it possible to identify those factors that predispose patients to inadequate care in the management of type-2 diabetes mellitus.

Statistical Analysis: Data were analyzed using SPSS v29. Descriptive statistics were used to summarize patient characteristics and prevalence rates of inadequate care. Multivariate logistic regression analysis was performed to identify independent predictors of inadequate care, with results presented as odds ratios (OR) and 95% confidence intervals (CI).

Ethical Considerations: The study was conducted in compliance with ethical standards, and approval was obtained from the institutional ethics review board. Written informed consent was obtained from all participants before data collection, and confidentiality was maintained throughout the study.

RESULTS

A total of 220 patients with type-2 diabetes mellitus (T2DM) participated in the study. The mean age of participants was 52.4 years (SD ± 10.6), with 55% being female and 45% male. The majority of patients (62%) were from middle-income households, and 48% had completed secondary education or higher. The average duration of diabetes was 8.3 years (SD ± 5.1), and 72% of patients reported at least one comorbidity, such as hypertension (54%) or dyslipidemia (39%).

Table 1: Participant Characteristics

Characteristic	Value
Mean Age (years)	52.4 ± 10.6
Gender (Female)	55%
Gender (Male)	45%
Middle-income households	62%
Completed secondary education or higher	48%
Mean duration of diabetes (years)	8.3 ± 5.1
At least one comorbidity	72%
Hypertension	54%
Dyslipidemia	39%

Among these, 68% had poor glycemic control (HbA1c > 7%), and 52% reported infrequent blood glucose monitoring. Additionally, 47% lacked routine screening for complications, while 39% demonstrated poor adherence to treatment or lifestyle modifications. Notably, 30% experienced delays in therapy adjustments, highlighting significant gaps in timely and comprehensive diabetes care.

Table 2: Prevalence of Inadequate Care

Indicator	Percentage (%)
Overall prevalence	60
Poor glycemic control (HbA1c > 7%)	68
Infrequent blood glucose monitoring	52
Lack of routine complication screening	47
Poor adherence to treatment/lifestyle	39
Delays in therapy adjustments	30

Poor dietary practices were the most prevalent issue, affecting 64% of patients, followed by low medication adherence at 57%. Systemic barriers also played a significant role, with 45% experiencing difficulty accessing healthcare, 22% facing financial barriers, and 18% reporting limited availability of medications. Physical inactivity was noted in 28% of participants, further emphasizing the need for targeted interventions to address these multifaceted challenges.

Table 3: Behavioral and Healthcare Access Factors

Factor	Percentage (%)
Low medication adherence	57
Poor dietary practices	64
Physical inactivity	28
Difficulty accessing healthcare	45
Financial barriers	22
Limited availability of medications	18

Patients with inadequate care had a mean HbA1c of 8.5% ± 1.2, compared to 6.9% ± 0.8 in those with adequate care, indicating poor glycemic control. Diabetes-related complications were more prevalent in the inadequate care group (43%) versus the adequate care group (18%), with specific complications including diabetic retinopathy (22%), neuropathy (18%), and nephropathy (15%).

Table 4: Clinical Outcomes and Complications

Outcome/Complication	Value
Mean HbA1c (Inadequate care)	8.5% ± 1.2
Mean HbA1c (Adequate care)	6.9% ± 0.8
Diabetes-related complications (Inadequate care)	43%
Diabetes-related complications (Adequate care)	18%
Diabetic retinopathy (Inadequate care)	22%
Diabetic neuropathy (Inadequate care)	18%
Diabetic nephropathy (Inadequate care)	15%

Depression was prevalent in 34% of patients with inadequate care compared to 12% in those with adequate care. Similarly, moderate to high levels of diabetes-related stress affected 40% of the inadequate care group, while only 18% of the

adequately managed group experienced such stress.

Low health literacy showed an odds ratio (OR) of 2.5 (95% CI: 1.6–3.8, p < 0.01), highlighting its critical role in poor outcomes. Financial barriers to healthcare were also significant, with an OR of 2.2 (95% CI: 1.4–3.5, p < 0.05). Poor medication adherence was the strongest predictor, with an OR of 2.8 (95% CI: 1.8–4.3, p < 0.001), followed by diabetes-related stress (OR: 1.9, 95% CI: 1.2–3.0, p < 0.05).

Table 5: Psychosocial Factors

Factor	Percentage (%)
Depression (Inadequate care)	34
Depression (Adequate care)	12
Moderate to high diabetes-related stress (Inadequate care)	40
Moderate to high diabetes-related stress (Adequate care)	18

Table 6: Predictors of Inadequate Care

Predictor	Odds Ratio (OR)	95% CI	p-value
Low health literacy	2.5	1.6–3.8	< 0.01
Financial barriers to healthcare	2.2	1.4–3.5	< 0.05
Poor medication adherence	2.8	1.8–4.3	< 0.001
Diabetes-related stress	1.9	1.2–3.0	< 0.05

DISCUSSION

The findings of this study highlight the significant prevalence of inadequate care in the management of type-2 diabetes mellitus (T2DM), affecting 60% of the participants. This high prevalence calls for the need to address the issues of quality glycemic control as well as holistic management of diabetes even with good management strategies available. The present study provided evidence of comparison between peripheral care and inadequate health care where patients lacking sufficient care were reported to have more elevated HbA1c levels, a high encounter toward complications related to diabetes, and a low QoL[14]. This paper has shown that glycemic control is still suboptimal with 68% of the inadequate care group having HbA1c > 7%[15]. This is in tandem with studies from around the world indicating sustained suboptimal glycemic control, especially in settings of resource constraints. In this case, the data indicate that inadequate management strategies, late therapy optimization, and the lack of optimal therapy including SGLT2 inhibitors and GLP-1 receptor agonists, are the main drivers of this problem[16]. The primary caregivers of diabetes complications, hence, need to revisit treatment plans, especially on individual patient's progress and how frequent therapy adjustments are necessary to enhance glycemic control. Diabetes-related complication surveillance screening was notably inadequate, as only half of the patients received regular evaluation[17]. This gap in care presumably contributes to the delayed diagnosis and management of such complications as retinopathy, neuropathy, and nephropathy that raise the risk of developing severe consequences. Enhancing adherence to screening check coordination and increasing access to diagnostic services is the key measure for the reduction of such long-term effects. Inadequate care was significantly linked to behavioral aspects of non-adherence to medication and unhealthy practices[18]. Poor self-compliance to given prescriptions with medication regimens was evidenced by 57% of the participants attributing this to forgetfulness, belief in side effects, or lack of perceived need for compliance. In addition, 64% of them had poor diets and 28% of them were physically inactive. These results underscore the importance of appropriate educational approaches as well as behavioral coping strategies to improve patients' involvement in those processes[19]. In our sample, patients with inadequate care for DM experienced moderate to high diabetes-related stress and/or depression. Regarding this research study, a similar projection was made in The Australian ISSN 1323-2967, which published a report in 2024 regarding the diabetes epidemic, stating that it has the potential to decrease life expectance and put significant pressure on health care systems – worst of all, it will disproportionately affect disadvantaged and remote Indigenous populations[20]. According to the report, priority should be given not only to the development of policies for healthy lifestyles but also to the availability of health systems that will enable the early detection of diseases. structural factors like cost and geographical accessibility to services which explained poor care according to our study[21].

CONCLUSION

It is concluded that inadequate care in type-2 diabetes mellitus management remains a significant challenge, driven by poor glycemic control, behavioral and psychosocial barriers, and systemic limitations in healthcare access. Addressing these gaps requires tailored educational interventions, improved mental health support, and policy reforms to enhance the affordability and accessibility of care. A holistic approach involving patients, providers, and policymakers is essential to improve outcomes and reduce the burden of diabetes-related complications.

REFERENCES

1. Syed Bakht Ruidar, Zainab Rizwan, Amir Bashir, Nadiya Khan, Muhammad Sajid Khan, Yasir Mansoor. (2023). Inadequate Care During the Management of Type-2 Diabetes Mellitus: Prevalence and Associated Characteristics. Pakistan Journal of Medical & Health Sciences, 16(12), 566. https://doi.org/10.53350/pjmhs20221612566
2. Atta Muhammad Khan, Ziaullah Khan, AnilaBasit, Mazhar Ali Khan, & Amjad Ali. (2022). The Prevalence and Related Characteristics of Type-2 Diabetes Mellitus Inadequate Concentration During Treatment. Journal of Population Therapeutics and Clinical Pharmacology, 29(04), 1464- 1469. https://doi.org/10.53555/jptcp.v29i04.4465
3. Yosef T, Nureye D, Tekalign E. Poor glycemic control and its contributing factors among type 2 diabetes patients at Adama Hospital Medical College in East Ethiopia. Diabetes, Metabolic Syndrome and Obesity. 2021 Jul 15:3273-80.
4. Pinchevsky Y, Butkow N, Raal FJ, Chirwa T, Rothberg A. Demographic and clinical factors associated with development of type 2 diabetes: a review of the literature. International Journal of General Medicine. 2020 Mar 31:121-9.
5. Demoz GT, Wahdey S, Bahrey D, Kahsay H, Woldu G, Niriayo YL, Collier A. Predictors of poor adherence to antidiabetic therapy in patients with type 2 diabetes: a cross-sectional study insight from Ethiopia. Diabetology & Metabolic Syndrome. 2020 Dec;12:1-8.
6. Izzo A, Massimino E, Riccardi G, Della Pepa G. A narrative review on sarcopenia in type 2 diabetes mellitus: prevalence and associated factors. Nutrients. 2021 Jan 9;13(1):183.
7. Kautzky-Willer A, Leutner M, Harreiter J. Sex differences in type 2 diabetes. Diabetologia. 2023 Jun;66(6):986-1002.
8. McCoy RG, Galindo RJ, Swarna KS, Van Houten HK, O'Connor PJ, Umpierrez GE, Shah ND. Sociodemographic, clinical, and treatment-related factors associated with hyperglycemic crises among adults with type 1 or type 2 diabetes in the US from 2014 to 2020. JAMA network open. 2021 Sep 1;4(9):e2123471-.
9. İlhan N, Telli S, Temel B, Aştı T. Health literacy and diabetes self-care in individuals with type 2 diabetes in Turkey. Primary care diabetes. 2021 Feb 1;15(1):74-9.
10. Yan Y, Wu T, Zhang M, Li C, Liu Q, Li F. Prevalence, awareness and control of type 2 diabetes mellitus and risk factors in Chinese elderly population. BMC Public Health. 2022 Jul 19;22(1):1382.
11. Remelli F, Ceresini MG, Trevisan C, Noale M, Volpato S. Prevalence and impact of polypharmacy in older patients with type 2 diabetes. Aging clinical and experimental research. 2022 Sep;34(9):1969-83.
12. Baral IA, Baral S. Self-care management among patients with type 2 diabetes mellitus in Tanahun, Nepal. Archives of Community Medicine and Public Health. 2021 Feb 4;7(1):037-42.
13. Daly A, Hovorka R. Technology in the management of type 2 diabetes: present status and future prospects. Diabetes, Obesity and Metabolism. 2021 Aug;23(8):1722-32.
14. Ke C, Narayan KV, Chan JC, Jha P, Shah BR. Pathophysiology, phenotypes and management of type 2 diabetes mellitus in Indian and Chinese populations. Nature Reviews Endocrinology. 2022 Jul;18(7):413-32.
15. Ortiz-Martínez M, González-González M, Martagón AJ, Hlavinka V, Willson RC, Rito-Palomares M. Recent developments in biomarkers for diagnosis and screening of type 2 diabetes mellitus. Current diabetes reports. 2022 Mar;22(3):95-115.
16. Lisco G, De Tullio A, Giagulli VA, Guastamacchia E, De Pergola G,

Triggiani V. Hypothesized mechanisms explaining poor prognosis in type 2 diabetes patients with COVID-19: a review. Endocrine. 2020 Dec;70:441-53.
17. Alzaid A, Ladrón de Guevara P, Beillat M, Lehner Martin V, Atanasov P. Burden of disease and costs associated with type 2 diabetes in emerging and established markets: systematic review analyses. Expert Review of Pharmacoeconomics & Outcomes Research. 2021 Jul 4;21(4):785-98.
18. Williams DM, Jones H, Stephens JW. Personalized type 2 diabetes management: an update on recent advances and recommendations. Diabetes, Metabolic Syndrome and Obesity: Targets and Therapy. 2022 Jan 1:281-95.
19. Dugani SB, Mielke MM, Vella A. Burden and management of type 2 diabetes in rural United States. Diabetes/metabolism research and reviews. 2021 Jul;37(5):e3410.
20. Lu Y, Xing P, Cai X, Luo D, Li R, Lloyd C, Sartorius N, Li M. Prevalence and risk factors for diabetic peripheral neuropathy in type 2 diabetic patients from 14 countries: estimates of the INTERPRET-DD study. Frontiers in public health. 2020 Oct 20;8:534372.
21. Raja SA, Chong VH, Rahman NA, Shakir LM, Knights J. Prevalence and associated factors of diabetic retinopathy among type 2 diabetes mellitus patients in Brunei Darussalam: a cross-sectional study. Korean Journal of Ophthalmology: KJO. 2021 Nov 8;36(1):26.

This article may be cited as: Khan Z, Afzal M, Usman K, Bhatti AM, Uddin MA: Inadequate Care during the Management of Type-2 Diabetes Mellitus: Prevalence and Associated Characteristics. Pak J Med Health Sci, 2023;17(12):470-473.