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GLYCEMIC CONTROL AND COMPLICATIONS IN TYPE 2 DIABETICS ATTENDING PUBLIC HOSPITALS IN PAKISTAN

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ABSTRACT

Introduction: Type 2 diabetes mellitus (T2DM) is a growing public health concern in Pakistan, with poor glycemic control contributing significantly to the development of microvascular and macrovascular complications. Despite increasing prevalence, data on glycemic control and complication rates in public hospital settings remain limited.

Objective: To assess glycemic control and the prevalence of diabetes-related complications among patients with T2DM attending a public tertiary care hospital in Abbottabad, Pakistan.

Materials and Methods: A cross-sectional study was conducted at Ayub Teaching Hospital Abbottabad, Pakistan, from November, 2020 to April, 2021. Adult T2DM patients attending outpatient clinics were enrolled. Glycemic control was assessed using HbA1c levels, and diabetes complications were documented through clinical evaluation and medical records.

Results: Among 300 patients, 78.1% exhibited poor glycemic control (HbA1c ≥7%). Microvascular complications, including retinopathy (44.4%), neuropathy (36.9%), and nephropathy (31.6%), were common. Macrovascular complications, such as ischemic heart disease (27.8%) and stroke (8.8%), were also prevalent. Longer duration of diabetes was significantly associated with higher complication rates.

Conclusion: Poor glycemic control and high complication rates in T2DM patients attending public hospitals highlight the urgent need for integrated diabetes management programs, emphasizing patient education, regular monitoring, and multidisciplinary care to improve outcomes in Pakistan.

Keywords: Type 2 diabetes mellitus, glycemic control, complications, public hospitals, Pakistan, HbA1c

INTRODUCTION

Diabetes mellitus type 2 (T2DM) has already become an important health issue at the global level as developing nations, such as Pakistan, are facing an escalating burden of the disease because of

urbanization, sedentary life, and dietary habits (1). Inadequate glycemic control of T2DM patients is a major contributor to the occurrence of both acute and chronic complications, and it raises both morbidity and mortality along with the healthcare cost (2). Major tertiary care hospitals in Pakistan like Ayub Teaching Hospital Abbottabad, are important places where significant proportions of diabetes patients in lower and middle-income settings are treated, which is why it is essential to conduct research in such areas (3). Most patients do not reach the recommended glycemic targets even though treatment guidelines are available, which contributes to a high prevalence of microvascular and macrovascular complications (4). Multiple Pakistani studies have reported that a considerable number of T2DM patients who visit public sector health institutions have poor glycemic control of HbA1c levels regularly being above targets (5).

The lack of control has been associated with several factors, including low levels of disease knowledge, low medication adherence, lack of self-care practices, and insufficient healthcare services (6). The significant prevalence of patients who were already showing evidence of chronic complications upon diagnosis in a large-scale registry analysis (5) points towards a delayed diagnosis and inadequate screening in the community. These results support the need to initiate specific measures in enhancing early diagnosis and treatment within a hospital, including within JPMC (7). Lifestyle habits such as diet change, physical exercise, self-blood glucose level monitoring, and medication compliance during pharmacotherapy are vital in the maintenance of optimal glycemic control (3). Nevertheless, qualitative studies in Pakistan have reported that patients experience a variety of barriers, which are known to negatively influence their capability to engage in desirable self-care behaviors, including health literacy, financial situation, cultural beliefs, and family support (8). Lack of proper patient education, as well as lack of sufficient counseling by the medical personnel on the proper treatment regimens given in overcrowded public hospitals, further contributes to poor compliance with treatment plans (4,6).

Other psychosocial features also have a great influence on adverse glycemic control and the development of complications, including depression. According to the evidence provided by local studies, depression is identified at a high rate in T2DM patients, and there is a close relationship between depression symptoms, poor glycemic control, and the elevated risks of having micro-macrovascular complications (9,10). There is a tendency to not detect or treat such mental health issues in general medical care, and the lack of treatment leads to deterioration of health status and ineffective treatment. Interventions and controlled programs in diabetes education programs have been promising in enhancing glycemic control in Pakistan when led by a pharmacist. Primary managers who received such specific counseling and self-security training exhibited a much greater reduction in their HbA1c levels than patients who received usual care, as shown by randomized controlled trials done in primary care and hospital settings (6,11). However, the adoption of these interventions within normal operations of public hospitals (especially in resource-limited settings such as JPMC) is not broadly achieved (12).

Proper glycemic control has a major impact on outcomes, as complications of diabetes are widespread among T2DM patients. These microvascular complications include neuropathy, retinopathy, and nephropathy in both newly detected and lifelong diabetic patients (5,15). Skin infections and diabetic dermopathy are among the cutaneous manifestations and have been associated with increased levels of HbA1c (14). Another such complication is diabetic foot ulcers, which have been found to occur frequently according to Lahore-based tertiary care hospitals and other cities as well, and can result in amputations unless addressed in time (17). The macrovascular complications that include ischemic heart disease and stroke contribute to the burden, and they are primary causes of death attributed to diabetes (7). Longitudinal experiences have also raised the progressive nature of microvascular complications in Abbottabad, where the incidence continued to rise with time in poorly glycemic-controlled patients in this region (15). The trends are further compounded by the low levels of

knowledge on complications among patients, which have been found to adversely influence the results and adherence to treatment (16).
There is insufficient education in classes regarding the identification of the initial warning signs of complications in the conditions of a publicly operated hospital system, including vision changes, foot lesions, and neuropathy symptoms (18). The results of a tertiary care hospital study in Abbottabad, Pakistan indicated that the majority of the patients did not have target HbA1c even when they received pharmacological therapy, which indicated lapses in patient education, follow-up, and lifestyle changes advice (12). Equivalent results have also been indicated by other centers that elderly diabetic patients have low knowledge levels about their conditions and the handling of diabetes, which correlates with poor glycemic control (13). These trends indicate that the direction in which the services in the state facilities should be improved is better patient education and training of the healthcare providers. Pakistan's healthcare has structural problems in maintaining integrated diabetes care. Process assessments carried out on integrated management programs in primary healthcare facilities have also noted a lack of trained personnel, inappropriate structures, records, and mechanisms of follow-up
(18). Such structural hurdles facilitate the delays in diagnosis, non-fabulous monitoring and management of complications, which is more worrying in tertiary hospitals, which are referral centers of complicated cases.

Since the prevalence of ineffective glycemic control and its complications is high among the T2DM patients in Pakistani governmental hospitals, there is an urgent need to determine the peculiarities, factors, and consequences of these processes. Ayub Teaching Hospital Abbottabad, being one of the biggest public tertiary hospitals in Abbottabad, was an ideal place to conduct such an investigation since it receives a wide variety of patients coming from all over Sindh and Balochistan. The analysis of the level of glycemic control and the range of complications in this population allows healthcare providers and policymakers to develop specific interventions that can enhance outcomes, reduce complications, and use fewer resources. The available literature in Pakistan indicates that poor glycemic control in the population of T2DM patients in the national health facilities is an ongoing problem, caused by patient-related issues, weaknesses in the healthcare system, and missing integration of evidence-based practices (1-18). The purpose of the study was to evaluate the glycemic control and complication percentage among patients with T2DM who visit Ayub Teaching Hospital Abbottabad, to add data that can lead to defining future strategies of treating diabetes in the public health sector.

Objective: The aim was to evaluate glycaemic control and burden of diabetes related complications among type 2 diabetes mellitus patients attending Ayub Teaching Hospital Abbottabad, Pakistan.

MATERIALS AND METHODS

Study Design: Descriptive cross-sectional study

Study Setting: Department of Medicine, Ayub Teaching Hospital Abbottabad, Pakistan.

Duration of the Study: November, 2020 to April, 2021.

Inclusion Criteria: Patients aged 30 years and older with a diagnosis of type 2 diabetes mellitus at least one year prior, and adults with diabetes who would visit the diabetic clinic in the study period were involved. Patients were required to have informed consent, and those willing to take part were selected. Both sexes of patients were regarded as eligible. Inclusion criteria were patients with an HbA1c test in their medical record within three months**.**

Exclusion Criteria: Subjects with diabetes mellitus type 1, gestational diabetes, or secondary diabetes caused by other endocrine diseases were eliminated. Individuals with severe comorbid

diseases like advanced malignancy or end-stage organ failure were not included because this might have skewed the assessment of the glycemic control. Moreover, those patients who could not present

a credible medical history because of cognitive impairment or communication complications were not included.

Methods

The data was measured through the use of a structured questionnaire and examination of the medical records of patients. They received information about the demographic profile, the length of diabetes, the treatment regimen, and reported compliance with medications. The glycemic control was determined based on the last HbA1c level, and poor control was described as HbA1c > 7 % as per the American diabetes association. Diabetes-related complications were found by clinical examination and reading the investigation report. The microvascular complications were retinopathy, nephropathy, and neuropathy, whereas the macrovascular ones were ischemic heart disease, stroke, and peripheral vascular disease. The entry of data and its analysis was achieved with SPSS version 25.0, and the results were presented in the form of frequencies and percentages, means, and standard deviations. The study had received ethics approval before starting the research from the institutional review board of JPMC.

Results

A total of 320 patients with type 2 diabetes mellitus were included in the study. The mean age was 54.7 ± 9.6 years, with a female predominance (59.4%). The majority of patients (68.8%) were from low-income households, and more than half (54.1%) had a diabetes duration exceeding 10 years. Hypertension was the most common comorbid condition, present in 62.5% of patients.

Table 1. Demographic and Clinical Characteristics of Study Participants

Characteristic	Frequency (n)	Percentage (%)
Gender		
Male	130	40.6
Female	190	59.4
Age Group (years)		
30–39	28	8.8
40–49	74	23.1
50–59	126	39.4
≥60	92	28.7
Duration of Diabetes		
1–5 years	64	20.0
6–10 years	83	25.9
>10 years	173	54.1

The mean HbA1c level was 8.9 ± 1.7%, with 78.1% of patients having poor glycemic control (HbA1c > 7%). Only 21.9% had good glycemic control.

Table 2. Glycemic Control Status Based on HbA1c Levels

Glycemic Control Category	HbA1c (%)	Frequency (n)	Percentage (%)
Good Control	≤ 7.0	70	21.9
Poor Control	> 7.0	250	78.1
Mean ± SD	8.9 ± 1.7	-	-

Among patients with poor glycemic control, the prevalence of complications was significantly higher. Microvascular complications were more frequent than macrovascular complications.

Table 3. Distribution of Diabetes-Related Complications

Complication Type	Frequency (n)	Percentage (%)
Microvascular		
Retinopathy	142	44.4
Nephropathy	101	31.6
Neuropathy	118	36.9
Macrovascular		
Ischemic Heart Disease	89	27.8
Stroke	28	8.8
Peripheral Vascular Disease	34	10.6

There was a strong association between longer diabetes duration and the presence of multiple complications. Patients with diabetes for over 10 years had a significantly higher prevalence of both microvascular and macrovascular complications compared to those with shorter disease duration.

Graph: Frequency Distribution of Diabetes-Related Complications among T2DM Patients

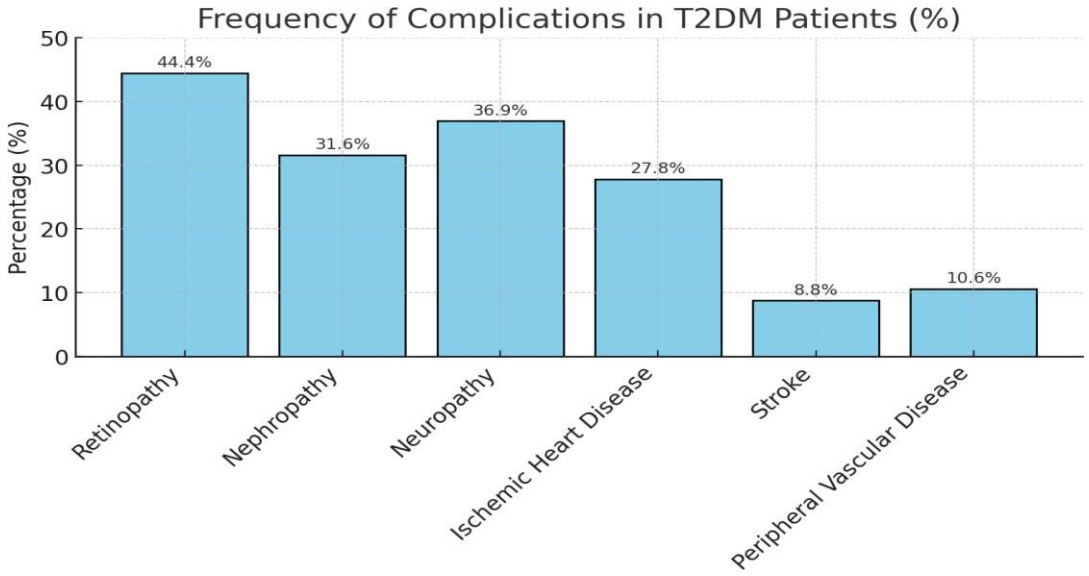

Table 4. Association Between Duration of Diabetes and Complications

Duration of Diabetes	Complication Present (n, %)	No Complication (n, %)
1–5 years	18 (28.1%)	46 (71.9%)
6–10 years	47 (56.6%)	36 (43.4%)
>10 years	146 (84.4%)	27 (15.6%)

Overall, the findings highlight that the majority of T2DM patients attending JPMC have poor glycemic control, with a high burden of chronic complications. The prevalence of both microvascular and macrovascular complications increases substantially with longer disease duration, emphasizing the need for early intervention and consistent follow-up.

Discussion

This paper has established that a large proportion (78.1%) of patients with type 2 diabetes mellitus (T2DM) at Ayub Teaching Hospital Abbottabad had poor glycemic control with the mean HbA1c level well above the required standards. These results are very much comparable with the previous research conducted in the street hospitals in Pakistan, where inadequate control has been consistently reported in over two-thirds of diabetic patients. Similar proportions of poor control in resource-limited

healthcare environments were demonstrated in a study undertaken by Jawed et al. (1) at the public diabetic clinics, confirming it as the major glycemic management problem in such environments. The prevalence of poor glycemic control in our cohort has been higher as a result of both patient- and system-related factors. The previous studies in Pakistan identify the areas of low disease-related knowledge, adherence to medications, and insufficient practices of self-care as the key determinants (4). The barriers were reflected in our setting with many patients citing lack of finances and access to self-monitoring devices, similar to existing literature using qualitative studies (8). In addition, patient loads in public hospitals are also high, which may restrict the time spent on person-based counseling that is already proven to have a profound impact on adherence and glycemic levels (4,6).

High prevalence of diabetes-related complications was also summarized in our findings, with microvascular complications (44.4 percent retinopathy, 36.9 percent neuropathy, 31.6 percent nephropathy) more predominant as compared to macrovascular complications. This observation is in line with other local data, which reported that the most frequent sequelae of poor glycemic control are microvascular complications (7). The prevalence of retinopathy is very high, and this observation aligns with results of a long-term follow-up study in Abbottabad, where poor glycemic control was also a strong prognosticator of progression (15). Likewise, skin complications associated with uncontrolled diabetes, as outlined by Niaz et al. (14), can accompany the problem but were not considered as a component of thorough dermatological examination in our case. The particularly high percentage of macrovascular complications included ischemic heart disease (27.8%) and stroke (8.8%). Similar patterns were noted in the previous studies carried out by tertiary care centers in Lahore and other cities, mainly in patients with long-standing illness (17). The correlation between the duration of diabetes and prevalence of complications in our sample supports those of Fawwad et al. (15) and Uddin et al. (5), who indicated that chronic hyperglycemia causes accumulating micro and macrovascular harm with regard to time.

Another very significant finding of this research is that there is a very close relationship between the duration of the disease and the complications that it possesses. Over 84 percent of patients with more than 10 years of diabetes experience at least one complication, which matches the results of the national registry (5) and the Abbasi Shaheed Hospital (1). This underlines the desire to manage earlier in a more aggressive way to prevent or postpone the complication. Factors such as depression and psychosocial issues are not directly measured in our study but have been described to play a major role in poor control among similar populations (9,10). Since the frequency of depression among Pakistani diabetics is very high, the probable influence on compliance and lifestyle change cannot be underestimated, and the option of incorporating mental health services into the diabetes treatment plan can be helpful. Multidisciplinary-based and single interventions led by pharmacists have been found to mitigate glycemic control and rates of complications in Pakistan (6,11).

Nevertheless, there is a minimum utilization of these programs in tertiary care hospitals in general because of insufficient staff and the absence of policy inclusion. The lack of awareness of patient education courses at the JPMC is closer to the systematic shortcomings in primary care settings stated by Khan et al. (18), which means that the issue can be reflected at all levels of healthcare. Our setting also showed high rates of poor control, as demonstrated in Zahra et al. (12) and Shams et al. (13), who also associated them with low knowledge of diabetes. Indirectly, our findings confirm such observations because the majority of patients did not receive formal diabetes training, and their instructions were verbal, during outpatient appointments. Further, Gull et al. (16) showed that the knowledge of complications is closely linked with compliance to treatment, indicating that education is linked to increased knowledge and, by extension, treatment compliance. Regarding foot health, our study did not analyze the amount of diabetic foot ulcers specifically, but the problem has been shown to be significant in a prior study that was done in Lahore tertiary care facilities (17). Based on this high prevalence of neuropathy and peripheral vascular disease in our sample, the reality of the risk of developing ulcers can be substantial, warranting interventional foot care prevention strategies.

The results have a clear focus on the need to organize and implement patient-centered diabetes interventions within the state-owned hospitals, given local and national public health concerns. They ought to include institutionalized screening of complications and individualized counseling in these

programs, as well as multidisciplinary care in the form of physicians, diabetes educators, and pharmacists. Evidence collected internationally indicates that integrated programs can provide significant improvements in both measures of glycemic control and quality of life even in low-resource settings (6,8). Our policy and practice implications include a few points. Firstly, HbA1c testing must be made widely available to all patients who visit the public hospitals, with results proactively implemented to adjust the therapy. Secondly, structural education on diabetes needs to be institutionalized with formal education on diabetes from the perspective of the socio-cultural background of Pakistani patients. Thirdly, complication screening ought to be standardized, and referral pathways out of the complex care should be described. Lastly, the incorporation of mental health-related interventions into diabetes management may help deal with the psychosocial aspects that lead to poor control (9,10).

Irrespective of the advantages of a hospital-based real-world dataset, our study has limitations. Because it is cross-sectional, there is no possible inference of causality between poor control and complications. Recall bias can be observed when there is self-reported adherence and lifestyle practices. Moreover, the study took place in only one tertiary hospital, which could not be generalized to primary or secondary care centers. However, these results align with the national trends and have illustrated crucial gaps that must be filled within the healthcare system. The risk of poor glycemic control and complications of this condition in T2DM patients at JPMC is representative of the national issue with diabetes management.

Conclusion

The research findings are critical to the point of showing a high prevalence of inadequate glycemic control in patients with type 2 diabetes who visit Ayub Teaching Hospital Abbottabad, with almost four out of five patients failing to achieve recommended HbA1c levels. Microvascular complications, especially retinopathy, neuropathy, and nephropathy, were more prevalent than macrovascular complications, and the occurrence of such complications was well correlated with the prolonged duration of the disease. This evidence highlights the importance of holistic care plans relating to diabetes that are implemented in public hospitals, such as tracking HbA1c measurements, standard patient education, periodic complications screening, and multidisciplinary approaches to care treatment. Combined clinical and psychosocial barriers, solved by better access to the resources of healthcare, patient-provider communications, and mental health integration, would lead to better glycemic control and lower rates of complications. The public sector needs to pay more attention to diabetes care to help restrain the increasing healthcare and economic burden of diabetes in Pakistan.

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