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Standard treatment guidelines and clinical decision-making in type 2 diabetes mellitus: insights from tertiary care healthcare providers in Islamabad

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Abstract

Diabetes mellitus (DM) is an illness caused by either a relative or absolute loss of insulin; it is highly prevalent worldwide. The role of standard treatment guidelines (STGs) is fundamental to ensure positive treatment outcomes for type 2 diabetes mellitus (T2DM), as they promote rationality in prescriptions. This descriptive cross-sectional study aimed to determine healthcare providers' perceptions of STGs for T2DM management, perceived barriers to T2DM management, and perceptions of the effectiveness of oral antidiabetics. Furthermore, the study also examined the associations of knowledge with the dose of antidiabetic agent, sector of employment and clinical experience. This study included 150 healthcare providers working in public and private tertiary care facilities in Islamabad. A relevant expert-verified questionnaire was employed in the study, and data were gathered via a convenient sampling technique. The results of the study revealed that 38.67% of the providers were from the public sector and that 61.33% of the providers were from the private sector. A total of 87.33% of the providers agreed that current antidiabetic drugs are effective, and 77.33% supported combination therapy; 64.00% reported that STGs are cost effective, and 94.67% underlined the importance of educational program treatment outcomes; 88.67% of the providers highlighted patient-related barriers, 80.67% highlighted limited guideline availability, and 80.00% highlighted a lack of prescriber awareness as major barriers in the implementation of STGs. Glimepiride by 82.00% of providers and metformin by 73.33% of providers were rated as most effective, whereas glibenclamide was the least preferred agent by 61.33% of providers. The level of knowledge varied, with sector showing a significant association (p = 0.001), whereas experience had no significant impact (p = 0.503). The study concluded that healthcare providers support the effectiveness of oral antidiabetics and the use of combination therapy, and the role of treatment guidelines in T2DM management, patient-related barriers, limited access to STGs, and discrepancies in knowledge across sectors remain major challenges in T2DM management.

Keywords

Type II diabetes mellitus; Standard treatment guidelines; Rational prescribing; Pharmacy practice; Healthcare provider perceptions; Prescribing practices

1. Introduction

Diabetes mellitus (DM) is a complex metabolic disorder that is characterized by either a relative or absolute deficiency of insulin secretion by the pancreas in the human body [1]. The clinical features of this disease include impaired glucose tolerance and dysregulation of lipid and protein metabolism [2]. The global incidence of type 2 diabetes mellitus (T2DM) has been assessed over the past two decades through the DiaMond Pro-

ject, which provides comprehensive data on newly diagnosed and existing cases from both developed and developing countries and maintains registries of patients diagnosed with T2DM [3]. Approximately 24 such registries are operational in the USA; the estimated prevalence of diabetes in the USA was 35 million in 2000, with a projected increase to approximately 64 million by the year 2025. Moreover, 52% of these cohorts are residents of the Caribbean and Latin America, where the prevalence of diabetes is expected to increase to 62% by the year 2025, accounting for 40 million individuals with T2DM [4,5]. In Australia, the prevalence of diabetes is recorded to be 7.4%, with an additional 16.4% of the population classified as diabetic; this figure has increased twofold since 1981, a tendency that cannot be attributed solely to demographic shifts or rising obesity rates [6].

The prevalence of diabetes in developing nations is a significant public health challenge, with females being affected by T2DM compared with their male counterparts; 32% of Asian Indians in Tanzania and 28% of urban male Micronesians in Kiribati have T2DM. Age-specific analyses revealed a consistent, directly proportional trend toward an increase in T2DM incidence with increasing age. In developing countries, there is a considerable burden of T2DM; 20% to even 50% of cases remain undiagnosed and are not reported at any healthcare facility [7]. Specifically, in Pakistan, the incidence of T2DM is increasing, and the World Health Organization (WHO) indicated that 11.77% of the population is affected by this condition, with males accounting for 11.20% and females accounting for 9.19% of the reported cases [8]. These statistical figures highlight T2DM as a growing public health disaster in developing countries, demanding the urgent attention of healthcare providers and interventions in both clinical and community settings [9].

Adherence to standard treatment guidelines (STGs) is important to ensure that healthcare providers appropriately prescribe medicines by considering the dose, frequency, route of administration, bioavailability and overall clinical effectiveness of the drug to improve the clinical condition and symptoms of patients [9]. Various factors contribute to variations in prescribing trends and practices by healthcare providers for patients with similar clinical features, requiring adherence to STGs for appropriate clinical outcomes [10]. These guidelines are usually developed by health organizations or regulatory bodies on a national or regional basis, and it is legally binding upon the government of the land to implement them uniformly across the country to maintain consistency in treatment protocols.

In the management of T2DM, multiple factors, such as prescribing patterns, treatment costs, and adherence to guidelines by prescribers, play important roles in optimizing clinical care and treatment outcomes [11]. Adherence to treatment includes both the patient's commitment to follow prescribed regimens and the physician's compliance with healthcare regulations and standardized clinical protocols [12,13]. Improved adherence not only enhances glycemic control but also reduces the risk of diabetes-related complications in most patients with T2DM [14]. Therefore, improving both provider and patient compliance with STGs is key to the successful management of T2DM worldwide.

Understanding the perceptions of healthcare providers of oral antidiabetics, particularly their clinical effectiveness and efficacy when used in combination therapy, is important for evaluating prescribing practice trends for the management of T2DM [15]. Similarly, assessment of the perceived clinical effectiveness and implementation of STGs and understanding of patient-related barriers and institutional limitations helps in the identification of loopholes in the system and draws attention to collaborative actions with intersectoral approaches to address these issues [16]. Furthermore, knowledge among healthcare providers regarding appropriate doses of antidiabetics is essential for safe and effective management of T2DM. This study was conducted to assess the perceptions of healthcare providers on STGs for T2DM management, perceived barriers in T2DM man-

agement, and perceptions of the effectiveness of oral antidiabetics. Furthermore, the study also examined the associations of knowledge with the dose of antidiabetic agent, sector of employment and clinical experience.

2. Materials and methods

2.1. Study design

This descriptive cross-sectional study was conducted over a period of three months, from January to March 2024.

2.2. Ethical approval

Ethical approval for the study was obtained from the Ethical Review Committee of Hamdard University, Islamabad (No. HU/ERC/2024/269).

2.3. Study setting

The study was conducted in Islamabad, the capital city of Pakistan, which comprises an urban area of 220.15 square kilometers and a rural area of 466.20 square kilometers. The city has a population of 2,003,368 and a literacy rate of 88% [17,18]. The city has several public and private tertiary healthcare facilities, many of which provide specialized diabetes care services.

2.4. Study population

The study targeted healthcare providers (medical officers and consultants) working at public and private tertiary healthcare facilities in Islamabad.

2.5. Inclusion and exclusion criteria

The study included all healthcare providers, including physicians and consultants, who held a valid medical license, were employed at public or private tertiary healthcare facilities, and were directly involved in clinical decision-making and patient care, with a minimum of two years of relevant working experience. However, healthcare providers who did not provide written informed consent were excluded from the study.

2.6. Sample size and sampling technique

The sample size for this descriptive cross-sectional study was calculated via the OpenEpi sample size calculator, assuming a 95% confidence level (Z = 1.96), a 5% margin of error (d), and an estimated prevalence of 6.00% on the basis of a prior study in Pakistan reporting that only a small proportion of physicians followed the diabetic guidelines [19,20]. The minimum sample size required was calculated to be 87, but it was increased to 174 to account for nonresponders and to strengthen the validity of the findings of the study. A convenient sampling technique was used to target healthcare providers at tertiary-level healthcare facilities.

2.7. Study instrument

A semistructured questionnaire was developed on the basis of the WHO guidelines for the standard care and clinical practice of T2DM [21]. It was assessed by field experts for content validity and pilot tested on 10 respondents whose data were not included in the final analysis.

2.8. Study measures

The questionnaire collected sociodemographic information of the healthcare providers, including type of hospital (public or private) and years of clinical experience. The second section of the questionnaire captured the responses of healthcare providers regarding T2DM management via a 3-point Likert scale (disagree, neutral, agree) across four major domains: perceived effectiveness of currently available antidiabetic medications, appropriateness of combination therapy in clinical practice, perceived impact of STGs on cost-effectiveness, and the role of educational programs in improving T2DM management. The third section of the questionnaire collected information on barriers perceived by healthcare providers for the management of T2DM by using the same 3-point Likert scale across five areas, including patient-related factors (noncompliance, socioeconomic constraints, and literacy levels), the availability of STGs, a lack of prescriber awareness, the clinical experience of healthcare providers in decision-making, and a lack of STG enforcement at healthcare facilities. The fourth section of the questionnaire assessed healthcare providers' perceptions of the clinical effectiveness of oral antidiabetics as monotherapies and combination regimens. The respondents had to rate each effectiveness of each drug on a 3-point Likert scale (least effective, neutral, most effective). The final section of the questionnaire evaluated the knowledge of healthcare providers regarding the appropriate dosing of commonly used oral antidiabetics. This section of the questionnaire included multiple-choice and true/false items evaluating key areas of clinical practice, such as initial and maintenance dosing, the maximum recommended dose, adjustment of the dose in patients with renal impairment, and contraindicated drugs. Each correct response was given one point, whereas incorrect or unanswered items received zero points, resulting in a total possible score ranging from 0-10 for the section.

2.9. Data collection procedure

The initial phase of the data collection consisted of training the data collection team by the relevant experts, followed by training, and the data collection team was then sent to the targeted healthcare facilities. Prior permission for data collection was obtained from the concerned authorities of the targeted healthcare facilities. Informed written consent was obtained from the healthcare providers eligible for the study who were willing to participate in the study, and the study objectives were clearly explained to the respondents. Data were collected via face–to-face interviews with healthcare providers with the help of the developed semistructured questionnaire.

2.10. Data analysis

The data were analyzed via IBM SPSS Statistics version 25. Descriptive statistics, including frequencies and percentages, were used to summarize categorical variables. The chi-square test was applied to assess the associations between knowledge of oral antidiabetic drug dosing and healthcare provider characteristics, including sectors of employment (public or private) and years of clinical experience. A p value of less than 0.05 was considered statistically significant.

3. Results

Among the 174 healthcare providers, 150 completed face-to-face interviews, for a participation rate of 86.21%. Among them, 38.67% (n = 58) were from public hospitals, and 61.33% (n = 92) were from private hospitals. In terms of clinical experience, 9.33% (n

= 14) had less than one year, 32.00% (n = 48) had 1 to 5 years, 27.33% (n = 41) had 6 to 10 years, and 31.33% (n = 47) had more than 10 years of experience.

Table 1 shows that 87.33% (n = 131) of healthcare providers agreed on the effectiveness of the current antidiabetic drugs available in hospitals, whereas 12.67% (n = 19) disagreed. Regarding the appropriateness of combination therapy, 77.33% (n = 116) agreed, and 22.67% (n = 34) disagreed. For the impact of STGs on cost-effectiveness, 64.00% (n = 96) agreed, and 36.00% disagreed. A large majority, 94.67% (n = 142), agreed that educational programs play a role in improving T2DM management, with only 5.33% (n = 8) disagreeing.

Table 1. Perceptions of T2DM treatment and STGs.

Variable	Disagree	Neutral	Agree
	Frequency (%)	Frequency (%)	Frequency (%)
Perceived effectiveness of current drugs in hospitals	19 (12.67)	0 (0.00)	131 (87.33)
Appropriateness of combination therapy in clinical practice	34 (22.67)	0 (0.00)	116 (77.33)
Standard Treatment Guidelines' impact on cost-effectiveness	54 (36.00)	0 (0.00)	96 (64.00)
Role of educational programs in improving T2DM management	8 (5.33)	0 (0.00)	142 (94.67)

Table 2 shows that 88.67% (n = 133) of healthcare providers agreed that patient-related factors are a barrier in T2DM management, whereas 11.33% (n = 17) disagreed. With respect to the availability of guidelines, 80.67% agreed that it was a barrier, and 19.33% (n = 29) disagreed. Similarly, 80.00% (n = 121) identified a lack of prescriber awareness as a barrier, with 20.00% (n = 30) disagreeing. Most respondents (94.67%, n = 142) agreed that the prescriber's clinical experience plays a critical role in T2DM management, and 5.33% (n = 8) disagreed. Additionally, 80.67% (n = 121) considered a lack of guideline enforcement a barrier, whereas 19.33% (n = 29) disagreed.

Table 2. Perceived barriers in T2DM management.

Variable	Disagree	Neutral	Agree
	Frequency (%)	Frequency (%)	Frequency (%)
Patient related factors	17 (11.33)	0 (0.00)	133 (88.67)
Availability of guidelines	29 (19.33)	0 (0.00)	121 (80.67)
Lack of prescriber awareness	30 (20.00)	0 (0.00)	120 (80.00)
Prescriber's clinical experience	8 (5.33)	0 (0.00)	142 (94.67)
Lack of guidelines enforcement	29 (19.33)	0 (0.00)	121 (80.67)

Table 3 indicates that glimepiride was viewed as the most effective monotherapy by 82.00% of the respondents (n = 123). This was followed closely by metformin and gliclazide, both of which were rated as effective by 73.33% of the respondents (n = 110 each), and pioglitazone, which was rated as effective by 72.00% (n = 108). In terms of combination therapies, respondents showed a stronger preference for combination therapies than for monotherapies, as evidenced by the higher percentage of providers rating these combinations as the most effective. Metformin combined with glimepiride was considered the most effective drug by 80.00% of the providers (n = 120). This was followed by metformin with gliclazide, which was rated effective by 74.00% of the respondents (n = 111), and metformin with pioglitazone, which was rated effective by 70.67% (n = 106). Glibenclamide was rated as the least effective, with only 61.33% of respondents (n = 92) considering it effective and only 38.67% (n = 58) rating it as the most effective.

Table 3. Perceived effectiveness of oral antidiabetic drugs (OADs).

Variable	Least Effective	Neutral	Most Effective
	Frequency (%)	Frequency (%)	Frequency (%)
Metformin	40 (26.67)	0 (0.00)	110 (73.33)
Pioglitazone	42 (28.00)	0 (0.00)	108 (72.00)
Gliclazide	40 (26.67)	0 (0.00)	110 (73.33)
Glimepiride	27 (18.00)	0 (0.00)	123 (82.00)
Metformin + Glimepiride	30 (20.00)	0 (0.00)	120 (80.00)
Metformin + Pioglitazone	44 (29.33)	0 (0.00)	106 (70.67)
Metformin + Gliclazide	39 (26.00)	0 (0.00)	111 (74.00)
Glibenclamide	92 (61.33)	0 (0.00)	58 (38.67)

Table 4 shows a statistically significant association between healthcare providers' sector of employment and their knowledge of oral antidiabetic drug dosing ($p = 0.001$). Among the public sector respondents, 34.48% had poor knowledge, 48.28% had moderate knowledge, and 17.24% had good knowledge. In contrast, in the private sector, 20.65% had poor knowledge, 43.48% had moderate knowledge, and 35.87% had good knowledge. No statistically significant association was found between years of clinical experience and knowledge level ($p = 0.503$).

Table 4. Associations between knowledge of oral antidiabetic dose, sector, and experience.

Variables	N	Knowledge Level			Degree of Freedom (df)	*p* Value
		Poor (0–3) (N = 39)	Moderate (4–6) (N = 68)	Good (7–10) (N = 43)		
		Frequency (%)	Frequency (%)	Frequency (%)		
Public sector	58	20 (34.48)	28 (48.28)	10 (17.24)	2	0.001 *
Private sector	92	19 (20.65)	40 (43.48)	33 (35.87)		
< 1 year	14	5 (35.71)	7 (50.00)	2 (14.29)	3	0.503
1 – 5 years	48	13 (27.08)	24 (50.00)	11 (22.98)		
6 – 10 years	41	9 (21.95)	17 (41.46)	15 (36.59)		
> 10 years	47	12 (25.53)	20 (42.55)	15 (31.91)		

* Data were analyzed via chi-square test. ** Significant value ($p < 0.05$).

4. Discussion

The findings of the present study indicate that a significant proportion of healthcare providers perceive the currently available oral antidiabetic medications in tertiary care hospitals as effective for managing T2DM. Furthermore, most providers advocate for the use of combination therapy; however, some dissent shows varying clinical perspectives. STGs are generally regarded as beneficial for enhancing the clinical effectiveness of antidiabetic therapy; however, their impact is not completely acknowledged by healthcare providers. Continuous medical education is considered important by most healthcare providers to improve T2DM management. Healthcare providers have identified several barriers to the effective management of T2DM, including patient-related factors such as nonadherence to therapy, financial constraints, and low health literacy. The clinical experience of healthcare providers is widely recognized as an important factor in clinical decision-making, but understanding the appropriate dose of antidiabetics varies across different healthcare sectors, with limited correlation with years of experience and the clinical practice of healthcare providers.

A study conducted in the United Kingdom (UK) revealed that, despite the absence of STGs in healthcare facilities, over 85% of general practitioners reported having access to

and regularly using the National Institute for Health and Care Excellence (NICE) guidelines for the clinical management of diabetes [22,23]. Similarly, an Australian study highlighted better compliance with national diabetes care guidelines; furthermore, the guidelines were uniformly implemented across the country through electronic medical systems and were a part of the continuous professional education of healthcare providers [24].

The results of our study regarding clinical effectiveness with respect to adherence to STGs contradict those of a study from Thailand, which revealed that STG implementation significantly reduced direct medical costs while maintaining good glycemic control among T2DM patients [25]. Moreover, healthcare providers recognized the importance of training programs to improve T2DM management in line with a multicenter Indian study, which revealed that frequent continuing medical education (CME) sessions increased healthcare providers' adherence to the Indian Council of Medical Research (ICMR) guidelines for the management of T2DM [26].

The current study identified metformin and glimepiride as the most effective drugs regarded by healthcare providers, which aligns with prescribing practices in the United States (US), where metformin continues to be recognized as the first-line treatment according to the American Diabetes Association (ADA), whereas glimepiride is typically utilized as a second-line agent. Furthermore, in Canada and South Africa, glibenclamide has been withdrawn from the market and is not recommended for diabetes management because of its associated risk of hypoglycemia in patients with T2DM; these findings are in line with those of the current study in which glibenclamide was least preferred by healthcare providers [27,28]. However, the preference of healthcare providers for combination therapy is consistent with the international literature, and a study from Spain highlighted that compared with combination therapy, monotherapy had a better effect on glycemic control in patients with moderate-to-severe T2DM [29].

The results of the current study that indicate that STG compliance increases cost-effectiveness contrast with the findings of German and Swedish studies, which highlight that STGs both improve clinical outcomes and reduce unnecessary costs [30]. Furthermore, the current study revealed a statistically significant difference in the knowledge of healthcare providers between the public and private sectors, where private-sector healthcare providers showed higher levels of understanding of antidiabetic doses. This finding contrasts with that of a study in Ethiopia, which revealed that public sector healthcare providers had better knowledge of doses because of institutionalized training programs for effective STGs implementation [31].

The study was conducted in Islamabad, and a semistructured questionnaire was developed by using WHO guidelines, which is a valuable addition to the literature. Furthermore, the study highlighted the perceptions of healthcare providers regarding STGs and determined the associations among the public and private sectors as well as the experiences of healthcare providers. However, qualitative factors for prescribing trends and clinical practices were not taken into consideration, which remains a disadvantage of the study.

5. Conclusions

This study revealed that healthcare providers in tertiary care hospitals of Islamabad largely recognized the effectiveness of oral antidiabetic agents, particularly glimepiride, metformin, and gliclazide, with combination therapies such as metformin, glimepiride perceived as most effective for glycemic control in patients with T2DM. Most respondents acknowledged the importance of STGs for rational prescribing and cost-effectiveness; however, patient-related factors, limited guideline availability, lack of prescriber

awareness, and insufficient enforcement were identified as key barriers to their consistent use. Most healthcare providers agreed that educational programs contribute to improved T2DM management. The study also found a statistically significant association between healthcare sector and knowledge of oral antidiabetic dosing, with private-sector providers demonstrating comparatively higher knowledge levels, while clinical experience showed no significant association with dosing knowledge.

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Data availability: The data supporting this study's findings are available from the corresponding author, Awais Ejaz, upon reasonable request.

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