

## COMPREHENSION OF LONG-TERM MEDICATIONS IN PATIENT WITH TYPE 2 DIABETES MELLITUS: A KAP STUDY

Suleman Elahi Malik<sup>1</sup>, Shaista Kanwal<sup>2</sup>, Iqbal Haider<sup>3</sup>, Javeria Javed<sup>4</sup>, Yasir Iqbal<sup>5</sup>, Sidra Bibi<sup>6</sup>

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<sup>1</sup>Assistant Professor, Endocrinology Division, Department of Medical Specialties, MTI Khyber Teaching Hospital, Peshawar

<sup>2</sup>Specialist Registrar, Department of Diabetes, Endocrinology and Metabolic Diseases, MTI Hayatabad Medical Complex, Peshawar

<sup>4</sup>Trainee Medical Officer, Department of Medicine, MTI Khyber Teaching Hospital, Peshawar

<sup>5</sup>Trainee Medical Officer, Department of Medicine, MTI Khyber Teaching Hospital, Peshawar

<sup>6</sup>Trainee Medical Officer, Department of Medicine, MTI Khyber Teaching Hospital, Peshawar

### Correspondence

<sup>3</sup>Iqbal Haider, Associate Professor, Department of Medicine, MTI Khyber Teaching Hospital, Peshawar

☎: +92-313-9696102

✉: [driqbalhaiderkth@gmail.com](mailto:driqbalhaiderkth@gmail.com)

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### ABSTRACT

#### OBJECTIVES

*The study aimed to assess the comprehension of long-term medications in patients with Type 2 diabetes mellitus.*

#### METHODOLOGY

*A descriptive cross-sectional study was conducted in Khyber Teaching Hospital Peshawar, Pakistan, a region with potentially low literacy rates that could affect health outcomes. After acquiring approval from the Institutional Ethical Review Board, the study utilized an appropriately designed and validated questionnaire to collect data from 305 willing participants. The questionnaire assessed demographic information, comorbid conditions, and comprehension of long-term medications.*

#### RESULTS

*The mean age of the patients was  $58.52 \pm 10.3$  years, with a mean HbA1c of  $9.15 \pm 2.1\%$ . Regarding T2DM treatment, 55.1% used oral anti-diabetic agents, 34.4% used insulin, and 10.2% used both. The complications were diabetic retinopathy (40.7%), chronic kidney disease (28.9%), diabetic foot ulcers (24.9%), cerebrovascular disease (16.7%), and cardiovascular disease (16.6%). Over 50% had T2DM for more than five years. Regarding affordability and access to healthcare, 8.2% couldn't afford medications, 44.9% occasionally missed medicines due to cost, and 74.4% had easy access to healthcare. Comorbidities included hypertension (47.5%) and dyslipidemia (12.8%).*

#### CONCLUSION

*Medication comprehension is crucial for T2DM patients' health outcomes. Tailored interventions can improve glycemic control and reduce complications risk.*

**KEYWORDS:** *Type 2 Diabetes Mellitus, Adherence, Education Level, Glycemic Control*

## INTRODUCTION

Type 2 Diabetes Mellitus (T2DM) is a global health problem associated with both microvascular and macrovascular complications, which not only leads to increased morbidity and mortality but also increased health expenditure.<sup>1</sup> According to the International Diabetes Federation's (IDF) survey published in 2021, it was estimated that around 537 million people worldwide have DM, and in Pakistan, 33 million people have DM. The prevalence of T2DM in adults in Pakistan, as estimated by IDF, is 26.7%.<sup>2</sup> Low- and middle-income countries are the most affected, accounting for 77 % of the global burden of T2DM, with rural and low economic populations being affected considerably.<sup>3</sup> In addition to lifestyle modification and diabetes self-management education and support (DSMES), pharmacological therapy is an integral part

of diabetes care.<sup>4</sup> These pharmacological approaches usually involve sequential approaches to achieve glycemic control, ranging from monotherapy to dual and triple therapy with combinations of oral anti-diabetic drugs (OADs) or OADs with injectable agents.<sup>5</sup> Additional medications are usually required to manage comorbidities and complications. This polytherapy is associated with an increased risk of adverse drug reactions and medication non-adherence.<sup>6</sup> Studies have shown a suboptimal adherence to medications in patients with T2DM, ranging from 23 to 77%.<sup>4</sup> This non-adherence to pharmacological management in patients with T2DM is associated with poor glycemic control, more significant occurrence of complications like retinopathy, nephropathy, neuropathy, cardiovascular complications, increased morbidity and mortality and thus increased health care

expenditure.<sup>7,8</sup> Several factors have been attributed to this poor adherence to medication. Some of these factors are polytherapy, emotional problems, diabetes distress, depression, unaffordability, lack of education, duration of the disease, poor social support system, decreased health literacy, side effects of medications and adequate interaction with their Physician.<sup>4</sup> Health literacy is crucial for managing diabetes. It involves patients' ability to understand and use health information to make informed decisions about their healthcare. Studies have shown a positive association between health literacy and diabetes knowledge.<sup>9</sup> Pakistan has one of the lowest literacy rates globally, which affects T2DM patients' comprehension of medications, leading to poor glycemic control and increased health risks and costs.<sup>10</sup> A study conducted in Pakistan showed a negative association between HbA1c and treatment adherence.<sup>11</sup> showed that improved disease-related knowledge was associated with improved adherence to pharmacological management.<sup>12</sup> In Pakistan, several studies have been conducted to evaluate the knowledge and self-management behaviours of patients with T2DM, including health literacy. However, none of the studies have separately assessed the comprehension of long-term medications in people with T2DM. Thus, this study aims to determine the understanding of long-term medications in patients with T2DM, including oral anti-diabetic drugs, anti-hypertensive medications, and lipid-lowering drugs, to explore the reasons that keep them from adhering to the recommended drugs.

## METHODOLOGY

This descriptive cross-sectional study was conducted at MTI-Khyber Teaching Hospital in Peshawar from October 2022 to January 2023. Before commencing the study, approval was obtained from the hospital's ethical committee (Ref. No. 753/DME/KMC Dated: 17/10/2022), and all enrolled patients provided written informed consent. With a prevalence of 26.7% for Diabetes Mellitus (DM) in Pakistan, a 95% confidence interval, and a 5% margin of error, the determined sample size for the study was 305 participants. A non-probability consecutive sampling technique was employed to select participants for the study. Comprehension in the context of this particular study was defined as the ability of study participants to understand the significance of long-term medications for the effective management and prevention of complications in diabetic patients. Medication comprehension includes understanding the long-term use of oral anti-diabetics, anti-hypertensives and statins. The study included T2DM patients aged 40-70 of both genders. Exclusion criteria were Type 1 DM, mental

illnesses, critically ill patients, and those with malignancies. The demographic profile and comorbid conditions data were collected using a validated questionnaire. Data was stored and analyzed using the statistical program SPSS.

## RESULTS

A total of 305 patients with T2DM were included in the study, out of whom 196 (64.3%) were females and 109 (35.7%) were males. The mean age of the study population was  $58.52 \pm 10.3$  years, while the mean HbA1c was  $9.15 \pm 2.1$  %. Different aspects of knowledge about the medication assess including Benefits of a commonly used drugs and most common side effects related to drugs and stratified them according to patient's education level. (Table 1 and 2). Timing of medication is also an important aspect of management so timing of commonly used anti diabetic medications was assessed and further stratified them in rural and urban areas to understand the trends. (Table 3) Study population was stratified according to their glycemic control as per the HbA1C levels and assessed for the medication compliance as per the health care physician advise. (Table 4) Finally, two other very important group of diseases, cardiovascular diseases (heart failure and myocardial infarction) and cerebrovascular disease (Stroke) frequencies were assessed against the compliance of their respective medications such that Antihypertensive and Statin. (Table 5).

**Table 1: Association of comprehension of Benefits of Anti-diabetic medications with the level of Education in patients with Type 2 DM**

Education	Not on Med	No Education	Improves Blood Sugar	No Benefit	P-Value
<b>Metformin</b>					
Nil	87	21	129	19	0.8
Primary	07	03	19	01	
High School	06	01	06	02	
University	01	00	03	00	
<b>DPP4i</b>					
Nil	94	33	84	45	0.7
Primary	08	04	08	10	
High School	06	03	04	02	
University	01	01	01	01	
<b>SGLT2i</b>					
Nil	199	12	29	16	<0.01
Primary	18	02	05	05	
High School	11	01	01	02	
University	00	02	00	02	
<b>Sulphonylurea (SUs)</b>					
Nil	139	63	44	10	0.09
Primary	10	09	09	02	
High School	07	02	06	00	
University	01	01	01	01	

**Table 2: Association of comprehension of Side Effects of Anti-diabetic medications with the level of Education in patients with Type 2 DM**

Education	Not on Meds	No Side Effects	No Education	Know Side Effects	p-Value
<b>Metformin</b>					
Nil	87	24	127	18	0.5
Primary	07	01	20	02	
High School	06	00	08	01	
University	01	00	03	00	
<b>Dipeptidyl Peptidase 4 Inhibitors (DPP4i)</b>					
Nil	94	33	128	01	0.4
Primary	08	04	17	01	
High School	06	03	06	00	
University	01	01	02	00	
<b>Sodium-Glucose Co-Transporter-2 Inhibitors (SGLT2i)</b>					
Nil	199	12	38	07	<0.001
Primary	18	02	04	06	
High School	11	01	00	03	
University	00	02	01	01	
<b>Sulphonylurea (SUs)</b>					
Nil	139	57	29	31	0.01
Primary	10	07	06	07	
High School	07	05	00	03	
University	01	01	02	00	

**Table 3: Association of comprehension of Timings of Anti-diabetic medications with the place of living in patients with Type 2 DM**

<b>Timings Of Metformin</b>						
	Not on Metformin	Before meals	After Meals	During meals	Total	P-Value
Rural	38	19	37	05	100	0.2
Urban	63	59	76	12	205	
Total	101	78	113	17	305	
<b>Timings of Dipeptidyl Peptidase 4 Inhibitors (DPP4i)</b>						
	Not on DPP4i	No Education	After breakfast	After meals	Total	P-Value
Rural	53	09	07	31	100	0.05
Urban	96	22	38	51	205	
Total	149	31	45	82	305	
<b>Timings of Sodium-Glucose Co-Transporter-2 Inhibitors (SGLT2i)</b>						
	Not On SGLT2i	No Education	Before meals	After meals	Total	P-Value
Rural	79	08	04	09	100	0.3
Urban	149	21	17	18	205	
Total	228	29	21	27	305	
<b>Timings of Sulphonylurea</b>						
	Not on SU	No education	Before breakfast	After breakfast	Total	P-Value
Rural	55	14	21	10	100	0.1
Urban	102	45	49	09	205	
Total	157	55	70	19	305	

**Table 4: Association of Glycemic control with the comprehension of Anti-diabetic medication**

<b>Medications For T2DM</b>					
<b>Taking Anti-Diabetic Agents as Advised</b>					
Glycemic Control	Taking as Advised	Not Taking	Total	p-value	
Less than 7%	32	02	34	0.847	
7 to 8 %	57	02	59		
More than 8 %	200	12	212		
Total	289	16	305		

**Table 5: Heart Failure – MI with Anti-hypertensives medications and Stroke with Lipid-lowering medicines in patients with Type 2 DM**

<b>Medications For Hypertension</b>					
<b>Taking Anti-Hypertensive Agents as Advised</b>					
Heart Failure / MI	Taking as Advised	Not Taking	No HTN	Total	P-Value
Yes	43	11	27	81	0.000
No	80	13	131	224	
Total	123	24	158	305	
<b>Medications For Lipids</b>					
<b>Taking Anti- Lipid Agents as Advised</b>					
Stroke	Taking as Advised	Not Taking	No HTN	Total	P-Value
Yes	10	03	38	51	0.000
No	15	12	227	254	
Total	25	15	265	305	

**DISCUSSION**

Type 2 diabetes mellitus (T2DM) is a chronic metabolic disease that requires long-term medication management.<sup>13</sup> Comprehension and adherence to these medications are crucial for achieving optimal glycemic control and reducing the risk of complications.<sup>14</sup> However, studies have shown that patients with T2DM often have poor knowledge, attitudes, and practices (KAP) regarding their medications.<sup>14</sup> A study conducted in India assessed the KAP related to T2DM, hypertension, and diabetic retinopathy among patient populations at different levels of eye health care.<sup>14</sup> This study found that people with diabetes had higher mean knowledge and attitude scores about DM, hypertension, and diabetic retinopathy compared to non-diabetics. Another study conducted in South Africa evaluated the level of knowledge, attitude, and practice (KAP) regarding lifestyle modifications among patients with T2DM attending an outpatient department.<sup>15</sup> This study revealed that the attitude and practice remain poor despite good knowledge about lifestyle modifications.<sup>15</sup> In Sudan, a hospital-based cross-sectional study

assessed dietary knowledge, attitude, and practice among T2DM patients.<sup>16</sup> Majority of the patients demonstrated good knowledge (54.6%), positive attitude (79%), and good practice (58%) regarding dietary recommendations for T2DM patients.<sup>16</sup> A review article examined the impact of KAP on managing T2DM in developing countries.<sup>17</sup> This review concluded that patient education, adhered practices, and attitudinal outlook can significantly help deter the ill effects of T2DM.<sup>17</sup> Another study conducted in Malaysia assessed the knowledge, attitude, and practice among T2DM patients.<sup>18</sup> The study found that most subjects had moderate knowledge (46.15%) and positive attitudes (59.60%) but poor practice.<sup>18</sup> A study in Saudi Arabia assessed outpatients' KAP for managing diabetes.<sup>19</sup> The study revealed that outpatient diabetes patients had insufficient knowledge, practice, and a negative attitude toward type 2 diabetes mellitus.<sup>19</sup> Several studies reported low levels of knowledge about T2DM, its complications, and management strategies among patients.<sup>14,19,20,21</sup> and one study found that only 41.8% of diabetic patients had good knowledge about DM.<sup>14</sup> Similarly, another study reported that only 28.3% of physicians knew the correct diagnostic criteria for T2DM.<sup>18</sup> Attitudes towards T2DM management varied across studies. While some patients had positive attitudes towards lifestyle modifications and self-management.<sup>18,22</sup> others exhibited poor attitudes towards recommended dietary changes and regular exercise.<sup>17,19</sup> Healthcare providers' attitudes towards patient education and counselling also influenced their practices in managing T2DM.<sup>22</sup> Practices related to long-term medication comprehension were generally suboptimal among patients and healthcare providers. Many patients did not adhere to prescribed medications or engage in regular self-monitoring practices such as blood glucose testing or foot examinations.<sup>14,18</sup> Healthcare providers often fail to provide adequate patient education on diabetes management or follow clinical guidelines for screening tests and interventions.<sup>22</sup> The weighted aggregated point estimate for the Relative Risk (RR) could not be computed due to insufficient data on outcomes explicitly related to long-term medication comprehension in T2DM.<sup>23</sup> Our study highlights the issue of medication adherence among patients with Type 2 Diabetes Mellitus. Similar studies from Iran and Bangladesh reveal low medication adherence rates due to factors like polytherapy, emotional distress, and inadequate health literacy. Tailored interventions are needed to address medication comprehension and adherence barriers. Medication adherence is crucial in reducing T2DM complications and achieving better health outcomes.<sup>17</sup> Studies from different countries have consistently demonstrated the impact of non-

adherence on glycemic control and increased risk of complications, reinforcing the global relevance of this issue. The study's emphasis on designing interventions based on education level, location, and cultural factors aligns with recommendations from international research.<sup>17</sup>

## LIMITATIONS

This study has limitations that need to be considered when interpreting the findings. The descriptive and cross-sectional study cannot establish a temporal relationship between thrombocytopenia and malaria. There were fewer cases of *P. falciparum* malaria included in the analysis than *P. vivax* malaria cases, which could limit the comparability and generalizability of the results. Other factors, such as sex, genetics, and immune status, may play a role in thrombocytopenia development, were not examined. The study may have also been affected by selection bias as it may have only included individuals with more severe malaria cases, skewing the findings. Further research is needed to confirm the relationship between thrombocytopenia and malaria and address these limitations.

## CONCLUSIONS

The study has limitations due to its cross-sectional design, small sample size, and self-reported data, which may impact the accuracy of responses. Future research should consider a longitudinal design, multi-centre studies, and objective measures of medication adherence. Digital health interventions could also improve adherence.

**CONFLICT OF INTEREST:** None

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## CONTRIBUTORS

1. **Suleman Elahi Malik** - Concept & Design; Data Acquisition; Drafting Manuscript; Supervision
2. **Shaista Kanwal** - Data Acquisition; Data Analysis/Interpretation; Critical Revision; Final Approval
3. **Iqbal Haider** - Concept & Design; Data Analysis/Interpretation; Drafting Manuscript; Critical Revision; Supervision; Final Approval
4. **Javeria Javed** - Data Acquisition; Data Analysis/Interpretation; Drafting Manuscript; Final Approval
5. **Yasir Iqbal** - Data Acquisition; Data Analysis/Interpretation; Drafting Manuscript; Final Approval
6. **Sidra Bibi** - Data Acquisition; Data Analysis/Interpretation; Drafting Manuscript; Final Approval



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