APPRAISAL OF KNOWLEDGE, ATTITUDE, PRACTICE AND MEDICATION ADHERENCE TOWARDS ANTIDIABETIC DRUGS AMONG DIABETIC PATIENTS IN TERTIARY CARE TEACHING HOSPITAL, DAVANGERE

Dr. Santosh Uttangi[1], Prof. J. S. Venkatesh[2], Aleena R. Reji[3], Aneeta G. Jacob[3], Bhoomika K. S.[3] and Dona Aju*[3]

[1]Assistant Professor, S C S College of Pharmacy, Harapanahalli.

[2]Professor, S C S College of Pharmacy, Harapanahalli.

[3*]Pharm. D Intern, S C S College of Pharmacy, Harapanahalli.

*Corresponding Author
Dona Aju
Pharm. D Intern, S C S
College of Pharmacy,
Harapanahalli.

ABSTRACT

Diabetes mellitus is a chronic condition that requires effective management through medication adherence to prevent complications and maintain optimal health. Understanding patient's knowledge, attitudes, and practices (KAP) regarding their medication is crucial for developing strategies to improve adherence. This study aims to assess the knowledge, attitude, and practices (KAP) of diabetic patients regarding antidiabetic medications and their adherence to prescribed treatment regimen. A questionnaire-based, cross-sectional study was conducted among diabetic patients admitted to a tertiary care teaching hospital for a period of 6 months using a structured questionnaire. Out of 220 patients, Metformin (Biguanides) being the most commonly used medication (183 patients). Results showed that the majority of patients had medium levels of knowledge (54.1%), attitude (52.7%), and practice (57.3%) regarding diabetes management. Knowledge was higher among males, those with higher education, longer diabetes duration, and a positive family history. However, there was no significant correlation between these factors and attitude. Good practice was notably higher in patients with higher education, a longer duration of diabetes, and a positive family history. Only 10.5% of participants were highly adherent to their medications, with 50% categorized as low adherents. The reasons behind non-adherence varied and ranged from forgetfulness (41.8%), feeling better or worse when taken (20.4%), low literacy level (12.3%),

cost of medication (6.8%), etc. Higher education, good glycemic control, and employment were associated with better adherence. The findings highlight the need for enhanced patient education, support, and clinical pharmacist involvement to improve KAP and medication adherence in diabetes management.

KEYWORDS: *Diabetes, Knowledge, Attitude, Practice, Medication Adherence, Antidiabetic Drugs.*

INTRODUCTION

Diabetes mellitus (DM) is a chronic metabolic disorder characterized by chronic hyperglycemia with disturbance of carbohydrate, fat and protein metabolism resulting from insulin deficiency, resistance or both. It may be due to several factors associated with environment and genetics.[1,2] According to International Diabetes Federation 10th edition, in 2021, it is estimated that 537 million people have diabetes, and this number is projected to reach 643 million by 2030, and 783 million by 2045.India is the world's top most country with incident (new) and prevalent (existing) cases of type 1 diabetes in children and adolescents and second most country with a greater number of adults with diabetes.[3]

Antidiabetic drugs are classified as oral antidiabetic agents and insulins and other injectable preparations. Related to degree of glycemic control, both insulin and sulphonylureas reduced microvascular complications in type 2 DM. Metformin, however, could reduce both microvascular and macrovascular complications. Many type 2 DM patients do not attain desired level of glycemic control with metformin alone, and a second drug is needed. Sulphonylureas are the most commonly selected 2nd drug and Pioglitazone is usually the 3rd choice drug. The latest hypoglycemics gaining popularity are the Dipeptidyl peptidase-4 (DPP-4) inhibitors. Upto 50% patients of type 2 DM initially treated with oral hypoglycaemics later need insulin. Insulin is one of the oldest valuable anti- diabetic medications available and also the most effective agent in lowering hyperglycemia when used in appropriate doses.[4-6] Poor adherence to these antidiabetic drugs leads to poor glycemic control which are found to be associated with increasing risk of micro and macro- vascular complications like retinopathy, neuropathy, nephropathy, coronary heart disease, stroke, and peripheral vascular disease. About one-third to one-half of the patients for whom appropriate therapies are prescribed do not receive the full benefit from the prescribed therapeutic regimen because of non-compliance.[7]

Self-management through medication adherence is essential for preventing and controlling hyperglycemic conditions and for managing the complications of diabetes. The measurement of a patient's self-management can be evaluated by conducting knowledge, attitude, and practice (KAP) studies among diabetes patients.[8] They usually have low level of Knowledge, Attitude and Practice (KAP) behaviour which is a major cause for non-compliance to therapeutic regimen leading to uncontrolled blood glucose level. Poor knowledge, attitude, practice and medication taking behaviour to anti-diabetic medication along with irregular exercise and unplanned diet, which further results in complications, premature disability and death.[9] Poor knowledge, attitude, and practices among the diabetes patients can be minimized by assessing their current knowledge, attitude, and practices towards antidiabetic drugs and it can be helpful in future planning for preparation of better educational interventional program for diabetic patients.[10] Various studies shows that increasing patient knowledge and practice regarding disease and its management has significant benefits with regard to patient compliance to treatment and to decreasing complications associated with the disease and to control blood glucose level.[11]

Medication adherence is defined as the extent to which patients take medications as prescribed. According to World Health Organization, it is ''the extent to which a person's behaviour in taking medication, following a diet, and/or executing lifestyle changes, corresponds with agreed recommendations from a healthcare provider.[12] Non adherence to medication is common in patients with diabetes and it compromises safety and treatment effectiveness, leading to increased morbidity and mortality rates. Low adherence to prescribed anti-diabetes medicines are responsible for 30% to 50% of treatment failures. The most common reasons for poor adherence include failure to remember, drug side effects, regimen complexity, patients stopping when they feel better or worse etc.[13,14] Therefore, for proper diabetes control medication adherence need to be assess. Medication adherence can be assessed through direct measures like assaying body fluids to detect the presence of the drug and indirect measures like patient self-reports, pill counts. Standardised questionnaires are a common choice because they are cheap and fast. The eight-item Morisky Medication Adherence Scale (MMAS-8),[15] has been used in several studies to assess adherence to medication in chronic diseases.

This study aims to evaluate the knowledge, attitude, practice (KAP) towards antidiabetic drugs among diabetic patients. It aids in future development of control programs and

techniques for effective education and patient counselling for proper glycemic control. The study also aimed to assess the medication adherence towards antidiabetic drugs and to identify the major reason for non-adherence.

MATERIALS AND METHODS

Study site: The study was conducted at the General Medicine Inpatient Department of Chigateri District Hospital, Davangere over a duration of six months.

Study design: Cross-sectional, questionnaire-based study.

Sample size: The study was conducted in 220 diabetic patients admitted in a tertiary care teaching hospital.

Study criteria: The study was carried out by considering the following inclusion and exclusion criteria.

Inclusion criteria

- Diabetic patients who were admitted to the hospital.
- Patients of either gender.
- Patients with an age above 18 years.
- Patients who were willing to give informed consent to participate in the study.

Exclusion criteria

- Patients with poor mental and physical states.
- Patients who were not willing to participate in the study.
- Patients had missing and insufficient data.
- Pregnant and lactating women were excluded.
- Patients with newly diagnosed diabetes.

Study procedure

A cross sectional questionnaire based study was conducted on 220 patients admitted to general medicine department of Chigateri District Hospital Davangere over six months. The study received approval from the Institutional Ethical Committee of SCS College of Pharmacy. A specifically designed data collection form was created to gather information, which encompasses, patient demographic details, major complaints, past medical and medication history, family history, laboratory investigations, complications/comorbidities as well as the medications prescribed for each individual. The informed consent form was also filled out. A

KAP questionnaire (each category contains 5 questions) was prepared and provided to the patients to assess their knowledge, attitude, and practice towards antidiabetic drugs. KAP score was obtained depending on the responses of the patient. Each correct and incorrect response in all categories was scored 1, 0 respectively. Thus, the maximum attainable score was 5 and the minimum score was 0. The total score of 0 and 1 were categorised as "poor", 2 and 3 as "medium(average)", 4 and 5 as "good" scores. A questionnaire on medication adherence has also been prepared and filled out.

RESULTS

A total of 230 questionnaires were collected voluntarily, 220 were considered eligible for analysis with a response rate of 95.6%. The patients with inclusion criteria are enrolled in this study. The collected results were analyzed statistically using MS Excel.

1. DISTRIBUTION OF PATIENTS ACCORDING TO AGE

Among the 220 patients most (28.2%) were in the age group of 51-60, followed by 61-70 (23.2%) years and 41-50 (22.3) years while the fewest (5.5%) were in the 18-30 age group.

Table 1: Distribution of patients according to age.

AGE (in years)	NO OF PATIENTS (n)	PERCENTAGE (%)
18-30	12	5.5
31-40	23	10.4
41-50	49	22.3
51-60	62	28.2
61-70	51	23.2
71-85	23	10.4

2. DEMOGRAPHIC PROFILES OF THE STUDY POPULATION

In this study the males and females had a comparable participation rate of 58.2% (128) and 41.8% (92) respectively. Most of the subjects received primary (46.4%) and above primary education (41.8%) and were self-employee (58.6%). A mere 38.2% of patients had a family history of diabetes mellitus.

Table 2: Demographic profiles of the study population.

VARIABLES	PATIENTS (n)	PERCENTAGE (%)
GENDER		
Male	128	58.2
Female	92	41.8
EDUCATION		
Uneducated	26	11.8

Primary level	102	46.4
Above primary level	92	41.8
PROFESSION		
Unemployed	45	20.4
Self-employee	129	58.6
Govt employee	5	2.2
House wife	41	18.6
FAMILY HISTORY OF DM		
Positive	84	38.2
Negative	136	61.8

3. FEATURES OF DIABETES MELLITUS IN PATIENTS

As per the analysis of the study, most of the subjects are suffering from Type 2 DM (92.8%) and the duration of DM was greater than 4 years (55%). The most frequent co morbid condition was hypertension (44.5%), followed by cardiovascular disease (10.9%), respiratory disease (7.3%), kidney disease (6.4%). The most prevalent complications associated with diabetes are diabetic foot (17.3%), followed by diabetic ketoacidosis (6.4%), neuropathy (3.6%), nephropathy (2.7%), heart attack (2.7%), retinopathy (2.3%).

Table 3: Features of diabetes mellitus in patients.

PARAMETERS	PATIENTS (n)	PERCENTAGE (%)
TYPE OF DIABETES		
Type 1	10	4.5
Type 2	204	92.8
Type 3c	6	2.7
DURATION OF DIABETES		
Upto 4 years	99	45
More than 4 years	121	55
COMORBIDITIES		
Hypertension	98	44.5
Cardiovascular disease	24	10.9
Respiratory disease	16	7.3
Kidney disease	14	6.4
Liver disease	5	2.3
Hypothyroidism	3	1.4
COMPLICATIONS		
Diabetic foot	38	17.3
Diabetic ketoacidosis	14	6.4
Neuropathy	8	3.6
Nephropathy	6	2.7
Heart attack	6	2.7
Retinopathy	5	2.3
Stroke	4	1.8
Amputation	1	0.4

4. PREVALENCE OF THE MAIN ANTIDIABETIC CLASSES USED AMONG THE PATIENTS

In this present study, the most commonly used drugs by the patients are Biguanides (Metformin-183), followed by sulphonylureas (Glimepiride-113, Gliclazide-4, Glibenclamide-1), Insulin (Human Mixtard-22, Human Actrapid-6, Insulin Glargine-2, Isophane Insulin-1), DPP-4 inhibitors (Vildagliptin-8, Tenegliptin-6, Sitagliptin-4, Linagliptin-1), Thiazolidinediones (Pioglitazone-11), SGLT-2 Inhibitors (Dapagliflozin-8), α-glucosidase inhibitors (Voglibose-7).

Table 4: Prevalence of the antidiabetic drugs used among the patients.

Category of drugs used in DM	Frequency of use in total population n (%)
Biguanides	183(83.2%)
Sulfonylureas	118(53.6%)
Insulin	31(14%)
Thiazolidinediones	11(5%)
α-glucosidase inhibitors	7(3.2%)
DPP-4 inhibitors	19(8.6%)
SGLT-2 inhibitors	8(3.6%)

5. KNOWLEGDE ASSESSMENT REGARDING ANTIDIABETIC DRUGS AMONG SUBJECTS

As it is depicted in the table 5, 61.8% subjects agreed that once the diabetes is controlled, the drugs should not be stopped. Only 18.2% of them thought that missing doses of the diabetic medication will have a negative effect on the disease control. Merely 32.3% of them knew about the complications, that caused due to uncontrolled sugars. A few subjects (17.3%) knew about the common side effects of antidiabetic drugs. 40.9% of them knew about the hypoglycemic symptoms. Regarding the symptoms of low blood glucose, dizziness (21.8%), sweating (19.1%), tremor (15.4%), fatigue (5.9%) and blurred vision (3.2%) were the responses obtained.

Table 5: Knowledge Assessment.

QUESTIONS	POSITIVE RESPONSES n (%)
1) Once the diabetes is controlled the drugs should be stopped?	136 (61.8%)
2) Do you think missing doses of your diabetic medication will have a negative effect on your disease control?	40 (18.2%)
3) Self stopping of the medication may cause complications. What are the major	71 (32.3%)

complications?	
4) What are the common side effects of antidiabetic drugs?	38 (17.3%)
5) Hypoglycemia is the major ADR of antidiabetic drugs. Do you know about the hypoglycemic symptoms?	90 (40.9%)

6. ATTITUDE ASSESSMENT REGARDING ANTIDIABETIC DRUGS AMONG SUBJECTS

As the table 6 illustrates, 91.8% subjects took the medicine at proper time as prescribed. 19.1% of them manage hypoglycemic condition by taking sweet or sugar. 57.3% patients have the right mindset regarding what to do when they miss a dose. 83.6% didn't face any challenges in taking medication as prescribed and 90% of them feel confident in managing the diabetes with medication.

Table 6: Attitude Assessment.

QUESTIONS	POSITIVE RESPONSES n (%)
1) At what time did you take your medicine?	202 (91.8%)
2)How do you manage hypoglycemic condition?	42 (19.1%)
3) What will you do if you miss the dose? (Double the dose, start with next dose, take as soon as remembering)	126 (57.3%)
4) Any challenges do you face in managing your diabetes with medications?	184 (83.6%)
5) Do you feel confident in managing your diabetes with medications?	198 (90%)

7. PRACTICE ASSESSMENT REGARDING ANTIDIABETIC DRUGS AMONG SUBJECTS

Just as table 7 illustrates, out of total 220 subjects 62.7% follow a proper diet and exercise along with medication. About 71.2% of them didn't make their own modification in the drug regimen without consulting the doctor. Majority of the subjects (77.3%) are able to remember on their own to take their medications at the appropriate times. Almost 70% of them took a regular checkup, but only 9.5% check their sugar level regularly.

Table 7: Practice Assessment.

QUESTIONS	POSITIVE RESPONSE n (%)
1) Along with medicine did you follow diet and exercise?	138 (62.7%)
2) Do you make your own modification in the drugs regimen without consulting?	157 (71.2%)

3) How do you remember to take your antidiabetic medication and what strategies do you use to ensure adherence?	170 (77.3%)
4) Do you take a regular checkup?	154 (70%)
5) How often did you check the sugar level?	21 (9.5%)

8. KAP SCORE AMONG THE PARTICIPANTS

In this study, the kap score was calculated and categorized as poor (score 0-1), medium (score 2-3) and good (score 4-5). 54.1% had medium knowledge, 42.7% had poor knowledge and 3.2% had good knowledge. Accordingly, 52.7% had medium attitude, 45% had good attitude and 2.3% had poor attitude. It was found that 57.3% had medium practice, 31.3% had good practice and 11.4% had poor practice.
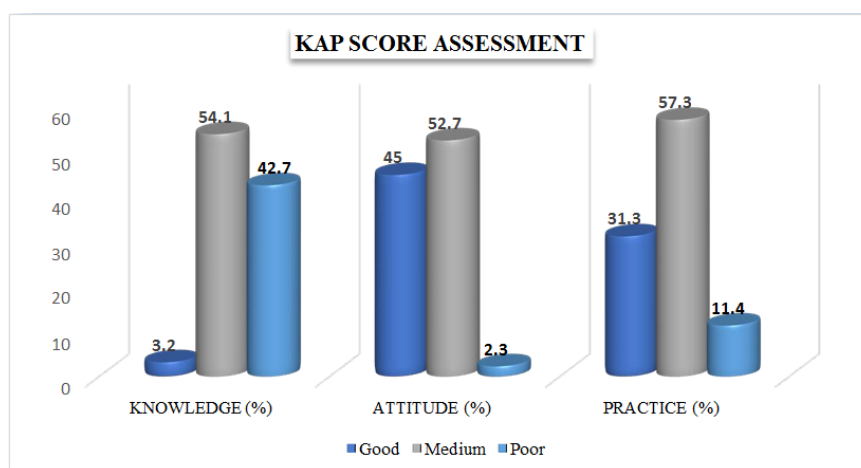
9. RELATIONSHIP BETWEEN VARIABLES AND KNOWLEDGE SCORE

When analyzing the relationship between different factors and knowledge, high knowledge was found in patients with a duration of Diabetes Mellitus greater than 4 years. Patients with more than primary education had higher knowledge than patients who were uneducated or had primary education. Similarly male had more knowledge than females. Subjects having a family history of diabetes had higher knowledge than those having a negative family history.

Table 9: Relationship between different Variables and Knowledge score.

VARIABLES	KNOWLEDGE	
	MEDIUM/GOOD (%)	POOR (%)
DURATION OF DM Up to 4 years More than 4 years	44.4 % 67.8%	55.6% 32.2%

EDUCATION		
Primary/Uneducated	47.7%	52.3%
More than primary	70.6%	29.4%
GENDER		
Male	60.1%	39.8%
Female	53.3%	46.7%
FAMILY HISTORY		
Positive	67.9%	32.1%
Negative	50.7%	49.3%

10. RELATIONSHIP BETWEEN DIFFERENT VARIABLES AND ATTITUDE SCORE

When analyzing the relationship between different factors and attitude, the level of attitude on the basis of gender, education, duration of DM, family history of DM is comparable. There is no relation between these variables and attitude score.

Table 10: Relationship between different Variables and Attitude score.

VARIABLES	ATTITUDE	
	MEDIUM/GOOD(%)	POOR (%)
DURATION OF DM		
Up to 4 years	98%	2%
More than 4 years	97.5%	2.5%
EDUCATION		
Primary/Uneducated	97.7%	2.3%
More than primary	97.8%	2.2%
GENDER		
Male	97.7%	2.3%
Female	97.8%	2.2%
FAMILY HISTORY		
Positive	97.6%	2.4%
Negative	97.8%	2.2%

11. RELATIONSHIP BETWEEN DIFFERENT VARIABLES AND PRACTICE SCORE

Based on the analysis, high practice was found in patients with a duration of Diabetes Mellitus greater than 4 years. Patients with more than primary education had higher knowledge than patients who were uneducated or had primary education. Similarly, females had more practice than males. Subjects having a family history of diabetes had higher knowledge than those having a negative family history.

Table 11: Relationship between different Variables and Practice score.

VARIABLES	PRACTICE	
	MEDIUM/GOOD (%)	POOR (%)
DURATION OF DM Up to 4 years More than 4 years	84.9% 91.7%	15.1% 8.3%
EDUCATION Primary/Uneducated More than primary	87.5% 90.2%	12.5% 9.8%
GENDER Male Female	85.2% 93.5%	14.8% 6.5%
FAMILY HISTORY Positive Negative	94% 85.3%	6% 14.7%

12. ASSESSMENT OF RESPONSE TO MEDICATION ADHERENCE QUESTIONNAIRE

As shown in table 12, 37.7% of the participants responded No to the question "Do you sometimes forget to take your anti-diabetic pills?", 65.5% of them didn't forget to take antidiabetic medicine over the past two weeks. Almost 70% of the subjects never cut back or stopped taking the medication without telling the doctor. Most of the patients (72.7%) didn't forget to bring the medication when they travel or leave home. The majority of them (94.5%) took their anti-diabetic drug yesterday. 67.7% of the subjects didn't stop taking their medication when they felt like the blood sugar level was under control. Almost 87.7% of them never feel hassled about sticking to their diabetic treatment plan. Only 11.4% of patients never or rarely feel difficulty in remembering to take all the anti-diabetic medication.

Table 12: Assessment of Response to Medication Adherence Questionnaire.

QUESTIONS	n (% adherence)
1) Do you sometimes forget to take your anti-diabetic pills?	83 (37.7%)
2) People sometimes miss taking their medications for reasons other than forgetting. Thinking over the past two weeks, were there any days when you did not take your diabetic medicine?	144 (65.5%)
3) Have you ever cut back or stopped taking your medication without telling your doctor because you felt worse when you took it?	154 (70%)
4) When you travel or leave home, do you sometimes forget to bring along your medication?	160 (72.7%)
5) Did you take your anti-diabetic drug yesterday?	208 (94.5%)
6) When you feel like your glucose level is under control, do you sometimes stop taking your medicine?	149 (67.7%)
7) Taking medication everyday is a real inconvenience for some people. Do you feel hassled about sticking to your diabetes treatment plan?	193 (87.7%)

8) How often do you have difficulty remembering to take all your anti-diabetic medication?
    a. Never/rarely
    b. Once in a while
    c. Sometimes
    d. Usually
    e. All the time
	25 (11.4%)

13. OVERALL ADHERENCE STATUS OF PARTICIPANTS

Only 23 (10.5%) of the participants were highly adherent to their antidiabetic medication. Medium adherers were 87 (39.5%), whereas the majority (50%; n=110) fell into the low category.

Table 13: Overall Adherence status of the Participants.

ADHERENCE LEVEL	NUMBER OF PATIENTS (n)	PERCENTAGE (%)
Low	110	50
Medium	87	39.5
High	23	10.5

14. ASSESSMENT OF THE FACTORS CONTRIBUTING TO MEDICATION NON-ADHERENCE

In this study, the reasons behind non-adherence were varied and ranged from forgetfulness 92 (41.8%), feeling better or worse when taken 45 (20.4%), low literacy level 27 (12.3%), cost of medication 15 (6.8%), disbelief in treatment 11 (5%), difficulty of administration 6 (2.7%), lack of trust in provider 5 (2.3%), side effects 4(1.8%), regimen complexity 4 (1.8%), inadequate availability of medication 4 (1.8%).

Table 14: Assessment of the factors contributing to medication non adherence.

FACTORS	FREQUENCY (n)	PERCENTAGE(%)
Forgetfulness	92	41.8%
Feeling better or worse when taken	45	20.4%
Low literacy level	27	12.3%
Cost of Medication	15	6.8%
Disbelief in treatment	11	5%
Difficulty of Administration	6	2.7%
Lack of Trust	5	2.3%
Regimen Complexity	4	1.8%
Side Effects	4	1.8%
Inadequate availability of medicine	4	1.8%

15. ASSESSMENT OF RELATIONSHIP BETWEEN DIFFERENT VARIABLES AND ADHERENCE TO THEIR ANTI-DIABETIC MEDICATIONS

As illustrated in figure, it was noted that compared to men, women tend to be slightly more adherence to anti-diabetic medication. In addition, participants who had more than primary education were less likely to poorly adhere to their medication. Similarly subjects with good glycemic control were more adherent and unemployed ones were less adherent than employed subjects.
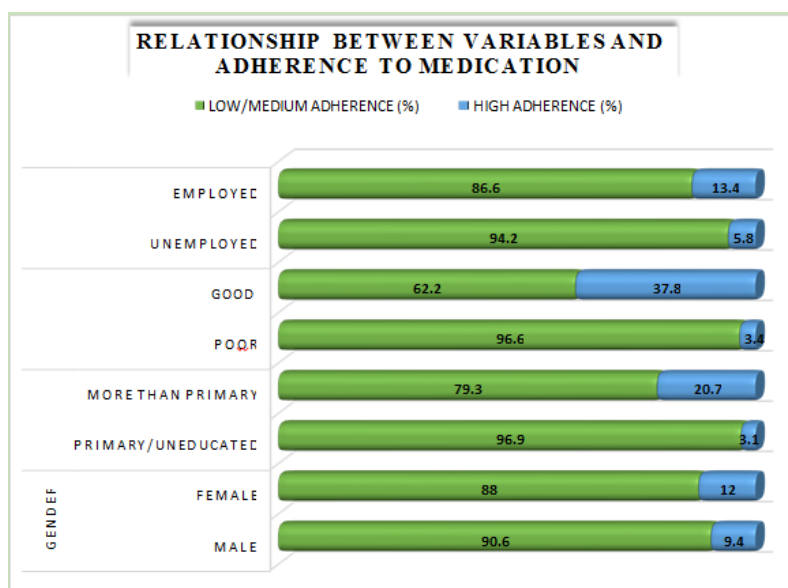
DISCUSSION

DM is considered as one of the most significant health issues in India and other developing countries. Diabetes can be effectively controlled through both non-pharmacological lifestyle modifications and pharmacological treatment.[1] Many recent studies show that improving the KAP of Diabetes Mellitus among patients is directly associated with their improvement in self-management of DM which results in improved disease control. In addition, American Diabetes Association has also emphasized the importance of improving self-management to enhance adherence and reduce chronic complications.[8] In the present study, a total of 230 questionnaires were collected, out of which 220 were eligible for analysis.

In our study the majority of the patients were found to be within the age range of 51-60 (28.2%), followed by 61-70 age group (23.2), 41-50 age group (22.3%) and the age group of 18-30 (5.5%) had the fewest number of patients. This trend was similar to the study conducted by Kasi *et al.*,[16] at Chitradurga, Karnataka, India.

Out of 220 patients, males (58.2%) outnumbered female patients (41.8%), similar results were found in the studies conducted by Nagar V *et al.,*[10] Shabaraya *et al.,*[4] where the majority of the participants were male. The reason being diabetes affects a higher proportion of males is due to lifestyle differences between men and women in India, where men spend more time having meals outside. Only 11.8% of them were uneducated, the remaining had a primary education (46.4%) or more than primary education (41.8%) which is comparable with the study conducted by Shabaraya *et al.,*[4] at Mangalore, Karnataka, India. Merely 38.2% of the participants had a family history of diabetes mellitus in our study, which is similar to the study conducted by Nagar V *et al.*[10]

The most prevalent diabetes mellitus was Type 2 (92.8%), similar to the study conducted by Das *et al.*[1] In the study the most frequent comorbid condition was hypertension (44.5%) which was identical in the study conducted by Das *et al.,*[1] and Demoz *et al.,*[14] In addition, the most commonly encountered diabetic complication was diabetic foot (17.3%) which is consistent with the study conducted by Obirikorang *et al.,*[17] at Ghana.

In our study metformin (83.2%) was the most frequently prescribed ADD followed by SUs (53.6%), which was in agreement with the study conducted by Mahmoud *et al.,*[18] where we found 89.96% of subjects were prescribed metformin.

In the current study among the participants, 3.2% had good, 54.1% had medium and 42.7% had poor knowledge. These findings are consistent with the findings of the studies conducted by Das *et al.,*[1] in West Bengal, India, and Nagar V *et al*[10] in Bhopal, India where most of the diabetic subjects had medium knowledge. Similar to the findings in a study conducted by Das *et al.,*[1] we found that the majority of the subjects (61.8%) thought that once the diabetes is controlled the drugs should be stopped. Besides, only 18.2% thought that missing doses of the antidiabetic medication would have a negative effect on disease control. Only 32.3% of them knew about the major complications of diabetes mellitus in our study and identical result was found in the study conducted by Hoque *et al.,*[19] at South Africa where only 32.5% of them knew. Only 17.3 % of the subjects knew about the common side effects of the drugs, which is higher than the percentage (0%) found in the study conducted by Umar *et al.,*[20] because in our study, the subjects who were experiencing adverse effects are aware about the common side effects like abdominal discomfort, hypoglycemia. A large number of subjects (40.9%) did not respond to the question regarding hypoglycemic symptoms. Regarding the symptoms of low glucose level, dizziness (21.8%), sweating (19.1%), and tremor (15.4%)

were the responses obtained. Similar pattern of response was found in the study conducted by Das *et al.,*[1] and only 37.98% respond to this question in their study.

Regarding attitude towards antidiabetic drugs, 52.7% had medium, 45% had good and 2.3% had poor attitude. Shabaraya *et al.,*[4] showed that 51% had medium attitude in their study. Almost all the subjects (91.8%) took their medication at proper time as prescribed, which is similar with the study conducted by Umar *et al.,*[20] at Istanbul where 100% of the subjects positively responded. Only 19.1% manage their less severe hypoglycemic condition by taking sugar, sweets, or juice. The remaining ones do nothing or they consult to doctor for even mild hypoglycemic conditions. Upadhyay *et al.,*[21] also found that only 17.28% of subjects know to manage the hypoglycemic condition. About 57.3% of the subjects ensure proper action is taken when a dose is missed, which is in line with the findings in the study conducted by Umar *et al.*[20]

In the present study, majority of the participants had medium practice (57.3%), followed by 31.3% had good and 11.4% had poor practice. This was consistent with the study conducted by Al-Maskari *et al.,*[22] and Shabaraya *et al.,*[4] where most of the participants had medium practice. Most of the subjects (62.7%) were aware that diet plays an important role in controlling DM. This was similar with the studies conducted by Das *et al.,*[1] Gautam *et al.,*[9] and Umoh Victor Aniedi *et al.*[23] Majority of our subjects (70%) took a regular check-up by consulting doctor, which is comparable with the study conducted by Al-Maskari *et al.*[22] But only 9.5% often check their sugar level regularly, which is identical to the study conducted by Das *et al.*[1]

Patients' education level significantly affects the knowledge score. Knowledge score was higher among the higher education group (more than primary) as compared to the lower education group (primary and uneducated) because the education status of patients significantly affects their knowledge regarding disease management. This highlights the importance of education which was in line with other studies conducted by Khaznadar A A *et al,*[2] Nagar V *et al,*[10] and El-Khawaga *et al*.[11] They also found that patients with a background of positive family history had higher knowledge which is similar in our study. The total score of knowledge was higher among male diabetic patients as compared to female. Similar findings have also been seen in study conducted by Nagar V *et al*.[10] The reason of low score of knowledge is due to low literacy rate among female as compared to male patients in India. The knowledge score was higher with longer duration of diabetes which was in agreement

with the study conducted by Khaznadar A A _et al_.[2] However the level of attitude based on gender, education, duration of DM, and family history of DM are comparable. There is no relation between these variables and attitude score. This was similar to the study conducted by Das _et al_.[1] Good practice was statistically significant among more educated patients (90.2%), patients having longer duration of diabetes (91.7%) and with positive family history (94%). This is in line with the findings in the study conducted by ElKhawaga _et al_.[11]

Regarding medication adherence score, the majority fell into the low category (50%), followed by medium adherers (39.5%) and only 10.5% of the participants were highly adherent to their antidiabetic medication. Jackson _et al_,[12] showed that 50.2% of subjects had medium adherence in their study. Although there were numerous reasons for medication non-adherence, the most common selfreported reason was forgetfulness (41.8%), which was consistent with the studies conducted by Jackson _et al_,[12] Demoz _et al_,[14] and Othman _et al_.[14]

In our study, the participants who had completed higher education, had good glycemic control and employed ones were high adhere to their antidiabetic drugs. This result was in agreement with the study conducted by Demoz _et al_.[14] Similarly females were more adhered than the males in our study, which is similar to the study conducted by A Khardali _et al_.[25]

CONCLUSION
This study provides a snapshot of the present situation of knowledge, attitude, practice, and medication adherence toward antidiabetic drugs among common people. The findings of our study revealed that most of the patients had medium knowledge, attitude, and practice towards antidiabetic medication which could have an impact on blood glucose control and overall quality of life. It highlights the significance of providing education on diabetes and antidiabetic medications. The assessment of knowledge and practice score demonstrates variability in relation to gender, the duration of diabetes mellitus, family history of diabetes mellitus, and educational background, but the attitude score shows no such association.

Significantly, the rate of participants with medium and low adherence were considerably higher. Medication non-adherence was associated with male gender, low education level, unemployed, and poor glycemic control. Factors like forgetfulness, low literacy level, feeling better or worse when taken, and cost of medication were most likely the cause of non-adherence.

In addition to prescription drugs, comprehensive education, and counseling are also necessary for the management of diabetes mellitus. The clinical pharmacist plays a crucial role in enhancing the patient's KAP towards the management of DM. Thus, clinical activities such as patient counseling, and pharmaceutical care programs may help to increase the patient's practice in disease management. Overall, improved medication adherence can produce better health outcomes for patients with diabetes with a corresponding increase in the quality of life.

AUTHOR'S CONTRIBUTION

All the authors have contributed equally.

CONFLICT OF INTEREST

All authors declare that there are no conflicts of interest.

ETHICS DECLARATION

The Institutional Ethics Committee at SCS College of Pharmacy approved the protocol. All residents in the hospital provided informed consent.

CONSENT FOR PUBLICATION

All authors have consented to the publication of their work.

COMPETING INTERESTS

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BIBLIOGRAPHY

1. Das AK, Ghosh D, Ghosh J. Assessment of Patients' Knowledge, Attitude and Practice Regarding Diabetes Mellitus in A Tertiary Care Hospital in Eastern India. Asian J Pharm

Clin Res., 2023; 16(1): 29-34.

2. Khaznadar AA, Al-Banna HI, Saeed NHR. Knowledge, Attitude, Practice, and Beliefs Among Adult Diabetics Attending Diabetic Consultation Clinic in Sulaimania. JSMC., 2015; 5(2): 129-37.

3. International Diabetes Federation. IDF Diabetes Atlas, 10th ed. Brussels, Belgium: 2021. Available at: https://www.diabetesatlas.org.

4. Shabaraya R, Fernandes B, Kumari S. An Interventional Study to Evaluate Knowledge, Attitude and Practice Regarding Insulin Administration among Diabetic Patients at a Tertiary Care Hospital in Dakshina Kannada. Indian Journal of Pharmacy Practice., 2024; 17(1): 42-49.

5. Wells BG, Dipiro JT, Schwinghammer TL, Dipiro CV. Diabetes Mellitus. Pharmacologic Therapy. Schwinghammer TL. Pharmacotherapy Handbook. 7th ed. McGraw-Hill, 213.

6. Tripathi KD. Insulin, Oral Hypoglycaemic Drugs and Glucagon. Status of oral hypoglycaemics in diabetes mellitus. Essentials of Medical Pharmacology.7th ed. New Delhi: JAYPEE, 2013; 275-98.

7. Kandasamy K, Rajagopal SS. Impact of a Pharmacist Intervention on Improving Medication Adherence and Knowledge towards Diabetes Mellitus: A Randomised Controlled Study. International Journal of Pharmaceutical Research., 2019; 11(1): 416-20.

8. Sharaf SE, Alsaedi MH, Bannani AB, Al-Shammari MN, Alzahrani TA, Al-Otaibi MJ, *et al*. Knowledge, attitude, practice, and pharmaceutical outcomes of type 2 diabetes mellitus selfmanagement among patients in Makka Region, Saudi Arabia. Pharm Pharmacol Int J., 2021; 9(3): 94-101.

9. Gautam S, Basnet R. Drug Utilization Pattern and KAP Assessment among Diabetic Patients at selected hospitals in Kathmandu, Nepal. World Journal of Pharmacy and Pharmaceutical Sciences, 2020; 9(11): 1424-37.

10. Nagar V, Prasad P, Mitra A, Kale S, Yadav K, Shukla M. Assessment of knowledge, attitude, and practice about diabetes among diabetic patients of tertiary care centre in central India. Int J Community Med Public Health, 2018; 5(9): 4065-4071.

11. El-Khawaga G, Abdel Wahab F. Knowledge, Attitudes, Practice and Compliance of Diabetic Patients in Dakahlia, Egypt. European Journal of Research in Medical Sciences, 2015; 3(1): 40-53.

12. Jackson IL, Adibe MO, Okonta MJ, Ukwe CV. Medication Adherence in Type 2Diabetes Patients in Nigeria. Diabetes Technology and Therapeutics, 2015; 17(6): 398-404.

13. Araya EM, Gebrezgabiher HA, Tekulu GH, Alema NM, Getnet D, Gebru HT, *et al.*

Medication Non-Adherence and Associated Factors Among Diabetic Patients Visiting General Hospitals in the Eastern Zone of Tigrai Northern Ethiopia. Patient Preference and Adherence, 2020; 14: 2071-83.

14. Demoz GT, Wahdey S, Bahrey D, Kahsay H, Woldu G, Niriayo YL, *et al.* Predictors of poor adherence to antidiabetic therapy in patients with type 2 diabetes: a cross- sectional study insight from Ethiopia. Diabetol Metab Syndr., 2020; 12(62): 1-8.

15. Martinez-Perez P, Orozco-Beltran D, Pomares-Gomez F, Hernandez-Rizo J, Borras-Gallen A, Gil-Guillen V, *et al*. Validation and psychometric properties of the 8-item Morisky Medication Adherence Scale (MMAS-8) in type 2 diabetes patients in Spain. Atencion Primaria., 2021; 53(2): 1-8.

16. Jagadeesh K, Kauser MM, Afreen A, Rekha L. Drug Utilization Evaluation In Diabetic Patients In A Tertiary Care Teaching Hospital: A Prospective Observational Study; Journal of Drug Delivery & Therapeutics, 2014; 4(5): 147-51.

17. Obirikorang Y, Obirikorang C, Anto EO, Acheampong E, Batu EN, Stella AD, *et al*. Knowledge of complications of diabetes mellitus among patients visiting the diabetes clinic at Sampa Government Hospital, Ghana: a descriptive study, BMC Public Health, 2016; 16: 1-8.

18. Mahmoud F, Mueller T, Mullen A, Sainsbury C, F. Rushworth G, Kurdi A. Patterns of initial and first-intensifying antidiabetic drug utilization among patients with type 2 diabetes mellitus in Scotland, 2010–2020: A retrospective population-based cohort study, Diabetes Obes Metab., 2024; 26: 2684–94.

19. Hoque AM, Hoque ME, Singh S, Chinnasamy Y, Hoque M. Knowledge, Attitude and Practices of Diabetes Amongst Diabetes Patients at A Primary Health Care Centre in Durban, South Africa. Med Clin Res., 2020; 5(10): 258-67.

20. Umar RM, Cattık BN, Aslan S. Evaluation of disease and medication knowledge levels of diabetic patients, Istanbul J Pharm., 2023; 53(2): 103-109.

21. Upadhyay DK, Izham M, Alurkar V.M Mishra P, Palaian S. Evaluation of knowledge, attitude and practice of newly diagnosed diabetes patients-a baseline study from Nepal. International Journal of Pharmacy Teaching and Practices., 2012; 3(2): 245-252.

22. Al-Maskari F, El-Sadig M, Al-Kaabi JM, Afandi B, Nagelkerke N, Yeatts KB. Knowledge, attitude and practices of diabetic patients in the United Arab Emirates, PloS one, 2013; 8(1): 1-8.

23. Aniedi UV, Effiong JH, Akpan EE. Knowledge, attitudes and practices on diabetes mellitus among out-patients with type 2 diabetes in Uyo, South-South Nigeria. JMSCR,

2020; 08(11): 423-430.

24. Abebaw M, Messele A, Hailu M, Zewdu F. Adherence and associated factors towards antidiabetic medication among type II diabetic patients on follow-up at University of Gondar Hospital, Northwest Ethiopia. Advances in nursing, 2016; 1-7.

25. Khardali A, Syed NK, Alqahtani SS, Qadri M, Mereya AM, Rajeh N, et al. Assessing medication adherence and their associated factors amongst type-2 diabetes mellitus patients of Jazan Province, Saudi Arabia: A single-center, cross-sectional study. Saudi Pharmaceutical Journal, 2024; 32: 1-8.