Int. J. Pharm. Investigation, 2026; 16(1):143-154.
https://www.jpionline.org

Original Article

Impact of an Educational Intervention on Knowledge, Attitude, and Practice among Women Diabetic Patients : A Prospective Randomized Controlled Study

Anushree Shrikant Deshpande, Madiwalayya Shivakantayya Ganachari*

Department of Pharmacy Practice, KLE College of Pharmacy, Belagavi, KLE Academy for Higher Education and Research (KAHER), Belagavi, Karnataka, INDIA.

ABSTRACT

Background: Diabetes Mellitus (DM) is a serious worldwide health challenge, currently affecting over 425 million people globally. India bears a significant burden, with approximately 74 million diagnosed cases as of 2021. Type 2 Diabetes Mellitus (T2DM) accounts for more than 95% of these cases, often leading to serious complications and nearly 4 million diabetes-related deaths annually. Women face unique challenges in managing diabetes due to factors such as gestational diabetes and sociocultural barriers that limit access to care and adherence to treatment. **Objectives:** To assess the Knowledge, Attitudes, and Practices (KAP) of women living with diabetes and to determine the impact of structured educational programs on enhancing their disease management. **Materials and Methods:** A prospective interventional study was conducted among 218 women diagnosed with diabetes at a tertiary care hospital. The participants were randomly assigned to either the intervention group and the control group. Baseline and follow-up KAP assessments were conducted using a validated questionnaire. The intervention group received diabetes education through interactive sessions, counseling, and educational leaflets, while the control group received standard care. **Results:** The intervention group demonstrated improved awareness and self-care practices compared to the control group. Although many participants understood basic diabetes concepts, misconceptions persisted, especially regarding treatment and lifestyle changes. Greater improvements in KAP scores were observed among those with longer disease duration. **Conclusion:** The study highlights the importance of gender-specific education and improved healthcare access. Structured educational programs can significantly enhance diabetes awareness, self-care, and quality of life among women. Broader studies are recommended for long-term assessment.

Keywords: Diabetes Mellitus, Women's Health, Knowledge, Attitudes and Practice, Health Education.

Correspondence:
Dr. Madiwalayya Shivakantayya Ganachari
Department of Pharmacy Practice, KLE College of Pharmacy, Belagavi, KLE Academy for Higher Education and Research (KAHER)-590010, Belagavi, Karnataka, INDIA.
Email: msganachari@gmail.com

Received: 17-06-2025;
Revised: 04-08-2025;
Accepted: 29-09-2025.

INTRODUCTION

Diabetes Mellitus (DM) is a long-term metabolic condition marked by elevated blood glucose levels resulting from inadequate insulin secretion, insulin resistance, or a combination of both (American Diabetes Association, 2021). It is associated with disturbances in macronutrient metabolism (Voet and Voet, 2000; Mohan, 2010). DM is a major global health issue, with an estimated 425 million cases in 2017, projected to increase significantly (Benedict *et al.*, 2018). If left uncontrolled, it can lead to microvascular and macrovascular complications, increasing morbidity, and mortality, and reducing Health-Related Quality of Life (HRQOL). The prevalence of diabetes is rising globally, with India experiencing a significant burden (Anjana *et al.*, 2017). More than 95% of adults with diabetes have Type 2 DM (T2DM). India ranks second globally in diabetes prevalence, with approximately 69 million cases in 2015 (Unnikrishnan *et al.*, 2016).

By 2021, the International Diabetes Federation estimated 74 million diagnosed cases in India, with an additional 40 million undiagnosed. Diabetes-related complications include microvascular issues such as retinopathy, neuropathy, and nephropathy, as well as macrovascular conditions like coronary artery disease, cerebrovascular disease, peripheral artery disease, and heart failure. These complications contribute to approximately 4 million diabetes-related deaths annually (International Diabetes Federation, 2019). Although the prevalence of diabetes is comparable between men and women, it tends to be higher in women after the age of 65 (Roglic, 2009).

DOI: 10.5530/ijpi.20260494

Women face unique physiological and socioeconomic challenges in diabetes management. Conditions such as Gestational Diabetes Mellitus (GDM) and Polycystic Ovary Syndrome (PCOS) raise their likelihood of developing T2DM (Buchanan and Xiang, 2005; Parker, 2023). Limited healthcare access, lower health literacy, and caregiving responsibilities further hinder disease control (Hill-Briggs *et al*., 2020). Studies indicate that women often have lower awareness of diabetes, its complications, and the importance of treatment adherence (Fatema *et al*., (2017). Poor glycemic control in women can lead to adverse maternal and fetal outcomes, increased cardiovascular risks, and reduced quality of life (Kautzky-Willer *et al*., 2016). This highlights the need for gender-specific diabetes awareness programs.

Effective diabetes management includes Oral Hypoglycemic Agents (OHAs), insulin therapy, lifestyle modifications, and regular monitoring (Shrivastava *et al*., 2013). The goal of treatment is to reduce the risk of complications while enhancing both life expectancy and overall quality of life (Tipnis and Bajaj, 2011). However, adherence to treatment remains a major challenge, particularly among women, due to social and economic barriers (Rezaei *et al*., 2019). Addressing these challenges through structured education and awareness campaigns is essential for better disease control.

Knowledge, Attitude, and self-care Practices (KAP) play a crucial role in diabetes management (Wang *et al*., 2024). A patient's understanding of their disease and adherence to self-care practices play a crucial role in achieving treatment goals and effectively managing their condition (Okonta *et al*., 2014). KAP surveys assess baseline knowledge, attitudes, and behaviors, aiding in the development of targeted educational programs (Al-Mutawaa *et al*., 2022). These studies help tailor health interventions to improve disease control (Chawla *et al*., 2019). The long-term nature of diabetes and the need for patients to manage their daily care in an outpatient setting highlight the importance of promoting and reinforcing self-care practices for all individuals with diabetes (Niguse *et al*., 2019). Adequate information enables individuals to understand diabetes risks, seek timely treatment, and adopt preventive measures (Ahmad and Joshi, 2023). Research using the KAP framework shows that many women, particularly those with GDM, have limited knowledge and inadequate self-care practices, highlighting the need for targeted interventions (Durghashree *et al*., 2024; Mantri *et al*., 2024).

Despite the increasing prevalence of diabetes among women, there is limited research on their KAP in India. Understanding these factors can help identify gaps in awareness and barriers to effective management. This study aims to assess KAP among women with diabetes, evaluate the effectiveness of existing antidiabetic campaigns, and provide recommendations for improving diabetes education and healthcare accessibility. By addressing knowledge gaps and promoting positive health behaviors, this study can contribute to better diabetes management and improved HRQOL for women.

MATERIALS AND METHODS

Participants and Data Collection

This research was designed as a prospective, interventional, randomized controlled trial. Participants were randomly allocated into two groups: an intervention group and a control group. The study was carried out over 12 months at KLE's Dr. Prabhakar Kore Hospital and Medical Research Centre (MRC), located in Nehru Nagar, Belagavi. Eligible participants included women aged 18 years or older who had been diagnosed with diabetes mellitus and were undergoing anti-diabetic treatment. At the beginning of the study, all participants were informed about the study's purpose, confidentiality measures, and their right to withdraw at any stage. Written informed consent was obtained before enrolment. A total of 218 women with diabetes took part in the study. Each participant completed a structured form capturing demographic data, socio-economic background, and clinical history. The study adhered to the ethical standards outlined in the Declaration of Helsinki and received approval from the institutional ethics committee. Participants were provided assistance as needed while filling out the data collection form. The KAP levels were evaluated using self- prepared questionnaire consisting of 25-items, which included 11 questions on knowledge, 7 on attitudes, and 7 on practices.

Ethical Clearance

Ethical clearance was obtained from the Institutional Ethical Committee of KLE Academy of Higher Education and Research, Belagavi (Reference number: KAHER/ EC/2223/134).

Questionnaire

The questionnaire used to assess KAP among women diabetic patients included sections on knowledge, attitude, and practice-related aspects. The questionnaire consisted of two sections: the first section gathered demographic details, and the second evaluated Knowledge, Attitudes, and practices (KAP) related to diabetes. This section comprised 11 knowledge questions, 7 questions assessing attitudes, and 7 addressing practices. The knowledge section examined participants' awareness of diabetes symptoms, risk factors, severity, prevention, and management, using a yes/no response format, where affirmative answers were given one point and negative responses received zero. The attitude and practice sections covered aspects such as blood glucose monitoring, physical activity, medication adherence, dietary habits, and follow-up routines, with predefined response options (Raj *et al*., 2010). Three physicians reviewed and validated the questionnaire, with only minor language modifications suggested. The study involved 218 diabetic patients, both inpatients and outpatients with comorbidities, who were interviewed. Data on

demographics, medical history, lab results, progress records, and prescribed treatments were documented using a structured data collection tool. The KAP levels were evaluated using self-prepared questionnaire consisting of 25-items, which included 11 questions on knowledge, 7 on attitudes, and 7 on practices. Results were presented using descriptive statistics, including means, percentages, tables, graphs, and charts, and a multivariate analysis was conducted to explore significant associations among variables.

Statistical analysis

The collected data were entered into Microsoft Excel and carefully reviewed to detect any discrepancies or missing information. Once data accuracy and completeness were ensured, responses from all 218 participants were coded for further analysis. Statistical analysis was performed using SPSS Version 16.0. Bivariate analysis was used to explore potential factors affecting KAP among participants, followed by multivariate analysis to control for confounding variables and identify independent predictors of KAP. Associations were expressed as Odds Ratios (OR) with 95% Confidence Intervals (CI), and a *p*-value of less than 0.05 was considered statistically significant.

RESULTS

A total of 218 participants were enrolled in the study, with an equal distribution between the control group (109) and the intervention group (109). Demographic and clinical characteristics are summarized in Table 1. The majority of participants were between 41-50 years of age (37.2%), followed by those aged 31-40 years (26.6%). Notably, a higher proportion of individuals aged 51-60 years was observed in the intervention group (32.1%) compared to the control group (11.9%). A considerable number of participants were either overweight (38.1%) or obese (19.7%), with similar distributions across both groups.

Regarding diabetes duration, 45.0% of participants had the condition for 6-10 years, with a larger percentage in the intervention group (51.4%) compared to control group (38.5%). Diabetes duration exceeding 10 years was reported by 17.9% of participants as shown in Figure 1. A family history of diabetes was prevalent, with 6.9% reporting parental history, 30.2% citing affected grandparents, and 17.9% mentioning other relatives. A majority (78.9%) resided in rural areas, and 89.4% were literate, with similar distributions in both groups. More than half (59.2%) were unemployed, with slightly more in the intervention group (60.6%) than in the control group (57.8%). Tobacco use was rare, with 95.9% of participants being non-users.

Hypertension was the most frequent comorbidity (34.9%), followed by chronic kidney disease (8.7%), hypothyroidism (6.4%), and ischemic heart disease (5.5%). Additionally, 39.9% of participants had no reported comorbidities. Neuropathy (9.2%), retinopathy (8.3%), and nephropathy (8.3%) were the most commonly observed diabetic complications. Notably, 59.5% of participants reported no diabetes-related complications as shown in Figure 2.

Overall responses to knowledge-based questionnaires

Most participants (86.7%) had heard of diabetes, but awareness of measurement methods (45.87%) and the Glucose Tolerance Test (6.42%) was low. While 66.06% recognized the need for lifestyle modifications, only 26.61% knew that high blood pressure could worsen diabetes. Participation in awareness programs was minimal (13.3%) as shown in Figure 3.

Knowledge comparison between control and interventional groups

Both groups had similar awareness levels, with around 40% recognizing diabetes. The interventional group showed slightly better knowledge of diabetes measurement (24% vs. 21.85%) and organ damage risks (16.94% vs. 9.66%). Exercise benefits were acknowledged more in the intervention group (36.92% vs. 32.8%), but misconceptions about medication use persisted. Awareness program participation remained low in both groups as shown in Table 2.

Overall responses to attitude-based questionnaires

Figure 4 shows less than half of the participants (41.74%) preferred daily exercise, and only 45.41% monitored their blood sugar levels monthly. Most (88.07%) disagreed that taking two doses would control diabetes faster. Regular medication use (82.57%)

Table 1: Characteristics of the study population.

Sl. No.	Demographics	Category	Control Group (*n*=109)	Intervention Group (*n*=109)	Total (*n*=218)
1.	Age Group	21-30 years	3 (2.8%)	4 (3.7%)	7 (3.2%)
		31-40 years	27 (24.8%)	31 (28.4%)	58 (26.6%)
		41-50 years	48 (44.0%)	33 (30.3%)	81 (37.2%)
		51-60 years	13 (11.9%)	35 (32.1%)	48 (22.0%)
		61-70 years	14 (12.8%)	5 (4.6%)	19 (8.7%)
		Above 70 years	4 (3.7%)	1 (0.9%)	5 (2.3%)

Sl. No.	Demographics	Category	Control Group (*n*=109)	Intervention Group (*n*=109)	Total (*n*=218)
2.	Body Mass Index (BMI)	Underweight (<18.5)	5 (4.6%)	4 (3.7%)	9 (4.1%)
		Normal weight (18.5-24.9)	40 (36.7%)	43 (39.4%)	83 (38.1%)
		Overweight (25-29.9)	42 (38.5%)	41 (37.6%)	83 (38.1%)
		Obese (>30)	22 (20.2%)	21 (19.3%)	43 (19.7%)
3.	Duration Of Diabetes	< 1 year	9 (8.3%)	6 (5.5%)	15 (6.9%)
		1-5 years	34 (31.2%)	32 (29.4%)	66 (30.3%)
		6-10 years	42 (38.5%)	56 (51.4%)	98 (45.0%)
		>10 years	24 (22.0%)	15 (13.8%)	39 (17.9%)
4.	Family History of Diabetes	Parents	9 (8.3%)	6 (5.5%)	15 (6.9%)
		Grandparents	34 (31.2%)	32 (29.4%)	66 (30.3%)
		Siblings	42 (38.5%)	56 (51.4%)	98 (45.0%)
		Others	24 (22.0%)	15 (13.8%)	39 (17.9%)
5.	Residence	Rural	85 (78.0%)	87 (79.8%)	172 (78.9%)
		Urban	24 (22.0%)	22 (20.2%)	46 (21.1%)
6.	Literacy Status	Literate	97 (89.0%)	98 (89.9%)	195 (89.4%)
		Illiterate	12 (11.0%)	11 (10.1%)	23 (10.6%)
7.	Occupation	Employed	46 (42.2%)	43 (39.4%)	89 (40.8%)
		Unemployed	63 (57.8%)	66 (60.6%)	129 (59.2%)
8.	Tobacco	Tobacco chewer	5 (4.6%)	4 (3.7%)	9 (4.1%)
		Non-Tobacco chewer	104 (95.4%)	105 (96.3%)	209 (95.9%)
9.	Comorbidity	Hypertension	36 (33.0%)	40 (36.7%)	76 (34.9%)
		Ischemic Heart Disease	5 (4.6%)	7 (6.4%)	12 (5.5%)
		Coronary Artery Disease	2 (1.8%)	3 (2.8%)	5 (2.3%)
		Rheumatic Heart Disease	1 (0.9%)	1 (0.9%)	2 (0.9%)
		Hyperthyroidism	2 (1.8%)	8 (7.3%)	10 (4.6%)
		Hypothyroidism	6 (5.5%)	8 (7.3%)	14 (6.4%)
		Chronic Kidney Disease	7 (6.4%)	12 (11.0%)	19 (8.7%)
		Acute Kidney Injury	1 (0.9%)	1 (0.9%)	2 (0.9%)
		Anaemia	3 (2.8%)	1 (0.9%)	4 (1.8%)
		Metabolic acidosis	1 (0.9%)	1 (0.9%)	2 (0.9%)
		Nil	49 (45.0%)	38 (34.9%)	87 (39.9%)
10.	Diabetic Complications	Neuropathy	9 (8.3%)	11 (10.1%)	20 (9.2%)
		Retinopathy	9 (8.3%)	9 (8.3%)	18 (8.3%)
		Ketoacidosis	7 (6.4%)	8 (7.3%)	15 (6.9%)
		Nephropathy	7 (6.4%)	11 (10.1%)	18 (8.3%)
		Diabetic foot	6 (5.5%)	11 (10.1%)	17 (7.8%)
		Nil	71 (65.1%)	59 (54.12%)	130 (62.4%)

and doctor check-ups (83.49%) were widely accepted. However, 37.16% believed long-term treatment could cause organ failure, and only 20.64% preferred quarterly HbA_{1c} testing.

Attitude comparison between control and interventional groups

Exercise preference was similar in both groups (21.56% vs. 20.18%). Blood sugar monitoring was slightly higher in the intervention group (23.39% vs. 22.02%). Regular medication adherence and doctor visits were comparable between groups (42.20% vs. 40.37% and 42.66% vs. 40.83%, respectively). Misconceptions about treatment effects persisted, with 20.18% in the intervention and 16.97% in the control group believing it leads to organ failure. HbA_{1c} testing preference remained low across both groups as shown in Table 3.

Overall responses to practice-based questionnaires

Less than half of the participants (42.66%) exercised daily, and 49.54% monitored their blood glucose monthly. Only 22.48% followed a small and frequent meal pattern, while 43.12% avoided rice. Regular medication adherence was reported by 61.01%, but only 23.85% underwent HbA_{1c} testing every three months. Tobacco chewing was noted in 4.1% of respondents as shown in Figure 5.

Practice comparison between control and interventional groups

Exercise habits were similar between groups (44.04% in the intervention vs. 41.28% in the control). Monthly blood glucose monitoring was slightly lower in the intervention group (48.62% vs. 50.46%). Small, frequent meals were rarely followed, with no

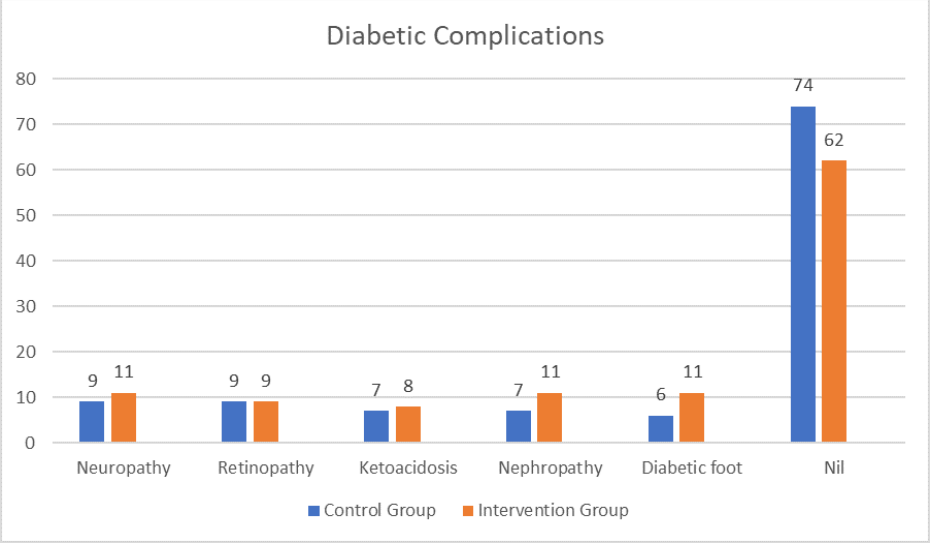

Figure 1: Distribution of subjects based on diabetes-related complications.

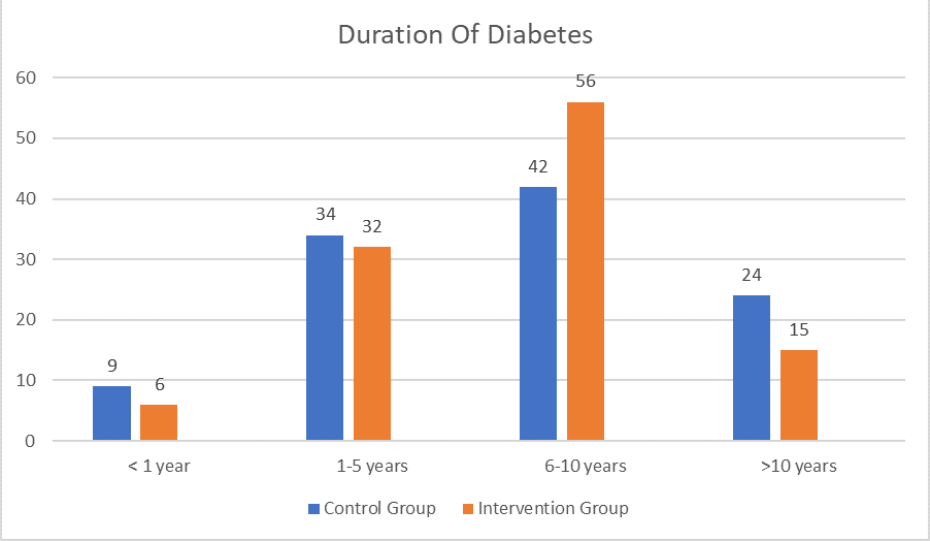

Figure 2: Distribution of subjects based on duration of diabetes.

Table 2: Responses for Knowledge-based Questionnaires in Control and Interventional Groups.

Sl. No.	Questionnaires	Control Group		Interventional Group		Total	
		Yes (%)	No (%)	Yes (%)	No (%)	Yes (%)	No (%)
1	Are you familiar with diabetes?	94 (39.50)	25 (10.50)	95 (40.00)	4 (1.70)	189 (86.70)	29 (13.30)
2	Does obesity play the major role in causing diabetes?	75 (31.50)	44 (18.50)	74 (31.00)	25 (10.50)	149 (68.35)	69 (31.65)
3	Do you know how to measure diabetes?	52 (21.85)	67 (28.15)	48 (24.00)	51 (26.00)	100 (45.87)	118 (54.13)
4	Do you know about the glucose tolerance test?	7 (2.90)	98 (41.20)	7 (3.50)	98 (41.98)	14 (6.42)	204 (93.58)
5	Does a diabetic patient need lifestyle modification?	75 (31.50)	44 (18.50)	69 (34.50)	30 (15.00)	144 (66.06)	74 (33.94)
6	Are you aware that exercise can help manage diabetes?	78 (32.80)	40 (16.80)	74 (36.92)	26 (13.00)	152 (69.72)	66 (30.28)
7	Could high blood pressure lead to a worsening of the disease?	29 (12.18)	70 (29.41)	29 (14.43)	90 (37.81)	58 (26.61)	160 (73.39)
8	Can a fibre-rich diet help in managing diabetes?	58 (24.37)	53 (22.27)	53 (26.55)	54 (26.81)	111 (50.92)	170 (49.08)
9	Could medicines alone control diabetes?	47 (19.75)	57 (23.95)	57 (28.96)	87 (27.00)	104 (47.71)	144 (52.29)
10	Can diabetes lead to complications in other organs?	23 (9.66)	77 (32.35)	35 (16.94)	83 (34.92)	58 (26.61)	160 (73.309)
11	Did you attend a diabetes awareness program?	15 (6.30)	94 (39.50)	14 (7.00)	66 (37.80)	29 (13.30)	189 (86.70)

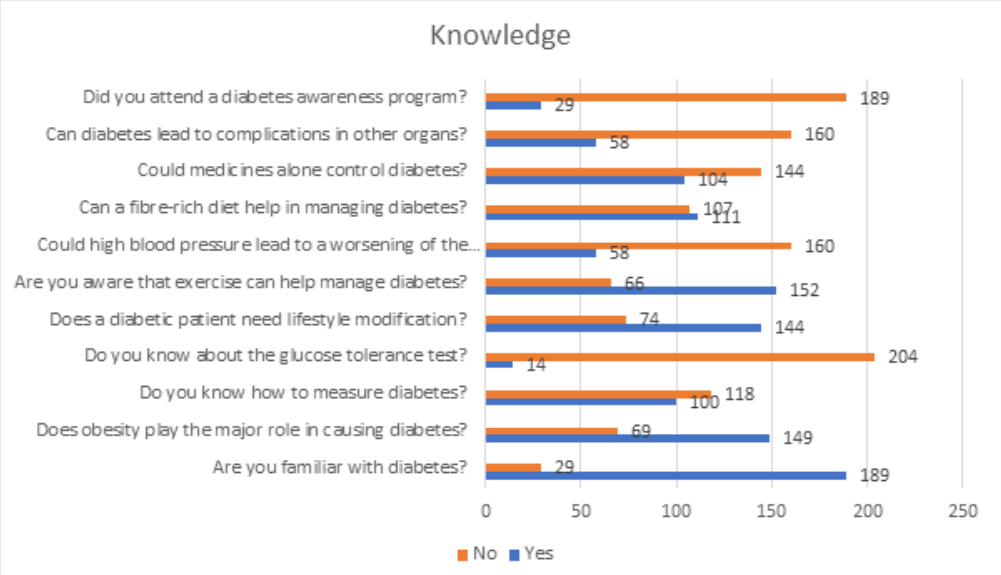

Figure 3: Overall Responses to Knowledge-based Questionnaires.

Table 3: Responses for Attitude-based questionnaires in Control and Interventional groups.

Sl. No.	Questionnaires	Control Group		Interventional Group		Total (%)	
		Yes (%)	No (%)	Yes (%)	No (%)	Yes (%)	No (%)
1	Would you prefer daily exercise?	44 (20.18)	65 (29.82)	47 (21.56)	62 (28.44)	91 (41.74)	127 (58.26)
2	Would you prefer to measure your Fasting Blood Sugar (FBS) and Post Prandial Blood Sugar (PPBS) levels every month?	48 (22.02)	61 (27.98)	51 (23.39)	58 (26.61)	99 (45.41)	119 (54.59)
3	Do you think that two doses will help manage diabetes more effectively?	12 (5.50)	83 (38.07)	14 (6.42)	85 (39.00)	26 (11.93)	168 (88.07)
4	Do you choose to take your medications every day?	88 (40.37)	19 (8.72)	92 (42.20)	19 (8.72)	180 (82.57)	38 (17.43)
5	Do you feel regular visits to your doctor are essential?	89 (40.83)	17 (7.80)	93 (42.66)	19 (8.72)	182 (83.49)	36 (16.51)
6	Do you feel that prolonged treatments will lead to organ failure?	37 (16.97)	64 (29.36)	44 (20.18)	73 (33.49)	81 (37.16)	137 (62.84)
7	Would you like to measure your HbA_{1c} (Glycated hemoglobin) levels every 3 months?	20 (1)	68 (31.19)	25 (11.47)	75 (34.40)	45 (20.64)	143 (79.36)

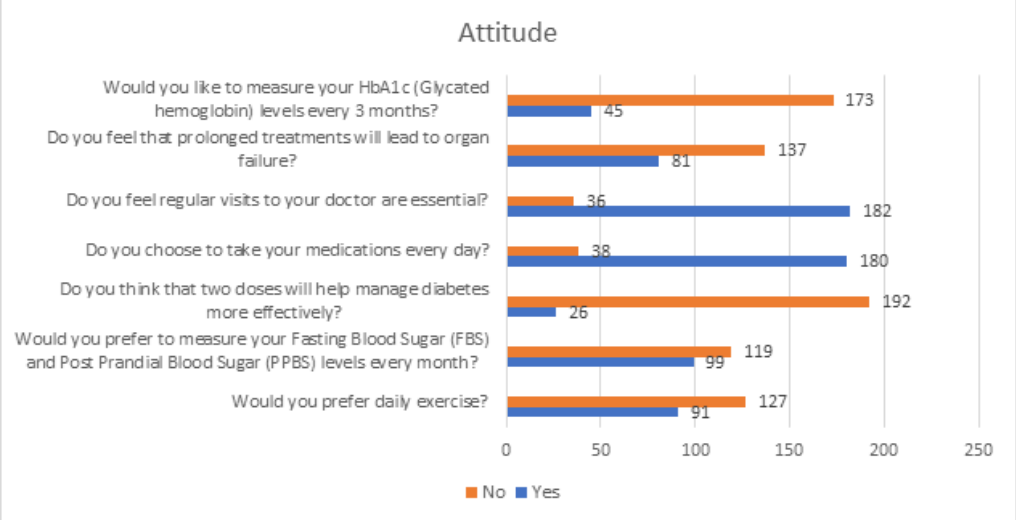

Figure 4: Overall responses to attitude-based questionnaires.

significant difference between groups. Medication adherence was slightly higher in the control group (62.39% vs. 59.63%), while HbA_{1c} testing remained low across both groups. Tobacco Chewing was reported at similar rates in both groups shown in Table 4.

Participants aged 41-50 showed the highest improvement in knowledge (14.68%), attitude (13.76%), and practice (12.84%) in the intervention group, while younger (21-30 years) and older (>70 years) individuals had lower improvements. Normal-weight individuals (18.5-24.9 BMI) exhibited the highest gains in knowledge (15.60%) and practice (13.76%), whereas overweight (25-29.9 BMI) and obese (≥30 BMI) individuals had slightly lower improvements. Those with diabetes for 6-10 years showed the most improvement across knowledge (14.68%), attitude (11.93%), and practice (12.84%), while those diagnosed for less than a year had minimal changes. Urban participants demonstrated slightly higher gains in knowledge (20.18%) and practice (19.27%) compared to rural participants. Literate individuals showed greater improvement in all domains-knowledge (27.52%), attitude (23.85%), and practice (25.69%)-compared to illiterate participants as shown in Table 5.

Table 4: Responses for Practice-based questionnaires in Control and Interventional groups.

Sl. No.	Questionnaires	Control Group		Interventional Group		Total (%)	
		Yes (%)	No (%)	Yes (%)	No (%)	Yes (%)	No (%)
1	Are you involved in 30–60 minutes of physical activity every day?	45 (41.28)	64 (58.72)	48 (44.04)	61 (55.96)	93 (42.66)	125 (57.34)
2	Are you monitoring your blood glucose levels every month?	55 (50.46)	54 (49.54)	53 (48.62)	56 (51.38)	108 (49.54)	110 (50.46)
3	Are you regularly eating small, frequent meals?	26 (23.85)	83 (76.15)	23 (21.10)	88 (78.90)	49 (22.48)	169 (77.52)
4	Are you avoiding rice in your meals?	47 (42.34)	64 (57.66)	47 (43.12)	60 (56.88)	94 (43.12)	124 (56.88)
5	Are you taking medications regularly?	68 (62.39)	41 (37.61)	65 (59.63)	44 (40.37)	133 (61.01)	85 (38.99)
6	Are you checking your HbA1c levels every 3 months?	28 (25.69)	81 (74.31)	24 (22.02)	85 (77.98)	52 (23.85)	166 (76.15)
7	Do you have a habit of chewing tobacco	5 (4.6)	104 (95.4)	4 (3.7)	105 (96.3)	9 (4.1)	209 (95.9)

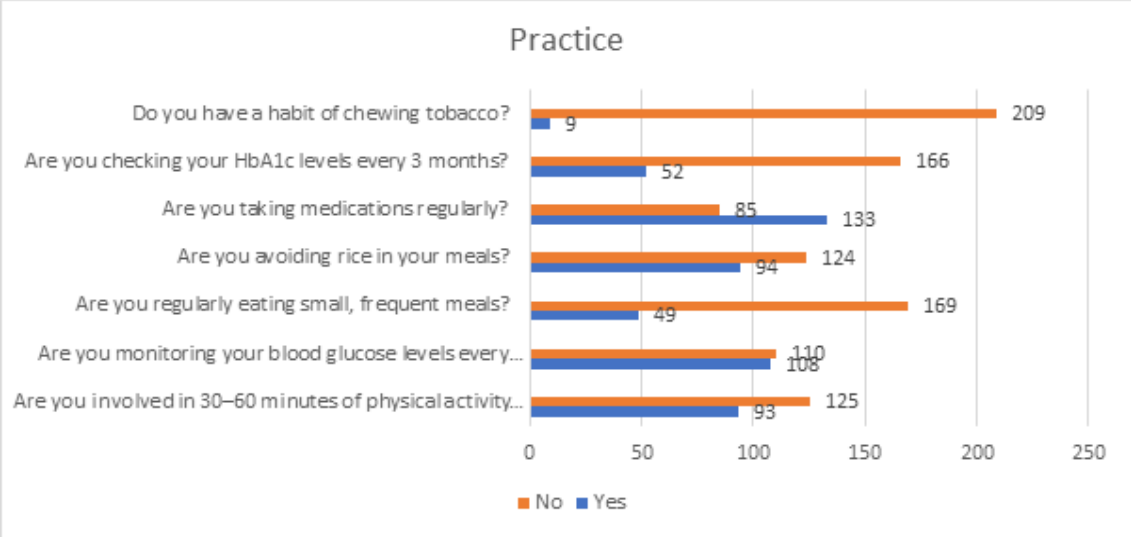

Figure 5: Overall responses to practice-based questionnaires.

The bivariate and multivariate analysis revealed that younger participants (21-30 years) had significantly lower odds of better knowledge (OR=0.4872, p=0.0183), attitude (OR=0.3258, p=0.0003), and practice (OR=0.5829, p=0.0271) compared to the reference group (41-50 years). Similarly, those above 70 years had reduced odds in all three domains. Underweight individuals showed significantly lower odds of better knowledge (OR=0.5612, p=0.0198), attitude (OR=0.3925, p=0.0017), and practice (OR=0.6142, p=0.0416), while obese individuals had a significantly lower attitude score (OR=0.5342, p=0.0142). Participants with diabetes for less than a year had significantly lower odds in all three areas compared to those with 6-10 years of diabetes. Rural residents had significantly lower attitude scores (OR=0.5814, p=0.0138), while literate individuals had higher odds of better knowledge (OR=0.6123, p=0.0416) and attitude (OR=0.4789, p=0.0064) than illiterate participants as shown in Table 6.

DISCUSSION

This study evaluates the KAP of individuals with diabetes and examines the impact of an educational intervention. The findings indicate gaps in awareness, adherence to self-care routines, and a positive shift in understanding following the intervention. Similar trends have been observed in other studies, reinforcing the need for structured educational programs in diabetes management.

The present study found that most participants were aged between 41-50 years, followed by those in the 51-60 age group.

Table 5: Study population demographics and the frequency of improved knowledge, attitudes, and practices in the intervention and control groups.

Variables	Total N (%)	Participants who achieved a knowledge score of ≥6		Participants who achieved an attitude score of ≥ 4		Participants who achieved a practice score of ≥ 4	
		(Control)	(Intervention)	(Control)	(Intervention)	(Control)	(Intervention)
Age (Years)							
21-30	7 (3.21)	1 (0.92)	2 (1.83)	1 (0.92)	1 (0.92)	1 (0.92)	1 (0.92)
31-40	58 (26.61)	10 (9.17)	10 (9.17)	8 (7.34)	7 (6.42)	9 (8.26)	9 (8.26)
41-50	81 (37.16)	14 (12.84)	16 (14.68)	12 (11.01)	13 (11.93)	13 (11.93)	14 (12.84)
51-60	48 (22.02)	9 (8.26)	9 (8.26)	7 (6.42)	9 (8.26)	8 (7.34)	9 (8.26)
61-70	19 (8.72)	4 (3.67)	4 (3.67)	3 (2.75)	4 (3.67)	3 (2.75)	3 (2.75)
>70	5 (2.29)	2 (1.83)	1 (0.92)	2 (1.83)	1 (0.92)	1 (0.92)	1 (0.92)
BMI (mg/dL)							
Under weight (<18.5)	15 (6.88)	3 (2.75)	3 (2.75)	2 (1.83)	3 (2.75)	2 (1.83)	3 (2.75)
Normal weight (18.5-24.9)	85 (38.99)	15 (13.76)	17 (15.60)	13 (11.93)	14 (12.84)	14 (12.84)	15 (13.76)
Over weight (25-29.9)	70 (32.11)	13 (11.93)	14 (12.84)	11 (10.09)	12 (11.01)	11 (10.09)	12 (11.01)
Obese (≥30)	48 (22.02)	9 (8.26)	9 (8.26)	7 (6.42)	8 (7.34)	7 (6.42)	8 (7.34)
Duration of Diabetes							
<1 Year	20 (9.17)	4 (3.67)	4 (3.67)	3 (2.75)	3 (2.75)	3 (2.75)	3 (2.75)
1-5 Years	60 (27.52)	12 (11.01)	13 (11.93)	10 (9.17)	11 (10.09)	11 (10.09)	12 (11.01)
6-10 Years	80 (36.70)	14 (12.84)	16 (14.68)	12 (11.01)	13 (11.93)	13 (11.93)	14 (12.84)
>10 Years	58 (26.61)	10 (9.17)	9 (8.26)	8 (7.34)	8 (7.34)	8 (7.34)	8 (7.34)
Residence							
Urban	110 (50.46)	20 (18.35)	22 (20.18)	18 (16.51)	19 (17.43)	20 (18.35)	21 (19.27)
Rural	108 (49.54)	20 (18.35)	20 (18.35)	15 (13.76)	16 (14.68)	15 (13.76)	16 (14.68)
Literacy Status							
Literate	150 (68.81)	28 (25.69)	30 (27.52)	25 (22.94)	26 (23.85)	27 (24.77)	28 (25.69)
Illiterate	68 (31.19)	12 (11.01)	12 (11.01)	8 (7.34)	9 (8.26)	8 (7.34)	9 (8.26)

Table 6: Bivariate and Multivariate analysis to evaluate the factors influencing KAP.

	Knowledge			Attitude			Practice		
Demographic Characteristic	**Odds Ratio**	**95% CI**	***p* value**	**Odds Ratio**	**95% CI**	***p* value**	**Odds Ratio**	**95% CI**	***p* value**
Age (Years)									
21-30	0.4872	(0.2453 0.8745)	0.0183*	0.3258	(0.1724 0.5791)	0.0003*	0.5829	(0.3692 0.9241)	0.0271*
31-40	0.6381	(0.3891 1.0456)	0.0895	0.4124	(0.2763 0.7015)	0.0021*	0.7216	(0.4628 1.0847)	0.1264
41-50	1(Ref)			1(Ref)			1(Ref)		
51-60	0.7594	(0.4891 1.1983)	0.2719	0.5638	(0.3524 0.9017)	0.0253*	0.7835	(0.5021 1.1523)	0.2634
61-70	0.5987	(0.3612 1.0094)	0.0685	0.4786	(0.2864 0.8261)	0.0087*	0.6845	(0.4235 1.1079)	0.1423
>70	0.4392	(0.2253 0.8016)	0.0129*	0.3481	(0.1759 0.6923)	0.0032*	0.5432	(0.2958 0.9426)	0.0398*
BMI (mg/dL)									
Underweight (<18.5)	0.5612	(0.2987 0.9324)	0.0198*	0.3925	(0.2154 0.6792)	0.0017*	0.6142	(0.3981 0.9735)	0.0416*
Normal weight (18.5-24.9)	0.7254	(0.4567 1.1189)	0.1034	0.4869	(0.3298 0.7851)	0.0036*	0.7561	(0.4913 1.1639)	0.1927
Overweight (25-29.9)	1(Ref)			1(Ref)			1(Ref)		
Obese (>30)	0.6821	(0.4231 1.0578)	0.0867	0.5342	(0.3176 0.8794)	0.0142*	0.7356	(0.4712 1.1938)	0.1537
Duration of Diabetes									
<1 Year	0.4893	(0.2691 0.8974)	0.0214*	0.3621	(0.2143 0.7216)	0.0043*	0.6142	(0.3981 0.9735)	0.0416*
1-5 Years	0.6985	(0.4512 1.1083)	0.1187	0.5023	(0.3194 0.8027)	0.0051*	0.7561	(0.4913 1.1639)	0.1927
6-10 Years	1(Ref)			1(Ref)			1(Ref)		
>10 Years	0.6732	(0.4149 1.0925)	0.0945	0.5214	(0.3137 0.8621)	0.0189*	0.7356	(0.4712 1.1938)	0.1537
Residence									
Rural	0.7251	(0.4563 1.1532)	0.1732	0.5814	(0.3642 0.8921)	0.0138*	0.7468	(0.4823 1.1267)	0.1574
Urban	1(Ref)			1(Ref)			1(Ref)		
Literacy Status									
Literate	0.6123	(0.3894 0.9827)	0.0416*	0.4789	(0.2913 0.7856)	0.0064*	0.6932	(0.4298 1.1257)	0.1392
Illiterate	1(Ref)			1(Ref)			1(Ref)		

These findings are in agreement with the study by (Nyamagoud *et al*., 2023) who reported a higher prevalence of diabetes in middle-aged individuals. (Le *et al*., 2021) also observed a similar trend in Vietnam, where most diabetic patients were between 40 and 60 years old. A study conducted by (Maduemezia *et al*., 2024) in South Africa further supported these observations, emphasizing that middle age is a critical period for the onset and progression of diabetes due to lifestyle and genetic factors.

The analysis revealed that a considerable percentage of participants were either overweight or obese, highlighting the strong link between excess body weight and diabetes. (Nyamagoud *et al*., 2023) found similar results, reporting a high obesity rate among diabetic patients. (Gautam *et al*., 2015) also identified obesity as a major contributing factor to diabetes in Nepal. In a study conducted in Kerala, (Manju *et al*., 2019) pointed out that unhealthy eating habits and sedentary lifestyles were key contributors to obesity in diabetic patients. (Baig *et al*., 2023) further reinforced this finding in Saudi Arabia, emphasizing the importance of weight management in preventing diabetes complications.

In terms of disease duration, the majority of participants in this study had been managing diabetes for 6-10 years. This observation is consistent with the findings of (Nyamagoud *et al*., 2023), who noted that a significant proportion of diabetic patients had long-standing disease. (Maduemezia *et al*., 2024) highlighted that prolonged diabetes duration often leads to complications, necessitating ongoing education and management strategies. Additionally, a family history of diabetes was prevalent among participants, which is consistent with findings from (Le *et al*., 2021) in Vietnam, where genetic predisposition was identified as a major risk factor for diabetes.

The baseline KAP scores in this study indicated that many patients lacked adequate knowledge about diabetes management, particularly regarding diet, exercise, and medication adherence. (Shah *et al*., 2009) found similar results in Gujarat, where patient awareness was insufficient. (Raj and Angadi, 2010) also reported knowledge gaps in Karnataka, emphasizing the need for structured diabetes education. (Goyal *et al*., 2019) observed comparable trends in Uttar Pradesh, suggesting that inadequate knowledge about diabetes self-care is a widespread issue across different regions.

After the educational intervention, a significant improvement in KAP scores was observed. This is in line with findings from (Le *et al*., 2021), who demonstrated that diabetes education enhances patient adherence to self-care behaviors. (Maduemezia *et al*., 2024) also found that educational programs positively influenced attitudes toward diabetes management, particularly in medication adherence and lifestyle modifications. (Gautam *et al*., 2015) emphasized that structured self-management programs contribute to better diabetes control by improving treatment adherence. (Tejaswi *et al*., 2018) observed similar outcomes in Central India, where patients who received counselling showed notable improvements in diabetes-related knowledge and self-care behaviors.

The effectiveness of educational interventions has been highlighted in various studies, including those by (Nyamagoud *et al*., 2023; Le *et al*., 2021) who reported that structured programs significantly enhance patient understanding and treatment adherence (Manju *et al*., 2019) found that targeted educational interventions in Kerala improved self-care behaviors among diabetic patients. Additionally, (Baig *et al*., 2023) noted that individuals who received diabetes-related education were more likely to adopt preventive practices, such as regular exercise and dietary modifications.

Despite the positive outcomes, this study acknowledges certain limitations. Factors such as socioeconomic status and literacy levels may influence how effectively patients engage with educational programs. Moreover, long-term follow-up is essential to evaluate the sustainability of behavioral changes over time. Future research should focus on multi-center studies to improve generalizability and to evaluate the long-term effects of enhanced KAP on diabetes-related health outcomes.

CONCLUSION

The prospective interventional study conducted among diabetes patients concludes that while knowledge levels are relatively high, attitudes remain negative, and practice behaviors are moderate to good. Although most participants were aware of diabetes and its complications, many lacked an understanding of glycemic control, risk factors, and the importance of regular monitoring. Misconceptions about long-term treatment and disease management were prevalent, highlighting the need for targeted health education programs. While adherence to medications and exercise routines was satisfactory, dietary habits and meal frequency showed gaps in proper management. These findings emphasize the urgent need for structured awareness campaigns focusing on lifestyle modifications, dietary management, and diabetes monitoring to enhance patient outcomes. Further large-scale and long-term studies are necessary to assess trends in diabetes KAP over time, comparing results across different populations and healthcare settings to track improvements or worsening patterns in diabetes care.

ACKNOWLEDGEMENT

The authors extend their heartfelt thanks to the Principal, J. N. Medical College; the Medical Superintendent and Medical Director, KLE's Dr. Prabhakar Kore Hospital, Belagavi; the Head, Department of General Medicine, KLE's Dr. Prabhakar Kore Hospital and MRC, Belagavi; and the Principal, KLE College of Pharmacy, Belagavi, for granting permission and providing the opportunity to carry out this project in their esteemed institution.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

ETHICAL APPROVAL

The present study is part of a randomized controlled trial titled "Impact of Clinical Pharmacist–Led Comprehensive Medication Management on Diabetic Women in a Tertiary Care Hospital – A Randomized Controlled Study." Approval was granted by the Institutional Ethics Committee of KLE Academy of Higher Education and Research (KAHER), Belagavi (Ref. No.: KAHER/EC/22-23/134). The trial was registered with the Clinical Trial Registry of India (CTRI/2022/12/048461). Written informed consent was obtained from all participants before study enrollment.

ABBREVIATIONS

DM: Diabetes Mellitus; **GDM:** Gestational Diabetes Mellitus; **PCOS:** Polycystic Ovary Syndrome; **OHAs:** Oral Hypoglycemic Agents; **KAP:** Knowledge, Attitude, and Practice.

REFERENCES

Ahmad, F., & Joshi, S. H. (2023). Self-care practices and their role in the control of diabetes: A narrative review. Cureus, 15(7), Article e41409. https://doi.org/10.7759/cureus.41409

Al-Mutawaa, K. A., Farghaly, A. H., Nasir, R., Loares, A. M., Skaroni, I., Al-Thani, M., & Abou-Samra, A.-B. (2022). Level of knowledge, attitude and practice towards diabetes among nationals and long-term residents of Qatar: A cross-sectional study. BMJ Open, 12(2), Article e052607. https://doi.org/10.1136/bmjopen-2021-052607

American Diabetes Association. (2021). Classification and diagnosis of diabetes: Standards of medical care in diabetes-2021. Diabetes Care, 44(Suppl. 1), S15–S33. https://doi.org/10.2337/dc21-S002

Anjana, R. M., Deepa, M., Pradeepa, R., Mahanta, J., Narain, K., Das, H. K., Adhikari, P., Rao, P. V., Saboo, B., Kumar, A., Bhansali, A., John, M., Luaia, R., Reang, T., Ningombam, S., Jampa, L., Budnah, R. O., Elangovan, N., ICMR–INDIAB Collaborative Study Group. (2017). Prevalence of diabetes and prediabetes in 15 states of India: Results from the ICMR-INDIAB population-based cross-sectional study. The Lancet. Diabetes and Endocrinology, 5(8), 585–596. https://doi.org/10.1016/S2213-8587(17)30174-2

Baig, M., Alzahrani, S., Abualhamael, S., Alotaibi, A., Alharbi, M., Almohammadi, T., & Alkaabi, T. (2023). Diabetes mellitus knowledge, attitudes, preventive practices and associated factors among a sample of adult non-diabetic Saudi residents. Diabetes, Metabolic Syndrome and Obesity: Targets and Therapy, 16, 1393–1406. https://doi.org/10.2147/DMSO.S409330

Benedict, A. W., Spence, M. M., Sie, J. L., Chin, H. A., Ngo, C. D., Salmingo, J. F., Vidaurreta, A. T., & Rashid, N. (2018). Evaluation of a pharmacist-managed diabetes program in a primary care setting within an integrated health care system. Journal of Managed Care and Specialty Pharmacy, 24(2), 114–122. https://doi.org/10.18553/jmcp.2018.24.2.114

Buchanan, T. A., & Xiang, A. H. (2005). Gestational diabetes mellitus. The Journal of Clinical Investigation, 115(3), 485–491. https://doi.org/10.1172/JCI24531

Chawla, S. P. S., Kaur, S., Bharti, A., Garg, R., Kaur, M., Soin, D., Ghosh, A., & Pal, R. (2019). Impact of health education on knowledge, attitude, practices and glycemic control in type 2 diabetes mellitus. Journal of Family Medicine and Primary Care, 8(1), 261–268. https://doi.org/10.4103/jfmpc.jfmpc_228_18

Durghashree, C. (2024). Knowledge, attitudes and practices regarding gestational diabetes mellitus among pregnant women - a cross-sectional study. RGUHS National. Sarojini, Prathima, S, and Meghana, C. Journal of Public Health, 9(4), 23–30.

Fatema, K., Hossain, S., Natasha, K., Chowdhury, H. A., Akter, J., Khan, T., & Ali, L. (2017). Knowledge attitude and practice regarding diabetes mellitus among nondiabetic and diabetic study participants in Bangladesh. BMC Public Health, 17(1), 364. https://doi.org/10.1186/s12889-017-4285-9

Gautam, A., Bhatta, D. N., & Aryal, U. R. (2015). Diabetes-related health knowledge, attitude and practice among diabetic patients in Nepal. BMC Endocrine Disorders, 15, 25. https://doi.org/10.1186/s12902-015-0021-6

Goyal, J., Raghav, S., Kumar, N, *et al.* (2019). Knowledge attitude and practice (KAP) of diabetes in Mathura, Uttar Pradesh, India-An observational study. International Journal of Medical Research [Review], 7(6), 482–489.

Hill-Briggs, F., Adler, N. E., Berkowitz, S. A., Chin, M. H., Gary-Webb, T. L., Navas-Acien, A., Thornton, P. L., & Haire-Joshu, D. (2020). Social determinants of health and diabetes: A scientific review. Diabetes Care, 44(1), 258–279. https://doi.org/10.2337/dci20-0053

International Diabetes Federation. (2019). IDF diabetes atlas (9th ed.). https://diabetesatlas.org/

Kautzky-Willer, A., Harreiter, J., & Pacini, G. (2016). Sex and gender differences in risk, pathophysiology and complications of type 2 diabetes mellitus. Endocrine Reviews, 37(3), 278–316. https://doi.org/10.1210/er.2015-1137

Le, N. K., Turnbull, N., Van Dam, C., Khiewkhern, S., & Thiabrithi, S. (2021). Impact of knowledge, attitude, and practices of type 2 diabetic patients: A study in the locality in Vietnam. Journal of Education and Health Promotion, 10, 72. https://doi.org/10.4103/jehp.jehp_712_20

Maduemezia, U., Variava, E., Moloantoa, T., Abraham, P., Rambau, B., Ndaba, T., Bhana, S., & Daya, R. (2024). Knowledge, attitude, and practices related to diabetes among patients with type 2 diabetes mellitus at Tshepong Hospital. Journal of Endocrinology, Metabolism and Diabetes of South Africa, 29(3), 100–111. https://doi.org/10.1080/16089677.2024.2424616

Manju, L., Ajithkumar, P. V., Divija, & John, S. (2019). Knowledge, attitude and practice regarding diabetes mellitus among patients with type 2 diabetes in a tertiary care teaching hospital in Kerala, India. International Journal of Medical and Health Sciences, 9(11), 665–674.

Mantri, N., Goel, A. D., Patel, M., Baskaran, P., Dutta, G., Gupta, M. K., Yadav, V., Mittal, M., Shekhar, S., & Bhardwaj, P. (2024). National and regional prevalence of gestational diabetes mellitus in India: A systematic review and meta-analysis. BMC Public Health, 24(1), 527. https://doi.org/10.1186/s12889-024-18024-9

Mohan, H. (2010). Pathology (6th ed.). Jaypee Brothers Medical Publishers.

Niguse, H., Belay, G., Fisseha, G., Desale, T., & Gebremedhn, G. (2019). Self-care related knowledge, attitude, practice and associated factors among patients with diabetes in Ayder Comprehensive Specialized Hospital, North Ethiopia. BMC Research Notes, 12(1), 34. https://doi.org/10.1186/s13104-019-4072-z

Nyamagoud, S. B., Viswanatha Swamy, A. H., & Kangrali, B. (2023). Assessment of knowledge, attitude, and practices in patients with diabetes mellitus in a tertiary care hospital. BLDE University Journal of Health Sciences, 8(2), 256–264. https://doi.org/10.4103/bjhs.bjhs_141_22

Okonta, H. I., Ikombele, J. B., & Ogunbanjo, G. A. (2014). Knowledge, attitude and practice regarding lifestyle modification in type 2 diabetic patients. African Journal of Primary Health Care and Family Medicine, 6(1), E1–E6. https://doi.org/10.4102/phcfm.v6i1.655

Parker, J. (2023). Pathophysiological effects of contemporary lifestyle on evolutionary-conserved survival mechanisms in polycystic ovary syndrome. Life, 13(4), 1056. https://doi.org/10.3390/life13041056

Raj, C. P., & Angadi, M. M. (2010). Hospital-based KAP study on diabetes in Bijapur, Karnataka. Indian Journal of Medical Specialities, 1(2), 80–83. https://doi.org/10.7713/ijms.2010.0022

Rezaei, M., Valiee, S., Tahan, M., Ebtekar, F., & Ghanei Gheshlagh, R. (2019). Barriers of medication adherence in patients with type-2 diabetes: A pilot qualitative study. Diabetes, Metabolic Syndrome and Obesity: Targets and Therapy, 12, 589–599. https://doi.org/10.2147/DMSO.S197159

Roglic, G. (2009). Diabetes in women: The global perspective. International Journal of Gynaecology and Obstetrics, 104(Suppl. 1), S11–S13. https://doi.org/10.1016/j.ijgo.2008.11.022

Shah, V. N., Kamdar, P. K., & Shah, N. (2009). Assessing the knowledge, attitudes and practice of type 2 diabetes among patients of Saurashtra region, Gujarat. International Journal of Diabetes in Developing Countries, 29(3), 118–122. https://doi.org/10.4103/0973-3930.54288

Shrivastava, S. R., Shrivastava, P. S., & Ramasamy, J. (2013). Role of self-care in management of diabetes mellitus. Journal of Diabetes and Metabolic Disorders, 12(1), 14. https://doi.org/10.1186/2251-6581-12-14

Tejaswi, D. P., Dhakre, D. S., Reddy, D. P., & Goyal, D. C. (2018). Evaluation of the knowledge, attitudes and practices of diabetic patients in a tertiary care hospital in Central India. International Journal of Medical Research and Review [Review], 6(1), 24–32. https://doi.org/10.17511/ijmrr.2018.i01.05

Tipnis, H. P., & Bajaj, A. (2011). Concept of pharmaceutical care. In Clinical pharmacy (2nd ed., pp. 534-548). Career Publishing.

Unnikrishnan, R., Anjana, R. M., & Mohan, V. (2016). Diabetes mellitus and its complications in India. Nature Reviews. Endocrinology, 12(6), 357–370. https://doi.org/10.1038/nrendo.2016.53

Voet, J. G., & Voet, D. (2000). Biochemistry and molecular biology education (BAMBEd). Biochemical Education, 28(3), 124. https://doi.org/10.1016/s0307-4412(00)00032-7

Wang, D., Liu, Z., Liu, Y., Zhao, L., Xu, L., He, S., & Duan, B. (2024). Knowledge, attitudes, and practices among patients with diabetes mellitus and hyperuricemia toward disease self-management. Frontiers in Public Health, 12, Article 1426259. https://doi.org/10.3389/fpubh.2024.1426259.

Cite this article: Deshpande AS, Ganachari MS. Impact of an Educational Intervention on Knowledge, Attitude, and Practice among Women Diabetic Patients : A Prospective Randomized Controlled Study. Int. J. Pharm. Investigation. 2026;16(1):143-54.