

An Interventional Study to Evaluate Knowledge, Attitude, and Practice Regarding Insulin Administration among Diabetic Patients at a Tertiary Care Hospital in Dakshina Kannada

Ramakrishna Shabaraya A, Blessy Fernandes*, Suchetha Kumari

Department of Pharmacy Practice, Srinivas College of Pharmacy, Mangalore, Karnataka, INDIA.

ABSTRACT

Background: Hyperglycemia is the defining characteristic of Diabetes Mellitus (DM) caused by abnormalities in insulin secretion, insulin action or both. In order to prevent complications, optimal glycemic management is necessary to lower DM morbidity and mortality. The technique for injecting insulin is one of the areas where mistakes are most likely to occur. Good knowledge, a positive attitude and right practice of insulin self-administration leads to better outcome. **Materials and Methods:** An interventional study was carried out for subjects who were on insulin of either gender for a period of 6 months with a validated questionnaire to assess the knowledge, attitude and practice on insulin administration. **Results:** A total of 100 patients were interviewed, of which 54% were male and 46% were female. The mean knowledge score was 3.03 ± 1.85 , mean attitude score was 3.22 ± 1.46 and the mean practice score was 3.0 ± 1.49 . On categorizing the scores, 31% were found to have good knowledge while 23% were found to have average level of knowledge and 46% had poor knowledge. Favorable, satisfactory and unfavorable attitude was found in 23%, 51% and 32% of the participants, respectively. The level of practice was found to be good in 17%, satisfactory in 42% and inadequate in 41% of subjects. **Conclusion:** In the study, suboptimal responses to insulin delivery were reported. Patients' KAP was enhanced by education regarding insulin administration. Therefore, during each hospital visit, barriers should be filled by instructing patients on how to inject insulin.

Keywords: Diabetes, Insulin administration, Knowledge, Attitude, Practice.

Correspondence:

Ms. Blessy Fernandes

Department of Pharmacy Practice,
Srinivas College of Pharmacy, Valachil,
Farangipete, Mangalore-574143,
Karnataka, INDIA.
Email: fernandesblessy1999@gmail.com

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INTRODUCTION

Diabetes Mellitus (DM) is a chronic progressive metabolic disorder characterized by hyperglycemia and is caused by abnormalities in insulin secretion, action, or both. Given that both developed and developing countries are affected by the disease, it is a problem for everyone's health.¹ In the past ten years, decreased beta-cell function has come to be understood as a major issue in Type 2 Diabetes Mellitus (T2DM), which has long been known as non-insulin dependent diabetes or adult-onset diabetes characterized by insulin resistance that may eventually proceed to absolute resistance.² For the prevention and/or delay of complications, optimal glycemic management is essential to reducing DM morbidity and mortality.³

Only patients who follow self-management practices like maintaining a healthy diet, getting sufficient exercise, monitoring their blood sugar levels, taking their medications as prescribed, being able to deal with any problems they may encounter with their diabetes, and developing healthy coping mechanisms can achieve optimal glycemic control.⁴

The cornerstone of Type 1 and Type 2 diabetes treatment plans is Insulin Therapy (IT), which is a crucial component of the drugs used to treat DM.⁵

Insulin Therapy (IT) presents many challenges due to complexities associated with its intricate use. Sufficient knowledge of its use can help to prevent complications, adverse patient outcomes, poor adherence to therapy and invariably poor glycemic control. Educating patients on self-administration of insulin helps to build self-confidence and pride of contribution in their management. Moreover, an appropriate injection technique is important for proper delivery to subcutaneous tissues and to prevent intramuscular injuries and lipo-hypertrophy.⁶ Insulin is one of the oldest valuable anti-diabetic medications available and also



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the most effective agent in lowering hyperglycemia when used in appropriate doses.⁷ The insulin injection technique is one of the most common areas with the likelihood of errors. It requires sound knowledge and attitude on self-insulin administration by patients so that they can contribute meaningfully to the management of their lives.⁸ Correct administration of insulin is associated with better management of diabetes and eventually a good quality of life.⁹

During the course of T2DM, IT may be crucial for many people. Even though insulin is more effective than Oral Anti Hyperglycemic drugs (OHA) at lowering glycated Hemoglobin (HbA1c), many people with T2DM are still hesitant to begin insulin therapy. This "psychological insulin resistance" involves anxiety over hypoglycemia, weight gain, injections, and emotions of failure and guilt. As a result, it is reasonable to assume that insulin therapy may have a negative impact on psychological health and wellbeing.¹⁰

Diet, physical activity and medication all have a role in controlling blood sugar and many patients also need to take insulin supplements as part of their care. Therefore, in order to utilize insulin correctly outside of the hospital, patients need to be proficient at insulin injection.¹¹

MATERIALS AND METHODS

Study Design: Prospective Interventional study.

Study Site: The study was conducted at Srinivas Institute of Medical Science and Research Centre, Mukka-574146.

Study Duration: The study was conducted for duration of 6 months from January 2022 to June 2022.

Sample Size: The study was limited to a sample of 100 based on the time Schedule allotted for the project including other circumstances.

Ethical Clearance: The study protocol was approved by the Institutional Ethics Committee (IEC) of Srinivas Institute of Medical Science, Mukka, Mangalore. (Ref. No.: SIMS & RC/2022/10/07).

Study Criteria

Inclusion criteria

Patients above 18 years of age.

Patients who are prescribed with insulin.

Patients of either gender.

Exclusion criteria

Patients below 18 years of age.

Pregnant women.

Participants who are not physically and mentally able to respond the interview.

Source of Data: Data(s) for the study were collected using data collection form from the in- patient medical files of patients admitted at Srinivas Hospital, Mukka-574143 and through direct interaction with the patient and caregiver.

Study Method

Ethical committee approval was obtained before starting this study.

Patient data collection form was designed as per need of the study to attain the required information.

Case files of the patients prescribed with insulin was reviewed.

Patient information leaflet was provided for preview on administration of insulin for patients with lower estimated average score.

Questionnaires was prepared and given to patients before and after intervention.

In the knowledge section, the questionnaire enquires about the definition, presentation and management of diabetes. The attitude section mainly dwelled on self-management, while the practice part highlighted on monitoring the disease and its complications. A correct response was given a mark of "one" and each wrong answer was given a score of "zero."

Operational definitions

Good KAP- A patient who answered 13-18 correct responses from the 18 questions used to assess patients' KAP.

Average KAP- A patient who answered 7-12 correct responses from the 18 questions used to assess patients' KAP.

Poor KAP- A patient who answered 0-6 correct responses from the 18 questions used to assess patients' KAP.

Pre-Educational Intervention Assessment

Patient selection

Participants were segregated based on inclusion and exclusion criteria.

Obtaining informed consent

In the study only the participants willed to fill ICF were included.

Providing intervention

Participants were provided with questionnaire and based on the above operational definition, scores were reviewed and intervention was provided for the following: Poor KAP Score: PII, patient counselling.

Medium KAP score: PIL

Post Educational Intervention Assessment

Patient Review: After reviewing the scores of questionnaires, the patients were followed up after 1 month.

Patient information leaflet: The patient information leaflet (PIL) is used to educate the patients on insulin administration.

Data(s) collection: Data(s) were collected using data collection form with the aid of in-patient medical records and through direct interaction with the patient and caregiver. Data collected include age, gender, educational qualification, duration of diabetes etc.

Data Analysis

The collected data(s) were analyzed using Microsoft Excel (version 2013) and SPSS software (version 27) and summarized using descriptive statistics in the form of tables and figures.

RESULTS

Socio-Demographic Details

Among 100 patients enrolled, 54% were male and 46% were female participants. In the current study it was found that majority of the participants (37%) belong to the age group of 46-60 Years. Most of the participants had primary to university education (92%) and only (8%) of them were illiterate. Majority of the participants were previously diagnosed (68%) and 38% of them were newly diagnosed with diabetes. The average duration of diabetes was 2.96 ± 3.11 years (Table 1).

Assessment of Knowledge

The mean score of patients' knowledge was 3.03 ± 1.85 out of 6. The majority of the patients had poor knowledge (46%) while 23% and 31% had average and good knowledge respectively.

Before the intervention 40% subjects answered "buttocks" as not the site of administration of insulin, 63% correctly answered refrigerator as ideal place for insulin storage, 52% of the participants considered "before food" as ideal time for administration of insulin, 45% of them were aware of the different tools of insulin administration and 52% of the participants do not agree that massage after insulin administration reduces its absorption. Since hypoglycemia is one of the side effects of taking more insulin, it is very important for the person receiving insulin to always keep a sugar candy to combat this effect, only 45% of participants correctly answered hypoglycemia as "deficiency of blood glucose in the blood"

After the intervention 69% subjects answered "buttocks" as not the site of insulin administration, 89% responded refrigerator as the correct place of insulin storage, 66% of the participants were aware of time for insulin administration, 61% of them knew the different tools of insulin administration, 58% disagreed that massage after insulin administration reduces its absorption and

63% of participants answered hypoglycemia as "deficiency of blood glucose in the blood" (Table 2).

Assessment of Attitude

An air bubble in an insulin syringe poses no direct health threat. Bubbles in a syringe displace insulin, and if you have a large number of bubbles, you aren't getting the amount of insulin you think you're getting. Simply put: Air bubbles cause under-dosing. Before the intervention, 51% of the subjects "removed air bubbles before administration, 51% of the participants' rotated site when asked "what will you do if you come across any pain at the injection site?". When asked "What will you do if you miss dose?" 36% of the subjects answered that they started with the "next dose" and about 51% of the participants abided by the doctor's advice on a daily basis.

A patient's decision to stop or continue insulin should always be made with a physician as they can warrant whether it to be continued or not. Out of 100 participants, 54% "stopped medication on doctor's advice" and 78% agreed insulin administration correctly decreases glucose in the blood.

After the intervention, 80% of the participants rotated site of insulin administration, 73% followed doctor's advice on a daily

Table 1: Demographic Details of participants.

Demographic Characteristics	No. of participants (n=100)	Percentage
Gender		
Female	46	46%
Male	54	54%
Age		
18-30	10	10%
31-45	27	27%
46-60	37	37%
>60	26	26%
Education Qualification		
Illiterate	8	8%
Primary education	31	31%
Secondary education	29	29%
University	32	32%
Time of Diagnosis		
Previously diagnosed	68	68%
Newly diagnosed	32	32%
Duration of Diabetes (Years)		
<2	49	49%
2-5	31	31%
6-10	16	16%
>10	4	4%

basis, 42% started with next dose on missing a dose, 64% removed air bubbles if present in the syringe, 68% “stopped medication on doctor’s advice”, and 81% felt that insulin correctly decreases glucose levels in blood (Table 3).

Assessment of Practice

Infections very commonly occur at site of injection when using insulin, in order to avoid them from going forth its necessary to clean site of injection before administering insulin. Before intervention, most of the participants (56%) practiced cleaning the site of insulin administration “daily”. Shaking the insulin increases the risk of bubbles and froth, which may affect dosage accuracy and hasten degradation of the insulin. Out of 100 participants, 28% shake the medication “every time” before usage, only about 40% of the participants reuse injection needles about 2

times, 52% rotated insulin site every time before receiving insulin and 40% practiced washing hands with soap and water before handling insulin device. Most of the participants (72%) didn’t have the habit of skipping dose without doctor’s advice. After intervention, 67% practiced cleaning site of administration daily, 56% never shook the medication, 64% reused insulin needle 2 times, 74% rotated site of insulin administration every time. About 64% started washing hands with soap and water every time they handled insulin device and 82% never skipped dose without doctor’s advice (Table 4).

Assessment of Pre and Post Intervention Data

In the data collected before the intervention, KAP scoring for 100 individuals was carried out, of which 46% had poor knowledge, 23% had medium knowledge and 31% had good knowledge

Table 2: Knowledge Assessment.

Questions	Pre intervention (correct response)	Post intervention (correct response)
All the following are sites of insulin administration, except? Arms, abdomen, thigh, buttocks.	40	69
Which is the ideal place for insulin storage? Oven, cupboard, refrigerator, don’t know.	63	89
What is the ideal time for administering insulin? Before food, after food, anytime, don’t know.	52	66
Which insulin device can be used for injection? Insulin pen, injection, both, don’t know.	45	61
Massage after insulin administration reduces its absorption, Yes or No?	52	58
What do you know about hypoglycemia? Deficiency of glucose in blood, normal level of blood glucose in blood, high level of blood glucose in blood, don’t know.	45	63

Table 3: Attitude Assessment.

Questions	Pre intervention (correct response)	Post intervention (correct response)
What will you do if you come across any pain at the injection site? Stop taking insulin, rotate site, decrease dose, increase dose.	51	80
How often do you follow the advice regarding the insulin administration given by the doctor? Daily, once a week, twice a week, never.	51	73
What will you do if you miss the doses? double the dose, start with next dose, take as soon as I remember, stop taking insulin.	36	42
What can be done if you find the presence of air bubbles in an insulin syringe? remove air bubbles, no need to remove air bubbles, stop taking insulin, take another syringe.	51	64
Which among the following statement is true? stop insulin once glucose level normalizes, stop based on doctor’s advice, stop insulin from advice of family members, stop insulin when you feel unnecessary.	54	68
Insulin administration correctly decreases glucose in the blood. Yes, no.	78	81

(50.1% overall knowledge). Accordingly, 32% had poor attitude, 51% had medium attitude and 17% had good attitude (53.66% overall attitude). It was found that 41% had poor practice, 42% had medium practice and 17% had good practice (50.00% overall practice) (Table 5, Figure 1).

In the data collected after the intervention, KAP scoring for 100 individuals was carried out, of which 15% had poor knowledge and 40% had medium knowledge and 45% had good knowledge (68.3% overall knowledge). Accordingly, 7% had poor attitude, 49% had medium attitude and 44% had good attitude (71.2% overall attitude). It was found that 7% had poor practice, 40% had medium practice and 53% had good practice (75.2% overall practice) (Table 6, Figure 2).

Table 4: Practice Assessment.

Questions	Pre intervention (correct response)	Post intervention (correct response)
How often do you clean the site before injecting insulin? daily, once in 2 days, once a week, never.	56	67
How often do you shake insulin before using it? Every time, sometime, rarely, never.	30	56
How many times do you use the same injection needles for insulin administration? 1, 2, 3, 4 or more.	40	64
How often do you rotate the site of administration while giving insulin? every time, once a week, once a month, never.	52	74
How often do you wash hands with soap and water before handling insulin device? Every time, sometimes, rarely, never.	40	64
Do you have the habit of adjusting /skipping dose without your doctor's advice? Yes, no.	72	82

Table 5: Pre-KAP Score of participants.

Pre-KAP Score	Knowledge (%)	Attitude (%)	Practice (%)
Good	31	17	17
Medium	23	51	42
Poor	46	32	41
Total	50.5	53.66	50.00

overall attitude). It was found that 7% had poor practice, 40% had medium practice and 53% had good practice (75.2% overall practice) (Table 6, Figure 2).

Comparison of Pre and Post Data

Before the intervention, the score of attitudes (53.66) were better than knowledge (50.5) and practice (50.0) and overall KAP score was found to be 51.38% and after the intervention the score of practice (75.2) was better than knowledge (68.3) and attitude (71.2) and the overall KAP score was 71.66%. Hence after intervention there was a significant improvement in the overall KAP score (Figure 3).

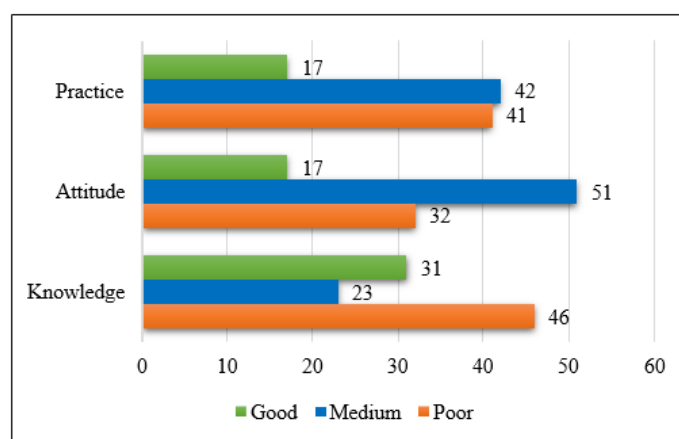


Figure 1: Pre-KAP Data of participants.

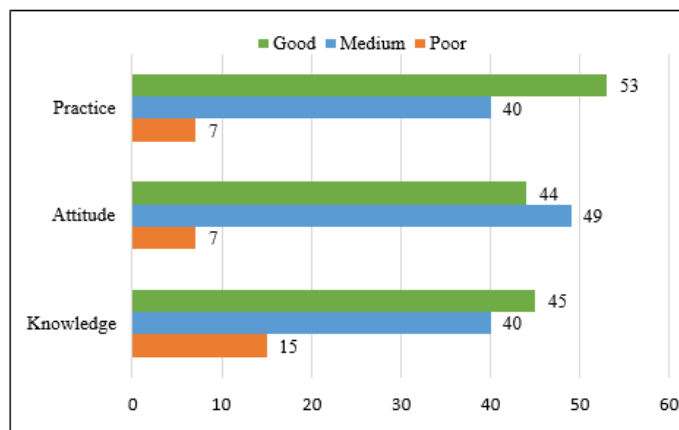
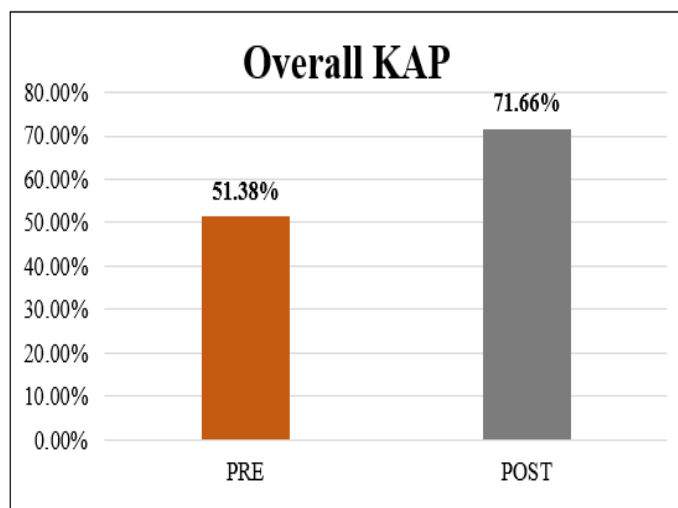


Figure 2: Post-KAP data of participants .

Table 6: Post-KAP Score of participants.

Post-KAP Score	Knowledge (%)	Attitude (%)	Practice (%)
Good	45	44	53
Medium	40	49	40
Poor	15	7	7
Total	68.3	71.2	75.2

**Figure 3:** Overall KAP analysis.

DISCUSSION

Insulin therapy necessitates the understanding and cooperation of both the patient and care giver. Diabetes can worsen due to improper insulin administration. Therefore, it is necessary to evaluate the patients KAP on insulin administration. In this study, a total of 100 patient data was collected. Questionnaire was provided regarding knowledge, attitude and practice and scores were recorded. After the questionnaire was answered and based on the medium and low KAP scores, the patients and patient party were counselled about the appropriate technique of insulin administration post the intervention period. According to the findings of the study, the current mean age of the study population was 51.05 ± 14.84 years. The results were consistent with the similar studies conducted by Choudhury S *et al.*¹² The occurrence of DM in this age group may be due to sedentary lifestyle with limited physical exercise.

In the current study, male patients (54%) outnumbered female patients (46%), similar results were found in the studies conducted by Shrestha D *et al.*, and Dinesh PV *et al.*, where the majority of the participants were male.^{13,14} The reason being male patients are predominant in the prevalence of diabetes due to lifestyle differences between men and women in India, where men spend more time having meal outside.

In the current study, the mean duration of diabetes was 2.96 ± 3.1 years. This result was contradictory to the study conducted by Netere AK *et al.*,¹⁵ and Bezawada S *et al.*¹⁶ In the present study, most patients had completed primary education (92%) which was similar to the study conducted by Dinesh PV *et al.*, where most patients had upper primary schooling.¹⁴

Knowledge was found to be average in the overall study (50.1%) as 31% had good knowledge, 23% had medium knowledge and 46% had poor knowledge. Patients' attitude towards insulin therapy was assessed by using 6 questions that study their behaviors. The majority (51%) of the study patients had a moderate attitude indicating acceptance with regard to need for insulin, willingness to learn proper techniques and procedure, adherence to therapy, responsiveness to changes as well as awareness of limitations, 32% of the patients had poor attitude and minority (17%) of the patients had good attitude. The results were in accordance to a similar study conducted by Suniram P *et al.*, where poor knowledge and moderate attitude was observed among the insulin based diabetic patients.¹⁷ This necessitates educating individuals on insulin therapy for their overall well-being, safety and better patient outcome. Educated individuals can pass on their knowledge to others, whether its family members, friends or support groups. This helps create a more informed and supportive community for people with diabetes. Moreover, the prevalence of knowledge was lower compared to studies done in India and Bangalore which were 68% and 86.7%.^{18,19} This difference from the previous studies might be due to high illiteracy rate of study participants, lack of self-insulin administration education facilities and low access to media and NGOs in creating awareness about insulin self-administration.

Considering the practice scores, 17% had good practice, 42% moderate and 41% poor practice. This finding was lower than a similar study conducted at Bedele Hospital, Southwest Ethiopia.²⁰ Possible explanations for this could be due to poor personal habits, misinformation, fear of needles and anxiety related to injections, complexity of insulin regimen, and lack of emotional and practical support, cultural or religious beliefs as well as scarcity of time by health professionals in demonstrating insulin injection technique. Intervention was provided at patient level using PIL (medication administration practice). There was

a significant improvement in the KAP scores from 51.38% to 71.66% indicating success of the intervention.

CONCLUSION

Diabetes mellitus poses a permanent threat to people and their families across the nation. This study demonstrated that patients' attitude toward self-insulin therapy were only marginally favorable and that their level of knowledge and practice of insulin therapy was insufficient. Hence to meet this need, education was provided regarding diabetes and insulin administration. Significant improvement was observed in all aspects of the therapy. It is very important to acknowledge the complexity of insulin administration and crucial education should be provided regarding the same. It may be concluded that people with diabetes should get continuing, need-based, high-quality diabetes education that is tailored to their needs and provided by qualified healthcare professionals.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

ETHICAL APPROVAL

The study was approved by the Institutional Ethics Committee. (Ref. No.: SIMS & RC/2022/10/07).

ABBREVIATIONS

DM: Diabetes Mellitus; **WHO:** World Health Organization; **KAP:** Knowledge, Attitude, Practice; **ISA:** Insulin self-administration; **OHA:** Oral Anti hyperglycemic Drugs; **HbA_{1c}:** Glycated Hemoglobin; **PIL:** Patient Information Leaflet; **SPSS:** Statistical Package for Social Sciences; **IT:** Insulin Therapy; **SD:** Standard Deviation.

SUMMARY

The current study was a prospective interventional study with the aim to evaluate the knowledge, attitude and practice of insulin administration among population for establishing proper technique in administration of insulin in patients on insulin treatment by providing them with questionnaire and assessing their feedbacks. The study helped in providing substantial information on insulin administration and improved the

condition among Diabetic patients in tertiary care hospital of Dakshina Kannada. The present study disclosed that knowledge and attitude was high compared with practice. This study indicates that the patient's knowledge, attitude and practice with regard to insulin administration can be enhanced through education by means of patient information leaflet. An ideal information leaflet should be easily accessible, contain sufficient health-related information, and have appropriate design elements that support patient learning. Patient education pamphlets can help patients learn how to administer insulin. The creation of informational pamphlets can help patients better comprehend not only the effects of medications but also the nature of their diseases.

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