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Assessment of Patients Knowledge and Attitude Regarding Insulin Pump Therapy

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Abstract:
Background: Assessing patients' knowledge and attitude regarding insulin pump therapy is crucial for ensuring the effective management of diabetes. A well-informed patient is more likely to properly adhere to the therapy, which can lead to better blood sugar control and reduced complications. Understanding a patient's knowledge allows healthcare providers to address any gaps in their comprehension, offering targeted education and guidance to optimize insulin pump use. Additionally, a patient's attitude plays a significant role in their willingness to accept and consistently use the device. **Setting:** This study was conducted at diabetes and endocrinology outpatient clinic at Ain Shames University Hospitals. **Sample:** A purposive sample of 302 patients. **Tools:** Patients interview questionnaire, Insulin Pump Attitudes Questionnaire **Results:** The study finding revealed that more than one third of the studied patients had a satisfactory level of total knowledge levels regarding diabetes mellitus and insulin pump therapy. While, more than half of them had an unsatisfactory knowledge level. And Shows more than half of the studied patients had a positive total attitude regarding insulin pump therapy. While, about half of them negative attitude**. Conclusion**: The current study concluded that there was a high statistically significant positive correlation between the total satisfactory knowledge level of the studied patients and their total attitude regarding insulin pump therapy. **Recommendations:** Implementation of an educational programs for patients' knowledge and attitude through carrying out continuing educational programs about insulin pump therapy.

Keywords: *Attitude, Knowledge, Insulin pump therapy.*

Introduction

Diabetes mellitus (DM) is a metabolic disorder caused by either a lack of insulin secretion, impaired insulin action, or both. Notably, insulin plays an important role as an anabolic hormone, affecting the metabolism of carbohydrates, lipids, and proteins. The metabolic abnormalities associated with diabetes mainly affect tissues such as adipose tissue, skeletal muscles, and the liver due to insulin resistance. Diabetes mellitus is a progressive, complex metabolic disorder characterized by progressive deterioration of pancreatic beta cell function, increasing insulin resistance in muscle and adipose tissue, unrestrained hepatic glucose production, and other hormonal deficiencies **(Antar et al., 2023).**

The management of diabetes mellitus involves implementing a healthy lifestyle and pharmacological interventions through the administration of anti-hyperglycemia drugs. An essential aspect of treating DM patients is insulin administration, which facilitates glucose transportation into cells. With progressive worsening of insulin resistance over time, the body attempts to compensate by secreting more insulin. As the beta cells become unable to produce enough insulin to normalize glucose, individuals will & Introduction 2 require treatment with exogenous insulin, starting with basal insulin and, eventually, multiple daily insulin injections (MDI) using basal plus bolus insulin **(Narahaubun & Kristianto, 2024).**

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Insulin pumps (continuous subcutaneous insulin infusion [CSII]) are commonly used for treatment of individuals living diabetes with great benefit for diabetes control. Whereas the first commercial insulin pumps appeared in the 1970s, over the past 30 years' diabetes medical device (MD) technology has advanced rapidly. Combining CSIIs with a continuous glucose monitoring (CGM) system is often used to reach even better glucose control. An increasing number of individuals with either Type 1 diabetes mellitus (T1D) or Type 2 diabetes mellitus (T2D) diabetes are recommended therapy with a variety of insulin pumps. The insulin is delivered through a catheter inserted into the subcutaneous tissue and secured on the skin with adhesive. Some pumps, referred to as "patch pumps," do not use tubing but adhere directly to the skin **(Von et al., 2024).**

Insulin pumps offer certain advantages. They allow for flexibility in meal timing, extended catheter use, and programmable basal insulin delivery. Some pumps integrate & Introduction 3 with CGM, forming an automated insulin delivery system that reduces hypoglycemia risk. The variety of insulin pumps, including tubed or tubeless, patch or pod, and closed-loop or open-loop systems, cater to different patients' preferences **(Calderon et al., 2024).**

Insulin pump therapy enables adjustment of basal insulin to daily requirements and circadian needs, offers more precise treatment for meals and physical activity. The ability to download and transmit data for analysis allow for treatment optimization. Newer pumps are simple to operate and increase user experience. Studies support the efficacy of pump therapy in improving glycemic control and reducing the occurrence of hypoglycemia without increasing episodes of diabetes ketoacidosis and improving quality of life. Recent evidence suggests a role for pump therapy in reducing microvascular and macro vascular diabetes-related complications **(Nimri et al.,2020).**

The nurse plays role in providing education about the diabetes including the importance of nutrition, monitoring, management of weight, teaching them how to identify signs of complications, and supportive services in order to help patients to self-manage their blood sugar levels. Patients are educated & Introduction 4 by nurse on ways to prevent complications in this phase of chronic disease, thus minimizing the burden on healthcare systems. Nurses are also implicated in coordinating any ongoing care of patients, counselling patients, and providing advice on medication and management of inter-current disease. Nurses work in both primary and secondary care **(Zhu et al., 2024).**

Significance of the study

Worldwide, it's expected that there will be 693 million DM patients by 2045, thus the increasing prevalence of DM is a significant focal point in public health, imposing unmanageable pressures on individuals, their professional pursuits, healthcare infrastructures, and broader society **(Annicchiarico et al., 2024).**

Diabetes recently has been identified as a growing epidemic due to its significant increase over the past 10 years. Egypt is listed as the 9th among the top 10 countries with diabetes, and the number of adult diagnosed with DM was 8,850,400 in early 2020, predicted to double to 16.9 million by 2045. In Egypt, At El-Demerdash hospital, in 2023-2024 the patients with diabetes is estimated 1050 patients **(Mohamed & Sabry 2024, Medical Health Statistical Records, 2024).**

Insulin pumps have increased in the United States from 350,000 users today. The majority of insulin pump users have type 1 diabetes, although 10% have type 2 diabetes. According to the T1D Exchange registry, >60% of individuals with type 1 DM use an insulin pump instead of a MDI regimen for intensive insulin therapy. Additionally, the use of insulin pump therapy for individuals with type 2 & Introduction 7 diabetes is increasing. In Egypt, At Med Consult Egypt center patients with insulin pump therapy is estimated 150000 patients **(Berget et al., 2019, Med Consult Egypt Center Statistical Records, 2024).**

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Patients' knowledge and attitudes towards insulin pump therapy play a crucial role in its effective implementation and overall success. Understanding the functionality of the insulin pump, including how it delivers insulin continuously and in boluses, is vital for patients. They need to be familiar with operating the device, setting basal rates, and administering boluses, as well as understanding how these actions impact their blood sugar control. Positive attitudes towards the pump as a beneficial tool for better glucose management and an improved quality of life can enhance adherence and effectiveness. Conversely, concerns about device malfunctions, social stigma, and discomfort can hinder acceptance **(Narahaubun et al., 2023).** So, this study aimed to assess patients' knowledge and attitude regarding insulin pump therapy.

Aim of the study

1- Assess the level of patients' knowledge regarding insulin pump therapy.
2- Assess the attitude of patients regarding insulin pump therapy.

Research questions:

1. What is the level of patients' knowledge regarding insulin pump therapy?
2. What is the attitude of patients regarding insulin pump therapy?

Subject and method

The subject and methods for this study was portrayed under the four main items as follows:

I. Technical item. II. Operational item.
III. Administrative item. IV. Statistical item.

I. Technical item

I. Technical item:

The technical items included research design, setting, subjects and tools for data collection used in this study.

Research design:

A descriptive exploratory research design was used in this study.

Setting:

This study was conducted at diabetes and endocrinology outpatient clinic at Ain Shames University Hospitals & Subjects and Methods 54 (ELDemerdash Hospital), Cairo, Egypt. It's one of the largest educational university hospitals in Egypt, and it receives patients from all governorates of Egypt and other countries. The endocrinology outpatient clinic consists of 2 beds, 2 nurses, 3 doctors with an average of 6-7 patients with DM visiting the clinic each day.

Sampling:

Type of the sample: A purposive sample composed of 302 patients from the previous mentioned setting has been recruited in this study according to the following inclusion criteria:

- Age 18 -60 years.
- Patient without contraindication of having insulin pump therapy as altered state of consciousness and prolonged instability of blood glucose levels.

Sample size: The sample size was calculated by adjusting the power of the test to 80%, and the confidence interval to 95% with a margin of error accepted adjusted to 5% using the following equation:

-Type I error (α) = 0.05% & Subjects and Methods 55

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- Type II error (B) = 0.20% - With power of test 0.80%

$$n = \frac{N \times p(1-p)}{\left[\left[N-1 \times \left(d^2 \div z^2\right)\right] + p(1-p)\right]}$$

N x p(1-p)	=1400x 0.5 x (1-0.5)
N-1	=(1400-1)x
d^2/z^2	=0.0025 / 3.8416+
p(1-p)	=0.5x (1-0.5)
N	=302

Where:

N= Community size

z= Class standard corresponding to the level of significance equal to 0.95 and 1.96

d= The error rate is equal to 0.05

p= Ratio provides a neutral property = 0.50 ***(Chandrasekharan et al., 2019).***

Based on the above equation, the sample size is 302

patients participated in this study.

Tools for data collection:

Two tools were used to collect data of this study as the following:

Tool I: Patients interview questionnaire:

This tool was developed by the investigator into simple Arabic language after reviewing of relevant and recent literatures and it included three parts:

Part I. Patient's demographic data:

This part was used to assess patient's demographic data as age, gender, occupation, educational level, marital status, residence and monthly family income.

Part II. Medical history of patients:

This part was used to assess the past & family history of DM and their relation to patients as history of chronic disease, duration of diabetes mellitus, type of diabetes mellitus, life style practices as smoking, history of obesity diet and practicing exercise and current history of patients as modification in the dose of prescribed insulin in the past three months, current complications of DM, value of hemoglobin A1C, frequency of self-monitoring blood glucose(SMBG).

Part III: Patient's knowledge questionnaire:

This tool was developed by the investigator into simple Arabic language after reviewing of relevant and recent literatures and it contained 28 items covering 3 domains:

- Patients' knowledge regarding DM and its management (7 items).
- Patients' knowledge regarding insulin pump therapy (12 items).
- Patients' knowledge regarding practices of insulin pump therapy (9 items).

Scoring system for knowledge questionnaire:

For assessing patients' knowledge, each correct answer was scored as (1), and incorrect answer was scored as (zero). The total score for all questions related to knowledge ranged from 0-28 was categorized into two levels as following:

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- **Satisfactory knowledge** if total score ≥ 80%.
- **Unsatisfactory knowledge** if total score from <80%.

Tool II: Insulin Pump Attitudes Questionnaire:

This questionnaire was adapted from (Messina et al., 2023). This questionnaire was used to assess attitude of patients regarding insulin pump therapy. It contained 19 items, covering 5 domains: items, covering 5 domains:

- Glycaemic control (5 items)
- Technology dependency (3 items)
- Ease to use (2 items)
- Flexibility (5 items)
- Impaired body image (4 items)

Scoring system for attitude items

Patients' responses were measured on three points Likert scale ranging from (0) Disagree, (1) Neutral, (2) Agree. The scores of the statement of each dimension was summed-up, converted into percent score and the total divided by the number of the items giving a mean score for each dimension. Patients' attitudes were considered positive attitude if the total percent score is above than 70 % and negative attitude if the total scores are less than 70%. The total scores of attitude were summed up converted into a percentage score It ranged from 0-26 grades and categorized as following: -

- **Positive attitude** if total score ≥ 70% .
- **Negative attitude** if total score from <70% .

II. Operational item:

Included preparatory phase, content validity and reliability, pilot study and field work.

A- The preparatory phase:

It included reviewing of past, current, national and international related literature and theoretical knowledge of various aspects of the study using books, articles, internet, periodical and magazines to develop tools for data collection.

B-Tool's Validity and Reliability.

Validity:

The developed tool was translated into Arabic and submitted to five experts, two assistant professors and three lectures of medical surgical nursing at faculty of nursing Helwan university. The experts reviewed the tool for clarity, relevance, accuracy, comprehensiveness, simplicity, applicability and necessary modification were done.

Reliability:

Cronbach's Alpha was used to determine the internal reliability of the tools. Reliability of the tools was tested to determine the extent to which the tools items are related to each other. Cronbach's Alpha reliability coefficient normally ranges between 0 and 1 with higher values (more than 0.7) denote acceptable reliability. Reliability score for patient's knowledge questionnaire was 0.90 and 0.86 for insulin pump attitudes questionnaire.

C-Pilot study:

The pilot study was done on 10% of the total sample size (30 patients) to examine the clarity of questions and time needed to complete the study tools. Based on results, modifications were done (if necessary). Subjects included in the pilot study were excluded from the study as major modification were required.

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D-Field work

- Data was collected upon six months started at the beginning of March (2024) and completed by the end of August (2024).
- The investigator explained the aim of the study, duration of data collection, sample size and how to collect data to the nursing directors. After that, the investigator began to use the study's tools to collect data.
- Before beginning to collect data from the patients, the investigator introduces her to them, explained the aim of the study.
- The investigator was present at the outpatient clinic 2 days/week to collect data in the morning and afternoon.
- Each day, the investigator met 6-7 patients.
- The investigator collected data by interviewing each patient. She started by filling in patient's interview questionnaire which took 10-15 minutes, then the investigator assessed patient's knowledge regarding insulin pump therapy which took 20-25 minutes, then patient's attitude, it took 10-15 minutes.
- The investigator ascertains all questions were answered and checked completion for items and any missing data.

Ethical Considerations:

An official permission to conduct the proposed study was obtained from the Scientific Research Ethics Committee faculty of nursing. Participation in the study is voluntary and nursing personnel were given complete and full information about the study and their role before signing the informed consent. The ethical considerations included explaining the purpose and nature of the study, stating the possibility to withdraw at any time, confidentiality of the information where it wasn't being accessed by any other party without taking permission of the nursing personnel. Ethics, values, culture and beliefs were respected.

III. Administrative item:

After explanation of the study's aim and objectives, an official permission was obtained from the dean of faculty of nursing and the director of Ain Shams university hospital asking for cooperation and permission to conduct the study.

IV. Statistical item:

Upon completion of data collection, collected data were organized, tabulated and analyzed using statistical package for social science (SPSS), version 25 for analysis. For quantitative data, numbers, percentage, mean and standard deviation (SD) were used to describe results. For qualitative data which describe a categorical set of data, frequency and percentage of each category were calculated.

Table (1) Indicates that 36.4 % and 26.5% of the studied patients were 40-< 50 years and 50-60 years old respectively with a mean 48 age 35.0 ± 8.06 61.3% of them were female, and 71.2% were married. While, 51.3% and 46.4 of them had secondary education and were employed respectively. 59.6% of the studied patients were from rural areas and 67.5% them hadn't enough monthly income.

Figure (1) illustrates 37.7% and 35.4% of the studied patients had knowledge about insulin pump therapy from physician and social media respectively.

Figure (2) shows that 42.4% of the studied patients had satisfactory of total knowledge levels regarding diabetes mellitus and insulin pump therapy. While, 57.6% of them had unsatisfactory knowledge level.

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Table (2) Indicates that 75.2 % of the studied patients didn't have insulin pump therapy, while 24.8% of them had the therapy. Regarding modifications in the dose of prescribed insulin in the past three months 66.7% of the studied patients had modifications. Also, 62.9% of them didn't have chronic complications of diabetes, while, 37.1% of them had complications as foot problems among 53.6% of them. Regarding frequency of self-monitoring blood sugar, 72.8% of the studied patients monitored less than three times per day. As well, 52% of them had value of hemoglobin A1C of ≤ 6.5% .

Table (3) Displays that 67.9% of the patients had a satisfactory knowledge level regarding diabetes mellitus. While, 59.9% of them had unsatisfactory knowledge level regarding practices of insulin pump therapy.

Table (4) Displays that 55.3% of the studied patients had positive attitude regarding flexibility of insulin pump therapy. While, 51% of them had negative attitude regarding impaired body image of insulin pump therapy.

Table (1): Frequency and percentage distribution of the studied patients' according to their demographic characteristics (N=302)

Patients' demographic characteristics	N	%
Age (year)		
18 - < 30 years	45	14.9
30 - < 40 years	67	22.2
40 - < 50 years	110	36.4
50 - 60 years	80	26.5
Mean±SD	35.0 ± 8.06	
Gender		
Male	117	38.7
Female	185	61.3
Marital status		
Single	52	17.2
Married	215	71.2
Divorced	25	8.3
Widow	10	3.3
Educational level		
Doesn't read or write	40	13.2
Primary education	95	31.5
Secondary education	155	51.3
University education	10	3.3
Post graduate studies	2	0.7
Occupational status		
Employed	140	46.4
Unemployed	50	16.6
Retired	28	9.2
House wife	84	27.8
Residence		
Urban	122	40.4
Rural	180	59.6

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Monthly income		
Enough	**98**	**32.5**
Not enough	**204**	**67.5**

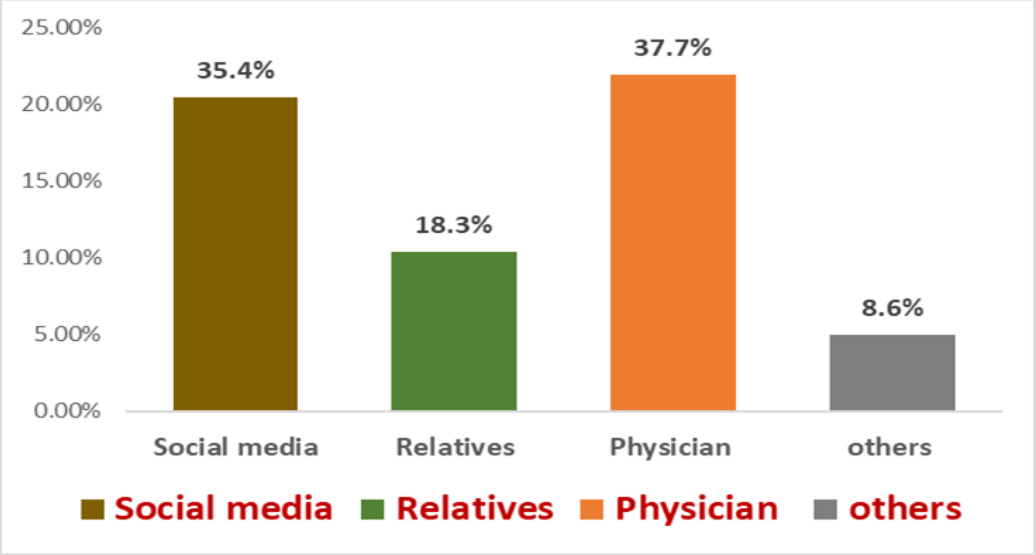

Figure (1): Percentage distribution of the studied patients according to their sources of knowing about insulin pump (n=175).

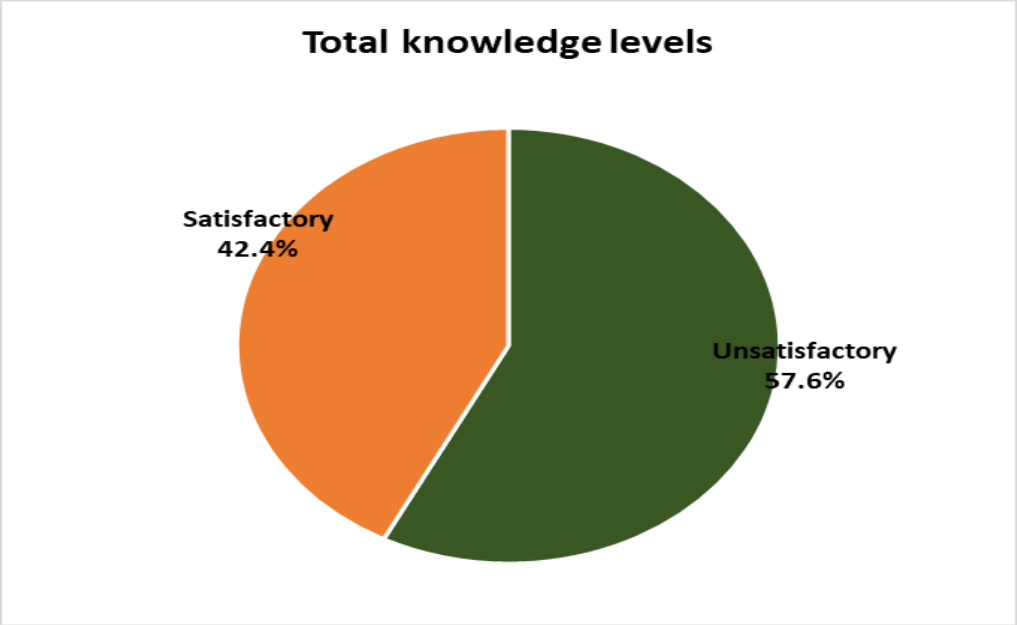

Figure (2): Percentage distribution of the studied patients according to total satisfactory and unsatisfactory knowledge levels (n= 302).

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Table (2): Frequency and percentage distribution of the studied patients according to their current history (n=302)

Patients' current history	N	%
Having insulin pump therapy		
Yes	75	24.8
No	227	75.2
Having modification in the dose of prescribed insulin in the past three month		
Yes	201	66.7
No	101	33.3
Having chronic complications of diabetes		
Yes	112	37.1
No	190	62.9
If yes, the complications of diabetes (n=112)		
Retinopathy	17	15.2
Foot problems	60	53.6
Mouth problems	35	31.2
Frequency of self-monitoring blood glucose		
Less than three times per day	220	72.8
Three times per day	56	18.5
More than three times per days	26	8.7
Value of hemoglobin A1C		
≤6.5%	157	52
$6.5 - 7.5\%$	100	33.1
≥7.5%	45	14.9

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Table (3): Frequency and percentage distribution of the studied patients regarding total satisfactory levels of knowledge about (n=302)

Dimensions of knowledge	Satisfactory		Unsatisfactory		Mean±SD
	N	%	N	%	
Patient's knowledge regarding DM	205	**67.9**	97	32.1	1.678± 0.467
Patient's knowledge regarding insulin pump therapy	135	44.7	167	55.3	1.569±0.495
Patient's knowledge regarding practices of insulin pump therapy	121	40.1	181	**59.9**	1.592±0.492

Table (4): Frequency and percentage distribution of the studied patients according to total attitude domains (n=302)

Items	Positive attitude ≥70%		Negative attitude <70%		Mean±SD
	N	%	N	%	
Glycemic control	**156**	**51.7**	**146**	**48.3**	**1.516± 0.500**
Technology dependency	**160**	**53**	**142**	**47**	**1.529 ±0 .499**
Ease of use	**161**	**53.3**	**141**	**46.7**	**1.533 ± 0 .4997**
Flexibility	**167**	**55.3**	**135**	**44.7**	**1.553 ± 0.498**
Impaired body image	**148**	**49**	**154**	**51**	**1.490± 0.5007**

Table (5): Correlation between total satisfactory knowledge of studied patients and total attitude regarding insulin pump therapy (n=302)

Items		Total attitude
Total knowledge levels	Pearson Correlation	0.461
	Sig. (2-tailed)	0.000 **

High statistically significant at p value (< 0.001)

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Discussion

Insulin pumps or continuous subcutaneous insulin infusion are commonly used for treatment of individuals living with diabetes with great benefit for diabetes control. Combining CSIIs with a continuous glucose monitoring system is often used to reach even better glucose control. A growing number of people with type 2 or type 1 diabetes are advised to use various insulin pumps as part of their treatment. The insulin is delivered through a catheter inserted into the subcutaneous tissue and secured on the skin with adhesive, the infusion set. Some pumps, referred to as "patch pumps," do not use tubing but adhere directly to the skin **(Von Kobyletzki et al., 2024).**

Part I: Demographic characteristics of the studied patients':

Regarding the patients' demographic characteristics, the current study findings showed less than two thirds of the studied patients were in the age group of 40 to 60 years and were female. From investigator point of view this could be due to their age of 40 to less than 60 years and hormonal changes of menopause among this age group, which affect the body cells use of insulin and predispose them to diabetes mellitus.

This study finding is supported by a cross sectional self-administered survey conducted in Saudi Arabia by **Mansy et al. (2022)**, entitled ''Assessing outpatients' knowledge, attitude, and practice toward managing diabetes'' and showed that about two thirds of the total studied patients were between the age of 41-75 years old. As well, this study agrees with a cross-sectional analytical study conducted in Saudi Arabia by **Wazqar et al, (2021)**, entitled ''Assessment of knowledge and foot self-care practices among diabetes mellitus patients in a tertiary care centre''and illustrated that the majority of the studied patients were females.

In the same context, the current study revealed that more than two thirds of the studied patients were married and more than half of them had secondary education, while, less than half of patients were employed. These finding may be interpreted by the age of 40-60 years and female gender of about two thirds of the studied patients, so, they were married by this age.

This result was agrees with **Ninsiima et al, (2024)**, who conducted a recent study, entitled ''Knowledge, attitudes and practices towards glycemic control among persons with diabetes mellitus at two tertiary hospitals in Uganda'' and revealed that the majority of patients were married, While, these findings are inconsistent with **Al-Wagdi & Al-Hanawi (2024)**, who conducted a cross sectional study, entitled ''Knowledge, attitude and practice toward diabetes among the public in the Kingdom of Saudi Arabia'' and revealed that the majority of patients had college /university degree and were employed.

Additionally, the current study findings stated that more than half of the studied patients were from rural areas and more than two thirds of them hadn't enough monthly income. From investigator point of view, this could be related to the cost of medical treatment of DM and the occupational status of the patients as more than half of them were unemployed, retired or house wife.

This result was agrees with **Kumar et al, (2023)**, who conducted a study, entitled ''Knowledge and awareness about diabetes mellitus among urban and rural population attending a tertiary care hospital in Haryana'', revealed that the majority of the patients were rural residence and is congruent with **Putra et al, (2019)**, who conducted study, entitled ''Monthly income of family, educational level,

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knowledge, and eating behaviour's among people with type 2 diabetes mellitus in sidoarjo'', and stated that the majority of patient had not enough monthly income.

Part II: Current history of the studied patients':

By evaluating current history of studied patients, this study result mentioned the majority of the studied patients didn't have insulin pump, while, about one quarter had the pump, two thirds had modifications in the dose of prescribed insulin in the past three months. Also, about two thirds of them didn't have chronic complications of diabetes, while, more than one third of them had complications as foot problems among more than half of them. This could be due to the most of studied patients maintained regular follow up and keep their blood sugar levels under control.

This result agrees with **Vargas et al, (2023)**, who conducted study, entitled ''Insulin detection in diabetes mellitus: challenges and new prospects'', stated that the majority of patient had modifications in the dose of prescribed insulin in the past three month, while, this finding disagrees with **Wang et al, (2023)**, who conducted study, entitled ''Underlying mechanisms of diabetes knowledge influencing diabetes self-management behaviours among patients with type II diabetes in rural China: Based on health belief model'', declared that more than half of patients had complications of diabetes.

Regarding frequency of self-monitoring blood sugar, more than two thirds of the studied patients monitored less than three times per day. As well, more than half of them had value of hemoglobin A1C of ≤ 6.5%. This result is in the same line with **Johari et al, (2024)**, who conducted a preliminary trial study in Malaysia, entitled ''The efficacy of self-monitoring of blood glucose (SMBG) intervention package through a subscription model among type-2 diabetes mellitus'' and their findings reported that the majority of the patients were self-monitoring blood glucose less than three times per day, additionally, the study conducted by **Alrashed et al, (2024)**, entitled ''Evaluating diabetic foot care knowledge and practices at education level'', and showed that more than half of the patients had A1C less than 6.5%.

Part III: Total knowledge levels of the studied patients':

By assessing total knowledge levels of the studied patients, this study result mentioned that more than one third of the studied patients had satisfactory total knowledge levels regarding diabetes mellitus and insulin pump therapy. While, less than two thirds of them had unsatisfactory knowledge level. These results agree with **Ninsiima et al, (2024**), whose study, revealed that about two thirds of the studied patient had good knowledge on diabetes mellitus.

Tool II: Total attitude domains of the studied patients':

By assessing total attitude domains of the studied patients, this study finding displayed that more than half of the studied patients had a positive attitude regarding flexibility of insulin pump therapy. While, half of them had a negative attitude regarding impaired body image of insulin pump therapy. This result agrees with **Emad-Eldin et al, (2024)**, who conducted a systemic review and meta-analysis study, entitled ''Insulin therapy in type 2 diabetes: Insights into clinical efficacy, patient-reported outcomes, and adherence challenges'' and mentioned that a significant majority of patients, showed a positive attitude toward insulin pumps, citing flexibility, improved quality of life, and greater control over insulin delivery as primary reasons for their satisfaction.

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Correlation between total satisfactory knowledge level and total attitude regarding insulin pump therapy:

By assessing Correlation between total satisfactory knowledge level of studied patients and total attitude regarding insulin pump therapy, presents that there was a high statistically significant positive correlation between the total satisfactory knowledge level of the studied patients and their total attitude regarding insulin pump therapy. The presented study results are similar to **Muhammad et al, (2020**), which titled ‘‘Knowledge and attitude regarding insulin self-administration among diabetic patients: a cross-sectional study in a teaching hospital of Khyber-Pakhtunkhwa, Pakistan’’ and mentioned significantly related to knowledge and attitude scores, and there was positive linear correlation between knowledge score and attitude score.

Conclusion

Based on the result of the current study and research questions the following can be concluded that:

The present study showed that more than one third of the studied patients had a satisfactory level of total knowledge levels regarding diabetes mellitus and insulin pump therapy. While more than half of them had an unsatisfactory knowledge level. Also shows more than half of the studied patients had a positive total attitude regarding insulin pump therapy. While, about half of them negative attitude.

Recommendations

- Implementation of an educational programs for patients’ knowledge and attitude through carrying out continuing educational programs about insulin pump therapy.
- Providing patients with diabetes with periodic training session to improve their attitude regarding insulin pump therapy.
- Availability of written guidelines and posters about using and management of insulin pump therapy.

Further researches

- Replication of the study on a larger probability subjects from different geographical locations in Egypt.
- Compare patients’ attitude of insulin pump therapy in different settings among patients with different educational background.

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