Original Article

Awareness and Attitude of Diabetic Patients toward Insulin Therapy in Sulaymaniyah City-Iraq

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Abstract

Background: Diabetes mellitus (DM) is one of the most prevalent chronic diseases worldwide, with a continuously increasing incidence. Insulin therapy remains a cornerstone in the management of diabetic patients. However, inadequate knowledge about insulin use may negatively influence patients' acceptance and adherence. Therefore, improving patients' knowledge, attitude, and practice (KAP) is essential for achieving optimal glycemic control and reducing the risk of complications. **Objectives:** To assess the awareness and attitudes of diabetic patients toward insulin therapy. **Materials and Methods:** A cross-sectional study was conducted between December 2023 and February 2024 at the Diabetic Center in Sulaymaniyah City. A total of 103 diabetic patients were enrolled. Data were collected through face-to-face interviews using a structured, paper-based questionnaire designed to evaluate patients' awareness and attitudes toward insulin therapy. **Results:** Among the 103 participants, 65% were female. Younger patients demonstrated higher levels of awareness compared to older patients, particularly regarding the common side effects of insulin. Male participants showed greater confidence in insulin self-administration compared to females (100% vs. 64%). Overall, awareness and attitudes toward insulin therapy were found to be at an acceptable level. **Conclusions:** The study revealed a generally acceptable level of awareness and a favorable attitude toward insulin therapy among diabetic patients. Nevertheless, there is a need for targeted educational interventions and continuous patient–healthcare provider communication to further improve patients' knowledge and optimize diabetes management outcomes.

Keyword: Awareness; Attitude; Diabetes mellitus; Insulin therapy.

Introduction

Diabetes mellitus (DM) is one of the major chronic diseases with its prevalence steadily increasing all over the world. The International Diabetes Federation (IDF) reports that over 80% of people with diabetes live in low- and middle-income countries.[1] Globally, the condition known as diabetes mellitus (DM) is becoming a more serious health issue. By 2040, there is anticipated to be 642 million people living with the condition, up from the current estimate of 415 million, and the associated mortality rate is projected to be one death every six seconds.[2] Genetic and environmental variables, such as inadequate insulin secretion, insulin resistance, elevated glucose production, and/or abnormal-lities in the metabolism of fat and protein, have a role in the pathogenesis of diabetes mellitus.[3] Diabetes increases a patient's risk of peripheral vascular, cerebral, and cardiovascular conditions.

[4] By receiving competent and prudent medical treatment, these consequences can be avoided. [5] Nevertheless, it is clear that diabetes and a number of other chronic illnesses are related. [6] Patients with diabetes who are highly likely to have comorbid conditions include hypertension, cardiovascular problems, nephropathies, retinopathy, ophthalmological, neurological, and other cardiovascular concerns, along with the complications and outcomes that go along with them. [7] DM is thought to be the main cause of mortality in the majority of underdeveloped countries. [8] This might be explained by poorly managed hyperglycemia, which is linked to a number of potentially fatal side effects, including heart disease and renal failure. [9] Only when patients adhere to self-management behaviors such as a nutritious diet, regular exercise, blood glucose monitoring, proper medication administration, problem-solving skills for diabetes, and good coping mechanisms can optimal glycemic control be attained. [10] The cause of type 1 diabetes is a whole or almost total insulin shortage. The diverse range of conditions known as type 2 diabetes is marked by varying degrees of insulin resistance, decreased insulin secretion, and elevated glucose production. As type 2 diabetes worsens, many of these patients eventually require insulin. [3] After middle age, diabetes type 2 mellitus (DM) is most common; it affects both sexes equally and most frequently presents itself between the ages of 50 and 70. Type 1 diabetes mostly affects children aged 10 to 12 and has a small male predominance. Nonetheless, Type 1 DM can occasionally affect the elderly, while Type 2 DM can occasionally affect young persons.[11] People with diabetes should have an assessment of their existing (KAP) before starting an educational program.[12] Insulin therapy is the cornerstone of treatment for both type 1 and type 2 diabetes, and it is a crucial part of the drugs used to treat DM. Despite this, 20% of individuals purposefully miss their insulin doses, and at least one-third of patients do not take their medication as directed. [11] There are four different forms of insulin: fast, short, intermediate, and long-acting. Although there are other bodily locations where insulin administration is carried out, the abdomen is the most often used region. [13] The patient's understanding of insulin therapy and attitude toward it determine whether they can self-administer insulin. Numerous research studies have been conducted globally to investigate patients' (KAP) related to self-administering insulin. According to the research, a person's age, gender, marital status, work history, educational background, place of living in an urban area, length of illness, and other factors might all affect their KAP. [14] The majority of diabetes patients may require caretakers because they are unable to self-administer insulin for a variety of reasons, including aging patients, numerous diseases, psychosocial issues, cognitive impairment, and complex treatment regimens. [13] Insulin therapy is filled with challenges due to the complicated procedure of its application. Proper knowledge of its administration can help prevent issues, adverse patient outcomes, insufficient therapy adherence, and ultimately insufficient glucose management. [15] In addition, a proper injection technique is required to guarantee that the medication reaches the subcutaneous tissues, avoiding intramuscular injuries, and prevent lipohypertrophy. [16] The American Diabetic Association developed a set of guidelines for syringe usage, insulin storage, mixing, and other related issues. But those who face severe socioeconomic challenges may not follow the rules, especially in underdeveloped countries.[17] Insulin acceptance and adherence are likely to be impacted by inadequate knowledge about its use. Twenty

percent of adults purposefully miss their insulin doses, and one-third diabetic patients do not take their medication as directed. Every diabetic patient who takes insulin has to know how to use it. [18] Primary care physicians can inform these patients about the dangers of diabetes, urge frequent blood sugar monitoring, and teach them about healthy lifestyle choices. Adequate understanding of its application can aid in averting problems, negative patient consequences, inadequate therapy compliance, and inevitably inadequate glucose control. [15] These patients can be imparted health education by primary care physicians to adopt healthy lifestyle practices, remain motivated for regular testing of glycemic status, and be aware of diabetic complications. Sufficient knowledge of its use can help to prevent complications, adverse patient outcomes, poor adherence to therapy, and invariably poor glycemic control. [15] Glycemic management and the avoidance of diabetic complications are contingent upon the ensuing modifications in the (KAP) of individuals with diabetes.[19] This study aims to assess the awareness and attitudes of diabetic patients toward insulin therapy.

Materials and Methods

Study design and duration

This study is a cross-sectional study design which took place from December 2023 to February 2024

Methods

This study enrolled 103 diabetic patients who attended the Diabetic Center in Sulaymaniyah City by. The convenience sampling method was used. A structured questionnaire was administered to each participant. The instrument was developed based on previously published studies and relevant literature, and its content validity was reviewed by subject experts. It was subsequently pilot-tested on a subset of patients to evaluate clarity, relevance, and feasibility. Reliability was assessed using internal consistency measures, and appropriate modifications were made prior to final data collection. Collecting demographic information (name, gender, occupation, residential status, and educational level) as well as questions assessing patients' awareness of and attitudes toward insulin therapy. Additional questions included:

- Duration of diabetes,
- Duration of insulin use,
- Type of insulin delivery device,
- Daily frequency of insulin administration,
- Daily insulin dose,
- Frequency of hypoglycemic episodes, and
- History of hospitalization due to insulin-related hypoglycemia.

All responses were recorded, and each questionnaire was assigned a code.

Inclusion criteria

1. Patients aged 18 years or older
2. Diagnosed with type 1 or type 2 diabetes
3. Minimum of 6 months of insulin use.

Ethics approval and consent to participate:

Approval (number 183) was granted by the ethical committee of the College of Medicine/University of Sulaimani / Iraq. This work was implemented in accordance with international guidelines and the 2008 Declaration of Helsinki. Consents were taken verbally from the patients.

Statistical analysis

Data entry performed via using an excel spreadsheet then the statistical analysis was performed by SPSS program, version 24.0 (IBM SPSS Statistical Package for the Social Sciences). The data presented in tabular forms showing the frequency and relative frequency

distribution of different variables among different groups. Chi-square tests were used to compare the categorical data between these groups of study participants in respect to different variables. Quantitative continuous variables were described by mean and SD (standard deviation). The statistical significance of difference in mean between two groups was assessed using independent sample t-test, while between more than 2 groups ANOVA test was used. Certain types of charts were used to describe some variables of the study diagrammatically. P values of 0.05 were used as a cut off point for significance of statistical tests.

Result

Socio-Demographic data

Among 103 patients enrolled, 65% were female, the remaining were males. The age of most of them located between 61-80 years old. Among the females, 60.2% were housewives. 24% of all patients were employed. 84.5% were urban residents. 35% were illiterate and only 14% attended higher education. (Table 1)

Table 1: Socio-demographic data presented as frequency and percentage

Variable		Frequency (%)
Sex	**Male**	36 (35)
	Female	67(65)
Age group	**19-30**	14(13.6)
	31-40	5(4.9)
	41-50	19(18.4)
	51-60	27(26.2)
	61-80	38(36.9)
Occupation	**Employee**	25(24.3)
	Housewife	62(60.2)
	not working	4(3.9)
	Student	4(3.9)
	Retired	8(7.8)
Domiciliary status	**Urban**	87(84.5)
	Rural	16(15.5)
Educational level	**Illiterate**	36(35)
	primary school	26(25.2)
	secondary school	18(17.5)
	high school	8(7.8)
	Institute	4(3.9)
	University	11(10.7)

Awareness and gender:

There were no significant gender differences in overall awareness, except for knowledge of the common symptoms of hypoglycemia, which was higher in males than in females, (P = 0.01). (Table 2 and figure 1)

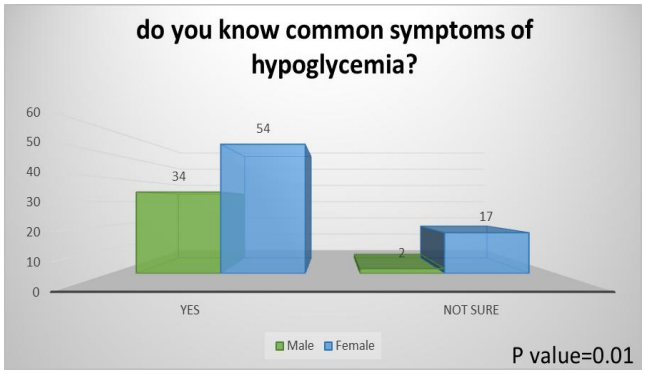

Figure 1: Awareness regarding common symptoms of hypoglycemia among males and females

Awareness and age groups

Overall, most age groups demonstrated good knowledge about injection-site rotation, proper insulin storage, and other variables. However, awareness of the most common side effects of insulin, with younger participants showing greater knowledge than older participants (P = 0.01). (Table 3 and figure 2)

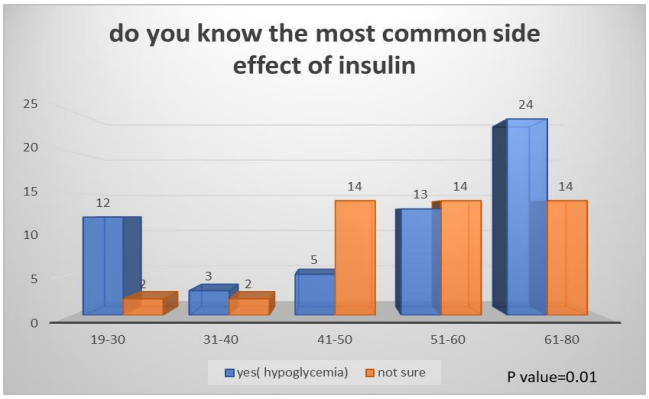

Figure 2: awareness regarding most common side effect of insulin among age groups

Awareness and domiciliary statues

There were no statistically significant differences in awareness of insulin use between patients living in urban and rural areas (Table 4).

Awareness and education level

There were no statistically significant differences in awareness variables across different educational levels (Table 5).

Attitude and gender

Males were more likely than females to self-inject insulin and reported greater confidence in doing so. The P value for both variables was 0.01 (Figure 3 and 4).

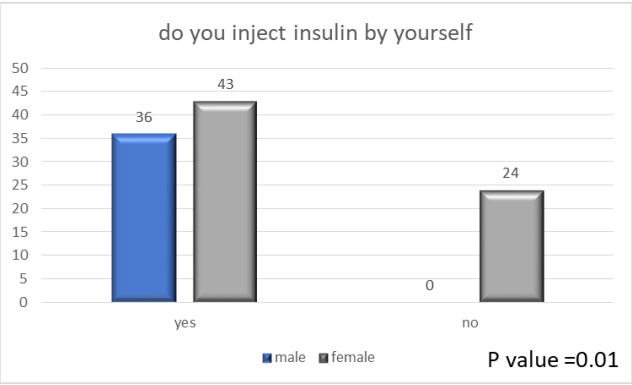

Figure 3: Attitude about insulin self-injection among males and females

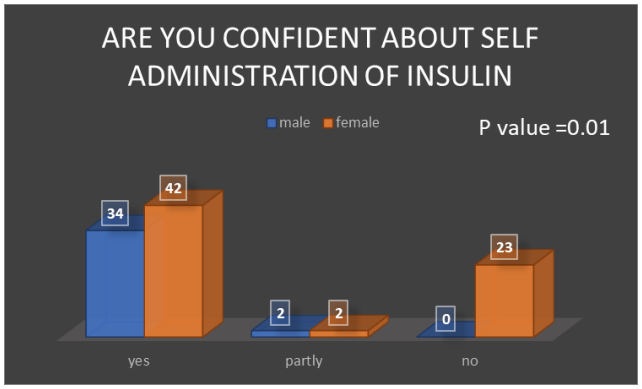

Figure 4: Attitude regarding confidence of insulin self-administration among males and females

Attitude and age groups:

There were no statistically significant differences in attitudes toward insulin across different age groups, except that self-injection was less common among older participants compared with younger ones (P = 0.01). (Table 7 and Figure 5)

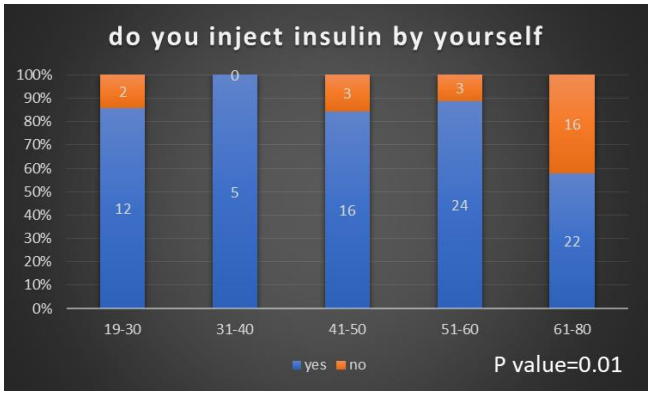

Figure 5: Attitude about self-injection of insulin across age groups

Attitude and domiciliary status

There were no statistically significant differences in attitude variables between urban and rural residents (Table 8).

Attitude and educational level

In the current study, self-injection of insulin and confidence in performing self-injection were lower among illiterate patients compared with those with higher educational levels. The

corresponding P values were 0.002 and 0.01, respectively (Table 9, Figure 6 and 7).

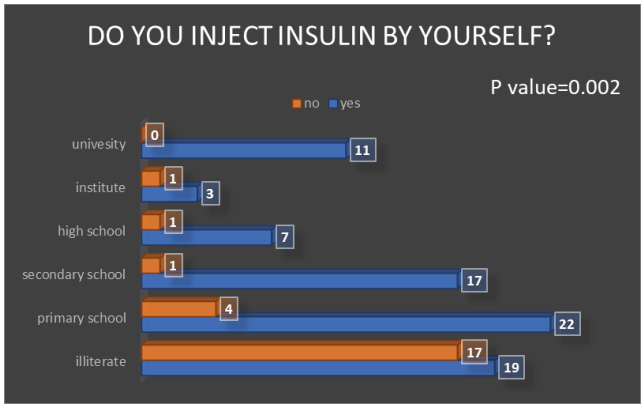

Figure 6: Attitude about self-injection of insulin across different educational levels

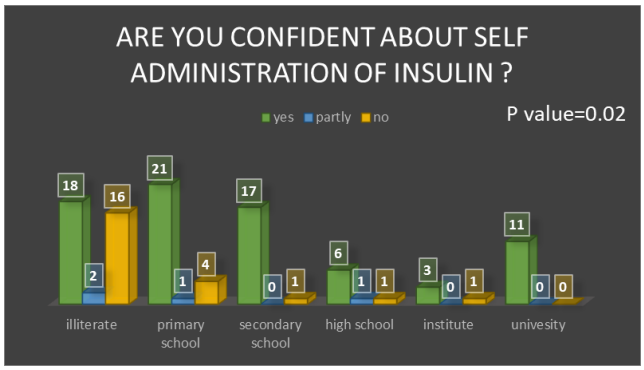

Figure 7: Attitude regarding confidence of insulin self-administration across different educational levels

Information about diabetes history, insulin use and insulin side effects

The majority of participants (77%) used syringes as insulin delivery device. Among the patients, 52% had diabetes for 11–20 years, indicating that most participants had long-standing diabetes. Seven percent experienced hypoglycemia daily, while 24% experienced it occasionnally. Additionally, 26% had been hospitalized multiple times due to hypoglycemia, and 18% reported hypoglycemia unawareness (Table 10).

Discussion

The present cross-sectional study provides a contemporary snapshot of knowledge, attitudes, and practices (KAP) regarding insulin therapy among 103 patients with diabetes attending the diabetic center in Sulaymaniyah city / Iraq. In the current study, the mean age of the study population was 52.97 years, which is comparable to findings from a previous study reporting a mean age of 54 years [20]. Female patients constituted the majority of participants (65%), outnumbering males (35%). This finding contrasts with studies by Anu Sunny et al. [13] and Dinesh PV et al. [21], where males predominated (63.92% and 61.25%, respectively). The higher proportion of females in the present study may reflect the greater representation of women among patients registered at the study center. Regarding educational status, 35% of participants were illiterate. This differs from studies by Anu Sunny et al. [13] and Dinesh PV et al. [21], where most participants had attained at least middle or upper primary education. This discrepancy may be attributed to higher illiteracy rates within the local population. In terms of occupation, the majority of participants (60.2%) were unemployed housewives. A similar trend was observed in the study by Berhe KK et al. [22], where 34.3% of participants were unemployed. In contrast, Dinesh PV et al. [21] reported that most participants were agriculturists or self-employed (28.5%). The most affected age group in the present study was 51–80 years (n = 65), which is consistent with findings by Anu Sunny et al. [13], where the majority of patients were older than 45 years. The median duration of insulin use in this study was 7 years, which is notably longer than that reported in studies by Anu Sunny et al. [13] and Netere AK et al. [23], where mean durations were 1 year and 2.3 years, respectively. This variation may reflect differences in disease duration, healthcare access, or treatment practices. Furthermore, the majority of participants in the current study were

urban residents (84.5%), with only 15.5% from rural areas. This contrasts with studies by Anu Sunny et al. [13] and Netere AK et al. [23], where most participants were from rural settings (83.35% and 51.8%, respectively). The predominance of urban participants in the present study may be explained by the urban location of the study center and the higher accessibility of healthcare services in urban areas. In the present study, males demonstrated significantly greater awareness of the common symptoms of hypoglycemia (94.4%) compared to females (74.6%) (P = 0.01). In contrast, Changwei Liu [24] reported no significant gender-based difference in awareness. The disparity observed in our findings may be explained by underlying socio-demographic factors, particularly the higher prevalence of illiteracy among female participants, which likely limited their access to health information and reduced their understanding of diabetes-related complications. Additionally, gender-related differences in health-seeking behavior, educational opportunities, and exposure to diabetes education programs may have further contributed to the lower awareness observed among females in this cohort. In the present study, the highest levels of awareness of hypoglycemia—the most common side effect of insulin—were observed among patients aged 19–30 years (85.7%) and 61–80 years (63.2%) (P = 0.01). This distribution may be explained by differences in both educational exposure and disease experience; younger patients are more likely to be educated and actively seek health-related information, whereas older patients may acquire greater awareness through prolonged personal experience with diabetes and its management. A similar pattern of hypoglycemia awareness was reported in the study by Changwei Liu [24]. Furthermore, higher educational attainment was associated with better awareness and a more positive attitude toward insulin therapy, particularly regarding self-injection practices and confidence in administering insulin independently. In addition, a substantial proportion of patients reported experiencing hypoglycemic episodes occasionally, affecting more than half of the study population, although these episodes did not occur on a daily basis.

Conclusions

This study showed acceptable level of awareness and favorable attitude toward insulin therapy among diabetic patient, though more educational programs and constant communication is needed to achieve maximum level of knowledge and attitude about insulin therapy. Self-injection of insulin and confidence in insulin self-administration were lower among older age groups compared to younger patients. Males were more likely to self-inject insulin than females. Additionally, awareness of the common symptoms of hypoglycemia and the common side effects of insulin was higher in younger age groups and in those with higher educational level.

Limitations

This study has several limitations that should be considered when interpreting the findings. First, as the study was conducted at a single center, the results may not be generalizable to the wider diabetic population. Second, the relatively short study duration (two months) and limited sample size further restrict the external validity of the findings. Third, the cross-sectional design captures data at a single point in time and does not allow for assessment of temporal changes or causal relationships. Additionally, the reliance on self-reported data may introduce recall and reporting bias, potentially affecting the accuracy of the responses.

Conflict of Interest Statement

The authors declare that there are no conflicts of interest related to this work.

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Table 2: Relationship between awareness and gender

Variable		Male	Female	Total	P value
Place of insulin injection	Upper arm	7 (19.4%)	20 (29.9%)	27 (26.2%)	0.15
	Abdomen	14 (38.9%)	13 (19.4%)	27 (26.2%)	
	Thigh	6 (16.7%)	10 (14.9%)	16 (15.5%)	
	Multiple areas	9 (25.0%)	24 (35.8%)	33 (32.0%)	
Do you rotate site of injection	Usually	26 (72.2%)	51 (76.1%)	77 (74.8%)	0.84
	Sometimes	7 (19.4%)	10 (14.9%)	17 (16.5%)	
	No	3 (8.3%)	6 (9.0%)	9 (8.7%)	
Where do you keep your insulin	Refrigerator	36 (100%)	66 (98.5%)	102(99.0%)	0.46
	Not fixed	0 (0.0%)	1 (1.5%)	1 (1.0%)	
In relation to food when do you inject insulin	Before meal	25 (69.4%)	40 (59.7%)	65 (63.1%)	0.58
	After meal	5 (13.9%)	14 (20.9%)	19 (18.4%)	
	Not fixed	6 (16.7%)	13 (19.4%)	19 (18.4%)	
Do you know why insulin is prescribed for diabetes	Yes	33 (91.7%)	54 (80.6%)	87 (84.5%)	0.31
	Partly	1 (2.8%)	6 (9.0%)	7 (6.8%)	
	No	2 (5.6%)	7 (10.4%)	9 (8.7%)	
How often do you check your blood sugar by glucometer	Daily	13 (36.1%)	32 (47.8%)	45 (43.7%)	0.51
	Somedays	5 (13.9%)	5 (7.5%)	10 (9.7%)	
	Occasionally	6 (16.7%)	13 (19.4%)	19 (18.4%)	
	Only during symptoms of hypoglycemia	12 (33.3%)	17 (25.4%)	29 (28.2%)	
Do you know the most common side effect of insulin	Yes (hypoglycemia)	24 (66.7%)	33 (49.3%)	57 (55.3%)	0.09
	Not sure	12 (33.3%)	34 (50.7%)	46 (44.7%)	
If you develop insulin-related hypoglycemia, how do you manage the dose of insulin for the next day	I will decrease the dose	9 (25.0%)	23 (34.3%)	32 (31.1%)	0.57
	I will use the same dose as the previous dose	23 (63.9%)	36 (53.7%)	59 (57.3%)	
	Not sure	4 (11.1%)	8 (11.9%)	12 (11.7%)	

Table 3: Relationship between awareness and different age groups

Variable	Age groups (year)	19-30	31-40	41-50	51-60	61-80	Total	P Value
Place of insulin injection	Upper arm	1(7.1%)	0 (0.0%)	4 (21.1%)	7 (25.9%)	15(39.5%)	27 (26.2)	0.29
	Abdomen	4 (28.6%)	1 (20.0%)	4 (21.1%)	10(37.0%)	8 (21.1%)	27(26.2%)	
	Thigh	4 (28.6%)	1 (20.0%)	5 (26.3%)	2 (7.4%)	4 (10.5%)	16(15.5%)	
	Multiple areas	5 (35.7%)	3 (60.0%)	6 (31.6%)	8 (29.6%)	11(28.9%)	33(32.0%)	
Do you rotate the site of injection	Usually	9 (64.3%)	5(100.0%)	14(73.7%)	22(81.5%)	27(71.1%)	77(74.8%)	0.72
	Sometimes	4 (28.6%)	0 (0.0%)	4 (21.1%)	3 (11.1%)	6 (15.8%)	17(16.5%)	
	No	1 (7.1%)	0 (0.0%)	1 (5.3%)	2 (7.4%)	5 (13.2%)	9 (8.7%)	
where do you keep your insulin	refrigerator	13(92.9%)	5(100.0%)	19(100.0%)	27(100.0%)	38(100.0%)	102(99.9%)	0.17
	not fixed	1 (7.1%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	
in relation to food when do you inject insulin	before meal	10(71.4%)	2 (40.0%)	15 (78.9%)	19 (70.4%)	19 (50.0%)	65 (63.1%)	0.26
	after meal	1 (7.1%)	1 (20.0%)	2 (10.5%)	6 (22.2%)	9 (23.7%)	19 (18.4%)	
	not fixed	3 (21.4%)	2 (40.0%)	2 (10.5%)	2 (7.4%)	10 (26.3%)	19 (18.4%)	
do you know why insulin is prescribed for diabetes	yes	13(92.9%)	3 (60.0%)	16 (84.2%)	24 (88.9%)	31 (81.6%)	87 (84.5%)	0.28
	Partly	0 (0.0%)	1 (20.0%)	3 (15.8%)	0 (0.0%)	3 (7.9%)	7 (6.8%)	
	no	1 (7.1%)	1 (20.0%)	0 (0.0%)	3 (11.1%)	4 (10.5%)	9 (8.7%)	
how often do you check your blood sugar by glucometer	Daily	7 (50.0%)	3 (60.0%)	7 (36.8%)	11 (40.7%)	17 (44.7%)	45 (43.7%)	0.83
	somedays	1 (7.1%)	0 (0.0%)	1 (5.3%)	5 (18.5%)	3 (7.9%)	10 (9.7%)	
	occasionally	2 (14.3%)	0 (0.0%)	6 (31.6%)	4 (14.8%)	7 (18.4%)	19 (18.4%)	
	only during symptoms of hypoglycemia	4 (28.6%)	2 (40.0%)	5 (26.3%)	7 (25.9%)	11 (28.9%)	29 (28.2%)	
do you know common symptoms of hypoglycemia	yes	13(92.9%)	5(100%)	13 (68.4%)	24 (88.9%)	29 (76.3%)	84 (81.6%)	0.18
	not sure	1 (7.1%)	0 (0.0%)	6 (31.6%)	3 (11.1%)	9 (23.7%)	19 (18.4%)	
if you develop insulin related hypoglycemia, how do you manage the dose of insulin for the next day	I will decrease the dose	6 (42.9%)	2 (40.0%)	3 (15.8%)	9 (33.3%)	12 (31.6%)	32 (31.1%)	0.56
	I will use the same dose as previous dose	6(42.9%)	2 (40.0%)	15 (78.9%)	16 (59.3%)	20 (52.6%)	59 (57.3%)	
	not sure	2(14.3%)	1 (20.0%)	1 (5.3%)	2 (7.4%)	6 (15.8%)	12 (11.7%)	

Table 4: Relationship between awareness and domiciliary status

Variable	Domiciliary status	Urban	Rural	Total	P Value
Place of insulin injection	Upper arm	23 (26.4%)	4 (25.0%)	27 (26.2%)	0.68
	Abdomen	24 (27.6%)	3 (18.8%)	27 (26.2%)	
	Thigh	12 (13.8%)	4 (25.0%)	16 (15.5%)	
	Multiple areas	28 (32.2%)	5 (31.1%)	33 (32.0%)	
Do you rotate site of injection	Usually	65 (74.7%)	12 (75.0%)	77 (74.8%)	0.78
	Sometimes	15 (17.2%)	2 (12.5%)	17 (16.5%)	
	No	7 (8.0%)	2 (12.5%)	9 (8.7%)	
where do you keep your insulin	Refrigerator	86 (98.9%)	16 (100.0%)	102 (99.0%)	0.67
	Not fixed	1 (1.1%)	0 (0.0%)	1 (1.0%)	
in relation to food when do you inject insulin	Before meal	57 (65.5%)	8 (50.0%)	65 (63.1%)	0.33
	After meal	16 (18.4%)	3 (18.8%)	19 (18.4%)	
	Not fixed	14 (16.1%)	5 (31.3%)	19 (18.4%)	
do you know why insulin is prescribed for diabetes	Yes	73 (83.9%)	14 (87.5%)	87 (84.5%)	0.92
	Partly	6 (6.9%)	1 (6.3%)	7 (6.8%)	
	No	8 (9.2%)	1 (6.3%)	9 (8.7%)	
how often do you check your blood sugar by glucometer	Daily	38 (43.7%)	7 (43.8%)	45 (43.7%)	0.96
	Somedays	9 (10.3%)	1 (6.3%)	10 (9.7%)	
	Occasionally	16 (18.4%)	3 (18.8%)	19 (18.4%)	
	Only during symptoms of hypoglycemia	24 (27.6%)	5 (31.3%)	29 (28.2%)	
do you know the most common side effect of insulin	Yes (hypoglycemia)	48 (55.2%)	9 (56.3%)	57 (55.3%)	0.93
	Not sure	39 (44.8%)	7 (43.8%)	46 (44.7%)	
do you know common symptoms of hypoglycemia	Yes	71 (81.6%)	13 (81.3%)	84 (81.6%)	0.97
	Not sure	16 (18.4%)	3 (18.8%)	19 (18.4%)	
if you develop insulin related hypoglycemia, how do you manage the dose of insulin for the next day	I will decrease the dose	26 (29.9%)	6 (37.5%)	32 (31.1%)	0.43
	I will use the same dose as previous dose	52 (59.8%)	7 (43.8%)	59 (57.3%)	
	Not sure	9 (10.3%)	3 (18.8%)	12 (11.7%)	

Table 5: Relationship between awareness and educational level

Variable	Education level	Illiterate	Primary school	Secondary school	High school	Institute	University	Total	P value
Place of insulin injection	Upper arm	13 (36.1%)	9 (34.6%)	2 (11.1%)	1 (12.5%)	0 (0.0%)	2 (18.2%)	27 (26.2%)	0.22
	Abdomen	8 (22.2%)	3 (11.1%)	7 (38.9%)	2 (25.0%)	1 (25.0%)	6 (54.5%)	27 (26.2%)	
	Thigh	4 (11.1%)	4 (15.4%)	4 (22.2%)	1 (12.5%)	2 (50.0%)	1 (9.1%)	16 (15.5%)	
	Multiple areas	11 (30.6%)	10 (38.5%)	5 (27.8%)	4 (50.0%)	1 (25.0%)	2 (18.2%)	33 (32.0%)	
Do you rotate site of injection	Usually,	26 (72.2%)	22 (84.6%)	14 (77.8%)	6 (75.0%)	3 (75.0%)	6 (54.5%)	77 (74.8%)	0.7
	Sometimes	6 (16.7%)	3 (11.5%)	3 (16.7%)	1 (12.5%)	0 (0.0%)	4 (36.4%)	17 (16.5%)	
	No	4 (11.1%)	1 (3.8%)	1 (5.6%)	1 (12.5%)	1 (25.0%)	1 (9.1%)	9 (8.7%)	
Where do you keep your insulin	Refrigerator	36 (100%)	26 (100%)	18 (100%)	8 (100%)	3 (75.0%)	11 (100%)	102 (99%)	0.01
	Not fixed	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (25.0%)	0 (0.0%)	1 (1.0%)	
In relation to food when do you inject insulin	Before meal	21 (58.3%)	15 (57.7%)	11 (61.1%)	6 (75.0%)	3 (75.0%)	9 (81.8%)	65 (63.1%)	0.94
	After meal	8 (22.2%)	6 (23.1%)	3 (16.7%)	1 (12.5%)	0 (0.0%)	1 (9.1%)	19 (18.4%)	
	Not fixed	7 (19.4%)	5 (19.2%)	4 (22.2%)	1 (12.5%)	1 (25.0%)	1 (9.1%)	19 (18.4%)	
Do you know why insulin is prescribed for diabetes	Yes	30 (83.3%)	18 (69.2%)	16 (88.9%)	8 (100%)	4 (100%)	11 (100%)	87 (84.5%)	0.39
	Partly	3 (8.3%)	4 (15.4%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	7 (6.8%)	
	No	3 (8.3%)	4 (15.4%)	2 (11.1%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	9 (8.7%)	
How often do you check your blood sugar glucometer	Daily	14 (38.9%)	12 (46.2%)	7 (38.9%)	4 (50.0%)	2 (50.0%)	6 (54.5%)	45 (43.7%)	0.58
	Somedays	5 (13.9%)	3 (11.5%)	0 (0.0%)	0 (0.0%)	1 (25.0%)	1 (9.1%)	10 (9.7%)	
	Occasionally	7(19.4%)	6 (23.1%)	3 (16.7%)	0 (0.0%)	0 (0.0%)	3 (27.3%)	19 (18.4%)	
	Only during symptoms of hypoglycemia	10 (27.8%)	5 (19.2%)	8 (44.4%)	4 (50.0%)	1 (25.0%)	1 (9.1%)	29 (28.2%)	
Do you know the most common side effect of insulin	Yes (hypoglycemia)	15 (41.7%)	13 (50.0%)	11 (61.1%)	6 (75.0%)	2 (50.0%)	10 (90.9%)	57 (55.3%)	0.07
	Not sure	21 (58.3%)	13 (50.0%)	7 (38.9%)	2 (25.0%)	2 (50.0%)	1 (9.1%)	46 (44.7%)	
Do you know common symptoms of hypoglycemia	Yes	26 (72.2%)	22 (84.6%)	16 (88.9%)	7 (87.5%)	3 (75.0%)	10 (90.9%)	84 (81.6%)	0.57
	Not sure	10 (27.8%)	4 (15.4%)	2 (11.1%)	1 (12.5%)	1 (25.0%)	1 (9.1%)	19 (18.4%)	
If you develop insulin related hypoglycemia, how do you manage the dose of insulin for the next day	I will decrease the dose	13 (36.1%)	9 (34.6%)	1 (5.6%)	2 (25.0%)	1 (25.0%)	6 (54.5%)	32 (31.1%)	0.2
	I will use the same dose as previous dose	19 (52.8%)	15 (57.7%)	13 (72.2%)	6 (75.0%)	3 (75.0%)	3 (27.3%)	59 (57.3%)	
	Not sure	4 (11.1%)	2 (7.7%)	4 (22.2%)	0 (0.0%)	0 (0.0%)	2 (18.2%)	12 (11.7%)	

Table 6: Relationship between attitude and gender

Variable	Gender	Male	Female	Total	P Value
Do you miss insulin doses	Often	1 (2.8%)	7 (10.4%)	8 (7.8%)	0.27
	Sometimes	7 (19.4%)	6 (9.0%)	13 (20.4%)	
	Infrequently	7(19.4%)	14 (20.9%)	21 (20.4%)	
	No	21 (58.3%)	40 (59.7%)	61 (56.2%)	
Do you think insulin is habit forming	Yes	17 (47.2%)	22 (32.8%)	39 (37.9%)	0.22
	Not sure	5 (13.9%)	18 (26.9%)	23 (22.3%)	
	No	14 (38.9%)	27 (40.3%)	41 ((39.8%)	
How did you accept the decision to start insulin therapy by your doctor for the first time	I accept the decision without discussion	32 (88.9%)	59 (88.1%)	91 (88.3%)	0.55
	I accept the decision after many times of discussion	4 (11.1%)	6 (9.0%)	10 (9.7%)	
	Reject it for many months or years	0 (0.0%)	2 (3.0%)	2 (1.9%)	
Why did you reject insulin therapy	I thought when start insulin it means that DM is end stage	0 (0.0%)	1 (12.5%)	1 (8.3%)	0.39
	I thought insulin is harmful to me	1 (25.0%)	3 (37.5%)	4 (33.3%)	
	I thought that insulin is habit forming and once you started you become dependent on it	1 (25.0%)	0 (0.0%)	1 (8.3%)	
	I cannot inject insulin by myself	2 (50.0%)	2 (25.0%)	4 (33.3%)	
	Others	0 (0.0%)	2 (25.0%)	2 (16.7%)	

Table 7: Relationship between attitude and different age groups

Variable	Age groups (year)	19-30	31-40	41-50	51-60	61-80	Total	P Value
Are you confident about self-administration of insulin	Yes	11 (78.6%)	5 (100.0%)	15(78.9%)	24 (88.9%)	21 (55.3%)	76(73.8%)	0.1
	Partly	1 (7.1%)	0 (0.0%)	1 (5.3%)	0 (0.0%)	2 (5.3%)	4 (3.9%)	
	No	2 (14.3%)	0 (0.0%)	3 (15.8%)	3 (11.1%)	15 (39.5%)	23(22.3%)	
Do you miss insulin doses	Often	1 (7.1%)	1 (20.0%)	1 (5.3%)	0 (0.0%)	5 (13.5%)	8(7.8%)	0.17
	Sometimes	2 (14.3%)	0 (0.0%)	0 (0.0%)	5 (18.5%)	6 (15.8%)	13(12.6%)	
	Infrequently	1 (7.1%)	1 (20.0%)	2 (10.5%)	6 (22.2%)	11 (28.9%)	21(20.4%)	
	No	10 (71.4%)	3 (60.0%)	16(84.2%)	16 (59.3%)	16 (42.1%)	61(59.2%)	
Do you think insulin is habit forming	Yes	9 (64.3%)	3 (60.0%)	6 (31.1%)	10 (37.0%)	11 (28.9%)	39(37.9%)	0.11
	Not sure	3 (21.4%)	1 (20.0%)	3 (15.8%)	3 (11.1%)	13 (34.2%)	23(22.3%)	
	No	2 (14.3%)	1 (20.0%)	10 (52.6 %)	14 (51.9%)	14 (36.8%)	41(39.8%)	
How did you accept the decision of starting insulin therapy by your doctor for the first time	I accept the decision without discussion	13 (92.9%)	5 (100.0%)	17 (89.5%)	20 (74.1%)	36 (94.7%)	91 (88.3%)	0.26
	I accept the decision after many times of discussion	1 (7.1%)	0 (0.0%)	2 (10.5%)	5 (18.5%)	2 (5.3%)	10 (9.7%)	
	Reject it for many months or years	0 (0.0%)	0 (0.0%)	0 (0.0%)	2 (7.4%)	0 (0.0%)	2 (1.9%)	
Why did you reject insulin therapy	I thought when start insulin it means that DM is end stage	0 (0.0%)	0 (0.0%)	0 (0.0%)	1(14.3%)	0 (0.0%)	1 (8.3%)	0.33
	I thought insulin is harmful to me	0 (0.0%)	0 (0.0%)	1 (50.0%)	3 (42.9%)	1 (0.0%)	4 (33.3%)	
	I thought that insulin is habit forming and once you started you become dependent on it	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (14.3%)	0 (0.0%)	1 (8.3%)	
	I cannot inject insulin by myself	0 (0.0%)	0 (0.0%)	0 (0.0%)	2 (28.6%)	2 (100.0%)	4 (33.3%)	
	Others	1 (100.0%)	0 (0.0%)	1 (50.0%)	0 (0.0%)	0 (0.0%)	2 (16.7%)	

Table 8: Relationship between attitude and domiciliary status

Variable	Domiciliary status	urban	Rural	Total	P Value
Do you inject insulin by yourself	**Yes**	66 (75.9%)	13 (81.3%)	79 (76.7%)	0.63
	No	21 (24.1%)	3 (18.8%)	24 (23.3%)	
Are you confident about self-administration of insulin	**Yes**	64 (73.6%)	12 (75.0%)	76 (73.6%)	0.83
	Partly	3 (3.4%)	1 (6.3%)	4 (3.9%)	
	No	20 (23.0%)	3 (18.8%)	23 (22.3%)	
Do you miss insulin doses	**Often**	7 (8.0%)	1 (6.3%)	8 (7.8%)	0.07
	Sometimes	8 (9.2%)	5 (31.3%)	13 (12.6%)	
	Infrequently	17 (19.5%)	4 (25.0%)	21 (20.4%)	
	No	55 (63.2%)	6 (37.5%)	61 (59.2%)	
Do you think insulin is habit forming	**Yes**	34 (39.1%)	5 (31.3%)	39 (37.9%)	0.66
	Not sure	20 (23.0%)	3 (18.8%)	23 (22.3%)	
	No	33 (37.9%)	8 (50.0%)	41 (39.8%)	
How did you accept the decision of starting insulin therapy by your doctor for the first time	**I accept the decision without discussion**	76 (87.4%)	15 (93.8%)	91 (88.3%)	0.72
	I accept the decision after many times of discussion	9 (10.3%)	1 (6.3%)	10 (9.7%)	
	Reject it for many months or years	2 (2.3%)	0 (0.0%)	2 (1.9%)	
Why did you reject insulin therapy	**I thought when start insulin it means that DM is end stage**	1 (9.1%)	0 (0.0%)	1 (8.3%)	0.7
	I thought insulin is harmful to me	4 (36.4%)	0 (0.0%)	4 (33.3%)	
	I thought that insulin is habit forming and once you started you become dependent on it	1 (9.1%)	0 (0.0%)	1 (8.3%)	
	I cannot inject insulin by myself	3 (27.0%)	1 (100.0%)	4 (33.3%)	
	Others	2 (18.2%)	0 (0.0%)	2 (16.7%)	

Table 9: Relationship between attitude and educational level

Variable	Educational level	Illiterate	Primary school	Secondary school	High school	Institute	University	Total	P value
Do you miss insulin doses	Often	4 (11.1%)	0 (0.0%)	2 (11.1%)	0 (0.0%)	0 (0.0%)	2 (18.2%)	8 (7.8%)	0.79
	Sometimes	4 (11.1%)	5 (19.5%)	2 (11.1%)	1 (12.5%)	0 (0.0%)	1 (9.1%)	13 (12.6%)	
	Infrequently	8 (22.2%)	4 (15.4%)	2 (11.1%)	3 (37.5%)	1 (25.0%)	3 (27.3%)	21 (20.4%)	
	No	20 (55.6%)	17 (65.4%)	12 (66.7%)	4 (50.0%)	3 (75.0%)	5 (45.5%)	61 (59.2%)	
Do you think insulin is habit forming	Yes	10 (27.8%)	9 (34.6%)	6 (33.3%)	5 (62.5%)	2 (50.0%)	7 (63.6%)	39 (37.9%)	0.55
	Not sure	11 (30.6%)	6 (23.1%)	4 (22.2%)	1 (12.5%)	0 (0.0%)	1 (9.1%)	23 (22.3%)	
	No	15 (41.7%)	11 (42.3%)	8 (44.4%)	2 (25.0%)	2 (50.0%)	3 (27.3%)	41 (39.8%)	
How did you accept the decision of starting insulin therapy by your doctor for the first time	I accept the decision without discussion	32 (88.9%)	22 (84.6%)	17 (94.4%)	7 (87.5%)	4 (100%)	9 (81.8%)	91 (88.3%)	0.5
	I accept the decision after many times of discussion	3 (8.3%)	4 (15.4%)	1 (5.6%)	0 (0.0%)	0 (0.0%)	2 (18.2%)	10 (9.7%)	
	Reject it for many months or years	1 (2.8%)	0 (0.0%)	0 (0.0%)	1 (12.5%)	0 (0.0%)	0 (0.0%)	2 (1.9%)	
Why did you reject insulin therapy	I thought when start insulin it means that DM is end stage	0 (0.0%)	1 (25.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (8.3%)	0.32
	I thought insulin is harmful to me	2 (50.0%)	0 (0.0%)	1 (100.0%)	1 (100.0%)	0 (0.0%)	0 (0.0%)	4 (33.4%)	
	I thought that insulin is habit forming and once you started you become dependent on it	0 (0.0%)	1 (25.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (8.3%)	
	I cannot inject insulin by myself	2 (50.0%)	1 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	2 (100.0%)	4 (33.4%)	
	Others	0 (0.0%)	2 (50.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	2 (16.7%)	

Table 10: Information about diabetes history, insulin use and insulin side effects

Variables		Frequency	%
Duration of diabetes (in years)	1-5	11	11%
	6-10	18	17%
	11-20	54	52%
	21-38	20	19%
Duration of using insulin (in years)	Lowest-5	43	42%
	6-10	28	27%
	11-20	25	24%
	21-38	7	7%
Type of insulin delivery device	Syringe	79	77%
	Pen	23	22%
	Pump	0	0%
	Multiple device	1	1%
Frequency of injecting insulin per day	One time	19	18%
	Two times	62	60%
	Three times	16	16%
	Four times	6	6%
Dose of insulin per day (unit)	5-20	25	24%
	25-45	33	32%
	50-70	32	31%
	75-95	9	9%
	100-150	4	4%
How often do you experience hypoglycemia	Daily	7	7%
	Some days	25	24%
	Occasionally	60	58%
	Never	11	11%
Do you experience symptoms of hypoglycemia	Yes	84	82%
	No (hypoglycemia unawareness)	19	18%
Have you ever been hospitalized for insulin related hypoglycemia	many times,	27	26%
	Once	11	11%
	No	65	63%