

Investigating Compliance with Insulin Injection Regimens among Diabetic Patients in Najran Armed Forces Hospital

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Received: March 2023. Accepted: April 2023; Published: May 1, 2023.

Citation: Metrek Almetrek et al. Investigating Compliance with Insulin Injection Regimens among Diabetic Patients in Najran Armed Forces Hospital. World Family Medicine. May 2023; 21(4): 75-88 DOI: 10.5742/MEWFM.2023.95256102

Abstract

Aim of Study: To investigate what factors affect patients' compliance with an insulin regimen as part of self-management in Najran Armed Forces Hospital.

Methodology: This study followed an exploratory descriptive cross-sectional research design. The study population consisted of diabetic patients receiving insulin. A simple random sampling technique was followed to select diabetic patients among those registered at the Chronic Disease Clinics at Najran Armed Forces Hospital. A Self-administered questionnaire was constructed and used to collect data over a two-week period.

Results: The study sample included 90 patients, of whom 53.3% were males. Many participants expressed poor attitudes and lacked self-management skills and the necessary health education information. There were statistically significant associations regarding the relationship between poor attitude and poor self-management. Participants' knowledge regarding how to take insulin injections; fear of insulin injection; having a monitoring device; health conditions; diabetes type residence location education; and seeing diabetes educators were significant factors related to patients' attitudes.

Conclusion: Diabetic patients' compliance regarding self-management advice is variable. It is of utmost importance for diabetic patients to be educated and supported in all aspects of self-management to avoid diabetes complications.

Keywords: Diabetes mellitus, Compliance, Insulin regimen, Saudi Arabia.

Introduction

The International Diabetes Federation (IDF) stated that the prevalence of diabetes in Saudi Arabia (SA) was 19.6% in 2011 and is expected to reach 22.3% by 2030(1). In SA, healthcare services for diabetic patients are mainly delivered in Primary Health Care Centres (PHCCs). Diabetic patients must be registered and monitored regularly at PHCCs (2-3).

Patients must also be provided with health education and be given treatment by their general practitioner(4). They are provided with oral hypoglycemic drugs or insulin, and they may be referred to a secondary or tertiary healthcare facility if there is a need for further evaluation or for management of their illness(5). There are 20 specialized diabetic clinics located around different regions of SA, and patients are referred to these clinics on a regular basis for assessment and management(6).

Patients' non-compliance is a major health concern on a global scale and severely hinders successful healthcare delivery(7-8). Non-compliance to diabetes treatment is critical to the management of the disease and the prevention of complications. Diabetes is a unique illness because treatment is self-administered via subcutaneous injection. Furthermore, diabetic patients deliver over 95% of their own care(7). It has been found that many diabetes patients do not achieve the medication goals appropriate to optimize care(9), even though optimal medical care can prevent diabetes complications. Health professionals may not have much control over treating diabetic patients because more than 95% of the care and treatment of diabetes is carried out by the patients themselves, thus making it difficult for healthcare professionals to control blood sugar levels. Therefore, non-compliance to medication is a common issue(10).

Empirical studies exploring compliance with insulin therapy as a part of treatment in diabetic patients in SA are lacking, indicating a dearth of studies on this population. Therefore, it is important to study non-compliance with insulin injections as well as contributing factors in more depth to recommend support for patients from a public health perspective. Various factors appear to contribute to non-compliance with treatment. These include low socio-economic status and low educational attainment, ultimately leading to increased morbidity. Low levels of health education, a lowered perception of the seriousness of the illness, and susceptibility to complications and treatment effectiveness are psychological factors that lead to non-compliance with treatment regimens(11).

The aim of the present study was to investigate factors that may affect diabetic patients' compliance with insulin regimens as part of self-management in Najran City, Saudi Arabia.

Materials and Methods

This study followed a cross-sectional, quantitative research design. The study population consisted of diabetic patients attending the Chronic Diseases Clinic (CDC) in Najran Armed Forces Hospital, Najran City, SA.

A simple random sampling was followed to select 90 patients. Before data collection, informed consent was obtained from participant patients, which highlighted their voluntary participation, full confidentiality, and anonymity.

Based on a thorough review of relevant literature, a self-administered questionnaire was constructed in the English Language by the researchers and was used for data collection. Patients' demographic characteristics (e.g., gender, age, education level, marital status, residence, and employment) were collected from the participants through close-ended questions in the questionnaire. Moreover, participants were asked questions about associated variables concerning diabetes and insulin use as well as other health issues associated with clinical management. Several questions adopted a Likert-style rating scale of items to determine attitudes toward self-management of insulin. Guidance was provided to participants regarding completing and submitting the questionnaire contained in the information pack. They were asked to respond to a 5-point scale (1=not at all, 2=slightly, 3=moderately, 4=quite a bit, 5=almost totally). In relation to self-management and health education, questions were answered on a 3-point scale (1=never, 2=sometimes, 3=always). A third scale of items measured attitudes about assistance with insulin, answered on a 4-point scale (1=daily, 2=several times, 3=sometimes, 4=never).

The questionnaire in this study was reviewed and validated by a consultant diabetologist at the School of Health and Life Sciences at Glasgow Caledonian University. A pilot study was carried out on 20 diabetic patients, who did not participate in the main study. The patients were asked to provide feedback about the clarity of the questions. The reliability/consistency of the study questionnaire was assessed using Cronbach's alpha coefficient.

The English version of the study questionnaire was translated into Arabic and was sent to two Arabic-speaking researchers and health practitioners in the diabetic outpatient department at King Khalid Hospital in Najran City. They suggested some minor modifications and language issues were corrected to enable understanding by participants.

All questionnaire sheets were coded and entered using the Statistical Package for Social Sciences (IBM, SPSS, Version 21). The data file was securely kept and was only accessible to the researchers. In addition, no names were included that can reveal the participants' identities. The data were analyzed descriptively (e.g. frequencies, percentages, mean, and standard deviation). Cronbach's alpha coefficient was used to assess the internal consistency of the study questionnaire. Statistical significance was set on an alpha level of 5%.

This study adhered to the ethical standards regarding voluntary participation i.e., patients were not pressured to participate. It was explained that they have the right to withdraw at any point during their participation. Consent was confirmed by completing the questionnaire, ensuring anonymity. To preserve confidentiality, data were securely saved and accessible only to the researcher. Furthermore, participants were thanked for taking part and were provided with details of the researcher and the health educator in the diabetes center in case they have issues or questions to raise regarding the study.

The study followed strict ethical guidelines in accordance with the ethical standards of the Armed Forces Hospital in Najran. Furthermore, this study achieved approval from the Najran Armed Forces Hospital which approved access to the hospital patients in the outpatient clinics.

Results

Table 1 shows that 53.3% of participants were males. The age of participants ranged from 25 to 55 years, with the most common age group being between 46-55 years (47.8%) and the least common age group being 25-35 years (25.6%). About one-third of participants had a secondary school level of education (36.7%), while 27.8% had a university level of education, 26.7% had an intermediate level of education and 8.9% had a primary level of education. Most participants (68.9%) were living in urban areas, while 31.1% were living in rural areas. About one-third of participants (35.6%) were type 1 diabetics, while 64.4% were type 2 diabetics. Almost two-thirds of participants had associated comorbidities, with 25.6% having associated cardiovascular diseases, 17.8% having retinopathy, and 15.6% having neuropathy.

Table 2 shows that the frequency of diabetes clinic attendance was monthly by 23.3% of participants and less frequently by 52.2% of the participants, while 24.4% do not attend the diabetes clinic. During the last year, 73.3% received instructions from a health educator on diabetes management. Only 43.3% of participants had blood glucose monitoring devices.

Figure 1 shows that 30.7% of participants check their blood glucose daily, while 15.9% do so on a weekly basis, 14.8% check their blood glucose every 6 months, and 8% do so on a monthly basis. However, 25% do not conduct self-monitoring at all, while 5.7% stated different periods for testing.

Figure 2 shows that only 40 participants reported that they attend the diabetes center every three months for HbA1c monitoring (44.4%).

Figure 3 shows that the majority of participants self-administer their insulin injection (72.2%), while 21.1% stated that they need the help of a family member, or a healthcare provider (6.7%).

Table 3 shows that 73.3% of participants receive health education on diabetes management. Furthermore, 74.4% of participants were aware of how and when to take the insulin injection, while 25.6% reported that they were not. A third of the participants expressed fear of taking insulin injections (33.3%). In addition, 38.9% stated that they feel embarrassed that they take insulin. Physicians were identified as the main sources of information according to 50% of the participants. This was followed by 25.6% of participants who stated that the diabetes educator is the main source of their knowledge about diabetes and insulin injections. Other sources of information include mainly family and friends (14.4%), while 10% stated that electronic sources and media are where they source information; 8.9% stated usage of booklets and brochures while only 6.7% explained that nurses, as health educators, provided them with the information regarding diabetes and insulin injections.

Table 4 shows participants' highest need for assistance was related to insulin injection (Mean±SD: 3.1±1.0), followed by home blood glucose testing (Mean±SD: 2.3±1.0) and portioning meals, as well as changing the insulin dose (Mean±SD: 2.3±1.1 for both), followed by attending clinics (Mean±SD: 2.2±1.0).

Table 5 shows participants' opinion statements about insulin injections and their use. The most positive opinions were generated for an item in the questionnaire stating that participants need to plan their daily activities around their insulin injection (Mean±SD: 3.3±1.3), followed by a statement indicating that it was difficult to follow the treatment plan for insulin (Mean±SD: 3.2±1.4). The least mean score was for the item stating that the healthcare provider does not help in understanding the importance of maintaining normal blood sugar level (Mean±SD: 2.6±1.4).

Table 6 shows that most participants regularly take their insulin injections and prevent diabetes complications (Mean±SD: 2.4±0.7 for both). High mean scores were also present regarding sufficient information about the type of diabetes and its related symptoms and complications, in addition to always remembering to take insulin injections (Mean±SD: 2.2±0.7 for all), followed by being provided information about the lifestyle-related risk factors, which may affect their disease (Mean±SD: 2.2±0.8). Moreover, high percentages of participants attend their appointments at the clinic, were provided with adequate information about how to manage hypoglycemia and hyperglycemia, and were provided with adequate information on diet management (Mean±SD: 2.1±0.7). The lowest scores were related to physical exercise performance (Mean±SD: 1.9±0.7), taking insulin injection because of being afraid of the physician's response (Mean±SD: 1.9±0.8) and following a healthy diet to help diabetes management (Mean±SD: 1.7±0.7).

Table 7 shows significant differences between those who were aware of their mode of insulin injection and those who were not regarding their attitude toward insulin injection, self-management, and health education, and

seeking assistance for insulin injection ($p < 0.001$ for all), with higher attitude and self-management scores among those who were aware, but lower scores regarding seeking assistance among those who were aware. There were significant differences between those who have fears of insulin injection and those who did not have fears regarding their attitude toward insulin injection, self-management, and health education, and seeking assistance for insulin injection ($p < 0.001$ for all), with higher attitude and self-management scores among those who did not fear insulin injection, but higher scores regarding seeking assistance among those who have fears. There were significant differences between those who have a blood glucose monitoring device and those who did not have it regarding their attitude toward insulin injection, self-management, and health education, and seeking assistance for insulin injection ($p < 0.001$ for all), with higher attitude and self-management scores among those who have a device, but higher scores regarding seeking assistance among those who did not have a device. There were significant differences between those who have a comorbidity and those who did not have it regarding their attitude toward insulin injection, self-management, and health education, and seeking assistance for insulin injection ($p < 0.001$ for all), with higher attitude and self-management scores among those who did not have a comorbidity, but higher scores regarding seeking assistance among those who have a comorbidity. There were significant differences between type 1 diabetic patients and type 2 diabetic patients regarding their attitude toward insulin injection, self-management, and health education, and seeking assistance for insulin injection ($p < 0.01$, $p < 0.05$, and $p < 0.05$, respectively), with higher attitude and self-management scores among type 1 diabetics, but higher scores regarding seeking assistance among type 2 diabetics. There were significant differences between patients who live in urban areas and those who live in rural areas regarding their attitude toward insulin injection, self-management, and health education, and seeking assistance for insulin injection ($p < 0.001$ for all), with higher attitude and self-management scores among those in urban areas, but higher scores regarding seeking assistance among those who live in rural areas. There were significant differences between patients according to their education regarding their attitude toward insulin injection, self-management, and health education, and seeking assistance for insulin injection ($p < 0.001$ for all), with higher attitude and self-management scores among those with higher levels of education, but higher scores regarding seeking assistance among those with lower educational levels. There were significant differences between patients who received health education on diabetes management and those who did not regard their attitude toward insulin injection, self-management, and health education, and seeking assistance for insulin injection ($p < 0.05$, $p < 0.01$, and $p < 0.01$, respectively), with higher attitude and self-management scores among those who received health education, but higher scores regarding seeking assistance among those who did not.

Table 1: Personal characteristics of the study sample (n=90)

Personal Characteristics	No.	%
Gender		
• Males	48	53.3
• Females	42	46.7
Age groups (in years)		
• ≤35	23	25.6
• 36-45	24	26.7
• ≥55	43	47.8
Educational level		
• Primary school	8	8.9
• Intermediate school	24	26.7
• Secondary (High) school	33	36.7
• University	25	27.8
Residence		
• Urban	62	68.9
• Rural	28	31.1
Type of diabetes		
• Type 1	32	35.6
• Type 2	58	64.4
Associated comorbidities†	58	64.4
• Cardiovascular diseases	23	25.6
• Retinopathy	16	17.8
• Neuropathy	14	15.6
• Nephropathy	7	7.8
• Others	7	7.8

Table 2: Frequency of attendance at diabetes clinics and receiving instructions

Variable	No.	%
Diabetes clinic attendance		
• Monthly	21	23.3
• ≥2 Months	47	52.2
• Do not attend	22	24.4
Receiving instructions on diabetes management during the last year		
• Yes	66	73.3
• No	24	26.7
Having a blood glucose monitoring device		
• No	51	56.7
• Yes	39	43.3

Figure 1: Frequency of participants' self-monitoring of their blood glucose

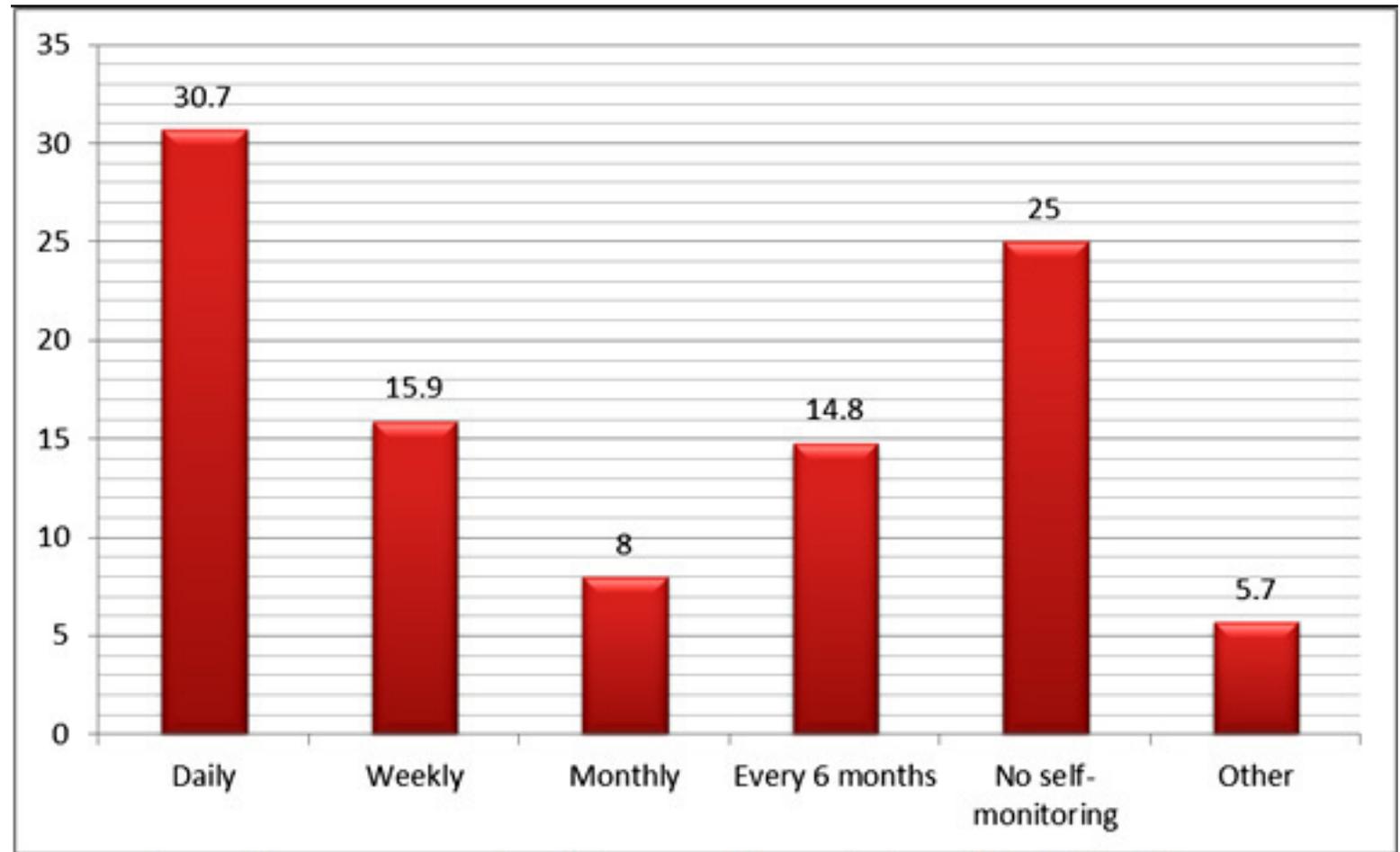


Figure 2: Participants' monitoring of their HbA1c

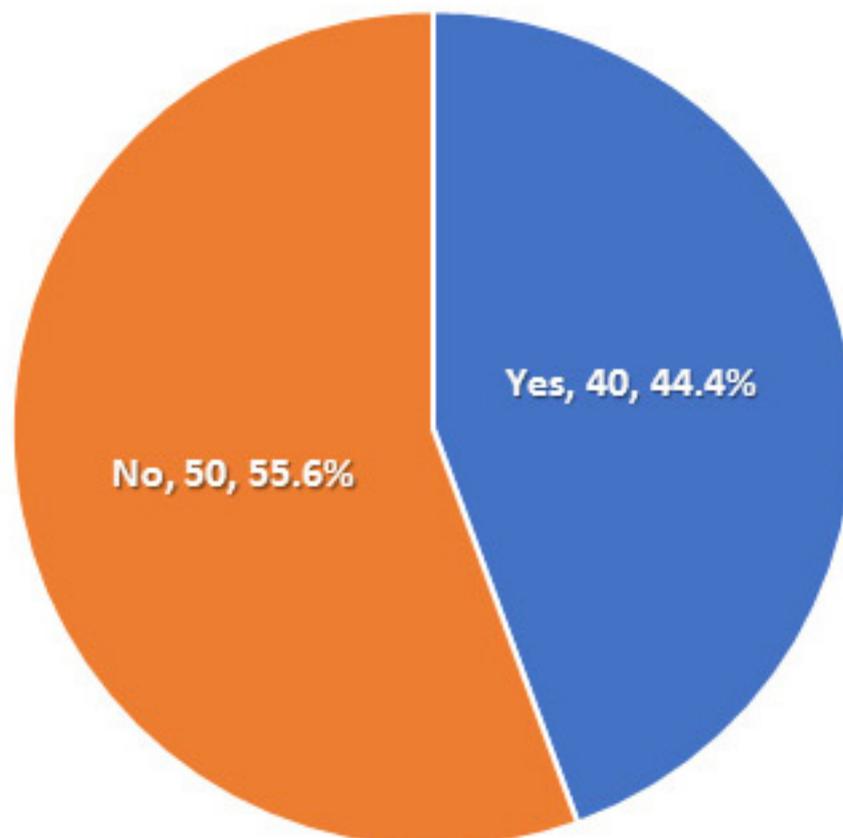


Figure 3: Participants' mode of insulin injection

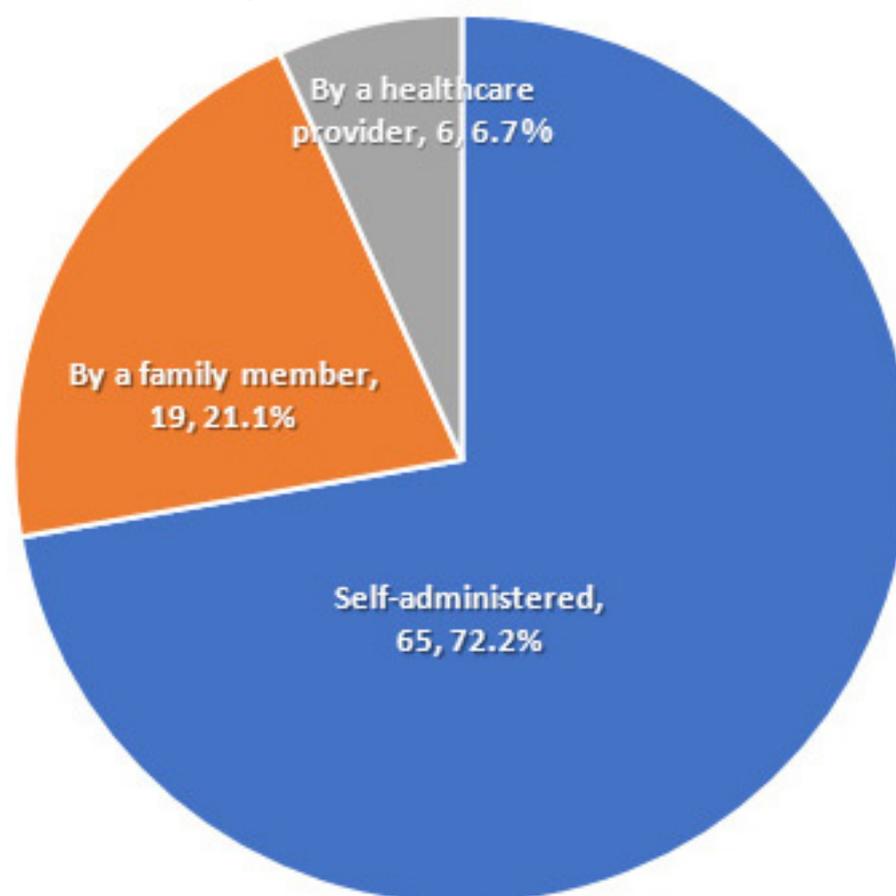


Table 3: Participants' knowledge and attitude regarding insulin self-injection

Variables	No.	%
Receiving health education on diabetes management		
• Yes	66	73.3
• No	24	26.7
Participants' full awareness of the insulin mode of injection		
• Yes	67	74.4
• No	23	25.6
Participants' attitude toward insulin self-injection		
• Fear	30	33.3
• Embarrassment	35	38.9
Sources of information about insulin self-injection		
• Physicians	45	50.0
• Health educator	23	25.6
• Friends/family members	13	14.4
• Mass media	9	10.0
• Educational brochures/booklets	8	8.9
• Nurses	6	6.7

Table 4: Percentage of assistance with insulin injections among patients

Statements	Daily	Several times per week	Sometimes	Never	Mean±SD
I need assistance with insulin injections	12.4	10.1	33.7	43.8	3.1±1.0
I receive help with home blood glucose tests (finger prick)	29.5	25	33	12.5	2.3±1.0
I receive help with portioning meals	29.2	33.7	19.1	18	2.3±1.1
I receive help with changing the insulin dose	34.8	25.8	19.1	20.2	2.3±1.1
I receive help with attending clinic visits	25.8	40.4	18	15.7	2.2±1.0

Table 5: Participants' attitudes/opinions regarding self-management using insulin therapy

Statements	Not at all	Slightly	Moderately	Quite a bit	Almost totally	Mean±SD
I need to plan daily activities around my insulin injections	11.1	11.1	35.6	17.8	24.4	3.3±1.3
Adherence to the treatment plan for taking insulin as instructed is difficult to follow	14.4	20	22.2	16.7	26.7	3.2±1.4
Taking insulin injections interferes with my ability to perform my hobbies or recreational activities, household chores, or shopping	21.1	15.6	18.9	20	24.4	3.1±1.5
Insulin injections interfere with my regular social activities involving meeting with family, friends, or social groups	31.1	14.4	16.7	10	27.8	2.9±1.6
I am unable to adjust my insulin dose in response to low/high blood sugar readings	21.3	23.6	30.3	7.9	16.9	2.8±1.3
I do not take my insulin injections in accordance with my daily regimen and blood glucose levels as explained by my healthcare professional	23.3	24.4	27.8	6.7	17.8	2.7±1.4
My healthcare provider at the clinic does not help me understand the importance of maintaining normal blood sugar levels	33.7	16.9	25.8	7.9	15.7	2.6±1.4

Table 6: Percentage and mean scores of self-management and healthcare education among patients

Statements	Never	Sometimes	Always	Mean±SD
Do you regularly take insulin injections	13.5	38.2	48.3	2.4±0.7
Do you take insulin injections to prevent diabetes-related complications	12.8	39.5	47.7	2.4±0.7
I am provided with sufficient information about my type of diabetes and its symptoms	14.4	47.8	37.8	2.2±0.7
I am provided with adequate information about diabetes-related complications	21.1	42.2	36.7	2.2±0.7
Do you always remember to take your insulin injections	16.7	48.9	34.4	2.2±0.7
I am provided information about the lifestyle-related risk factors (diet, exercise, smoking, etc.), which may affect my diabetes	22.2	40	37.8	2.2±0.8
Do you attend appointments at the clinic	24.4	37.8	37.8	2.1±0.8
I am provided with adequate information about how to manage hypoglycemia (low blood sugar) and hyperglycemia (high blood sugar)	21.1	46.7	32.2	2.1±0.7
I am provided with adequate information on managing my diet	22.2	44.4	33.3	2.1±0.7
Do you attend regular medical checkups to prevent complications, e.g., eye and foot tests	29.2	44.9	25.8	2.0±0.7
I am provided with helpful advice and information at the diabetes clinic and I am satisfied with the consultation	25.6	44.4	30.0	2.0±0.7
I am provided with adequate information on self-management of my diabetes, using insulin injection	27.8	44.4	27.8	2.0±0.8
Do you perform physical exercise	31.1	44.4	24.4	1.9±0.7
Do you take insulin injections because you are afraid of the response your physician may have	36.7	32.2	31.1	1.9±0.8
Do you follow a healthy diet to help you manage your diabetes	40.9	46.6	12.5	1.7±0.7

Table 7: Participants' attitudes toward insulin injection, self-management, and health education and seeking assistance for insulin injection according to their personal characteristics

Patients' personal characteristics	No.	Attitude toward insulin injection	Self-management and health education	Seeking assistance for insulin injection
Awareness about the mode of insulin injection				
• Not aware	23	35.4	19.2	63.6
• Aware	67	69.5	53.5	37.0
• P-value		<0.001	<0.001	<0.001
Fear of insulin injection				
• Yes	30	38.5	34.3	53.0
• No	60	57.7	50.4	40.3
• P-value		<0.001	<0.001	<0.005
Having a blood glucose monitoring device				
• Yes	39	61.2	55.2	34.7
• No	51	36.4	28.8	62.6
• P-value		<0.001	<0.001	<0.001
Having a comorbidity				
• Yes	58	32.0	30.5	59.8
• No	32	57.7	59.8	29.2
• P-value		<0.001	<0.001	<0.001
Type of diabetes				
• Type 1	32	37.1	44.0	33.4
• Type 2	58	33.3	31.9	45.9
• P-value		<0.01	<0.05	<0.05
Residence				
• Urban	62	57.6	52.0	37.4
• Rural	28	38.8	33.8	58.5
• P-value		<0.001	<0.001	<0.001
Educational level				
• Primary school	8	26.3	26.3	57.4
• Intermediate school	24	40.8	26.1	58.5
• Secondary school	33	57.8	51.5	43.9
• University	25	58.8	70.8	22.5
• P-value		<0.001	<0.001	<0.001
Receiving health education on diabetes management				
• Yes	66	58.2	56.2	35.3
• No	24	37.8	29.5	58.5
• P-value		<0.05	<0.01	<0.01

Discussion

The present study revealed that most insulin-dependent diabetic patients comply with visiting the diabetic clinic for their blood glucose monitoring. Most participants frequently check their blood glucose, mainly on a daily basis. Our findings are also in accordance with that of Al-Quwaidhi, who emphasized that diabetic patients are mostly treated in PHCCs where they are mostly compliant with their regular monitoring (6).

It is concerning that about two-thirds of patients reported some variability in checking their blood glucose levels, and one-quarter stated that they do not do self-monitoring at all. Kumar and Clark argued that those who monitor their blood glucose on a regular basis are optimizing their health outcomes by controlling their diabetes(12).

However, those who do not measure their blood glucose levels are at risk of complications from high levels of blood glucose. Therefore, diabetes must be controlled with regular monitoring of blood glucose, as well as exercise and dietary adaptations(13). Furthermore, since diabetes usually gets worse over time, it is essential that patients should comply with the correct medicines in order to reduce high blood glucose levels. Without adequate blood glucose monitoring, healthcare practitioners will not be aware of the level of glucose in their blood and will thus not be in a position to prescribe the correct medication(14).

It was found that most of our patients experienced hypoglycaemic episodes in the last month. Haque et al. noted that many healthcare workers were hesitant to engage in a discussion on treatment risks associated with insulin to avoid worrying patients about inducing hypoglycaemia(15).

Thus, it may be that the patients who had suffered hypoglycaemic episodes may have not received sufficient health education about the risk of hypoglycemic episodes, and thus had not adhered to its prevention. Vijan et al. found that all patients in their study considered all forms of diabetes management to be a heavy burden(16). This may explain why some patients in our study suffered hypoglycaemic episodes, possibly as a result of insufficient adherence to the instruction for the prevention of hypoglycemia.

When our patients were asked about their sources of information about the management of diabetes and insulin injections, 50% stated that their physician was the main source of information, followed by 25.6% who stated that the diabetes educator was their main source of information, 14.4% stated that their main source of information was their relatives and friends, while 10% stated that the internet sources and social media were the main sources they usually consulted; 8.9% declared that it was booklets and brochures, and 6.7% stated that nurses provided them with the information. This finding agrees with the statements that in Saudi Arabia, diabetic patients are mainly treated in PHCCs where physicians and health

educators provide them with healthcare information about their illness(6). On the other hand, for those who stated other sources of information about diabetes, it may be that they do not comply with regularly visiting the PHCC as often as they should and therefore they were not able to gain the necessary information about diabetes as those who attend regularly to their PHCCs.

Moreover, very few participants in our study stated that their nurse was their main source of information about diabetes. This may reflect that healthcare providers are often hesitant to initiate a discussion on treatment risks associated with insulin injection to avoid worrying their patients about hypoglycemia(15). Thus, it may be that most nurses at PHCCs were cautious about providing them with information. This shortage in health education provision needs to be managed since diabetic patients need a high level of support when diabetes treatment is introduced(17).

Generally, our patients had negative attitudes toward insulin injections. The most positive opinions were related to the statement "I need to plan my day around taking insulin injections". This was followed by the statement related to sticking to the treatment plan for insulin as instructed is hard to follow. The least mean score was for that the healthcare provider does not help in understanding the importance of keeping normal blood sugar levels. These findings are in accordance with those of Vijan et al., who reported that all of the participants stated that all of their diabetic medication was a burden to them. They also found that insulin injections were the most burdensome to the participants, and adherence to this form of treatment was negatively associated with the sense of burden perceived (16).

Most of our patients also stated that they are provided with sufficient information about their type of diabetes and its related symptoms. Therefore, even though not all patients received information about diabetes from their healthcare providers, the rest must have obtained reliable information from other sources, such as booklets. In terms of a healthy diet, our patients had low scores, indicating that this item/instruction is the least followed; 40.9% stated that they never follow a healthy diet, while 44.4% stated that they occasionally do so. Therefore, it has been found that among our patients, a healthy diet was not the top priority for them. Furthermore, our patients expressed a low score regarding physical exercise with 31.1% of patients stating that they never do physical exercise, while 44.4% stated that they sometimes do so. These findings need to be urgently improved. Several studies indicated that diabetes is not a curable disease, but along with insulin injections, patients need to ensure that they perform regular exercise and have a healthy diet, or else their condition will worsen(18-20).

Overall, more than half of our patients have sought help in terms of each of the items listed above, either daily or several times per week. Although most items indicate that assistance is needed, most patients stated that they require no assistance or only occasional assistance in terms of

their diabetes therapy. Several other studies confirm these findings of the present study (21-23).

Inferential statistics revealed that the poorer the patient's attitude toward insulin injections the more likely they have poor self-management and health education knowledge. This is synonymous with the health promotion model that was put forward by Downie, who stated that a person needs to be educated about health if he/she becomes capable of efficiently looking after his/her own health and wellbeing(24). Furthermore, it is also in accordance with the theories put forward by two studies which stated that diabetic patients need to be provided with advanced health information and trained effectively on how to medicate themselves and the need for the treatment(23,25).

It was also reported that diabetic patients' educational levels have an impact on their compliance with diabetes treatment. Patients need to be made aware that diabetes progresses with time and that their treatment will have to be intensified(23). It was concluded that when diabetic patients are educated sufficiently about the vital role that insulin plays in the management of their treatment, they are more likely to adhere to the treatment(21).

The present study confirmed that there is a significant difference between those who understand how to take insulin and those who do not. This points out the poorer attitude, lack of self-management, and need for assistance on the part of patients who do not know how to take insulin compared to patients who do. This agrees with the study of Khan et al. in Al Hasa District of Saudi Arabia, who pointed out that disease-related knowledge, attitudes, and skills may be absent, and that this may be attributable to a lack of sufficient patient education during the consultation with healthcare providers(25). However, it is essential to be aware of how this attitude could determine methods when it comes to health practice and could challenge the effective management of diabetes(26).

In our study, a significant proportion of patients who fear insulin injections have a poorer attitude, inferior self-management, and needed more assistance compared with patients who do not fear insulin injections. Similarly, Haque et al. reported that a significant proportion of patients who fear insulin injections had poor self-management and the progression of complications associated with diabetes(15). Therefore, diabetes health education methods and psychological treatment approaches such as addressing the fear of insulin injections may also help to change the negative perceptions of the patient(27).

This study showed that the impact of poor attitude, inferior self-management and need for assistance on the part of those who have type 2 diabetes was significantly greater than was the case of those with type 1 diabetes. However, this finding is considerably higher than that of Rajagopalan et al., who noted that there was a better attitude and superior self-management in patients with type 2 diabetes. Thus, there is a need to investigate this situation through further studies with larger sample sizes(28). Although the

results of several studies agreed with those of our study, they argued that type 1 diabetes is a chronic disease, has a longer duration and type 1 diabetic patients are more likely to have an increased awareness in terms of the progression of diabetes(16).

Our study showed that patients' educational level has an impact on their attitude toward insulin injections, self-management, and assistance. The poorest scores were found among participants who had primary or intermediate school education, while the best scores were for university graduates. This finding is congruent with the results of the study of Siddiqui et al. in Abha(26), which showed that the educational status of participants was a significant determinant of their compliance. However, the findings of the current study are not in line with those of Kalyango et al., conducted in a Ugandan hospital to determine the prevalence and factors associated with non-compliance to diabetes treatment. It was found that that level of education did not have a significant effect on medication compliance(29).

The discrepancy in findings between studies could be due to the fact that the Ugandan hospital study was carried out in different countries. It also supports the findings of the study carried out by Khan et al., who conducted a cross-sectional, quantitative study to determine the rate of non-compliance and the factors that contribute to non-compliance among patients with diabetes in Saudi Arabia(25). In the present study, the level of non-compliance to insulin injections was higher among those who had primary school education, while it was better among better-educated patients.

A significant association was found according to the participant's place of residence regarding their attitudes toward insulin injection. The participants who lived in the urban areas had significantly more positive scores compared to those living in rural areas. This finding goes against those of the study carried out by Khan et al., which found that the rate of non-compliance was higher amongst the participants who lived in urban areas than in rural areas (71.04% n=355 and 60.15% n=133, respectively)(25). However, this study was only based on one region in Saudi Arabia, and therefore, it may be that there are variations across the country.

A significant effect was found regarding diabetes education on patients' attitudes, self-management, and the need for assistance in terms of insulin injections. Our study showed that a poor attitude, inferior self-management, and need for assistance existed for those who had never consulted an educator compared with patients who had met an educator more than twice. Health promotion approaches as part of an ongoing education consultation with an educator towards diabetes management had a significant impact on patients' attitudes and changed behavior(30).

Study Strengths and Limitations:

This study explored numerous variables associated with the compliance of diabetic patients with insulin treatment and their understanding of their condition. However, it is

important to consider the limited generalizability of our results to the whole population since the present study followed a cross-sectional study design and was conducted in one region only. Furthermore, the sample size was not large enough (n=90).

Every possible precaution has been taken to ensure the lack of bias in the results. However, it must be noted that since participants were asked to complete the questionnaire during their clinical consultations, they may have felt pressured to complete it within a certain limited time frame, as they may have had other commitments. Therefore, some of their responses may not be accurate, thereby implying the potential for response bias in the results.

Conclusions

Diabetic patients show variable self-management compliance, and their attitudes toward their condition vary, e.g., approximately one-third of the diabetics do not regularly monitor their blood glucose levels. This reveals critical issues regarding health education of diabetic patients in Saudi Arabia regarding self-management to prevent the exacerbation of their condition. Furthermore, this study has implications for healthcare in a hospital setting, which should be addressed to reverse this trend.

Recommendations

Diabetes healthcare practitioners in Saudi Arabia should ensure that they optimize opportunities to educate their patients regarding regular blood glucose monitoring to prevent exacerbation of their condition. Consequently, healthcare teams must ensure their availability in clinics to provide their patients with information and advice regarding insulin treatment. This could be addressed during discussions with the physician, who could proactively refer patients on an annual basis to the healthcare teams for diabetes education. This may enable communication with patients and may promote a positive attitude towards insulin treatment and quality of life in diabetes patients. Hence, professional educators are recommended to ensure that healthcare teams for diabetes education in Saudi Arabia, receive adequate and specific training in communicating with diabetes patients about their condition and its treatment. This appears important, as the patients in this study did not rely on their educator as the primary source of information about their condition and its treatment.

Further studies are required using a much larger sample size including diabetes patients from different parts of the country, in both rural and urban areas, using random sampling techniques. This would allow for more reliable and valid findings for policies and practices in diabetes care.

Acknowledgments:

We would like to thank the Administration of Najran Armed Forces Hospital for assistance with facilitating the data collection, and Dr. Saad Algamdi, the hospital director for facilitating guiding and directing this study.

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