The perceived barriers to insulin therapy among type 2 diabetic patients

Amin Hussein[1], Arafa Mostafa[2], Alnomi Areej[1], Al-muteb Mona[1],
Alduaiji Shimaa[1], Al-Gazlan Najd[1], Alnemari Futoon[1]

1. King Saud University, Family and Community Medicine
2. King Saud University, Chair of Cancer Research

Abstract:
Background: Problems may arise with insulin treatment, due to patients' perspective towards it leading to refusal.
Objectives: To evaluate diabetic patients' refusal towards insulin therapy, and to assess patients' perception and perceived barriers towards insulin.
Methods: A cross-sectionalstudy, where type 2 diabetics participated in the study during a period, February through March 2017. They were interviewed in person by a questionnaire including three sections; socio-demography, medical history and a health belief model, comprising barriers to use insulin. Five points Likert scale was used to measure patients' perception and barriers towards insulin therapy.
Results: One fourth (24.4%) of the diabetic patients refused insulin. Among the controlled group, 34.4% refused insulin, while 21% refused insulin among the uncontrolled group. The study showed different barriers towards insulin therapy, including fear of injection, pain, insulin injection needs help from others, fear of hypoglycaemia and embarrassment.
Conclusion: Diabetics showed a negative attitude towards insulin therapy due to social and psychological factors. The results necessitate the development of a strategy to address problems related with a reluctance to initiate insulin and put a strategy to implement education and better interaction with diabetic team to the stigma from phobia from insulin use.
Keywords: Barriers to insulin therapy, type 2 diabetic patients.

Introduction

All over the world, an estimated 382 million people are living with diabetes, and this number is expected to rise to 592 million by 2035[1]. The World Health Organization (WHO) has reported that Saudi Arabia ranks the second highest in the Middle East and is the seventh in the world for the rate of increasing number of diabetes cases. It is estimated that around 7 million of the Saudi population are diabetics and around 3 million have pre-diabetes.

Diabetes has approximately registered a ten-fold increase over the past three decades in Saudi Arabia[2].
For the management of diabetes, there are various oral hypoglycemic drugs (OHDs) that are available worldwide. Recommendations for their use either as monotherapy or in combination with or without insulin are described in many of diabetes management guidelines including the American Diabetes Association (ADA) guidelines[3].
Insulin is eventually required for control of diabetes when secondary failure of β-cells of pancreas occurs down the course of the disease. One of the main problems associated with insulin therapy is the delay in initiation of treatment up to complete refusal by the patient due to different perspectives and health beliefs. This results in many complications which inflicts a huge burden on the health care budget as well as economy of the country[4].
There are many causes for refusal of insulin therapy by

Corresponding author:
Amin Hussein,
King Saud University,
Family and Community Medicine
Email: hsmamin@gmail.com

diabetics as well as several patient related factors for delay in insulin initiation. These factors have been studied by many researchers in Saudi Arabia in 2014[5] as well as other countries such as Korea[6], England and United States (US)[6-8].

In 2014, it has been estimated that the prevalence of insulin refusal among type 2 diabetic patients in Saudi Arabia was 34.6%[5]. The refusal of insulin is a problem worldwide, not just in Saudi Arabia. A study conducted in Korea showed that insulin refusal rate was 33.6% and patient-related factors for delay in insulin initiation included older age, shorter duration of diabetes and lower glycated haemoglobin (HBA1c)[6]. The study conducted in London by Khan et al among Bangladeshi patients with poorly controlled type 2 diabetes showed that 20.3% refused to commence insulin therapy despite repeated counseling[7] and in another study conducted by Karter et al in the US revealed that 35% refused insulin for many reasons[8].

The aim of the current study was to measure the refusal rate of insulin therapy among type 2 diabetic patients in 2017, to assess their perception towards insulin therapy and enumerate the most significant barriers to refusal of insulin intake.

Methods

A cross–sectional study was conducted at the primary health care clinics in King Khaled University Hospital, Riyadh, Saudi Arabia, where patients with type 2 diabetes mellitus attending theclinics during the months of February and March 2017 were invited to participate in the study. The aim and rationale of the study were explained to each participant. An informed consent was signed by every patient included in the study. All type 1 diabetic patients, those below the age of 30 years and gestational diabetes have been excluded excluded from the study.

Sampling:

In order to calculate the sample size we hypothesized that 34.6% of Saudi type 2 diabetic patients refused insulin therapy based on a study conducted in 2014[5]. With a significance level of 95% (Z = 1.96), a margin error of 5% (d = 0.05) and by using the formula (n = Z^2p (1-p)/d2), the minimal required sample size was estimated to be 348 with 10% non-response rate.

Data collection:

Trained personnel were used to interview patients and fill out a pre-prepared questionnaire. The questionnaire was divided into three sections: socio-demographic information, medical history and perceived barriers to use insulin. The section in questionnaire concerning insulin barriers has been adopted and modified from other studies[5,6,7,8]. A health belief model was constructed where five points Likert scale was used to measure patients' perception and barriers towards insulin therapy. The scale ranged from 'strongly agree' to 'strongly disagree'. The highest score was 5 and the lowest score was 1. Fifteen statements were used to compose this scale. The sum of the factors within this scale ranged from 15 to 75 points. Data regarding HbA1c levels and any diabetic complications were retrieved from the patients' medical records.

Pilot study:

A pilot study was conducted for 10 participants to test the questionnaire feasibility and the reliability of Likert scale where krobach's alpha was 74.2%.

Statistical analysis:

Data were analyzed using SPSS software, version 23 (SPSS Inc., Chicago, Illinois, USA). The categorical variables in the study were presented as percentages. The chi-square test was used for comparison. Analysis was carried out at a significance level of 0.05 (p<0.05).

The study was approved by the Institutional Review Board (IRB) of the College of Medicine and performed in accordance with the ethical standards.

Results:

The study included 402 type 2 diabetic patients, where 152 (37.8%) were males. Their ages ranged from 30 to over 70 years. More than one third of the patients (37.8%) were in the age group 51-60 years. Nearly, one-third (32.1%) were uneducated.

Only 23.9% of population study had controlled diabetes (HbA1c $\leq$ 7) while the majority (76.1%) were uncontrolled. Among the controlled group, 63 patients (65.6%) accepted insulin therapy while 33 patients (34.4%) refused it. On the other hand, 79% of the uncontrolled group accepted insulin therapy and 21% refused. The difference between the two groups was statistically significant (p=0.008).

Among the participants enrolled, 242 (60.2%) were using OHDs while the rest 160 (39.8%) were already on insulin. Concerning the acceptance of insulin use, 98 patients (24.4%) refused insulin injections. None of elements of the socio-demographic data was statistically significantly different between the two groups (Table 1).

Table 1: Accept or refuse taking insulin according to patients' socio-demographic data.

Variable	Sub group	Accept	Refuse	P-value
Gender	Male	118 (77.1%)	35 (22.9%)	0.506
	Female	186 (74.7%)	63 (25.3%)	
Age	30 – 40 years	13 (68.4%)	6 (31.3%)	0.374
	41 – 50 years	59 (76.6%)	18 (23.4%)	
	51 – 60 years	122 (80.3%)	30 (19.7%)	
	61 – 70 years	79 (73.8%)	28 (26.2%)	
	More than 70	31 (67.7%)	15 (32.6%)	
Nationality	Saudi	288 (75.4%)	94 (24.6%)	0.640
	Non-Saudi	16 (80%)	4 (20%)	
Place	City	273 (76.9%)	82 (23.1%)	0.083
	Village	30 (65.2%)	16 (34.8%)	
Education	Non-educated	93 (72.1%)	36 (27.9%)	0.396
	Primary school	56 (72.7%)	21 (27.3%)	
	Middle school	40 (76.9%)	12 (23.1%)	
	High school	58 (85.3%)	10 (14.7%)	
	Graduate	44 (73.3%)	16 (26.7%)	
	Post-graduate	13 (81.3%)	3 (18.8%)	
Monthly income	< 5000 Riyals	145 (72.9%)	54 (27.1%)	0.424
	5000-10000 Riyals	83 (80.6%)	20 (19.4%)	
	10000-15000 Riyals	39 (76.5%)	12 (23.5%)	
	>15000 Riyals	30 (81.1%)	7 (18.9%)	
Social status	Single	6 (75%)	2 (25%)	0.428
	Married	223 (77.4%)	65 (22.6%)	
	Divorced	18 (78.3%)	5 (21.7%)	
	Widowed	57 (68.7%)	26 (31.3%)	
Do you live alone	Yes	56 (76.7%)	17 (23.3%)	0.800
	No	247 (75.3%)	81 (24.7%)	

The perceived barriers to insulin therapy amongst all patients are shown in Table 2. The mean of the items' sum was 46.4 + 8.7 which indicated poor perception towards insulin therapy. It is worth mentioning that most of the patients (87.6%) take treatment information from their physicians, yet, refusal rate was still high. After combining the two categories of 'strongly agree' and 'agree', five statements represented the most prominent perceived barriers amongst patients on OHDs in comparison with those on insulin therapy. The statements were: (1) using insulin means reaching end-stage diabetes, (2) using insulin means failure of a diabetic to take care of his/her health, (3) using insulin can cause anxiety because I don't know the right way to inject it, (4) injecting insulin requires the help of others and finally, (5) fear of injections. In addition, two social factors have been recognized as significant barriers to insulin therapy, namely the restriction of daily life activities and feeling different from others.

The barriers to take insulin	Sub group	Patients on Pills	Patients on Insulin	P-value
1. Using insulin means reaching end-stage diabetes.	Strongly Disagree	8 (42.1%)	11 (57.9%)	
	Disagree	33 (64.7%)	18 (35.1%)	
	Neutral	90 (61.7%)	51 (38.3%)	0.011
	Agree	79 (63.2%)	46 (36.8%)	
	Strongly Agree	74 (68.5%)	34 (31.5%)	
2. Using insulin restricts daily life activities.	Strongly Disagree	27 (41.5%)	38 (58.5%)	
	Disagree	66 (53.7%)	57 (46.3%)	
	Neutral	35 (77.3%)	13 (22.7%)	<0.0001
	Agree	83 (67.7%)	40 (32.3%)	
	Strongly Agree	35 (64.8%)	19 (35.2%)	
3. Using insulin causes severe hypoglycemia.	Strongly Disagree	3 (20.0%)	12 (80.0%)	
	Disagree	27 (52.9%)	24 (47.1%)	
	Neutral	75 (68.8%)	34 (31.2%)	0.005
	Agree	80 (61.1%)	51 (38.9%)	
	Strongly Agree	24 (38.7%)	38 (61.3%)	
4. Using insulin means failure of taking care of oneself	Strongly Disagree	12 (30.0%)	28 (70.0%)	
	Disagree	92 (52.0%)	68 (48.0%)	
	Neutral	53 (59.6%)	36 (40.4%)	<0.0001
	Agree	70 (70.0%)	30 (30.0%)	
	Strongly Agree	55 (75.3%)	18 (24.7%)	
5. Insulin increases body weight.	Strongly Disagree	36 (62.1%)	22 (37.9%)	
	Disagree	43 (61.6%)	28 (38.4%)	
	Neutral	91 (75.2%)	30 (24.8%)	<0.0001
	Agree	46 (51.7%)	46 (48.0%)	
	Strongly Agree	41 (54.7%)	34 (45.3%)	
6. Insulin can cause anxiety from not knowing the right way to inject it.	Strongly Disagree	11 (30.6%)	25 (69.4%)	
	Disagree	44 (62.7%)	39 (37.3%)	
	Neutral	60 (73.2%)	22 (26.3%)	<0.0001
	Agree	76 (73.8%)	27 (26.2%)	
	Strongly Agree	49 (64.5%)	27 (35.5%)	
7. Injecting insulin requires the help of others.	Strongly Disagree	12 (29.3%)	29 (70.7%)	
	Disagree	60 (49.6%)	61 (50.4%)	
	Neutral	52 (73.2%)	19 (26.8%)	<0.0001
	Agree	74 (74.0%)	26 (26.0%)	
	Strongly Agree	43 (64.2%)	24 (35.8%)	

	The barriers to take insulin	Sub group	Patients on Pills	Patients on Insulin	P-value
8.	Fear of injections	Strongly Disagree	17 (33.3%)	31 (84.8%)	<0.0001
		Disagree	46 (67.9%)	30 (32.1%)	
		Neutral	38 (69.1%)	17 (30.9%)	
		Agree	80 (73.4%)	29 (26.6%)	
		Strongly Agree	60 (65.2%)	32 (34.8%)	
9.	Insulin injections are painful.	Strongly Disagree	20 (40.0%)	30 (60.0%)	<0.0001
		Disagree	60 (52.6%)	54 (47.4%)	
		Neutral	68 (80.0%)	17 (20.0%)	
		Agree	58 (61.1%)	37 (38.9%)	
		Strongly Agree	34 (61.8%)	21 (38.2%)	
10.	Using insulin means addiction to it for rest of life	Strongly Disagree	10 (62.5%)	6 (37.5%)	0.882
		Disagree	25 (58.1%)	18 (41.9%)	
		Neutral	49 (64.5%)	27 (35.5%)	
		Agree	82 (61.7%)	51 (38.3%)	
		Strongly Agree	76 (57.6%)	56 (42.4%)	
11.	Insulin as treatment is not necessary.	Strongly Disagree	30 (81.1%)	7 (18.9%)	<0.0001
		Disagree	39 (72.2%)	15 (27.8%)	
		Neutral	54 (72.0%)	21 (28.0%)	
		Agree	78 (59.1%)	54 (40.9%)	
		Strongly Agree	39 (38.6%)	62 (61.4%)	
12.	Using insulin makes one feel different from others.	Strongly Disagree	38 (43.7%)	49 (56.3%)	<0.0001
		Disagree	74 (56.9%)	56 (43.1%)	
		Neutral	61 (83.6%)	12 (16.4%)	
		Agree	49 (66.2%)	25 (33.8%)	
		Strongly Agree	19 (54.3%)	16 (45.7%)	
13.	It is embarrassing to use insulin in front of others.	Strongly Disagree	54 (48.6%)	57 (51.4%)	0.015
		Disagree	71 (59.7%)	48 (40.3%)	
		Neutral	44 (74.6%)	15 (25.4%)	
		Agree	45 (66.2%)	23 (33.8%)	
		Strongly Agree	27 (61.4%)	17 (38.6%)	
14.	Compliance to the treatment plan means I am not in need for insulin.	Strongly Disagree	66 (83.5%)	13 (16.5%)	<0.0001
		Disagree	67 (70.5%)	28 (29.5%)	
		Neutral	56 (63.6%)	32 (36.4%)	
		Agree	37 (42.5%)	50 (57.5%)	
		Strongly Agree	15 (28.8%)	37 (71.2%)	
15.	Insulin can cause health problems.	Strongly Disagree	30 (41.1%)	43 (58.9%)	<0.0001
		Disagree	58 (58.6%)	41 (41.4%)	
		Neutral	99 (67.8%)	47 (32.2%)	
		Agree	32 (61.5%)	20 (38.5%)	
		Strongly Agree	23 (71.9%)	9 (28.1%)	

During the conduction of the study, special interest was directed towards nephropathy as the main complication of diabetes. Of the entire study group, 118 (29.9%) patients had documented nephropathy as a complication while 276 (70%) did not suffer from diabetic nephropathy. Within the nephropathy group, 93 (78.8%) accepted insulin therapy while the remaining 25 (21.2%) had refused (Table 3). No statistically significant difference was detected between the groups with or without nephropathy, (p=0.336).

Regarding the control of diabetes, most of the uncontrolled diabetic patients, 241 (79%), accepted insulin therapy versus 64 (21%) uncontrolled patients who refused to receive insulin; the difference was statistically significant, (p=0.008) (Table 3).

Hypertension was reported in 248 (61.7%) patients, hyperlipidemia in 256 (63.7%) patients, cardiovascular disease in 68 (16.9%) patients and 88 patients (21.9%) had other chronic diseases (Figure 1). It was found that only hyperlipidemia showed a statistically significant difference (p= 0.006) regarding acceptance or refusal of insulin injections.

Table 3: Accept or refuse taking insulin according to the control of diabetes and nephropathy as a complication.

Variable	Sub group	Accept to use insulin	Refuse to use insulin	P-value
HbA1C	Controlled	63 (65.6%)	33 (34.4%)	0.008
	Uncontrolled	241 (79%)	64 (21%)	
Nephropathy	Yes	93 (78.8%)	25 (21.2%)	0.336
	No	205 (74.3%)	71 (25.7%)	

Figure 1

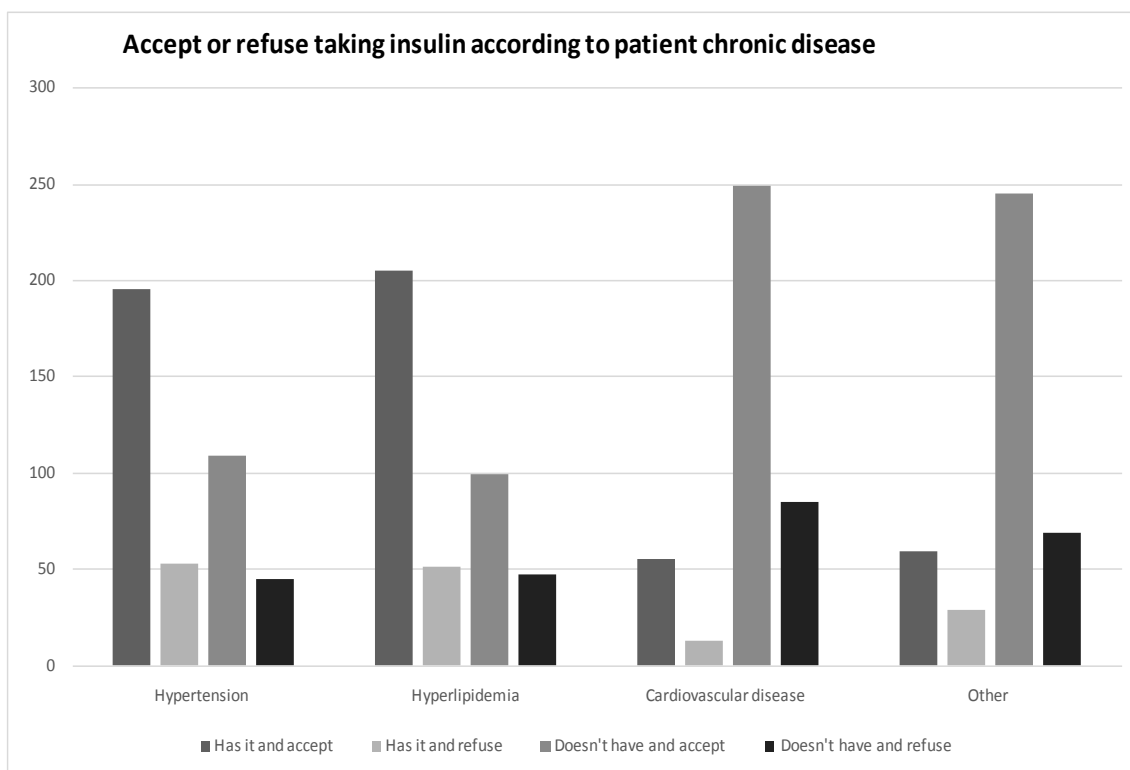## Discussion

Guidelines for management of diabetes recommend the use of OHDs as monotherapy or as combination therapy with or without insulin. The oral hypoglycemic drugs are often initially successful in lowering the glycated hemoglobin level but unfortunately, alone, they are unable to maintain normal levels of HbA1c on the long run. Appropriate timing for initiation of insulin therapy is recommended in patients who are uncontrolled, as it reduces diabetes-related complications, improves the cardiovascular profile and helps preserve β-cell function for a longer duration than OHDs alone[9].

The percentage of diabetics who refused insulin therapy in the current study is still high (25%), although it has dropped compared to a previous study done in Saudi Arabia in 2014 (34.6%)[5]. In comparison with other countries; our figure is much lower than the refusal rates reported in Iran (77%)[10], Malaysia (74.2%)[11] and Singapore (70%)[12]. However, it is quite close to the figure reported in the US (28.2%)[13].The great discrepancy between results across different countries could be attributed to the different inclusion criteria. In our study, we included type 2 diabetic patients only whether on OHDs or insulin therapy and we excluded type 1 diabetics.

None of the socio-demographic factors were found to be significantly different between the groups in the current study, which is different from the conclusions reached in other studies such as in the US where females were found to be less likely to accept insulin therapy[13]. Also, in Malaysia, the level of education had a significant impact on the willingness to use insulin[11] as well as in South Africa[14]. Participants who had controlled levels of HbA1c were more reluctant to use insulin than those with uncontrolled levels; this finding was supported by previous studies conducted in Singapore[12] and Korea[15]. Patients with controlled HbA1c believe that they do not require insulin therapy. These results are opposite to the work presented by Hosomura et al that discovered a higher insulin therapy refusal rate among uncontrolled diabetics[16]. The study by Khan et al in London on Bangladeshi patients showed that informing patients that they require insulin leads to the false belief of being in a late stage of the disease with imminent, premature death. Other patients in the same study had fear of hypoglycemia, weight gain and loss of independence[7]. In spite of getting information about diabetes from their physicians, the majority of participants in our study had many misconceptions,

whether they were OHDs- or insulin-users[12]. Those who were using OHDs only tended to refuse insulin therapy more strongly than the insulin using group.

Participants in our study in both groups (OHDs- and insulin-users) showed a negative attitude and poor perception towardsinsulin therapy. Certain statements have been chosen as stronger barriers to insulin therapy than others. The most prominent reasons for refusal were fear of injection, the need to be compliant with the treatment plans, concerns about way of life and future and finally, the perception that they reached an end-stage in the disease course. Similar reasons have been mentioned in earlier studies and therefore, researchers stated that it was preferable to introduce insulin to the treatment plan early in the course of the disease so that insulin would not be perceived as being a treatment for end-stage patients[10]. Other barriers that were perceived by patients include weight gain, hypoglycemia and other health problems. These barriers were also reported by other studies as some of the main factors that discourage patients to use insulin[7,16].

Another major concern that was mentioned by insulin naïve diabetics is the awkwardness of being falsely recognized by the community as drug addicts due to the continuous use of syringes and vials. Patients with prior insulin experience had fewer barriers arising from injection-related issues and worried less about the burden of insulin dose increments than did insulin-naive patients[17]. In the current study, concerns about the impact of insulin injections on the participants' daily life activities were one of the significant social barriers mentioned regarding the intake of insulin. Restriction of daily life activities and feeling different from others were also found to be important by other studies[11,13,15,19,20]. Regarding complications of diabetes and its impact on insulin therapy, most of the patients suffering from nephropathy had accepted insulin. There are no reports in the literature to support or refute this finding or reveal any relation between diabetes complications and the patients' attitude towards insulin. Amongst different comorbidities, the only one that was statistically significant between the two groups was the presence of hyperlipidemia. Dyslipidaemic patients tended to accept insulin therapy more readily than other group.

Facing the stigma of diabetes has become a must. We need to change the behavioral goals and eliminate certain

feelings associated with the disease and its treatment such as sense of personal failure, low self-esteem, phobia from insulin injections and the negative impact of insulin on social life and work. The prevalence of diabetes mellitus in Saudi Arabia has been increasing during the past thirty years and the rate of insulin therapy refusal is still high, even after decreasing from 34% in 2014 to 25% in our current study. Such rate is related to the negative attitude and poor perception of diabetic patients towards insulin therapy because of numerous social and psychological barriers[18]. Exploring patients' worries and beliefs about diabetes and insulin is crucial to support physicians in delivering patient-centered care. Educating patients about the benefits of insulin therapy and the proper way of administration is necessary to make patients accept insulin treatment more readily. This could be achieved through attending support groups consisting of insulin users together with teaching pills-only users how to deal with complications related to insulin use such as hypoglycemia and weight gain.

Limitation of the study:
The main limitation of this study was the lower number of male diabetic patients as the data collectors were females which posed some difficulty in accessing the male clinics. Enrolling a larger number of patients by recruiting other hospitals and different health sectors will certainly provide a more accurate insight on all possible barriers perceived by patients to insulin therapy.

Conflict of interest
None declared.

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