# Psychological insulin resistance among type 2 diabetic patients attending primary healthcare centers, Al-Ahsa, Saudi Arabia

Asmaa M. Alomran, Duaa A. Almubarak, Batool A. Alrashed, Abdul S. Khan[1]

**Abstract:**

**BACKGROUND:** Patients' adherence to insulin therapy is crucial to achieve good glycemic control. The present study was conducted to determine psychological insulin resistance (PIR) and the effect of doctor–patient relationship on PIR among type 2 diabetes patients attending primary health-care centers of Al-Ahsa region in Saudi Arabia.

**MATERIALS AND METHODS:** This was a cross-sectional survey of all type 2 diabetic patients attending the primary healthcare centers of Al-Ahsa. A multistage sampling technique was used. The calculated sample size was 396. Two validated structured questionnaires were used to collect information. The degree of agreement to insulin therapy was done on the Likert 5° scale. SPSS was used for data entry and analysis. Chi-square test was used to test for stistical significane at $P=0.05$.

**RESULTS:** Out of 396 patients who were given the questionnaires, 366 filled the questionnaires yielding 92% response rate. Fifty-one percent were male and about 85% were older than 35 years. Willingness to use insulin was significantly associated with age ($P = 0.013$) and duration of diabetes ($P=0.0001$). The strongest negative attitudes toward insulin therapy arose from participants having heard about a bad experience with insulin (59.34%, $P < 0.05$) and the fear of possible dependence (54.20%, $P < 0.05$). Participants who responded of "mostly appropriate" and "very appropriate" to questions on patient–doctor relationship were significantly more willing to take insulin (64.9% vs 24.5%, and 70.3% vs 22.9%, $P = 0.0001$).

**CONCLUSION:** The study showed that one-third of the patients with type 2 diabetes had PIR. Since the behavior of doctor plays an important role in reducing PIR, there is a need for greater emphasis on the importance of good doctor–patient relationship and the establishment of a therapeutic education program.

**Keywords:**

Doctor–patient relationship, psychological insulin resistance, primary healthcare centers, type 2 diabetes

*Postgraduate Center for Studies of Family and Community Medicine, Ministry of Health, [1]Department of Family and Community Medicine, College of Medicine, King Faisal University, Al-Ahsa, Saudi Arabia*

**Address for correspondence:**
Dr. Asmaa M. Alomran, Postgraduate Center for Studies of Family and Community Medicine, Ministry of Health, P.O. Box 40172, Al-Ahsa 31982, Saudi Arabia.
E-mail: asmaa-alomran@ hotmail.com

## Introduction

Type 2 diabetes mellitus (DM) is a chronic endocrine disorder[1] of hyperglycemia either as a result of insulin resistance or relatively impaired insulin secretion.[2,3] The prevalence of type 2 diabetes has markedly increased in the past few decades and is emerging as a serious public health concern. It currently affects 285 million people globally and is projected to affect over 439 million by the year 2030.[4]

Patients with type 2 (DM) need a long restricted treatment regimen to achieve glycemic control. The United Kingdom Prospective Diabetes Trial (UKPDS) has

suggested the benefits of tight glycemic control in individuals with type 1 and type 2 diabetes in reducing diabetes complications. For example, it showed that a 1% decrease in HbA1c was associated with a 37% reduction in the risk of micro vascular complications and a 14% reduction in the risk of macro vascular complications.[5-7] Insulin therapy is known to be a highly effective choice of treatment in diabetes resulting in tight glycemic control and the reduction of diabetes-related complications. American Diabetic Association (ADA) recommends initiating insulin therapy (with or without additional agents) in patients with newly diagnosed type 2 diabetes who are symptomatic and/or have A1C more than 10% (86 mmol/mol) and/or blood glucose levels of more than 300 mg/dl (16.7 mmol/L).[8]

Psychological insulin resistance is defined as psychological opposition toward the use of insulin by people with diabetes and health-care providers. It describes both doctor- and patient-barriers to initiating and maintaining insulin treatment.[9,10] One of the principal factors which contributes to PIR is patients' lack of accurate knowledge about diabetes and insulin treatment.[10] Some patients believe that insulin is appropriate for those with severe diabetes and so patients with PIR believe that a new prescription of insulin treatment is a negative sign of their diabetes. They consider its prescription as a sign of their worsening diabetes instead of it being an important next step in management.[11] Apart from this, patients have varying fears of insulin and its use;. Some fear the pain of insulin injection, for some it is the fear of self-administration. Others have concerns regarding lifestyle changes and the time required.[12] Studies suggest that some patients think that poor self-management in the past caused their need of insulin and some blame their health-care providers for not explaining the risks and benefits of insulin adequately.[13] Psychological insulin resistance in type 2 diabetes patients is, therefore, considered a barrier to insulin therapy.[13] A systematic review (1985–2007) found that psychological insulin-resistance played an important role in glycemic control and should not be ignored. Knowledge and awareness of its prevalence would enhance the role of health education for both the physician and the patient.[14,15]

The situation in Saudi Arabia indicates that PIR is a public health problem. A study conducted in Riyadh found a PIR rate of almost 30%.[16] Another study in Aseer region of Saudi Arabia also showed that the overall prevalence of therapeutic non-adherence was 38% and the most common barriers to patients' adherence to insulin therapy were: forgetfulness, fear of low blood glucose, increase in weight and difficulties with injection techniques.[17] Thus, the aim of this study was to determine the factors associated with Psychological insulin resistance in type 2 diabetic patients and the barriers to initiating insulin therapy in them. We aimed to find out if there was any association between doctor–patient relationship and patient acceptance of starting insulin therapy.

## Materials and Methods

This was a cross-sectional study conducted at the Ministry of Health primary healthcare (PHC) centers of the Al-Ahsa region in Saudi Arabia between February 2019 and January 2020. The study population consisted of all type 2 diabetic patients (estimated to be 30,000 patients) attending the chronic disease clinics at PHC centers. Epi info CDC software was used to calculate the sample size based on the result of the same type of study done in Riyadh,[16] which showed PIR as 34.6% in type 2 diabetic patients. Therefore, for sample size calculation, we assumed a prevalence of PIR at 34%.[18] The calculated sample size was 396 type 2 diabetics based on a 95% confidence level with an additional 20% to compensate for missing data.

A multistage sampling technique was used. Stratified cluster was done for stage I and systemic random sampling for stage II. The Al-Ahsa area has 72 PHC centers distributed in 3 sectors: Al-Omran, Al-Hufof and Al-Mubarraz. Cluster sampling was done for all these three sectors. Three PHC centers from each sector were randomly selected and Info epidemiologic software was used to calculate a representative sample. The inclusion criteria were: Both males and females aged between 18 and 65 years old who had been diagnosed with type 2 DM, whether on insulin therapy or not and were being followed at PHC centers. DM patients with psychiatric disorders and patients with medical conditions in which hypoglycemia increased mortality and morbidity such as malignancy and dementia were excluded from the study. Data were collected with a self-administered validated questionnaire.[19] The questionnaire had been translated into Arabic and its validity and reliability assessed by means of a pilot study.[16] In order to re-assess the reliability of the same questionnaire we also conducted a pilot study for 20 participants and found 83.2% Cronbach's alpha reliability co-efficient. The participants of the pilot study were excluded from the main study. The first section of the questionnaire consisted of sociodemographic data such as age, gender, level of education , location of residence and diabetes duration. The second section contained 19 questions on thoughts, knowledge, attitude and concerns that the patients might have with regard to insulin injection on the Likert scale of 1–5 where, 1 indicates strongly agree and 5 strongly disagree. Section 3 consisted of a 9-item patient-doctor relationship questionnaire (PDRQ-9).[19] The PDRQ-9 was developed and established by Helping

Alliance Questionnaire of Lubrosky and validity was assessed after the application of the questionnaire.[19] It was used to assess the patient's understanding and feeling toward his primary care physician (PCP). For each item there were 5 lickert scale response options (1 = "not at all appropriate," 2 = "somewhat appropriate," 3 = "appropriate," 4 = "mostly appropriate," 5 = "totally appropriate." The total score was interpreted as: Score 18 = 40%, score 27 = 60%, and score 36 = 80%. Not appropriate = ≤40%, somewhat appropriate = 40%–60%, mostly appropriate = 60%–80%, and very appropriate = ≥80%.

Ethical approval was obtained from the Institutional Review Board vide letter No. 1420798/4/26/41 dated 13/03/2019 and informed written consent was taken from all participants in the study.

Data entry, analytic and descriptive analysis were done using the IBM SPSS Statistics version 23 (New York, USA). Each variable was coded for purposes of analysis in the questionnaire. Inference analysis was done using Chi-square. $P = 0.05$ was considered as statistically significant. Demographic data were reported as percentages. The degrees of agreement to insulin therapy were agree and strongly agree, and unwillingness in patients who disagreed or strongly disagreed. Natural option was considered as undecided.

## Results

Out of 396 participants who received the questionnaires, 366 returned them giving a response rate of 92%. The mean age of the participants was 47.71 years ± 11.33 (standard deviation). Fifty-one percent of them were male. Fifty percent of them were preuniversity, 31.1% university educated and 18.6% uneducated. Most of the participants (80.9%) had been diagnosed with diabetes for <15 years. The details of the sociodemographic data are shown in Table 1.

About one third (32.5%) of the participants stated that they were unwilling to use insulin, but 8.7% were undecided. There was a significant relationship between age and willingness ($P = 0.013$) in favor of (50–65 years). In addition, there was a significant relationship between the length of diabetes diagnosis and willingness ($P = 0.0001$). However, there was no significant relationship between gender and educational level and willingness. The details of the participants' characteristics by willingness to use insulin are shown in Table 2.

There were significant differences between agreement categories in all attitude items. The participants significantly agreed that insulin would help to improve diabetes and can reliably prevent long term complications

**Table 1: Demographic characteristics of type 2 diabetic patients attending primary health care centers in Al-Ahsa, Saudi Arabia (*n*=366)**

| Characteristics | N (%) |
|---|---|
| Age (years) | |
| 18-35 | 56 (15.3) |
| 36-50 | 141 (38.5) |
| 51-65 | 169 (46.2) |
| Gender | |
| Male | 188 (51.4) |
| Female | 178 (48.6) |
| Educational level | |
| Uneducated | 68 (18.6) |
| Preuniversity | 184 (50.3) |
| University | 114 (31.1) |
| How long have been diagnosed with diabetes? (years) | |
| 0-5 | 116 (31.7) |
| 6-10 | 98 (26.8) |
| 11-15 | 82 (22.4) |
| >15 | 70 (19.1) |

resulting from diabetes, but also agreed that diabetes would be worse with the use of insulin and they were fearful of insulin-related side effects such as hypoglycemia and weight gain. They believed that their need to use insulin meant they had failed to properly care for their diabetes but they would rather delay the use of insulin until there was no alternative. On the other hand, the participants significantly disagreed thinking that insulin might cause more diabetic complications in the long term, injection-related issues and diet-related issues. The details of the participants' attitude toward insulin are shown in Tables 3 and 4.

There were no significant differences in the willingness of participants according to their opinion on the "fear of hypoglycemia" and on "weight gain." The most notable negative attitudes toward insulin therapy in unwilling participants compared to willing and undecided participants were: "heard that some people had a bad experience with insulin" (59.34%, $P < 0.05$), "dependence owing to regular injection" (54.20%, $P < 0.05$), "not enough time for regular doses of insulin" (51.78%, $P < 0.05$), and "inability to pay close attention to their diet as insulin treatment requires" (50.46%, $P < 0.05$). Additional comparisons of participants' attitudes on insulin therapy between willing, undecided, and unwilling participants are presented in Table 4.

Almost 89% of the participants responded "appropriate to most appropriate" to the statement that "my PCP helped me" and so did 79% with the statement that "my PCP had enough time for me." "Eighty-eight percent of the participants responded that they trusted their PCP." Similarly, 84% of the participants affirmed the statement that treating PCP understood them as "appropriate"

**Table 2: Willingness of type 2 diabetic patients attending primary health care centers in Al-Ahsa to use insulin**

| Demographic variables | Willingness | | | Total | *P*-value |
|---|---|---|---|---|---|
| | **Undecided** N (%) | **Unwilling** N (%) | **Willing** N (%) | N (%) | |
| Age (years) | | | | | |
| 18-35 | 8 (14.3) | 22 (39.3) | 26 (46.4) | 56 (100) | 0.013 |
| 35-50 | 14 (9.9) | 53 (37.6) | 74 (52.5) | 141 (100) | |
| 50-65 | 10 (5.9) | 44 (26.0) | 115 (68.0) | 169 (100) | |
| Gender | | | | | |
| Male | 15 (8.0) | 66 (35.1) | 107 (56.9) | 188 (100) | 0.528 |
| Female | 17 (9.6) | 53 (29.8) | 108 (60.7) | 178 (100) | |
| Educational level | | | | | |
| Illiterate | 3 (4.4) | 22 (32.4) | 43 (63.2) | 68 (100) | 0.165 |
| Preuniversity | 13 (7.1) | 63 (34.2) | 108 (58.7) | 184 (100) | |
| University | 16 (14.0) | 34 (29.8) | 64 (56.10) | 114 (100) | |
| How long have you had diabetes? (years) | | | | | |
| 0-5 | 19 (16.4) | 46 (39.7) | 51 (44.0) | 116 (100) | 0.0001 |
| 6-10 | 7 (7.1) | 34 (34.7) | 57 (58.2) | 98 (100) | |
| 11-15 | 2 (2.4) | 23 (28.0) | 57 (69.5) | 82 (100) | |
| >15 | 4 (5.7) | 16 (22.9) | 50 (71.4) | 70 (100) | |

and that the treating PCP was dedicated to helping them. The same was true with the statements that "my doctor and I fully understood the nature of my medical symptoms" and that they were content with their PCP treatment. Here 87% and 86% of the participants answered with "appropriate" to "most appropriate" respectively. Only 21% of the participants did not respond with "appropriate" to the question whether the PCP was easily accessible. The details of the response of the participants on patient–doctor relationship questionnaires are shown in Table 5.

Those participants whose responses were "mostly appropriate and very appropriate" for the questionnaires in patient–doctor relationship were significantly willing to take insulin (64.9% vs. 24.5% and 70.3% vs. 22.9% *P* = 0.0001) than those who were unwilling to take insulin. However, those whose response were "somewhat appropriate" were significantly unwilling to accept insulin treatment than those who were willing (49.5% vs. 40%, *P* = 0.0001). However, those whose response was "not appropriate" were significantly unwilling to take insulin than those who were willing (80% vs. 20%, *P* = 0.0001). The details of the relationship between the willingness of the participants and PDRQ-9 are shown in Tables 5 and 6.

## Discussion

The present study was conducted to determine the psychological insulin resistance in the type 2 diabetes patients attending the PHC centers of Al-Ahsa region in Saudi Arabia. One-third of the participants in our study expressed their unwillingness to use insulin. Globally, in similar studies done in the USA,[20] Netherland[21]

Kenya[22] and Korea[23] the prevalence of PIR have been found to be from 30% to 83%. However, a study done on the Bangladeshi population in East London found a comparatively lower level of refusal for insulin injection among the type 2 diabetic patients.[24] Almost the same result was found in a Saudi study where one-fourth of the studied type 2 diabetic population refused insulin.[16] A moderately low level of insulin therapy refusal (15%) was found in a Malaysian study, but[25] a very high level of unwillingness for insulin was reported in a Libyan study in which 94.6% of the participants expressed unwillingness to accept insulin therapy.[26]

The prevalence of PIR in males was higher than in females in our study, but the difference was not statistically significant. Moreover, another Korean study[23] found significantly higher prevalence of insulin refusal in males compared to females, results which are similar to our study results. However, the reverse is true in the American study in which females were more unwilling for insulin than males.[20] In addition, the Congo study[27] showed significantly higher PIR in females than males. Similar results were found in Malaysian[25] and South Iranian studies.[28] The disparities in the results may be due to socio-cultural differences of the countries as well as demographic dissimilarities in the samples recruited in the different studies (e.g., male-to-female ratio of the included population and duration of diabetes).

There was a significant relationship between the duration of diabetes diagnosis and insulin willingness (*P* = 0.0001) in our study. Higher duration of diabetes was associated with lower insulin refusal in a Malaysian study[25] also where odds ratio was 0.89, 95% confidence interval = 0.87, 0.93 when the relation of duration of

**Table 3: Attitude of type 2 diabetes patients attending primary healthcare centers in Al-Ahsa, towards insulin use**

| Items | Unwilling, N (%) | Undecided, N (%) | Willing, N (%) | P-value |
|---|---|---|---|---|
| Negative attitudes toward insulin | | | | |
| Insulin may cause more diabetic complications in the long term | 46 (44.6) | 12 (11.6) | 45 (43.6) | 0.001 |
| I will feel that my diabetes has become worse if I start to use insulin | 74 (45.1) | 16 (9.7) | 74 (45.1) | 0.0001 |
| It would be better to delay insulin until there was no alternative | 101 (38.4) | 23 (8.7) | 139 (52.8) | 0.001 |
| Using insulin, means I failed to properly care for my diabetes | 82 (38.6) | 19 (8.9) | 111 (52.3) | 0.02 |
| Lifestyle restrictions and adaptations | | | | |
| Insulin would make my life difficult, such as in traveling or eating out | 77 (44.5) | 19 (10.9) | 77 (44.5) | 0.0001 |
| I just don't have enough time for regular doses of insulin | 58 (51.7) | 15 (13.3) | 39 (34.8) | 0.0001 |
| I can't pay as close attention to my diet as insulin treatment requires | 54 (50.4) | 12 (11.2) | 41 (38.3) | 0.0001 |
| injection rejection concerns | | | | |
| I am afraid of needle injections | 43 (43.8) | 12 (12.2) | 43 (43.8) | 0.0001 |
| I will not be able to use the proper injecting technique | 56 (50.0) | 11 (9.8) | 45 (40.1) | 0.0001 |
| Injections in front of people would be embarrassing for me | 64 (44.1) | 11 (7.5) | 70 (48.2) | 0.0001 |
| Regular injections would give me a feeling of dependence | 58 (54.2) | 10 (9.3) | 39 (36.4) | 0.0001 |
| Fear of side effects | | | | |
| Insulin can lead to serious problems with low blood sugar | 72 (36.9) | 17 (8.7) | 106 (54.0) | 0.059 |
| Insulin is likely to increase my weight | 62 (37.8) | 17 (10.3) | 85 (51.8) | 0.068 |
| Social influences and stigma | | | | |
| People will think that I am sicker if I use insulin | 67 (48.9) | 10 (7.2) | 60 (43.7) | 0.0001 |
| I don't want to start insulin because I heard some people had a bad experience with insulin | 54 (59.3) | 11 (12.0) | 26 (28.5) | 0.0001 |

*Contd...*

**Table 3: Contd...**

| Items | Unwilling, N (%) | Undecided, N (%) | Willing, N (%) | P-value |
|---|---|---|---|---|
| Positive attitudes toward insulin | | | | |
| Insulin will allow me to have a less restrictive diet | 30 (29.1) | 7 (6.7) | 66 (64.0) | 0.009 |
| Insulin would help my diabetes to improve | 53 (23.0) | 15 (6.5) | 162 (70.4) | 0.0001 |
| Insulin can reliably prevent long term complications due to diabetes | 65 (25.3) | 19 (7.4) | 172 (67.1) | 0.0001 |

**Table 4: Positive and negative attitudes of type 2 diabetes patients attending primary healthcare centers in Al-Ahsa towards insulin use**

| Attitudes | Unwilling, N (%) | Undecided, N (%) | Willing, N (%) | P-value |
|---|---|---|---|---|
| Negative attitudes toward insulin | 70 (44.3) | 17 (10.8) | 71 (44.9) | 0.0001 |
| Lifestyle restrictions and adaptations | 48 (57.1) | 10 (11.9) | 26 (31.0) | 0.0001 |
| Injection rejection concerns | 45 (57.0) | 8 (10.1) | 26 (32.9) | 0.0001 |
| Fear of side effects | 71 (39.0) | 18 (9.9) | 93 (51.1) | 0.036 |
| Social influences and stigma | 57 (58.2) | 11 (11.2) | 30 (30.6) | 0.0001 |
| Positive attitudes toward insulin | 26 (23.9) | 8 (07.3) | 75 (68.8) | 0.0001 |

diabetes and refusal rate was compared. In the same study, patients diagnosed with diabetes <10 years previously had an increased chance of insulin refusal by more than two-fold. In a Korean study,[23] the researchers found that insulin refusal was more among diabetic patients of less duration than those of more duration.[23] However, one Saudi[17] as well as one Libyan study[26] found that there were no significant associations between unwillingness to start insulin with the duration of diabetes. The most pronounced negative attitudes of the participants in our study which led to the PIR were: hearing that some people had had a bad experience with insulin, fear of dependence due to regular injections, lack of time for regular doses of insulin, and inability to pay close attention to diet as insulin treatment requires. As observed in a study done in a university hospital in Germany, patients who were already on insulin treatment had a less negative attitude toward the use of insulin compared to patients who were not on insulin treatment.[15]

The perception of the type 2 diabetic participants that insulin therapy was painful and that insulin was addictive was also noted in the Libyan study[26] in which almost 50% of the participants with PIR agreed. The same result was found in the Congo[27] where the participants

**Table 5: Patient-doctor relationship among type 2 diabetic patients attending primary healthcare centers in Al-Ahsa, Saudi Arabia**

| PDRQ-9 | Not appropriate at all N (%) | Somewhat appropriate N (%) | Appropriate N (%) | Mostly appropriate N (%) | Totally appropriate N (%) |
|---|---|---|---|---|---|
| My PCP helps me | 4 (1.0) | 37 (10.1) | 98 (26.7) | 162 (44.2) | 65 (17.7) |
| My PCP has enough time for me | 19 (5.1) | 57 (15.5) | 85 (23.2) | 149 (40.7) | 56 (15.3) |
| I trust my PCP | 6 (1.6) | 37 (10.1) | 92 (25.1) | 155 (42.3) | 76 (20.7) |
| My PCP understands me | 9 (2.4) | 49 (13.3) | 96 (26.2) | 132 (36.0) | 80 (21.8) |
| My PCP is dedicated to help me | 11 (3.0) | 47 (12.8) | 107 (29.2) | 128 (34.9) | 73 (19.9) |
| My PCP and I 4 on the nature of my medical symptoms | 9 (2.4) | 37 (10.1) | 108 (29.5) | 140 (38.2) | 72 (19.6) |
| I can talk to my PCP | 9 (2.4) | 51 (13.9) | 94 (25.6) | 145 (39.6) | 67 (18.3) |
| I am content with my PCP's treatment | 7 (1.9) | 44 (12.0) | 98 (26.7) | 137 (37.4) | 80 (21.8) |
| I find my PCP easily accessible | 13 (3.5) | 63 (17.2) | 99 (27.0) | 116 (31.6) | 75 (20.4) |

PDRQ=Patient-doctor relationship questionnaire, PCP=Primary care physician

**Table 6: Patient-doctor relationship and willingness for insulin therapy among type 2 diabetic patients attending primary healthcare centers in Al-Ahsa, Saudi Arabia**

| Patient-doctor relationship | Willingness | | | P-value |
|---|---|---|---|---|
| | Unwilling N (%) | Undecided N (%) | Willing N (%) | |
| Not appropriate at all | 8 (80.0) | 0 | 2 (20.0) | 0.0001 |
| Somewhat appropriate | 52 (49.5) | 11 (10.5) | 42 (40.0) | |
| Mostly appropriate | 23 (24.5) | 10 (10.6) | 61 (64.9) | |
| Totally appropriate | 36 (22.9) | 11 (7.0) | 110 (70.1) | |
| Total | 119 (32.5) | 32 (8.7) | 215 (58.7) | |

who refused insulin were significantly apprehensive of the pain and the possibility of being addicted as compared to those who accepted insulin. In a qualitative study in Kuala Lumpur, Malaysia, injection pain, needle phobia and the belief that insulin was for life and for more severe disease were the negative perceptions of the diabetic patients who were unwilling to take insulin.[29] Unlike other studies, there were no significant differences in the willingness of participants who were fearful of hypoglycemia and weight gain in our study. In Kenyan study,[22] nearly 40% of the participants who showed unwillingness cited weight gain and the risk of hypoglycemia with insulin use as the main reason for PIR respectively. In the USA study[20] the issue of hypoglycemia was also one of the important reasons for the negative attitude of diabetic patients toward insulin therapy. Fear of dependency and pain as the main factors contributing to the unwillingness of participants were in accord with the results of other studies.

A positive doctor–patient relationship plays a pivotal role in patient care and patients' compliance with the treatment and is highly dependent on patients' perceptions, physician empathy, and communication style. Commencing insulin treatment for diabetic patients poses a challenge for treating physicians because the acceptance of this treatment depends on how the treating physician manages to convince the patients by removing their doubt and alleviating their fear of insulin treatment. In our study, the good doctor–patient relationship played an important role in the willingness to undergo insulin treatment. Those patients who were satisfied with their doctors' management were more willing to take insulin treatment. A similar result was wrevealed in a Hong Kong study where proper counseling by the treating physician was one of the factors in lower prevalence of PIR.[30]

A study in the USA[20] showed that the participants' perceived starting insulin as a negative experience that would be painful and would lead down the "slippery slope" to complications. The healthcare providers engaged in four primary behaviors that involved a display of the insulin pen/needle and a demonstration of the injection process, an explanation of how insulin could help in diabetes control and reduce the risk of complications, the use of a collaborative communication style and a show of support and a willingness to answer questions so that participants are not be "on their own." After initiation, most participants noted that insulin was not as bad as they thought and recommended insulin to other adults with type 2 diabetes.[31] Another study done in Argentina demonstrated that patients with type 2 diabetes who were dissatisfied with aspects of their interactions with physicians, exhibited poor insulin adherence. In this study, perceived physician inattention and lack of engagement (and diabetes-related distress) directly affected insulin adherence and glycemic control.[32]

### Limitation of the study
PIR in our study was measured by self-reported items that reflected expectation and not the actual behavior and practices. Therefore, further study is needed to truly translate into true PIR once recommendations are made. The attitudinal items in the questionnaires were necessarily limited and there may be other important

contributions to PIR that were not assessed. The study could be extended to determine other social factors and to remove any confounding effect of these factors.

## Conclusion

The study showed that one-third of the patients with type 2 diabetes had PIR. The main negative attitude toward insulin were: Hearing of bad experience with insulin, feeling of dependence on insulin, lack of time for regular doses of insulin and the fear of not being able to pay as close attention to diet as is required by insulin treatment . The participants who were satisfied with the treating doctors were more willing to start the insulin treatment. However, there is a need for further improvement in doctor–patient communication and the establishment of a suitable therapeutic education program to reduce the prevalence of PIR and its harmful consequences on the control of DM and quality of life of diabetic patients.

### Financial support and sponsorship
Nil.

### Conflicts of interest
There are no conflicts of interest.

## References

1. Bao H, Liu J, Ye J. Influencing factors of the diabetes distress among Chinese patients with type 2 diabetes mellitus. Psychiatr Danub 2018;30:459-65.
2. Harris MI. Impaired glucose tolerance in the U.S. population. Diabetes Care 1989;12:464-74.
3. Sullivan PW, Morrato EH, Ghushchyan V, Wyatt HR, Hill JO. Obesity, inactivity, and the prevalence of diabetes and diabetes-related cardiovascular comorbidities in the U.S., 2000-2002. Diabetes Care 2005;28:1599-603.
4. Shaw JE, Sicree RA, Zimmet PZ. Global estimates of the prevalence of diabetes for 2010 and 2030. Diabetes Res Clin Pract 2010;87:4-14.
5. Marín-Peñalver J, Martín-Timón I, Sevillano-Collantes C, Cañizo-Gómez F. Update on the treatment of type 2 diabetes mellitus. World J Diab 2016;7:354.
6. U.K. prospective diabetes study 16. Overview of 6 years' therapy of type II diabetes: A progressive disease. U.K. Prospective Diabetes Study Group. Diabetes 1995;44:1249-58.
7. Intensive blood-glucose control with sulphonylureas or insulin compared with conventional treatment and risk of complications in patients with type 2 diabetes (UKPDS 33). UK Prospective Diabetes Study (UKPDS) Group. Lancet 1998;352:837-53.
8. Summary of Revisions: Standards of Medical Care in Diabetes-2020, ADA, Diabetic Care 2020;43 Suppl 1:S4-6. Available from: https://care.diabetesjournals.org/content/43/Supplement_1/S4. [Last accessed on 2020 Jul 20].
9. Leslie CA. Psychological insulin resistance: A missed diagnosis? Diabetes Spect 1994;7:52-7.
10. Allen NA, Zagarins SE, Feinberg RG, Welch G. Treating psychological insulin resistance in type 2 diabetes. J Clin Transl Endocrinol 2017;7:1-6.
11. Polonsky W, Hajos T, Dain M, Snoek F. Are patients with type 2 diabetes reluctant to start insulin therapy? An examination of the scope and underpinnings of psychological insulin resistance in a large, international population. Curr Med Res Opinion 2011;27:1169-74.
12. Tong WT, Vethakkan SR, Ng CJ. Why do some people with type 2 diabetes who are using insulin have poor glycaemic control? A qualitative study. BMJ Open 2015;5:e006407.
13. Holmes-Truscott E, Pouwer F, Speight J. Assessing Psychological Insulin Resistance in Type 2 Diabetes: A Critical Comparison of Measures. Curr Diab Rep 2017;17:46.
14. Brod M, Kongsø JH, Lessard S, Christensen TL. Psychological insulin resistance: Patient beliefs and implications for diabetes management. Qual Life Res 2009;18:23-32.
15. Bahrmann A, Abel A, Zeyfang A, Petrak F, Kubiak T, Hummel J, *et al*. Psychological insulin resistance in geriatric patients with diabetes mellitus. Patient Educ Couns 2014;94:417-22.
16. Batais MA, Schantter P. Prevalence of unwillingness to use insulin therapy and its associated attitudes amongst patients with Type 2 diabetes in Saudi Arabia. Prim Care Diabetes 2016;10:415-24.
17. Almaghaslah D, Abdelrhman AK, Masdaf SK, Majrashi LM, Matary BM, AsiriWM, *et al*. Factors contributing to non adherence to insulin therapy among type 1 and type 2 diabetes mellitus patients in Asser region, Saudi Arabia. Biomed Res 2018;29:2090-95.
18. Charan J, Biswas T. How to calculate sample size for different study designs in medical research? Indian J Psychol Med 2013;35:121-6.
19. Van der Feltz-Cornelis CM, Van Oppen P, Van Marwijk HW, De Beurs E, Van Dyck R. A patient-doctor relationship questionnaire (PDRQ-9) in primary care: Development and psychometric evaluation. Gen Hosp Psychiatry 2004;26:115-20.
20. Polonsky WH, Fisher L, Guzman S. Villa-Caballero L, Edelman SV. Psychological insulin resistance in patients with type 2 diabetes, the scope of the problem. Diabetes Care 2005;28:2543-5.
21. Moura CS, Rosenberg ZB, Abrahamowicz M, Bernatsky S, Behlouli H, Pilote L. Treatment discontinuation and clinical events in type 2 diabetes patients treated with dipeptidyl peptidase 4 inhibitors or NPH insulin as third line therapy. J Diabetes Res 2018;2018:4817178.
22. Gulam AH, Otieno FC, Omondi-Oyoo G. Prevalence of psychological insulin resistance among patients with type 2 diabetes at Kenyatta National Hospital, Kenya. Health Sci J 2017;11:1.
23. Song Y, Ku BJ, Cho J, Jun Y, Kim B, Nam S. The prevalence of insulin refusal and psychological insulin resistance among Korean patients with type 2 diabetes mellitus. Ann Transl Med 2019;7:760.
24. Khan H, Lasker SS, Chowdhury TA. Prevalence and reasons for insulin refusal in Bangladeshi patients with poorly controlled Type 2 diabetes in East London. Diabet Med 2008;25:1108-11.
25. Ishak NA, Awang H, Abd Aziz R, Abdullah AJ, Bahari N. Prevalence and determinants for Insulin therapy refusal among type 2 diabetes mellitus patients in primary health care facilities in east Coast Region of peninsular Malaysia. Int J Public Health Clin Sci 2019;6:160-71.
26. Sabei LT, Sammud M. Attitude towards insulin therapy among patients with type 2 diabetes in Tripoli, Libya. Ibnosina J Med Biomed Sci 2015;7:127-35.
27. Rita SL, Lubaki FJ, Bompeka LF, Ogunbanjo GA, Ngwala LP. Prevalence and determinants of psychological insulin resistance among type 2 diabetic patients in Kinshasa, Democratic Republic of Congo. Afr J Prim Health Care Fam Med 2019;11:e1-e5.
28. Jalilolghadr S, Javadi A, Mahram M, Farshidgohar M, Javadi M. Prevalence of metabolic syndrome and insulin resistance in children and adolescent of Qazvin, Iran. Malays J Med Sci 2015;22:32-9.
29. Tan WL, Asahar SF, Harun NL. Insulin therapy refusal among type II diabetes mellitus patients in Kubang Pasu district, the state

of Kedah, Malaysia. Singapore Med J 2015;56:224-7.

30. Lee KP. Psycholosocial factors associated with psychological insulin resistance in primary care patients in Hong Kong. J Clin Sranslat Endocrinol 2015;2:157-62.

31. Stuckey HL, Polonsky W, Fisher L, Hessler DM, Snoek FJ, Tang TS, *et al*. Key factors for overcoming psychological insulin resistance

an examination of a large international sample through content analysis.. Diabetes 2018; 67(Supplement 1).

32. Pichon-Riviere A, Irazola V, Beratarrechea A, Alcaraz A, Carrara C. Satisfaction with treatment in type 2 diabetes patients requiring insulin treatment in Buenos Aires, Argentina. Health Outcomes Res Med 2012;3:e231-7.