RESEARCH ARTICLE

Psychological insulin resistance in type 2 diabetes patients: A cross-sectional study at a tertiary care hospital in Islamabad, Pakistan

Mohammad Ali Arif[1], Fibhaa Syed[2], Ayesha Javed[3]

Abstract

Objective: To assess psychological insulin resistance, and to identify associated factors among type 2 diabetes patients.

Methods: The cross-sectional study was conducted at the Pakistan Institute of Medical Sciences, Islamabad, Pakistan, between August 2023 and January 2024, and comprised type 2 diabetes patients. Apart from routine demographic and clinical data, Insulin Treatment Appraisal Scale scores were collected to evaluate the participants' attitudes towards insulin therapy. Data were analysed using SPSS 25.

Results: Of the 397 patients with mean age 47.22±15.04 years, 201(50.6) were females and 196(49.4) were males. The mean Insulin Treatment Appraisal Scale score was 34.58±7.75, indicating a moderately resistant attitude towards insulin therapy. Concerns about insulin use were prevalent, with 136(34.3%) participants agreeing that insulin initiation signified a failure in managing diabetes through diet and tablets, and 148(37.3%) having a fear of needles. The Insulin Treatment Appraisal Scale score had significant associations with marital status, monthly income, education level and certain comorbidities ($p<0.05$).

Conclusion: The level of psychological insulin resistance was found to be considerable among type 2 diabetes patients, emphasising the need for targetted patient education.

Keywords: Type 2 diabetes mellitus, Psychological insulin resistance, Insulin Treatment Appraisal Scale, Diabetes management. (JPMA 76: 160; 2026) **DOI: https://doi.org/10.47391/JPMA.22269**

Introduction

Diabetes mellitus (DM) presents a significant 21st-century challenge, with global prevalence reaching alarming proportions and having profound implications for human health. According to the International Diabetic Federation (IDF) Atlas 2025, an estimated 589 million people worldwide live with diabetes. This renders DM to be the fastest-growing health emergency of modern times.[1] Alarmingly, four in every five diabetics, with a staggering 81% of these cases concentrated in low- and middle-income countries (LMICs), such as Pakistan. The Middle East and North Africa (MENA) region, including Pakistan, grapples with the highest regional prevalence of DM at 19.9%. In 2025, the IDF reported that Pakistan had the highest comparative diabetes prevalence rate at 31.4%, surpassing Marshall Islands (25.7%), and Kuwait (25.6%).2

Effective management of type 2 DM (T2DM) relies heavily on lifestyle interventions, including regular physical activity, healthy dietary practices, maintaining optimal body weight, and smoking cessation.[3] Stopping smoking not only reduces the risk of developing T2DM, but also improves diabetes management, leading to better overall health outcomes. Therefore, smoking cessation is crucial for both the prevention and effective management of T2DM.

When lifestyle changes prove insufficient, oral medications are initiated. In progressive and heterogeneous T2DM, a combination of defects in insulin secretion and action emerges, necessitating insulin therapy for many patients.[4] The American Diabetes Association (ADA) recommends initiating insulin therapy, alone or in combination with other agents, when glycated haemoglobin (HbA1c) is >10% or blood glucose levels exceed 300mg/dl.[5] However, healthcare practitioners frequently encounter staunch resistance to insulin initiation despite clinical indications.[6]

The term Psychological Insulin Resistance (PIR), coined in 1994, encapsulates the barriers hindering the initiation of insulin therapy and adherence to prescribed treatment. PIR involves various psychological factors, such as fear of needles, pain, anxiety, concerns about poorly-controlled diabetes, social stigma, adherence to a rigid lifestyle, and increased dependence on healthcare providers.[7] Despite recognising the need for insulin therapy, research indicates that insulin therapy refusal rates among T2DM patients range from 24.4% to 38%.[8-10]

In Pakistan, there is a notable lack of data on the extent of PIR, and many existing studies have not utilised standardised and validated tools. A local study in Islamabad

[1,2]Department of Medicine, Shaheed Zulfiqar Ali Bhutto Medical University, Islamabad, Pakistan; [3]Department of General Medicine, Pakistan Institute of Medical Sciences, Teaching Hospital of Shaheed Zulfiqar Ali Bhutto Medical University, Islamabad, Pakistan.

Correspondence: Fibhaa Syed. e-mail: drfibhasyed@szabmu.edu.pk

ORCID ID: 0000-0002-9053-8407

Submission complete: 29-10-2024 **1st Revision received:** 28-02-2025

Acceptance: 17-09-2025 **Last Revision received:** 16-09-2025

using a validated questionnaire reported that a significant number of participants (n=128) were unwilling to initiate insulin therapy.[11] Additionally, over 65% of patients in another study conducted in Rawalpindi showed reluctance to start insulin therapy.[12]

The current study was planned to determine the prevalence of PIR among T2DM patients, and to identify associated factors.

Subjects and Methods

The cross-sectional study was conducted at the Pakistan Institute of Medical Sciences (PIMS), which is a teaching hospital affiliated with Shaheed Zulfiqar Ali Bhutto Medical University, Islamabad, Pakistan, between August 2023 and January 2024. After approval from the institutional ethics review board, the sample size was calculated using the RaoSoft online calculator for a single proportion.[13] Based on a previous local study by Ali et al. that reported a 37% prevalence of insulin reluctance[14] and using a margin of error of 5% and a 95% confidence level, the minimum required sample size was 359. To account for potential non-response, we aimed to recruit a larger sample of 397 participants. The sample was raised using consecutive sampling technique. Informed consent was obtained from all the participants.

Those included were both male and female patients aged 18 years or older diagnosed with T2DM, with a diagnosis duration of ≥1 year, and who were insulin-naïve, currently on insulin, or had a history of insulin use, and were capable of completing the Insulin Treatment Appraisal Scale (ITAS). Patients with type 1 DM or gestational diabetes, those with end-stage organ failure or under palliative care, those with cognitive impairment, severe psychiatric conditions, or language barriers preventing valid completion of the ITAS were excluded.

Demographic factors, including age, gender, marital status, literacy and monthly income, were noted. Additionally, T2DM-related factors, such as the presence of complications, comorbidities, like hypertension (HTN), chronic kidney disease (CKD), ischemic heart disease (IHD), asthma and chronic liver disease (CLD), were also noted. The participants' insulin usage history was a crucial variable, including whether they were insulin-naïve, currently using insulin, or had used it before.

The dependent variable was PIR, which was evaluated using the validated Insulin Treatment Appraisal Scale (ITAS), which comprises 20 items.[15] Total scores for each participant were determined by employing a Likert scale where a rating of 1 represented "Strongly Disagree" and a rating of 5 denoted "Strongly Agree". The positive and negative subscale scores were calculated by summing up the scores of the four positive and 16 negative statements, respectively. The total possible score ranged from 0 to 80, with a higher score indicating a more negative appraisal of insulin.

Data was analysed using SPSS 25. Data was expressed as mean±standard deviation or as frequencies and percentages, as appropriate. To examine the association between participants' demographic and clinical profiles with ITAS scores, independent samples t-tests and one-way analysis of variance (ANOVA) were used for normally distributed variables, whereas the Mann-Whitney U test was applied for non-normally distributed variables. $P<0.05$ was considered statistically significant.

Results

Of the 397 patients with mean age 47.22±15.04 years, 201(50.6) were females and 196(49.4) were males. The mean T2DM duration was 7.90±6.90 years. DM-related complications included neuropathy 249(62.7%), nephropathy 101(25.4%) and retinopathy 104(26.2%). Comorbidities included HTN 258(65%) (Table 1).

The mean ITAS score was 34.58±7.75, indicating a moderately resistant attitude towards insulin therapy. Concerns about insulin use were prevalent, with 136(34.3%) participants agreeing that insulin initiation signified a failure in managing diabetes through diet and

Table-1: Demographic and clinical profile of the participants.

Variables	Mean±SD
Age (Years)	47.22±15.04
Duration of Diabetes Mellitus Type II (Years)	7.90±6.90
Glycosylated haemoglobin (%)	8.37±1.84
	n (%)
Gender	
Male	196(49.4)
Female	201(50.6)
Marital status	
Single	57(14.4)
Married	340(85.6)
Patients education	
Illiterate	109(27.5)
Primary	109(27.5)
Secondary	98(24.7)
Intermediate & above	81(20.4)
Monthly Income	
< 20,000 PKR	159(40.1)
20 to 40,000 PKR	133(33.5)
> 40,000 PKR	105(26.4)
Neuropathy	
Yes	249(62.7)
No	148(37.3)

Continued on next column .....

tablets, 148(37.3%) having a fear of needles, and 123(31%) agreeing that insulin signified a worsening of their diabetes. Despite such concerns, 183(46.1%) subjects believed insulin helped prevent diabetes complications, and 183(46.1%) agreed that insulin improved their health (Table 2).

The ITAS score had significant associations with marital status, monthly income, education level (Table 3) and comorbidities (p<0.05) except asthma and CLD (Table 4).

Table-1: *(Continued from previous column.)*

	n (%)
Nephropathy	
Yes	101(25.4)
No	296(74.6)
Retinopathy	
Yes	104(26.2)
No	293(73.8)
Peripheral arterial disease	
Yes	23(5.8)
No	374(94.2)
Cardiovascular	
Yes	64(16.1)
No	333(83.9)
Diabetic foot	
Yes	82(20.7)
No	315(79.3)
Hypertension	
Yes	258(65)
No	139(35)
Ischaemic heart disease	
Yes	88(22.2)
No	309(77.8)
Chronic kidney disease	
Yes	22(5.5)
No	375(94.5)
Asthma	
Yes	22(5.5)
No	375(94.5)
Chronic liver disease	
Yes	25(6.3)
No	372(93.7)
Family/friends using insulin	
Yes	233 (58.7)
No	164(41.3)
Aware of insulin side effects	
Yes	108(27.2)
No	289(72.8)
Patient characteristics	
Insulin naïve	102(25.7)
Currently on insulin	254(64)
Has taken insulin in the past	41(10.3)

SD: Standard deviation

Table-2: Perceptions and beliefs related to insulin therapy among individuals with diabetes.

Variables	n (%)
Taking insulin means I have failed to manage my diabetes with diet and tablets.	
Strongly Disagree	75(18.9)
Disagree	73(18.4)
Agree nor Disagree	73(18.4)
Agree	136(34.3)
Strongly Agree	40(10.1)
Taking insulin means my diabetes has become much worse.	
Strongly Disagree	26(6.5)
Disagree	101(25.4)
Agree nor Disagree	94(23.7)
Agree	123(31.0)
Strongly Agree	53(13.4)
^Taking insulin helps to prevent complications of diabetes?	
Strongly Disagree	66 (16.6)
Disagree	48(12.1)
Agree nor Disagree	79(19.9)
Agree	183(46.1)
Strongly Agree	21(5.3)
Taking insulin means other people see me as a sicker person.	
Strongly Disagree	39(9.8)
Disagree	105(26.4)
Agree nor Disagree	66(16.6)
Agree	150(37.8)
Strongly Agree	37(9.3)
Taking insulin makes life less flexible.	
Strongly Disagree	69(17.4)
Disagree	91(22.9)
Agree nor Disagree	94(23.7)
Agree	121(30.5)
Strongly Agree	22(5.5)
I am afraid of injecting myself with a needle.	
Strongly	
Disagree	34(8.6)
Disagree	106(26.7)
Agree nor Disagree	65(16.4)
Agree	148(37.3)
Strongly Agree	44(11.1)
Taking insulin increases the risk of low blood glucose levels (hypoglycaemia).	
Strongly Disagree	62(15.6)
Disagree	70(17.6)
Agree nor Disagree	111(28)
Agree	128(32.2)
Strongly Agree	26(6.5)
^Taking insulin helps to improve my health?	
Strongly Disagree	32(8.1)
Disagree	50(12.6)
Agree nor Disagree	88(22.2)
Agree	183(46.1)
Strongly Agree	44(11.1)
Insulin causes weight gain.	
Strongly Disagree	82(20.7)
Disagree	107(27)
Agree nor Disagree	112(28.2)
Agree	80(20.2)
Strongly Agree	16(4.0)

Continued on next column .....

Table-2: *(Continued from previous column.)*

Variables	n (%)
Does managing insulin injections take a lot of time and energy?	
Strongly Disagree	45(11.3)
Disagree	116(29.2)
Agree nor Disagree	81(20.4)
Agree	132(33.2)
Strongly Agree	23(5.8)
Taking insulin means I have to give up activities I enjoy.	
Strongly Disagree	69(17.4)
Disagree	108(27.2)
Agree nor Disagree	89(22.4)
Agree	113(28.5)
Strongly Agree	18(4.5)
Taking insulin means my health will deteriorate.	
Strongly Disagree	49(12.3)
Disagree	131(33)
Agree nor Disagree	88(22.2)
Agree	104(26.2)
Strongly Agree	25(6.3)
Injecting insulin is embarrassing?	
Strongly Disagree	88(22.2)
Disagree	131(33)
Agree nor Disagree	68(17.1)
Agree	84(21.2)
Strongly Agree	26(6.5)
Injecting insulin is painful?	
Strongly Disagree	37(9.3)
Disagree	91(22.9)
Agree nor Disagree	77(19.4)
Agree	156(39.3)
Strongly Agree	36(9.1)
It is difficult to inject the right amount of insulin correctly at the right time every day.	
Strongly Disagree	62(15.6)
Disagree	107(27.0)
Agree nor Disagree	86(21.7)
Agree	126(31.7)
Strongly Agree	16(4.0)
Taking insulin makes it more difficult to fulfil any responsibilities (at work/home).	
Strongly Disagree	47(11.8)
Disagree	114(28.7)
Agree nor Disagree	77(19.4)
Agree	138(34.8)
Strongly Agree	21(5.3)
^Taking insulin helps to maintain good control of blood glucose.	
Strongly Disagree	58(14.6)
Disagree	72(18.1)
Agree nor Disagree	67(16.9)
Agree	166(41.8)
Strongly Agree	34(8.6)
Being on insulin causes family and friends to be more concerned about me.	
Strongly Disagree	49(12.3)
Disagree	78(19.6)
Agree nor Disagree	71(17.9)
Agree	151(38.0)
Strongly Agree	48(12.09)

Continued on next column .....

Table-2: *(Continued from previous column.)*

Variables	n (%)
^Taking insulin helps to improve my energy level.	
Strongly Disagree	63(15.9)
Disagree	67(16.9)
Agree nor Disagree	107(27)
Agree	139(35)
Strongly Agree	21(5.3)
Taking insulin makes me more dependent on my physician.	
Strongly Disagree	54(13.6)
Disagree	68(17.1)
Agree nor Disagree	62(15.6)
Agree	169(42.6)
Strongly Agree	44(11.1)

^Positive items

Table-3: Association of demographic characteristics with Insulin Treatment Appraisal Scale (ITAS) scores.

Variables	ITAS score Mean±SD	*p*-value
Gender		
Male	34.38±7.848	0.611
Female	34.78±7.681	
Marital status		
Single	31.12±8.352	<0.01
Married	35.17±7.510	
Monthly Income		
< 20,000 PKR	36.62±7.424	<0.01
20 to 40,000 PKR	34.18±7.062	
> 40,000 PKR	32.03±8.301	
Education		
Illiterate	37.55±7.506	<0.01
Primary	34.53±7.026	
Secondary	33.49±7.465	
Intermediate & above	31.96±8.192	

SD: Standard deviation.

Discussion

In the current study, the mean ITAS score was 34.58±7.75, indicating a moderately resistant attitude towards insulin therapy. Nam et al. reported a higher mean ITAS score of 52.7,[16] highlighting variations in psychological perceptions across different populations. The current ITAS score aligns with findings from developed countries, such as Germany (48.0) and Denmark (55.5), emphasising the consistency of psychological attitudes towards insulin therapy globally.[17,18]

In the current study, a considerable portion of participants expressed concerns about insulin use, with 136(34.3%) agreeing that the initiation of insulin suggested a failure in managing their diabetes through diet and tablets. In a similar study, 61% participants attributed their inability to control diabetes to personal failure, while 40% believed that insulin usage would exacerbate their condition.[19]

Table-4: Association of clinical profile of the participants with Insulin Treatment Appraisal Scale (ITAS) score.

Variables		ITAS score Median(IQR)	Mann-Whitney U	*Z*-score	*p*-value
Complication of diabetes					
Neuropathy	Yes	36 (11)	17123.5	-1.12	0.264
	No	35 (12)			
Nephropathy	Yes	38 (9)	11428.5	-3.50	<0.001
	No	34 (10)			
Retinopathy	Yes	35 (11)	14197.5	-0.89	0.372
	No	35 (11)			
Peripheral arterial disease	Yes	41 (11)	3087.0	-2.26	0.024
	No	35 (11)			
Cardiovascular	Yes	37.5 (13)	9110.5	-1.81	0.071
	No	35 (11)			
Diabetic Foot	Yes	38 (10)	10405.5	-2.68	0.007
	No	35 (11)			
Comorbidities					
Hypertension	Yes	36 (11)	15396.0	-2.27	0.023
	No	33 (12)			
Ischaemic heart disease	Yes	38 (11)	11075.0	-2.62	0.009*
	No	35 (11)			
Chronic kidney disease	Yes	41 (9)	2800.5	-2.52	0.012
	No	35 (11)			
Asthma	Yes	34.5(11)	4018.5	-0.183	0.855
	No	35.5(11)			
Chronic liver disease	Yes	34 (9)	4038.5	-1.082	0.279
	No	36(11)			

IQR: Interquartile range

Peyrot et al. observed self-blame in 48% of their patients.[20] It is imperative to educate patients about the natural progression of diabetes, emphasising that beta-cell failure occurs over time in all patients, but at varying rates. Healthcare providers should also emphasise the potential need for insulin at any stage of the disease continuum.

Concerns about hypoglycaemia acting as a barrier to insulin therapy were identified in 128(32.2%) of the current participants. Gavin et al. reported that both patients and healthcare providers view hypoglycaemia as a primary driver of therapeutic inertia, with 75.5% of physicians reporting they would treat more aggressively without this concern.[21] In contrast, a study in Iran[22] reported a lower proportion, with only 5.4% of their participants fearing hypoglycaemia being associated with insulin use. The varying proportions across these studies suggest that the fear of hypoglycaemia may be influenced by actual or perceived experiences with insulin therapy, and may vary considerably. Nevertheless, addressing concerns about hypoglycaemia should be an integral component of patient education on the proper use of insulin.

The current study also uncovered a range of perspectives regarding insulin injection management, with a significant proportion expressing concerns about flexibility 121(30.5%). Approximately 148(37.3%) acknowledged having some level of fear of needles. Barriers to insulin initiation exist for both patients and healthcare providers, including concerns about patient capabilities and perceived risks.[23] Similarly, Alsaidan et al., reported occurrence of hypoglycaemia (31%), weight gain (26%), and the fear of needles (22%) were among the most common barriers during insulin administration.[24] The specifics of insulin therapy, including dosage determination, syringe and vial management, and adherence to specific administration schedules, can be overwhelming for some patients. Consequently, injection-related anxiety has emerged as one of the primary reasons for resistance to initiating insulin therapy.[20,25] While concerns about needles or injection pain are valid, it is crucial to emphasise during patient education that the ultrafine needles used in insulin therapy are associated with less discomfort.

Moreover, the current study also assessed perception regarding the negative effect of insulin on health, showing that 104(26.2%) participants agreed that initiating insulin may negatively affect their health. Additionally, 25(6.3%) strongly agreed with this notion. Similar perceptions were reported in another study,[25] where approximately 80% subjects perceived insulin as not providing significant benefits. Ali et al. identified several prevalent misconceptions, including the belief that insulin is more harmful, may cause organ damage and hypoglycaemia, is more expensive than oral medications, involves painful injections, and is difficult to store and handle during travel. A significant portion of the study population held multiple misconceptions, reflected in a negative perception score of 7.5.[14]

The current study noted no significant gender differences in ITAS scores, while married individuals tended to have higher scores than their single counterparts. Notably, participants with lower monthly income and education levels demonstrated higher ITAS scores, underscoring potential disparities in perceptions of insulin therapy. Participants with complications like nephropathy, peripheral artery disease (PAD) and diabetic foot had higher ITAS scores compared to the rest ($p<0.05$). The analysis of specific comorbidities, like HTN, IHD and CKD, demonstrated significant association with ITAS scores ($p<0.05$). However, Nam S et al.[16] found that women had more negative attitudes and reluctance towards insulin therapy compared to men.

The current study has limitations. The cross-sectional design hindered establishing causal relationships, emphasising the need for longitudinal investigations. The reliance on self-reported data introduced potential biases, and the study's single-centre nature may have limited the generalisability of the findings. Besides, the study did not delve into nuanced psychosocial factors contributing to insulin attitudes, and lacked an assessment of objective clinical outcomes related to insulin therapy. Future research should address these limitations to provide a more comprehensive understanding of PIR.

Conclusion

The level of PIR was found to be considerable among T2DM patients, emphasising the need for targeted patient education.

Acknowledgement: We are grateful to the Medical Affairs Department, Getz Pharma, for technical support and assistance in the publication process.

Disclaimer: None.

Conflict of Interest: None.

Source of Funding: None.

References

1. International Diabetes Federation. Annual Report 2023. [Online] [Cited 2024 July 22]. Available from: URL: https://www.diabetesatlas.org.
2. International Diabetes Federation. IDF Diabetes Atlas, 10th ed. Brussels, Belgium: 2021. [Online] [Cited 2024 May 10]. Available from: URL: https://www.diabetesatlas.org.
3. IDF Clinical Practice Recommendations for Managing Type 2 Diabetes in Primary Care. International Diabetes Federation; 2019. [Online] [Cited 2024 June 10]. Available from: URL: https://www.idf.org/e-library/guidelines/128-idf-clinical-practice-recommendations-formanaging-type-2-diabetes-in-primary-care.html.
4. Galicia-Garcia U, Benito-Vicente A, Jebari S, Larrea-Sebal A, Siddiqi H, Uribe KB, et al. Pathophysiology of type 2 diabetes mellitus. Int J Mol Sci. 2020;21:6275. doi:10.3390/ijms21176275.
5. Summary of Revisions: Standards of Medical Care in Diabetes-2020, ADA. [Online] [Cited 2024 July 12]. Diabetic Care. 2020 43(Suppl 1):S4–6. Available from: URL: https://care.diabetesjournals.org/content/43/Supplement_1/S4.
6. Younis H, Younis S, Ahmed S. Awareness regarding complications of type II diabetes mellitus among diabetics in Karachi, Pakistan. Int J Endorsing Health Sci Res. 2019;7:47-54. doi:10.29052/IJEHSR.v7.i1.2019.47-54
7. Jang YJ. Psychological insulin resistance: key factors and intervention. J Korean Diabetes. 2021;22:192-6. doi:10.4093/jkd.2021.22.3.192
8. Zaheer S, Fatima Zeb T, Ali Baloch A, Amin R, Amjad Z, Sheikh A. The multifactorial burden of type 2 diabetes mellitus: a study from clinical settings of University Hospital, Karachi, Pakistan. Int J Endorsing Health Sci Res. 2020;8:275-87. doi:10.29052/IJEHSR.v8.i4.2020.275-287
9. Hussein A, Mostafa A, Areej A, Mona AM, Shimaa A, Najd AG, et al. The perceived barriers to insulin therapy among type 2 diabetic patients. Afr Health Sci. 2019;19:1638-46. doi:10.4314/ahs.v19i1.39
10. Davoudi Z, Chouhdari A, Mir M, Akbarian F. Attitude and compliance with the onset of insulin therapy in patients with type 2 diabetes. Shiraz E-Med J. 2020;21:e95408. doi:10.5812/semj.95408
11. Taherdoost H. Validity and reliability of the research instrument: how to test the validation of a questionnaire/survey in research. Int J Acad Res. 2016;5:2294-747. doi:10.2139/ssrn.3205040
12. Khan MM, Manzoor S, Kahlid MA, Tarrar MG, Aslam F, Ahmad SI. Factors responsible for delay in initiation of insulin treatment in type-2 diabetes mellitus patients with secondary failure of oral hypoglycemic agents. J Rawal Med Coll. 2016;20:244-50
13. RaoSoft Inc. Sample size calculator [Internet]. 2004 [cited 2025 Sep 11]. Available from: http://www.raosoft.com/samplesize.html
14. Ali U, Munir MW, Maqsood J, Jamil M, Rehman SS, Ansari AM. Reluctance of patients with diabetes mellitus to insulin therapy: psychological insulin resistance. PAFMJ. 2021;71:602-5
15. Snoek FJ, Skovlund SE, Pouwer F. Development and validation of the insulin treatment appraisal scale (ITAS) in patients with type 2 diabetes. Health Qual Life Outcomes. 2007;5:69. doi:10.1186/1477-7525-5-69
16. Nam S, Chesla C, Stotts NA, Kroon L, Janson SL. Factors associated with psychological insulin resistance in individuals with type 2 diabetes. Diabetes Care. 2010;33:1747-9. doi:10.2337/dc10-0099
17. Peyrot M, Rubin RR, Lauritzen T, Skovlund SE, Snoek FJ, Matthews DR, et al. Resistance to insulin therapy among patients and providers: results of the cross-national Diabetes Attitudes, Wishes, and Needs (DAWN) study. Diabetes Care. 2005;28:2673-9. doi:10.2337/diacare.28.11.2673
18. Mollema ED, Snoek FJ, Heine RJ, van der Ploeg HM. Phobia of self-injecting and self-testing in insulin-treated diabetes patients: opportunities for screening. Diabet Med. 2001;18:671-4. doi:10.1046/j.1464-5491.2001.00547.x
19. 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
20. Peyrot M, Rubin RR, Lauritzen T, Snoek FJ, Matthews DR, Skovlund SE, et al. Psychosocial problems and barriers to improved diabetes management: results of the cross-national Diabetes Attitudes, Wishes and Needs (DAWN) study. Diabet Med. 2005;22:1379-85. doi:10.1111/j.1464-5491.2005.01644.x
21. Gavin JR, Abaniel RM, Virdi NS. Therapeutic inertia and delays in insulin intensification in type 2 diabetes: a literature review. Diabetes Spectr. 2023;36:379-84. doi:10.2337/ds22-0084
22. Ghadiri-Anari A, Fazaelipoor Z, Mohammadi SM. Insulin refusal in Iranian patients with poorly controlled type 2 diabetes mellitus. Acta Med Iran. 2013;51:567-71
23. Forst T, Choudhary P, Schneider D, Linetzky B, Pozzilli P. A practical approach to the clinical challenges in initiation of basal insulin therapy in people with type 2 diabetes. Diabetes Metab Res Rev. 2021;37:e3418. doi:10.1002/dmrr.3418

24. Alsaidan AA, Alsaidan OA, Mallhi TH, Khan YH, Alzarea AI, Alanazi AS. Assessment of adherence to insulin injections among diabetic patients on basal-bolus regimen in primary and secondary healthcare centers in Al-Jouf region of Saudi Arabia: a descriptive analysis. J Clin Med. 2023;12:3474. doi:10.3390/jcm12103474

25. Liu C, De Roza J, Ooi CW, Mathew BK, Elya, Tang WE. Impact of patients' beliefs about insulin on acceptance and adherence to insulin therapy: a qualitative study in primary care. BMC Prim Care. 2022;23:15. doi:10.1186/s12875-022-01627-9

Author Contribution:

MAA: Design, data analysis, revision, editing, final approval and agreement to be accountable for all aspects of the work.
FS: Concept, design, data collection, drafting, final approval and agreement to be accountable for all aspects of the work.
AJ: Data collection, entry, interpretation, drafting final approval and agreement to be accountable for all aspects of the work.