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Original Article

Psychological Insulin Resistance and its Association with Glycemic Control among Patients with Diabetes Mellitus: A Cross-Sectional Study

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ABSTRACT

Background: Psychological insulin resistance (PIR) is a significant barrier to optimal glycemic control in patients with diabetes mellitus. PIR stems from misconceptions, fear of side effects, and social stigma, leading to reluctance in initiating or adhering to insulin therapy. This study assesses PIR among diabetic patients on insulin therapy and evaluates its correlation with glycemic control using the Insulin Treatment Appraisal Scale (ITAS).

Methods: A hospital-based cross-sectional study was conducted in the Department of General Medicine at PGIMER and Capital Hospital, Bhubaneswar. A total of 386 patients with Type 1 or Type 2 diabetes mellitus, on insulin therapy for more than six months, were included. The ITAS questionnaire was administered to evaluate patients' perceptions of insulin therapy. Glycemic control was assessed using HbA1c levels. Data analysis was performed using SPSS version 22, and Spearman correlation was used to assess the relationship between ITAS scores and HbA1c levels.

Results: The study population had a mean age of 53.7±9.9 years, with 62.4% males. The majority (49%) had been on insulin for 2– 5 years. PIR was evident in a substantial proportion of participants, with concerns regarding insulin-related stigma, lifestyle adjustments, fear of hypoglycemia, and weight gain. Correlation analysis revealed a statistically significant relationship between negative perceptions of insulin therapy and poor glycemic control (HbA1c >9.0%, p<0.05).

Conclusion: Psychological barriers have a significant impact on insulin adherence and glycemic outcomes. Addressing misconceptions through patient education and counseling is crucial for improving insulin acceptance and optimizing diabetes management.

Key-words: Psychological insulin resistance, Diabetes mellitus, Insulin adherence, Glycemic control, HbA1c, Insulin Treatment Appraisal Scale (ITAS), Patient perceptions, Insulin therapy barriers

INTRODUCTION

Diabetes mellitus (DM) is a significant global health concern, currently affecting approximately 415 million individuals worldwide. This number is projected to rise to 642 million by 2040 ^[1].

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The underlying pathology involves impaired insulin secretion, resistance to insulin action, or a combination of both ^[2]. Many patients are diagnosed based on symptoms such as polyuria, polydipsia, and unexplained weight loss. However, in numerous cases, diabetesrelated complications serve as the first indicator of the disease ^[3].

The diagnosis of diabetes is primarily based on the detection of elevated blood glucose levels [4]. International guidelines emphasize the early initiation of insulin therapy to optimize glycemic control and reduce complications ^[5]. Despite its well-documented efficacy, various factors contribute to delays in initiating insulin among insulin-naïve patients and poor adherence among those already on insulin therapy ^[6]. These barriers often stem from misconceptions and negative perceptions about insulin use among diabetic individuals ^[7].

Psychological insulin resistance refers to the reluctance or refusal to initiate or adhere to insulin therapy due to negative beliefs and attitudes. This multifactorial phenomenon is influenced by factors such as inadequate knowledge, misconceptions about insulin, fear of side effects, lifestyle adjustments, social stigma, and attitudinal barriers ^[8]. The Insulin Treatment Appraisal Scale (ITAS) is a validated 20-item questionnaire designed to assess both positive and negative perceptions of insulin therapy ^[9].

MATERIALS AND METHODS

Study Design, Setting, and Participants– This was a hospital-based, cross-sectional study conducted over a period of six months in the Department of General Medicine at PGIMER and Capital Hospital, Bhubaneswar, Odisha—a tertiary care teaching hospital. A total of 386 patients with Type 1 or Type 2 diabetes mellitus, who had been on insulin therapy for more than six months were included.

Inclusion criteria

- Patients aged 18 years and above
- Diagnosed with Type 1 or Type 2 diabetes mellitus
- On insulin therapy for more than six months

Exclusion criteria

- Patients below 18 years of age
- On insulin therapy for less than six months
- Patients with significant cognitive impairment

Sampling and Sample Size- The estimated sample size was 316, calculated using OpenEpi software with a prevalence of 28.2% based on previous studies. A total of 386 participants were recruited to enhance statistical power.

Data Collection Procedure- Eligible patients from the outpatient department and medical wards were recruited. A detailed clinical history related to diabetes mellitus was recorded. Participants completed the Insulin Treatment Appraisal Scale (ITAS) questionnaire to assess psychological perceptions of insulin therapy.

Biochemical Assessment- A 3 ml venous blood sample was collected from each participant for the measurement of HbA1c levels to assess glycemic control.

Statistical Analysis- Data entry and analysis were performed using SPSS version 22. The Spearman correlation test was used to evaluate the relationship between ITAS scores and HbA1c levels. A p-value of less than 0.05 was considered statistically significant.

RESULTS

The study included 386 participants aged between 23 to 79 years, with a mean age of 53.7±9.9 years. Table 1 presents the demographic details of the 386 study participants. The mean age of the participants was 53.7±9.9 years, ranging from 23 to 79 years. The study population consisted of 241 males (62.4%) and 145 females (37.6%), indicating a male predominance. Regarding body mass index (BMI), 45.6% of participants were overweight (BMI>25), while 32.1% had a normal BMI (18.5-25), and 22.3% were underweight (BMI<18.5). In terms of socioeconomic status, most participants belonged to the lower socioeconomic group (62.2%), followed by the middle class (26.2%) and the uppermiddle class (11.7%). Education levels among participants varied, with 67.9% having completed school education, 21.2% being illiterate, and 10.9% being graduates.

Table 2 summarizes the duration of diabetes and insulin therapy among the study population. Most participants (44.3%) had diabetes for 2-5 years, followed by 28.0% for 6-10 years. Only 7.5% had diabetes for less than a year, while 20.2% had the disease for more than 11 years. Regarding insulin therapy duration, 49.0% had been on insulin for 2-5 years, while 27.5% had started insulin within the last year. A smaller proportion (4.7%) had been on insulin for over 10 years.

Table 3 highlights the insulin dosage and glycemic control (HbA1C levels) among the study population. The most prescribed insulin dose was 20-50 units (53.4%), followed by <20 units (28.2%) and >50 units (18.4%). Glycemic control, as measured by HbA1C levels, revealed that 47.4% of participants had HbA1C values between 9.0-13, indicating poor glycemic control. Only 7.0% had well-controlled diabetes (HbA1C 5.5-6.8), while 10.4% had very high HbA1C values (>13).

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Variables	Categories	Number (n=386)	Percentage (%)
Condor	Male	241	62.4
Gender	Female	145	37.6
	<18.5	86	22.3
BMI	18.5-25	124	32.1
	>25	176	45.6
Socio	Upper-middle	45	11.7
-0100C	Middle	101	26.2
	Lower	240	62.2
	Illiterate	82	21.2
Education	School education	<18.5	67.9
	Graduate	42	10.9

Table 1: Demographic Characteristics of Study Participants

Table 2: Clinical Characteristics of Study Participants

Variables	Categories	Number (n=386)	Percentage (%)
	<1 year	29	7.5
Duration of Diabotos	2-5 years	171	44.3
Duration of Diabetes	6-10 years	108	28.0
	>11 years	78	20.2
	<1 year	106	27.5
Duration of Insulin	2-5 years	189	49.0
Therapy	6-10 years	73	18.9
	>10 years	18	4.7

Table 3: Insulin Dosage and Glycemic Control

Variables	Categories	Number (n=386)	Percentage (%)	
	<20 units	109	28.2	
Insulin Dosage	20-50 units	206	53.4	
	>50 units	71	18.4	
	Not available	39	10.1	
	5.5 - 6.8	27	7.0	
HbA1C Levels	Categories Nu <20 units	97	25.1	
	9.0 - 13	183	47.4	
	>13	40	10.4	

Table 4 presents the correlation coefficients (R values) and their significance levels for each ITAS question. Out of the 20 questions, 10 demonstrated a statistically significant correlation, indicating a meaningful association between the responses and the perceived attitudes toward insulin therapy. The correlation analysis between ITAS questions and response scores revealed that out of the 20 questions, 10 demonstrated a

statistically significant correlation, indicating a meaningful association between the responses and the perceived attitudes toward insulin therapy. The highest significant correlation was observed for question 19 (r=0.408, p<0.05), suggesting that respondents who believed insulin therapy enhances energy levels had stronger associations with positive perceptions of insulin use.

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ITAS Question	R values	p-value
1	0.17	Non-significant
2	0.20	Non-significant
3	0.24	Significant
4	0.32	Significant
5	0.38	Significant
6	0.07	Non-significant
7	0.12	Non-significant
8	0.33	Significant
9	0.14	Non-significant
10	0.33	Significant
11	0.05	Non-significant
12	0.30	Significant
13	0.28	Significant
14	0.32	Significant
15	0.20	Significant
16	0.27	Non-significant
17	0.25	Non-significant
18	0.06	Non-significant
19	0.40	Significant
20	0.36	Significant

Table 4: Correlation Between ITAS Questions and Response Scores

R value= Correlation coefficients

Table 5 summarizes the participant's responses to various statements regarding insulin therapy. A significant proportion of respondents associated insulin therapy with disease progression, as seen in responses to question 2, where 92% strongly disagreed that starting insulin therapy means diabetes has worsened. Concerns about insulin-related anxiety were evident, with 109 participants (strongly disagree) and 164 (disagree) expressing fear of self-injection (question 6). Many respondents believed that insulin use is associated with weight gain (question 9: 98 strongly disagree, 122 disagree), highlighting a common misconception. Public embarrassment was a notable concern (question 13: 78 strongly disagree, 145 disagree), indicating stigma around insulin administration in social settings. Insulin therapy was perceived as a constraint to flexibility in daily life, with responses to question 5 showing 119 disagree, 83 neutral, and 146 agree. Time management concerns were evident, with 188 agreeing and 44 strongly agreeing that insulin injections require significant effort (question 10).

Questions	Strongly Disagree (%)	Disagree (%)	Neutral (%)	Agree (%)	Strongly Agree (%)
Using insulin signifies an inability to control diabetes with diet and oral medication.	8	81	138	108	51
Starting insulin therapy indicates that my diabetes has significantly worsened.	92	3	72	101	118
Insulin usage helps in preventing diabetes- related complications.	0	29	178	121	58
Using insulin makes others perceive me as being more ill.	4	94	82	174	32

Table 5: Distribution of Responses to ITAS Questions

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Insulin therapy reduces flexibility in daily life.	11	119	83	146	27
I feel anxious about injecting myself with a	109	164	46	54	13
needle.					
Insulin use increases the likelihood of	16	172	72	99	27
experiencing hypoglycemia.					
Insulin therapy contributes to better overall	6	54	109	183	34
health.					
Using insulin leads to weight gain.	98	122	95	62	9
Managing insulin injections is time-consuming	1	36	117	188	44
and requires significant effort.					
Insulin therapy restricts participation in	13	101	85	136	51
enjoyable activities.					
Using insulin negatively impacts my health	119	178	76	9	4
over time.					
Injecting insulin in public is an embarrassing	78	145	58	92	13
experience.					
Insulin injections cause pain.	94	124	45	99	24
Accurately timing and dosing insulin injections	13	93	89	154	37
is challenging.					
Insulin therapy makes it harder to fulfill daily	12	77	103	149	45
responsibilities.					
Using insulin contributes to better blood	0	31	126	215	14
sugar control.					
Being on insulin makes family and friends	2	74	88	187	35
more concerned about my health.					
Insulin therapy enhances my energy levels.	1	48	101	189	47
Insulin use increases my dependence on my	23	24	72	166	101
healthcare provider.					

The bar graph illustrates the proportion of patients categorized by their daily insulin dosage in units. The highest proportion of patients (52%) falls within the 20–50 units range, indicating that this dosage is the most

administered among the study population. A smaller proportion (28%) of patients receive less than 20 units of insulin per day, while the lowest proportion (20%) requires more than 50 units daily.



Fig. 1: Insulin dosage among study participants

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DISCUSSION

Our study provides a comprehensive assessment of PIR among patients with diabetes mellitus undergoing insulin therapy. The findings highlight the significant role of patient perceptions in influencing insulin adherence and glycemic control.

The study population predominantly comprised middleaged individuals (mean age: 53.7 years), with a male preponderance (62.4%). A significant proportion of (62.2%) belonged participants to the lower socioeconomic group, a factor that could contribute to limited access to healthcare resources and diabetes education. Education levels varied. with most participants (67.9%) having completed school education, 21.2% were illiterate. Lower educational while attainment has been associated with misconceptions about insulin therapy, which may impact treatment adherence [10].

Analysis of the ITAS questionnaire responses revealed a diverse spectrum of attitudes toward insulin therapy. While some participants recognized its benefits in improving glycemic control and overall health, a considerable proportion harbored negative perceptions, particularly regarding disease progression, lifestyle restrictions, and social stigma.

A common misconception observed was that starting insulin therapy indicates worsening diabetes, with 92% of participants strongly disagreeing with this notion. However, 81 participants either agreed or strongly agreed with this belief, reflecting persistent negative perceptions that may hinder insulin acceptance. Concerns about self-injection were prevalent, with a significant number of respondents expressing anxiety about needle use. This aligns with previous studies that identified injection fear as a major barrier to insulin initiation.

The belief that insulin therapy reduces flexibility in daily life was another notable concern, with 146 participants agreeing with this statement. Additionally, many respondents believed that insulin use is associated with weight gain, a misconception that could further contribute to treatment reluctance. The social stigma surrounding insulin therapy was evident, with 145 respondents expressing concern about being perceived as sicker due to insulin use ^[11].

The correlation analysis between ITAS responses and HbA1c levels demonstrated a significant association

between psychological barriers and glycemic outcomes. Ten out of twenty ITAS questions showed statistically significant correlations with insulin-related perceptions. The strongest correlation was observed for question 19 (r=0.408, p<0.05), indicating that individuals who believed insulin enhances energy levels had more positive perceptions of insulin use. Similarly, question 8 (r=0.338, p<0.05) highlighted the belief that insulin contributes to better health outcomes, reinforcing the importance of addressing educational gaps in diabetes management.

Conversely, negative perceptions such as insulin reducing daily life flexibility (r=0.385, p<0.05) and increasing the time burden of diabetes management (r=0.332, p<0.05) were associated with poor adherence. The persistence of these negative beliefs underscores the necessity for targeted patient education strategies to address misinformation and promote insulin acceptance.

The study underscores the need for comprehensive diabetes education programs that address both the medical and psychological aspects of insulin therapy. Interventions should focus on dispelling misconceptions regarding insulin use, reducing fear of injections, and emphasizing the long-term benefits of insulin therapy in preventing diabetes-related complications ^[12,13]. Healthcare providers should adopt a patient-centered approach, incorporating behavioral counseling and motivational interviewing techniques to enhance insulin adherence ^[6,14].

Additionally, efforts should be made to integrate culturally sensitive educational materials tailored to different socioeconomic and literacy levels. Addressing social stigma through community-based awareness programs may also improve patient attitudes toward insulin therapy ^[8,12,15].

One of the strengths of this study is its large sample size (n=386), which enhances the generalizability of the findings. The use of the validated ITAS questionnaire allows for a standardized assessment of psychological perceptions toward insulin therapy. However, certain limitations should be acknowledged. The study was conducted in a single tertiary care hospital, which may limit the applicability of findings to broader populations. Additionally, self-reported questionnaire responses may be subject to response bias, as participants might provide socially desirable answers.

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CONCLUSIONS

The findings of this study highlight the significant impact of psychological insulin resistance on treatment adherence and glycemic control in diabetic patients. While some participants recognized the benefits of insulin therapy, negative perceptions regarding disease progression, lifestyle restrictions, and social stigma were prevalent. The significant correlations between ITAS scores and HbA1c levels reinforce the need for targeted educational and behavioral interventions to improve insulin acceptance. Future research should explore the effectiveness of structured educational programs and psychological counseling in reducing insulin resistance and enhancing diabetes management outcomes.

CONTRIBUTION OF AUTHORS

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