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Original Article

Psychological Insulin Resistance in Patients Diagnosed with Type 2 Diabetes Mellitus: A Cross Sectional Study at a Rural Setting in Sri Lanka

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Abstract

Introduction:
Timely insulin initiation in long-standing type 2 diabetes (T2DM) is vital to prevent complications, yet reluctance to start it, known as psychological insulin resistance (PIR) remains common. Evidence on PIR in South Asia is limited. We aimed to determine the prevalence, determinants and latent constructs of PIR among patients with T2DM in rural Sri Lanka.

Methods:
A cross-sectional study was conducted among adults (aged >18 years) with T2DM attending the endocrinology clinic, District General Hospital, Hambantota. PIR and psychological status were assessed using the 20-item Insulin Treatment Appraisal Scale (ITAS) and General Health Questionnaire-12, respectively. PIR was defined as a total score greater than the sample median. Exploratory factor analysis (EFA) was performed to identify the latent constructs underlying ITAS. Associations between PIR and sociodemographic and clinical characteristics were assessed using multiple logistic regression, odds ratios with 95% confidence intervals are presented.

Results:
Data of 311 participants (mean age 54.7 years; SD±10.4, female 63.7%, median duration of T2DM four years; IQR3-8) were included in the analysis. Over one-third (34.4%) had only primary education, over 60% had low income (<50,000LKR/month), and 59.5% were unemployed. The prevalence of PIR was 76.8%(n 239) and psychological distress was 6.4%(n 20). EFA revealed five latent factors within PIR; loss of autonomy with insulin use (35.4%), negative impact of injecting insulin (28.7%), emotional discomfort with injecting insulin (35.9%), positive impact of insulin (38.3%), and personal failure in diabetes management (66.4%). Increasing age (OR=1.05;1.01-1.08), being insulin naïve (OR 1.99;1.11-3.97), and having middle level of family income comparted to lowest level (OR–2.64;1.12-6.17) increased the risk of PIR, while longer duration of diabetes had lower risk of PIR (OR=0.92;0.87-0.97).

Conclusion:
The prevalence of PIR in Sri Lankan rural settings is high, posing a substantial barrier to effective diabetes management. This resistance is particularly pronounced among those who are older, insulin-naive, and from middle-income families.

Keywords: Insulin, Psychological insulin resistance, Rural setting, Type-2 diabetes mellitus

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Introduction

Type 2 Diabetes Mellitus (T2DM) is characterized by chronic hyperglycemia resulting from persistent insulin resistance at multiple organs and inadequate insulin secretion. Many patients with long-standing T2DM can eventually end up requiring insulin treatment. Timely initiation of insulin therapy is essential to reduce diabetes-related complications, improves the cardiovascular profile, lowers insulin resistance, reverses glucotoxicity and helps preserve β-cell function for a longer duration than oral hypoglycaemic agents alone. Despite the known benefits of timely insulin initiation, insulin is not initiated at the appropriate time in a considerable proportion of patients who require insulin [1]. Causes for this delay, according to existing data, are attributed to patient and physician-related causes. Most patients diagnosed with T2DM tend to refuse insulin and bargain with the physician to delay the commencement of insulin [2]. This unwillingness to start insulin treatment has been described as 'psychological insulin resistance' (PIR) [3,4].

Several attempts have been made to evaluate the multifactorial entity of PIR and to identify the contributors to PIR. Concerning the point that the transition to insulin treatment was due to poor self-management, misbelief that insulin is used in the later stage of the disease, and fear of being stigmatized [5], concerning the unknown effects of insulin on their current and future health [2,6], unwillingness to take on new responsibilities, and erroneous beliefs about insulin [6] were the patient related contributors to PIR. Several physician-related barriers to initiating insulin treatment have been discussed, such as the fear of hypoglycemia [7], fear of inadequate education among patients, insufficient consultation times, inadequate appointment frequency, and unavailability of HbA1C results [8]. The socio-demographic factors associated PIR have shown mixed results where Polonsky et al. [2] reported no significant differences in psychological resistance to insulin across sex, age and time of diagnosis, while other studies presented differences across sex [9], and depressive symptoms [10]. Proper patient education, demonstrations, and practical and emotional support from others reduce PIR [5,10]. Hence, the reasons for resistance to initiation of insulin therapy must be understood in order to explore the means of reversing the trend of delayed insulin initiation. Community-specific intervention studies should then be carried out as a priority to reduce the negative impact on the management of patients with T2DM. Even though PIR has been studied vastly internationally, the data on local settings is minimal. The only research conducted in Sri Lanka was from an urban area [11], and the results would be significantly different from a rural setting. Therefore, we aimed to evaluate the PIR and associated factors in patients diagnosed with T2DM in a selected diabetes practice in rural Sri Lanka.

Methods

Study setting & sampling:
This cross-sectional study was conducted at the endocrinology clinic at District General Hospital, Hambantota, from July to September in 2022. Patients diagnosed with T2DM for over two years were recruited for the study. The sample size was calculated using the following equation;

$$n = \frac{z^2.\ p(1-p)}{d^2}$$

where p (the estimated prevalence) assumed to be 0.5 [12], d (margin of error) was 0.05 and z equals 1.96. The calculated sample size was 384. Thirty patients were selected randomly in each day and continued till the required number was achieved. Patients residing in urban council areas were excluded.

Data collection:
Two medical officers with prior research experience collected data in the clinic without disrupting the routine clinic work. Healthcare assistants who were working at the clinic assisted the data collectors. An assistant was provided with a set of 30 randomly generated numbers and instructed to identify patients in the queue whose assigned daily que numbers matched these. The selected patients were then specifically referred to the data-collecting doctor for inclusion in the study. Data were collected using a structured, interviewer administered questionnaire. Mental health status was assessed using the General Health Questionnaire–12 (GHQ-12), for which a validated Sinhala version [13] was utilized. The GHQ-12 was scored using the binary method (0-0-1-1), yielding a total score ranging from 0 to 12. In this method, a score of 0 is assigned to non-stress-indicating responses, the first two options (e.g., "not at all" and "no more than usual") and a score of 1 to stress-indicating responses, the latter two options (e.g., "rather more than usual" and "much more than usual") for each item. Higher scores reflect greater levels of psychological distress. According to the Sri Lankan validation study of the GHQ-12, the optimal cut-off point was identified as "1/2," indicating a threshold score of ≥2 [13]. Accordingly, a score of 2 or more was used in our study to classify individuals as experiencing psychological distress. Psychological insulin resistance was assessed using the Insulin Treatment Appraisal Scale (ITAS), a 20-item instrument that had been pretested [14]. Responses to each ITAS item were recorded on a 5-point Likert scale ranging from "strongly disagree" to "strongly agree."

Data Analysis:

Descriptive statistics:
Data were analyzed with SAS software. The continuous data were tested for normality using the Shapiro-Wilk test. Descriptive statistics are presented as means with standard deviations, medians with interquartile ranges (IQR) and proportions relevantly.

Assessing the PIR:
The positively worded items of the ITAS were reversed for their scoring. The total ITAS score is the summation of the reversed positively worded four items' (4–20) and negatively worded 16 items' (16–80) scores, resulting in a total score between 20 and 100. The original developers of the ITAS did not propose a strict cut-off [14]. Hence, PIR was defined as a total score greater than the sample median, in accordance with a rule-of-thumb approach. For the purpose of describing the distribution of responses to each statement, the categories 'strongly agree' and 'agree' were combined and classified as agreement, while 'strongly disagree' and 'disagree' were combined and classified as disagreement. Associations between PIR and sociodemographic and clinical characteristics were assessed using multiple logistic regression, odds ratios with 95% confidence intervals are presented.

Latent factors in ITAS:
Normality was tested for each item of the ITAS separately, and the majority were positively skewed. Logarithmic transformation was applied and exploratory factor analysis (EFA) was performed using the principal factor method and oblimin (oblique) rotation. Oblique rotation allowed for correlated factors, as we might

expect with components of ITAS, which are known to be correlated. Kaiser Meyer Olkin (KMO) measure of sampling adequacy and Bartlett's Test of Sphericity were performed to check the suitability of data for factor analysis. The scree plot of eigenvalues was used to determine the optimal number of factors. Then, a confirmatory factor analysis (CFA) model was employed to validate the results. The goodness-of-fit indices were checked to evaluate the fitted model. Cronbach alpha was used to assess the internal consistency of items within each factor. Average percentages of disagree, uncertain, and agree for items representing a particular factor were computed to present the distribution of each factor.

Results

Socio-demographic characteristics:

The final analysis of this study included data from 311 patients attending the diabetes clinic of District General Hospital Hambanthota with 80.9% of response rate. The mean age of the participants was 54.7 years (+10.4), ranging between 27 to 91 years. Socio-demographic characteristics of the participants are presented in Table 1.

Table 1: Distribution of Socio-demographic characteristics (frequency,%)

Characteristic	Frequency	Percentage
Sex		
Males	113	36.3
Females	198	63.7
Education		
Primary	107	34.4
Secondary	125	40.2
Tertiary	79	25.4
Occupation		
Unemployed	185	59.5
Clerical and technical workers	51	16.4
Retired	9	2.9
Businessman	27	8.7
Non-skilled workers	39	12.5
Monthly family income		
>100,000LKR (>$279)	23	7.4
50,000-100,000LKR ($140-279)	94	30.2
<50,000LKR (<$140)	194	62.4
Current Smokers	25	8.0
Current Alcohol consumers	59	19.0

Clinical characteristics

The median duration of T2DM among the participants was four years (IQR 3-8). Their disease duration ranged from two years to 36 years. Only 24.4% (n=76) of the participants were treated with insulin. Oral hypoglycemic agents have been prescribed for all participants. Lifestyle modifications have been recommended for 73% (n=227) of participants. Frequencies of perceived compliance for the clinic follow-up, dietary and exercise recommendations, and intake of medications are shown in Figure 1. The mean glycated haemoglobin (HbA1c) was 7.1% (+1.3). Less than one tenth (6.4%, n=20) were in psychological distress as measured by GHQ score.

Psychological insulin resistance

The prevalence of PIR was 76.8% (n=239). Associations of socio-demographic and clinical characteristics with PIR are presented as adjusted odds ratios and 95% CI in table 2.

Table 2: Associations of socio-demographic and clinical characteristics with PIR (adjusted OR and 95% CI)

Characteristic	Odds Ratio	95% Confidence Interval
Sex		
Males	1.18	0.57-2.42
Females	Reference	
Age	1.05 [a]	1.01-1.08
Diabetes duration	0.92 [a]	0.87-0.97
Psychological distress	1.11	0.35-3.45
HbA1C	0.95	0.75-1.19
Insulin naïve patients	1.99 [a]	1.11-3.97
Monthly family income		
>100,000LKR (>$279)	0.64	0.19-2.11
50,000-100,000LKR ($140-279)	2.64 [a]	1.12-6.17
<50,000LKR (<$140)	Reference	
Education		
Tertiary	2.25	0.81-6.31
Secondary	0.98	0.47-2.06
Primary	Reference	

[a] Significant association

Kaiser's Measure of sampling adequacy for the EFA was 0.84. In general, KMO>0.7 is acceptable. We performed the Bartlet's test and results revealed that factor analysis is appropriate for this data set (Chi-Square=2891.8, p<0.001). Exploratory factor analysis played an integral role by revealing five clear factors, latent dimensions of ITAS, which manifested the PIR with eigenvalues exceeding 1.00 and a distinct elbow on a Scree plot (Figure 2). The first five eigenvalues were 6.62, 2.29, 1.61, 1.34, and 1.2.

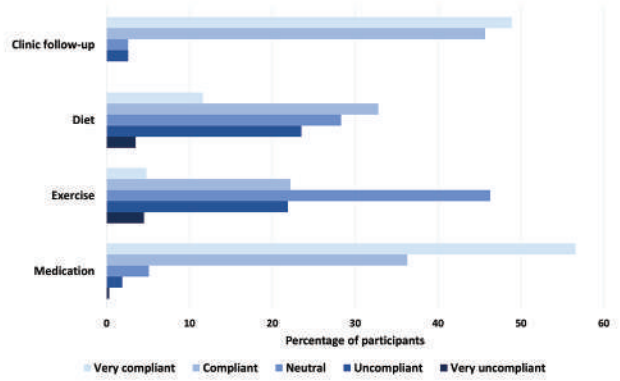

Figure 1: Distribution of perceived adherence for the clinic follow-up, dietary and exercise recommendations, and intake of medications

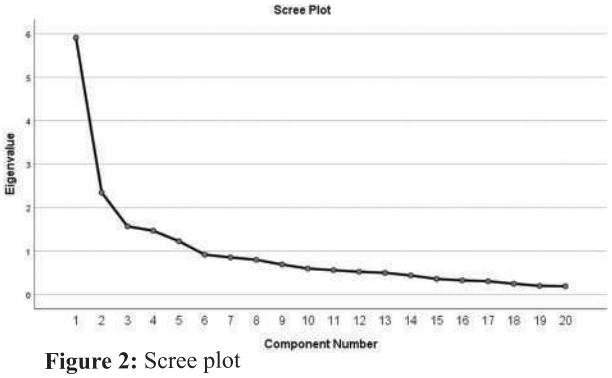

Figure 2: Scree plot

To approximate simple factor structure as closely as possible, we retained items only if they had oblique factor loadings >0.39 as a criterion used in the original study in which the instrument was developed [13]. The five-factor solution was then tested in confirmatory factor analysis and displayed better-fit indices than the two-factor, three-factor, and four-factor models. The goodness-of-fit indices are presented in Table 3. The internal consistency, as measured by Cronbach's alpha, was 0.751 for Factor 1, 0.828 for Factor 2, 0.614 for Factor 3, 0.675 for Factor 4, and 0.857 for Factor 5, indicating acceptable to high reliability across most factors.

Table 3: Goodness of fit indices

The goodness of fit test	5 factors	4 factors	3 factors	2 factors
Chi-square	670.95	944.46	1044.42	1139.49
df	160	164	167	169
p-Chi-square	<0.0001	<0.0001	<0.0001	<0.0001
AGFI	0.76	0.7	0.69	0.67
CF1	0.82	0.72	0.68	0.65
SRMR	0.08	0.1	0.12	0.1
RMSEA	0.1	0.12	0.13	0.14
RMSEA LL	0.09	0.12	0.12	0.13
RMSEA UL	0.11	0.13	0.14	0.14
Probability of close fit	<0.0001	<0.0001	<0.0001	<0.0001
AIC	770.95	1036.46	1130.46	1221.48

df: Degrees of freedom, p-chi- square: p-value of the chi square test, AGFI: adjusted goodness-of-fit index, CFI: comparative fit index, SRMR: standardized root mean square error index, RMSEA: root mean square error of approximation, RMSEA LL: root mean square error of lower limit, RMSEA UL: root mean square error of upper limit, AIC: Akaike information criterion

These five factors corresponded to the following latent dimensions; factor 1- loss of autonomy with insulin use, factor 2- negative impact of injecting insulin, factor 3- emotional discomfort with injecting insulin, factor 4- positive impact of insulin, and factor 5-personal failure in diabetes management. The factor loadings of each item of ITAS are mentioned in Table 4. Distribution of frequency responses for five factors is presented in Table 5.

However, for ease of interpretation, the five original factors were grouped into three key themes: Factors 1, 2, and 3 were consolidated as 'perceived barriers to insulin use,' while Factors 4 ("positive impact of insulin") and 5 ("perceived failure in diabetes management") were retained as distinct themes from the initial five-factor solution (Figure 3).

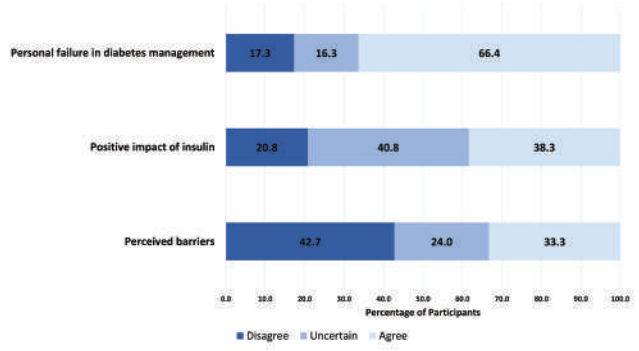

Figure 3: Distribution of the frequency of emerged three factors

Discussion

The current study concluded a high prevalence rate of PIR in the rural settings of Sri Lanka. Findings of our study underscore the importance of gaining a deeper understanding of the sociocultural and educational factors that shape patients' perceptions of their role in managing chronic illness. The Endocrinology Clinic at Hambantota General Hospital caters to a diverse group of patients primarily from the Southern and Uva Provinces of Sri Lanka. Most patients attending the clinic come from semi-urban and rural backgrounds, with varying levels of health literacy and limited access to healthcare resources. A significant proportion are referred from primary healthcare institutions, reflecting a growing need for specialist endocrine services in the region.

The high prevalence of psychological insulin resistance observed in this study (76.8%) highlights a significant barrier to effective diabetes management in the outpatient setting. These findings suggest that PIR is a common and under-recognized challenge, even in patients attending regular clinic follow-ups. Also, it underscores the importance of early screening for PIR in high-risk individuals and tailoring intervention strategies based on patient characteristics. Given that data collection was conducted in a resource-constrained clinic setting, and considering that 6.4% of patients also reported psychological distress, integrating mental health support and brief behavioral interventions into routine diabetes care could enhance treatment acceptance and adherence. Previous studies on PIR have documented varying levels of psychological insulin resistance across different regions. An early study conducted in the United States in 2005 reported that 28.2% of individuals were unwilling to initiate insulin therapy [15]. In the Netherlands, 39% of participants expressed reluctance to use insulin in a 2012 study [16]. Notably, higher prevalence rates of PIR have been reported in Asian countries compared to Western settings. For instance, in Hong Kong, 47.2% of insulin-naive patients exhibited PIR in 2015 [17], while in Singapore, 70.6% of patients reported unwillingness to initiate insulin therapy in 2011 [18]. Similarly, in Malaysia, 51% of patients were found to be unwilling to commence insulin therapy in 2011 [19]. A recent study from China (2024) indicated a particularly high prevalence, with 82.1% of patients with type 2 diabetes demonstrating PIR [20]. Evidence from African countries also indicates considerable levels of PIR: 42.7% in the Democratic Republic of Congo in 2018 [21], 82.7% in Kenya in 2017 [22], and 82.9% in Botswana in a 2020 [23]. Since there is a marked variation across countries due to its multifactorial nature and differences in the perceived value of insulin therapy among populations, further research should be focused on evaluating underlying root causes.

Our study identified several key predictors of psychological insulin resistance among individuals with T2DM. Increasing age was significantly associated with a higher likelihood of PIR (OR = 1.05; 95% CI: 1.01–1.08), suggesting that older adults may be more susceptible to embedded beliefs and fears regarding insulin initiation. These reservations may be due to misconceptions about insulin therapy, challenges in self-management, or fears related to loss of autonomy. Additionally, being insulin-naive was also a significant risk factor (OR = 1.99; 95% CI: 1.11–3.97), indicating that patients who had never used insulin were nearly twice as likely to exhibit resistance. This aligns with previous findings [17,23]. Interestingly, participants with a middle level of family income had a higher risk of PIR compared to those in the lowest income group

Table 4: Factor loadings for each component

Statement	Loss of autonomy with insulin use	Negative impact of injecting insulin	Emotional discomfort with injecting insulin	Positive impact of insulin	Personal failure in diabetes management
1.Taking insulin means I have failed to manage my diabetes with diet and tablets.					0.87
2. Taking insulin means my diabetes has become much worse.					0.82
3. Taking insulin helps to prevent complications of diabetes.				0.69	
4. Taking insulin means other people see me as a sicker person.			0.47		
5. Taking insulin makes life less flexible.		0.39			
6. I'm afraid of injecting myself with a needle.			0.91		
7. Taking insulin increases the risk of low blood glucose levels (hypoglycaemia).		0.47			
8. Taking insulin helps to improve my health.				0.67	
9. Insulin causes weight gain.		0.9			
10. Managing insulin injections takes a lot of time and energy.		0.63			
11. Taking insulin means I have to give up activities I enjoy.		0.65			
12. Taking insulin means my health will deteriorate.		0.39			
13. Injecting insulin is embarrassing.			0.67		
14. Injecting insulin is painful.			0.88		
15. It is difficult to inject the right amount of insulin correctly at the right time every day.	0.81				
16. Taking insulin makes it more difficult to fulfil my responsibilities (at work, at home).	0.85				
17. Taking insulin helps to maintain good control of blood glucose.				0.69	
18. Being on insulin causes family and friends to be more concerned about me.	0.73				
19. Taking insulin helps to improve my energy level.				0.79	
20. Taking insulin makes me more dependent on my doctor.	0.5				

Note: Items were considered for inclusion under each latent construct only if they demonstrated significant oblique factor loadings >0.39 [Factor loadings show the strength and direction of the relationship between each item and its underlying latent factor].

Table 5: Distribution of the frequency of each factor

Latent Factor	Disagree	Uncertain	Agree
Loss of autonomy with insulin use	40.1	24.5	35.4
Negative impact of injecting insulin	43.8	27.5	28.7
Emotional discomfort with injecting insulin	44.3	19.9	35.9
Positive impact of insulin	20.8	40.8	38.3
Personal failure in diabetes management	17.3	16.3	66.4

(OR = 2.64; 95% CI: 1.12–6.17).This could reflect a socioeconomic pattern in which middle-income individuals may have higher expectations of controlling diabetes without insulin or may perceive insulin as a marker of disease severity or personal failure. Conversely, a longer duration of diabetes was associated with a reduced risk of PIR (OR = 0.92; 95% CI: 0.87–0.97). This inverse association has also been reported in earlier studies, including a United States based study conducted in 2005 [15]. Possibly this may be due to patients with a longer disease history might have had more exposure to diabetes education, more progressive deterioration in glycemic control, and increased acceptance of insulin as a necessary treatment step. Together, these findings underscore the importance of targeted interventions, particularly for older adults, insulin-naive patients, and middle-income groups, to address misconceptions and promote timely acceptance of insulin therapy. Education and counseling tailored to patient experience and socioeconomic context may help reduce psychological resistance and improve diabetes outcomes. However, sex (OR=1.18, 95% CI:0.57-2.42), psychological distress (OR=1.11, 95% CI:0.35-3.45), HbA1C (OR=0.95, 95% CI: 0.75-1.19), tertiary education compared to primary (OR=2.25, 95%CI:0.81-6.31), and secondary education compared to primary (OR=0.98,95% CI:0.47-2.06) were not statistically significant in our study. The prevalence of distress among T2DM patients in our rural clinic (6.4%) is comparable to the 5.9% reported in a study conducted in a diabetes clinic at tertiary care hospital in Colombo [24]. The similarity in prevalence rates, despite differences in healthcare settings, suggests that the psychological burden of diabetes may be consistently present across Sri Lanka. This supports the validity and generalizability of our findings within the Sri Lankan context. The non-significant association between psychological distress and PIR (OR=1.11, 95% CI : 0.35 - 3.45) in our study may reflect a masking effect, in which PIR is influenced more by patients' beliefs and attitudes toward insulin use than by their overall psychological state. Polonsky et al. [2] reported no significant difference in PIR across gender, age, and time since diagnosis. Some other studies have reported several significant associations with PIR, such as female gender [9] and depressive symptoms [25]. Even though a recent South Korean study has concluded poor glycemic control was inversely associated with PIR [26], our study did not reveal any significant association. A potential limitation of our study is the possibility of selection bias. Patients who were more adherent to diabetes management may have been preferentially selected by healthcare assistants, which could have influenced the representativeness of the study sample. This preferential selection may have been encouraged by the higher likelihood of these patients to consent to participation. This may have contributed to the non-significant association observed between PIR and HbA1C, and potentially led to an overestimation of positive attitudes or behaviors related to diabetes care.

Exploratory factor analysis revealed five major contributors of PIR. Out of these five latent factors, perceptions of personal failure (66.4%) and emotional discomfort with injecting insulin (35.9%) and loss of autonomy related to insulin use (35.4%) emphasizes the need for personalized, empathetic communication strategies in clinical encounters. Addressing misconceptions and emotional concerns related to insulin through structured counseling, peer support, and culturally sensitive educational materials may help reduce resistance. Similar sub-themes have been described throughout the literature in different studies. Alllen et al. [5] concluded patients' negative perception of insulin therapy as a personal failure and insulin as a last resort for T2DM was the major contributor to PIR. Perception of social stigmata and perception of injection conveyed higher negative appraisal in a previous Sri Lankan study conducted in an urban setting [11]. Furthermore, anticipated concerns about personal and future health were also found to be contributed to the PIR [27]. Fear of needles also contributed to PIR in USA finding as well [5]. The negative impact of injecting insulin (28.7%) were the most minor contributor to PIR in our setting. Both local and international literature have reported a higher proportion of patients who acknowledge that insulin prevents diabetes-related complications and helps maintain blood glucose levels. However, these benefits are often obscured by negative attitudes toward insulin [11]. This is reflected in our findings, where 38.3% of participants reported a positive perception of insulin, while 33.3% identified perceived barriers to its use.

The results of our study and the significant prevalence of PIR in Asian nations mentioned in the previous paragraph highlight the need for more research in Sri Lanka and the larger South Asian region. In order to improve generalizability, future research should concentrate on verifying and extending these findings across a range of geographic areas, healthcare settings (rural vs. urban), and ethnic groups, given the substantial correlation between PIR and different demographic and psychosocial characteristics. Furthermore, qualitative research is necessary to identify the ingrained attitudes, cultural perceptions, and emotional experiences that underlie PIR, especially in environments with limited resources. Research should also prioritize the development and evaluation of intervention models, such as structured counseling, peer-led support programs, and digital health solutions, ensuring alignment with the local cultural and healthcare landscape. Additionally, studies exploring the influence of healthcare provider communication, community leaders, and social norms on insulin perceptions could provide valuable insights into system-level strategies aimed at lowering PIR. Strengthening collaborative efforts among clinicians, behavioral scientists, and public health experts will be essential in designing comprehensive, evidence-based frameworks that can be integrated into national diabetes care protocols for effective management of PIR.

One notable limitation of this study is the small sample size, which may limit the statistical power and generalizability of the findings. While the analyses, including EFA and multiple logistic regression, were conducted rigorously, the reduced sample size may affect the stability of parameter estimates and increase the risk of overfitting, particularly in CFA. Future studies with larger and more diverse samples are recommended to validate these findings and improve external validity. Factors such as sources of diabetes-related information, the influence of peers and family members, media exposure, and interactions with first-contact healthcare providers were not captured. This limitation was partly due to the time constraints faced during data collection, as the questionnaire was administered by doctors amidst their routine clinical duties. Including a longer and more detailed questionnaire could have further disrupted clinical workflows, potentially affecting both the quality of patient care and the completeness of data. Future studies should consider alternative data collection strategies or dedicated research personnel to allow for a more comprehensive exploration of these contributing factors.

Conclusion

The prevalence of psychological insulin resistance among individuals with type 2 diabetes mellitus in rural Sri Lankan settings is high, posing a substantial barrier to effective diabetes management. This resistance is particularly pronounced among those who are older, insulin-naive, and from middle-income families. Key psychological factors contributing to PIR include loss of autonomy with insulin use, negative impact of injecting insulin, emotional discomfort with injecting insulin, and personal failure in diabetes management.

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