Prevalence of Psychological Insulin Resistance among Patients with Type 2 Diabetes at Kenyatta National Hospital, Kenya

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Abstract

Background: The psychological barriers to initiation and persistence with insulin therapy also referred to as Psychological Insulin resistance (PIR), interferes with use of insulin in patients with diabetes. However, ultimate use of insulin in majority of patients with type 2 diabetes is inevitable over time yet many of the patients still resist it because of PIR. The magnitude of PIR among type 2 diabetics is not known in many clinical practice settings, including Kenya.

Patients and methods: This was a cross-sectional survey of PIR in subjects with type 2 diabetes at the Kenyatta National Hospital (KNH), which is a tertiary care and teaching hospital in Kenya, a developing country. Subjects were recruited from the Diabetes Outpatient Clinic where we obtained their socio-demographic and clinical data. We used Insulin Treatment Appraisal Scale (ITAS), which is a validated tool and a structured questionnaire, to collect information regarding psychological insulin resistance.

Results: A total of 167 patients with type 2 diabetes were enrolled, where the females were 59.3%. The prevalence of Psychological Insulin Resistance was 82.6% and the mean ITAS score was 52.7. The gender, age, family history of diabetes, duration of diabetes of the patients and their duration of insulin therapy and ability to purchase medication had no significant influence on the positive and/or negative attitudes towards insulin therapy, (p>0.05). Patients who were using insulin had lower mean ITAS score 50.9, than the non-insulin users, ITAS score 59, which reflected lesser negative attitudes in the insulin-treated group (p<0.05).

The mean (SD) age was 55.5 (13.8) years and the mean (SD) duration of diabetes was 10.2 (8.7) years. Fifty four (32.3%) were on insulin-only treatment, 71 (42.5%) were on combination insulin and oral hypoglycemic agents and 42 (25.1%) were on oral hypoglycemic agents-only therapy.

Conclusion: The prevalence of psychological insulin resistance (PIR) among the study patients was quite high at 82.6%. Patients who were already using insulin therapy showed less psychological resistance than the non-insulin user patients which implied a relative acceptance of insulin therapy in the patients who were already using it. Thus, PIR should be deliberately addressed as a unique condition in type 2 diabetes, recognizing from published work that there may be co-morbid depression in insulin users. Counseling patients with type 2 diabetes regarding insulin use should focus on, among many other issues, the perceptual domains of negative attitudes exhibited by a high proportion of them, because these negative attitudes towards insulin therapy can be mitigated. However, we recommend further studies to determine how PIR affects self-care and consequent metabolic control.

Keywords: Insulin resistance; Diabetes; Insulin therapy

Introduction

The number of people living with diabetes is projected to have increased by over 90% in sub-Saharan Africa by 2030 [1]. This projected rise in cases of type 2 diabetes translates to a rise in care demands and diabetes-related morbidity and mortality if effective management strategies are not employed.

Although oral glucose-lowering agents are the mainstay treatment of type 2 diabetes, the UKPDS [2] reported that one half of the study patients required additional insulin within six years of treatment with oral agents. This reinforced the fact that type 2 diabetes is a progressive disease and an increasing proportion of such patients would require insulin therapy in the course of their disease, in order to attain recommended glycemic control.

Psychological Insulin Resistance (PIR), which refers to the barriers to the initiation and use of insulin therapy, hampers the use of Insulin therapy [3]. Thus, PIR can place glycemia levels of patients beyond recommended targets, with the consequent risk of developing diabetes-related complications.

Previous studies have reported that negative appraisal of insulin therapy is modifiable when insulin therapy is initiated, which suggests that barriers to insulin use are more of temporary than a stable phenomenon [3-6].

An evaluation of studies on PIR reveals that domains of perceived personal failure/self-blame, fear, self- pity/social stigma, perceived loss of one's ability to control and dependence are significant contributors [4-7].

Fear of both hypoglycemia and needles has also been documented to deter use of insulin therapy amongst patients with type 2 diabetes [7].

Psychosocial problems occur amongst patients living with diabetes that are not often addressed effectively for improved diabetes outcomes. This is because healthcare providers often lack skill, time and adequate referral alternatives [8]. We have already demonstrated that nearly a third of the patients with type 2 diabetes in our out-patient diabetes clinic have co-morbid depression that was previously undiagnosed [9].

That PIR among patients with type 2 diabetes in our clinic had not been studied; we sought to determine the prevalence of PIR and also employed explanatory models to determine factors that may be associated with it for potential intervention.

Materials and Methods

Participants in this study were randomly sampled from the population of patients with type 2 diabetes seeking ambulatory care at Kenyatta National Hospital (KNH) Diabetes Clinic, each clinic day, over two months, April-May 2014. The clinics are conducted daily where Monday to Thursday, were mini-clinic days with fewer patients, especially those with needs that would not wait, like renewal of prescription. Fridays are the main clinic day when the numbers are larger. The clinic reviews are paid for by the patients though fairly subsidized, including and if available, the prescribed medications. The context of clinical care may differ in many healthcare systems but once patients access the care after barriers have been surmounted, the challenges surrounding use of medications tend to be similar. The patients were selected on account of having type 2 diabetes, diagnosed the standard way, for not less than six (6) months and on treatment with glucose-lowering agents. The potential participant must have had the capacity to understand English and/or Kiswahili and also gave informed consent to participate in our study. Patients with type 1 diabetes were excluded.

The total number of patients with diabetes, both types 1 and 2, seen within the study period from the records were 1341. We assigned random numbers each clinic day to eligible patients. We screened 730 patients with type 2 diabetes with potential for enrolment and assigned random numbers to

them. From them, 179 were randomly selected for the interview. However 12 patients were excluded because they were unable to avail time for the interview. The remaining 167 patients who fulfilled the inclusion criteria were enrolled into the study after giving informed consent.

Data collection

The study proposal received written approval by the KNH/UoN-Ethics and Research Committee before commencement of data collection.

Data generated from the study patients were captured using a structured questionnaire, including socio-demographic and clinical characteristics. Insulin Treatment Appraisal Scale (ITAS) [6] which is a standard validated tool was used to collect data on insulin therapy in the study patients. Both the questionnaire and the ITAS tool were administered by the interviewer.

All procedures were done in accordance with good clinical practice and the institutional ethical standards.

Statistical Analysis

Statistical package for social scientists (SPSS) version 17.0 was used to perform statistical analysis. Continuous variables like age and duration of diabetes were presented as mean (SD) and medians and also in categories of age groups or ranges. Data was presented in the form of tables and pie-chart.

ITAS scores range from 20 to 100, where lower scores, 40 and below represent more positive attitudes and beliefs about insulin therapy but scores above 40 represent more negative attitudes. The ITAS instrument is a 20-point (4 Positive and 16 Negative statements) tool that provides an appraisal of the patient on insulin therapy. Each statement has a 5-point Likert-scale that earn. The four positive statements are reverse-scored before obtaining the total score. The foregoing interpretation was the applied to the study participants to obtain the summation score of each participant.

Patients were then categorized into those with predominantly positive or negative attitudes: scores of 40 and below represented positive attitudes and scores above 40 represented negative attitudes.

Each of the ITAS statements were also analyzed and grouped into the 5 domains of PIR captured in the ITAS instrument, i.e., perceived personal blame, fear, self-pity/social stigma, Perceived loss of one's ability to control and dependence.

Means (SD) of age and duration of diabetes were compared between patients with positive and negative attitudes using Student's t-test statistic. Also, age and duration of diabetes were categorized and any associations with attitudes tested using Chi-square statistic.

Any associations of gender, family history of diabetes, diabetes medications used and ability to purchase drugs with attitudes towards insulin therapy were determined using Chi-square test.

The factors independently associated with negative/positive attitudes towards insulin therapy were determined using Logistic regression analysis and the Odds ratios represented the likelihood of associations between variables. The statistical tests were performed at 5% level of significance and (95% confidence interval).

Results

Among the 167 patients with type 2 diabetes studied, male to female ratio was 0.69:1. Their mean age was 55.5 years. The age range of the sample was between 30-84 years. Majority (55.6%) of the patients studied were between 50-69 year age group. The majority, 69%, were of modest annual income **(Table 1)**.

Table 1 Socio-demographic characteristics of the study participants.

Variable	Value/Frequency, n (%)
Age (years)	
Mean (SD)	55.5 (13.8)
Median (IQR)	56 (48-64)
Min-Max	30-84
Age categories, n (%)	
Below 40 years	22 (13.2)
40-49	29 (17.4)
50-59	47 (28.1)
60-69	46 (27.5)
70 years and above	23 (13.8)
Sex	
Male	68 (40.7)
Female	99 (59.3)
Level of formal education	
No education	15 (8.7%)
Primary school(1-7yrs)	79 (47.2%)
Secondary/Mid-level college (8yrs and above)	57 (34.1%)
University level	16 (10.0%)
Family income Per Annum	
≤Kshs 150,000 (USD 1500)	115 (69%)
>Kshs 150,000 (USD 1500)	52 (31%)

Positive family history of diabetes was found in 68 (40.7%) patients. Of the 167 patients: 54 (32.3%) were on insulin alone, 42 (25.1%) were on oral hypoglycemic agents and 71 (42.5%) were on both insulin and oral hypoglycemic agents **(Table 2)**.

Age, gender, family history of diabetes, duration of diabetes, duration of insulin use and ability to purchase medication did not influence the positive and or negative attitudes towards insulin therapy **(Table 3)**.

Table 2 Clinical characteristics of the study participants.

Variable	Value/Frequency, n (%)
Duration of diabetes in Years	
Mean (SD)	10.2 (8.7)
Median (IQR)	8 (3-16)
Min-Max	0-49
Duration categories in years, n (%)	
0-9	93 (55.7)
10-19	47 (28.1)
20-29	23 (13.8)
30 and above	4 (2.4)
Diabetes Medication used	
Insulin only	54 (32.3)
Oral Anti-diabetic Agents only	42 (25.1)
Both -Insulin and Oral Agents	71 (42.5)
Duration of insulin use in years	
Median (IQR)	5.0 (1.0-11.0)
Min-Max	<1 – 27
Ability to purchase Diabetes Medication	
Self	115 (68.9)
Relative	47 (28.1)
Friend	1 (0.6)
No means	4 (2.4)
Family history of Diabetes Mellitus	
Yes	68 (40.7)
No	99 (59.3)

Table 3 Univariate analysis of factors associated with psychological insulin resistance in the study participants.

Variable	ITAS score, mean (SD)	P value
Age categories		
40 years and below	54.4 (10.7)	0.075
41-50	53.7 (14.4)	
51-60	56.1 (14.6)	
Above 60 years	49.7 (12.0)	
Gender		
Male	53.2 (13.9)	0.825
Female	52.8 (12.8)	

Family history		
No	53.4 (13.4)	0.607
Yes	52.3 (13.0)	
Duration of Diabetes Mellitus (years)		
0-9	54.8 (13.6)	0.181
10-19	50.7 (12.0)	
20 years and above	51.5 (12.6)	
Diabetes medication used		
Insulin	50.9 (12.6)	0.001
Oral Agents	59.0 (13.3)	
Duration of insulin use (years)		
5 and below	52.6 (11.9)	0.205
6-10	52.9 (13.8)	

Above 10	46.2 (10.8)	
Ability to purchase Diabetes medication		
Self	53.2 (14.0)	0.761
Other	52.5 (11.4)	

Insulin naïve and insulin treated patients were analyzed for positive and negative attitudes towards insulin therapy and it was found that those on insulin therapy had lower ITAS scores (50.9 versus 59) reflecting lesser degree of negative attitudes in the latter group **(Table 3)**.

Each of the ITAS statements were also analyzed and grouped into the 5 major domains of PIR, which were: Perceived Personal failure, Fear, Self-pity/social stigma, Perceived loss of control, Dependence, **(Table 4)** below.

Table 4 Domains of psychological insulin resistance (PIR) and findings in the study participants.

Domains of psychological insulin resistance (PIR)	Participant response and proportions
Perceived Personal blame	1. 61% believed that taking insulin means that they had failed to manage their diabetes with diet and tablets.
	2. 43.7% believed that taking insulin means their diabetes has become much worse.
Fear	1. 33.5% of the patients studied was noted to have Injection phobia.
	2. 47% cited risk of hypoglycemia with insulin therapy.
	3. 35% cited weight gain with Insulin use.
	4. 17.4% believed that their health will deteriorate with insulin use.
	5. 44.3% believed that Insulin injections were painful.
Self-Pity/Social stigma	1. 41.3% believed Insulin use will make other people see them as more sick.
	2. 28.2% believed injecting insulin is embarrassing.
	3. 58% believed that being on Insulin causes family and friends to be more concerned about them.
Perceived Loss of Control	1. 46.4% believed Insulin makes life less flexible.
	2. 28.9% believed that insulin use takes a lot of time and energy.
	3. 31.4% believed that they would have to give up activities that they enjoy.
	4. 40.7% was noted to have a problem with injecting the correct amount of Insulin every day.
	5. 24.8% believe that insulin use makes it more difficult to fulfill responsibilities.
Dependence	1. 55% felt that Insulin use was associated with more dependence on their doctor.

The mean ITAS score for the study population was 52.7 with the prevalence of Psychological Insulin Resistance at 82.6% **(Figure 1)**.

Discussion

We have demonstrated before that glycaemic control of our patients with type 2 diabetes is poor, so, among the insulin-treated [10]. However, in that study, we did not determine the causes. There was a high prevalence of Psychological Insulin Resistance in our patients with type 2 diabetes, with mean ITAS score for the study population of 52.7.

Mean ITAS score for our study population was comparable to the studies done elsewhere, even developed countries like Germany [4] and Denmark [6] where the mean ITAS score was 48 and 55.5 respectively. The prevalence of Psychological Insulin Resistance in our study was noted to be high at 82.6%, meaning that most of our study patients resented insulin therapy **(Figure 1)**.
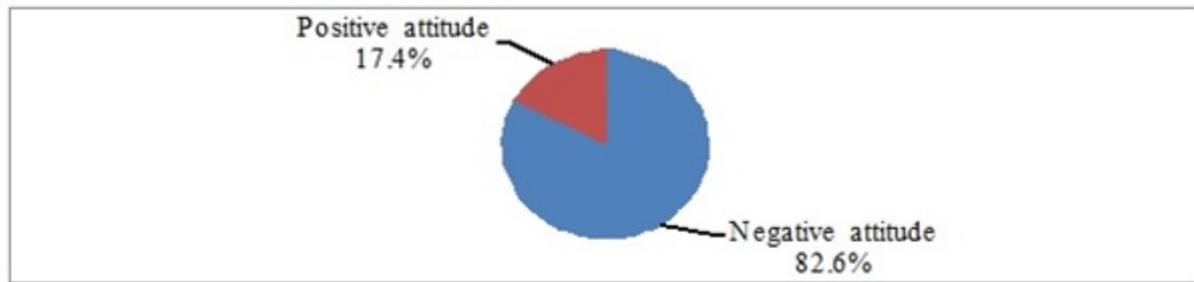
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Figure 1 Psychological insulin resistance (ITAS score) in the study participants.

Both the males and females in our study showed similar attitudes towards insulin therapy (p=0.825). However, Nam S et al. [11] demonstrated in their study that women had more negative attitudes and reluctance towards insulin therapy than the men. Nur et al. [12] in Malaysia, also found that PIR was higher in females than the men. We could not possibly explain the similarity of attitudes towards insulin therapy in both males and females from the cross-sectional study design of this study. This observation will need further evaluation in the psychosocial domains, coping skills and uptake of diabetes self-management education by gender.

The study also explored if a positive family history of diabetes and the duration of disease would influence patients' attitudes towards Insulin therapy but found they had no significant influence. Both groups of patients with and those without family history exhibited similar attitudes (p=0.936). Even those patients with diabetes for less than and above 20 years had comparable ITAS scores, without any significant difference. (p>0.05) **(Table 3)**. Living longer with diabetes is thought to confer better knowledge and understanding of diabetes to the patient from the long experience but apparently this had no advantage in terms of positive attitudes to insulin therapy in such patients in our study.

A higher proportion (95.2%) of patients using oral anti-diabetic (OAD) agents had negative attitude compared to that of those using insulin (78.4%), OR 5.5 (1.3-24.3), p=0.013. The mean ITAS scores for those on OAD agents-only therapy was 59 while those on Insulin were 50.9. These scores mean that insulin-treated patients in our study had less negative attitude towards insulin use than those on oral anti-diabetic agents. Norbert et al. [4] have similarly demonstrated that patients on insulin treatment and those switched to insulin treatment had better appraisal of Insulin therapy than those on oral hypoglycemic agents (mean ITAS score: OAD group 53.6, switched to Insulin 46.2, on insulin at baseline group 44.5). Therefore, a negative appraisal of insulin treatment is probably modifiable by the initiation of insulin therapy and some barriers to uptake of insulin may be temporary [13]. However we were alive to considerations of the care-related context which is unique to countries and healthcare systems. It is probable that patients who are exposed to insulin therapy acquire the necessary skills regarding how to handle insulin and adapt, thus changing their appraisal of this treatment option [14,15].

The patient's perceptions on insulin use may be a result of their physician's approach to the subject. Patients may receive subtle messages from their health care provider that insulin would be initiated only if the patient fails to control the disease with diet, exercise, and oral agents [16]. Thus, insulin therapy is viewed as a threat or the punishment for failure to benefit from the 'kinder', non-injection therapeutic choices. Indeed, the earlier treatment algorithms (guidelines) relegated insulin use to the last phases of disease continuum, when oral agents were presumed to have failed. That has changed in the new guidelines.

Over sixty, (61%) percent of our study patients blamed themselves for having failed to manage their diabetes with diet and tablets and 40% felt that use of insulin would mean worse disease. The proportion in our study is comparable with those in studies by Nur et al. [12] and Peyrot et al. [8] who found Personal failure/self-blame in 59% and 48% respectively, in their study patients. It is therefore vital to educate patients on the natural history/progression of diabetes and that all patients experience β-cell failure over time, but at different rates. Health care providers should also introduce the need for or use of Insulin at any time in the disease continuum.

Of our study patients, 41.3%, demonstrated 'self-pity' as they perceived insulin therapy would make them appear sicker before others.

Fear of Hypoglycemia as a deterrent to the use of insulin therapy was noted in 47%, a proportion comparable to that in the Malaysian study with prevalence of 47.8% [12]. An Iranian study by Gadhiri et al. [17] found that only 5.4% of their study patients feared hypoglycemia from the use of insulin. The different proportions of patients with fear of hypoglycemia seen in these studies suggest real or perceived experiences with hypoglycemia with insulin therapy, which may be vary considerably. The concern of hypoglycemia should however be addressed alongside education on the correct use of insulin.

Insulin therapy was reported to be associated with a perceived loss of control over one's life, [15] which then hinders the use of insulin amongst both insulin-naïve and the insulin-treated patients with type 2 diabetes. In a survey of insulin-naive patients, 44.8% believed that insulin therapy would restrict their lives [14]. Patients believed their lifestyle would be restricted by insulin therapy, for example, they would have to eat at specific times or would be unable to

travel or eat out, and would not be left alone. This study found the feeling of loss of self-control and flexibility attributable to insulin therapy was reported by 46.4% of the study patients, while 28.9% believed that insulin use would take a lot of time and energy. Some of our study patients, 24.8%, cited insulin use as a deterrent to fulfill their responsibilities as another 31.4% averred that they would have to give up the activities they enjoy. Many patients were unaware of the newer once-daily insulin formulations that can be administered at nighttime, minimizing the impact on activities of daily living.

Polonsky et al. in their study on Psychological Insulin resistance [14] reported that approximately 44% of their patients did not feel confident handling the day-to-day demands of insulin therapy. From our study 40.7% of patients cited correct insulin dosing and administration as a problem. Insulin therapy can be overwhelming at first for some patients when they are faced with the prospect of determining dosages, handling syringes and vials, and administering insulin at specific times, along with the demands of blood glucose monitoring. Therefore it is not surprising that Injection-related anxiety was one of the most common reasons for resisting the idea of starting insulin therapy. [12,13]. About one third (33.5%) of our patients reported injection phobia and 44.3% believed that insulin injections are painful. While the fear of needles or injection pain is a genuine concern, the ultrafine needles currently being used in insulin therapy are associated with less pain and should be emphasized during education on use of insulin.

The psycho-social matters in patients with type 2 diabetes remain inadequately addressed with the patient himself/herself by the doctors [2,18].

ITAS instrument does not cover, by its design, aspects of the healthcare provider-related causes of psychological insulin resistance. However the care providers also contribute towards causation or perpetuation of PIR.

Khunti K et al. found very long median time to treatment intensification, even with multiple OADs or higher HbA1c levels in their study [19]. Sorli C et al. observed that 40% of the doctors, who cared for patients with diabetes in the study, believed that initiating insulin would not be compelling as long as the patients still followed their recommendations [20]. Lovre D et al. found that additional OADs enhanced the reluctance by doctors to initiate insulin [21].

Despite the benefits of insulin therapy in achieving optimal glycemic control, 17.4% of our patients reported that their health would deteriorate on insulin therapy. The DAWN study [13] reported that approximately 80% of their study population perceived insulin as not beneficial.

However, as Lee KP demonstrated in the study in Hong Kong, [22] that patients indeed listen when physicians advise them on insulin initiation or adjustment. Therefore healthcare providers have a critical role to play in reducing psychological insulin resistance. They should educate patients regarding the benefits of insulin therapy in type 2 diabetes. Indeed some studies, [11,23] have recommended enhancement of interaction between the healthcare provider and the patient

as a way of mitigating psychological insulin resistance. Our recent study showing enhanced diabetes-associated distress (manifesting as comorbid depression), [24] lends credence to this need.

Intervention should focus on explaining to patients the need for insulin at all the stages of diabetes, especially from the onset and the benefits thereof. We can infer from our study that the negative attitudes towards insulin therapy can be addressed in Diabetes Self-Management Education (DSME). DSME as a strategy and tool should be used to assist the patients overcome psychological insulin resistance by dismantling psycho-social barriers thereof. Lastly, but not the least, is to build capacity of health care providers to enable them to increase insulin uptake in a greater number of patients who need it. The healthcare providers should prescribe what they also believe in!

What this study adds?

The study revealed the huge challenge of psychological insulin resistance in this clinical setting. Thus, it added a probable explanatory variable of why most patients on insulin therapy may have persistent poor glycaemic control as reported in our previous studies.

Psychological insulin resistance (PIR) is likely to be a unique condition in patients with type 2 diabetes which is not mitigated by either having had diabetes for long or long-term use of insulin. Therefore, this discounts the role of experienced long-term users/peers to help fellow patients out of this condition through peer education.

Limitations of the study

The study was a cross-sectional survey and the number of patients studied was relatively small that would limit its generalizability.

We did not include the cross-sectional HbA1c values of the study patients because its determinants are multiple.

The tool used to determine PIR does not cover healthcare provider contribution to this condition, leaving room for only inferences regarding their roles.

Author's Contribution

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Otieno CF Frederick, cfotieno@gmail.com: Design, proposal writing, draft and final manuscript writing.

Omondi-Oyoo George, geomondi@hotmail.com: Design, proposal writing, draft manuscript writing.

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Disclosures

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