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PUBLIC HEALTH | RESEARCH ARTICLE

Insulin perception among insulin-naïve type-2 diabetes mellitus patients in Pakistan

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Abstract: This cross sectional study was conducted to assess insulin perception among insulin naïve type-2 diabetes mellitus (T2DM) patients who attended an out-patient department in a tertiary care hospital in Pakistan. A total of 160 T2DM patients participated in the study, whereby the majority (64.4%) were females, nearly 50% were jobless and 20% were doing a government job. Nearly 65% patients were unwilling to use insulin and approximately every 9 in 10 (90%) patients had negative perception regarding insulin therapy. Furthermore, the insulin perception was significantly associated with the gender (95% CI = 8.691–16.378; $p < 0.001$), level of education (95% CI = 0.835–4.577; $p < 0.005$), and monthly income (95% CI = 0.071–3.785; $p < 0.042$) of patients. In conclusion, the majority of insulin-naïve T2DM patients were unwilling to initiate the insulin therapy due to their negative perception. Therefore, healthcare professionals should provide sufficient information regarding insulin therapy and try their best to minimize insulin resistance in patients. In addition, policy-makers should be aware of the low-utilization of insulin therapy by patients especially for those with poor living conditions. We recommend, policies should be developed and implemented to promote health literacy and health equity throughout the country.

Subjects: Behavioral Medicine; Diabetes; Health Education and Promotion; Public Health Policy and Practice

Keywords: insulin perception; insulin naïve patients; diabetes mellitus; T2DM; Pakistan

ABOUT THE AUTHORS

We are a team of clinical pharmacy and pharmacy practice researchers. The first two authors are affiliated with Department of Pharmacy, The Islamia University of Bahawalpur, Pakistan and the third author is affiliated with School of Pharmacy, Monash University, Malaysia. Our research primarily focuses on behavioral health, health literacy, and therapy related issues faced by chronic disease patients, in particular, diabetes, hypertension, and kidney disease patients.

PUBLIC INTEREST STATEMENT

Diabetes mellitus is a chronic disease that puts a substantial cost burden on patients both in developed and developing countries. Usually, diabetes is managed by oral anti-diabetic medicines however in later stages when disease progresses to an advance stage due to the severity of illness and perhaps due to the negligence of patients, insulin therapy is often initiated to manage disease in a better way. However, recently intentional insulin resistance has been observed in diabetes patients. Compared with developed countries, developing countries have considerably poor health literacy levels. Therefore it is essential to know what diabetes mellitus patients think about insulin therapy in developing countries. Herein, we present the perception of type 2 diabetes mellitus patients regarding insulin therapy in Pakistan. Our results may inform policy makers and health professionals about the importance of health literacy and highlight concerns of diabetes mellitus patients toward insulin therapy.

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1. Introduction

Diabetes mellitus (DM) is a chronic metabolic disease and a growing public health concern worldwide (Hu, 2011). DM affects every 1 in 11 adults, and approximately every 6 s, a person dies from diabetes (International Diabetes Federation, 2015). In 2014, around 387 million of the global population had DM (International Diabetes Federation, 2014). Recently, a report by the International Diabetes Federation revealed that around 415 million people are affected with DM, and the number of patients will reach 642 million by 2040 (International Diabetes Federation, 2015).

Diabetes Mellitus, especially type 2 DM (T2DM), is more prevalent in Asian countries as compared to Western industrialized countries due to rapid urbanization, poor living standards, and inadequate healthcare facilities, and putting a substantial cost burden on patients (Afroz et al., 2015; Jabbar, Hameed, Chawla, & Akhter, 2008). In addition, the slowly progressing nature of T2DM leads patients to a stage when oral anti-diabetic therapy fails to control the glycaemic levels alone and the initiation of insulin therapy becomes an essential approach to achieve the required glycaemic values, and to maintain HbA$_{1C}$ level below 7.0% (Wong et al., 2011).

The management of T2DM is quite challenging, however, the initiation of insulin therapy at an earlier stage plays a vital role in managing T2DM effectively. For instance, a research study reported that insulin therapy was initiated in nearly 25–50% of T2DM patients in Great Britain within first 6 years of their disease to prevent disease related complications (Wright, Burden, Paisey, Cull, & Holman, 2002). Despite the importance and promising effects of insulin therapy, insulin initiation is often delayed due to the refusal of insulin therapy by diabetes patients, of which, the majority are insulin naïve (Tan, Asahar, & Harun, 2015). Insulin-naïve T2DM patients are those who never used insulin to control their glycaemic values (Koopmans et al., 2009). Literature suggests that insulin-naïve T2DM patients demonstrate several concerns regarding insulin therapy, and the refusal rate for insulin therapy is 70.6% in Singapore (Wong et al., 2011), 42.5% in Bangladesh (Khan, Lasker, & Chowdhury, 2008), and nearly 33.0% in the United States of America (Larkin et al., 2008).

A lot of work has been done worldwide to determine the barriers to initiating insulin therapy among DM patients and to assess the awareness of the general population and patients regarding diabetes (Brod, Kongsø, Lessard, & Christensen, 2009; Masood et al., 2016; Nazir, Hassali, Saleem, Bashir, & Aljadhey, 2015; Peyrot, Rubin, & Khunti, 2010). However, there is a paucity of data from Muslim countries especially Pakistan regarding insulin perception and barriers to the initiation of insulin therapy, wherein the prevalence of diabetes is around 6.9% (International Diabetes Federation, 2015).

The assessment of insulin perception in patients seems essential and of vital importance as it has been postulated that the knowledge and perception of patients towards their illness strongly influence their compliance to the treatment prescribed (Masood et al., 2016). Therefore, the present study is aimed to assess insulin perception and willingness to initiate insulin therapy among insulin-naïve T2DM patients in Pakistani settings. Another aim of the present study is to assess the association of insulin perception with T2DM patient characteristics.

2. Material and methods

2.1. Study design and setting

A cross sectional questionnaire based study was conducted from November 2015 to January 2016. Insulin-naïve type 2 diabetes mellitus (T2DM) patients attending an outpatient department in a public sector tertiary-level hospital in the city of Bahawalpur, Pakistan, were approached.

2.2. Sampling and data collection

The sample comprised of all adult insulin-naïve T2DM patients (i.e. those patients who have never used insulin) (Koopmans et al., 2009), able to read or understand Urdu (the national language of Pakistan), regardless of gender, ethnic origin and qualification, and prescribed insulin for the first

time. T2DM patients aged <18 years, Type 1 DM patients, and gestational diabetes patients were excluded from the study. The HbA$_{1c}$ values of patients were cross-referenced with their patient profiles. To approach T2DM patients, a universal sampling method was adopted. All insulin-naïve T2DM patients in the concerned outpatient department in a public sector hospital were asked to participate and only those patients were recruited who agreed to participate in the study voluntarily. Approximately 15–20 min were given to each patient for filling out the Insulin Perception Questionnaire (IPQ). Those patients who were unable to read or write were face-to-face interviewed by primary author.

2.3. Ethics approval
The ethical approval was obtained by the Pharmacy Research Ethics Committee (PREC) of The Islamia University of Bahawalpur, Pakistan. The informed consent was taken from the enrolled patients after explaining study objectives and before handing over the questionnaire.

2.4. Study tool and pilot testing
To achieve the desired study objectives, a 20-itemed insulin perception scale was developed and somewhat adapted from internationally published literature after an extensive literature review (Brod et al., 2009; Peyrot et al., 2010; Wong et al., 2011). The instrument was named by the authors as the IPQ. To measure the responses of T2DM patients, a 5-point Likert scale [*strongly disagree, disagree, don't know, agree, strongly agree*] was used. The face and content validity of the construct were checked by two senior researchers in a similar field and an endocrinologist. The questionnaire was translated into Urdu and translated back into English by two independent translators using the forward backward method. A pilot study was performed by using a sample of 30 T2DM patients. The Cronbach's alpha was calculated using statistical software as $\alpha = 0.73$, which showed sufficient reliability and internal consistency of the study tool (Nunnally, 1978). In addition, factor analysis was carried out using Bartlett's test of sphericity and the Kaiser-Mayer-Olkin measure of sampling adequacy. The Bartlett's test of sphericity for the study tool was significant <0.001 and the Kaiser-Mayer-Olkin measure of sampling adequacy was 0.603. According to Sheridan and Lyndall (2001), a measure of ≥0.6 reflects the adequacy of the contents of the questionnaire (Sheridan & Lyndall, 2001). The IPQ was scored as follows: 1 for strongly disagree, 2 for disagree, 3 for don't know, 4 for agree, and 5 for strongly agree. The first three questions of the construct were positive, and the last 17 questions were negative. Reverse scoring [5 for strongly disagree, 4 for disagree, 3 for don't know, 2 for agree, and 1 for strongly agree] was performed for all negative questions and the perception scores were computed and rated as follows: negative perception (<66%), and positive perception (≥66%).

2.5. Statistical analysis
Descriptive statistics were used to describe the demographic characteristics of the T2DM patients. Frequencies, percentages, mean, and standard deviations were calculated for the normally distributed continuous variables as per requirements. A Mann-Whitney test and the Kruskal-Wallis test were used to find the association between insulin perception and patient characteristics. Moreover, the effect of change due to each variable was determined using linear regression analysis by taking the scores as the dependant variable and patient's characteristics as independent variables. All the collected data were analysed by using the Statistical Package for the Social Sciences (SPSS) version 21.0 software (SPSS Inc., Chicago, IL, USA). A $p < 0.05$ were taken as significant data for all statistical analyses.

3. Results
In total, 182 insulin-naïve type 2 diabetes mellitus patients were approached initially, of which, 160 willingly participated in the study giving a response rate of around 87.91%. Of these patients, the majority, 103 (64.4%) were females, and aged between 41 and 50 & 51 and 60 years. More than half 96 (60%) of T2DM patients were urban residents, and nearly half of the respondents 80 (50%) were jobless or retired. Overall, secondary education was found to be the highest level of education among the respondents and nearly 20% (n = 32) were illiterate. Nearly 48 (30%) patients had a monthly income of PKR > 20,000 (Pakistani Rupees). The mean duration of diabetes and the mean HbA$_{1c}$ were 6.90 (±3.246) and 8.62 (±0.481) respectively. Further details are provided in Table 1.

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Table 1. Patient characteristics (*N* = 160)		
Variables	*N*	**%**
Age (years)		
<30	2	1.3
31–40	26	16.3
41–50	70	43.8
51–60	43	26.9
>60	19	11.9
Gender		
Female	103	64.4
Male	57	35.6
Residence		
Rural	64	40
Urban	96	60
Occupation		
Business	8	5
Government job	32	20
Private job	24	15
Labor	16	10
No job/retired	80	50
Education		
Illiterate	32	20
Religious	16	10
Primary	24	15
Secondary	48	30
Tertiary	40	25
Income (PKR)		
<5,000	16	10
5,001–10,000	24	15
10,001–15,000	40	25
15,001–20,000	32	20
>20,000	48	30
Willingness to use insulin		
Yes	56	35
No	104	65
Duration of diabetes (years)		
Mean (SD)	6.9	(±3.246)
Recent HbA$_{1C}$ (%)		
Mean (SD)	8.62	(±0.481)

Notes: Income is mentioned in Pakistani Rupees (1 PKR = 0.0095 USD). The USD rate is based on the international currency conversion rate as that of 2 February 2016.

The responses of T2DM patients to the IPQ are given in Table 2. Overall, 55.5% of the patients agreed that insulin will increase the risk of hypoglycemia, and 40.0% of patients were worried about getting heart disease due to insulin use. In addition, about 35.0% of the respondents agreed that insulin use will make them blind, and nearly 37.5% strongly agreed that insulin is haram (food and medicinal items that are strictly prohibited in Islam). Moreover, 65.0% of the patients were not

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No.	Insulin Perception Questionnaire	Response N (%)				
		SD	D	DK	A	SA
1	Insulin will help me in controlling diabetes	4 (2.5)	15 (9.4)	7 (4.4)	59 (36.9)	75 (46.9)
2	Insulin will improve my health status	5 (3.1)	21 (13.1)	17 (10.6)	39 (24.4)	78 (48.8)
3	Insulin will make me less diet restrictive	16 (10.0)	32 (20.0)	8 (5.0)	56 (35.0)	48 (30.0)
4	Insulin usage will show that my diabetes has worsened	5 (3.1)	26 (16.3)	9 (5.6)	40 (25.0)	80 (50.0)
5	Insulin usage will show that I failed to take care myself	13 (8.1)	14 (8.8)	16 (10.0)	40 (25.0)	77 (48.1)
6	Insulin once started, can't be stopped	14 (8.8)	13 (8.1)	9 (5.6)	8 (5.0)	116 (72.5)
7	Insulin usage will make my travel and eat out difficult	16 (10.0)	16 (10.0)	8 (5.0)	40 (25.0)	80 (50.0)
8	Insulin usage will cause complications in later life	14 (8.8)	16 (10.0)	24 (15.0)	16 (10.0)	90 (56.3)
9	Insulin usage will increase the risk of hypoglycemia	14 (8.8)	16 (10.0)	38 (23.8)	40 (25.0)	52 (32.5)
10	Insulin usage will increase my weight	7 (4.4)	9 (5.6)	8 (5.0)	24 (15.0)	112 (70.0)
11	Insulin usage will make me blind	40 (25.0)	40 (25.0)	16 (10.0)	24 (15.0)	40 (25.0)
12	Insulin usage will increase the risk of heart diseases	8 (5.0)	32 (20.0)	64 (40.0)	32 (20.0)	24 (15.0)
13	Insulin usage will badly affect my body shape	7 (4.4)	16 (10.0)	7 (4.4)	40 (25.0)	90 (56.3)
14	Insulin is too expensive	19 (11.9)	14 (8.8)	46 (28.8)	16 (10.0)	65 (40.6)
15	Insulin is obtained from haram sources	8 (5.0)	32 (20.0)	46 (28.8)	14 (8.8)	60 (37.5)
16	I believe I can't measure the correct dose of insulin	8 (5.0)	40 (25.0)	8 (5.0)	56 (35.0)	48 (30.0)
17	I believe I can't inject insulin correctly	8 (5.0)	34 (21.3)	14 (8.8)	40 (25.0)	64 (40.0)
18	I am afraid of needle injections	25 (15.6)	32 (20.0)	16 (10.0)	15 (9.4)	72 (45.0)
19	If I used Insulin, people will treat me differently	35 (21.9)	32 (20.0)	21 (13.1)	8 (5.0)	64 (40.0)
20	Insulin usage will make me feel embarrassed in front of people	31 (19.4)	22 (13.8)	21 (13.1)	22 (13.8)	64 (40.0)

Notes: Likert scale: SD = strongly disagree, D = disagree, DK = don't know, A = agree, SA = strongly agree.

confident to measure the exact dose of insulin, and almost the same number of patients lacked the courage to take the insulin shot on their own. The fear of needle was observed between 50.0 and 55.0% of the respondents, and almost the same number of patients agreed that insulin use will make them feel embarrassed in front of other people.

Further analysis revealed that insulin perception was more positive in patients aged 41–50, 51–60, and above 60 years ($p < 0.001$). The T2DM patients who were willing to use insulin scored higher than unwilling patients ($p < 0.001$). Male T2DM patients scored higher than females ($p < 0.001$), while urban residents scored higher than rural residents ($p < 0.001$). Similarly, the insulin perception scores were higher in patients who work in government jobs, followed by businessmen and private employees ($p < 0.001$). Likewise, the insulin perception scores were higher in patients with tertiary education, followed by secondary, and primary education, while the illiterate patients and patients with only religious education scored significantly lower perception scores ($p < 0.001$). Lastly, the insulin perception scores were higher in patients with a monthly income of Pakistani Rupee (PKR) 15,001–20,000, followed by PKR > 20,000, and PKR 10,001–15,000 ($p < 0.001$). For more details, see Table 3.

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Table 3. Association of insulin perception with T2DM patient characteristics				
Variables	**Mean**	**SD**	**Mean rank**	***p*-value**
Age[a]				
<30	45.00	18.39	65.75	<0.001
31–40	44.65	10.72	53.77	
41–50	51.03	10.19	81.66	
51–60	52.89	9.07	89.85	
>60	53.19	11.11	93.18	
Gender[b]				
Female	46.89	7.05	63.47	<0.001
Male	57.63	12.76	111.27	
Residence[b]				
Rural	47.55	11.4	62.72	<0.001
Urban	52.83	9.82	92.35	
Occupation[a]				
Business	56.38	1.3	113.06	<0.001
Government Job	61.91	10.49	122.19	
Private Job	51.63	9.67	83.19	
No Job/Retired	48.69	2.75	69.38	
Labor	45.81	9.05	61.99	
Education[a]				
Illiterate	40.34	9.21	32.22	<0.001
Religious	40.94	4.15	38.73	
Primary	52.73	7.28	91.26	
Secondary	56.83	5.58	101.13	
Tertiary	56.85	11.05	112.48	
Income[a]				
<5,000	38.5	7.86	28.06	<0.001
5,001–10,000	41.63	8.37	41.77	
10,001–15,000	51.83	10.24	85.55	
15,001–20,000	55.69	7.83	103.23	
>20,000	55.1	8.95	97.98	
Willingness to use insulin[b]				
Yes	54	9.4	94.48	<0.001
No	44.63	10.56	54.54	

Notes: The minimum possible score was 0 and maximum was 100. The income is mentioned in Pakistani Rupees (1 PKR = 0.0095 USD). The USD rate is based on the international currency conversion rate as that of 2 February 2016.
[a]Kruskal-Wallis test.
[b]Mann-Whitney test.

Further assessment showed that nearly 92.5% T2DM patients had a negative perception (scored <66%) and only 7.5% had a positive perception (scored ≥66%) regarding insulin (Figure 1). Lastly, the linear regression analysis revealed that out of the seven independent variables, only gender (95% CI = 8.691–16.378; $p < 0.001$), level of education (95% CI = 0.835–4.577; $p < 0.005$), and monthly income (95% CI = 0.071–3.785; $p < 0.042$) had a significant impact on the perception scores of patients (Table 4).

Figure 1. Perception of insulin in T2DM patients.

Notes: All of the patients who scored <66% scores were categorized as patients with negative perception, and those scoring ≥66% were categorized as patients with positive perception. Overall, the minimum achievable score was 1 and maximum was 100.
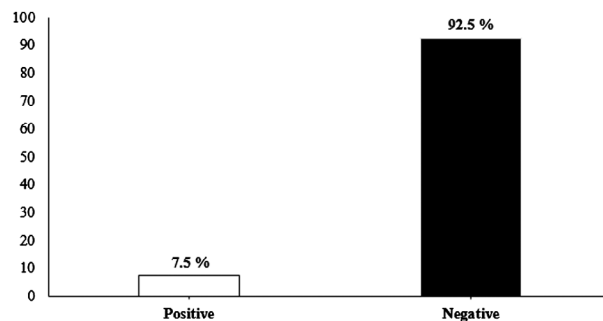
Table 4. Factors affecting the perception score of diabetes patients				
Variables	**Regression coefficient (β) [95% CI]**	**t**	**Std. error**	***p*-value**
Age	0.075 [−0.451–2.191]	1.301	0.669	0.195
Gender	0.559 [8.691–16.378]	6.443	1.945	**<0.001**
Residence	−0.109 [−5.517–0.754]	−1.501	1.587	0.136
Occupation	0.055 [−1.268–2.367]	0.597	0.920	0.551
Education	0.366 [−0.835–4.577]	2.858	0.947	**0.005**
Income	0.238 [0.071–3.785]	2.051	0.940	**0.042**
Willingness to use insulin	0.060 [−2.306–5.011]	0.730	1.852	0.466

Notes: Linear regression was applied using score as a dependent variable and the age, gender, residence, occupation, education, income and willingness to use insulin as independent variables. A $p < 0.05$ was considered significant.

4. Discussion

To the best of our knowledge, this is perhaps the first study of its kind performed in one of the semi-urban areas of Pakistan to evaluate insulin perception and willingness to initiate insulin therapy in insulin-naïve T2DM patients. The present study shows that nearly 65% T2DM patients were unwilling to initiate insulin therapy. These findings are in line with previous studies elsewhere with the exception of a Singaporean study where the insulin resistance was much higher (>70%) comparatively (Khan et al., 2008; Peyrot et al., 2010; Wong et al., 2011). The reason behind reluctance to initiating insulin therapy in our patients could be the negative perception in the majority of (>90%) the study population (Figure 1).

Moreover, the present study shows that T2DM patients were concerned regarding the potential adverse outcomes of insulin such as the risk of hypoglycaemia, heart diseases, blindness, the cost of insulin, changed lifestyle due to insulin therapy, social stigma (the fear of what people think about them), and lack of confidence to self-inject insulin safely. These findings are also consistent with the previous studies as performed elsewhere (Nur Azmiah, Zulkarnain, & Tahir, 2011; Polonsky, Fisher, Guzman, Villa-Caballero, & Edelman, 2005; Tan et al., 2015), which denotes that despite differences in race and ethnicity, the existence of negative perception among T2DM patients regarding insulin therapy is a global issue.

A study conducted in Malaysia reports that some of the abovementioned concerns could be partially correct to some extent and attention seeking such as the risk of hypoglycaemia and risk of heart diseases, while others are incorrect such as the risk of blindness (Nur Azmiah et al., 2011). Additionally, in the present study, the majority of T2DM patients were concerned regarding the halal (edible and medicinal items that are allowed in Islam and prepared in Islamic way) source of insulin, which shows that there is a strong influence of Islam on T2DM patients. To the best of our knowledge, this aspect was not studied before. Therefore, the drug regulatory authorities, especially in

Muslim countries and in those countries where Muslims are in the minority, should ensure the production of medicines from halal sources and advertise in the media that they are effectively monitoring drug products and allowing only drugs that are obtained from halal sources to be marketed.

Furthermore, the average HbA_{1c} level obtained in this study was only 8.62% (±0.481). Many studies have reported that insulin is an effective hormone to regulate glycaemic levels in even those patients who have an HbA_{1c} level ≥9% (Nur Azmiah et al., 2011; Vinagre et al., 2013). However, the willingness to use insulin could be affected badly as it depends strongly on the perception of diabetic patients (Nur Azmiah et al., 2011). The health belief model explains this phenomenon in a systematic way and proposes that perceived benefits and barriers in the healthcare regimen play a vital role in achieving therapeutic success (Rosenstock, 1974). Therefore, it can be concluded that the personal beliefs of patients strongly influence their behaviour and compliance with the treatment prescribed (Norman & Smith, 1995).

There is another possibility that the negative perception in the majority of T2DM patients could be due to their low health literacy and the lack of effective communication between the attending physicians and the T2DM patients. This statement has been validated by a recent study (conducted in the same outpatient settings), which reported that the average consultation time was 1.2 min only rather than the standard of 10 min time (Rehan Sarwar et al., 2015). This discrepancy reflects the lack of communication and inadequacy of the medical care services provided by the physicians and suggests a strong correlation between the consultation time and the negative perception of T2DM patients regarding their insulin therapy.

Finally, the non-parametric tests have shown a significant association between insulin perception and all the independent study variables (Table 3). However, the linear regression analysis has confirmed the association of perception scores only with the gender, level of education, and income of patients (Table 4). These findings are in contrast with a Chinese study which reported that gender and education do not affect the perception of patients (Chen et al., 2011). Therefore, it is concluded that education and purchasing power of T2DM patients significantly impact the perception of patients regarding insulin therapy. Due to this reason, the perception in government employees has been observed better than others most probably due to a reason that they were getting free treatment from public sector hospitals. On the other hand, the businessmen also have better perception because of their affordability of expensive private medical care services (Saleem, 2015). Therefore, the private employees tend to have a negative perception as compared to the former groups due to their unaffordability issue. We recommend, healthcare professionals such as physicians and pharmacists should pay attention to the risk factors of negative perceptions and try to educate T2DM patients adequately regarding their disease and prescribed treatment to ensure 100% compliance with the prescribed treatment as the concept of linking lack of communication with low health literacy was postulated previously (Nazir et al., 2015). In addition, policy makers should make effective policies to promote health literacy and equity in health especially for lower strata of society that lack affordability to optimal healthcare services.

Despite these interesting findings, the present study has several limitations. First, the study adopted a cross sectional study design that is limited in a sense that it only gives a snapshot: the situation may provide differing results if another time-frame had been chosen. Second, the study population was too small and limited to only one city; therefore these findings are not generalizable throughout the country. Third, type 1 DM and gestational DM patients were excluded due to the difficulty in approaching these patients. Fourth, the T2DM patients attending private physicians were not approached, which makes this study quite restricted. Despite these limitations, the present study has several strengths. First, although the study construct was comparatively new, the Cronbach's alpha value was α = 0.73, Bartlett's test of sphericity was significant <0.001, and the Kaiser-Mayer-Olkin measure of sampling adequacy was 0.603, which is one of the strengths of this study. Another strength of the study is the high response rate of T2DM patients. The third strength is the successful evaluation of negative perception in T2DM patients in a semi-urban area where these kinds of

studies are not usually performed. We recommend, further research should be conducted to observe the effectiveness of communication between physicians and T2DM patients in terms of their qualifications, experience, and study settings. Moreover, an intervention study with control group testing can be conducted to see whether better communication would improve uptake of insulin in T2DM patients and help to achieve better clinical outcomes.

5. Conclusion

It is concluded that more than half of insulin-naïve T2DM patients are not willing to initiate insulin therapy. Most of the patients have a negative perception regarding insulin therapy. In addition, gender, level of education and monthly income have a significant impact on the insulin perception scores of insulin-naïve T2DM patients. Therefore, in the Pakistani health care setting, it is essential for the attending physicians to focus on and pay attention to insulin-naïve patients for minimizing their false perceptions by providing and equipping them with sufficient disease and treatment related knowledge. In addition, policy makers should play there role to promote health literacy and health equity in lower strata of society.

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