Perceptions of Type 2 Diabetes Mellitus Patients towards Insulin Therapy and Willingness to Accept Insulin Therapy at the Public Health Clinics in South Seberang Perai District, Malaysia

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Abstract

Introduction: Many patients living with Type 2 diabetes mellitus (T2DM) require insulin as an adjunct to lifestyle interventions and oral hypoglycaemic agent (OHA), Timely initiation of insulin therapy at an earlier stage plays a vital role in managing T2DM effectively. Insulin initiation is often delayed due to the refusal of insulin therapy by diabetes patients.

Objective: This study was conducted to evaluate T2DM patients' perceptions towards insulin and willingness to accept insulin therapy, and to identify the associating factors affecting patients' willingness to accept insulin therapy.

Methods: A cross-sectional survey was conducted from 1 January 2018 to 30 April 2018 in four public health clinics of South Seberang Perai District. Validated questionnaires were adopted as the survey tool. Purposive sampling method was used to include insulin naive adult T2DM patients who were on follow-up treatment at the health clinics and were treated with at least one OHA.

Results: A total of 458 patients participated in this survey, among which 338 (73.8%) patients were not willing to accept insulin if initiated. Multiple Logistic Regression showed that females (AOR 1.67, 95% CI 1.09-2.56, p=0.018), patients who did not know anybody on insulin (AOR 1.78, 95% CI 1.16-2.75, p=0.008) and patients who were not recommended insulin by doctor (AOR 1.83, 95% CI 1.08-3.09, p=0.024) more likely to refuse insulin therapy. In terms of perception, patients who felt that taking insulin would make their life less flexible (AOR 2.43, 95% CI 1.49-3.96, p<0.001), patients who worry that injecting insulin would be painful (AOR 1.95, 95% CI 1.17-3.24, p=0.010), and patients who lacked the confidence to manage insulin therapy (AOR 1.79, 95% CI 1.11-2.90, p=0.017) were more likely to refuse insulin.

Conclusions: Current acceptance rate for insulin treatment was only 26.2%. Promoting custom-made patient-centric approach will improve patient's initial negative perception towards accepting insulin therapy.

Keywords: diabetes, insulin, type 2 diabetes melitus

NMRR ID: NMRR-17-1964-37319

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Introduction

Type 2 diabetes mellitus (T2DM) is an endocrine disorder that is characterised by insufficient insulin production or failure of the body to utilise the produced insulin. Almost 150 million people are affected globally (1), and the disease is more prevalent in Asian countries due to poor living standards, inadequate healthcare facilities and demographic shift to aging population (2). T2DM affects almost 21% of Malaysian adults above the age of 30 and has become a major public healthcare concern according to the National

Health and Morbidity Survey 2015. Of the 1.1 million T2DM patients receiving treatment at public healthcare facilities in Malaysia, 70% attended the primary care clinics (3). This shows that primary care is the centre point for diabetes management.

Many patients living with T2DM require insulin as an adjunct to lifestyle interventions and oral hypoglycaemic agent (OHA). While insulin therapy was traditionally managed by specialised diabetes services, it is now largely managed by the primary care teams. Timely initiation of insulin therapy at an earlier stage plays a vital role in managing T2DM effectively. Despite the importance and promising effects of insulin therapy, insulin initiation is often delayed due to the refusal of insulin therapy by diabetic patients (4). Psychological insulin resistance is common among T2DM patients. The resistance is multifactorial but mainly involves negative beliefs and perception regarding diabetes and insulin (5-7). A recent review of 34 studies within the context of primary care (5) supported that insulin-related beliefs, social influences and psychological factors are the main factors contributing to the sub-optimal insulin. However, the review solely involved qualitative studies, and had only included one Malaysian study that focused on the barriers and facilitators of blood glucose in people with type 2 diabetes using insulin (8). There were other prior studies that were conducted in the primary care settings in Malaysia but mostly were on insulin therapy refusal (8,9). Due to the limited number of studies on the perception and willingness to accept insulin therapy, our understanding about the issue is still unclear. The assessment of insulin perception in patients is therefore of vital importance as it has been postulated that the knowledge and perception of patients towards their illness strongly influence their compliance to the prescribed treatment (10). This study was conducted to evaluate the perception towards insulin and willingness to accept insulin therapy among T2DM patients at the primary healthcare setting in Penang, Malaysia. The study also aimed to identify the associating factors affecting patients' willingness to accept insulin therapy.

Methods

This cross-sectional survey was conducted in four public health clinics in the South Seberang Perai District of Penang from 1 January 2018 to 30 April 2018. The clinics were Bandar Tasek Mutiara Health Clinic, Nibong Tebal Health Clinic, Bukit Panchor Health Clinic and Sungai Acheh Health Clinic.

The sample size was determined based on the estimation of 20% dropout, with 95% confidence interval and 5% precision (11). The calculated sample size was 450 respondents. The inclusion criteria for this study were T2DM patients on follow-up treatment at the health clinics aged 18 years and above, who were treated with at least one OHA and being insulin naive. Patients suffering from dementia, cognitive impairment and psychiatric disorder, patients with visual or manual dexterity impairment that would impede self-injection and patients with cerebrovascular accident (CVA) were excluded from this study. Before participating in this study, a written consent was obtained.

Data was collected using a validated questionnaire in English and Malay language. The English version of questions were adopted from Polonsky *et al*. (6) while the translated Malay version of the questionnaire was adopted from Zainuddin *et al*. who conducted a study on psychological insulin resistance (PIR) among T2DM patients (8). The questionnaire consisted of two parts. The first section of the questionnaire collected socio-demographic and clinical information relating to age, gender, ethnicity, educational attainment, occupations, duration of disease, fasting blood glucose level, HbA1c, know relative or friends using insulin, taking traditional and complementary medicines and whether insulin was ever recommended by their physician. The second part of the questionnaire had nine items regarding the perception of patients towards insulin therapy. Each question had a response of either agree or disagree. The patients need to choose one option for each question. The questionnaires were self-administered by the patients and patients took an average of 20 minutes to complete the questions.

Data analyses were conducted using Statistical Package for Social Sciences (SPSS) v.20 (IBM Corp, Armonk, NY, USA.). Continuous values are expressed as the mean ± standard deviation (SD), and categorical variables are presented as numbers (percentage). The association between risk factors and patient willingness to accept insulin were estimated using univariate analysis and multiple logistic regression. Significant variables in the univariate analysis was included in the multiple logistic regression. The odds ratios and 95% confidence intervals (CI) were estimated, and the level of significance was set at $p<0.05$.

The ethical approval for this study was obtained from the Medical Research Ethics Committee (MREC), Ministry of Health Malaysia and was registered under National Medical Research Registry (NMRR-17-1964-37319).

Results

A total of 458 respondents participated in the survey with participants' age ranging from 24 to 86 years old. The average mean ± SD age was 56.7±10.9 years old. The male and female respondents were almost equally distributed and most patients were Malay (44.1%). Most of the respondents in this study did not take any traditional and complementary medicines for their diabetes treatment (86.2%). The mean duration of diabetes was 5.6 years and the mean HbA1C level was 7.8%. Only 120 (26.2%) patients were willing to accept insulin treatment if initiated by their doctor (Table 1).

The perception of study participants towards insulin therapy were presented in Table 2. Almost half (42.8%) of the study respondents agreed that taking insulin could indicate that their disease had become worse, although the majority (82.5%) disagreed that taking insulin can cause problems. On the expected pain, three-quarter (72.5%) agreed that injecting insulin would be painful and more than half (61.8%) agreed that insulin should not be stopped after it was started.

Univariate analysis was used to analyse the association between demographic and clinical factors, and their willingness to accept insulin therapy (Table 3). Gender (p=0.013), knowing any relatives or friends have who used insulin (p=0.004) and doctor's recommendation (p=0.019) could significantly influence the patients' willingness to accept insulin. After adjusting for other demographic factors, multiple logistic regression showed that female patients were 1.67 times more likely to refuse insulin treatment if initiated (adjusted OR (AOR) 1.67, 95% CI 1.09-2.56, p=0.018]. Patients who did not have any relatives or friends on insulin were 1.78 times more likely to refuse insulin if initiated (AOR 1.78, 95% CI 1.16-2.75, p=0.008]. Patients who were never recommended insulin by their physician were 1.83 times more likely to refuse insulin if initiated (AOR 1.83, 95% CI 1.08-3.09, p=0.024).

In Table 4, univariate analysis demonstrated that all nine perception items showed significant associations with patients' willingness to accept insulin therapy. Multiple logistic regression showed that only restrictiveness, expected pain and low self-efficacy were significantly associated with insulin refusal. Patients who felt taking insulin would make their life less flexible (restrictiveness) were 2.43 times more likely to refuse insulin treatment (AOR 2.43, 95% CI 1.49-3.96, p<0.001). Patients who felt injecting insulin would be painful (expected pain) were 1.95 times more likely to refuse insulin (AOR 1.95, 95% CI 1.17-3.24, p=0.010). Patients who had lack of confidence in managing the demands of insulin therapy (low self-efficacy) were 1.79 times more likely to refuse insulin (AOR 1.79, 95% CI 1.11-2.90, p=0.017) (Table 4).

Table 1: Demographic and clinical characteristics of respondents (n=458)

Characteristics	Value
Age in years, mean ± SD	56.7 ± 10.9
Gender, n (%)	
Male	211 (46.1%)
Female	247 (53.9%)
Ethnicity, n (%)	
Malay	202 (44.1%)
Chinese	132 (28.8%)
Indian	124 (27.1%)
Education, n (%)	
No Formal Education	36 (7.9%)
Primary Education	167 (36.5%)
Secondary Education	214 (46.7%)
Tertiary Education	41 (9.0%)
Occupation, n (%)	
Government	44 (9.6%)
Private	108 (23.6%)
Self-employed	70 (15.3%)
Not Working	236 (51.5%)
Duration of diabetes, years, mean ± SD	5.62 ± 4.76
Fasting blood glucose level, mmol/L, mean ± SD	7.94 ± 2,81
HbA1C, %, mean ± SD	7.75 ± 1.63
Know that relatives / friends have ever used insulin, n (%)	
Yes	223 (48.7%)
No	235 (51.3%)
Taking Traditional & Complementary Medicine (T&CM) for DM treatment, n (%)	
Yes	63 (13.8%)
No	395 (86.2%)
Recommendation of insulin by doctor, n (%)	
Yes	78 (17.0%)
No	380 (83.0%)
Willingness to accept insulin if recommended by doctor, n (%)	
Yes	120 (26.2%)
No	338 (73.8%)

Table 2: Perceptions of diabetic patients towards insulin therapy (n=458)

Characteristics	n (%)	
	Agree	Disagree
Expected harm: Taking insulin can cause problems	80 (17.5%)	378 (82.5%)
Illness severity: Taking insulin means DM becomes much worse	196 (42.8%)	262 (57.2%)
Restrictiveness: Taking insulin would make life less flexible	302 (65.9%)	156 (34.1%)
Lack of fairness: Taking insulin would be just unfair	258 (56.3%)	200 (43.7%)
Expected pain: Injecting insulin would be painful	332 (72.5%)	126 (27.5%)
Risk of hypoglycaemia: Taking insulin would increase risk of hypoglycaemia	192 (41.9%)	266 (58.1%)
Low self–efficacy: Lack of confidence in managing the demands of insulin therapy	287 (62.7%)	171 (37.3%)
Personal failure: Taking insulin would means personal failure to manage disease	242 (52.8%)	216 (47.2%)
Permanence: Never quit insulin once it is started for DM treatment	283 (61.8%)	175 (38.2%)

Table 3: Association between patients' characteristics and willingness to accept insulin therapy

Variable	Willingness, n (%)		Crude OR	95% CI OR	χ^2 stat. (df)[a]	p-value[a]	AOR	95% CI OR	χ^2 stat. (df)[a]	p-value[a]
	Yes	No								
Age in years, mean ± SD	55 ± 10	57 ± 10	1.02	0.99;1.04	2.84 (1)	0.092				
Gender										
Male	67 (31.8)	144 (68.2)	1.00				1.00			
Female	53 (21.5)	194 (78.5)	1.70	1.12;2.60	6.23 (1)	**0.013**	1.67	1.09;2.56	5.89 (1)	0.018
Ethnicity					1.77 (2)	0.413				
Malay	56 (27.7)	146 (72.3)	1.00							
Chinese	29 (22.0)	103 (78.0)	1.36	0.81;2.28	1.39 (1)[b]	0.239[b]				
Indian	35 (28.2)	89 (71.8)	0.98	0.59;1.61	0.01 (1)[b]	0.922[b]				
Education					3.774 (3)	0.287				
No Formal Education	5 (13.9%)	31 (86.1%)	1.00							
Primary Education	48 (28.7%)	119 (71.3%)	0.40	0.15;1.09	3.21 (1)[b]	0.073[b]				
Secondary Education	56 (26.2%)	158 (73.8%)	0.46	0.17;1.23	2.42 (1)[b]	0.120[b]				
Tertiary Education	11 (26.8%)	30 (73.2%)	0.44	0.14;1.42	1.90 (1)[b]	0.169[b]				
Occupation					7.732 (3)	0.052				
Government	9 (20.5%)	35 (79.5%)	1.00							
Private	38 (35.2%)	70 (64.8%)	0.47	0.21;1.09	3.10 (1)	0.078				
Self-employed	21 (30.0%)	49 (70.0%)	0.60	0.25;1.47	1.26 (1)	0.262				
Not Working	52 (22.0%)	184 (78.0%)	0.91	0.41;2.01	0.05 (1)	0.816				
Diagnosed as diabetic, years, mean ± SD	5.9 ± 5.31	5.5 ± 4.56	0.98	0.94;1.03	0.61 (1)	0.436				
Fasting blood glucose level, mmol/L, mean ± SD	8.3 ± 2.90	7.8 ± 2.76	0.94	0.87; 1.01	2.94 (1)	0.086				
HbA1C, %, mean ± SD	7.8 ± 1.85	7.7 ± 1.55	0.96	0.84, 1.08	0.52 (1)	0.472				
Know that relatives / friends have ever used insulin										
Yes	72 (32.3)	151 (67.7)	1.00				1.00			
No	48 (20.4)	187 (79.6)	1.86	1.22; 2.84	8.36 (1)	**0.004**	1.78	1.16; 2.75	6.41 (1)	0.008
T&CM for DM treatment										
Yes	15 (23.8)	48 (76.2)	1.00							
No	105 (26.6)	290 (73.4)	0.86	0.46; 1.61	0.22 (1)	0.639				
Recommendation of insulin by doctor										
Yes	29 (37.2)	49 (62.8)	1.00				1.00			
No	91 (23.9)	289 (76.1)	1.88	1.12;3.15	5.53 (1)	**0.019**	1.83	1.08;3.09	4.16 (1)	0.024

[a] Likelihood Ratio (LR) test; [b] Wald test

Abbreviation: AOR – adjusted odds ratio; OR – odds ratio; SD – standard deviation; IQR – interquartile range; T&CM - Traditional & Complementary Medicine; DM – diabetes mellitus

Table 4: Association between patients' perceptions and willingness to accept insulin therapy

Variable	Willingness, n (%)		Crude OR	95% CI OR	χ^2 stat. (df)[a]	p-value[a]	AOR	95% CI OR	χ^2 stat. (df)[a]	p-value[a]
	Yes	No								
Expected harm: Taking insulin can cause problems										
Agree	13 (16.2)	67 (83.8)	2.04	1.08;3.84	5.38 (1)	**0.020**				
Disagree	107 (28.3)	271 (71.7)	1.00							
Illness severity: Taking insulin means DM becomes much worse										
Agree	33 (16.8)	163 (83.2)	2.46	1.56;3.87	16.08 (1)	**<0.001**				
Disagree	87 (33.2)	175 (66.8)	1.00							
Restrictiveness: Taking insulin would make life less flexible										
Agree	51 (16.9)	251 (83.1)	3.90	2.52;6.04	38.38 (1)	**<0.001**	2.43	1.49; 3.96	9.19 (1)	**<0.001**
Disagree	69 (44.2)	87 (55.8)	1.00				1.00			
Lack of fairness: Taking insulin would be just unfair										
Agree	49 (19.0)	209 (81.0)	2.35	1.54;3.59	15.81 (1)	**<0.001**	1.55	0.97; 2.47	2.43 (1)	0.064
Disagree	71 (35.5)	129 (64.5)	1.00				1.00			
Expected pain: Injecting insulin would be painful										
Agree	63 (19.0)	269 (81.0)	3.53	2.26; 5.51	30.69 (1)	**<0.001**	1.95	1.17; 3.24	5.80 (1)	**0.010**
Disagree	57 (45.2)	69 (54.8)	1.00				1.00			
Risk of hypoglycaemia: Taking insulin would increase risk of hypoglycaemia										
Agree	39 (20.3)	153 (79.7)	1.72	1.11; 2.66	6.04 (1)	**0.014**				
Disagree	81 (30.5)	185 (69.5)	1.00							
Low self–efficacy: Lack of confidence in managing the demands of insulin therapy										
Agree	52 (18.1)	235 (81.9)	2.98	1.94; 4.58	25.39 (1)	**<0.001**	1.79	1.11; 2.90	4.30 (1)	**0.017**
Disagree	68 (39.8)	103 (60.2)	1.00				1.00			
Personal failure: Taking insulin would mean personal failure to manage disease										
Agree	48 (19.8)	194 (80.2)	2.02	1.32; 3.09	10.78 (1)	**0.001**				
Disagree	72 (33.3)	144 (66.7)	1.00							
Permanence: Never quit insulin once it is start for DM treatment										
Agree	62 (21.9)	221 (78.1)	1.77	1.16; 2.70	6.95 (1)	**0.008**				
Disagree	58 (33.1)	117 (66.9)	1.00							

[a] Likelihood Ratio (LR) test

Abbreviation: AOR – adjusted odds ratio; OR – odds ratio; SD – standard deviation

Discussion

Of 458 patients involved in this study, almost three quarter of the patients (73.8%) with T2DM seen in the public health clinics in South Seberang Perai District were not willing to accept insulin if initiated. This percentage was higher than several other studies done previously. As observed in other studies conducted by Zainuddin *et al*. 2011 in Kuala Lumpur, 50.7% of the respondents refused, Nadasen et al. 2012 in Durban, 56% of patients refused, Wong et al. 2011 at Singapore, 70.6% of the patients refused and Khan et al. 2008, conducted on Bangladeshi patients residing at East London with poorly controlled T2DM showed that 42.5% refused insulin therapy when it was initiated (8,12-14). Only in study done by Polonsky et al. 2005 United States of America showed a relatively low prevalence of insulin therapy refusal (i.e. 28.2%) (7). Compared to these studies, which were conducted in urban settings (where exposure of patients to healthcare services and health promotion are plenty) (8,12-14), the present study was conducted in the outskirt setting in Penang mainland where patient have limited access to health promotion and health information regarding their disease. This might explain why the patients were lacking proper understanding towards effective treatment options available for treating T2DM (8,15).

Hence, in this present study HbA1c level and duration of having T2DM did not significantly influence patients to accept insulin therapy. Previous study conducted by Tan et al. 2015 however, showed that HbA1c was a significant factor associated with insulin therapy refusal (9). This showed that patients were more concern on the route of taking medication than disease prognosis. In addition, female patients in this study with T2DM were more likely to refuse insulin therapy compared to their male counterpart, which coincides with the study conducted by Zainuddin et al. 2011 (8). Furthermore, most of the respondents were female (53.9%) and were not working (51.5%). This group of patients spent most of their time with family and close friends and may might easily accept any wrong information or myths that were passed on to them.

In addition, different with other studies that had been published beforehand, patients at South Seberang Perai District were more concerned on knowing either relatives or their close friends using insulin for them to accept insulin therapy. Mean age patients in this study was 56 years old, at this age patients most of the time will be with their family member or relatives. With proper support and encouragement for patients, they will be accepting insulin as a choice of therapy. These findings were highlighted in the study of Koin et al. 2010 in Japanese patients, which emphasizes the importance of family and friends support in improvement of clinical outcome of Diabetes Mellitus (16). As can be seen in this study, education level and occupation status did not contribute to influencing patient's initial decision of refusing insulin. In view of these, peer support group may be effective in promoting insulin acceptance among insulin naive diabetics as peer testimonies could facilitate insulin initiation.

In present study, it was also highlighted regarding the importance of physician recommendation of insulin during patient's clinical visit. Exposure to insulin treatment option during early phase of disease progression could produce more positive impact on patient's acceptance to receive insulin. A major setback in overcoming patient's negative misconception towards insulin is to curb emotional distress of patients living with diabetes for many years (6,7,17). Patient with T2DM will have high pill burden to manage the disease progression. Adding insulin will further complicate their life due to nature of insulin being an invasive procedure to apply. Therefore, it is important for clinicians and other healthcare providers to treat each patient with a more individualised approach – a treatment plan more custom made based on patient's routine and needs. It will be beneficial for patients to be exposed to the nature of diabetes, progression of disease which will lead to usage of insulin sooner or at a later part of the disease stage. Early education and focusing diabetic patient counselling by health care providers will clear patient's negative belief towards insulin.

There were three major barriers found in this study associated with unwillingness to initiate insulin therapy. Majority of the patients manifest several excuses for refusing insulin. Firstly, to the patients perception of taking insulin restrict their life and make it life less flexible. Due to current busy and active lifestyle, patient felt it is a big hassle to take along insulin with them everywhere. As highlighted in study by Hassan et al. 2013, patients were more worried whether the insulin therapy will hinder them from managing their work and personal commitments. Insulin injection requires special device to administer and must be kept at specific storage condition will further complicate patients' routine norm of life. Patients may feel uncomfortable and embarrassed taking insulin outside their home especially during travel (18). This led to more patients only opting for oral medication. Thus, it is important to *tailor-made* individualised insulin therapy plan based on patient daily routine can have a positive acceptance rate among T2DM patients.

Secondly, patients had negative perception on pain associated with insulin injection. Patient associate needle with pain thus they were reluctant to inject insulin. As highlighted in many previous studies,

fear of pain was one of major setback preventing patients from initiating insulin (7,8,12,17). Patient still have the perception of injecting insulin with needle and syringe. With the advancement of modern treatment newer devices are available which ease the administration process of insulin. Therefore, education and hands on demonstration to emphasize on the absence and negligence of pain during injecting insulin will change patients' negative perceptions of pain.

Thirdly, patients had low self-efficacy in handling insulin injection especially multiple injection regimen and frequently adjusted dosing based on their response. As shown in Polonsky et al. 2007, lack of self-efficacy was one of more pronounced negative attitudes in insulin refusal by patients (7). Similar observation was observed in Wong et al. 2011 and Tan et al. 2015 studies that patients fear of mishandling insulin device which might lead to treatment failure (9,13). A more comprehensive approach needs to be formulated to facilitate patient's understanding on insulin devices and injection method. More direct hands-on teaching method and more promotional material on ease of using insulin devices will help boost patient's confidence in handling it.

There were some limitations in this study, firstly this study included patients who had optimal diabetic control and suboptimal diabetic control. Patients in the first group might thought insulin therapy is not appropriate for them. Secondly, patient's compliance to the current treatment was not analysed in this study. Patients with poor compliance might feel that injecting insulin will just add burden to their current treatment. Lastly, in this study results were obtained from self-reported questionnaire by patients, it could not be ascertained whether patients' future response would be the same and the study was only conducted in the state of Penang and therefore the findings might not represent the whole population of Malaysia.

Conclusion

Current acceptance rate for insulin treatment is exceptionally low due to several negative perceptions of patients towards insulin with main rejection reasons were restrictiveness, expected pain and low self–efficacy. The data obtained from this study will help in facilitate to overcome patients reluctant to start insulin in clinical practice, especially with identified factors like gender, recommendation of insulin by doctor and knows relative or friends taking insulin have a significant influence on insulin acceptance. Educating patients to rectify the negative perception will improve overall acceptance rate, especially custom-made patient-centric approach will improve patient's initial negative perception towards insulin therapy.

Acknowledgements

We thank the Director General of Health, Malaysia for his permission to publish this paper. We also would like to express our very great appreciation to all the staff involved in assisting our study. Our special thanks are extended to all the participants in this study.

Conflict of Interest Statement

This study was not funded by any organisation and has no conflict of interest.

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