Orginal Article Open Access
Iranian Journal of Diabetes and Obesity (IJDO)

The Satisfaction level with Insulin Treatment in Type 1 Diabetics - Yazd Diabetes Research Center 2019

Akram Ghadiri-Anari[1,2], Nasim Namiranian[3], Hassan ali Mahmoudi Kohani[4], Roghaye Razavi[4*], Saeedeh Jam Ashkezari[4], Zohre Mozafari[4], Mahtab Ordooei[4,5]

[1]Associate Professor, Diabetes Research Center, Shahid Sadoughi University of Medical Sciences, Yazd, Iran.
[2]Nutrition and Food Security Research Center, Shahid Sadoughi University of Medical Sciences, Yazd, Iran.
[3]Associate Professor of Community & Preventive Medicine, Diabetes Research Center, Shahid Sadoughi University of Medical Sciences, Yazd, Iran.
[4]Diabetes Research Center, Shahid Sadoughi University of Medical Sciences, Yazd, Iran.
[5]Associate Professor of Pediatric Endocrinology & Metabolism, Children Growth Disorder Research Center, Shahid Sadoughi University of Medical Sciences, Yazd, Iran.

Abstract

Objective: Diabetes is a non-communicable disease. The patient satisfaction with treatment is a key point of patient's compliance. Definitive treatment for patients with type 1 diabetes is lifelong insulin injections, but type 1 diabetic patients are commonly in poor glycemic state due to poor compliance. Therefore, it is necessary to check insulin treatment satisfaction in this population. Therefore, the main purpose of this study was to evaluate the satisfaction of insulin treatment in patients with type 1 diabetes in Yazd.

Materials and Methods: In this cross-sectional study, 114 patients with type 1 diabetes participated. Persian version of Insulin Treatment Satisfaction Questionnaire (ITSQ) used. All analyzes were performed by SPSS 22.

Results: The overall satisfaction mean score in this study was 49.72(± 8.88). Insulin treatment satisfaction score had a significant positive correlation with BMI (*P*: 0.00) and age (*P*: 0.04). Hypoglycemic control sub-scale showed a positive correlation with BMI (*P*: 0.01) and age (*P*: 0.01). Also, inconvenience of insulin therapy regimen sub-scale showed a significant positive correlation with age (*P*: 0.04). Overall satisfaction and sub-groups had no significant correlation with other variables.

Conclusion: The overall satisfaction in type 1 diabetics was unacceptable. Understanding the pathogenesis of this problem could guide health care providers for better and effective management of type 1 diabetes. Also, a more comprehensive approach with consider all potentially relevant variables is necessary.

Keywords: Type 1 diabetes mellitus, Insulin, Treatment satisfaction

QR Code:

Citation: Ghadiri-Anari A, Namiranian N, Mahmoudi Kohani H A, Razavi R, Jam Ashkezari S, Mozafari Z et al . The Satisfaction level with Insulin Treatment in Type 1 Diabetics - Yazd Diabetes Research Center 2019. IJDO 2023; 15 (2) :81-86

URL: https://ijdo.ssu.ac.ir/article-1-790-en.html

10.18502/ijdo.v15i2.12965

Article info:

Received: 08 January 2023
Accepted: 08 April 2023
Published in June 2023

This is an open access article under the (CC BY 4.0)

Corresponding Author:

Roghaye Razavi, Diabetes Research Center, Shahid Sadoughi University of Medical Sciences, Yazd, Iran.
Tel: (98) 353 728 0226
Email: forough.nutritionist@gmail.com
Orcid ID: 0000-0002-7081-4945

[Downloaded from ijdo.ssu.ac.ir on 2026-11-08]

[DOI: 10.18502/ijdo.v15i2.12965]

Introduction

Diabetes is a non-communicable disease and a major cause of disability in the world, which imposes a heavy burden on the public health budget due to its complications. The prevalence of this disease is increasing rapidly (1-4). It is estimated that the prevalence of type 1 diabetes(T1DM) was 6.9 per 10 000 people in Asia (1).

Diabetes management, in addition to the effectiveness and safety of the drug, also includes patient satisfaction with treatment (1). Given that only insulin in the drug for treatment in T1DM subjects, it is important to carefully assess patients' satisfaction with their treatment.

Treatment satisfaction defined as the patient's view of the treatment process and its associated outcomes (4). It is important to evaluate three issue for treatment satisfaction that include drug side effects, burden of treatment and effectiveness of treatment (control of hyperglycemia) for this purpose (5).

Assessment of insulin side effects consist of factors such as incidence of hypoglycemia and weight gain. Evaluation of burden of treatment may consist factors such as number of injections or difficulty with devices and problem in access. Evaluations of effectiveness of treatment performed by Hemoglobin A1C (HbA1c). Also, age, gender and duration of diabetes and availability of insulin may influence treatment satisfaction (6).

Devices of insulin usage (pen or syringe) showed a significant difference in overall satisfaction and all subscales of satisfactions in Ghadiri-Anari et-al study (7). All aspects of satisfaction were better in patients who used pen insulin. However, the cost of treatment was higher in pen insulin users (7). A significant difference in glycemic control score and hypoglycemic control score was seen based on BMI. The glycemic control score and hypoglycemic control score in persons with normal BMI was better than the overweight and obese persons (7).

Definitive treatment for patients with T1DM is lifelong insulin injections to better control blood glucose in the target range to reduce diabetes related complications (1,5,6). People with diabetes who are highly satisfied with insulin therapy have reported a better quality of life and clinical outcomes, fewer complications and more improvement (3-6). Preliminary studies have shown that T1DM patients are rarely good control of HbA1c due to poor acceptance and compliance for daily insulin injection (8). So, it is necessary to evaluate this problem from different aspects. One of the reasons is to check the satisfaction of insulin treatment. Therefore, the aim of this study was evaluation of insulin treatment satisfaction in patients with T1DM in Yazd diabetes research center.

Materials and Methods

The data presented in this analytical cross-sectional study were taken from 114 patients with T1DM in Yazd Diabetes Research Center. The convenient sampling method was done to select the studied population .Inclusion criteria were: type 1 diabetic patient, Age≥ 14 years, at least one year living with diabetes. Patients with chronic disease and cognitive impairment were excluded.

Insulin treatment satisfaction questionnaire (ITSQ):

Comprehensive tools for diabetes treatment satisfaction include ITSQ (6). ITSQ was translated to Persian by Ghadiri-Anari et al. in 2020 (7) that confirmed on 572 patients with 2 diabetes. Persian version of insulin treatment satisfaction measurement was consistently comparable with the origin questionnaire (6). Cronbach's alpha and intra-class correlation coefficient for overall questionnaire were 0.88 and 0.81. ITSQ consisted of 22 questions in 5 subscales that include inconvenience of insulin therapy regimen (IR/5 questions), lifestyle

[Downloaded from ijdo.ssu.ac.ir on 2026-11-08]

[DOI: 10.18502/ijdo.v15i2.12965]

flexibility (LF/3 questions), glycemic control (GC/3 questions), hypoglycemic control (HC /5 questions) and insulin delivery device satisfaction (DD/6 questions). For study participants, ITSQ, age, sex, weight and height, duration of diabetes, medical history, Hba1c level, frequency of hypoglycemia during the past week and the characteristics of insulin consumption (type of insulin, syringe or pen), number of insulin injection per day) and availability of insulin were completed by a trained person in a quiet and almost private environment. The answer to each ITSQ question was scored on a ten-point Likert scale from strongly disagree to strongly agree (1= strongly disagree/10= strongly agree). Higher scores indicated more and more satisfaction.

Quantitative continuous variables are presented as mean (± standard deviation) and stratified variables are presented as number (percentage). In this study, Pearson tests were used to analyze the variables. $P \leq 0.05$ was considered statistically significant for all tests. All analyzes were performed using SPSS 22 software (USA, III., Chicago, SPSS Inc.).

Ethical considerations

This study was in line with the principles of the Helsinki Declaration, Also, before starting, it was approved by the Ethics Committee of Shahid Sadoughi University of Medical Sciences in Yazd (IR.SSU.REC.1399.070). Also, the purpose of the study was explained to all participants and informed written consent was obtained from them.

Results

A total of 114 T1DM patients participated in the study. Participants were evaluated in terms of age, sex, duration of diabetes, insulin use, etc. Tables 1 and 2 showed the demographic characteristics of the participants. The mean age of the study population was 20.45(± 8.26) years. The mean duration of diabetes was

Table 1. Characteristics of participants (part 1)

Characteristics		N (%)
Sex	Male	44 (37.7)
	Female	70 (62.3)
BMI	<18.5	38 (33.3)
	18.5- 24.9	52 (45.6)
	>25	24 (21.1)
Insulin type	Pen	65(57%)
	Syringe	37(32.5)
	Mix	12(10.5)
Availability	Difficult	53 (46.5)
	Easy	15 (13.1)
	No answer	46(40.4)
Numbers of insulin injection per day	1	0(0.00
	2	5 (4.4)
	3	12 (10.5)
	4	62 (54.4)
	5	21 (18.4)
	≥ 6	14 (12.3)
Numbers of hypoglycemic event in week	0	27 (23.7)
	1	24 (21.1)
	2	25 (21.9)
	3	4 (3.5)
	≥ 4	34 (29.8)

Values reported as count (percentage).
Abbreviations: BMI: Body Mass Index; HbA1c: Hemoglobin A1C.

Table 2. Characteristics of participants (part 2)

Characteristics	Age(year)	HbA1c (%)	Diabetes duration (year)	Satisfaction	IR	LF	GC	HC	DD
mean ± SD	20.45 (± 8.26)	9.13 (± 2.07)	8.61 (± 5.14)	49.72 (± 8.88)	51.39 (± 18.02)	40.94 (± 20.39)	55.96 (± 20.31)	53.07 (± 16.76)	47.15 (± 12.02)

Abbreviations: HbA1c: Hemoglobin A1C; IR: Inconvenience of Regimen; LF: Lifestyle Flexibility, GC: Glycemic Control, HC: Hypoglycemic Control; DD: Insulin Delivery Device

[Downloaded from ijdo.ssu.ac.ir on 2026-11-08]

[DOI: 10.18502/ijdo.v15i2.12965]

8.61(± 5.14) years. Mean HbA1c levels were 9.13(± 2.07%) in this study. 37.7% of patients were male. The majority of injecting users used the pen (57%) and only 32.5% used the syringe exclusively.

The overall satisfaction score for the participants in this study was 49.72(± 8.88) from 100 (Table 2). Mean scores of overall satisfactions in different gender groups of participants are 49.17 (±12.57) in male and 50.09 (±11.12) in female (p-value: 0.6). Also, there was no significant difference between overall insulin satisfaction and type of insulin (pen or syringe) use (*P*= 0.67).

As shown in Table 3, the score of overall insulin satisfaction had a positive correlation with BMI and age. Inconvenience of insulin therapy regimen (IR) sub-scale showed a significant positive correlation with age. Hypoglycemic control sub-scale demonstrated a significant correlation with age (r= 0.24, *P*= 0.01) and BMI (r= 0.23, *P*= 0.01). There was no significant relationship between satisfaction scores and other variables.

The results obtained from this study demonstrated that, the overall satisfaction score and its subgroups were not statistically significantly different between men and women (Table 4).

Discussion

In this research, we studied insulin satisfaction and five main dimensions of patient satisfaction with insulin therapy in type 1 diabetic subjects. The results of the present study show that the insulin treatment satisfaction score had a positive correlation with BMI and age. Inconvenience of insulin therapy score indicated a significant positive correlation with age. Also, hypoglycemic control domain illustrated a significant positive correlation with BMI and age. In our study no correlation found between overall satisfaction and five main subgroups with other variables such as duration of diabetes, HbA1c level, type of insulin (pen or syringe), and number of insulin injection per day, number of hypoglycemic events per week and insulin availability.

In this study the overall satisfaction in type 1 diabetics was 49.72**(** ± 8.88**)**from 100 that is low and unacceptable. It is necessary to find strategies for increasing satisfaction for example by socioeconomic or psychological

Table 3. Correlation between the overall insulin satisfaction and sub-groups and studied variables

Variable		Duration diabetes (years)	HbA1c (%)	Age (years)	BMI (kg/m^2)	Numbers of insulin injection per day	Numbers of hypoglycemic event in week
Satisfaction	r	0.18	0.003	0.19	0.31	0.19	0.051
	P	0.05	0.98	0.04	0.00	0.05	0.635
IR	r	0.11	0.22	0.19	0.16	-0.151	0.020
	P	0.21	0.06	0.04	0.06	0.121	0.83
LF	r	-0.03	0.03	0.11	0.17	0.01	0.107
	P	0.72	0.79	0.24	0.08	0.92	0.313
GC	r	0.12	-0.07	-0.05	-0.9	0.116	-0.062
	P	0.19	0.53	0.59	0.36	0.245	0.52
HC	r	0.16	-0.13	0.24	0.23	-0.084	0.177
	P	0.09	0.27	0.01	0.01	0.39	0.95
DD	r	0.09	-0.09	0.00	0.12	0.039	-0.056
	P	0.32	0.46	0.94	0.22	0.69	0.58

Values reported as r. P-value was obtained from Pearson's test.
Abbreviations: BMI: Body Mass Index; IR: Inconvenience of Regimen; LF: Lifestyle Flexibility, GC: Glycemic Control, HC: Hypoglycemic Control; DD: Insulin Delivery Device; HbA1c: Hemoglobin A1C.

Table 4. Overall satisfaction score and its subgroups based on sex

Sex	Satisfaction	IR	LF	GC	HC	DD
Male	49.32 (± 7.84)	48.83 (± 17.98)	39.45 (± 17.86)	58.37 (± 18.23)	52.04 (± 16.08)	48.53 (± 10.90)
Female	50 (±9.54)	53.08 (± 18.07)	42.31 (± 21.69)	54.09 (± 21.33)	53.71 (± 17.35)	46.35 (± 12.72)
P	0.7	0.22	0.47	0.27	0.61	0.36

Values reported as mean± SD. *P* was obtained from T- test. Abbreviations: IR: Inconvenience of Regimen; LF: Lifestyle Flexibility, GC: Glycemic Control, HC: Hypoglycemic Control; DD: Insulin Delivery Device.

[Downloaded from ijdo.ssu.ac.ir on 2026-11-08]

[DOI: 10.18502/ijdo.v15i2.12965]

support.

In our study, no correlation was seen between satisfaction and HbA1c level. Inverse correlation between satisfaction and HbA1c level in people with type 1 and type 2 diabetes were found in some studies (6,7,10,11). Our study performed in type 1 diabetic that is younger subjects and absolutely used insulin that maybe justify this discrepancy. Indeed, overall satisfaction in our study is in the lower of mid-range (low).

We found an unexpected correlation between BMI and overall satisfaction score and hypoglycemic control sub-scale. In people with higher BMI, treatment satisfaction score increased. Richard R Rubin et al. displayed that diabetes concerns are lower in people with higher BMIs, which confirms the results of our study (11) but the results of Ghadiri-Anari et al. showed that mean ITSQ scores and hypoglycemic control sub-scale are lower in people with higher BMIs, which contradicts the findings of this study (7). One of the major concerns for the patient taking insulin is weight gain and hypoglycemia. The cause of paradox result of our study is unclear, but maybe good adherence of this group for insulin injection that lead to increasing weight and better satisfaction.

In this vein, we demonstrated that age had positive correlation with overall satisfaction score and hypoglycemic control sub-scale and inconvenience of insulin therapy sub-scale. Results in this regard are various. Studies have found that greater satisfaction is associated with decreasing age, while others have indicated that younger patients are less satisfied with their treatment (8-13). For example, there were significant differences between means of age and overall satisfaction and hypoglycemic control sub-scale in the educated group in Ghadiri-Anari et al. study (7). In this regard, correlation found between age and inconvenience of insulin therapy sub-scale in this study (7). Brod found that when a patient is beginning insulin treatment, age is not a factor influencing current treatment satisfaction, but it is only a significant factor for the glycemic control and device satisfaction subscales. Most of mentioned studies performed in type 2 diabetics that are older than type 1 diabetics, so concomitant comorbidities are high in older type 2 diabetics that explain low satisfaction. It is suggested clinicians should be considered people age more in to account when discussing glycemic control and device satisfaction issues than when discussing overall treatment satisfaction (12).

Understanding the interaction between factors that may impact how persons explain their treatments satisfaction and complex and multidimensional nature of treatment satisfaction is necessary. For example, evaluation of concomitant micro or macro-vascular complication or other comorbidity (somatic or psychological) or poly-pharmacy maybe helpful for this purpose. Also use of novel insulin delivery systems for example insulin pump maybe another way for increasing satisfaction (3).

Our study has some limitations. First, the participants were all from the urban population. In addition, the data obtained from patients are self-report and there is no real observation of the patient's behavior. Anyway, evaluation of concomitant micro or macro-vascular complication and socioeconomic conditions in the context of insulin treatment was not performed in this study. Hence, it is recommended that evaluate insulin satisfaction in patients with type 1 diabetes with a larger sample size and different region.

Conclusions

In this study, ITSQ, was used to determine satisfaction with insulin therapy in patients with T1DM. In summary, the overall satisfaction in type 1 diabetics was unacceptable. Understanding the etiology of this problem is necessary. These findings could help health care providers for better and effective management of T1DM patients. Also, a more comprehensive approach with consider all potentially relevant variables is necessary.

[Downloaded from ijdo.ssu.ac.ir on 2026-11-08]

[DOI: 10.18502/ijdo.v15i2.12965]

Acknowledgments

The authors would like to thank all the study participants and their families. We also thank Shahid Sadoughi University of Medical Sciences and Health Services for financial support, Yazd Diabetes Research Clinic and all medical staff in this center for their support and cooperation.

Funding

We thanks Shahid Sadoughi University of Medical Sciences and Health Services for financial support.

Conflict of Interest

The authors declare that they have no conflicts of interest.

References

1. Bhutani J, Bhutani S. Worldwide burden of diabetes. Indian journal of endocrinology and metabolism. 2014;18(6):868.
2. Mobasseri M, Shirmohammadi M, Amiri T, Vahed N, Fard HH, Ghojazadeh M. Prevalence and incidence of type 1 diabetes in the world: a systematic review and meta-analysis. Health promotion perspectives. 2020;10(2):98-115.
3. Bromba M, Campbell F, Levy BL. The Insulin Treatment Satisfaction Questionnaire and assessment of satisfaction with a latest-generation insulin pump. European Endocrinology. 2015;11(2):67.
4. Brod M, Cobden D, Lammert M, Bushnell D, Raskin P. Examining correlates of treatment satisfaction for injectable insulin in type 2 diabetes: lessons learned from a clinical trial comparing biphasic and basal analogues. Health and quality of life outcomes. 2007;5(1):1-0.
5. Atkinson MJ, Sinha A, Hass SL, Colman SS, Kumar RN, Brod M, et al. Validation of a general measure of treatment satisfaction, the Treatment Satisfaction Questionnaire for Medication (TSQM), using a national panel study of chronic disease. Health and quality of life outcomes. 2004;2:1-3.
6. Anderson RT, Skovlund SE, Marrero D, Levine DW, Meadows K, Brod M, Balkrishnan R. Development and validation of the insulin treatment satisfaction questionnaire. Clinical therapeutics. 2004;26(4):565-78.
7. Ghadiri-Anari A, Jam-Ashkezari S, Namiranian N, Biglari Abhari M. Persian version of insulin treatment satisfaction measurement; an original study. Journal of Renal Endocrinology. 2020;6:e02.
8. Cappelleri JC, Gerber RA, Kourides IA, Gelfand RA. Development and factor analysis of a questionnaire to measure patient satisfaction with injected and inhaled insulin for type 1 diabetes. Diabetes care. 2000;23(12):1799-803.
9. Wilbur K, Al Hammaq AO. Validation of an arabic version of the diabetes treatment satisfaction questionnaire in Qatar. Diabetes Research and Clinical Practice. 2016;113:53-9.
10. Rubin RR, Peyrot M. Psychometric properties of an instrument for assessing the experience of patients treated with inhaled insulin: the Inhaled Insulin Treatment Questionnaire (IITQ). Health and Quality of Life Outcomes. 2010;8(1):1-8.
11. Brod M, Christensen T, Bushnell D. Maximizing the value of validation findings to better understand treatment satisfaction issues for diabetes. Quality of Life Research. 2007:1053-63.
12. Redekop WK, Koopmanschap MA, Stolk RP, Rutten GE, Wolffenbuttel BH, Niessen LW. Health-related quality of life and treatment satisfaction in Dutch patients with type 2 diabetes. Diabetes care. 2002;25(3):458-63.
13. Taylor MD, Frier BM, Gold AE, Deary IJ. Psychosocial factors and diabetes-related outcomes following diagnosis of type 1 diabetes in adults: The Edinburgh prospective diabetes study. Diabetic Medicine. 2003;20(2):135-46.

[Downloaded from ijdo.ssu.ac.ir on 2026-11-08]

[DOI: 10.18502/ijdo.v15i2.12965]