ORIGINAL ARTICLE

Bali Medical Journal (*Bali Med J*) 2018, Volume 7, Number 3: 678-681
P-ISSN.2089-1180, E-ISSN.2302-2914

Published by DiscoverSys

Insulin-related outcomes (satisfaction, pain, and adherence) among type II diabetes patients switched from syringe to insulin pen

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ABSTRACT

Background: The purpose of this study was to compare the effect of insulin-related outcomes (satisfaction, pain and treatment adherence) in patients using insulin pen and syringe.

Method: We conducted a comparative interventional study. The subjects were 110 diabetic patients attending Kermanshah Diabetes Clinic. 110 Subjects were selected through simple random sampling. Data were gathered using a researcher-made treatment satisfaction questionnaire; a General Adherence Scale (GAS) and Chronic Graded Pain Scale (CGPS). Data were analyzed using SPSS version 21.

Results: Independent t-test results showed no significant difference in the satisfaction of patients using pen vs. syringe ($p < 0.05$). However, injection pain and treatment adherence was significantly ($p<0.001$) different at the baseline and follow-up of pen users.

Conclusions: Switching the diabetes treatment from syringe to insulin pen improved patients' satisfaction and adherence while decreased their injection pen.

Keywords: Insulin Therapy, Patients' Satisfaction, Treatment Adherence, Insulin Pen

Cite This Article: Aazami, S., Mozafari, M., Poorabdollah, H. 2018. Insulin-related outcomes (satisfaction, pain, and adherence) among type II diabetes patients switched from syringe to insulin pen. *Bali Medical Journal* 7(3): 678-681. DOI:10.15562/bmj.v7i3.1009

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Received: 2018-01-08
Accepted: 2018-7-5
Published: 2018-9-1

INTRODUCTION

Diabetes is the most common metabolic disease in humans. This disease is referred to a group of metabolic disorders in which high blood glucose levels occur in all diabetic patients.[14] Diabetes is a concern because it involves all age groups. It is estimated that 300 million people globally will suffer from diabetes until 2025. Diabetes was the leading cause of 4.6 million deaths in 2011, and today has become one of the five causes of death in high-income countries.[10] The cost and burden of diabetes for a country is very expensive. Diabetic patients, especially those with cardiovascular complications reported lower levels of health and quality of life and a higher incidence of depression and disability.[4,19]

There are significant factors in controlling diabetes. One of these factors is the patient's satisfaction with the method of treatment. Patient's satisfaction leads to greater compliance and ultimate progress of treatment. Dissatisfied patients are less likely to adhere to drug orders and show less progress in symptoms relief. Therefore, physicians and healthcare providers should find factors which influence patients' satisfaction to contribute to promoting health status. On the other hand, there are plenty of side effects related to insulin injections including weight gain, redness and itching at the site of injection, thickening of the skin as well as swelling of the face, lips or tongue. The use of an insulin pen causes less pain when injected, helps determining dosage more precisely compared to insulin syringes which is easier to be used by patients with visual or hand impairment.[13] Insulin pens make multiple insulin injections easier, thus are a newer replacement for syringes. Each insulin pen includes a replaceable needle, a glass of insulin (3 ml instead of 10 ml), and a pen. The available insulin for use in these pens are the simple and mixed types. In the latter, the insulin glass contains both short and long-acting insulin. The amount of insulin injected by the pen is determined through a screw at the end of the back part, and is more accurate than syringes. Modern needles with advanced technologies, such as triple grinding, polishing, and silicone coating, are useful to minimize injection pain. The convenience, low price, and simple transport has led to the high use of insulin pens in many diabetic patients.[2,17] Evidence from previous studies suggested that patients using insulin pens have higher treatment and satisfaction compared to patients using syringes. Insulin pen use, instead of vials and syringes, not only increases patient satisfaction, but also improves safety and reduces costs.[3,12] Despite the widespread use of insulin pens, studies in Iran assessing insulin-related outcomes among patients switch from syringe to pen are scarce. Therefore, this study aimed to compare the degree of satisfaction, injection pain

and treatment adherence in patients who switch their insulin injection method from syringe to pen.

MATERIALS AND METHODS

This interventional-comparative study was conducted among 110 diabetic patients attending Kermanshah Diabetes Clinic, Iran, 2017. Totally, 82 diabetic patients under treatment of insulin using syringe were selected. A physician assigned patients into two groups of cases and controls. Controls (N=41) were patients continue to receive insulin using syringes while, cases (N=41) were patients changed their treatment device to insulin pen. The two groups were matched in terms of duration of diabetes, insulin therapy doses, age, level of education, and no underlying illnesses. We used a researcher-made questionnaire to measure treatment satisfaction which consisted of 6 Likert type scale ranging from 1(very satisfied) to 5(very dissatisfied). General Adherence Scale (GAS) originally developed by Hayes was used to measure patients' adherence one physician's recommendations. GAS is a five items Likert type questionnaire ranging from 1(never) to 6(always).[11] Finally, the injection pain was measured using theVonkorff's Graded Chronic Pain Scale (GCPS). Three facets are assessed using this questionnaire including pain intensity, disability score as well as disability points. The GCPS is a 7 items scale and responses are from an 11 point Likert scale range from 0 to 11.[18] The content validity of the questionnaires was assessed using a panel of experts. To determine the reliability of the employed questionnaires, internal consistency used Cronbach's alpha were assessed. SPSS was used to analyze the data.. Inclusion criteria in this study was aged more than18 years old, diagnosed with diabetes mellitus type II at least one year ago and a history of insulin therapy for a minimum of six months. Individuals with HbA1c levels less than 7% and more than 10% and those diagnosed with cardiovascular disease, chronic renal failure, and other systemic diseases were not included in the current study Participants were informed about the study objectives, benefits and any potential harms prior to data collection. Our subjects signed the written consent. Treatment satisfaction, adherence, and injection pain were measured at baseline and after 12 weeks of follow up. Researchers filled up the form by orally reading the items for illiterate patients. Four weeks after the baseline, patients were re-visited. This is to ensure patients have no difficulty in the administration of insulin pain and to monitor any potential side effect. Then, the three employed questionnaires were administrated for the second time at the 12th weeks.

Participants were assured their information remained confidential. This study did not add any financial burden to participants and ethically respected each person involved in the research process

RESULTS

The study population were 51.2% male (N=42) and 48.8% female (N=40). Majority of Our sample aged 46-55 years old (41.2%), and 12.2% aged 26-35 years old. Around one-third (35.433%) of our sample were illiterate and 4.9% had elementary school education level. In terms of income, 47.6% (N=39) earned less than 5,000,000 Iranian Rials and 2.4% earned 20,000,000-20,500,000 Iranian Rial.

The results of the independent sample T-test showed significant differences in treatment satisfaction between patients using syringes and insulin pens (p=0.000). There was also a significant difference between the mean of injection pain between patients using syringes and insulin pens (p=0.000). Similarly, independent sample T-test showed a significant difference between the mean of treatment adherence in the two groups (p=0.000).

The paired t-test showed no significant differences between the average treatment satisfaction in the baseline and follow-up measurement in patients using insulin pens (p=0.256). This test showed a significant difference in injection pain for baseline and follow-up of patients using insulin pen (p=0.000). Similarly, there was a significant

Table1 **T-test to compare insulin therapy outcomes between cases and controls**

Variable	Respondent group	n	Mean	SE	F	Significance level	T	df	Significance level
Treatment satisfaction	Syringe users	41	2.6	0.60	2.365	0.128	-12.617	80	0.000
	Pen users	41	3.74	0.60					
Injection pain	Syringe users	41	4.22	920	8.111	0.006	17.853	65.268	0.000
	Pen users	41	1.21	0.55					
Treatment adherence	syringe users	41	2.90	1.06	5.899	0.017	-11.659	67.441	0.000
	Pen users	41	5.20	0.67					

Table 2 **Paired T-test for the differences in treatment satisfaction, injection pain and treatment adherence before and after use of insulin pen**

Variable	n	Mean	Standard deviation	T	Df	Significance level
Treatment satisfaction	41	-0.11	0.66	-1.153	40	0.256
Injection pain	41	0.40	0.41	6.289	40	0.000
Treatment adherence	41	-0.61	0.48	-8.062	40	0.000

difference in treatment adherence for baseline and follow-up of patients using insulin pen (p=0.000).

DISCUSSION AND CONCLUSION

The current study aimed to assess insulin-related outcomes among type II diabetic patients switched from syringe to pen. We assessed the three insulin-related outcomes including satisfaction, pain, and adherence to the treatment. Findings from this study showed a non-significant difference between the satisfaction of pen users vs. syringe users. However, elaborating the results indicated that although this difference was statistically insignificant, but the mean satisfaction score was relatively higher among pen users rather than syringe users. That is, diabetic patients using insulin pen were more satisfied with the treatment method. This finding is consistent with previous evidences showing that insulin pen users are more satisfied than the syringe users.[8,15,16] Use of insulin pen is easier for diabetic patients in comparison with vials and syringes. An insulin pen is also feasible to keep and maintain compare to the vials which need to be stored at refrigerator.[6,7]

This research found that patients after three months of switching treatment from syringe to insulin pen reported lower injection pain. Similarly, previous evidences reported a lower amount of pain for injection in inulin pen users rather than syringe users.[8] This can be explained by less frequent injections, precise dosage and smaller size of needles in insulin pens.

A further highlight from the present study is higher adherence to the treatment among diabetic patients using insulin pen compared to syringe users. It has been shown that the shape of insulin pen is less terrifying and more attractive to administer insulin.[9] Diabetes is accompanied with several consequences including peripheral neuropathy which make the self-management difficult to perform. It would be much easier to adhere to the treatments using an easily readable dosage device especially for patients with visual impairment.[3] This may justify why patients' adherence to the treatment is higher among those who use easy to handle dose selector pens.

Continuous education is one of the principles in the treatment of diabetes due to enabling patients in self-management. To confirm this statement, a study in Korea examined the effect of previously designed training on blood glucose control and self-care. It was observed that trained patients, compared to untrained ones, could inject insulin more effectively and subsequently, glycemic control was ultimately achieved. The use of insulin pen, due to ease of dosage adjustment and injection, improved patient satisfaction and adherence. It also had a higher precision for delivering small dosage that is socially more acceptable, and there is a less injection pain.[20] Therefore, use of insulin pens may improve insulin-related outcomes among patients suffering from complications associated with diabetes treatment. It is necessary to raise public awareness regarding the use of insulin pens that can be done by mass media (radio, television, internet, etc.) and training programs in diabetes clinics. Educational programs either at individual setting or within groups can play a major role in raising awareness and performance of diabetic patients to use new treatment methods.

On the other hand, it might be difficult to reach all diabetic patients as the target of educational programs. Therefore, it is critical to empower health care providers by increasing their awareness about the benefits and consequences of new methods in the treatment of diabetes. It is obvious that health-care professionals require less time to train patients on instruction to use insulin pen than a syringe, leaving more space to explain about other complications of initiating insulin therapy.[6]

There are some limitations to the current study which need to be considered. One of these limitations is the small sample size which is due to low number of patients attending Kermanshah diabetes clinic. The current study only compared insulin pen versus syringe. However, future studies may benefit from comparing different insulin pens to find the most preferred and convenient pen. This would also help health-care professionals to give an opportunity to patients for choosing a method from a selection of appropriate devices. Future studies are recommended to compare the acceptability of different patients at different life stages (especially children and elderly) to switch to a new method of insulin therapy. Finally, this study only investigated patients suffering from diabetes type II. It would be beneficial to study Individuals' acceptability on using insulin pen among type I diabetic patients.

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