

# The Use of Insulin Pumps in Adults with Type 1 Diabetes – Experience from a Secondary Care Hospital in Kuwait

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**Received date:** 20 Oct 2016; **Accepted date:** 22 Nov 2016; **Published date:** 28 Nov 2016.

**Citation:** Alsaleh FM, Alattar AT, Abdulla KA, Muzaffar T, Al-Muaili TN (2016) The Use of Insulin Pumps in Adults with Type 1 Diabetes – Experience from a Secondary Care Hospital in Kuwait. *J Dia Res Ther* 3(1): doi <http://dx.doi.org/10.16966/2380-5544.124>

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## Abstract

**Aim:** To explore the experiences of adults switching to insulin pumps, and to determine patients' views regarding the training/education they had received.

**Methods:** A descriptive cross-sectional study was conducted using questionnaires containing both open-ended and closed questions. All patients with type 1 diabetes mellitus (T1DM) who were receiving continuous subcutaneous insulin infusion (CSII; i.e. insulin pump therapy) and attending adult diabetes outpatient clinics at Amiri Hospital, a secondary care hospital in Kuwait and pioneer in delivering insulin pump therapy service, were invited to participate (n=19). The questionnaires were distributed on one occasion whilst patients were waiting for their clinic appointment at the Hospital. Data management was undertaken using established qualitative and quantitative analytical procedures.

**Results:** The majority of patients (n=18 out of 19; 95%) reported finding it easier to maintain glycemic control within their target range using CSII compared to their multiple daily injection (MDI) regimens. This was reflected in their mean glycated hemoglobin A1c levels (HbA1c) which fell from  $9.53 \pm 2.72\%$  to  $7.93 \pm 1.51\%$  ( $P < 0.05$ ; 95% CI, 0.31-2.89), 6 months after CSII initiation. Patients also reported an overall increase in lifestyle flexibility and the ability to lead more 'normal' lives at home (n=12; 63%) and college/work (n=16; 84%). CSII improved social interactions of some patients (n=9; 47%) and their capability to perform sports and physical activities (n=11; 58%) compared to injections. This was explained by the advantages the pumps had over injections: easier dose delivery, calculation, and correction; more accurate dosing; flexible eating pattern (time, type and amount of meals); and improved glycemic control. Negative experiences related to wearing pumps and body image were also reported. Although education and training were received as part of insulin pump therapy programme at the Hospital, some patients thought that this was not enough. Accordingly, they highlighted the need for continuous update and training, with an emphasis on issues such as carbohydrate counting, insulin dose monitoring and dealing with pump malfunctions.

**Conclusion:** Considering patients' experiences, using insulin pump was advantageous. Pump therapy programme at the Hospital can be further improved and used as a model for wider implementation in Kuwait.

**Keywords:** Adults; T1DM; Insulin pumps; Insulin injections; Glycemic control

## Introduction

Diabetes represents a growing healthcare challenge worldwide. Currently, there are approximately 387 million people aged 20-79 living with diabetes [1]. By 2040, this number is expected to expand to 635 million. The Middle East region represents a rich epidemic area, where countries with the highest diabetes prevalence are located; Saudi Arabia (17.6%) and Kuwait (14.3%). This high burden is partially attributed to the physical inactivity and sedentary lifestyle that characterize these countries [2]. Type 1 diabetes mellitus (T1DM) is a common metabolic disorder in Kuwait [3,4]. Kuwait represents the third country in the world with the highest yearly incidence of T1DM in children; 37.1 new cases per 100,000 population [1].

Insulin constitutes the mainstay for managing T1DM. Results of the Diabetes Control and Complications Trial indicated that intensive insulin therapy, via multiple daily injections (MDIs); >2 injections per day, or continuous subcutaneous insulin infusion (CSII) via insulin pumps could achieve near-normoglycemia as well as delay the progression of long-term complications [5]. Over the past few decades, CSII has become an attractive alternative to injections, with a growing widespread use [6-8].

A number of systematic clinical reviews highlight the ample evidence for using CSII in the management of T1DM in patients of different age groups. Reviews evaluated outcomes such as glycemic control, safety, quality of life and cost-effectiveness and showed that there are numerous benefits to using CSII, including improved glycemic control, reduced rate of hypoglycemia, and enhanced quality of life [9-12]. Assuming a reduction in glycated hemoglobin A1c (HbA1c) levels is 1.4%, the cost per quality-adjusted life year falls from £50,000 to around £25,000 and hence CSII via insulin pumps was found to be cost-effective [10].

To date, there are limited qualitative studies exploring users' experiences of CSII via insulin pumps from children/young people's perspectives [13-16], while fewer examined adults' experiences [17-21]. The latter indicates a range of positive and negative experiences by adult users. Positive experiences were encountered with CSII being viewed as a tool that enhances quality of life and improves glycemic control [17,19-21]. However, challenges relevant to visibility of the pump (e.g. body image, stigma) and operation of the device were reported. Ritholz et al. [19] and Piven and Nazeran [18] focused on the individual's perceived notions and psychosocial factors that can affect experience with managing diabetes with CSII. None of the studies that were extracted from the literature,

except one [18], highlighted participants' experiences during the transition from MDIs to CSII. This highlights the need for a more comprehensive approach of reporting the experiences to include the different stages of therapy (during transition from MDIs to CSII and ongoing therapy) and at various aspects of life (home, school/college, social events). Additionally, none of these studies were done in the Middle East or other regional countries where different cultural background and lifestyle could have affected patients' coping and experiences to this advanced treatment strategy.

In parallel with the worldwide growth, physicians in Kuwait have started prescribing insulin pumps in the last few years as an alternative treatment option to injections. To date, no studies were done to examine how patients have coped with this advanced treatment option. Therefore, the current study aimed to describe experiences of using CSII *via* insulin pumps for different periods to manage adults with T1DM and how that impacted their lives. It also aimed to determine patients' views regarding training and education they had received when commencing insulin pump therapy. Performing this study is timely and will reveal the perceived needs and challenges, from the patients' perspectives, which will help delivering appropriate support to them. It will also provide data needed to develop recommendations for the provision of health services and prescribing policy with regard to CSII therapy for managing diabetes in Kuwait.

## Materials and Methods

A descriptive cross-sectional study was conducted using qualitative and quantitative approaches.

### Study setting

Data collection was carried out in Amiri Hospital; a major secondary care hospital in the City of Kuwait. It is recognized as a pioneer in CSII therapy; commenced in 2004. However, there was no structured educational programme at that time to educate patients on how to use the pumps efficiently. In 2007, a programme for delivering CSII therapy to adults was established in the Hospital. Guidance for commencing was approved by the Ministry of Health (MoH) in Kuwait and similar to international guidance [22,23]. It stated that T1DM patients (Kuwaitis only) who used MDIs for 6 months or more, or failed MDIs, should be initiated on insulin pumps, funded by the MoH. Patients should also show willingness to commit to achieving the skills needed for using the therapy effectively. Before using a pump, patients should undergo educational programme and training organized by the diabetes healthcare team at the Hospital and the pump manufacturer's representatives.

### Sampling and recruitment

With the preliminary fieldwork, the Hospital's records showed that there are 39 adult patients receiving CSII therapy at the Hospital. All patients with T1DM who were receiving CSII therapy and attending adult diabetes outpatient clinic at Amiri Hospital were invited. A covering letter (with a consent form enclosed) explaining aim of the study, confidentiality issues and investigator's information was distributed to the patients during clinic visits.

Patients with type 2 diabetes mellitus or those with diabetes suffering from depression were not included in the study. Patients on CSII therapy, pregnant females and pediatrics were also excluded.

### Study instruments and procedures

The questionnaires were devised following a literature review and discussions with members of the diabetes team. They comprised open-ended questions about patients' experiences/views on using CSII therapy compared to MDIs, and closed-ended to collect medical information (e.g. diabetes and pump therapy duration, etc.) and personal data (e.g. age, sex, nationality, etc.).

Two researchers reviewed the questionnaire and checked the questions' consistencies, clarity and relevance. Moreover, the first 3 questionnaires were piloted to assess the content and face validity of the tool and whether data collection procedures were feasible or not. The questionnaires were distributed in English on one occasion whilst patients were waiting for their clinic appointment.

### Ethical consideration

Ethical approval to conduct the study was obtained from the Joint Committee for the Protection of Human Subjects in Research of the Health Science Center (HSC) & Kuwait Institute for Medical Specialization (KIMS), MoH.

### Analysis

Data from the open-ended questions were analyzed using the computer package MAXQDA 2010 to enable qualitative data management. Themes and subthemes were developed based on issues raised by the respondents. An iterative approach comprising constant comparison was used, as described by Lincoln and Guba [24]. By this method, the data relating to each theme were constantly revisited after initial coding until it was clear that no new themes or ideas were emerging. Data from the closed-ended questions were entered into Microsoft Excel 2010 and descriptive statistics were used to analyse the data [frequency and percentage].

Quantitative analysis was undertaken using the Statistical Package for Social Sciences (SPSS), version 17. To test the statistical significance of CSII therapy in achieving glycemic control, mean HbA1c% for 6 months pre- (last 6 months on the MDIs) and post-CSII initiation were calculated and paired data were analyzed using the parametric t-test. This protocol was followed in other studies found in the literature [14,25,26]. All reported results were two-tailed and were considered significant at  $P < 0.05$ .

## Results

At the time of data collection, there were 21 patients with type 1 diabetes attending adult diabetes outpatient clinic at the Hospital. However, one of them aged 15 years and another was a pregnant female patient and hence both were excluded from the study. Accordingly, 19 patients aged 18-47 years (mean 29.5 years) were regularly visiting the Hospital for follow-up. All of those were invited and returned reply slips expressing willingness to take part in the study. Characteristics of the respondents are shown in table 1.

Four themes were generated: transition period, efficacy and safety, impact on life and Hospital services.

### Transition period

The transition period in this study refers to the initial period (first few days-to- weeks) when a patient was switched from MDIs to CSII therapy. According to the literature, in order to use the pump successfully patients should gain skills and knowledge to handle management tasks associated with the technology (e.g. changing infusion set, calculating/monitoring doses) [27].

Almost half of the sample ( $n=9$ ; 47%) expressed having difficulty at the beginning adjusting to the new therapy. Thirteen patients (68%) reported they needed an average of 20 days (min 3 days to max 60 days) to master the device and the associated management tasks. On the other hand, the rest ( $n=6$ ; 32%) reported that they required more time (min 6 months to max 2 years).

Patients reported various challenges during this transition period. The most commonly reported issues were: worries about using pump (e.g. continuous attachment to a device and clothing issues) and difficulty of the management tasks (e.g. operating pump, monitoring insulin doses) which led in some instances to losing glycemic control.

Patients' demographics			Medical information			
	Category (years)	n		Range (years)	n	
Age	18-20	3	T1DM duration Mean: 15.6	<1	0	
	21-25	6		1-<2	1	
	26-30	1		2-<5	0	
	31-35	5		5-<10	3	
	36-40	2		>10	15	
	41-45	1		Pump therapy duration Mean: 4.3	<1	4
	46-50	1			1-<5	6
Sex	Male	7		5-<10	9	
	Female	12		>10	0	
Nationality <sup>1</sup>	Kuwaiti	18	Current pump model	Medtronic MiniMed	19	
	Non-Kuwaiti	1	Pump insulin	Aspart	19	
Education	Postgraduate	1	Pump combined with glucose sensor	Yes	2	
	University	14		No		17
	Diploma	2				
	High School	2				

**Table 1:** Characteristics of patients who were invited and consented to take part in the study (n=19)

n: Number of participants; T1DM: Type 1 diabetes mellitus

<sup>1</sup>Although pumps are funded by the MoH to Kuwaiti patients only, a non-Kuwaiti-patient was on a self-funded insulin pump and visiting the Hospital regularly for follow-up. All patients with T1DM attending adult diabetes outpatient clinics at the Hospital were included in the study.

### Efficacy and safety of insulin pumps

There was an overall agreement (N=18; 95%) that blood glucose control was generally improved with CSII therapy. This was consistent with the measures of the HbA1c%, showing that mean ( $\pm$  SD) HbA1c% fell from  $9.53 \pm 2.72\%$  to  $7.93 \pm 1.51\%$ , 6 months after initiating CSII therapy. This 1.6% drop in HbA1c was statistically significant ( $P < 0.05$ ; 95% CI, 0.31-2.89).

When participants were asked about the problems they experienced with CSII using insulin pumps (Table 2), the most frequent ones were hyper- and hypoglycemia. However, their occurrence was mainly at the initiation of pump therapy. Patients also were asked to specify any recent problems with insulin pumps (in last month). The most commonly quoted problems were loss of blood glucose control [e.g., hyperglycemia n=8 (40%), hypoglycemia N=5 (25%)]. However, patients usually had explanations for these incidents (e.g. strict diet to reduce weight, pregnancy).

### Impact on life

**Home life:** The majority of the patients (n=12; 63%) stated that life at home in general became better. Five of them felt that this was due to the flexibility the CSII therapy provided in regard to diet:

*"Now I can share all sorts of food and exercises; no need to worry about hyperglycemia and hypoglycemia."* A 40-year old female [pt. no. 18].

On the other hand, 6 patients (32%) thought that there was no difference regarding the CSII compared to their previous MDIs therapy.

**Social life:** Nine patients (47%) agreed that CSII therapy improved their social interaction with other people. Reasons cited included: not feeling sick; not having restrictions in the type of food and time of meal or insulin administration, resulting in greater social interactions.

**Performance at college/work:** The majority of patients (n=16; 84%) thought that managing diabetes at college/work was easier with CSII therapy than with MDIs. They justified their views to easier dose administration (by pressing a few buttons within the pump rather than looking for a private place to inject), and device carrying (i.e. pump is already worn and hence there is no need to carry needles or insulin).

Seven patients (37%) felt that CSII via pumps affected their performance positively. This was related to improved diabetes control and hence fewer sick days. In addition, students did not have to leave the class or look for a private place to administer insulin as was the case with the MDIs. On the other hand, 10 patients (53%) thought that CSII did not impact them in any way:

*"It is irrelevant to insulin pump; it is more related to diabetes."* A 21-year old female [pt. no. 4].

**Participation in sports and physical activities:** Participating in physical activity such as sports (e.g. walking, swimming) was improved with the use of CSII possibly due to enhanced glycemic control, as reported by 11 patients (58%). In contrast, some participants believed that sports were difficult with pumps (CSII), as reported by 2 patients (11%).

*"More hypoglycemic episodes with insulin pump during sports because active insulin is always there in blood."* A 31-year old male [pt no 19]

**Psychological wellbeing:** The most commonly reported psychological concern was related to the physical appearance of the pump, as it drew attention to the device and in turn questions by observers. Four patients, among whom 2 were male patients aged 31- and 35-year-old, thought that this was source of embarrassment and annoyance. Moreover, patients also felt that hiding pumps under clothes was not always easy, particularly when wearing fitted clothes or evening dresses (n=4; 20%).

Whether CSII therapy had positive or negative impact on the patients' lives was highly related to the perceived balance of advantages and disadvantages (Table 3).

**Hospital services:** Eleven patients (58%) were initiated on the CSII therapy at Amiri Hospital. Although the remaining eight (42%) were initiated elsewhere (e.g. abroad such as in the USA, or locally such as private diabetes clinics), they were regularly visiting the Hospital for follow-up.

**Description of help received from the hospital:** When asked to describe the type of support/service received at the commencement of pump therapy and that they were currently receiving; a number of services were reported such as: pump training and education at initiation of therapy (n=12; 63%); continuous help with dose monitoring (n=2; 11%); nutritional support (n=2; 11%); educational booklets (n=1; 5%).

**Need for improving insulin pump services at the hospital:** Six patients (32%) did not make any recommendations as they were satisfied with the services; data were missing from 2 (11%). In contrast, 58% of patients (n=11) had some suggestions (Table 4).

Seven patients (37%) thought that they still need continuous update and training, with an emphasis on issues such as carbohydrate counting, basal insulin monitoring, dealing with pump malfunctions and using continuous glucose monitoring devices (glucose sensors).

Problem	Yes (n)	No (n)
Hyperglycemia <sup>1</sup>	13	6
Hypoglycemia <sup>2</sup>	14	5
Cannula-associated skin infection <sup>3</sup>	4	14
Infusion set's adhesive tape-associated skin allergy <sup>3</sup>	4	14
Pump malfunctions (e.g. not working)	9	10

**Table 2:** Problems experienced while using insulin pumps to manage T1DM, as reported by patients (n=19)

n: Number of participants

<sup>1</sup>Hyperglycemia is defined as blood glucose values  $>10$  mmol/L OR  $>180$  mg/dL

<sup>2</sup>Hypoglycemia is defined as blood glucose values  $<4$  mmol/L OR  $<72$  mg/dL

<sup>3</sup>Numbers do not add to the total due to missing data

Advantages (n=19)		n <sup>1</sup>	Disadvantages (n=17)		n <sup>1</sup>
Improved quality of life	Flexible eating patterns (time, type, amount of meal)	9	Wearing pump	Hiding pump in clothes is difficult	4
	Flexible lifestyle (easier to go out, more comfortable and organized lifestyle)	9		Apparent to people and their opinion	4
Easier use and dose administration (e.g. freedom from needle sticking, no need for a private place, flexible timing for dose administration)		10		Difficulty in carrying and moving around	1
Easier monitoring/dose correction		6	Tendency to malfunction or break	2	
Dose accuracy (dose auto-calculation)		3	Needle issues	Painful insertion process	2
Continuous device attachment (no carrying of needles and insulin vials)		6		Scar at site of needle insertion	1
Better glycaemic control		5		Pain at site of needle insertion	1
Easier fasting (during the Ramadan <sup>2</sup> )		1		Existence of a needle in the body all the time	1
Feeling as a normal person		1		Site failure (i.e. impaired insulin delivery to the site due to frequent needle insertion at the same site)	1
More independence		1	Uncomfortable while sleeping	4	
			Continuous attachment to the device	2	

**Table 3:** Advantages and disadvantages of insulin pumps compared to injections, as reported by patients (n=19)

n: Number of participants; BG: Blood glucose

<sup>1</sup>Numbers refer to the frequency of issues that were reported by the patients

<sup>2</sup>Ramadan is the holy month when all Muslims fast.

Recommendations	n <sup>1</sup>
Consider continuous update; educational/training courses (every 6-12 months)	7
Provide smaller pumps	4
Provide pumps without infusion set (attached directly to the skin)	2
Provide pumps with internal sensors	2
Provide pumps for all patients with T1DM	2
Reduce needles' size (which are parts of the infusion sets)	1
Provide pumps with water resistance	1
Consider more frequent follow up (medical appointments) for new users	1

**Table 4:** Suggestions with regards to insulin pump therapy at Amiri Hospital, as reported by patients (n=11)

n: Number of participants; T1DM: Type 1 diabetes mellitus.

<sup>1</sup>Numbers refer to the frequency of issues that were reported by the patients

Although current insulin pumps are a relatively small pager-like size, patients felt that they would like them to be even smaller. Many patients also highlighted the need for providing pumps integrated with internal glucose sensors:

*"I recommend having a pump that can measure blood glucose levels without the need for a sensor because having two needles [one for pump and another for sensor] inserted into the body is difficult."* A 42-year old female [pt. no. 12].

## Discussion

Using CSII therapy to manage diabetes can be stressful, requiring patients to acquire knowledge and skills to effectively use the technology, which may impact on their daily lives [28]. Although few studies were extracted from the literature [17-21], this is the first regional study, to our knowledge, exploring the experiences of adult patients who have been on CSII via insulin pumps for different time periods/settings, and determining users' views regarding the services they receive.

Adding to their well-documented efficacy [10,11], switching to CSII therapy by adults with T1DM in the current study was accompanied by improved HbA1c% which was consistent with patients' reports. However, due to the relatively small sample size, the interpretation of quantitative data should be taken with care. Several factors might have contributed to the improved glycaemic control with CSII compared to the MDIs. The improvements in pump technology itself, such as having an automated dose

calculations feature could also have contributed to the improvement [6]. Also, the continuous support and education, as reported by many patients is critically important [29]. On the other hand, patients had episodes of lost glycaemic control which were not related to the technical capabilities of the pump, but rather due to dietary factors. In such cases, the insulin dose has to be monitored to match the body's needs. Within this context, the USA Food and Drug Administration in 2012 has reported that patient errors in the use of CSII appear to be the most common cause of adverse events associated with these devices [27]. This accordingly emphasizes the need for careful selection of pump candidates and empowering them with skills and knowledge to use the device effectively to manage their condition.

In the current study, no pre-therapy assessment strategy was followed when assigning candidates on CSII therapy to measure their competencies of undertaking management tasks effectively (e.g. monitoring/adjusting insulin doses, carbohydrates counting, operating the device), as followed in other Centers [30,31]. Patients were initiated on CSII therapy if they were Kuwaitis, or non-Kuwaitis with self-funded pumps, and failed MDIs. As a result, many patients thought that they were still lacking skills associated with the use of CSII and recommended further training and update.

This is the first study that reports patients' experiences and views on CSII therapy service at a major secondary care hospital in Kuwait. Despite availability of training and education on pump use and dietary considerations, many patients agreed that the current insulin pump therapy services need to be improved, particularly with regards to education and training on management tasks (education on pumps, infusion set insertion, counting carbohydrate, and insulin dose adjustments according to meals and physical activities). Moreover, the provided CSII therapy services were still lacking other components of support, such as psychosocial therapy. This was apparent by the fears and concerns that some patients expressed, particularly at the transition period, about wearing the pump and how people would perceive this. Similar issues were also documented from a study by Ritholz et al. [19]. Within this context, a multidisciplinary team approach is vital for successful CSII therapy [32,33]. Therefore, integrating psychosocial support as a part of the educational programme provided at the Hospital is vital, as it will help preparing patients to accept their body image and to interact with other people effectively. Also, there is a need to develop a holistic approach to therapy by a multidisciplinary team (including physicians, nurses, pharmacists, nutritionist and psychologists) and empowered patients.

In agreement with other studies [17,19-21], the use of CSII via insulin pumps in the current study did not influence negatively on the quality of patients' lives, but more often improved it. Positive experiences and impact spanned many aspects of the patients' daily lives including their lifestyle, social interactions and professional lives. These were mostly related to the CSII being a more accurate and easier method of insulin delivery and hence, achieving better glycemic control and flexible lifestyle. However, there were also some negative experiences, mostly related to the size and physical appearance of insulin pumps. Results from the current study suggest that patients' needs differ at different stages of therapy and at different environments, and this should be taken into consideration when offering them support.

### Acknowledgement

This study was funded by Kuwait University, Kuwait. The authors would like to thank Mrs. Shahd Al-Rabiy (beginner pharmacist, MoH, Kuwait) for her valuable effort in collecting the data and to Dr. Elizabeth Jamieson, Dr. Eman Alsaed and Dr. Nada Shibl for reviewing the paper and providing editing assistance. The authors are also grateful to all patients who contributed to this study.

### Conclusion

In line with the literature, the study results revealed that despite different cultural backgrounds, CSII impacted positively on patients' lives. However, before considering wider use of this technology in Kuwait, an emphasis should be made on problems and challenges faced by patients at different stages of therapy (transition period and on-going therapy) and at various environments (home, work, college), which should be addressed by health care providers and policy makers. This will allow filling in the gaps in the current insulin pump therapy programmes (such as the one in Amiri Hospital), using other countries' experiences as a model [29,30], which should reflect positively on patients' mastery of technology and ultimately therapeutic outcomes.

### Study Limitations

This study is limited by the small sample size of participants. Based on the preliminary fieldwork, there were 39 patients in the Hospital records, who were receiving insulin pump therapy. However, at the time of data collection, it was recognized that many of them did not attend the follow-up visits. Accordingly, the interpretation and generalization of the quantitative data should be made with caution. Also the time restriction for the data collection did not allow a follow-up study. However, this should be considered for future research.

### Comments

#### Background

Advances in medical technology and research documenting the clinical efficacy and safety to manage T1DM have made CSII via insulin pumps an attractive treatment option compared to injections. However, the use of CSII is still lacking in many countries and there are limited qualitative studies in the literature describing how switching to CSII affected lives of adults with T1DM.

#### Research frontiers

Evidence regarding the use of CSII from the patients' perspective is limited and it is far less in adults compared to children and young people. From the extracted literature, adult users documented a wide range of positive and negative experiences with using CSII instead of the injections. However, little focus was made on the experience of CSII via pumps use at different settings and during various times of therapy.

### Innovations and breakthroughs

This study highlights the importance of the comprehensiveness when exploring the patients' experiences of being on CSII; at the different stages of therapy (during transition period and ongoing therapy) and at various aspects of life (home, school/college, social events). Patients reported various challenges that they faced at different stages of therapy and in different settings. Also, the current study was first to explore adult users' views regarding the services they receive at their local Hospital. This allowed them to express their opinions and to make recommendations.

### Applications

Taking the experience from the Amiri Hospital, insulin pump therapy programme can be further improved and used as a model for implementation in other local hospitals in Kuwait.

The insulin pump therapy is still in its infancy in Kuwait. From the preliminary fieldwork, some other general hospitals (e.g. Jahra Hospital; far from the City and occupied mainly by Bedouins) are in the process of establishing the service. Thus, a larger-scale study will allow having wide spread of patients (Bedouins versus Civilians) from different areas (close versus far from the City) and with different experiences. This will give a good picture about patients who experience the clinical and quality of life benefits of CSII and will enable exploring the circumstances around those who do not benefit.

### Terminology

Insulin pump, also called CSII, is a pager-size external device that works as an artificial pancreas to continuously deliver insulin to the body.

### Authors contributions

Every author listed on this manuscript contributed significantly in the study:

Dr. FA contributed the research idea, design and write up of the protocol and the manuscript;

Dr. A Al-A and Dr. KA contributed mainly in the tool development, data collection and revising the manuscript;

Dr. TM and Dr. T Al-M contributed by providing data and revising the manuscript. All the authors have approved the final article.

### Supported By

The Research Sector, Kuwait University, Kuwait- Research Initiation Grant (RIG) No. ZP01/12.

### Institutional review board statement

The study protocol, questionnaires, consents and all study procedures were reviewed and approved by the Joint Committee for the Protection of Human Subjects in Research of the Health Science Center (HSC) & Kuwait Institute for Medical Specialization (KIMS), MoH.

### Conflict of Interest

All authors declare that they have no competing interests.

### Data Sharing Statement

No additional data are available.

### Core Tip

CSII via insulin pumps have become an alternative treatment option to injections over the past few decades in managing patients with T1DM. Their use is growing in many countries worldwide, such as the USA and European countries, but are lacking in others, such as Kuwait, despite their

proven efficacy and safety. To date, there are limited qualitative studies in the literature, and none in Kuwait, exploring the views and experiences of adult patients using insulin pumps to manage their condition.

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