

Training of Diabetic Patients on the Safe Disposal of Household Sharps



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ABSTRACT

Diabetes is one of the most significant global health emergencies of the 21st century. In Egypt, about 16 million insulin injection devices were used daily by 8.9 million adult diabetics. The improper disposal of these sharps poses many environmental and public health risks. Therefore, the current study aimed to train diabetic patients on the safe disposal of household sharps. Through a one-group pre-posttest quasi-experimental study design, 38 diabetic patients were recruited conveniently from Kafr El-Salahat Unit, Dakahlia Governorate. The investigators identified diabetic patients' demographic and economic characteristics, health history, and issues related to household sharps, and assessed their knowledge regarding diabetes mellitus, household sharps, and self-reported practices regarding safe disposal of household sharps through a four-part self-administrated structured questionnaire. Results declare that there were statistically significant differences in mean scores of total knowledge, and total self-reported practice pre- and post-training sessions $P \leq 0.001$. Also, there was a statistically significant positive correlation ($p \leq 0.001$) between total knowledge, and total self-reported practice scores post-training sessions. The investigators conclude that there is an improvement in the diabetic patients' knowledge and self-reported practice after the implementation of the training sessions. Finally, the investigators recommend adopting the developed training session related to the safe disposal of households' sharps to be utilized in primary health care settings. Further studies are needed to explore other contributing issues related to the safe disposal of household sharps.

Keywords: diabetes mellitus, households sharps, safe disposal, training sessions

Introduction:

Diabetes Mellitus (DM) is a chronic metabolic disorder characterized by a serious long-term condition that has a significant influence on the lives and well-being of individuals, families, and societies all over the world, and it is one of the top ten causes of death in adults (Loha et al., 2022).

The International Diabetes Federation ([IDF], 2021) estimates that the global diabetes population is expected to reach 537 million by 2021. Egypt is among the top ten nations in the world in terms of diabetes patients. The fact that DM prevalence in Egypt has risen dramatically in a very short period, from around 4.4 million cases in 2007 to 8.2 million cases in 2017, is concerning. By 2035, it is predicted that there will be 13.1 million diabetes patients.

Hence, DM is a lifelong condition whose management may require patients to administer insulin at home using a variety of medical devices and instruments such as insulin pens, needles, and syringes, as well as measure their blood glucose levels. These procedures constantly generate sharps within the household (Loha et al., 2022). Although diabetes-related technologies, such as insulin pens and lancets designed to assist with managing and controlling the disease, are more convenient at

home, these technologies are also linked to an increase in medical waste at the household level. Due to the fact that people with diabetes must administer at least four insulin injections daily and undergo one to ten blood glucose tests each day (Bicer, 2019).

Unsafe disposal of discarded sharps poses a public health risk that is a global issue in both developed and developing countries (Biçer, 2018). According to the World Health Organization ([WHO], 2019), every year, about 16 billion insulin injections are administered around the world. Despite the fact that effective healthcare waste disposal has become a global concern, needles and lancets used by diabetic patients are not always disposed of properly. Previous studies reported that many diabetic patients discarded used insulin needles in their household garbage (National Health Commission of the People's Republic of China, 2021; Fang et al., 2016).

By 2035, the 8.9 million adult diabetics in Egypt who currently use over 16 million insulin-injectable devices daily are predicted to double. Therefore, sharp waste will be consistently produced by a growing Egyptian diabetic population (Hassan et al., 2021). According to

Atukorala et al. (2018), people frequently throw away sharps from insulin in their household garbage bins. Improper disposal could result in needle-stick injuries, increasing the possibility of getting blood-borne infections such as the human immunodeficiency virus (HIV), hepatitis B, and/ or C, as well as contaminating the environment (Tu et al., 2022).

While handling and disposal of medical sharps are extensively controlled in healthcare settings, minimal attention is given to sharps generated at the household and community level (Biçer, 2018). The vast majority of patients (97%) disposed of used needles into their household garbage bin, whereas only 2.0% of diabetics took and disposed of their sharps at healthcare facilities, according to a South African survey (Loha et al., 2022).

A variety of factors influence proper sharps disposal, including a lack of knowledge about how and where to dispose, a lack of appropriate advice from healthcare practitioners, a lack of awareness, misperceptions about sharps disposal, and the administration of insulin by diabetics themselves, long-term diabetes mellitus, and long-term insulin use (Soliman et al., 2022).

Healthcare professionals can address the problem of lack of knowledge for diabetic patients on how to properly dispose of sharps by giving enough health education, and assistance to diabetic patients, as well as developing awareness programs aimed at the general public and diabetics in particular (Huang et al., 2018).

Nurses should take responsibility for educating and reinforcing information about correct sharps disposal methods for insulin-dependent diabetic patients. Patients should be advised to either return sharps to secure containers for distribution facilities to dispose of them or to dispose of them in puncture-resistant containers placed in domestic trash. They should also be aware of the risks to their health posed by the use of certain types of needles (Corte-Real et al., 2022).

However, there is little information available regarding how Egyptian diabetic patients dispose of their insulin sharps. Mostly, they dispose of their used blood-stained sharps and syringes in household waste, which may end up in municipal garbage (Hassan et al., 2021). Therefore, the investigators take a step to assess diabetic patients' knowledge, as well as self-reported practice; accordingly, plan, and implement training sessions on the safe disposal of household sharps.

Aim of the Study

This study aimed to train diabetic patients on the safe disposal of household sharps.

Study Hypotheses

1. Diabetic patients' knowledge will be improved after implementing training sessions on the safe disposal of sharps at home.
2. Diabetic patients' self-reported practice will be improved after implementing training sessions on the safe disposal of sharps at home.

Method

Study Design

This study was conducted using a quasi-experimental one-group pre-posttest study design.

Setting

The study was carried out at a primary health care center located in Kafr El-Salahat Unit, affiliated with the Ministry of Health and Population. Kafr El-Salahat is a rural village affiliated to Bani Obaid Center, Dakahlia Governorate; this unit serves a population of 6,788. The unit consists of two buildings: the first building: has outpatient clinics, while the second building: is divided into a blood bank, pharmacy, vaccination department, and health office. The unit's capability is to serve 400 populations per day during the working period. The nurse-patient ratio in the unit is (3:1).

Participants

Study participants included diabetic patients, who fulfill the following criteria: registered in the previously stated unit's health records, and both genders.

Sampling

All diabetic patients who fulfilled the previously mentioned criteria were included in the study, (38 patients); recruited conveniently.

Tools for Data Collection

The investigators developed a self-administrated structured questionnaire in Arabic based on Mohamed, (2017); Ashraf, Roe and Bansal, (2019); Ishtiaq, (2012); Hasan, (2019); Si, (2018); Aynalem and Zeleke, (2018); Markkanen, (2015); Zapolski, (2008); Johnson, (2010); Gyawali, (2016); Atukorala, (2018); Montoya, (2019); Quiwa and Jimeno, (2014); Fakery, (2018); Brouillette, Quinn and Kriebel, (2017); Dianati, (2012); Majumdar, (2015); El Gendi, Elawady, Abed and Eltaher, (2017). The questionnaire consisted of four parts as the following:

Part (I) Demographic and economic characteristics of diabetic patients. The investigators identified the demographic and economic characteristics of diabetic patients including age, gender, marital status, residence, education level, occupation, and monthly income.

Part (II) Health history of diabetic patients and issues related to households' sharp. The investigators used this part to assess the history of diabetes mellitus and disposal of households' sharps including: comorbid diseases and receiving treatment via injection, duration of diabetes and insulin use, type of insulin injecting tool, schedule of insulin daily dose, frequency of insulin needle use and lancets, number of needles and lancets disposed of per week, self-monitoring of blood glucose, frequency of physician visits in the last six months, healthcare services utilized by diabetic patients, source of information on safe disposal of households' sharps, place of disposal insulin injection tool, covered trash boxes, safety box, material, size, and disposal from it, and history of needle stick injury to self or family members and actions taken.

Part (III) Diabetic patients' knowledge regarding diabetes mellitus and households' sharps. The investigators used this part to assess diabetic patients' knowledge about household sharp disposal. This part was composed of eight categories, which were composed of 62 questions.

Diabetic patients' knowledge scoring system: The investigators awarded each correct answer one mark, and zero for incorrect and did not know the answer, as the following: definition of diabetes mellitus, and types (Included 4 items), sign and symptoms of diabetes mellitus (Included 9), causes of diabetes mellitus (Included 7 items), complication of diabetes mellitus (Included 12), definition and examples of households' sharps (Included), high-risk groups for households' sharps (Included), risks resulting from exposure to households' sharps (Included 5 items), households' sharps disposal (Included 11 items). Based on the researcher's cut-off point, knowledge was categorized into three levels as the following:

Poor = scores less than 55% of the total scores (less than 34.1)

Fair = scores 55% to less than 75% of the total scores (34.1 to less than 46.5)

Good = scores of 75% and more of the total scores (46.5 and more)

Part (IV) Diabetic patients' safe disposal of households' sharps. The investigators used this part to assess diabetic patients' self-reported

practices regarding the safe disposal of household sharps. This part is composed of four main categories; all of these categories are composed of 55 statements requiring a response on a three-point Likert-rating scale with three continuums (never, sometimes, and always).

Diabetic patients' practices scoring system: The investigators assigned a point value response, from zero to two, as the following: safe injection practices (Included 18 items), use of lancet practices (Included 8 items), households' sharps disposal practices (Included 17 items), and households' sharps collection practices (Included 12 items)

Total score of self-reported practices ranged from zero to 110. According to the researchers' cut-off point, the self-reported practices consisted of two categories the following:

Proper = scores 75% or more of the total scores (82.5 and more).

Improper = scores less than 75% of the total scores (less than 82.5).

Procedure

Preparation phase. It included the following:

Administrative process. To conduct this study, the Faculty of Nursing at Mansoura University submitted an official letter to the manager of Kafr El Salahat Unit, affiliated with the Ministry of Health and Population, to obtain this approval for conducting the study. The investigators informed the manager about the study's aim and its process to gain his cooperation and support during the process of data collection.

Ethical considerations. The investigators obtained approval from the Research Ethics Committee of the Faculty of Nursing, Mansoura University (Re. No. P. 0524) to conduct this study. The investigators also got verbal informed consent from the participants, assuring them that their participation in the study was voluntary and that the data gathered would be kept private and used only to enhance healthcare services. The participants had the right to ask any questions related to the study and to withdraw from the study at any time, without providing any reason.

Literature review. The investigators used scientifically published publications, online searches, and textbooks to review national and international literature on the various aspects of diabetes mellitus, household sharps disposal, and associated preventive measures. This review served as a blueprint for creating training materials.

Development of study tools. The investigators developed one tool contains four parts for data collection based on reviewing the relevant literature.

Face and content validity. The developed tool was assured by submitting to a jury of five experts; four from the field of community health nursing, and one from the medical surgical nursing, Faculty of Nursing Mansoura University who reviewed the tools for face, and content validity cinderling clarity, relevancy, applicability, comprehensiveness, understanding, and ease for implementation and according to their opinions simple modifications were applied. And the necessary modifications were made accordingly.

Pilot study. A pilot study was carried out on a sample of (four) diabetic patients, which represented 10% of the sample size. The purpose of the pilot study was to assess whether the study tools were clear, applicable, and relevant, as well as to predict when data would be collected. After making the necessary adjustments to the data collection tool and rephrasing some questions and sentences in light of the piloting, the final fieldwork plan was created. The pilot-study participants were not excluded from the main study sample because to do so would result in too small a sample. So, participants in the pilot study were included in the main sample of the study.

Tool's reliability. Cronbach's coefficient alpha test assured tool's reliability in SPSS version 24 as the following:

- The Cronbach's alpha test was .890 for the knowledge part.
- The Cronbach's alpha test was .771 for the self-reported practice part.

Development of the training sessions

Baseline assessment. The investigators asked all diabetic patients to complete the structured self-administered questionnaire. Initial data collection to identify demographic and economic characteristics, history of diabetes

mellitus, and disposal of households' sharps by using parts I, and II. Assessment of diabetic patients' knowledge and self-reported practice about safe disposal of households' sharps through parts III, and IV. The investigators met the diabetic patients every day for a week except Friday in the training room of the health care center in the afternoon shift from 3, 00 P.m. To 4,00 P.m.

Content development. The investigators developed the content of the training sessions according to the findings of the baseline assessment and literature review, which consisted of six sessions. The investigators determined the training sessions' logistics (timetable, teaching methods, material, and evaluation methods). The investigators prepared and used the equipment needed for training sessions such as manikin, syringes, lancets, empty detergent bottles with screw-on caps, a safety box, personal protective equipment (gloves, and masks), and alcohol. The investigators used different teaching materials such as a booklet and PowerPoint presentation (PPT). The investigators wrote the booklet in plain Arabic language with various colored illustrations to aid patients in understanding and improve the retention of their acquired knowledge. All topics about diabetes patients on the proper disposal of household sharps were covered in the booklet. Simplified presentation slides to be understood by the patients and provided with many pictures for clarification. Various instructional methods were used, including interactive lectures, group discussions, brainstorming sessions, demonstrations, re-demonstrations, and role play. This step lasted for four months.

Training sessions implementation: The investigators divided all (38) diabetic patients into six groups, four groups consisted of six diabetic patients and two other groups consisted of seven diabetic patients. The investigators conducted 36 sessions, six sessions for a week for each group as shown in blew session plan in Table (1).

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Table 1. Training sessions plan

Session: First
Total hours: two hours
This training session aimed to: <ol style="list-style-type: none"> 1. Orient the diabetic patients on the training session plan 2. Conduct the pre-testing
Session: Second
Total hours: two hours
By the end of the training session, the diabetic patients will be able to: <ol style="list-style-type: none"> 1. Define diabetes mellitus 2. Classify types of diabetes mellitus 3. Identify causes of diabetes mellitus 4. Discuss symptoms of diabetes mellitus 5. Discuss complications of diabetes mellitus
Session: Third
Total hours: two hours
By the end of the training session, the diabetic patients will be able to: <ol style="list-style-type: none"> 1. Define household sharps 2. Classify household sharps 3. Identify the high-risk groups exposed to household sharps 4. Discuss the risks resulting from household sharps
Session: Fifth
Total hours: two hours
By the end of the training session, the diabetic patients will be able to: <ol style="list-style-type: none"> 1. Points to the insulin injection sites 2. Demonstrate safe injection 3. Demonstrate disposing of household sharps safely
Session: fifth
Total hours: two hours
By the end of the training session, the diabetic patients will be able to: <ol style="list-style-type: none"> 1. Discuss risks of malpractices associated with household sharps 2. Demonstrate how to prepare safety boxes 3. Demonstrate methods of collection and handling of the box safely 4. Explain steps to be taken when pricking
Session: sixth
Total hours: two hours
This training session aimed to: <ol style="list-style-type: none"> 1. Conduct the post-testing

Evaluation of the training sessions. The investigators evaluated the diabetic patients' knowledge and self-reported practices using the same pre-test formats for each group at the session (6).

Statistical analysis. The Statistical Package of Social Science (SPSS) application for Windows was used to analyze the data (Standard version 24). The Kolmogorov-Smirnov test was initially used to determine whether the data was normal. The

presentation of continuous variables was mean and standard deviation (SD). The paired groups (before and after intervention) were compared using a paired t-test, whereas the two groups were compared using an independent t-test. Continuous variables were correlated using Pearson correlation. The threshold of significance is fixed at a 5% level (p-value). The results were considered significant when the probability value was less than 5% ($p \leq 0.05$). The results are more significant the lower the p-value that was achieved.

Results

Table 2 illustrates that 52.6% of the diabetic patients were aged more than 40 years with a mean age of 42.47 (13.05) years, 63.2%, 68.4%, and 94.7% were women, married, and residents in urban areas, respectively. Secondary school/ upper middle education was the educational level of 39.5 % of diabetic patients. As regards occupation, 55.3% of diabetic patients did not work. Finally, 71.1% of diabetic patients reported that they had enough monthly income.

Table 3 clarifies that 2.6%, 10.5%, and 13.2%, of diabetic patients, had a history of rheumatoid arthritis, cardiac diseases, and hypertension, respectively. Receiving treatment for those diseases via injections was reported from 10.5% of diabetic patients. The mean duration of having diabetes was 5.21(3.02) years. Receiving insulin, for less than five years, and its syringe was reported by 71.1%, and 57.9% of diabetic patients, respectively. Twice or more insulin doses daily, from 2-6 days used insulin needles, less than 5 needles disposed of per week: among 94.8%, 47.4%, and 68.4% of diabetic patients, respectively. Once, less than 5 lancets were used and disposed of per week among 94.7%, and 92% of the diabetic patients, respectively. In the last 6

months, 23.7%, and 57.9% of the diabetic patients conducted once/week (month) self-monitoring of blood glucose, and once/3 months follow-up, respectively.

Figure 1 indicates that 47.4% of diabetic patients were receiving healthcare from private clinics.

Table 4 shows that only 5.3% of diabetic patients had non-punctured plastic and small safety boxes at their homes. The other methods used to dispose of sharps were garbage 52.6%, toilet pits 28.9%, and 13.2% buried in the ground. Regarding NSIs 13.2% of the diabetic patients reported a history of needle stick injuries.

Table 5 clarifies that there was a statistically significant difference related to the diabetic patients' total knowledge levels regarding the safe disposal of household sharps pre- and post-training sessions since; 92.1% had a poor level of knowledge pre-training sessions with a mean score of 20.42 (9.22), while 60.5% had a good level of knowledge after training sessions with a mean score of 48.55 (8.83).

Table 6 reveals that there was a statistically significant difference related to the diabetic patients' total self-reported practice levels regarding safe disposal of household sharps pre and post-training sessions since; all 100% of the diabetic patients had improper score level of self-reported practice pre-training sessions with mean scores of 27.74 (6.79), while 86.8% had proper score level of self-reported practice post-training sessions with mean scores of 93 (9.99).

Table 7 shows that there was a statistically significant positive correlation between the diabetic patients' knowledge and self-reported practice pre- and post-training sessions.

Table 2. Diabetic patients' demographic and economic characteristics (N=38)

Items	N	%
Age (in years)		
Less than 25	4	10.5
From 25 to 40	14	36.8
More than 40	20	52.6
Mean (S.D)	42.47 (13.05)	
Gender		
Man	14	36.8
Woman	24	63.2
Marital status		
Divorced	1	2.6

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Widow	3	7.9
Single	8	21.1
Married	26	68.4
Residence		
Rural	2	5.3
Urban	36	94.7
Education level		
Cannot read and write	1	2.6
Reads and writes/ Primary education/ Preparatory education	9	23.7
Secondary education / upper middle education	15	39.5
University education/ Postgraduate	13	34.2
Occupation		
Contracted (pensioner)	2	5.3
Student	4	10.5
Free work	5	13.2
Government	6	15.5
Not working / housewife	21	55.3
Monthly income		
Not enough	11	28.9
Enough	27	71.1

Table 3. Diabetic patients' past and current health history (N=38)

Items	N	%
Comorbid diseases		
Rheumatoid arthritis	1	2.6
Cardiac diseases	4	10.5
Hypertension	5	13.2
Receiving treatment via injection	4	10.5
Duration of diabetes /year		
Less than 5 years	24	62.6
5 years or more	14	36.9
Mean (SD)	5.21(3.02)	
Duration of treatment with insulin /year		
Less than 5 years	27	71.1
5 years or more	11	28.9
Mean (SD)	4.34(3.21)	
Type of insulin injecting tool		
Needle with a separate syringe	6	15.8
Insulin pen	10	26.3
Insulin syringe	22	57.9
Schedule of insulin daily dose		
Once	2	5.3

Twice or more	36	94.8
Frequency of insulin needle use		
Once	1	2.6
For a day	11	28.9
From 2-6 days	18	47.4
7 days or more	8	21.2
Number of disposed of needles per week		
Less than 5	26	68.4
From 5 to more than 10	12	31.5
Frequency of lancets use per week		
Multiple times	2	5.2
Once	36	94.7
Number of disposed of lancets per week		
Less than 5	35	92
5 and more	3	7.9
Self-monitoring of blood glucose for the last 6 months		
Only when getting sick	1	2.6
Daily	3	7.9
Once/week	9	23.7
Once/month	9	23.7
Schedule of follow-up the last 6 months		
Once/month	11	28.9
Once/3 months	22	57.9
Once every 6 months	5	13.2

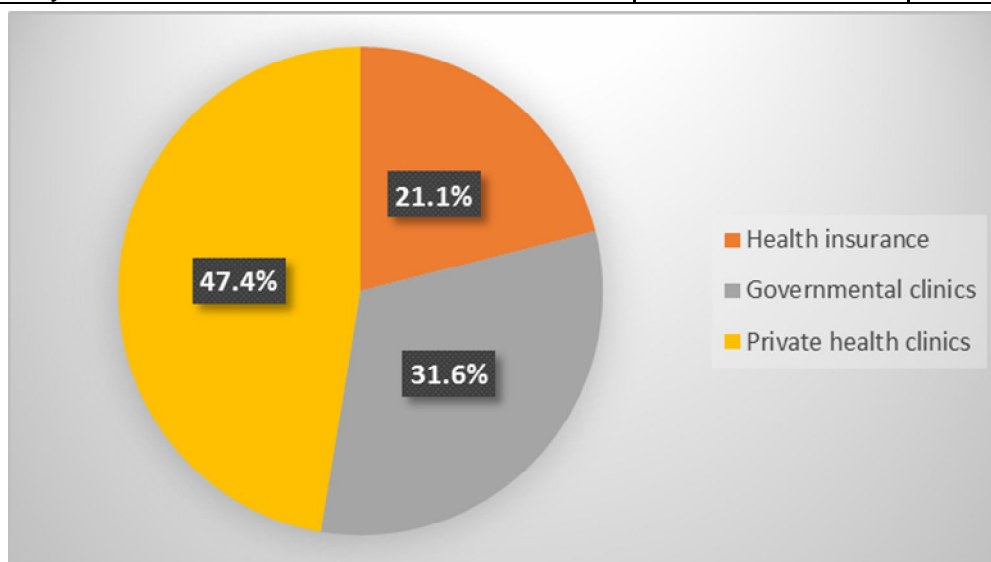


Figure 1. Healthcare services utilized by diabetic patients (N=38)

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Table 4. Diabetic patients' dispose techniques of households' sharps and history of needle stick injuries (N=38)

Items	N	%
Having a safety box at home		
	2	5.3
Safety box material		
Non-punctured plastic	2	5.3
Size of safety box		
Small	2	5.3
Covered trash boxes in home	4	10.5
Place of disposal insulin injection tool		
Safety box (sharps container)	2	5.3
Buried in the ground.	5	13.2
Toilet pit	11	28.9
Garbage	20	52.6
Place of disposal safety box		
Carry to landfill	1	2.6
Mail to a processing facility	1	2.6
History of needle stick injury (NSIs) to the diabetic patient or family embers	5	13.2
Actions are taken after NSIs		
Press site of NSI	1	2.6
Wash with soap and water	4	10.5

Table 5. Diabetic patients' total levels of knowledge regarding safe disposal of household sharps pre- and post- training sessions (N=38)

Total knowledge score (62 marks)	Post		Pre	
	N	%	N	%
Poor	35	92.1	3	7.9
Fair	2	5.3	12	31.6
Good	1	2.6	23	60.5
Mean (SD)	20.42 (9.22)		48.55 (8.83)	
t	19.912			
P	.000			

Note. Poor = less than 55% (less than 34.1). Fair = from 55 % to less than 75% (34.1 to less than 46.5). Good = 75% and more (46.5 and more).

Mean (SD): Mean (Standard deviation). t-value (Paired-Sample T test). Significant (p< 0.05). Highly significant (P< 0.01).

Table 6. Diabetic patients' total levels of self-reported practice related to safe disposal of households' sharps pre- and post- training sessions (N=38)

Total self-reported practice score (110 marks)	Pretest		Posttest	
	N	%	N	%
Improper	38	100	5	13.2
Proper	0	0	33	86.8
Mean (SD)	27.74 (6.79)		93 (9.99)	
t	39.422			
P	0.000**			

Note. Improper = less than 75% (less than 82.5). Proper = 75% and more (82.5 and more). Mean (SD): Mean (Standard deviation). t-value

(Paired-Sample T test). Significant ($p < 0.05$). Highly significant ($p < 0.01$).

Table 7. Correlation between knowledge and self-reported practice of diabetic patients' pre and post-training sessions (N=38)

Predictor		Knowledge score	
		r	P-value
Self-reported practice score	Pre	0.653	0.000**
	Post	0.453	0.004**

Note. r: Pearson correlation. Significant ($p \leq 0.05$). Weak correlation ($r \leq 0.5$). Strong correlation ($r > 0.5$).

Discussion

Diabetes mellitus is one of the most difficult public health issues in the globe (CDC, 2021). A global "epidemic" of diabetes is currently threatening numerous nations and is quickly expanding across the globe (Darenskaya et al., 2021). Widespread morbidity of DM affects people, healthcare systems, and country economies.

The prevalence of DM worldwide in adults almost doubled (from 85% to 95%) between 1980 and 2014. Men are more affected by these increases than women, and they are more pronounced in low- and middle-income nations. Egypt ranks eighth in the world in terms of diabetes prevalence. In 2022, it is estimated that more than ten million adults are living with diabetes in Egypt, representing a prevalence of approximately 18.4% (Hussein & Soliman, 2023).

Diabetes mellitus self-management is the cornerstone for controlling DM and preventing complications. Patients with DM can administer insulin at home and use a variety of medical devices and instruments, including insulin pens, needles, and syringes, to manage and control their condition (CDC, 2023).

Consequently, if handled improperly, used needles and other sharp objects can cause harm to humans and spread infections that can result in life-threatening medical disorders. Hepatitis B (HBV), Hepatitis C (HCV), and the HIV virus are the most prevalent illnesses. When travelling, working, attending school, or visiting other public locations like hotels, parks, and restaurants, it's crucial to properly dispose of sharp objects (FDA, 2018).

Hence, the present study aimed to train diabetic patients on the safe disposal of household sharps. The section aims to discuss and interpret the results of this study in light of relevant publications. Thereby, the findings of this study are discussed as follows:

Concerning the health history of diabetic patients and issues related to households' sharps, the current study reveals that about two-thirds of diabetic patients, have had diabetes for a mean of less than five years. Along the same line, a study carried out by, Atukorala et al. (2018), in Sri Lanka found that the mean duration of living with diabetes was seven years. On the other hand, two studies by Tu et al. (2022), in China and Quiwa and Jimeno, (2014), both displayed most patients had diabetes for more than ten years.

The present study reports that almost three-quarters of diabetic patients are treated with insulin for less than five years. Similarly, a study by Ishtiaq et al. (2012), in Pakistan, noted that most patients' duration using insulin is less than five years. On the other hand, a study by Soliman, Abdou, Fetohy and Hussein (2022), in Alexandria, reported that more than two-thirds of patients' duration of insulin use was more than five years.

The current study shows that more than half of diabetic patients used insulin syringes. Matches with this result, a study by Sharif et al. (2018) stated that almost two-thirds of patients used insulin syringes. On the contrary, two studies by Soliman et al. (2022), and Alshawwa et al. (2021) found that more than half to most of the respondents used insulin pens.

The researcher interprets that the syringe is the most feasible tool within a mean of the diabetic patients' affordability, wherein two-thirds of diabetic patients are either student, not working, or housewives; furthermore, almost three-quarters of the diabetic patients have just enough monthly income.

The present result notes that most diabetic patients have two or more daily doses of insulin. Consistent with this, Atukorala et al. (2018) mentioned that most patients required more than two doses of insulin per day. On the opposite side, two studies by Hassan et al. (2021), and Basazn

Mekuria et al. (2016) reported that most of the studied patients had only a twice-daily schedule of insulin.

The current study finds that almost half of the diabetic patients self-monitor their blood glucose once per week, or per month in the last six months, as well as have utilized private clinics, while most diabetic patients dispose of lancets less than five times per week.

These results come a line with Basazn Mekuria et al., (2016) revealed that more than half of patients had self-monitoring of blood glucose once per month in the last six months. On the other hand, a study by Hasan et al. (2019) found that most patients had self-monitoring of blood glucose.

The present study declares that only five percent of diabetic patients have safety boxes at their homes and more than half of them dispose of sharps in garbage. In the same context two studies by El Gendi, Elawady, Abed and Eltaher, (2017), and Atukorala et al. (2018) found that percentages ranged from two-thirds to most of the patients did not have any sharps containers and disposed injections sharps into the household garbage. Although, Ashraf, Roe and Bansal, (2019) found that more than half of the studied patients had sharps containers.

In the current study, a small percentage of diabetic patients have reported a history of needle stick injuries. As well, Tu et al., (2022) reported that almost one-quarter of participants had a history of needle stick injuries. In contrast, Atukorala et al. (2018) found that only two patients had experienced accidental needle-stick injuries.

The current study clarifies that there is a statistically significant difference related to the diabetic patients' total knowledge levels regarding the safe disposal of household sharps before and after training session. Furthermore, El Gendi, Elawady, Abed and Eltaher, (2017), Hasan et al. (2019), and Mohamed, (2017), all those studies indicated improvement in patients' knowledge in various areas of waste disposal and their total scores; with statistically significant improvements through the different phases of the program.

The present study reveals that there is a statistically significant difference related to the diabetic patients' total practice levels regarding safe disposal of household sharps pre- and post-training session. Supporting the study's findings, Hasan et al. (2019) stated that the diabetes community's sharp disposal education module had a positive impact on Malaysian diabetic patients' sharp disposal habits. At the one-month and three-month

follow-up periods, there was a statistically significant rise in the proportion of diabetic patients in the intervention group.

In addition to El Gendi, Elawady, Abed and Eltaher, (2017), Hasan et al. (2019), in Malaysia, Licy et al. (2013), and Mohamed, (2017) had consensus on practice scores were improved after training, and there was a statistically significant difference between pre- and post-training.

Wherein there is a statistically significant positive correlation between the diabetic patients' knowledge and self-reported-practice pre-and post-training sessions, this proves the importance of empowering nurses' different roles with diabetic patients, taking into consideration, and building on patients' centered care.

Conclusion

The findings of this study reveal that after implementing the training sessions, diabetic patients' total knowledge levels, and total self-reported practice levels regarding the safe disposal of household sharps significantly improved, indicating that the research hypotheses are proved.

Recommendations

- Adopting, the developed training session related to the safe disposal of households' sharps to be utilized in other primary health care settings.
- Conducting mass health awareness programs related to the safe disposal of households' sharps.
- Equipping healthcare settings to be capable of aiding diabetic patients in the safe disposal of households' sharps.
- Conducting further research to explore other contributing issues related to the safe disposal of households' sharps.

Conflict of Interest

The investigators claim that there are no conflicts of interest.

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