Home Disposal of Used Insulin Syringes and Needles by the Patients With Diabetic in Rwanda

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Abstract

For many people living with diabetes, using needles to inject insulin and test blood glucose levels is a part of their everyday lives. Improper disposal of these highly contaminating sharp materials can cause injuries to people as well as pollute water sources and agricultural land.

Approximately 3.4% of the population in Rwanda lives with diabetes. There is no law specifying how these individuals should dispose of home-used syringes and lancets, and prior to this study, home disposal practices for sharp instruments including needles and lancets used for diabetes self-management were unknown.

A cross-sectional study design was used to identify the common methods used by people living with diabetes to dispose of sharps after home use. A total of 201 people living with diabetes participated in the study. Only 107 (53.3%) of them could identify the proper methods of sharp disposal and only 69 (34.3%) reported using these proper disposal methods. The top three challenges to the use of proper disposal practices reported by participants included not being informed of such practices (76, 37.8%), not having appropriate containers (66, 32.8%) and having to travel a long distance to return safety boxes containing sharp materials (47, 23.4%).

Future studies should be conducted to understand the financial feasibility of health facility provision of safe disposal boxes for patients. Education focusing on training people living with diabetes to use hard plastic bottles as an acceptable alternative to boxes is also needed. Convenient and effective mechanisms for obtaining and returning used safety boxes should be established. Larger scale studies including more patients could generate more representative data.

Keywords: diabetes, home disposal, syringe and needles, safety box

1. Introduction

Due to diabetes' association with rapid urbanization, dietary changes, and increasingly sedentary lifestyles, the global burden of the disease is constantly increasing (IDF Diabetes Atlas, 2017). For many people living with diabetes, injecting insulin and testing blood glucose levels is a part of everyday life (World Health Organization, 2016; American Diabetes Association, 2015; Majumdar, Sahoo, Roy, & Kamalanathan, 2015). On average, a person with diabetes on insulin administers two or more injections per day, translating to at least two syringes per person per day if syringes are not re-used, in addition to the lancets used for blood glucose testing (Ogle et al., 2017; American Diabetes Association, 2015; Coustan, 2013).

Improper disposal of these highly contaminating sharp materials can cause injuries to people and pets as well as pollute water source and agricultural land (Gold, 2011). Different countries have implemented various policies and programs to guide proper disposal of home-used sharp materials for people living with diabetes. The United States

Department of Health and Human Services recommends the distribution of biohazard safety boxes to patients; the boxes may be returned to pharmacies or collected locally (Markkanen et al., 2015; U.S. Department of Health and Human Services, 2016). In low-resource countries like Sri Lanka, India, and Ethiopia where proper safety boxes are not readily available, hard plastic bottles are used to collect sharps and are discarded at local hospitals (Atukorala, Sumanasekera, Wickramasinghe, & Wickramasinghe, 2016; Basazn Mekuria, Melaku Gebresillassie, Asfaw Erku, Taye Haile, & Melese Birru, 2016; Majumdar et al., 2015). Studies have found that when safety boxes are not available, most people dispose of used syringes in toilets, household garbage, streets, or backwoods (Basazn Mekuria et al., 2016; Ishtiaq et al., 2012).

Approximately 3.4% of the population in Rwanda live with diabetes (IDF Diabetes Atlas, 2017). Of these, all those who have type 1 diabetes and a proportion of those with type 2 diabetes use insulin injections. The national healthcare waste guidelines recommend that patients or caregivers take responsibility for safe disposal of healthcare waste in case of home-based treatment; however, there is no law specifying how home-used syringes and lancets should be disposed (Ministry of Health, 2016). Among people living with diabetes in Rwanda, methods of home disposal of sharp instruments for diabetes self-management were unknown prior to this study.

2. Method

2.1 Setting

The study was conducted at one Rwanda Diabetes Association (RDA) clinic in Kigali and one rural district hospital supported by RDA. RDA is a non-governmental organization founded in 1997 to provide diabetes care and promote diabetes prevention in Rwanda; it supports people living with diabetes and their families (Gishoma, 2014). In 2000, the RDA established a clinic in Kigali and since then has registered more than 27,000 people diagnosed with diabetes, providing them with insulin syringes and needles (Gishoma, 2017; Marshall et al., 2012; Rwanda Diabetes Association, 2016). RDA also provides support to the district hospitals in Rwanda by providing education, medical supplies, and trainings related to diabetes to the healthcare providers (Marshall et al., 2012; Rwanda Diabetes Association, 2012).

2.2 Design and Sample

A cross-sectional study design was used to determine the methods of disposing sharps (including needles and lancets) after home use. Study participants included all adults living with diabetes or guardians of children with diabetes who had received syringes and needles from the RDA programs via the RDA clinic in Kigali or the district hospital for at least two months.

2.3 Measures and Data Collection

Participants were approached when attending the RDA clinic or the hospital for diabetic care during December 2017 and January 2018. Informed consent was collected from them after the purpose of the study was explained. Consented participants were asked to fill out a questionnaire (appendix 1). The questionnaire was developed based on literature review and consultation with local physicians who worked with diabetic patients on a regular basis. The questionnaire was first written in English and then translated to Kinyarwanda (the local language) and then back-translated to English again to ensure accuracy of translation. The questionnaire was pretested on 10 diabetic patients prior to the actual data collection, and modifications were made to the questionnaire based on feedback from the pretest. The participants were asked to fill out the questionnaire. For those who were illiterate, the data collector read the questions to them and recorded their answers. The questionnaire collected some basic demographic information, and information on how many syringes and needles the participants had received and used on a monthly basis. Two questions specifically probed participants' understanding of best sharp disposal methods and their sources of information. Two questions were related to their syringe and needle disposal practices and the main challenges they were facing when disposing sharps. The key measures were the knowledge and practices related to sharp disposal methods. Proper disposal methods referred to either depositing sharps in safety boxes or hard plastic bottles. This project received ethical approval from the University of Global Health Equity Internal Review Board.

2.4 Data Analysis

Descriptive statistics were used to present the participants' demographic characteristics and to describe their disposal practices and knowledge. Fisher's exact test was used to analyze the factors associated with knowledge and practices related to sharp disposal. All statistical analyses were conducted using SPSS v. 21 with statistical significance set at 0.05.

3. Results

Two hundred and one patients (201) participated in the study, with a mean age of 28 years (SD ±15.3). The majority of the participants were adults (173, 86.1%). Out of all the participants, 86 (42.8%) were males, 115 (57.2%) were female, 139 (69.2%) were single, 52 (25.9%) were married. Most of the participants (163, 81.1%) attended RDA clinic, while the rest (38, 18.9%) attended the district hospital. More than 80% of participants had primary or secondary levels of education, and 84.1% belonged to socioeconomic categories 2 and 3 (with 1 being the poorest and 4 the richest). The average number of members in a household was 5.4 (SD= 2.2). On average, participants required 69 (SD= 17) injections per month but only received 14.7 (=9.2) syringes per month, leading them to reuse the syringes 5.6 times before disposing them. Only 79 (39.3%) of the participants reported that they had received training on the proper methods for sharp disposal, and of those, most had received the training from nurses (n=64, 82.1%). Out of all participants, 107 (53.3%) could identify proper methods of sharp disposal (4.5% identifying plastic bottles and 48.8% identifying safety boxes); however, only 17 (8.5%) actually disposed of sharps in plastic bottles and 52 (25.9%) in safety boxes (Table 1).

Table 1. Summary of results

Variable		n (%)
Sample (N)		201
Sex	M	86 (42.8%)
	F	115 (57.2%)
Age	Mean (SD)	28 (±15.3)
	Less than 18	28 (13.9%)
	18 or above	173 (86.1%)
Marital	Single	139 (69.2%)
	Married	52 (25.9%)
	Widowed	10 (5%)
Health facility	RDA clinic	163 (81.1%)
	District hospital	38 (18.9%)
Education level of participants	None	14 (7%)
	Primary	89 (44.3%)
	Secondary	75 (37.3%)
	University or above	23 (11.4%)
Socioeconomic level	1	25 (12.4%)
	2	56 (27.9%)
	3	113 (56.2%)
	4	3 (1.5%)
Size of household	Mean (SD)	5.4 (±2.2)
Residential area	Urban	124 (61.7%)
	Rural	77 (38.3%)
# years since diagnosed	Mean (SD)	6.4 (±5.4%)
# years on insulin	Mean (SD)	5 (±5.2%)
# syringes given per Month	Mean (SD)	14.7 (±9.2%)
# injections per month	Mean (SD)	69.4 (±17.1)
# time syringe reused before disposal	Mean (SD)	5.6 (±4.2)
Received training on disposal method	No	122 (60.7%)
	Yes	79 (39.3%)
Training provided by	Doctor	6 (7.7%)
	Nurse	64 (82.1%)

	Pharmacist		2 (2.6%)	
	Other people living with diabetes		3 (3.8%)	
	Other parents		3 (3.8%)	
Knowledge (believe the best way to dispose)	Improper	Back wood	0 (0%)	94 (46.7%)
		Toilet	68 (33.8%)	
		Trash	24 (11.9%)	
		Pit	1 (0.5%)	
		Others	1 (0.5%)	
	Proper	Plastic bottle	9 (4.5%)	107 (53.3%)
		Safety box	98 (48.8%)	
Practice (disposal method)	Improper	Back wood	1 (0.5%)	132 (65.7%)
		Toilet	96 (47.8%)	
		Trash	27 (13.4%)	
		Pit	4 (2.0%)	
		Others	4 (2.0%)	
	Proper	Plastic bottle	17 (8.5%)	69 (34.3%)
		Safety box	52 (25.9%)	
Challenge	Not informed		75 (37.3%)	
	No container		66 (32.8%)	
	Container too expensive		2 (1.0%)	
	Long distance to dispose		47 (23.4%)	
	Others		11 (5.5%)	

Five factors were found to be significantly associated with knowledge of proper sharp disposal methods; they were age (P=0.002), marital status (P=0.007), health facility (P<0.001), residential area (P=0.009) and having received training on proper disposal methods (P<0.001) (Table 2). Eight factors were found to be significantly associated with the practice of proper sharp disposal methods, they were age (P=0.018), marital status (P<0.001), health facility (P<0.001), education level (P=0.036), residential area (P=0.09), having received prior training on proper disposal methods (P= 0.012), health professional providing the training (P=0.012), and knowledge score (P<0.001) (Table 2).

Table 2. Table summarizing factors associate with proper disposal knowledge and practice

Variable		Proper disposal knowledge n (%)	P-value	Proper disposal practice n (%)	P-value
Sex	F	65 (60.7%)	0.318	42 (60.9%)	0.46
	M	42 (39.3%)		27 (39.1%)	
Age	Less than 18	7 (6.5%)	0.002*	4 (5.8%)	.018*
	18 or above	100 (93.5%)		65 (94.2%)	
Marital	Single	64 (59.8%)	0.007*	35 (50.7%)	<0.001*
	Married	35 (32.7%)		26 (37.7%)	
	Widowed	8 (7.5%)		8 (11.6%)	
Health facility	RDA clinic	71 (66.4%)	<0.001*	34 (49.3%)	<0.001*
	District hospital	36 (33.6%)		35 (50.7%)	
Education level of	None	8 (7.5%)	0.858	7 (10.1%)	.036*

participants	Primary	49 (45.8%)		38 (55.1%)	
	Secondary	37 (34.6%)		18 (26.1%)	
	University or above	13 (12.1%)		6 (8.7%)	
Socioeconomic level	1	10 (9.4%)	0.384	6 (8.7%)	0.61
	2	30 (28.3%)		19 (27.5%)	
	3	65 (61.4%)		43 (62.3%)	
	4	1 (0.9%)		1 (1.4%)	
Residential area	Urban	57 (53.3%)	0.009*	27 (39.1%)	<0.001*
	Rural	50 (46.7%)		42 (60.9%)	
Received training on disposal method	No	40 (37.4%)	<0.001*	10 (14.5%)	<0.001*
	Yes	67 (62.6%)		59 (85.5%)	
Training provided by	Doctor	5 (7.6%)	0.108	5 (8.6%)	0.012*
	Nurse	56 (84.8%)		50 (86.2%)	
	Pharmacist	2 (3.0%)		2 (3.4%)	
	Other people living with diabetes	2 (3.0%)		0 (0%)	
	Other parents	1 (1.5%)		1 (1.7%)	
Knowledge on best way to dispose	Improper		NA	2 (2.9%)	<0.001*
	Proper			67 (97.1%)	

The top three challenges to proper disposal of sharps reported by participants were not being informed of proper disposal practices (n=75, 37.8%), not having appropriate sharp containers (n=66, 32.8%) and having to travel a long distance to the place where the sharp materials should be disposed of (n=47, 23.4%) (Table 1).

4. Discussion

This study aimed to understand the sharps home disposal knowledge and practices used by people living with diabetes in Rwanda. Our results showed only 69 (34.3%) of participants properly disposed of the sharps at home, by either using safety boxes (25.9%) and plastic bottles (8.5%). The majority of participants disposed of their used sharps in toilets (47.8%) and regular trash (13.4%). Such practices are common in many other developing countries – studies among persons living with diabetes showed that proportion of sharps mixed into the household garbage varied from 46.9% to over 90% (Mekuria et al., 2016; Bouhanick et al, 2000; Costello & Parikh, 2013; Govender & Ross, 2012; Ishtiaq, et al, 2012), posing risks to both people and the environment (Majumdar et al., 2015).

Our study also showed that slightly more than half of participants knew the proper ways to dispose of sharps (53.3%). Among those who knew the proper disposal methods, almost all of them (93%) disposed of sharps in the proper ways. Those who received training on the disposal methods were scored significantly higher in both knowledge level and practice.

Among the participants who had not received any training on sharp disposal methods, the most common challenge they reported was not being informed. Among those who had received trainings, the most common challenge they reported was that the distance to return the filled containers was too far. The results indicate that successful interventions to enhance safe disposal of sharps should focus not only on empowering people living with diabetes with the proper knowledge but also providing them easy channels for returning containers.

Some countries have been supporting patients to bring back used syringes and lancets to nearby hospitals for proper disposal (Ogle et al., 2017; Markkanen et al., 2015; Atukorala, Sumanasekera, Wickramasinghe, & Wickramasinghe, 2016; Basazn Mekuria, Melaku Gebresillassie, Asfaw Erku, Taye Haile, & Melese Birru, 2016; Majumdar et al., 2015). Such practices have not been implemented in Rwanda. In some rural areas, the travel distance to the nearby hospitals is far; however, there are local private pharmacies that are usually more conveniently located in most town centers. These facilities could help to put in place convenient and effective mechanisms for collecting sharp

materials. Policy makers should consider providing local private pharmacies incentives to assist in the collection of sharp-filled containers or bottles. RDA should also encourage their patients to bring back their containers/bottles during their regular follow up visits. A policy could be put in place requiring patients to bring back their sharp-filled containers before collecting their supplies.

The location of the health facility was found to be significantly associated with knowledge level and practice, with 66% of participants from RDA clinic versus 33% from district hospital knowing proper disposal practices. Since the RDA clinic was established for one specific clientele and has the mission of educating and supporting people living with diabetes, it makes sense that the participants attending RDA clinic would have more exposure to proper training. However, the results showed higher percentage of participants from district hospital properly disposed the sharps. Further analysis showed 92.1% participants from district hospital disposed using safety boxes - the district hospital was providing safety boxes for their clients, while RDA was not. Since lack of containers was one of the main challenges mentioned by the participants, a cost benefit analysis should be conducted in order to understand the feasibility for other health facilities to implement such a practice. Long term financial sustainability should also be studied. Since it could be a challenge for health care facilities to constantly provide safety boxes to clients, using hard plastic bottles is an acceptable alternative. Future interventions could focus on educating clients on using this method to deposit their used needles.

The relatively small sample size of our study limits the generalizability of the results. Similar studies with larger sample sizes should be conducted.

5. Conclusion

This study aimed to provide preliminary data on the sharp disposal practices of people living with diabetes in Rwanda. Findings of this study provide information that can guide the focus of future interventions. Programs to inform patients of the proper disposal practices should continue, and such programs should inform patients that using hard plastic bottles to dispose sharps is acceptable. A corresponding policy requiring patients to return the filled containers or bottles to local hospitals and pharmacies should be enacted. Striking up collaboration with local private pharmacies for such services may also be a way to encourage compliance since their locations are more convenient for some patients.

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Appendix 1. Questionnaire

Health care Facility	□ RDA clinic	□ District hospital	Gender:	□ male	□ female	Age (Year):	
Residential area:	□ rural	□ urban	Educational level	□ none □ primary	□ secondary	□ university or above	
Marital status:	□ single	□ married	□ widowed	Economic level (Ubudehe)	□ 1	□ 2 □ 3	□ 4
Number of members in the household:			Year on Insulin (year):		Year since diagnosed:		
How many syringes and needles do you receive in a month?							
How many syringes and needles do you use in a month?							
How many times do you use the same syringe/needle before discarding it?							

What is the way to dispose used syringe and needles?

□ Back wood □ Toilet □ Trash □ Pit □ Plastic bottle □ Safety box

□ Other

Who taught you how to dispose used syringes and needles?

□ Nobody □ Doctor □ Nurse □ Pharmacist □ Other people living with diabetes □ Other parents

How do you dispose used syringes and needles?

□ Back wood □ Toilet □ Trash □ Pit □ Plastic bottle □ Safety box

□ Other

What are the main challenges you face in disposing the used syringes and needles at home?

□ I am not informed on proper method

□ I don't have the appropriate container

□ The containers are expensive

□ There is a long distance to where we dispose the syringes

□ Other.