KNOWLEDGE, ATTITUDE AND PRACTICES (KAP) ON DISPOSAL OF SHARP WASTE, USED FOR HOME MANAGEMENT OF TYPE-2 DIABETES MELLITUS, IN NEW DELHI, INDIA

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ABSTRACT: This was a cross-sectional study to explore the factors influencing practices about household sharp waste management among type 2 diabetics in Delhi, India. The study used self-administered questionnaires to find socio-demographic characteristics, diabetes management characteristics, and knowledge, attitude and practices (KAP) towards household sharp waste management. While there is a large amount of literature on sharp disposal practices in the healthcare setting, to the best of our knowledge sharp disposal at home and associated factors has not been studied in India before. A total of 303 type 2 diabetics, who were above 18 years of age and gave informed consent, were asked to fill a self-administered questionnaire stating their socio-demographic, diabetes management characteristics, and KAP on household sharp management. Information or education on sharp use and disposal by healthcare provider, pharmacist and sharp manufacturer was collected as influencing factors. Any past injury to self, family member or to pet was also collected as one of the potential influencing factors. The study did not find any association of socio-demographic factors, diabetes management characteristics (like duration of type 2 diabetes, duration and frequency of insulin use, number of needles and lancets used, reuse of sharps, frequency of blood glucose monitoring, frequency of physician visit etc.), knowledge and attitude with sharp disposal practices of respondents. Household waste bins were frequently used by majority (84.1%) of respondents to discard their sharps, whereas only a few (16.9%) had informed their garbage handlers about presence of sharps in their waste. In contrast, influencing factors like education form healthcare provider, pharmacist and friends were significantly associated with good sharp disposal practices.

Keywords: Household sharp waste, Knowledge Attitude and Practices (KAP), Type-2 diabetes mellitus, Delhi

INTRODUCTION

Type 2 diabetes is the commonest form of diabetes, constituting 90% of the diabetic population. The global prevalence of diabetes is estimated to be increasing, from 4% in 1995 to 5.4% by 2025 [1]. The countries with the largest number of diabetic people are, and will be in the year 2030, India, China and United States [1]. Studies conducted in Indian population in the last decade have highlighted that not only the prevalence of type 2 diabetes is high, but it is also increasing rapidly in the urban population [2]. One of the study showed an early onset of type 2 diabetes, before the age of 50 years, in 54.1% of cases, implying that these persons developed diabetes in the most productive years of their life and had a greater chance of developing chronic complications of diabetes [3]. Also, younger age for onset of diabetes had been noted in Asian Indians in several other studies [4].

Due to substantial benefit and lesser side effects of early insulin therapy over oral pharmaceutical drugs for control of type 2 diabetes, aggressive use of insulin by physicians is seen in recent years in India. Availability of new and convenient home blood monitoring devices, insulin formulations to suit different patients' requirements and availability of smaller gauge needles has improved the acceptance by patients for insulin therapy at home [5].

The US EPA had issued guidelines [6] for proper disposal of sharps used at home. The American Diabetes Association (ADA) [7] developed similar recommendations regarding sharp disposal and management at home. These practices include breaking off or capping the needle before disposal, and always disposing the sharps in puncture proof boxes. Similar guidelines are available in UK on safe disposal of household sharps [8].

India is home to 30.8 million diabetics, making it the world's unchallenged diabetes capital [9]. The number is expected to go up to 87 million, 8.4% of the country's adult population by 2030 [9]. If even 0.5% of our diabetic population uses just two insulin syringes and one lancet per day, 3 billion syringes and 1.5 billion lancets are being discarded annually. Home users of sharps dispose used sharp

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objects as household waste in unsafe manner in the community. Unfortunately, in India, insulin syringe manufacturers, lancet makers and health authorities have not effectively addressed this issue.

We found many studies which were done in hospital setting on needle stick and sharp injuries in Asian countries like Korea [10] and Australia [11]. KAP of health care giver was also evaluated at health care facility [12] and at home in home health care registered nurses [13] on percutaneous injuries and blood exposure. Practices on sharp waste disposal at home were also studied in a few studies in US [14, 15]. There were some studies in UK [16, 17] which documented practices of home insulin users. To the best of our knowledge, no study in India has been conducted so far on the practices of household sharp waste disposal by insulin users and present study will help to fill this gap in knowledge.

MATERIALS AND METHODS

Self-administered questionnaire was used for collection of socio-economic, knowledge, attitude and presence of influencing factors. Practices on sharp waste management at home were ascertained through same questionnaire. The questionnaire was given to patients who were visiting diabetes mellitus clinics in New Delhi. In case the subject was not able to understand or read questionnaire, the health care provider (HCP) provided clarification to the respondents.

The study questionnaire was constructed by adapting questions from other studies. The Berkowitz et al questionnaire [14] included questions related to syringe use. Dichotomous (yes/no) scoring was used on the practice of safe disposal of sharps. The questionnaire used by Berkowitz et al. had reported good reliability and validity [14]. Similar scale was used for reporting practices in the present study. Questions related to knowledge on sharp use, reuse and sharp waste disposal were asked on dichotomous (yes/no) scale. To assess attitude, 'Likert' 5 point scale, which was adapted from McConville et al., [15] was used.

A pilot qualitative survey and discussion on questionnaire was conducted with one practicing physician in Delhi who is a frequent prescriber of insulin for her patients. The final questionnaire was developed incorporating her suggestions and some deletions which were not found to be applicable to study population. For validity and clarity, the questionnaire was circulated to 3 content experts and appropriate changes were incorporated. In order to ensure questionnaire reliability, a pretest with 30 subjects was conducted in one of the participating clinic at Delhi. Their responses were evaluated by calculating Cronbach Alpha for the knowledge and attitude sections of questionnaire. The Cronbach alpha value of .74 was obtained for reliability.

The final study was conducted in 20, purposively selected, diabetes mellitus clinics across Delhi. The study population consisted of type 2 diabetes mellitus patients of both sexes who were visiting diabetes clinics and had been on insulin therapy for at least one month. From the sampling timeframe, the first 20 consecutive subjects were approached for participation in the study from each site. This method enabled to enroll all study subjects within two weeks, and provided reasonable representation of the populations of diabetics visiting each study clinic.

Type II diabetes mellitus patients above 18 years of age and who were on insulin therapy for more than one month, were enrolled in the study. At each clinic, the researcher thoroughly explained to HCPs the objective of the research, the components of the questionnaire and the technique to employ for administering the questionnaire. All study respondents were asked by their HCPs to sign a consent form stating that they understand the purpose of the research and were willing to participate in the study. The information obtained from the questionnaire was utilized purely for the study, and confidentiality of the respondents was maintained during data entry and analysis. All completed responses to the questionnaire were coded and entered into SPSS version 16. The final coded dataset did not contain any personal details of the responders. The research has been approved by Independent Research Board in India.

RESULTS

A total of 303 subjects gave informed consent and completed the study questionnaire. All the participants were above 18 years of age and were resident of New Delhi, India, at the time of study. The study population comprised 112 (37%) females and 119 (63%) males who aged between 24 to 76 years. The mean age of respondents was 47 years and standard deviation was 12.2.

Questions were asked to explore the respondents' knowledge on household sharp waste disposal methods which included 12 statements consisting of both positive and negative questions. For positive questions, the respondents got 1 score for true answer and 0 score for false answer. For negative questions, respondents got 0 score for true answer and 1 score for false answer. An additional question on safe disposal and destruction method was asked for which description of correct method scored 1. The score ranged from 0 to 13 for knowledge section. Frequency and percentage of respondents who answered true and false to each question about knowledge towards household sharp waste disposal is shown in Table 1. The obtained score was converted in terms of score level and was classified into 3 levels (low, medium and high knowledge). A mean knowledge score of 8.4 and standard deviation of 1.5 was used to classify subjects into 3 groups. The distribution of knowledge towards

Table 1 Frequency and percentage of respondents who answered true and false to each question about knowledge towards household sharp waste disposal (n=303)

No.	Statement	True n (%)	False n (%)
1.	The sharp waste produced at home is infectious.	209(69)	94(31)
2.	One can reuse needles and lancets if they are still sharp and clean	87(28.7)	216(71.3)
3.*	The needles and lancets can be cleaned by spirit swab and reused.	104(34.3)	199(65.7)
4.*	One can also use someone else needle for injecting insulin after cleaning with spirit.	46(15.2)	256(84.8)
5.	Needle should be recapped after use and before throwing away in bin.	251(82.8)	52(17.2)
6.	Needle should be broken away from syringe and collected in puncture proof bottles.	237(78.2)	66(21.8)
7.	Lancets should not be recapped after use and before throwing in waste bin.	157(51.8)	146(48.2)
8.	One should bend the lancet tip after use and before throwing in waste bin.	240(79.2)	63(20.8)
9.	Sharps like needles and lancets can cause injury if disposed in public places like parks, streets etc.	261(86.1)	42(13.9)
10.*	The sharps in household waste can never cause injury to rag pickers and garbage handlers.	76(25.1)	227(74.9)
11.	Used needles and syringes can be misused by rag pickers.	257(84.8)	46(15.2)
12.*	Sharps like needles can be recycled like plastics	154(50.8)	149(49.2)
13.	Knowledge on at least one sharp collection and destruction method	11(3.6)	292(96.4)

* Negative statement and answer false scored 1

Table 2 Frequency and percentage towards respondents' attitude towards household sharp waste disposal (SD=Strongly disagree; D=Disagree; UN=Uncertain; A=Agree; SA=Strongly agree)

No.	Statement	Frequency (Percentage)				
		SD	D	UN	A	SA
1.*	Sharp waste produced at home is very small and is no cause of concern.(n=303)	76 (25.1)	108 (35.6)	30 (9.9)	75 (24.8)	14 (4.6)
2.*	Household garbage pickers should be responsible for any injury caused by sharps in waste. (n=302)	59 (19.5)	132 (43.7)	23 (7.6)	80 (26.5)	8 (2.6)
3.*	Sharp injuries is a cause of concern only in hospitals etc. (n=294)	38 (12.9)	139 (47.3)	59 (20.1)	53 (18)	5 (1.7)
4.*	Household sharp waste can not cause any harm or injury. (n=303)	63 (20.8)	124 (40.9)	45 (14.9)	62 (20.5)	9 (3)
5.*	It is the responsibility of the sharp manufacturer for providing safe disposal methods. (n=301)	18 (6)	50 (16.6)	29 (9.6)	115 (38.2)	89 (29.6)
6.*	It is the responsibility civic agency for providing safe disposal methods for sharps. (n=303)	14 (4.6)	20 (6.6)	53 (17.5)	135 (44.6)	81 (26.7)
7.	I want to know more about safe sharp disposal practices. (n=301)	7 (2.3)	31 (10.1)	48 (15.9)	127 (42.2)	88 (29.2)
8.	I want to spend extra effort and money on safe management of household sharps. (n=301)	19 (6.3)	50 (16.6)	85 (28.2)	96 (31.9)	51 (16.9)
9.*	Buying and extra equipment for safe disposal of sharps may cost huge money. (n=302)	19 (6.3)	70 (23.2)	71 (23.5)	96 (31.8)	46 (15.2)
10.	I want to protect anyone from any injure due to my sharp waste. (n=301)	12 (4)	20 (6.6)	21 (7)	124 (41.2)	124 (41.2)
11.*	By reusing needles and lancets I can save a lot of my medical cost. (n=302)	66 (21.9)	78 (25.8)	34 (11.3)	83 (27.5)	41 (13.6)
12.	I want to know about needle disposal program from my physician, chemist. (n=302)	15 (5)	17 (5.6)	48 (15.9)	149 (49.3)	73 (24.2)

* Negative Statement

household waste disposal is shown in Figure 1. About two-thirds of the participants (65.9%) had moderate level of knowledge while less than one-third of them (23.8%) had the high level for knowledge. 31(10.3%) respondents had low level of knowledge about household sharp waste disposal management.

To characterize attitude towards household waste disposal, all the respondents were asked about their opinions to either agree or disagree with the questionnaire statements which correspond to the attitude of respondents on household sharp waste disposal. A total of 12 positive and negative statements were administered to all respondents. For positive statements, the score was given 5 for strongly agree, 4 for agree, 3 for uncertain, 2 for disagree and 1 for strongly disagree response. The reverse score was given for negative statements.

Figure 1 Distribution of knowledge score among the respondents

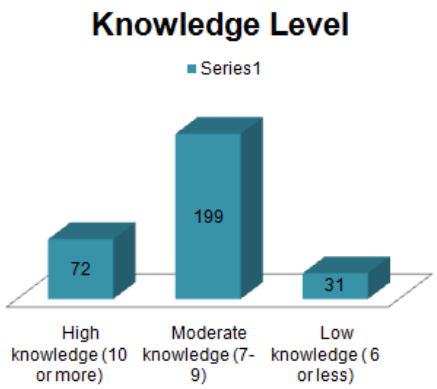

Figure 2 Distribution of attitude score among the respondents

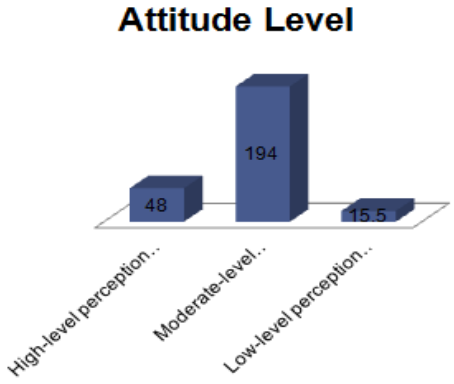

Table 3 Frequency and percentage of respondents' practices regarding household sharp waste disposal

Statement	Yes %	No %
I recap the needle after injecting insulin.	84.1	15.9
I throw away insulin needle and lancets into the household garbage bags.	84.4	15.6
Sometimes I collect sharp waste in plastic containers or tin cans.	42.9	57.1
I sometimes re-use needle if the condition seems right to use again.	54.1	45.9
If I go out, I bring my used needles back home.	25.2	74.8
I throw sharps on street if I am travelling outside or in a party.	29.1	70.9
I bend the needle and sharp after use so that it cannot be reused by anyone else.	65.4	34.6
I keep my unused needles and lancets at a place not reachable to children and others (along with my used medicine)	81.5	18.5
I collect all sharps and dispose at one particular day.	10.6	89.4
I have informed my garbage picker of sharps in my garbage.	16.9	83.1
I have asked my doctor about disposal of insulin syringes.	16.8	83.2
I have asked my chemist about disposal of insulin syringes.	32.9	67.1

Table 4 Associations between influencing factors and practice using chi-square test

Factor	(Count)	Practice Level (%)		P-value
		Good practice	Bad practice	
Education by Health care provider	No (249)	76 (30.5)	173 (69.5)	<.001
	Yes (42)	29 (69.0)	13 (31.0)	
Education by pharmacist or friend	No (231)	74 (32.0)	157 (68.0)	.006
	Yes (60)	31 (51.7)	29 (48.3)	
Any past injury to pet or someone in family or friend	No (267)	99 (37.1)	168 (62.9)	.274
	Yes (24)	6 (25.0)	18 (75.0)	

The maximum score of 60 and a minimum score of 12 was possible in attitude section. Frequency and percentage of respondents' attitude towards household sharp waste disposal are shown in Table 2. The obtained attitude score was converted in terms of attitude-score level and was classified into 3 levels (low, moderate and good attitude). A mean score of 39.7 and standard deviation of 4.6 is used to classify subjects into 3 groups. Level of attitude towards sharp household waste of the respondents and its distribution is shown in Figure 2. 67.1% of the respondents showed moderate attitude level while 16.3% of respondents had low level attitude on sharp waste disposal. About 16.6% of the participants showed high attitude level towards household sharp disposal.

Respondents were also asked two questions on whether they had any advice or recommendation form their health care provider or pharmacist on sharp use and disposal methods. History of any injury caused by sharps at home to anyone known to respondent was also asked. Presence of these potential influencing factors was scored 1 and absence was scored 0. Only 43 (14.2%) of responders had received any kind of information on sharp waste management from their healthcare provider while 62 (20.5%) had similar information through their needle seller, chemist and or friend.

Sharp injury to any family member or pet was experienced by 27 (8.9%) of respondents.

For practices on household sharp waste disposal, the respondents' were asked 12 statements, which were answered as either yes or no. Frequency and percentage of respondents who answered yes or no to each statement towards household sharp waste disposal practice, is shown in Table 3. Majority of respondents (84.4%) disposed their sharps in household garbage bins, whereas only 16.9% had informed their garbage handlers on the presence of sharps in garbage. Sharps were regularly discarded in household garbage by most of the respondents (89.4%) while a few (10.6%) collected their sharps for disposal.

Socio demographic factors and diabetes management characteristics showed significant associations with level of knowledge (Chi-square P-value <0.05). We found that being married (P-value < 0.001), high education level (P-value = 0.001), living in own residence (P-value = 0.022), higher duration of stay (P-value = 0.025), high duration of insulin use (P-value = 0.041), more number of needle used (P-value < 0.001), more number of lancets used (P-value < 0.001), frequent home blood glucose monitoring (P-value < 0.001) and frequent visit to physician (P-value = 0.008) were positively associated with level of knowledge towards household waste management.

For association between socio demographic, diabetes management characteristics with attitude towards household waste management, we found that education (P-value < 0.001), garbage pick-up by collectors (P-value = 0.002), higher duration of insulin use (P-value < 0.001), use of insulin syringe to inject insulin (P-value = 0.015), high number of needles used (P-value = 0.02), high number of lancets disposed (P-value = 0.019), frequent home blood glucose monitoring (P-value < 0.001) and frequent of visit to physician (P-value < 0.001) were positively associated to level of attitude towards household sharp waste management.

The study did not find any association between knowledge/attitude levels with practices on household sharp waste disposal. Influencing factors like education from healthcare provider, pharmacist and friends were only factors which were significantly associated with good sharp disposal practices by home insulin users. Positive correlation was found between presence of influencing factors and sharp disposal practices. Associations of influencing factors with practice are shown in Table 4.

DISCUSSION

People with diabetes are the largest group of patients who use lancets, needles and syringes on a consistent basis in the community. Other conditions that require self-administered injections (e.g., osteoporosis, multiple sclerosis, HIV, hepatitis C, cancer and allergies) are very low as compared to diabetics in India. The present study was done in type 2 diabetics, which presently comprise of largest group of home sharp users (followed by type 1 diabetics). Some of the diabetics may inject two different types of insulin that cannot be mixed requiring up to four separate insulin syringes to be used during a day. New hormone therapies (e.g. Symlinand, Byetta etc.) are being used by patients with diabetes, which may require additional 1-3 injections per day, additionally increasing the burden of sharps in household waste. In the present study, 4.7% of subjects injected insulin more than 2 times per day. Moreover 45.9% of respondents reported not reusing their needles and lancets, further increasing sharp waste burden.

In the present survey, we found that only 3.6 % of respondents have correct knowledge about safe disposal method whereas 96.4% of respondents have no knowledge on any disposal method. Our survey showed a mean score of 8.3 (possible range 0-13) with standard deviation of 1.55, showing that 80% of respondents had knowledge level below 10.4 score, considered as benchmark for good knowledge level [18]. Though, attitude was significantly correlated with disposing of syringe in puncture proof container at home and away from home in an earlier study [15], this was not observed in present study. The present study found 83.7% of subjects with high and moderate level attitude which was not correlated with sharp disposal practices. This supports the notion that without proper knowledge on sharp disposal methods, attitude alone cannot bring right behavior and practice towards sharp waste management.

Regarding influencing factors, only 14.2% of respondents answered having any advice or education about sharp waste management from their health care provider. In contrast, 64.6% subjects received formal advice from their HCPs in an earlier study conducted in England [16]. Education from healthcare provider played a very important role, as shown by significant correlation (P-value < .0001) of presence of influencing factors score on sharp disposal practices, in present study. Having received previous information about proper syringe disposal practices played a significant role in actual practices for syringe disposal was also shown in earlier study conducted in US [15]. Earlier studies also identified health professionals as a major (> 56%) source of information for the respondents and concluded that diabetes education can improve syringe disposal practices of their patients through education at each office visit. Another study confirmed the importance of education by healthcare provider and found statistical difference in practices between patients receiving and not receiving advice on sharps disposal [OR 6.36 (95% CI 2.04-23.28, p<0.001) for needle disposal and OR 15.41 (95% CI 3.57-90.12, p<0.001) for lancet

disposal] [17].

CONCLUSION

The awareness on safe disposal of sharp among sharp users and health care professionals is low, which is one of the reasons for lack of education to home sharp users by healthcare providers and sharp manufacturers. To achieve the goal of safe disposal practices for sharps in household waste, awareness, education and importance of safe needle-disposal program should be initiated for both users and healthcare professionals.

Currently there are no needle-disposal laws either by local government or Ministry of Environment and Forest. The law should ensure that the safe disposal programs are available and that the sharps are no longer to be discarded in the household trash or public locations like parks, buildings or streets. In present study 29.1% of respondents answered that they sometimes disposed their sharps on streets. Around 75% of respondents did not bring back their used sharps back home, if they are travelling. These laws should be publicized on sharp (needle and lancet) packs and safe disposal methods should be adequately promoted and advertised. India being a developing country, low-cost, user friendly programs should be designed that will ensure the participation of home based users without incurring extra cost. It is very important that healthcare providers and other related professionals become involved as they play a vital role in promoting awareness on sharp disposal, formulating stakeholder partnerships and changing laws, policies and regulations to increase access to safe disposal programs. Safe household sharp waste disposal can only be achieved through collaborative efforts from local governments, environmental ministry, solid waste authority, HCWs, pharmacist, diabetes advocacy groups, healthcare facilities and sharp manufacturers. A low-cost, user friendly program and equipment can be designed to suit socio-cultural practices [19]. All above stakeholders should be involved to chalk a strategy and most effective program in this regard.

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