

Patterns of Sharp Handling and Disposal among Insulin Using Patients with Diabetes Mellitus

Prabin Adhikari,¹ Kritika Bhattarai,¹ Ashish Acharya¹

¹Nepal Medical College and Teaching Hospital, Kathmandu, Nepal.

ABSTRACT

Background: Proper knowledge and practice regarding insulin sharps disposal is crucial to prevent health and environmental risks. Improper handling can lead to needle-stick injuries and transmission of blood-borne infections. This study aimed to assess the patterns of insulin sharps handling, disposal practices, and related knowledge among patients with diabetes mellitus.

Methods: A single-center descriptive cross-sectional study was conducted at Nepal Medical College and Teaching Hospital, Kathmandu, from July 2023 to February 2024. Diabetic patients meeting the inclusion criteria were enrolled after obtaining informed consent. Data were collected using a structured questionnaire, including demographic details (age, sex, education) and specific information on insulin therapy (duration, method, type of insulin use) and disposal practices (how and where) along with their knowledge on disposal. Microsoft Excel was used for statistical analysis.

Results: Among the 105 patients, 56 (53.3%) were males and 49 (46.7%) females, with the largest proportion (35.2%) aged 40–60 years. A notable 25.7% were literate without formal education. Most patients (93.3%) used insulin pens, and 54.3% self-administered injections. Improper disposal of insulin sharps was reported by 92 (87.6%) patients, commonly through household dustbins. Only 13 (12.4%) practiced proper disposal via hospital waste systems. While 42 (40.0%) patients were aware of proper disposal methods, 54 (51.4%) understood the potential consequences of unsafe disposal.

Conclusions: Knowledge and proper practices related to insulin sharps disposal remain inadequate among diabetic patients. Raising awareness about safe disposal and the consequences of improper handling is essential.

Keywords: Diabetes; disposal; sharps.

INTRODUCTION

Diabetes mellitus is a chronic metabolic disorder characterized by raised blood sugar level. It is a topic of global concern with estimated 537 million cases according to the International diabetes foundation (IDF) Atlas 2021.¹ In accordance to the WHO Nepal steps survey 2019, the prevalence rose from 3.6% (2013) to 5.8%.² A prevalence rate of 6.3% is reported in 2021 in Nepal.³ Insulin is main treatment of therapy in type 1 DM, while some type 2 patients also need insulin if OHA are insufficient to control blood sugar level or in serious clinical conditions such as major surgeries, administration of which is done via insulin pen, needles and syringes.⁴ Currently, data on proportion of diabetes

patients using insulin are lacking from Nepal. With its increasing diabetes burden, a high demand for insulin therapy in Nepal is expected. There have been no detailed in-country assessments of insulin access and use in Nepal. The WHO study on 2018, estimated 16 billion injections being used annually worldwide, and unsafe disposal practices of syringes accounted for 1.7 million and 315000 cases of Hepatitis B and C respectively in 2010.⁵ WHO defines sharps as needles, hypodermic needles, scalpel, broken glass and other items that could cause potential cut and puncture wounds.⁵ Improper disposal of sharps could cause needle prick injuries to the patient, their family and also could affect the waste handlers and community members.⁷ Transmission of blood borne disease has also been a consequence.

Correspondence: Dr Prabin Adhikari, Department of Endocrinology, Internal Medicine, Nepal Medical College and Teaching Hospital, Kathmandu, Nepal.
Email: aprabin@gmail.com, Phone: +9779841269346.

Therefore, a proper handling and disposal of the sharps is mandatory. A systematic review of the literature on sharps disposal among diabetic patients revealed that the majority of diabetic patients are unable to manage sharps safely outside medical institution globally.⁸ Although proper disposal of sharps has been relatively well studied in hospital settings, there are few studies addressing sharps disposal in home settings. While proper disposal of insulin syringes and sharps is critical for preventing injuries and the transmission of blood-borne diseases, there is a lack of comprehensive data on insulin injection practices in Nepal, particularly on the handling and disposal of insulin syringes. Studies conducted in the past in Nepal, and in neighboring countries have been focused on injection techniques rather than sharps disposal practices.⁹⁻¹²

The lack of awareness and education on proper disposal methods may contribute majorly to unsafe practices among diabetic patients. Though there could be several other barriers which may not have been studied extensively.

This study aimed to examine the patterns of sharps disposal among insulin-using patients in Nepal.

METHODS

This was a single-center observational descriptive cross-sectional study conducted at a tertiary hospital in Kathmandu, Nepal from July 2023 to February 2024. Ethical approval was obtained from the Research and Institutional Review Committee (Reference number: 36-080/081). The study included outpatients and inpatients with Diabetes Mellitus (insulin initiated before admission) on insulin therapy, either new (<1 month) or long-term users. Patients using insulin drips, or those with gestational diabetes (as it affects only pregnant women, making it a non-comparable group with general diabetes patients) were excluded from the study.

Convenience sampling was used, and the sample size was calculated to be 91 using the formula $n = Z^2 \cdot p(1-p) / E^2$, where $Z=1.96$ (for a 95% confidence interval), $p=0.06$ (prevalence rate from a 2021 data³), and $E=5\%$ margin of error. A total of 105 respondents were included in the study, which exceeds the calculated sample size of 91. The sample size was increased to account for potential non-responses and incomplete data, ensuring that the final dataset would still provide robust and reliable results. A structured questionnaire was developed to collect basic demographic information (age, sex, education level, occupation), the duration of insulin use, self-injection practices, knowledge about sharps disposal, and the actual disposal practices. The participants were asked questions by investigators and obtained information were entered in pre-structured data collection form. The data were then entered in Micro Soft Excel Spreadsheet. Data were analyzed using Microsoft Excel, and the prevalence was reported within 95% confidence intervals. Descriptive statistics were performed mainly and frequency was represented in number and percentage.

RESULTS

Among the 105 patients, 56 were male (53.3%) and the remaining 49 females (46.7%). Most of them were from the age group of 40-60 years which accounted to 37 (35.2%). Table.1 Represents summary of the patient characteristics.

The educational status of the patients which reveals that about 20.0% of the total patients had an education level greater than Higher Secondary (implying to bachelor's or master's degree in their relevant field) and about 22% of the total patients had educational level of upto higher secondary (high school equivalent). However, it is important to note here that the majority 27 of them (25.7%) were just literate without any formal education but were able to read and write simple native language.

Table 1. Characteristics of Insulin-Using Diabetes Patients. (N = 105)

Variable	Category	n	%
Sex	Male	56	53.3
	Female	49	46.7
Age Group	40-60 years	37	35.2
Education Level	Above Higher Secondary (Bachelor/Master)	21	20.0
	Up to Higher Secondary	23	22.0
	Literate without formal education	27	25.7
Occupation	Professional (teachers, doctors, engineers, etc.)	19	18.1
	Skilled (builders, technicians, etc.)	6	5.7

Table 1. Characteristics of Insulin-Using Diabetes Patients. (N = 105)			
Variable	Category	n	%
	Semi-skilled (clerks, small business owners, etc.)	38	36.2
	Unskilled (housewives, unemployed, retired)	42	40.0
Duration of Insulin Use	<1 month	6	5.7
	≤1 year	29	27.6
	1-5 years	34	32.4
	5-15 years	29	27.6
	>15 years	7	6.7
Method of Injection	Self-injection	57	54.3
	Family assistance	42	40.0
	By healthcare professionals	6	5.7
Type of Insulin Delivery	Insulin pen	98	93.3
	Syringe	7	6.7
Sharps Disposal Method	Proper (hospital waste system)	13	12.4
	Improper (dustbin, burial, burning)	92	87.6
Knowledge of Disposal Method	Aware	42	40.0
	Not aware	63	60.0
Knowledge of Consequences	Aware	54	51.4
	Not aware	51	48.6

Occupational status of all the patients were categorized. Professional category of the occupation in our study typically included teachers, doctors, engineers etc. , semi-skilled as clerks and ownership, and farmers, and the skilled workers were builders, mason, carpenter technicians. At last, we have categorized unskilled workers which included those who were retired, unemployed and house-wives, this accounted for about 40.0% of the total respondents.

The majority of the (about 34 patients) have been using insulin either in the form of an insulin pen or syringe since the last 1 to 5 years and this figure accounted to 32.4% of the total patients. This data is subsequently followed by 29 individuals (27.6%) who have been using insulin for both 5-15 years and up to a year respectively. Interestingly, only 7 reported using insulin for more than 15 years and 6 for less than a month. The majority of patients had injected insulin themselves (54.3%), followed by 40.0% needing the help from family members and on the other hand, only 5.7% of the total patients had health care practitioners (nurse, pharmacist and doctors) for the injection.

Among 105 insulin users, majority of then 98(93.33%) of them were using insulin pens and 6 (6.66%) of them

were using insulin in syringe.

The patients were asked where they were disposing the sharps after the injection and our survey revealed that the majority (92, 87.6%) patients (did improper disposal of sharps). The sharps were disposed by either wrapping in plastics and throwing them in household dustbins along with other household wastes or by burial and burning pit method. Only 13 (12.4%) reported of disposing the sharps via the proper method of disposing.

As per knowledge assessment questionnaire, more than half of the individuals (60%) did not know the proper method of disposal of sharps, while the remaining 40% were told on how to properly dispose of the sharps after the insulin therapy. On the contrary, 51% knew about the consequences of improper disposal as compared to the 49% who had no knowledge about the consequences.

DISCUSSION

Diabetes is one of the most prevalent non communicable diseases worldwide, is also a growing health issue in Nepal. The use of insulin is a critical aspect of managing both Type 1 and some cases of Type 2 diabetes. ¹³ While guidelines for proper sharps disposal been established

by associations in developed countries¹⁴, which too is not implemented in home setting, proper disposal of insulin syringes remains a significant challenge in Nepal.

The results of our study show that most diabetic patients in Nepal dispose of insulin syringes improperly (87.6%), often throwing them into household waste or burning them. This is followed by burning in a pit outside their household premises. Disposing of sharps in regular waste increases the risk of needle-stick injuries for waste handlers, with the potential for exposure to blood-borne diseases like HIV, Hepatitis B, and Hepatitis C.⁷ Such practices pose considerable risks to public health, as they increase the likelihood of needle-stick injuries, which can lead to the transmission of diseases like HIV, Hepatitis B, and Hepatitis C. Improper disposal in landfills also harms wildlife and exposes individuals who come into contact with the waste to injuries.⁶⁻⁷ Burning sharps, while intended to reduce their presence, releases harmful fumes and does not ensure complete destruction of the needles, still posing injury risks. These practices highlight the urgent need for better health education, community interventions, and accessible, safe disposal solutions to mitigate the public health and environmental risks associated with improper sharps disposal.

Interestingly our study had reported 12.4% who had proper disposal which they had collected in a container and disposed of the sharps while visiting the hospital or a tertiary care health center. This finding is in contrast to a similar study done by Poudel et al.⁹ where they had reported out of 42 participants only one participant had participated in proper disposal of insulin sharps. The difference in findings between the Poudel et al 2017 (conducted in Chitwan) study and the present study is not only influenced by the difference in sample size of the study. However, other factors such as education level, health literacy or awareness of patients and duration of insulin therapy. More so, our study included a good number of participants who were newly initiated on insulin therapy, and they may have received more recent education from healthcare professionals regarding safe disposal practices.

In our study majority of the patients (93.33%) patients were using insulin pens which is similar to other studies reported from Nepal and Germany.¹⁵ This preference can be attributed to the convenience and ease of use with insulin pen chosen by patients as well by practicing physicians.

More than half of the patients did not have any knowledge

on proper insulin disposal practices but on the contrary a similar number of the respondents knew about the consequences of improper disposal practices, which to their knowledge majority told of transmission of blood borne diseases (like HIV and Hepatitis B and Hepatitis C) and accidental injuries and pricks. These findings align with similar studies that have reported a significant number of participants unaware of safe disposal practices.¹⁶⁻¹⁷ Interestingly, in other studies, participants who were aware of safe disposal practices and their associated risks indicated that they had received this information directly from healthcare practitioners.¹⁸⁻²¹ Although KAP (Knowledge, Attitude, and Practice) studies on sharps disposal are limited, a 2015 study involving 244 diabetes patients in urban Nepal found that 21.3% had highly insufficient knowledge and 22.5% had insufficient knowledge about diabetes. Additionally, 28.3% of participants demonstrated poor attitudes, and the level of practice was similarly low, with only 29.1% showing good practices.²² This highlights the crucial role of healthcare professionals in educating patients about the importance of both proper use and proper sharps disposal and its potential health consequences.

Our study also highlighted that a significant portion of the participants were only literate but had no formal education. This may have contributed to the lack of awareness regarding safe insulin sharps disposal. This knowledge gap has serious implications not only for public health but also for environmental safety. The fact that this issue is prevalent even in developed countries, where diabetic patients still lack proper disposal knowledge, suggests a broader problem related to health literacy and the need for more targeted educational as well as training efforts from healthcare providers.²³ Misconceptions and a general lack of awareness among patients further contribute to improper disposal.²⁴

This study was conducted in a single tertiary care center study, so it might not be representative or generative of insulin sharps disposal practices in Nepal. Because participation was voluntary and survey-based, selection bias must be considered. In addition, since the records or the data used and interpreted in our study is collected from the patient and their relatives, this imposes an information bias as direct observation of disposal practices could not be done. However, we believe the findings from our study provide insights into the current state of insulin sharps disposal in the region and can serve as a foundation for further research so that a border understanding of this issue at a national level so that effective public safe disposal of sharps could be developed.

CONCLUSIONS

Our study reveals a significant gap in knowledge and practice regarding proper insulin sharps disposal among diabetic patients in Nepal, with most participants engaging in improper disposal methods, such as discarding sharps in household waste or burning them. This is compounded by insufficient education from healthcare professionals, misconceptions, and limited access to healthcare facilities. Despite a small percentage of participants disposing of sharps properly, the overall awareness remains low.

CONFLICT OF INTEREST

None to declare.

REFERENCES

1. International Diabetes Federation. IDF Diabetes Atlas 10th Edition. Brussels: IDF; 2021 [cited 2022 Aug 18]. Available from: <https://diabetesatlas.org/atlas/tenth-edition/>
2. World Health Organization. Noncommunicable Disease Risk Factors: STEPS Survey Nepal 2019 [Internet]. Kathmandu: WHO; 2019 [cited 2023 Nov 22]. Available from: <https://www.who.int/docs/default-source/nepal-documents/ncds/ncd-steps-survey-2019-compressed.pdf>
3. International Diabetes Federation. Nepal [Internet]. 2021 [cited 2022 Aug 18]. Available from: <https://idf.org/our-network/regions-and-members/south-east-asia/members/nepal/>
4. Stewart MA. Effective physician-patient communication and health outcomes: a review. *CMAJ*. 1995;152(9):1423-33. [PubMed]
5. World Health Organization. Health-care waste [Internet]. Geneva: WHO; 2018 [cited 2021 May 1]. Available from: <https://www.who.int/news-room/fact-sheets/detail/health-care-waste>
6. World Health Organization. Status of health-care waste management in selected countries of the Western Pacific Region [Internet]. Manila: WHO; 2015 [cited 2023 Nov 22]. Available from: <https://www.who.int/publications/i/item/9789290617228>
7. Centers for Disease Control and Prevention. Healthcare-Associated Hepatitis B and C Outbreaks [Internet]. Atlanta: CDC; 2020 [cited 2023 Nov 22]. Available from: <https://www.cdc.gov/hepatitis/outbreaks/healthcarehepoutbreaktable.htm>
8. Wu J, Wang M, Yan H. Status of waste disposal of sharps outside medical institutions for patients with diabetes: a systematic review. *PLoS One*. 2023;18(11):e0288993. [PubMed]
9. Poudel RS, Shrestha S, Piryani RM, Basyal B, Kaucha K, Adhikari S. Assessment of insulin injection practice among diabetes patients in a tertiary healthcare centre in Nepal: a preliminary study. *J Diabetes Res*. 2017;2017:8648316. [PubMed]
10. Tandon N, Kalra S, Balhara YP, Baruah MP, Chadha M, Chandalia HB, et al. Forum for injection technique (FIT), India: the Indian recommendations 2.0, for best practice in insulin injection technique, 2015. *Indian journal of endocrinology and metabolism*. 2015 May 1;19(3):317-31. [PubMed]
11. Rehman MU, Ahmad B, Uttra KM. Assessment of insulin injection practices in patients with diabetes presenting to a tertiary care hospital. *Pak Armed Forces Med J*. 2025;75(Suppl-1):S20-S23. <https://www.pafmj.org/PAFMJ/article/view/6189>
12. Ji J, Lou Q. Insulin pen injection technique survey in patients with type 2 diabetes in mainland China in 2010. *Curr Med Res Opin*. 2014;30(6):1087-93.
13. Centers for Disease Control and Prevention. Types of Insulin [Internet]. Atlanta: CDC; 2022 [cited 2023 Nov 22]. Available from: <https://www.cdc.gov/diabetes/basics/type-1-types-of-insulin.html>
14. Satterfield D, Kling J. Professional development: diabetes educators encourage safe needle practice. *Diabetes Educ*. 1991;17(4):321-5. [PubMed]
15. Shrestha HK, Tamrakar R, Shrestha A, Amatya S. Insulin prescription pattern among type 2 DM patients visiting outpatient department at a tertiary hospital in Kathmandu, Nepal. *J Diabetes Endocrinol Assoc Nepal*. 2018;1(1):3-7. <https://www.nepjol.info/index.php/jdean/article/view/21188>
16. Montoya JM, Thompson BM, Boyle ME, Leighton ME, Cook CB. Patterns of sharps handling and disposal among insulin-using patients with diabetes

mellitus. *J Diabetes Sci Technol*. 2019;15(1):60-6. [\[PubMed\]](#)

17. Mekuria AB, Gebresillassie BM, Erku DA, Haile KT, Birru EM. Knowledge and self-reported practice of insulin injection device disposal among diabetes patients in Gondar town, Ethiopia: a cross-sectional study. *J Diabetes Res*. 2016;2016:1897517. [\[PubMed\]](#)
18. Hasan UA, Mohd Hairon S, Yaacob NM, Daud A, Abdul Hamid A, Hassan N, et al. Factors contributing to sharp waste disposal at health care facility among diabetic patients in North-East Peninsular Malaysia. *International Journal of Environmental Research and Public Health*. 2019 Jul;16(13):2251. [\[PubMed\]](#)
19. Ishtiaq O, Qadri AM, Mehar S, Gondal GM, Iqbal T, Ali S, et al. Disposal of syringes, needles, and lancets used by diabetic patients in Pakistan. *Journal of Infection and Public Health*. 2012 Apr 1;5(2):182-8. [\[PubMed\]](#)
20. Tu H, Lu X, Wang J, Sheng Z, Liu D, Li J, et al. At-home disposal practices of used insulin needles among patients with diabetes in China: A single-center, cross-sectional study. *Frontiers in Public Health*. 2022 Dec 8;10:1027514. [\[PubMed\]](#)
21. Singh AP, Chapman RS. Knowledge, attitude and practices on disposal of sharp waste used for home management of type-2 diabetes mellitus in New Delhi, India. *J Health Res*. 2017;25(3):135-40. <https://he01.tci-thaijo.org/index.php/jhealthres/article/view/81159>
22. Gautam A, Bhatta DN, Aryal UR. Diabetes related health knowledge, attitude and practice among diabetic patients in Nepal. *BMC Endocr Disord*. 2015;15:25. [\[PubMed\]](#)
23. Costello J, Parikh A. The sticking point: diabetic sharps disposal practices in the community. *J Gen Intern Med*. 2013;28(7):868-9. [\[PubMed\]](#)
24. Majumdar A, Sahoo J, Roy G, Kamalanathan S. Improper sharp disposal practices among diabetes patients in home care settings: need for concern? *Indian J Endocrinol Metab*. 2015;19(3):420-5. [\[PubMed\]](#)