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## ORIGINAL PAPER

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# Disposal of Used Pens and Needles from Diabetes Patients' Perspective

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**ABSTRACT**

**Introduction:** Diabetes as lifelong chronic disease requires pharmacological treatment using plastic pens and needles. Proper disposal of used pens and needles have impact not just on health but environment as well. In 2020 there will be 3.2 million pens used and disposed in Bosnia and Herzegovina resulting in over 600 tons of this waste. Worldwide problem is related to proper disposal of used insulin pens and sharps. **Aim:** To investigate and evaluate what are the attitudes, knowledge and practices on insulin pens and needles disposal among diabetes patients in Bosnia and Herzegovina. **Methods:** The research was conducted in five cities in Bosnia and Herzegovina in period December 2019–January 2020 using questionnaire consisted of 28 questions distributed among patients with diabetes through their local patient associations. **Results:** Total 250 diabetes patients participated. 40.4% inject medicines for 2 times per day and 37.6% for three and more times a day. Patients have not been instructed on proper disposal of used pens or needles in 67.6% and 66% respectively. The most appropriate place to dispose used pens is pharmacies and 90% of respondents would participate in program of collecting used pens if one exists. 75.6% of respondents consider improper disposal of pens and needles as healthcare problem, 18.8% see this as ecological problem and for 4% of them this is not a problem at all. **Conclusion:** Current practice of disposing used insulin pens and sharps is improper. Patients are aware of health and environmental risk. There is a huge opportunity for pharmacists and other healthcare providers to provide better information and counseling diabetes patients on this topic.

**Keywords:** diabetes, insulin pens disposal, environment, pharmacist counseling.

**1. INTRODUCTION**

Diabetes is significant health problem in Bosnia and Herzegovina (B&H), and based on IDF Atlas 2017 it is estimated that there are more than 366 thousands adults with diabetes in B&H with prevalence of 12.5% (1).

Diabetes type 2 is chronic disease progressing throughout the time requiring different treatment and pharmacological agents adapted to patients' needs – from oral treatments to injectable like GLP-1RAs and insulin. Diabetes type 1 is immediately treated with insulin due to disease nature (2).

An injector pen (medication pen) is a device used for injecting medication under the skin, and are designed to make injectable medication easier and more convenient to use, thus increasing patient adherence and also decrease the fear or adversity towards self-injection of medications (3). The first insulin pen, the *NovoPen*, was launched by *Novo Nordisk* in 1985 (4). An injector pen consists of a chamber or cartridge of medication, a tip to attach a needle, and a piston or plunger to inject the dose. Some pens, including most insulin pens, include dials to adjust the dose of the injection before each administration (5). Even if an insulin pen consists of around 77% plastic, it cannot be thrown into the plastic recycling bin. Current guidance varies from country to country, but often used insulin pens end up in general household waste. Insulin pen producers focused on using biodegradable plastics that dissolve when they become waste. However, such plastics are not necessarily biodegradable in a landfill or in nature, but only when put into industrial composting plants. In order to assure product components to be recycled and reused, producers are moving from using biodegradable to high quality bio-based plastics (6).

Based on available data on annual utilization of insulin and other injectable diabetes treat-

Variable	Category	N	Percentage (%)
City	Bijeljina	60	24.0
	Prijedor	50	20.0
	Trebinje	60	24.0
	Kakanj	21	8.4
	Banja Luka	59	23.6
Gender	Male	124	49.6
	Female	126	50.4
Age	<35	38	15.2
	36-50	72	28.8
	51-65	74	29.6
	>65	66	26.4
Employment status	Employed	95	38.0
	Unemployed	57	22.8
	Student	13	5.2
	Retired	85	34.0
Education level	Primary school	40	16.0
	High school	136	54.4
	University	66	26.4
	No education	8	3.2

Table 1. Demographic characteristics of surveyed diabetes patients

ments it is approximated that in year 2020 there will be 3.2 million pens used and disposed in BH (7). Considering a fact that empty pen weight 20 grams we can conclude that only in 2020 total waste produced from this source would be around 640 tons (derived from IQVIA data).

Insulin pens are not just problematic as plastic pollutant but also can be considered as medical waste with infectious potential, especially in case of improper pen needles (sharps) disposal (8, 9).

## 2. AIM

The aim of this study was to investigate and evaluate what are the attitudes, knowledge and practices on insulin pens and needles disposal among diabetes patients in Bosnia and Herzegovina.

## 3. MATERIAL AND METHODS

The research was conducted in five cities in Bosnia and Herzegovina (Bijeljina, Prijedor, Trebinje, Kakanj and Banja Luka) in period December 2019 - January 2020 using questionnaire consisted of 28 questions. All questionnaires are distributed through patient associations to their members together with consent form. Questionnaires collected demographic data, practice on disposal of needles and used pens, perception and knowledge on proper disposal as well as attitudes on potential improvements.

Statistical analysis of collected data has been conducted in the SPSS program. We used descriptive statistic as well as exploratory factor analysis (EFA) and confirmatory factor analysis (CFA).

## 4. RESULTS

Total 250 diabetes patients participated in a survey from five cities in Bosnia and Herzegovina and with dif-

Question	Answer	N	%
Do you read the instructions for use of the medicine in detail before using the medicine?	Yes	92	36.8
	No	158	63.2
Is there a note in the instructions, what to do with the used pen?	Yes	107	42.8
	No	143	57.2
According to the instructions, the used insulin pen should be disposed in:	Communal waste	41	16.4
	Hand it over to the physician	7	2.8
	Hand it over to the pharmacist	45	18.0
	Hand it over to the patient association	14	5.6
	I do not know	143	57.2

Table 2. Patients PIL reading practice and instructions on used pen disposal understanding

Question	Answer	N	%
Where do you think it is more appropriate to dispose of a used pen?	Pharmacy	118	47.2
	Physician office	82	32.8
	Patient association	46	18.4
	Supermarket	4	1.6
	Burn them in a yard	10	4.0
What do you think is the most appropriate way to destroy a used pen?	Bury them in the ground	8	3.2
	Dispose of in municipal waste	32	12.8
	Hand it over to someone authorized to take care of it	200	80.0

Table 3. Patients attitudes on proper used pens disposal

ferent profile regarding education, duration of diabetes, employment status and employment as presented in Table 1. Majority of respondents (44.8%) have been living with diagnosed diabetes 6 to 10 years, 30% of them have diabetes for less than 3 years and 25.2% more than 10 years. 39.6% of surveyed patients use injectable medicines less than 3 years, 43.2% four to 10 years and 17% more than ten years. When it comes to number of injections per day 40.4% inject medicines for 2 times per day and 37.6% for three and more times a day. It is interesting that majority of respondent do not read patient information letter (PIL) inserted in their medicine package. Table 2 represents question related to PIL instruction on proper use and disposal of insulin pens, showing that 57.2% of respondent do not know how to properly handle used pens.

Majority of respondents consider used needles and glucose measuring strips are hazardous; 85.6% and 77.6%, respectively. Used needles are disposed in special box by 48% of respondents, while 44% of them throw it into communal garbage. Those who use special box for disposing used needles use plastic or glass bottle (34%), plastic bag (23.2%) and rest of them use metal or cartoon box or simply wrap it in a paper.

Patients have not been instructed on proper disposal of used pens or needles in 67.6% and 66% respectively. Those who have been instructed get this information from vari-

ous sources as presented in Figure 1. In Table 3 we present patients attitudes on best way where to properly dispose used pens pointing pharmacy as the most suitable place, and 90% of them confirmed they would participate in program of collecting used pens if one exists.

Out of 75.6% of respondents consider improper disposal of pens and needles as healthcare problem mainly due to possible infections, 18.8% see this as ecological problem and for 4% of them this is not a problem at all.

## 5. DISCUSSION

Problem of medical waste and its impact on environment is well recognized (10). Current regulations on Good Manufacturing Practice and effluent emission (use and disposal) and on manufacturing effluent discharge and emission require evaluation of contained manufacture, use, and disposal of pharmaceuticals with the goal of minimizing the release of pharmaceutical chemicals into the environment (11). Medical products used and discarded in a hospital setting are considered biomedical waste. However, those used in the home care or domestic setting, including insulin syringes, needles, lancets, cartridge and pens, are included in municipal solid waste (MSW), and disposed accordingly. Studies throughout the world have demonstrated that diabetics inappropriately discard medical wastes. In a Nepal study, the most common methods used to dispose of used needles were transferring them into municipal waste disposal vehicles, throwing them in isolated places, and burning them (12). Our findings also suggest similar practices but in much lower rate since 80% of respondents are aware that used insulin pens should be handed over to someone authorized to take care of it in a proper way. Patients in our study found improper disposal mainly as a healthcare problem which corresponds to other countries findings (13-15). Some of the barriers for proper handling of used sharps and pens identified include lack of information about how and where to dispose, lack of proper advice by healthcare professionals. We found that only one third of patients have been instructed on proper disposal of used sharps and pens. Additional problem is that patients stated that they do not read PILs where such instruction can be found. However, it would be interesting to evaluate if these instructions are clear and practical or just of formal nature to meet regulatory requirements since 57.2% of those who claimed to read PILs said they do not know where and how to dispose used insulin pens. Majority of patients who have been advised on proper disposal got this information from their nurse or physician, and only 9% of them received such instruction from pharmacists. One study in Iran found that pharmacists can play an important role in safe and efficient use of insulin pen in elderly diabetic patients including its proper disposal as well (16). Pilot study conducted in Guyana found that, with training, nurses and pharmacists were able to counsel clients successfully resulting in insulin needle re-use declined from 87% to 8% with the provision of full supply and clients felt safer using a single needle for each injection, disposing used syringes into containers and returning full containers to facilities for disposal (17). Pharmacies have been recognized as place for disposing used insulin pens among patients in Bosnia and Herzegovina.

This has been confirmed in pilot project conducted among 100 pharmacies in Bosnia and Herzegovina during eight months period in 2020 during which almost 200 kilograms of used pens and needles have been collected (18).

Our findings suggest that patients are interested in getting more knowledge on this issue as well their high awareness on environmental and health impact on improper disposal.

This is the first study conducted in Bosnia and Herzegovina and neighboring countries on this topic. Considering a fact that cultural characteristics of patients and similar healthcare system organization we are free to suggest similar findings in other countries but conduction of such study would be preferable to get more precise insight.

## 6. CONCLUSION

Our study found that practice of disposing used insulin pens and sharps are improper but there is a huge interest among patients to be better informed. Patients are aware of health and environmental risk and are willing to participate in programs that would provide clear guidance and systematic approach to collection of used pens. There is a huge opportunity for pharmacists and other healthcare provides to provide better information and counseling diabetes patients on this topic.

- **Author's contribution:** Each author gave substantial contribution to the conception or design of the work and in the acquisition, analysis and interpretation of data for the work. Each author had role in drafting the work and revising it critically for important intellectual content. Each author gave final approval of the version to be published and they agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.
- **Conflicts of interest:** There are no conflicts of interest.
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