Editorial

Green diabetology

Sanjay Kalra, Rajiv Girdhar[1], Rakesh Sahay[2]

Department of Endocrinology, Bharti Hospital, Karnal, Haryana, [1]Department of Civil Engineering, Hydroair Tectonics (PCD) Ltd., Navi Mumbai, Maharashtra, (Karnal Plant, Karnal, Haryana), [2]Department of Endocrinology, Osmania Medical College, Hyderabad, Telangana, India

This editorial aims to highlight the various rules and regulations of waste disposal and explain them a propos diabetes waste. It hopes to encourage a nation-wide movement for green diabetology, which utilizes scientific practices to prevent an adverse impact of diabetes waste on our environment. The communication also tries to sensitize diabetes care professionals to their responsibility toward the physical environment, while reinforcing the need for interdisciplinary cooperation between all stakeholders.

Diabetes has become pan-endemic now.[1] Apart from the health-related and economic consequence of uncontrolled glycemia, avoidable chronic complications, and acute co-morbid conditions, there is another issue that has hitherto been ignored. This is the burden that modern diabetes management places upon the environment. While modern insulin technique guidelines address the need for appropriate disposal of needles and syringes,[2,3] this aspect is not discussed in conjunction with national regulations for biomedical waste disposal. Thus, the potential impact of diabetes care upon our surroundings is not realized.

Environmental Burden

The 65 million Indians living with diabetes consume about 160 million insulin syringes and about 50 million pen needles annually, along with about 40 million syringes used for immunization (source: IMS data and market assumption on insulin injection habits). Each syringe weighs 3.28 g. Excluding the weight of the cannula, the net amount of plastic generated from insulin syringes alone, each year is 600,000 kg (3 g × 200 million syringes) (derived from IMS data).

Apart from this, roughly 9.6 crore (96,000,000) vials, cartridges and prefills are consumed in a 12-month period (6.7 crore vials, 2.5 cartridge and 0.7 disposable pens), adding to the burden of glass and plastic on the environment (derived from IMS data).

Corresponding Author: Dr. Sanjay Kalra, Department of Endocrinology, Bharti Hospital, Karnal, Haryana, India. E-mail: brideknl@gmail.com

As the number of people living with diabetes increase, diabetes care-related waste is bound to rise, as modern tools and devices are used more frequently for diabetes management. Table 1 lists some commonly produced diabetes waste, which can be classified into bio-medical, plastic, and e-waste. Table 2 enumerates the various categories of bio-medical waste, as listed in current Indian regulations.

Bio-medical Waste

"Bio-medical waste" means any waste, which is generated during the diagnosis, treatment or immunization of human beings or animals, or in research activities pertaining there to or in the production or testing of biologicals.[4]

As per current Indian regulations, 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.[4]

Untreated bio-medical waste should not be mixed with other waste. It should be segregated into color-coded, labeled containers/bags at the point of generation, prior to storage, transportation, treatment and disposal. Bags of appropriate color with nonwashable labels must be used.

According to earlier guidelines, glucose monitoring sticks, and other solid waste were to be collected in red bags. Now, they can be disposed of in yellow nonchlorinated bags.

Disposable pens should be disposed of after removing pen needles. Pen needles should also be disposed of safely. Transport should be undertaken only in authorized vehicles.

Storage of bio-medical waste of categories 1, 2, 3, and 6 should not exceed 48 h without treatment. This includes items contaminated with blood and body fluids, including monitoring sticks, cotton swabs, ulcer dressings, (category 6) and waste from clinical/laboratory samples (category 3).[4]

Plastic Waste

Plastic waste is a separate type of special waste. Various plastics used in manufacture are classified into seven types by the Bureau of Indian Standards. These include both recyclable and nonrecyclable varieties.

Plastic is an important waste generated by diabetology. Plastic syringes, disposable pens, reusable pens, pen needles, glucometers, and other monitoring devices are all made of plastic. Medicine bottles and insulin syringes are made of polypropylene (PP). Disposable pens are also made of PP. Most disposable pens contain a cartridge made of type 1 (flint) glass, a plunger of bromobutyl, a stopper of bromobutyl/polyisoprene, and a glass ball to facilitate resuspension. Dimeticone or silicon emulsion may have been used to treat the cartridge plunger, and/or the glass cartridge.[5-6]

Table 1: Bio-medical waste produced in diabetology

	Disposable	Reusable
Diagnosis	Glucose monitoring strips Urine monitoring strips CGMS disposables Blood samples Urine samples Needles Lancets	Glucometers CGMS device
Treatment	Insulin vials/cartridges Insulin pen needles Disposable pens Insulin syringes Discarded/used tablets	Reusable pens Insulin pump devices
Management of complications	Foot ulcer dressings Cotton swabs Spirit swabs	

CGMS: Continuous glucose monitoring system

Re-cycling

According to Indian MSW (Management and Handling) Rules, 2000, treated biomedical wastes that are subjected to disinfection or autoclaving are considered to be devoid of any biological or microbiological organisms. They can, in effect, be disposed of as MSW.

The bulk of plastic used in diabetes care, therefore, can easily be shifted from bio-medical waste to plastic waste, provided it is disinfected properly. This will include all insulin syringes, plastic cartridges and pens. The plastic used in the manufacture of many disposable pens is biodegradable. However, the time frame for bio-degradation is quite long. Hence, disinfection, followed by recycling, is a better option. The same applies for glass waste, such as vials and cartridges, and stainless steel waste, like needles. These can also be disinfected and recycled as per norms of MSW disposal.

Such a practice will allow recycling, promote conservation and efficiency, and help in revenue generation for waste disposal sites. Strict safeguards to prevent the spread of infections among waste handlers and end-users must be put in place. It must be re-emphasized that recycling; which is an acceptable approach to plastic disposal, is completely different from re use, which is absolutely contraindicated. The Schedule I specifically mentions that "shredding and mutilation must be such that so as to prevent unauthorized reuse." Cutting the needle hub allows separation of most,

Table 2: Bio-medical waste disposal

Categories of biomedical waste (schedule I)	Examples relevant to diabetology	Color code	Type of container	Treatment and disposal
Human anatomical waste	Foot debridus	Yellow	Nonchlorinated plastic bag	Incineration
Animal waste	Animal tissues waste used in experiments	Yellow	Nonchlorinated plastic bag	Incineration
Microbiology waste and other laboratory waste	Wastes from clinical/ laboratory samples	Yellow	Nonchlorinated plastic bag	Disinfection at source (chemical/autoclaving). Final disposal in land fill/recyclable wastes through recycling
Waste sharps	Needles, glass syringes, lancets	White translucent	Puncture proof container	Disinfection (chemical) or destruction by needle and tip cutters, autoclaving/microwaving; followed by mutilation/shredding. Final disposal in secured land fill/concrete waste sharp pit
Discarded medicines and cytotoxic drugs	Outdated contaminated, discarded injectable and oral drugs	Yellow	Nonchlorinated plastic bag	Secured land fill/incineration
Solid waste	Ulcer dressings, cotton swabs, glucose monitoring sticks, urine monitoring sticks	Yellow	Nonchlorinated plastic bag	Incineration
Infectious solid waste	Gloves, intravenous bottles and tubing	Red	Nonchlorinated plastic bag	Disinfection (chemical) or autoclaving/ microwaving followed by mutilation/shedding final disposal through recycling
Chemical waste	Spirit, disinfectants	Blue	Nonchlorinated plastic bag	Chemical treatment, discharge into drains/ secured landfill

but not all, of the stainless steel component from the plastic component of syringes.

Plastic waste can be recycled, used for co-processing in cement plants, or blended with bitumen and used to construct roads. All these conventional technologies are more reliable than an unproven method such as plasma pyrolysis and liquid fuel generation. Incineration and land filling of plastic should be avoided.

Summary

Diabetes care professionals have a responsibility not only towards persons with diabetes, but also towards the community at large, and the environment. Modern diabetes care understands its social obligations and works to involve society, community and family in the management of the syndrome.

Our attitude toward the physical environment, however, is not so laudable. We exhibit a person-centric approach toward our environment, advocating for diabetes – friendly surroundings.[7] While we decry the role of chemical pollutants and physical obstacles in promoting disease, we neglect our own contribution to pollution of our environment. This responsibility has to be shared by all stake-holders from consumer to waste disposer to recycler [Table 3]. However, as health care professionals, it is our duty and responsibility to ensure that safe disposal takes place.[8,9]

Green Diabetology

Through this editorial, we support the call for a green diabetology movement,[9] which addresses safe and environment-friendly insulin disposal. We encourage adoption of simple practices that will facilitate optimal recycling and usage of insulin-related waste material while providing a source for revenue generation as well.

Table 3: Recommendations for optimal disposal of diabetes-related waste

At consumer level
Do not waste diabetes-related drugs and delivery devices
Dispose waste sharps in red bag/puncture proof container in hospital setting
Dispose discarded/used vials pens and glucose monitoring sticks in yellow bag in hospital setting
Dispose waste sharps in puncture proof container in hospital setting
Dispose all diabetes-related waste in dry refuse bag
At waste disposal unit level
Segregate glass, plastic and steel waste
Disinfect all medical-related waste
Shred and mutilate such waste to prevent reuse
Do not incinerate plastic waste or use it for land fill
At recycling unit level
Utilize glass and plastic waste for recycling

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