Review Article

Green insulin use — disposal of insulin related supplies

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A learned monk said — "Be wise in your actions today, so that you don't regret tomorrow"

This communication aims at creating awareness about disposal and recycling of waste that is generated in management of diabetes through Insulin Therapy. There is a growing urgency to not only earmark rules of medical waste disposal, but also develop & implement scientific practices to actively galvanize a nationwide movement for green use of insulin, which will prevent an adverse impact of diabetes waste on our environment.

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Key words **: Biodegradable, cost, diabetes, disposal, environment, Green, Insulin syringes, medical waste, pens, plastic, recycling.**

The Green Challenge :

At the very outset, we need to evaluate that whether at the cost of managing one health condition, we are contributing towards the generation of another environmental biohazard. Type 2DM is the modern epidemic emerging rapidly in the developing countries and India is presently leading the world with more than 70 million people with Diabetes with this number growing rapidly. The mainstays in treatment of Type 2DM are Oral Anti-diabetic Drugs (OAD's). To quantify the number, nearly 4 out of 10 patients in India use Insulin alone, or in combination with OAD's at any given point of time. Insulin therapy is an essential part of diabetes management, as all Type 1 and most Type 2 diabetes patients require insulin at some stage, due to the progressive nature of disease[1].

Insulin therapy requires multiple blood glucose readings on a daily basis and use of injections /pens /infusion devices with regular change of disposable components. These disposable components, like test strips, needles, lancets, tubes, infusion sets, cartridges, disposable pens, syringes, etc, lead to a substantial generation of waste[2]. Continuous Subcutaneous Insulin Infusion (CSII) through insulin pumps is considered the most optimal method to achieve near normal blood glucose levels in patients with Type 1 Diabetes. However, in order to avoid infusion site events or problems like skin rashes, tube occlusions, loosening of adhesives at taping sites, etc., CSII requires changing of infusion sets and tubing's every 2-3 days[2].

A review towards the fate of these disposable components after use shows that in India alone, millions of people living with diabetes consume about 160 million insulin syringes. Each syringe weighs 3.28 grams. Therefore, excluding the weight of the cannula, the net amount of plastic generated from disposed insulin syringes alone is a mind boggling 6,00,000 kg per year. To add to this, 9.6 crore vials, cartridges and prefills are consumed in a year, which add to the burden of glass and plastic on our environment[3].

Various types of plastics are used to manufacture these containers, which include both recyclable and non-recyclable varieties. Only some non-recyclable plastics are biodegradable and those that are biodegradable, have long gestational periods before decomposition. This all adds up to a huge pile of plastic that is already endangering the environment of our planet.

The Non-Green Impact :

Knowing about the cause and effect relationship, there are studies which talk about numerous endocrine disruptors being linked to the development of Type 2 Diabetes. Endocrine disruptors are also implicated in complications and diseases that relate to Type 2 Diabetes, including atherosclerosis and cardiovascular diseases. Endocrine disruptors are the chemicals found in metals, plastics, food contaminants etc. We cannot deny that number of people living with diabetes is increasing and so diabetes care related waste is bound to increase. While we are trying to treat or manage the people with diabetes with modern tools and devices simultaneously we are adding to the existing menace of environmental pollution. Thus the need of the hour is to pay attention to safe disposal, recycling and decomposition of the supplies used[4].

The Sharps Challenge :

There is also a growing concern about the disposal of insulin pen needles or "sharps". Sharps have been defined by World Health Organization (WHO) as "items that could cause cuts or puncture wounds, including needles, hypodermic needles, scalpel and other blades, knives, infusion sets, saws, broken glass and nails"[5]. A study conducted in New Delhi found that 84.1% diabetes patients discarded sharps directly into their household waste bins. Out of these 71% patients disposed at least 7-needles/ week, while 89% patients disposed at least 7 lancets/ week. With astounding figures like these in a metropolitan city like New Delhi,

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it is safe to assume that the prevalence of improper sharp waste disposal in most parts of the country is very high[2].

The Sharps Impact :

In India alone about 50 million pen needles are used and discarded annually. Incorrect sharp disposal practices by diabetes patients & caregivers leads to needle-stick injuries (NSIs) among them and also to domestic waste handlers, rag pickers and other members of the community. NSI's can lead to epidemics of blood borne infections such as HIV/ AIDS, Hepatitis B & Hepatitis C[6].

Disposal of Continuous Subcutaneous insulin Infusion (CSII) sets presents another challenge. According to manufacturers, all discarded infusion sets should be incinerated after use. In this process a significant part of the energy content of plastics is recovered, but the plastics are not recycled. The proportion of metallic content of the products is almost negligible. So no large-scale recovery of metals from the incinerated residue is possible. Thus, the component recycling of infusion sets is effectively 0%, representing a high input consumption rate, which in turn will put a load on the limited environmental resources[2].

The Green Solution :

One of the important wastes generated during management of Diabetes is Plastic. Disposable syringes, disposable pens, reusable pens, glucometers, and other monitoring devices are mostly made of plastic. Disinfection or autoclaving treatment of biomedical wastes makes them devoid of any biological or microbiological organisms. These plastics can then be disposed off as MSW, post autoclaving, in accordance to the Indian MSW (Management & Handling) Rules 2000. Thus if disinfected properly, bulk of plastics used in diabetes care like plastic syringes, disposable pens, reusable pens, pen needles can be easily shifted from biomedical waste to plastic waste. This practice will allow recycling, promote conservation and efficiency and help in revenue generation of waste disposal sites[3].

The role of Diabetes Educators & health care professionals is crucial in generating greater awareness amongst diabetes patients about methods of medical waste disposal that need to be adopted when diabetes care is being administered at home, or at a personal level. While this is a persuasive methodology, it can be given more effectiveness, if the Govt. introduces a Law concerning medical waste disposal techniques, which covers domestic households and not just medical establishments. This two-pronged strategy of educating and enforcing medical waste management/ disposal methods on the population at large will help control the health & environmental hazards of improper waste management. At an institutional level, medical establishments administering diabetes care can educate and advocate the single use of pen needles to reduce the risk of NSI's.

Though pharmaceutical companies manufacturing insulin therapy equipment are now developing biodegradable plastics or recyclable plastic dispensing components, efforts need to be made to use products with shorter time cycles of biodegradability. Either that, or the plastics used need to be 100% recyclable. There needs to be a concerted effort made towards researching & developing path breaking methods of administering insulin, without using the current technology which leaves behind a heavy burden of medical waste.

References

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