



Health care professional training in biomedical waste management at a tertiary care hospital in India

Dear Editor:

Biomedical waste is any waste generated during the diagnosis, treatment or immunization of human beings or animals, in research activities pertaining to or in the production of or testing of biologicals, and all other categories waste generated by healthcare activities. It includes a broad range of materials from used needles and syringes, soiled dressings, body parts, diagnostic samples, blood, chemicals, pharmaceuticals, medical devices, and radioactive materials and carries a higher potential for infection and injury than any other type of waste. Therefore, it should be properly managed to protect the general public, healthcare and sanitation workers who are regularly exposed to biomedical waste as an occupational hazard^[1].

Hospital waste management has been brought into focus in India, particularly with the notification of the Biomedical Waste (Management and Handling) Rules, 1998, which make it mandatory for healthcare establishments to segregate, disinfect and dispose of their waste in an eco-friendly manner^[2]. The legal provisions (*Biomedical Waste Management and Handling Rules 1998, amended 2003 and drafted 2011*)^[3] are aimed at mitigating the impact of hazardous and infectious hospital waste on the community. These Rules are applicable to all persons who generate, collect, receive, store, transport, dispose or handle bio-medical waste. Color coding for containers or bags used for various categories of waste collection, including the waste disposal options, has been specified. Under the new draft rules, the categories of biomedical waste have been reduced from 10 to 8, e.g., human anatomical waste, animal waste, other laboratory waste, waste sharps, discarded medicines and cytotoxic drugs, infectious solid waste and chemical waste, and soiled waste^[3]. Biomedical waste management has been entrusted with waste

segregation, at the source of generation, into labelled color-coded containers/bags that have been pre-assigned for the eight defined categories. Attitude and understanding of the issues are important determinants of proper waste triage at the source.

Nurses, sanitary and hospital attendants, and clinicians spend maximum time with patients, increasing their exposure and risk of the hazards present in a hospital environment, mainly biomedical waste. They need to be well-equipped with the latest information, skills and practices for managing this waste to reduce hospital-acquired infections, and to protect their own health. They are also responsible for preventing risk, due to waste, to the community at large^[2]. Inadequate and inappropriate knowledge of the handling of healthcare waste may have serious health consequences and a significant impact on the environment as well. Of the total amount of waste generated by healthcare activities, about 80% is general waste. The remaining 20% is considered hazardous material that may be infectious, toxic or radioactive. If this waste is mixed with the general waste, it will all become bio-hazardous (WHO, 2011). In developed countries, approximately 1–5 kg of waste is generated per bed per day^[4]; in India, it is estimated to be 2.0 kg/bed/day^[5]. The quantity may vary depending upon the specialty of the source health set-up, its hierarchical position, and service utilization patterns.

The Post Graduate Institute of Medical Education and Research (PGIMER) is a tertiary hospital with referrals from Northern India. It has 1,740 beds, generating 2 kg/bed/day. There are 700 sanitary attendants and nearly 900 hospital attendants on contract with the hospital. We conducted the current study with the objective of educating the hospital staff about biomedical waste management and to assess the awareness by nurses and

healthcare workers of biomedical waste management through questionnaires and their knowledge was re-evaluated after a training session.

The questionnaire for the sanitary and hospital attendants had 30 questions. The nursing staff were given 40 questions related to their knowledge about the source of biomedical waste, laws pertaining to the waste, waste identification symbols, knowledge about the disposal of the waste in a properly colored bag, various disposal methods, and various waste categories. The training sessions, in the form of presentations and discussions, consisted of elaboration on the rules and regulations, demonstrations of waste segregation, disinfection methods for various categories of waste, and interactive methods.

Totally 171 subjects completed the questionnaire, including 47 nurses, 76 hospital attendants and 48 sanitary attendants. There was a significant increase in awareness about the source of biomedical waste in the hospital set-up after training ($P < 0.001$) (**Fig. 1A**).

The respondents' awareness of different biowaste symbols was also markedly improved with training ($P < 0.001$) (**Fig. 1B**). Awareness about the disposal of biomedical waste in properly color-coded bins significantly increased by the training sessions ($P < 0.001$) (**Fig. 1C**). Furthermore, the response was similar in terms of the awareness of the final disposal of the biomedical waste categories (**Fig. 1D**). There was a significant increase in the awareness of biomedical waste disposal methods ($P < 0.001$) (**Fig. 1E**).

Our study showed that knowledge about sources of biomedical waste management rules among the technically qualified personnel (nurses) was high, but low among the hospital attendants and the sanitary staff, which is consistent with findings reported by other studies^[7,8]. Similarly, knowledge about color coding of containers, waste segregation and waste disposal, which are the most important and crucial elements for waste management, was also found to be better among the nurses as compared to that of the

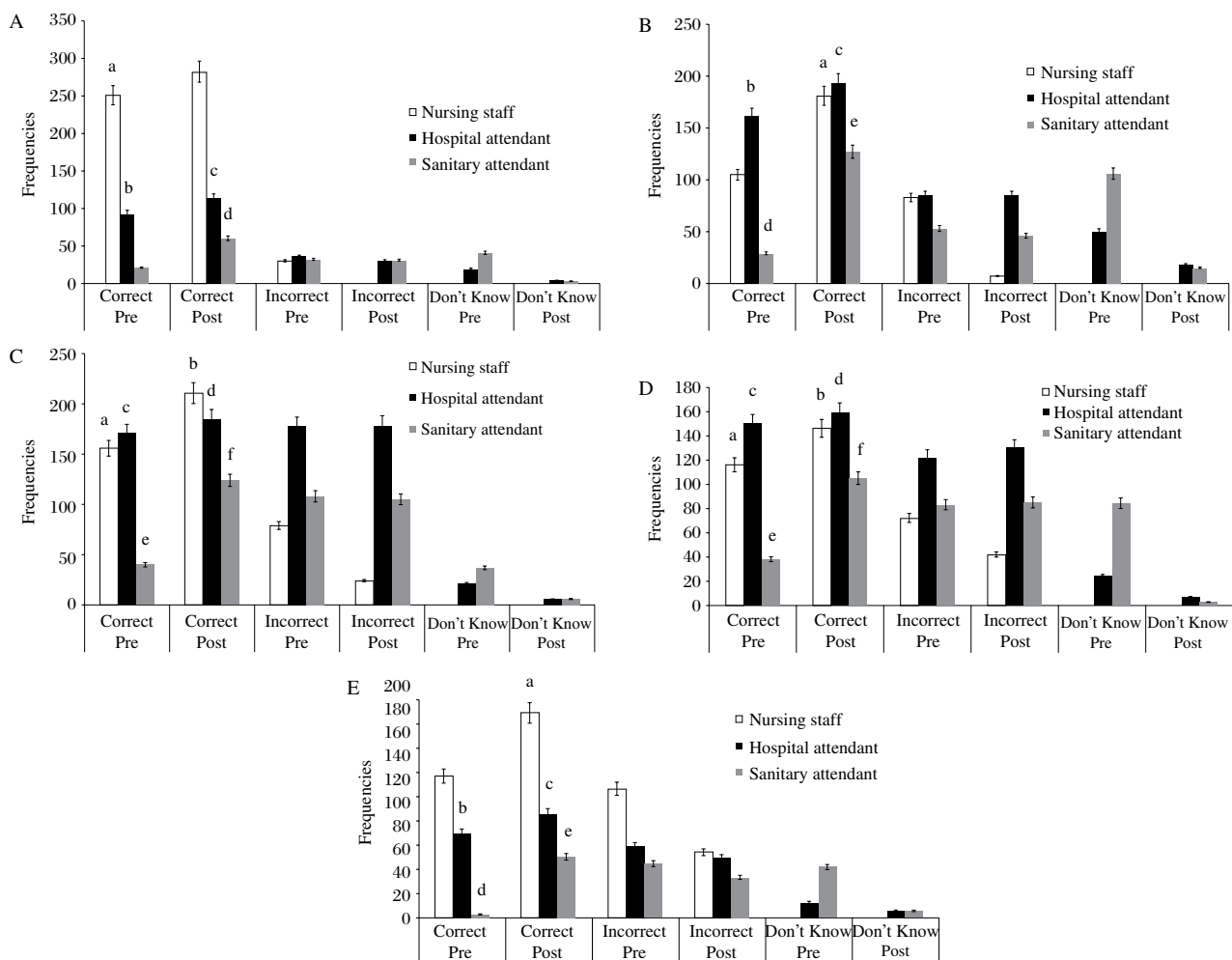


Fig. 1 Outcome of the questionnaires on biomedical waste. A: Knowledge about the source of the biomedical waste. B: Knowledge about the symbols of the biomedical waste. C: Knowledge about the disposal of biomedical waste in proper color baggage. D: Knowledge about the final disposal of different categories of biomedical waste. E: Knowledge about the methods of the disposal.

hospital attendants and sanitary staff. Training, however, resulted in tremendous improvement in biowaste management knowledge of the hospital and sanitary attendants. A similar study conducted by Mathur *et al.* showed that training of the staff impacted on waste management^[9].

Medical waste poses a significant impact on health and the environment in a developing country like India. However, this study found that though the management of biomedical waste can be done at an appreciable level still, there is an urgent need for raising awareness of and educating staff on medical waste issues. Training of both the technical staff and the nontechnical staff is critical for the proper and appropriate management of biomedical waste. Nursing professionals had an edge over the other staff regarding awareness of waste management. The regular training of non-technical staff should be strengthened to ensure proper disposal of biomedical waste.

Yours Sincerely,

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