

主論文の要旨

**Evaluation of Knowledge, Practices, and Possible
Barriers among Healthcare Providers regarding
Medical Waste Management in Dhaka, Bangladesh**

（ バングラデシュのダッカでの医療用廃棄物に関する
知識、習慣、想定される障害についての医療提供者による評価 ）

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Background

The wastes generated during the process of diagnosis, treatment, operation, immunization, or medical research, are termed as medical wastes. It is an ongoing problem for many countries and poses a serious public health problem. Approximately 75-95% of bio-medical wastes are non-hazardous and the remaining 10-25% are hazardous to human or animals and detrimental to environment. It is very important to realize that if both of these types are mixed together, then the whole wastes become harmful. There are approximately 1,300 government hospitals with 43,000 beds including public specialized hospitals, medical college hospitals, district hospitals, and upazila health complexes in Bangladesh. In addition, a large number of private hospitals and clinics are also providing healthcare. Most of the health facilities do not have adequate and effective systemic approaches to medical wastes disposal. The medical wastes are simply mixed with the municipal wastes in the collecting bins at road side and some percentage are buried without any measure or burn out under open sky. The Ministry of Health and Family Welfare, Bangladesh, started to address the medical waste management (MWM) as one of the priority program. Healthcare providers (HCPs) has been brought under extensive MWM-related training program, logistics including different colored bins were supplied among the healthcare institutes; however, the scenario is not yet satisfactory.

Very few studies had reported on different isolated components of MWM in Bangladesh. Moreover, WHO recommended raising the awareness of risk regarding medical wastes and its safe and sound practice to improve the situation. Therefore, it was necessary to conduct this study with the objective of assessing knowledge, practices, and to identify possible barriers about MWM among HCPs. The associations of knowledge and practices with background characteristics were also evaluated.

Methods and Materials

This cross-sectional study was conducted from June to September, 2012 among different level hospitals in Dhaka division, Bangladesh. A 2-stage cluster sampling method was used to select different levels of hospitals. One tertiary level hospital was selected purposively from Dhaka city. In the first stage, 3 out of 17 district (secondary level) hospitals were selected using a simple random sampling (SRS) method. In the second stage, we also selected 3 upazila (primary level) hospitals, 1 from each of the above-mentioned districts, by applying the SRS.

Medical officers, including post-graduate medical students, nurses, technologists, and cleaning staff related to MWM, were recruited from enrolled hospitals. We recruited 625 HCPs, including 245 medical doctors, 220 nurses, 44 technologists, and 116 cleaning staff. A self-administered, semi-structured questionnaire was adapted from other studies with little modification to fit the situation in Bangladesh.

Chi-square test was used to compare the categorical data, including age and duration of working among groups. Knowledge scores and practice scores were calculated by giving "1" for

a correct answer and “0” for an incorrect answer to each item. Mean (\pm standard deviation, SD) scores were computed for knowledge and practices for all groups of HCPs. Inadequate knowledge and poor practice were defined as correctly answering less than 60% of knowledge (scoring less than 8 out of 12 points) and practice items (scoring less than 5 out of 8 points), respectively. A bivariate logistic regression model was used to estimate odds ratios (ORs) of having inadequate knowledge and poor practices regarding MWM. All tests were 2-sided, and statistical significance was considered at $P < 0.05$. The study was approved by the ethical review committee of the National Institute of Preventive and Social Medicine, Dhaka, Bangladesh.

Results

Most of the respondents were female (61.4%). Males were more common among doctors and technologists, whereas females were more common among nurses and cleaning staff. Mean (\pm SD) age of the respondents was 32.3 (\pm 8.0) years (Table 1).

The mean knowledge score (\pm SD) of the respondents was 7.70 (\pm 1.94). Medical doctors had the highest mean knowledge score (8.22; SD \pm 1.70), whereas cleaning staff had the lowest (6.14; SD \pm 1.82) ($P < 0.001$). At least one-third of medical doctors and nurses, and nearly two-thirds of technologists and cleaning staff had inadequate knowledge. Mean (\pm SD) practice score of HCPs was 4.71 (\pm 1.64). Nurses had the highest practice mean score of 5.29 (\pm 1.31) and cleaning staff had the lowest (4.18; SD \pm 1.54). Nearly half of the medical doctors (44.0%) and more than half of the cleaning staff (56.0%) had poor practices. With regards to knowledge, the lowest percentage of correct answer for cleaning staff (9.5%) was with the item of treatment before disposal, whereas the lowest percentage of correct practice in all 4 groups was with the item of bending/crushing/burning the used needles (Tables 2 and 3).

Males, older people (30 years and above), technologists, cleaning staff, and district hospitals were more likely to have inadequate knowledge compared to females, younger age, medical doctors, and tertiary hospitals, respectively after being mutually adjusted for potential confounders. Moreover, nurses (adjusted OR, 0.40; $P < 0.001$) were less likely to have poor practices than to medical doctors. The respondents who did not receive training (adjusted OR, 2.43; $P < 0.001$) were more likely to have poor practices (Table 4).

Lack of personal protective equipment, equipment for final disposal, MWM-related staff, proper policy/guideline, and lack of incinerator were identified as the top 5 barriers (Table 5).

Discussion

To our knowledge, this is the first study to assess the knowledge, practices, and possible barriers regarding MWM among HCPs in Bangladesh. Inadequate knowledge was observed more among technologists and cleaning staff than medical doctors and nurses, which is congruent with past studies. This inadequate knowledge could be due to low level of general education and, in particular, the basic understanding regarding MWM. Poor practice was also

observed among cleaning staff, which is in line with a previous study. Deficient practice among cleaning staff might be due to work load, shortage of cleaning staff relative to patients, lack of necessary equipment, and lack of strict supervision and training. Since medical wastes are usually mixed with municipal general wastes and are dumped together on vacant land in Bangladesh, the HCPs are sometimes reluctant to properly sort waste. Even with adequate knowledge, HCPs may underestimate the importance of safe waste handling. Moreover, the possible reasons for better practices among nurses could be due to the maximum time spent in the clinical ward and closely handling the patients; therefore, risk of acquiring infection was greater than for other staff.

The top 5 barriers identified by HCPs were insufficient personal protective equipment (PPE), lack of instruments for final disposal, lack of staff, lack of appropriate guidelines, and lack of incinerators. However, the rank of barriers varied according to profession. Insufficient PPE was identified as the most serious barrier by HCPs except technologists, who identified lack of instruments for final disposal. This could be due to insufficient supply of PPE in the hospital relative to patient turnover, ignorance of this issue, improper hospital management by local administration, and insufficient monitoring and evaluation of the logistics related to MWM by central administration.

Conclusions

Inadequate knowledge and poor practices were more prevalent among technologists and cleaning staff than medical doctors and nurses. Insufficient PPE, lack of instruments for final disposal, lack of staff, lack of appropriate guidelines, and lack of incinerators were identified as the top 5 possible barriers.