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Original Research Article

Assessment of knowledge and practices of biomedical waste management and infection control among health assistants in a rural block of Nadia district, West Bengal

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ABSTRACT

Background: Improper biomedical waste management, inadequate precautions to prevent needle stick injuries and air-borne infections among health care workers can lead to several hazards not only to them, but community can also be in danger due to environmental pollutions or risk of transmission of diseases. Sub-centres are the peripheral most points to deliver health services and health assistants posted there are in a unique position to get infected frequently if they are not adhering to standard protocols to manage these problems. The current study aimed to assess the status of infrastructure of sub-centres, knowledge and practices of the health assistants related to biomedical waste management and infection control.
Methods: A cross-sectional study had been conducted in 40 sub-centres of Chakdaha block, Kalyani subdivision, Nadia district, West Bengal, selected purposively. All the health assistants were interviewed after taking informed consent with a pretested predesigned semi-structured questionnaire. An observational checklist had been used to assess infrastructure of the sub-centres and also some practices of the health assistants.
Results: More than half of the study population (61.6% and 63%) secured poor score regarding knowledge and practices related to biomedical waste management and infection control respectively. There was no relationship between knowledge and practices of the same (p=0.187).
Conclusions: Pre-service and also frequent in-service training should be conducted to improve the knowledge and practices of the health assistants. Regular monitoring, supervision of their day to day work by the higher authority, can improve their attitude and practices related to such an important public health issue.

Keywords: Knowledge, Practice, Biomedical waste, Infection control, Heath assistant, Rural block

INTRODUCTION

Biomedical waste refers to any solid or liquid waste generated during diagnosis, treatment or immunization of human beings and animals or during research that may present a threat of infections to human beings.[1] While most of this (80%) is communal waste, a significant percentage (20%) can be deemed infectious and hazardous. These include infected sharps and wastes with infectious, hazardous, radioactive or genotoxic characteristics, which if inadequately treated and managed can have adverse impact on the environment and on public health through air, land and water pollution.[2,3] During providing services to beneficiaries, hospitals or different health care delivery points generate some infectious wastes. Effective waste management

system in all health-care facilities is a key prerequisite to improve efficiency and effectiveness of health care.

In order to streamline the waste collection, segregation, processing and disposal practices, the Government of India notified rules known as the Biomedical Waste (Management and Handling) Rules, 1998 which has been further revised on March 28, 2016 for management of biomedical wastes in an environmentally sound manner.[4]

Healthcare workers are at a greater risk of needle stick injuries that can transmit infectious diseases, especially blood-borne viruses- HIV, Hepatitis B, Hepatitis C and other diseases like tetanus.[5,6,7] WHO estimated that globally around 2.6%, 5.9% and 0.5% of health-care workers (HCW) were exposed to blood-borne pathogens like HCV, HBV and HIV respectively.[8]

Airborne infections like common cold, tuberculosis, influenza, measles, mumps etc. are quite prevalent among health care workers due to their occupational exposures and inadequate compliance to infection prevention guidelines.[9]Strict adherence to infection prevention protocol is critical to avoid spread of infection among hospitalized patients and fundamental of quality of care.

Sub-centres are the most peripheral and the first contact health care delivery point between health system in India and the community. To provide quality health care services strict compliance to biomedical waste management rule, universal precaution and airborne infection prevention guideline is of utmost importance as a healthy workforce and healthy practices at health care delivery point can curtail several serious environmental and health hazards to community. Adequate knowledge can promote proper practices with availability of appropriate logistics. With this background, the present study had been taken up to assess infrastructure of the sub-centres, knowledge and practices of health assistants related to biomedical waste management and infection control in a rural block of Nadia district of West Bengal.

METHODS

An observational cross-sectional study had been conducted in Chakdaha block of Kalyani subdivision, Nadia district, West Bengal from February 2019-June 2019. The block had been selected purposively considering feasibility of work. All the 40 sub-centres and all the health assistants posted in those sub-centres (1st ANM, 2nd ANM and health assistant male) were included in the study by complete enumeration method after taking informed consent. Health assistants who were absent on the day of survey were excluded from the study. Institutional ethical clearance had been obtained from institutional ethics committee.

The study tool was a predesigned pretested semi-structured questionnaire and an observational checklist to get information on some general characteristics of the health assistants, infrastructure of the sub-centres, knowledge and practices of the heath assistants related to biomedical waste management, prevention and precaution of needle stick injuries and airborne infection control. The questionnaire was first prepared in English. Then it was translated into Bengali by a linguistic expert keeping semantic equivalence. To check the translation, it was re-translated into English by two independent researchers who were unaware of the first English version. Face validity of each item had been checked from previous researches in the presence of public health experts. They also decided the content validity of each domain. Reliability was checked by test-retest method (r=0.9). Pretesting followed by pilot testing was conducted. Necessary corrections and modifications of the questionnaire were done accordingly. One to one interview had been conducted with the final corrected schedule.

Data thus collected had been entered in MS Excel and analysed subsequently in SPSS 20.0 version. Each item to assess knowledge and practice had been scored. The total attainable knowledge and practice score were 10 and 20 respectively. Then for analytical purpose the scores had been categorized into good score (>median value) and poor score (≤median value). Association between dependent and independent variable was checked through inferential statistics. All analyses were two tailed with $p \leq 0.05$ considered statistically significant.

RESULTS

The study population consisted of 1st ANM (49.3%), 2nd ANM (46.6%) and health assistant male (4.1%). Majority of the study population belonged to the age group of 40-50 years (37%) with the mean age of 44.18 (7.691) years. Most of them were Hindu (93.2%) and belonged to general caste (65.8%). Regarding educational qualification, majority (39.7%) were graduate. Most of them (95.9%) had a work experience of >5 years with a mean of 16.9 (10.78) years. Only 12.3% of the health assistants had received training on bio-medical waste management while majority (77.78%) received the last training within last 5 years and only 15.1% of the health assistants were vaccinated with Hepatitis B vaccine (Table 1).

Regarding infrastructure, majority (65%) of the sub-centres had own functional building but 55% did not have a toilet with running water supply and 77% were found to have unclean/ dirty toilets. Majority of them had electric supply (95%), at least two available rooms (67.5%); while cross ventilation in working room was found in 87.5% of sub-centres. Hand-washing basin with running water was found in 55% of sub-centres, but only 7.5% of them had clean towels; though in each of the sub-centres new gloves were available. Majority (95%) of them had hub cutter with needle destroyer. Puncture proof container was found in only 55% of the sub-centres.

Though in each white bin was available, only 15% of them had red bins and majority (85% and 87.5%) of them had blue and black bin respectively. Only 7.5% cases Gram Panchayat was involved in bio-medical waste management (Table 2).

Table 1: Distribution of health assistants according to general characteristics (n=73).

Characteristics	Frequency (n)	%
Designation		
1st ANM	36	49.3
2nd ANM	34	46.6
Health assistant (male)	3	4.1
Age (in completed years)		
30-40	26	35.6
40-50	27	37
50-60	20	27.4
Mean (SD)	44.18 (7.691)	
Minimum	30	
Maximum	60	
Religion		
Hindu	68	93.2
Muslim	5	6.8
Caste		
General	48	65.8
SC	18	24.7
ST	1	1.4
OBC	6	8.2
Educational qualification		
Secondary	18	24.7
Higher secondary	18	24.7
Graduate	29	39.7
Post graduate	8	11.0
Years of work experience		
<5	3	4.1
5-10	30	41.1
10-15	10	13.7
>15	30	41.1
Mean (SD)	16.9 (10.78)	
Minimum	3	
Maximum	40	
Training in BMW management		
Yes	9	12.3
No	64	87.7
Last training received (years ago) [n=9]		
≤5	7	77.78
6-10	1	11.11
>10	1	11.11
Vaccinated with Hepatitis B vaccine		
Yes	11	15.1
No	62	84.9

Table 2: Distribution of sub centres according to infrastructure related to BMW management and infection control (n=40).

Infrastructure (General)	Frequency (n)	%
Government building (functional)		
Available	26	65.0
Not available	14	35.0
Toilets with running water supply		
Available	18	45
Not available	22	55
Cleanliness of toilet		
Satisfactory	12	30.0
Unsatisfactory	28	70.0
Electricity supply		
Available	38	95.0
Not available	2	5.0
At least two room		
Available	27	67.5
Not available	13	32.5
Cross Ventilation of the working room		
Available	35	87.5
Not available	5	12.5
Hand-washing basin with running water		
Available	22	55.0
Not available	18	45.0
Liquid soap		
Available	38	95.0
Not available	2	5.0
Clean towel		
Available	3	7.5
Not available	37	92.5
New gloves		
Available	40	100.0
Infrastructure (related specifically to BMW management)		
Hub cutter with needle destroyer		
Available	38	95.0
Not available	2	5.0
Puncture proof container		
Available	22	55.0
Not available	18	45.0
Red bin		
Available	6	15.0
Not available	34	85.0
White bin		
Available	40	100.0
Blue bin		
Available	34	85.0
Not available	6	15.0
Black bin		
Available	35	87.5
Not available	5	12.5
Biomedical waste managed by		
Panchayat	3	7.5
Others	37	92.5

More than half of the study population (57.5%) had knowledge that personal protective equipment can protect against needle stick injury while those who had this knowledge, everyone (100%) knew the name of that personal protective equipment (gloves). Only 15.1% of the health assistants had knowledge that immediately after needle stick injury hands should be washed with soap and a band-aid should be used after that; while 13.7% knew that post exposure prophylaxis after needle stick injury is found in district hospital. Majority (98.6%) knew that diseases can be caused by transmission from person to person through air of which 76.39% and 51.38% said that tuberculosis and common cold respectively can be caused by this way. Most of them (68.5%) heard about personal protective equipment (mask) to protect against air borne diseases. Only 42.5% and 5.5% of them knew that segregation is the first step and there are 4 colour coded bags for bio-medical waste management respectively; whereas only 20.5% and 16.4% of them knew correctly that sharps should be discarded in white bag and the container collecting biomedical wastes should be changed or emptied after it is 2/4th full (Table 3).

Regarding practice related to bio-medical waste management and infection control, none of the health assistants wore apron during their work. Majority (64.4%) of them sometimes used to wear mask when suffering from respiratory disease but 82.2% did not wear gloves at all during work. Though majority (65.8%) of them never practiced removal of accessories like watches, ring etc. during patient contact, but 75.3% practiced hand washing with soap before and after patient contact. Less than half of the study population (49.3%) always practiced recapping of needle after use, whereas majority (71.2%, 57.5% and 57.5%) never used gloves during handling of bio-medical waste, never segregated bio-medical waste at source and never discarded used up medicine and vaccine vials and ampoules in blue coloured bag respectively. Most of them (91.8%) used to change or empty the container of bio-medical waste after 2 days with mean of 16.1 (9.54) days (Table 4).

Regarding knowledge and practice scores of health assistants, majority (61.6%) scored poor regarding knowledge with a mean of 4.19 (1.43) and 63% scored poor regarding practice with a mean of 6.88 (1.992). The health assistants who had good knowledge score among them 46.4% had good practice score and 53.6% had poor practice score, while among those who had poor knowledge score, 31.1% had good practice score and 68.9% had poor practice score. But this difference was not found to be statistically significant ($p>0.05$) demonstrating the fact that there was no relationship between knowledge and practices of the health assistants (Table 5).

Table 3: Distribution of study population according to knowledge regarding BMW management and infection control (n=73).

Knowledge	Frequency (n)	%
Does needle stick injury have any effect to your health?		
Yes	61	83.6
No	10	13.6
Don't know	2	2.7
What are the diseases that can occur due to needle stick injury? (n=61)*		
HIV or AIDS	58	95.08
Hepatitis B	35	57.38
Hepatitis C	3	4.91
Tetanus	7	11.48
Have you heard of any personal protective equipment for protection of needle stick injury?		
Yes	42	57.5
No	30	41.1
Don't know	1	1.4
Name the personal protective equipment for protection of needle stick injury. (n=42)		
Gloves	42	100.0
Immediately after accidental needle stick injury what should be done?		
Wash hand with soap and use a Band-Aid	11	15.1
Wash hand with soap	27	37.0
Wash hand with water only	1	1.4
Wash hand with water and use a band aid	1	1.4
Use a band aid without washing hand	11	15.1
Do not know	22	30.1
Do you know where to go to get the post exposure prophylaxis (PEP) for needle stick injury?		
BPHC	61	83.6

Continued.

Knowledge	Frequency (n)	%
BPHC and District Hospital	2	2.7
District Hospital	10	13.7
Have you heard about any disease which is transmitted from person to person through air?		
Yes	72	98.6
Do not know	1	1.4
Which diseases can be transmitted by this route? (n=72)*		
Tuberculosis	55	76.39
Common cold	37	51.38
Pneumonia	2	2.78
Measles	5	6.94
Influenza	20	27.78
Diphtheria	5	6.94
Rubella	4	5.56
Chicken pox	2	2.78
Leprosy	2	2.78
Have you heard any personal protective equipment to prevent transmission of air-borne diseases?		
Yes	50	68.5
No	22	30.1
Do not know	1	1.4
Name the equipment to prevent air transmission (n=50)		
Mask	50	100.0
Which is the first step of biomedical waste management?		
Segregation	31	42.5
How many colour bags are used for this purpose?		
1	1	1.4
2	23	31.5
3	45	61.6
4	4	5.5
In which colour bag sharp waste should be discarded?		
White	15	20.5
Black	2	2.7
Red	6	8.2
Blue	43	58.9
Yellow	7	9.6
When the container for collecting the sharp waste should be changed or emptied?		
1/4 full	20	27.4
2/4 full	12	16.4
3/4 full	39	53.4
Do not know	2	2.7

*: Multiple responses.

Table 4: Distribution of study population according to practice regarding BMW management and infection control (n=73).

Practice	Frequency (n)	%
Do you wear apron at Sub-centre?		
Never	73	100.0
Do you wear mask when you are suffering from respiratory disease while patient contact?		
Always	17	23.3
Sometimes	47	64.4
Never	9	12.3
Do you wear gloves during vaccination?		
Always	3	4.1
Sometimes	10	13.7
Never	60	82.2

Continued.

Practice	Frequency (n)	%
Do you remove accessories like watches, ring and bracelet before patient contact?		
Always	7	9.6
Sometimes	18	24.7
Never	48	65.8
Do you practice hand washing with soap before and after each patient contact?		
Always	55	75.3
Sometimes	17	23.3
Never	1	1.4
Do you recap the needle after use?		
Always	36	49.3
Sometimes	8	11.0
Never	29	39.7
Do you wear gloves during handling of Bio-medical waste?		
Always	10	13.7
Sometimes	11	15.1
Never	52	71.2
Do you segregate Bio-medical waste management at source?		
Always	30	41.1
Sometimes	1	1.4
Never	42	57.5
Do you put used up medicine vial and ampoule in blue colour bag?		
Always	21	28.8
Sometimes	10	13.7
Never	42	57.5
When do you change each container that is used for Bio-medical waste management?		
1 day	6	8.2
2 day	0	0.0
>2 day	67	91.8
Mean (SD)	16.1(9.54)	
Minimum	1	
Maximum	120	

Table 5: Relationship of knowledge and practice score of the study population: (n=73)

Knowledge	Good Practice	Poor practice	Test of significance
	N (%)	N (%)	
Good	13 (46.4)	15 (53.6)	Chi-square=1.738, df=1, p=0.187
Poor	14 (31.1)	31 (68.9)	

DISCUSSION

The current study revealed that majority of the health assistants had poor knowledge and practice related to biomedical waste management and infection control. There was no relationship of knowledge and practice depicting that despite of having knowledge on a particular matter, they were not practicing it either due to reluctancy, lack of motivation or inadequacy of logistic support. A study by Ranjini et al demonstrated that majority (78%)of health workers had good knowledge on biomedical waste management while another study conducted in Kerala depicted that overall knowledge was found to be satisfactory regarding infection control practices among 29% of the workers of designated microscopy centres.[10,11] In consistency with the present study findings Kumar et al demonstrated that only 25% of the nurses in eight hospitals in Tamil Nadu had good knowledge score regarding biomedical waste management.[12]

The present study depicted that majority (83.6%) knew that needle stick injury has effects to health; while 95.08%, 57.38% and 4.91% of them said that needle stick injury causes HIV or AIDS, Hepatitis B and Hepatitis-C respectively. A study in Egypt by Eldein et al demonstrated that majority (79.3%) of health care workers had knowledge about blood borne infections like Hepatitis-B, Hepatitis-C and AIDS.[13] They also reported that 57.3% and 69.5% of health care workers had proper knowledge regarding sharps waste disposal and use of four colour coded bags for biomedical waste management

respectively, whereas the present study showed that only 20.5% and 5.5% of health assistants were aware of the above facts. The study in Kerala showed that 87%, 76% and 42% of the workers knew about proper disposal of sharps, personal protective equipment (gloves) to prevent needle stick injury and waste segregation at source while only 57.5% and 42.5% of health assistants of this study knew about importance of gloves for personal protection and about waste segregation respectively.[11] Singh et al while reported that 69.48% of dental students knew that tuberculosis can be caused by transmission from person to person through air, while 76.39% health assistants of the current study knew the same.[14] Muralidhar et al reported that only 40% of HCWs knew about the availability of PEP services in the hospital and Chacko and Isaac found it to be 31.6%, but the present study found that only 16.4% of health assistants knew it.[15,16]

A situational analysis in selected small health care facilities in Bangalore, India revealed that segregation of biomedical waste was present in 62.9% of cases; while in present study only 42.5% of the health assistants practiced segregation at source.[17] A study in Gujrat by Pandit et al reported that recapping of needles was practiced by only 17% of health care providers; while in this study 49.3% of the health assistants always practiced it and Muralidhar et al also found the practice of recapping of needles after use was prevalent among HCWs (66.3%).[15,18] Lee et al in South Korea found that only (9.52%) of the health assistants had taken the vaccination for Hepatitis B, while in current study it was 15.1%.[19] Muralidhar et al also demonstrated that 74% of HCWs were wearing gloves at the time of NSI (needle stick injury), Aslesh et al found the figure to be 61%, Askarian et al in Iran showed it as high as 96.2 %; but all of the above results were not consistent with the present study result which depicted that only 17.8% of the health assistants used to wear gloves during work.[11,15,20]

Though an observational checklist had been used to assess practices, most of the times the assessment was actually based on stated practice which was fully dependent on verbal responses of the health assistants who might had been wilfully falsified their practices. Due to time and manpower constraints the present study had been conducted in only one block selected purposively. Researches should be conducted to explore the status of health assistants in other blocks with application of proper sampling methods in future.

CONCLUSION

The present study revealed that overall knowledge and practices regarding biomedical waste management and infection control were not satisfactory for more than half of the health assistants. It also demonstrated that there was no relationship between knowledge and practice regarding the same enlightening the fact that even those who had good knowledge did not practice that in day to day work. This unfortunate gap sometimes was due to inadequate logistics; while lack of proper attitude of the health assistants, infrequent monitoring and supervision from higher authority might be the other possible causes.

With the fact that sub-centres are the most peripheral part of Indian health care delivery system and the first contact point between the patients and health system, the health care assistants are in a unique position to get infected and also to infect others with hazardous wastes, to be exposed to infections from the patients coming to them to get health care; if they do not know or practice the standard guideline for biomedical waste management, needle stick injury prevention and air-born infection control. Therefore, pre-service and refresher courses at regular interval should be undertaken by the respective higher authority regarding the topic; while to curtail the gap between knowledge and practice regular supply of necessary logistics, strict monitoring and supervision are to be done to ensure compliance with hand hygiene, sharps handling, wearing gloves and other related practices.

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