

## A Study on Knowledge and Practice Regarding Precautionary Measures in Biomedical Waste Management among the Health Care Workers of Health Facilities of Rural Ghaziabad

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### ABSTRACT:

**Introduction:** The advances in healthcare activities have resulted in generation of excessive amount of Biomedical waste. Improper waste management has a negative impact on the health of medical professionals, sanitary staff, general public and the environment in general.

**Objectives:** To assess the Knowledge and Practice regarding biomedical waste management (BMWM) among healthcare workers (HCW) of government health facilities of rural Ghaziabad.

**Methodology:** A cross-sectional study was conducted to assess the knowledge and practices regarding Bio-Medical waste, in rural blocks of the district Ghaziabad at C.H.C, P.H.C and Sub-centres. Health care worker (HCW) like Doctor, Nursing Staff, Laboratory technician and Sanitary staff working in the Health care facilities were selected for the Study. A total number of 122 HCW were selected, which included 27 Doctors, 75 Nurse, 06 Lab technician and 14 sanitary staff, using Proportional allocation scheme respectively. **Result:** The Knowledge regarding precautionary measure of BMWM was 82.7% and practice was 59.1% among the HCW. Multinomial regression between socio-demographic features of HCW and their practice regarding precautionary measures revealed that the practice was 6.045 (1.883-19.411) times higher among graduates than diploma holders. Practice regarding precautionary measures was 13.542 (2.992-61.289) times higher among doctors as compared to nurses. Practice regarding the precautionary measure was 12.509 (3.302-47.380) times higher among

the CHC staff and 3.059 (1.330- 7.038) times higher among PHC staff than sub-center staff. **Conclusion:** Level of knowledge and practice scores were unsatisfactory. Healthcare facilities should provide periodic training and adequate supplies for the waste handlers.

**Keywords-** Biomedical waste, Health Care workers.

## INTRODUCTION:

Health-care waste (HCW) is a serious problem, which frequently causes water, air and soil pollution along with dreaded nosocomial diseases.<sup>1</sup> In the past few years many countries have experienced a tremendous expansion in health care system across the world.<sup>2</sup> Any site/location where human population is diagnosed, treated, or immunised, regardless of the scope and nature of the health care setup along with associated research work is called a Health Care Facility (HCF).<sup>3</sup> Every year, 16 billion injections are given around the world. There is an increased risk of infection and injury as a result of improper disposal of the used needles and syringes. Every year approximately 1.7 million hepatitis B, 315,000 hepatitis C viral infections and 33,800 HIV infections occur in low-income countries due to poor waste management.<sup>4</sup> Numerous studies have amply demonstrated the grave health risks that improper biomedical waste disposal poses to hospital employees, rag pickers, municipal workers, and the general public. The significant prevalence of illnesses like HIV, Hepatitis B and C adds to this threat.<sup>5</sup> Even before the coronavirus pandemic hit the global population, just 27% of health-care facilities were providing the biomedical waste management services.<sup>6</sup> If these wastes are not handled adequately, the dangerous effects of medical waste on the general public and the environment will be multiple. Hospital waste management has a wide range of health consequences for patients, healthcare professionals (doctors, nurses, sanitary staff, etc.), and the general public.<sup>7</sup>

Therefore, the purpose of this study was to assess the Knowledge and Practice regarding precautionary measures in Biomedical Waste Management among the Health Care Workers of Health Facilities of rural Ghaziabad.

## MATERIALS AND METHOD:

This is a health care facilities based cross-sectional study. This observational cross-sectional study was conducted from 27<sup>th</sup> July 2022 to 23<sup>rd</sup> Sept. 2022. Government health facilities in district Ghaziabad i.e. Community health center (C.H.C), Primary health center (P.H.C) and Sub-center was the sampling frame. Doctors, Nursing Staff, Laboratory technician and Sanitary staff working in the Health care facilities was taken as a study Unit of the study. For sample size calculation, data of total number of health care worker posted at selected health facilities in the district was collected, which came out to be 232. The sample was calculated by using the estimated proportion of knowledge (79%) on BMW among healthcare workers, reported by Pavan P. Amin et al, in the year 2018.<sup>8</sup> Using the proportion with the estimated population of health care worker i.e., 232 (which is the finite population) the sample size was

calculated to be to be 122. Proportional allocation scheme was used to select the required number of health care workers from each facility. Stratified sampling technique was used with proportional allocation scheme. The total sample size was first stratified on the basis of educational qualification of the respondents and then on the basis of health care facilities where the respondents were posted. There are four blocks in district Ghaziabad, in each block there is one CHC, under each CHC there are four PHC. The total number of sub-centres in these four blocks are 145. Data was collected randomly from 4 CHC, 12 PHC and 50 Sub-centres. A predesigned Semi-structured questionnaire was used as a study tool to collect data. Consents & Approvals: Informed written consent was taken from all the health care workers and Ethical approval have been taken from the intuitional ethical committee. The data was collected and entered in MS excel 2016. Analysis was done with the appropriate statistical method using SPSS software version 20.0 If p value <0.05, considered as statistically significant and if p-value>0.05, then it is statistically insignificant.

## RESULTS:

### 1) Demographic characteristics

In this study we have collected data from 122 health care workers working in different health facilities in the district. Out of total health care workers, 26 (21.3%) were from CHC, 46 (37.7%) were from PHC and 50 (41%) were from sub-centre. Majority of the study participants 96 (78.6) were female. Maximum number of the study participants 61 (50.0%) were in the age group of 31-40 years. Most of the health care workers were 71 (58.2%) diploma holders followed by 25 (20.5%) being graduate and 13 (10.7%) were post graduate. The complete socio-demographic characteristics are depicted in **table 1** below.

Table:1. Showing socio-demographic characteristics of the Health Care Workers.

| <b>Socio-demographic characteristics</b> | <b>Health Care workers (n=122)</b> | <b>Percentage (%)</b> |
|--|------------------------------------|-----------------------|
| <b>Health Facilities</b>                 |                                    |                       |
| C.H.C (n=4)                              | 26                                 | 21.3                  |
| P.H.C (n=12)                             | 46                                 | 37.7                  |
| Sub Center (n=50)                        | 50                                 | 41.0                  |
| <b>Gender of Health Care workers</b>     |                                    |                       |
| Male                                     | 26                                 | 21.3                  |
| Female                                   | 96                                 | 78.6                  |
| <b>Age of the Health Care workers</b>    |                                    |                       |
| 21-30                                    | 17                                 | 13.9                  |
| 31-40                                    | 61                                 | 50.0                  |
| 41-50                                    | 37                                 | 30.3                  |
| 51 and above                             | 07                                 | 5.70                  |

**Education of the Health Care****workers**

|                       |    |      |
|-----------------------|----|------|
| Post Graduate         | 13 | 10.7 |
| Graduate              | 25 | 20.5 |
| Diploma               | 71 | 58.2 |
| 12 <sup>th</sup> Pass | 03 | 2.50 |
| 10 <sup>th</sup> pass | 10 | 5.40 |

We observed that, of the total 27 (22.1%) doctors 18 (69.2%) were from CHC and 9 (19.6%) were from PHC. The 75 nurses selected were 50 (100%) from sub center, 21 (45.7%) from PHC and 4 (15.4%) from CHC. One lab technician (3.8%) was from CHC and the remaining 5 (10.9%) from PHC. Regarding the 14 (11.5%) sanitary staff 11 (23.9) were from PHC and 3(11.5%) from CHC. The complete distribution of study participants according to occupation are depicted in **table 2** below.

Table 2: Distribution of study participants according to occupation.

| Health Facilities                       | Doctor (%) | Lab Technician (%) | Nurse (%) | Sanitary Staff (%) | Total (100%) |
|---|------------|--------------------|-----------|--------------------|--------------|
| <b>CHC</b><br>(Community Health Centre) | 18 (69.2)  | 1 (3.8)            | 4 (15.4)  | 3 (11.5)           | 26           |
| <b>PHC (Primary Health Centre)</b>      | 9 (19.6)   | 5 (10.9)           | 21 (45.7) | 11 (23.9)          | 46           |
| <b>Sub-Centre</b>                       | 0 (0)      | 0 (0)              | 50 (100)  | 0 (0)              | 50           |
| <b>Total</b>                            | 27 (22.1)  | 6 (4.9)            | 75 (61.5) | 14 (11.5)          | 122          |

## 2) Knowledge regarding precautionary measures in Biomedical Waste Management

The appropriate Knowledge regarding precautionary measures in Biomedical Waste Management was found in 82.7% of the health care workers. We found that all of the doctors 27 (100%), Lab technicians 6 (100%) and Nurses 75 (100%) while 13 (92.9%) of the sanitary staff were aware of the precautionary measure to be taken while handling biomedical waste. We observed that among the doctors 26 (96.3%), 24 (88.9%), 22 (81.5%) and 22 (81.5%) respectively know that gloves, mask, goggle and PPE are the precaution to be taken while handling biomedical waste. In case of sanitary staff workers, the result was 14(100%), 9 (64.3%), 5 (35.7%) and 5 (35.7%), while in case of nurses it was 75 (100%), 59 (92%), 54 (72%) and 63 (84%) for gloves, mask, goggles and PPE respectively. Notably all of the 6 (100%) lab technicians have correctly answered that each of the four – gloves, mask, goggles and PPE should be taken as the precautionary measures. All the doctors 27 (100%), lab

technicians 6 (100%) and Nurses 75 (100%), 12 (85.7%) sanitary staff think that wearing a PPE can reduce the risk of infection. More than three fourth of health care workers 94 (77%) knew that the general waste should not be collected in yellow colour coded bins. We also observed that 101 (82.78%) of the health care worker did not know the correct colour coding as per the revised 2016 biomedical waste management and handling rule. The complete knowledge regarding precautionary measures in Biomedical Waste Management are depicted in **table 3** below.

Table 3: Showing knowledge regarding precautionary measures in Biomedical Waste Management

| Knowledge regarding precautionary measures in Biomedical Waste Management       |            |           |                    |                    |       |            |
|---|------------|-----------|--------------------|--------------------|-------|------------|
| Parameters  | Doctor (%) | Nurse (%) | Lab Technician (%) | Sanitary Staff (%) | Total | Percentage |
| <b>Are you aware of precaution to be taken while biomedical waste handling?</b> |            |           |                    |                    |       |            |
| Yes   | 27 (100)   | 75 (100)  | 6 (100)            | 13 (92.2)          | 121   | 99.2       |
| No  | 0 (0)      | 0 (0)     | 0 (0)              | 1 (7.1)            | 1     | 0.8        |
| <b>If yes, What precaution do you think one should be taking.?</b>              |            |           |                    |                    |       |            |
| Gloves (Yes)  | 26 (96.3)  | 75 (100)  | 6 (100)            | 14 (100)           | 121   | 99.2       |
| Mask (Yes)  | 24 (88.8)  | 69 (92.0) | 6 (100)            | 9 (64.3)           | 108   | 108        |
| Goggle (Yes)  | 22 (81.5)  | 54 (35.7) | 6 (100)            | 5 (35.7)           | 87    | 71.3       |
| PPE (Personal protective equipment) Kit (Yes)                                   | 22 (81.5)  | 5 (35.7)  | 6 (100)            | 5 (35.7)           | 96    | 78.7       |
| <b>Do you think, wearing a PPE can reduce risk of infection?</b>                |            |           |                    |                    |       |            |
| Yes   | 27 (100)   | 75 (100)  | 6 (100)            | 12 (85.7)          | 120   | 98.4       |
| No  | 0 (0)      | 0 (0)     | 0 (0)              | 2 (14.3)           | 2     | 1.6        |
| <b>Is general waste collected in yellow bin?</b>                                |            |           |                    |                    |       |            |
| Yes   | 8 (29.6)   | 17 (22.7) | 1 (16.7)           | 2 (14.3)           | 28    | 23         |
| No  | 19 (70.4)  | 58 (77.3) | 5 (85.7)           | 12 (77.0)          | 94    | 77         |
| <b>What is the colour code for dustbin that is being currently followed?</b>    |            |           |                    |                    |       |            |
| Yellow, Green, Red, Blue  | 3 (11.1)   | 7 (9.3)   | 0 (0)              | 1 (7.1)            | 11    | 9          |

|                            |           |           |          |           |    |      |
|----------------------------|-----------|-----------|----------|-----------|----|------|
| Yellow, Red, Blue, Black   | 16 (59.3) | 56 (74.3) | 5 (83.3) | 12 (85.7) | 89 | 73   |
| Yellow, Red, Blue, White   | 8 (26.9)  | 12 (16.0) | 0 (0)    | 1 (1.7)   | 21 | 17.2 |
| Yellow, Red, Purple, White | 0 (0)     | 0 (0)     | 1 (16.7) | 0 (0)     | 1  | 0.8  |

### 3) Practice regarding precautionary measures in Biomedical Waste Management

Overall appropriate practice regarding precautionary measures in Biomedical Waste Management was found in be 59.1% of the health care workers. We observed that most of the study participants 87 (71.3%) were wearing PPE while handling biomedical waste. Puncture proof containers for sharps waste were used by 72.1% of HCWs.

In this study majority 88 (72.1%) of the health care workers were having a system of reporting injuries and accident due to biomedical waste. We observed that 86 (70.4%) health care workers were reporting any hazardous event due to biomedical waste management within 24 hours. All of the lab technician 6 (100%), 25 (92.6%) doctors, 60 (80%) nurses and 8 (57.1%) sanitary staff workers, were immunized against Hepatitis B. After needle stick injury or percutaneous injury, it was observed that 101 (82.8%) were taking but 21 (17.2%) were not taking the post exposure prophylaxis. We observed that, among the doctors 27 (100%), 27 (100%), 21 (81.5%) and 24 (88.9%) respectively wear gloves, mask, goggle and PPE while handling biomedical waste. In case of sanitary staff workers, the result was 14(100%), 9 (64.3%), 6 (42.9%) and 7 (50%), while in case of nurses it was 71 (94.7%), 61 (81.3%), 53 (70.7%) and 57 (76%) for gloves, mask, goggles and PPE respectively. The complete practice regarding precautionary measures in Biomedical Waste Management are depicted in **table 4** below.

Table 4: Showing Practice regarding precautionary measures in Biomedical Waste Management

| Practice regarding precautionary measures in Biomedical Waste Management                            |            |           |                    |                    |       |            |
|---|------------|-----------|--------------------|--------------------|-------|------------|
| Parameters  | Doctor (%) | Nurse (%) | Lab Technician (%) | Sanitary Staff (%) | Total | Percentage |
| <b>Do you wear PPE (Personal Protective Equipment) while handling Bio Medical Waste management?</b> |            |           |                    |                    |       |            |
| Yes   | 21 (77.8)  | 53 (70.7) | 5 (83.3)           | 8 (57.1)           | 87    | 71.3       |
| No  | 6 (22.2)   | 22 (29.3) | 1 (16.7)           | 6 (42.9)           | 35    | 28.7       |
| <b>Do you use puncture-proof plastic/cardboard container to collect waste sharp?</b>                |            |           |                    |                    |       |            |

|   |           |           |           |           |     |      |
|---|-----------|-----------|-----------|-----------|-----|------|
| Yes   | 25 (92.6) | 50 (66.7) | 6 (100)   | 7 (50)    | 88  | 72.1 |
| No  | 2 (7.4)   | 25 (33.3) | 0 (0)     | 7 (50)    | 34  | 27.9 |
| <b>Do you have a system of reporting injuries and accidents due to Bio-medical waste?</b>                     |           |           |           |           |     |      |
| Yes   | 23 (85.2) | 50 (66.7) | 5 (83.3)  | 10 (71.4) | 88  | 72.1 |
| No  | 4 (14.8)  | 25 (33.3) | 1 (16.7)  | 4 (28.6)  | 34  | 27.9 |
| <b>How much time was taken to report any hazardous event occurred due to bio medical waste in your setup?</b> |           |           |           |           |     |      |
| 12 hour   | 13 (48.1) | 42 (56.0) | 5 (83.3)  | 8 (57.1)  | 68  | 55.7 |
| 24 hour   | 7 (25.9)  | 9 (12.0)  | 0(0)      | 2 (14.3)  | 18  | 14.8 |
| 48 hour   | 1 (3.7)   | 9 (12.0)  | 0(0)      | 2 (14.3)  | 7   | 5.7  |
| No such event occurred  | 6 (22.2)  | 21 (28.0) | 1 (16.7)  | 1 (7.1)   | 29  | 23.8 |
| <b>Have you been immunized against Hepatitis B?</b>   |           |           |           |           |     |      |
| Yes   | 25 (92.6) | 60 (80.0) | 6 (100)   | 8 (57.1)  | 99  | 81.1 |
| No  | 2 (7.4)   | 15 (20.0) | 0 (0)     | 6 (42.9)  | 23  | 18.9 |
| <b>Do you follow PEP after needle stick injury or percutaneous injury?</b>                                    |           |           |           |           |     |      |
| Yes   | 26 (96.3) | 62 (82.7) | 0 (0)     | 7 (50)    | 101 | 82.8 |
| No  | 1 (3.7)   | 13 (17.3) | 6 (100)   | 7 (50)    | 21  | 17.2 |
| <b>What precautions do you take while handling Biomedical Waste?</b>  |           |           |           |           |     |      |
| Gloves (Yes)  | 27 (100)  | 06 (100)  | 71 (94.7) | 14 (100)  | 118 | 96.7 |
| Mask (Yes)  | 27(100)   | 6 (100)   | 61 (81.3) | 9 (64.3)  | 103 | 84.4 |
| Goggle (Yes)  | 21 (81.5) | 05 (83.3) | 53 (70.7) | 06 (42.9) | 86  | 70.5 |
| PPE (Personal protective equipment) Kit (Yes)   | 24 (88.9) | 05 (83.3) | 57 (76.0) | 7 (50)    | 93  | 76.2 |

In the present study we observed that 20 (76.9%) male and 81(84.4%) female had good knowledge regarding precautionary measure of Biomedical waste management and maximum of them were nurse 64 (85.3%). In CHCs and PHCs health care workers 4 (15.4), 9 (19.6) respectively had bad knowledge regarding precautionary measure of Biomedical waste. The complete relationship of Knowledge regarding Precautionary measure of BMWM with socio-demographic variable are depicted in **table 5** below.

Table 5 Relationship of Knowledge regarding Precautionary measure of BMWM with socio-demographic variable

| Variable             | Category                        | Knowledge Regarding<br>Precautionary measure of<br>BMWM |           | Total<br>(100%) | p value   |
|----------------------|---------------------------------|---|-----------|-----------------|-----------|
|                      |                                 | Good (%)  | Bad (%)   |                 |           |
| Gender               | Male                            | 20 (76.9)   | 6 (23.1)  | 26              | 0.375     |
|                      | Female                          | 81 (84.4)   | 15 (15.6) | 96              | Reference |
| Education            | 10th Pass                       | 6 (60)  | 4 (40)    | 10              | 0.055     |
|                      | 12th Pass                       | 3 (100%)  | 0 (0)     | 3               | 0.999     |
|                      | Diploma                         | 61 (85.9)   | 10 (14.1) | 71              | Reference |
|                      | Graduate                        | 21 (84)   | 4 (16)    | 25              | 0.816     |
| Occupation           | Post Graduate                   | 10 (76.9)   | 3 (23.1)  | 13              | 0.415     |
|                      | Doctor                          | 22 (81.5)   | 5 (18.5)  | 27              | 0.638     |
|                      | Lab Technician                  | 5 (83.3)  | 1 (16.7)  | 6               | 0.895     |
|                      | Nurse                           | 64 (85.3)   | 11 (14.7) | 75              | Reference |
| Health<br>Facilities | Sanitary Staff                  | 10 (71.4)   | 4 (28.6)  | 14              | 0.211     |
|                      | C.H.C (Community health center) | 22 (84.6)   | 4 (15.4)  | 26              | 0.944     |
|                      | P.H.C (Primary Health Center)   | 37 (80.4)   | 9 (19.6)  | 46              | 0.648     |
|                      | Sub- Center                     | 42 (84)   | 8 (16)    | 50              | Reference |

A significant association was found between education level and practice regarding precautionary measure of biomedical waste management. Practice regarding precautionary measure was six time better 6.045 (1.883-19.411) in graduate and post graduate than diploma holders.

Doctors had thirteen time 13.542 (2.992-61.289) better practice regarding precautionary measure in biomedical waste management than nurses.

Practice regarding precautionary measure was twelve times better 12.509 (3.302-47.380) among the CHC staff and three times higher 3.059 (1.330- 7.038) among PHC staff than sub-centre staff.

The complete relationship of Practice regarding Precautionary measure of BMWM with socio-demographic variable are depicted in **table 6** below.

Table 6: Relationship of Practice regarding Precautionary measure of BMWM with socio-demographic variable

| Variable | Category | Practice regarding<br>Precautionary<br>Measure of BMWM |          | Total<br>(100%) | p value | OR (CI) |
|----------|----------|--|----------|-----------------|---------|---------|
|          |          | Good (%)   | Bad (%)  |                 |         |         |
| Gender   | Male     | 19 (73.1)  | 7 (26.9) | 26              | 0.105   |         |



|                   |                                 |           |           |    |           |                       |
|-------------------|---------------------------------|-----------|-----------|----|-----------|-----------------------|
| Education         | Female                          | 53 (55.2) | 43 (44.8) | 96 | Reference |                       |
|                   | 10th Pass                       | 5 (50)    | 5 (50)    | 10 | 0.835     |                       |
|                   | 12th Pass                       | 2 (66.7)  | 1 (33.3)  | 3  | 0.504     |                       |
|                   | Diploma                         | 33 (46.5) | 38 (53.5) | 71 | Reference |                       |
|                   | Graduate                        | 21 (84)   | 4 (16)    | 25 | 0.003*    | 6.045 (1.883-19.411)  |
|                   | Post Graduate                   | 11 (84.6) | 2 (15.4)  | 13 | 0.022*    | 6.33 (1.308-30.661)   |
| Occupation        | Doctor                          | 25 (92.6) | 2 (7.4)   | 27 | 0.001*    | 13.542 (2.992-61.289) |
|                   | Lab Technician                  | 3 (50)    | 3 (50)    | 6  | 0.925     |                       |
|                   | Nurse                           | 36 (48)   | 39 (52)   | 75 | Reference |                       |
|                   | Sanitary Staff                  | 8 (51.7)  | 6 (42.9)  | 14 | 0.531     |                       |
|                   | C.H.C (Community health center) | 24 (92.3) | 2 (7.7)   | 26 | <0.05*    | 12.509 (3.302-47.380) |
|                   | P.H.C (Primary Health Center)   | 33 (71.7) | 13 (28.3) | 46 | 0.009*    | 3.059 (1.330-7.038)   |
| Health Facilities | Sub- Center                     | 24 (48)   | 26 (52)   | 50 | Reference |                       |

## DISCUSSION:

Majority of the study participants in the present study were female 96 (78.6). Similar finding was seen in a cross-sectional study conducted by Saha A et.al in Tripura, where majority of the study participants (65.4%) were females.<sup>9</sup>

In current study, maximum number of the study participants 61 (50.0%) were in the age group of 31-40, followed by 41-50 years (30.3 %). There were 17 (13.9%) subjects 'of the age 21-30 years respectively. Similar result was found in a study conducted by a Kamakar N et al in Agartala, where maximum number (74.2%) of health care worker were from 20-30-year age group.<sup>10</sup>

In this study most (58.2%) of the health care workers were diploma holders followed by 25 (20.5%) graduates and 13 (10.7%) were post graduates. Also 10 (8.2%) had studied till 10<sup>th</sup> and 3 (2.5%) up to 12<sup>th</sup> respectively. Similar result was found in a cross sectional study in Haryana conducted by Singh S at el in 2020, where maximum number of health care workers were diploma holders (47.6%).<sup>11</sup>

In the current study, all of the doctors 27 (100%), lab technicians 6 (100%) and Nurses 75 (100%) and 12 (85.7%) sanitary staff in the current study knew that wearing a PPE kit could reduce the risk of infection. Deress T et al in Euthopia, in the year 2019 found that 94.5% of HCW believed that wearing PPE kit could reduce the risk of infection,<sup>12</sup> while Letho Z et al.

in the year 2021, observed that 98.2% of the healthcare workers had good knowledge regarding PPE kit.<sup>13</sup> Both these studies substantiated this study.

In the present study, more than three fourth of health care workers (77%) knew that the general waste should not be collected in yellow colour coded bins. A close finding was reported by Deress T et al, who identified that 72.7% study participants knew that the general waste should be disposed off in a black colored container.<sup>12</sup>

The precautionary practices of wearing PPE were considerably better (71.3%) in this study than a study conducted by Basavaraj TJ et al in Bangalore in the year 2021, where sanitary Staff were not wearing PPE while the nurses and doctors were wearing PPE most of the time<sup>14</sup>

In the present study puncture proof containers for sharp waste were used by 88 (72.1%) of the HCW. Likewise, Amin PP et al, found that around 3/4th (75.3%) of the participants disposes off the sharps in white puncture proof container.<sup>8</sup> Deress T. et al, observed that most (93%) HCFs used puncture resistant containers to store hazardous wastes temporarily, implying the need to improve the precautionary practices among health care workers of our study area.<sup>12</sup> In the present study most of the doctors (85.2%) were practicing a system of reporting injuries and accidents due to BMW. Basavaraj TJ et al., observed that majority of the doctors and nurses were in a habit of reporting injuries and accidents.<sup>14</sup> In the study conducted by Amin PP et al, the doctors had a system for reporting the incidence of any hazardous event.<sup>8</sup> In this study, a system of reporting needle stick injuries within 24 hours was being practiced by 86 (70.4%) health care workers. Amin PP et al., observed that majority of health care workers (91.7%) believed that needle-stick injuries should be reported immediately<sup>8</sup>

In the present study 99 (81.1%) of the HCW were immunized against Hepatitis B, which is comparatively higher than the findings of Saha A et.al., where only 66.17% were immunized against hepatitis B.<sup>9</sup> In the present study 96.7% of the HCW were using gloves and 88.9% of our health care workers were wearing PPE. Bit similar finding was seen in Deress T et al., where 44 (80.0%) of the study participants were using heavy-duty gloves while 48 (87.3%) were using protective apron.<sup>12</sup>

In the present study practice of precautionary measures revealed that the practice was six [6.045 (1.883-19.411)] times higher among graduates and six [6.33 (1.308-30.661)] times higher among post graduates than diploma holders. Practice regarding precautionary measures was thirteen [13.542 (2.992-61.289)] times higher among doctors as compared to nurses. Mathur et al in the year 2011, had similar finding in which precautionary practice was significantly higher among health-care workers having higher technical qualifications.<sup>15</sup>

To conclude Level of knowledge among the HCW were good but practice scores were unsatisfactory. Technical qualification of the health-care workers was identified as the

important determinant of their waste management practice. This emphasizes that healthcare facilities should provide periodic training for the waste handlers.

## REFERENCES:

1. Javedh S. Moosa AS, Sharli L. A study of knowledge about biomedical waste management among health care professionals in a tertiary care teaching hospital. *Int J Univ Pharm Bio Sci* 2013; 2:162-70.
2. Shalini S, Harsh M. Evaluation of bio-medical waste management practices in a government medical college and hospital. *Nat J Commun Med.* 2012;3(1):80–84
3. Ministry of Environment and Forests. Government of India. Draft bio-medical waste (management and handling) rules. (2011). Accessed: April 5, 2013: <http://moef.nic.in/downloads/public-information/salientfeatures-draft-bmwmh.pdf>.
4. WHO. Status of Health-Care Waste Management in Selected Countries of the Western Pacific Region, 2008–2013; 2015.
5. Schaefer ME. Hazardous waste management. *Dental Clinics of North America.* 1991; 35:383-90.
6. World Health Organization; UNICEF. WASH in health care facilities: global baseline report 2019. [https://www.who.int/water\\_sanitation\\_health/publications/wash-in-health-carefacilities-global-report/en/](https://www.who.int/water_sanitation_health/publications/wash-in-health-carefacilities-global-report/en/). Accessed September 27, 2020
7. You S, Sonne C, Ok YS. COVID-19's unsustainable waste management misguided forest action in EU Biodiversity Strategy as a biodiversity strategy. *American Association for the Advancement of Science* 2020;368(6498):1438–1439
8. Amin PP, Sochaliya KM, Kartha GP. A study to assess the knowledge, attitude and practice regarding biomedical waste management among health care personnel of C. U. Shah Medical College and Hospital, Surendranagar. *Int J Community Med Public Health* 2018; 5:4377-81.
9. Saha A, Bhattacharjya H. Health-care waste management in public sector of Tripura, North-East India: An observational study. *Indian Journal of Community Medicine: Official Publication of Indian Association of Preventive & Social Medicine.* 2019 Oct;44(4):368.
10. Karmakar N, Datta S, Datta A, Nag K. A cross-sectional study on knowledge, attitude and practice of biomedical waste management by health care personnel in a tertiary care hospital of Agartala, Tripura. *Natl J Res Community Med.* 2016;5:189–95
11. Singh S, Dhillon BS, Shrivastava AK, Kumar B, Bhattacharya S. Effectiveness of a training program about bio-medical waste management on the knowledge and practices

- of health-care professionals at a tertiary care teaching institute of North India. *Journal of Education and Health Promotion*. 2020;9.
12. Deress T, Jemal M, Girma M, Adane K. Knowledge, attitude, and practice of waste handlers about medical waste management in Debre Markos town healthcare facilities, northwest Ethiopia. *BMC research notes*. 2019 Dec;12(1):1-7.
  13. Letho Z, Yangdon T, Lhamo C, Limbu CB, Yoezer S, Jamtsho T, et al. (2021) Awareness and practice of medical waste management among healthcare providers in National Referral Hospital. *PLoS ONE* 16(1): e0243817
  14. Basavaraj TJ, Shashibhushan BL, Sreedevi A. To assess the knowledge, attitude and practices in biomedical waste management among health care workers in dedicated COVID hospital in Bangalore. *The Egyptian Journal of Internal Medicine*. 2021 Dec;33(1):1-5.
  15. Mathur V, Dwivedi S, Hassan M, Misra R. Knowledge, attitude, and practices about biomedical waste management among healthcare personnel: A cross-sectional study. *Indian J Community Med* 2011; 36:143-5.