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AWARENESS ABOUT BLOOD BORNE VIRAL INFECTIONS (HIV, HBV AND HCV) IN BIOMEDICAL WASTE MANAGEMENT WORKERS OF AN URBAN CITY

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Abstract

Background: WHO defines **'Biomedical Waste Management (BMW)'** as any waste generated during diagnosis, treatment or immunization of human beings or animals. In India, around 1.5-2 kg waste is generated per bed per day in hospitals and annually 0.23 million tons of BMW. If proper disposal of BMW is not done then all wastes generated from hospital gets contaminated and become infectious. BMW Management workers are at **maximum risk of exposure to blood and body fluids from** patients through needle stick injuries, a cut by sharp instrument, a bite that penetrates the skin and contamination of mucous membrane (Ex. A splash of blood in eye). For safe and sustainable management of BMW, knowledge of risk and good practices should be there in these workers. Therefore, the following study is being conducted.

Methods: It is a cross-sectional type of descriptive study with sample size of about 150 conducted at tertiary care centers of an urban city and biomedical waste management plants. Questionnaire and interview based study. Approval was taken from Institutional Ethics Committee (IEC).Permission to conduct the research was obtained from appropriate authorities. Study participants were recruited from various hospitals of the urban cities and biomedical waste management plants. Voluntary consent was taken.

Results: *Overall result:*

Knowledge: Overall percentage of knowledge about blood borne viral infections is only 67.1%.
Overall percent about knowledge regarding BMW management is just 50.5%.

Attitude: Overall result of attitudes among BMW management workers is 72.7%.

Practice: Overall result about precautions taken to prevent infections is 72.5% and regarding management of BMW is 77.9%.

Conclusions: It can be concluded that knowledge about blood borne viral infections is lacking among class IV workers, reason for this can education barrier. Attitudes of participants are good and whatever lacking would fill up when they get adequate knowledge. Practices about BMW management should be continuously under check.

Keywords: BMW

Introduction

Medical care is vital for our life and health, but the waste generated from medical activities represents a real problem in developing countries [1]. WHO defines 'Biomedical Waste Management (BMW)' as any waste generated during diagnosis, treatment or immunization of human beings or animals [2]. BMW is generated from government and private hospitals, Nursing homes, clinics, medical laboratory, veterinary, etc [2]. BMW Management includes all the steps required to ensure that BMW is managed in such a manner so as to protect health and environment against any adverse effects [3].BMW Management workers include all persons who generate, collect, receive, store, transport, treat, dispose or handle BMW in any form [3]. In India, around 1.5-2 kg waste is generated per bed per day in hospitals and annually 0.23 million tons of BMW [2].

Problem

If proper disposal of BMW is not done then all wastes generated from hospital gets **contaminated and become infectious** [4]. Improper management of waste generated in health care facilities cause a direct health impact on community, on health care workers and the environment [4].BMW Management workers are at **maximum risk** of exposure to blood and body fluids from patients through needle stick injuries, a cut by sharp instrument, a bite that penetrates the skin and contamination of mucous membrane (Ex. A splash of blood in eye). This could result from contact between person with infected body fluid and other person with non-intact skin (For Ex. abraded skin, etc.). While as many as 20 pathogens can be transmitted through accidental needle prick and/or sharp injury but potentially life threatening ones are HIV, HBV and HCV [5].

Need of the study

Biomedical waste management comes in focus with the notification of Biomedical waste Management and

Handling Rules, The Ministry of Environment and Forests, Government of India notified the BMW Management and Handling Rules on 28th March 2016 [3].

For safe and sustainable management of BMW, knowledge of risk and good practices should be there in these workers. There are few studies regarding KAP of health care workers at the hospital about blood-borne diseases but there are **no studies** about Blood borne pathogen related diseases knowledge and universal precautions practices among BMW management workers at BMW Management plant.

Therefore, the following study is being conducted.

Objectives:

1. To assess knowledge, attitudes and practices of proper carriage till disposal of bio-medical waste in connection to **blood borne viral infections** (HIV, HBV and HCV).

2. To assess the knowledge and practices regarding biomedical waste management rules in the study population.

Methodology

Type of study: Cross-sectional study

Place of study:

1. Tertiary care hospitals of the city

2. Bio-medical waste plant

Sample size: Minimum of 150 (as calculated by statistician)

Study participants:

1. Class III and class IV workers of tertiary care hospitals

2. Workers at bio-medical waste management plant.

Study design:

Questionnaire and interview based study. Study participants are recruited from tertiary care hospitals and bio-medical waste plant. Permission to conduct the research is obtained from appropriate authorities. Written informed consent will be taken from all participants and data will be collected using pre-designed questionnaire.

Hypothesis:

We may find that class III and class IV workers at hospital have less knowledge about blood borne viral infections and also about recent bio-medical waste management rules. We expect to find some positive results regarding information about blood borne viral infections and also about recent bio-medical waste management rules in workers of bio-medical waste management plant.

Calculations and Results

The study was conducted successfully and analyzed with complete understanding using SPSS version 22.0. We had the sample size 150 which includes **participants** from class III and class IV workers of tertiary care hospitals (137 out of 150) and workers from bio-medical waste treatment plant (13 out of 150).

Analysis of knowledge and attitude was done on the whole of 150 members. Analyses of practices are different for workers at tertiary care hospitals and bio-medical waste treatment plant. Result is presented under following **HEADS**:

1. Socio-demographic data

2. Knowledge

a. In connection to blood borne viral infections

b. Regarding recent practices of BMW management.

3. Attitude

4. Practice

A. In staff working at 3^{o} care hospitals

- Precautions taken to prevent blood borne viral infections through bio-medical waste
- About management of BMW

B. In workers at bio-medical waste treatment plant

- Precautions taken to prevent blood borne viral infections through bio-medical waste
- About management of BMW

Socio-demographic results:

- Major working population i.e. **49%** in management of BMW is in age of **30-39 years**.
- About 25% people to age of 40-49 years.
- 59% of populations lie in female group.
- 22% of study population is **illiterate**. 25% of people have education level up to **primary school level**. 27% are educated up to middle school. 18% have studied up to high school level. 7% have studied till post high school level. 1% people are educated up to under graduate level.

Knowledge assessment:

a) In connection to blood borne viral infections

Overall percentage of knowledge about blood borne viral infections is only **67.1%**.

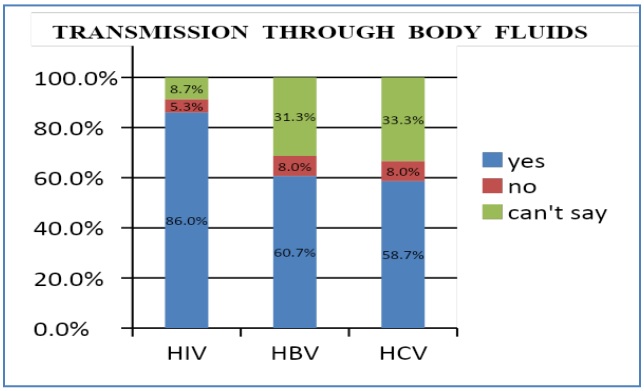
- 97.3% people know that **infection is spread** from BMW. 2.6% people are still not aware about infectious nature of BMW.
- About 63% people believe that that **all BMW is hazardous**. About 35% are of opinion that not all BMW is hazardous. About 3% people had no opinion about the question.
- About 85% had **heard about HIV** infection.

About 59% people had **heard about HBV**. About 56% people had **heard about HCV** infection.

- About 89% knew that **HIV infection** could occur from **needle stick injury**, while 10% people were not aware of this fact.

About 62% knew that **HBV** infection can occur from this route.

58% people knew that **HCV** infection can result from this route also.



- About 58% people knew that **HIV was not preventable by any vaccine** while 24.7% were of the opinion that it had vaccine and 17% people could not give any opinion about it.

Only 48% people knew that **HBV had vaccine**.

About 11% people knew that HCV had no vaccine.

- About 73% knew about **HIV transmission from mother to child**.

Only 56% knew about **HBV transmission** from mother to child.

About 53% knew about **HCV transmission** from mother to child.

- 41% people knew that **HIV** infection was **not curable**.

Only 8% people knew that **HBV** infection was **not curable**.

Only 7% knew that **HCV** was **not curable**.

- 77% people **knew about PEP** while about 23% people were not aware about it.

*b) **Regarding recent practices of BMW management***

Overall percent about knowledge regarding BMW management is just **50.5%**.

- Only 76% of people of study population had **training about BMW management**. About 90% people had their training done **within 1 year's span**.

- Only 69% people knew that any plastic bags are not to be used for collection/storage and only bags specified bags should be used.

- 73% people believed that BMW can be **stored maximum for 24hrs** before the start of treatment.

- Correct symbol of biohazard i.e.  was identified by 81% of people while others selected some other symbols out of the given options.

- 85% people **do not know** about the place where treatment occurs.

- 49% of people **don't know** who does the **transportation of BMW**.

Attitude assessment:

Overall result of attitude among the study population is **72.2%**.

- 97.3% people feel that **proper carriage and disposal** is helpful in **prevention of blood borne viral infections**.

- 97.3% people feel that BMW should be **segregated** in different categories.

- 93.3% people **feel the need for training** in BMW management.

- 50.0% **feel afraid while working with BMW** while 48% don't feel afraid while working with BMW.

- 98.7% feel that there is **need for Personal Protective Equipment's** is needed while handling BMW.

- 71% people said that they would **never treat any patient differently** whether/not he/she is suffering from any disease.

Practice assessment:

A. In staff working at 3^{o} care hospitals

I. Overall result about practices in biomedical waste management workers at hospitals regarding precautions about blood borne viral infections spread through BMW is **72.5%**.

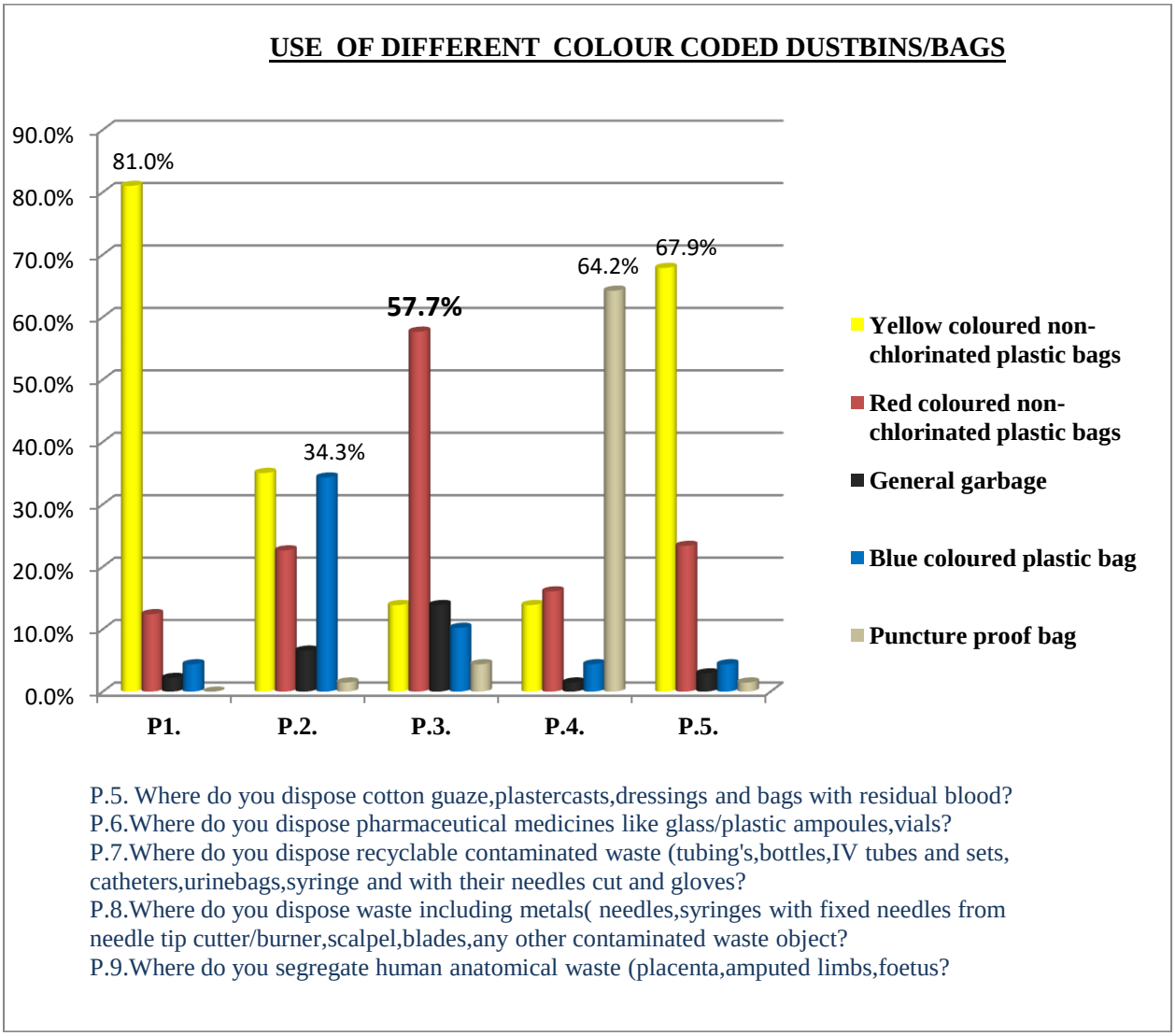
II. Overall result regarding BMW management is **77.9%**.

I. Precautions taken to prevent Blood Borne Viral infections through Biomedical waste:

- About 60% of hospital workers told that **regular health checkup was not conducted** for them. 39% said that health checkup was regularly done with the frequency varying from 1-4 times in a year. Remaining 1% said that it was done sometimes.

- 97% people among the hospital study population were **provided with PPE and always use them**.

- 94% people said that they always **report to concerned authority after any injury** with sharps/needle stick.



- And 3.98% said that they **segregate BMW in different categories** and regularly **use color-coded dustbins**.
- 98% said that they **fastened the waste properly before storage and transportation**.
- 92% people said that they **collect and store the BMW out of campus**.

B. In workers at BMW treatment plant (13 workers)

I. Regarding precautions taken for prevention of blood borne viral infections is **92.4%**.

II. Regarding BMW management is **91.2%**.

I. Precautions taken to prevent Blood borne viral infections through Biomedical Waste:

- All the workers said that they were routinely examined for the identification of health problems.
- All the workers were provided with protective equipment's (gown, gloves, shoes/slippers, head mask).
- All the workers wear/use protective equipment's regularly.
- 77% only report after any injury with sharps/needle stick.

Only 85% are vaccinated for HBV and HCV.

II. About management of BMW:

- Everyone reported that BMW was everyday collected from all the hospitals.
- Treatment of collected BMW was started immediately or at least in 24 hrs.
- As reported final disposal of **human anatomical waste and soiled waste** most of the times is done by **incineration /plasma pyrolysis**. Discarded/expired medicines are disposed by **deep burial**.

- 92% people knew the correct method of disposal of waste in red colored non-chlorinated bags i.e. **Recyclable plastic is sterilized and then shredded**.
- 77% correctly knew the method of disposal of BMW in white container **sanitary landfills/deep burial**.
- 92% correctly knew about the method of disposal of BMW in blue colored cardboard i.e. by **Disinfection** (by soaking the washed glass waste after cleaning with detergent and Sodium Hypochlorite treatment) or **through autoclaving or microwaving or hydroclaving** and then sent for recycling.

Discussion

Socio-demographic results of 150 participants were taken as a whole. Most of the members were in age of 30-39 years (49%) followed by 25% in 40-49 years and 17% in less than 30 years group almost similar to the study of Wu et. al. where the average healthcare workers is, 39 years [6]. So, from this it becomes evident that how important it is to train the staff about management and hazards of biomedical waste as most of them are from **reproducing age** group, if they get contracted by any dangerous infection unknowingly, generations and generations would suffer. Majority of working population was made by women (59%) almost same as the study by Sanjeev et. al. where about 67% of the population is female [7], this implies the **importance of women education**. Education levels of study population were poor, 22% of the population was illiterate, 25% had primary level of education while 27% and 18% were the statistics of middle and high school levels. Education is very important as education is a **source for learning of language**. If a person understands a language only then will he be able to understand the training given to him.

Overall mean percentage of knowledge was not encouraging. Overall knowledge about Blood borne viral infections is just 67.1% while about management of BMW is only 50.5%.

Most of the participants had knowledge and awareness that infections are spread from biomedical waste (97.3%). But only 35% of participants knew that not all BMW waste is harmful while rest i.e. 65% believed that all BMW is hazardous as compared to study by Sanjeev et. al. where 75% of the population believed that all biomedical waste is hazardous [7].

In comparison, knowledge about HIV was the most followed by HBV and HCV infection was least known. 85% of participants had heard about HIV and knew that its transmission could result from infected sharps and needle pricks as well as from contact with infected blood. About 59% participants had heard about HBV and knew about its route of transmission. Only about 56% knew about HCV and that it can spread by this route also.

Only about 58% of participants knew that HIV was not preventable by vaccine while 48% had knowledge about HBV and HCV vaccines. When asked about transmission of these infections from mother to child, 73% of participants responded in positive for HIV while only 56% and 46% knew about HBV and HCV respectively. HIV, HBV and HCV infections can't be cured (completely) once infected. But only 41% of study population knew this regarding HIV while less than percent population knew that HBV and HCV infections were also not curable.

Knowledge that Post Exposure Prophylaxis (PEP) was helpful in preventing infections was present in most of the workers.

Only 76% of study population actually had their BMW management training this result was comparatively better than the studies the study by Sanjeev et. al. where only 16% had the training [7]. Training about BMW management should be taken once every year. Time since training for about 10% people was more than one year. Majority of people knew that only specified bags should be used for disposal of BMW and not the bags used for disposal of general garbage (69%). Time limit for storage of BMW is 48hrs. This was known to only 23% people which is slightly better than the study by Sanjeev et. al. where the result was only about 9.6% [7].

Symbol of biohazard was identified correctly by almost all people (81%) which is again better than that of Sanjeev et. al. study where 64% of people could identify the symbol [7]. Place where treatment of BMW occurs was known only to 15% people. Most of the people did not even know who does the transportation of BMW from hospitals to treatment plants. Only 39% of the population knew that transportation was done by Municipal Corporation.

Overall result of Attitudes towards management of BMW is satisfying and about 72.7%. But still there is underlying insecurities among biomedical waste management workers and 48% of workers don't feel safe working with BMW and have fear of getting infections from them, similar to the study by Wu. et. al. where 47% of the population was having the same fear [6], these insecurities could be due to lack of knowledge. 23% of participants showed attitudes to treat the patients with dangerous diseases like HIV bit differently and would hesitate to go near the patient. 71% of the population said that they would never treat a patient differently whether or not he/she is suffering from any disease; this result is almost similar to the study done by Wu et al where almost 80% of the population came up with the positive response [6].

Overall results of practice in both staff at tertiary care hospitals as well as in workers at BMW treatment plant are quite encouraging. Regular health checkup which is mandatory once every year for all the workers was not done for 60% population at tertiary care hospitals while for

workers at BMW treatment health checkup was regularly done. Almost all the workers were provided with Personal Protective Equipment's (PPE) and almost everyone used them while managing BMW. Almost everybody had awareness of reporting after any injury with sharps or needle stick. As mentioned in BMW management rules 2016, it is compulsory for BMW managing workers to be vaccinated at least against HBV but still percentage of study population at hospital who were vaccinated is only 60% while almost everyone is vaccinated in BMW treatment plant (85%).

About 90% of the hospital staff said they segregate the waste in different categories and do not dispose it with general garbage, this result is quite similar to the result in the study by Sanjeev et. al where the result was about 81.8% [7]. Almost everyone at tertiary hospitals (98%) told us that they fastened the waste properly before transportation which is the correct way. 92% people said that they collect and store BMW differently and out of campus.

Knowledge about use color coded dustbins and bags were not so satisfactory. We dispose cotton gauze, plaster casts, dressings and bags with residual blood in yellow colored bags. Use of yellow colored bags was comparatively well known but still there was some unawareness about disposal of discarded and expired medicines in yellow bag. Overall result for usage of yellow bag is about 81% which is much better than the result from the study by Sanjeev et. al. where the yellow bag usage was just 28.8% [7]. Knowledge about disposal of needles, sharps and glass ampoules and vials which is done in blue colored cardboard box is just about 34.3%.

Disposal of recyclable contaminated waste (tubing's, bottles, IV tubes and sets, catheters, urine bags, syringe and with their needles cut and gloves is done in red colored bags and the practice of using it is about 57.7%. White puncture proof containers are used to dispose waste including metals (needles, syringes with fixed needles from needle tip cutter/burner, scalpel, blades, any other contaminated waste object and practice of using this is about 64.2% as compared to the study of Sanjeev et. al. where this result was 56.8% [7].

About final disposal at BMW plant, knowledge about disposal of different colored bags was adequate (on an average more than 80% study population knew the ways of disposal). But our lookout should be for 100% results because **"only 1 prick is enough…to cause the havoc in the lives of innocent people…."**

Conclusion

- It can be concluded that knowledge about blood borne viral infections is lacking among class IV workers, reason for this can **education barrier.**
- Regular training is must but if this training is supported by some **one-to one** interactive sessions, along with **live demonstrations** and **video clips**.
- **Regular health check up's** and **vaccination** schedules should be properly maintained for all the staff members.
- **Attitudes** of participants are good and whatever lacking would fill up when they get adequate knowledge.
- **Practices** about BMW management should be continuously under **check**. If any mistake has been done by any worker at any step, it should be brought to everyone's notice so as to avoid such mistakes by any of the members in the future.

Implications:

i). **Reduction in overall cases of HIV, HBV and HCV** in the community because increase in knowledge will help to stop the vicious cycle of transmission of blood borne infections (i.e. from blood and body fluids of infected patients → Healthy Biomedical waste management workers → other healthy public).

ii). It will **enhance knowledge and awareness** among BMW management workers on blood borne viral disorders and universal safety precaution.

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