

# To Assess the Extent of Skin Aberrations on the Hands of Biomedical Waste Handlers by using Suitable Objective Methods

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**Abstract:** *There is a need of training biomedical waste handlers for improving their work efficiency and adoption of safe practice of biomedical disposal there by improving the safety exposed to the infectious and toxic waste of the hospitals. Aim: To improve the work efficiency of biomedical waste handlers and adopt safe practices of bio-medical waste disposal in a hospital setting. Objectives: To assess the extent of skin aberrations on the hands of biomedical waste handlers by using suitable objective methods. Material and Methods: A study was conducted on 187 BMWHs working in KH&KIMS, Karad. To fulfill the appropriately calculated minimum simple size of 144. The study period October 2008 to Sept. 2013. It included observations made by sterilized and cooled India ink manufactured by Camlin Ltd, Mumbai for revealing abrasions and cuts on the hands of BMWH. The lecture and CD ROM presentation were followed by discussion to remove any doubts in the minds of the participants. Handouts of do's and don'ts were distributed for ready references. Ten days after training posttest was taken on the same knowledge questionnaire and check list of observation of practices. Written consent of the participant and ethical committee clearance was obtained before the commencement of the study. Results: Injury: the lesion/cuts and abrasions could be identified by naked eyes in 41persons .41(21.9%) as compared to 64(34.2%)by 10X lens and 51(27.3%) after India ink application the highest detection rate noticed by 10Xlens with magnification.*

**Key word:** Learning package, knowledge, practices, biomedical waste handling management & skin aberrations.

## 1. Introduction

**Importance of This Study:** The bio-medical waste requiring special attention includes those that are potentially infectious, sharps, e.g. needle, scalpels, objects capable of puncturing the skin, also plastic, pharmaceutical and chemically hazardous substances used in laboratories etc<sup>3</sup>.

A need clearly exists for education of at risk health care workers on the nature of the risk exposed by the medical waste and methods for their proper handling. Biomedical waste treatment facilities are mostly licensed by the local government that have specified rules and laws regarding the possessing and disposal of waste. The laws ensure that general public is protected from any form of contamination<sup>1</sup>.

Worldwide, approximately 2 million workers experience a needle stick injuries each year. A needle stick injury could transmit hepatitis-B, Hepatitis-C or the Human Immunodeficiency Virus (HIV). The risk of infection after exposure to the infected blood varies with the type of pathogen. The risk of transmission after exposure to (HIV) – infected blood is about 0.3% whereas it is estimated to be up to 100 times greater for Hepatitis –B virus (30%) and could be as high as 10% for Hepatitis C virus. A higher risk is associated with pre-existing cuts or wounds on the hands of waste handlers not using gloves while handling the waste<sup>4</sup>.

Recently a study conducted by the central pollution control board has been evaluated for the disposal procedure and found that almost 56% biomedical waste is disposed of with the municipal waste<sup>4</sup>. A study was therefore undertaken at

Krishna Hospital, Karad to find out effectiveness of the educational intervention on knowledge and practices of biomedical waste handlers.

## 2. Objective

To assess the extent of skin aberrations on the hands of biomedical waste handlers by using suitable objective methods.

## 3. Material and Methods

A before and after quasi experimental interventional study was carried out on the same group of participants' i.e. biomedical waste handlers at Krishna Hospital, Karad in the state of Maharashtra from October 2008 to September 2013. Location of Karad is shown in the state of Maharashtra in the map of India (fig.2). The map of K.I.M.S.&Krishna Hospital Shows, OPDs Operation theatres, blood bank, labour room, different wards biomedical waste and general waste collection room and incinerator.



Figure 2: Map of India showing location of Karad in the State of Maharashtra

Study Area:-Karad (State of Maharashtra)

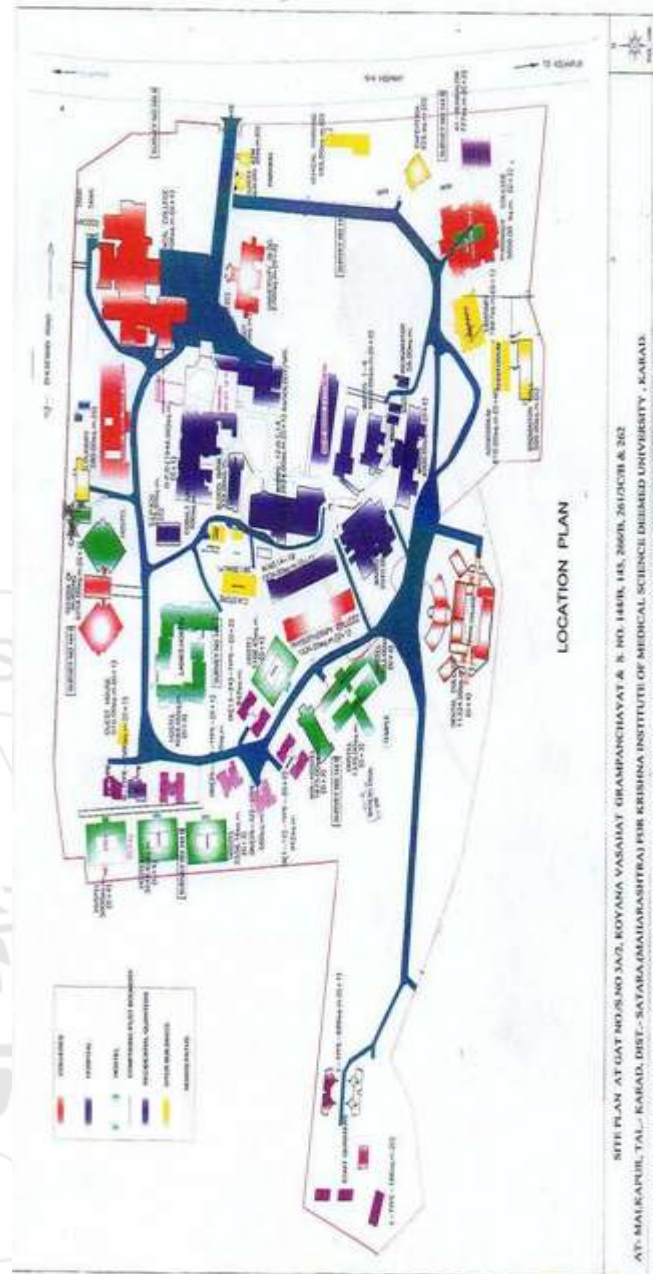


Figure 3: Map of Krishna Hospital & KIMS, Karad

**Sample Size Calculation:**

**Determination of Sample Size<sup>54</sup>:** The sample size to evaluate change in knowledge and practice scores with an error of 6% i.e. the proportion of subjects having adequate knowledge to lie in the range of 78% to 90% with 95% confidence was determined as:

$$N = \frac{1.96^2 \times p \times q}{E^2}$$

Where p: proportion of subjects with adequate knowledge  
 q: proportion of subjects with no adequate knowledge  
 p=84, q=16, E=6

$$N = \frac{1.96^2 \times 84 \times 16}{6^2} = 144$$

Thus minimum 144 subjects were required to be studied. Since the study design was before and after type, considering chance of non-response due to any reason, more subjects

were needed to be included than the calculated minimum sample size.

### Sample and sampling technique

The biomedical waste handlers at Krishna Hospital attached to K.I.M.S. Karad were identified. There were 188 biomedical waste handlers who were either permanent or semi-permanent as daily wage earners so all of them were decided to be included in the study.

All biomedical waste handlers were contacted and plan & purpose of the study was explained to them. A written informed consent was taken from all the willing workers. Enrollment of all biomedical waste handlers in the study was undertaken.

One worker refused to participate in the study due to personal inconvenience. Thus 187 biomedical waste handlers from Krishna Hospital attached to K.I.M.S. Karad were included in the study which fulfilled the sampling criteria.

**Subjects:** The participants of the present study comprised of all biomedical waste handlers, who were working during October 2008 to July 2010 in Krishna Hospital attached to K.I.M.S. Karad.

### Variables:

**Independent variables-** Independent variable was Educational Intervention that is planned teaching and audio-visual CD ROM presentation regarding biomedical waste management.

**Dependent variables-** The dependent variables of this study were age, sex, educational status, work place and experience of biomedical waste handlers.

### Data collection:

#### Ethical clearance:

The study was approved by the Institutional Ethical committee of the Krishna Institute of Medical Sciences Deemed University, Karad Maharashtra, before the commencement of the study.

A written permission was obtained from the Dean of Krishna Institute of Medical Sciences, Karad. The pre-training interventional data were collected from 1<sup>st</sup> July 2009 to 30<sup>th</sup> April 2010. Filling up of multiple choice questionnaires to assess knowledge was undertaken. Observation of biomedical waste handling and management procedures was undertaken for each worker separately as per check list. Each biomedical waste handler was interviewed to assess the knowledge. The questionnaire was filled by the researcher as most of the workers were illiterates or neo-literates and were not able to fill up the questionnaire on their own. All wards were observed. The biomedical waste handlers were observed during their peak working time while they were handling biomedical waste between 5.00am to 7.00am, 1.00pm to 3.00pm and 9.00pm to 11.00pm as per schedule.

To observe cuts and aberrations on the hands of biomedical waste handlers the workers were made to wash their hands thoroughly with soap and water. After drying the hands with clean towel observations with naked eye and observations under the 10 X lens were made. Application of India blue ink manufactured by Camlin Limited Talaja, India was undertaken after sterilization of the ink by autoclaving and cooling. Observations were made by naked eyes as well as by 10X magnifying lens after washing the hands with plain tap water. The blue ink was retained by the cuts and aberrated skin surface where as it was washed away to a large extent from the undamaged skin surfaces.



Figure 4.1: Naked Eye Examination.



Unaberrated skin



Aberated/infected skin

Figure 4.2: Examination of Skin by 10X Magnifying Lens.



Unaberrated skin



Aberated/cuts skin

Figure 4.3: Examination of Skin After Applying and Washing of Blue Ink to the Skin Surface



Figure 5.1: Observation of wounds on finger .



**Figure 5.2:** Observation of wounds on back of palm



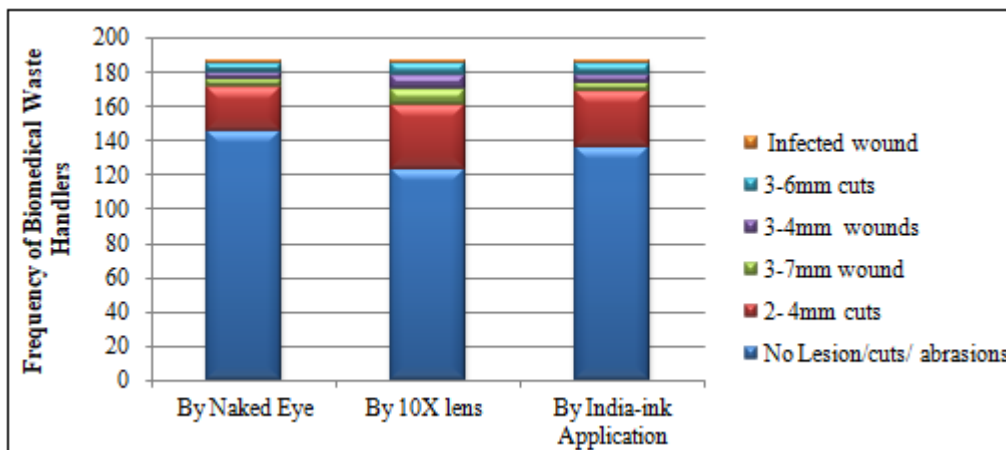
**Figure 5.3:** Observation of wounds on little finger

**Figures 5:** Examination and Observation of 187 BMWHs Hands.

After the data collection was over all the biomedical waste handlers were thanked for their participation in the study.

**Results of the Examination of Hands for Lesion/Cuts/ Abrasions by Naked Eye, 10 X Magnifications and After India - Ink Application**

Lesion/cuts/ abrasions	By Naked Eye		By 10X lens		By India-ink Application	
	No.	%	No.	%	No.	%
No Lesion/cuts/ abrasions	146	78.07	123	65.78	136	72.73
2- 4mm cuts	26	13.9	38	20.32	33	17.65
3-7mm wound	4	2.14	9	4.81	5	2.67
3-4mm wounds	4	2.14	8	4.28	5	2.67
3-6mm cuts	5	2.67	7	3.74	6	3.21
Infected wound	2	1.07	2	1.07	2	1.07
Total	187	100	187	100	187	100



**Figure 6:** Presentation of Lesion/Cuts/ Abrasions on Hands of Biomedical Waste Handlers

Table 25: All BMWHs both hands Examination done for Lesion/Cuts/ Abrasions by Naked Eye, 10X Magnifications and After India -Ink Application. It was observed that naked eye examination could detect only 41(21.9%) of persons with aberrations, whereas by 10X lens the detection rate was 64(34.2%) and with blue India ink it was 51(27.3 %).

During the study three BMWHs had history of needle stick injury. Nobody had taken any antiretroviral treatment. Fortunately when post counseling Elisa test for HIV was done, none of them showed HIV+ve status but the ignorance about the risk was 100% and the management of needle stick injuries was absent before training.

Both the hands of all 187 participants could be observed with naked eyes, 10X Lens and after application of blue India ink. Findings showed that a high proportion of workers 64(34.2 %) were found with various lesions like up to 7mm cracks, wounds with examination of 10X lens. Out of these 51 (27.8%) could be identified with application of India blue ink and only 41(21.9%) were observed with naked eyes.

These lesions were on palm, fingers as well as combined on palm and fingers on one or both hands. Size of cracks was from 1 to 7 mm. However according to the participants these injuries were not due to needle stick but due to their domestic activities. There was better detection of injuries when hands were observed by magnifying lens and application of sterile ink was made on the hands. Injuries were best identified by magnifying lens. These lesions on the hands of 25 biomedical waste handlers could have been missed if examination was not undertaken by magnifying lens and in 14 BMWHs if assessment with India ink was not done.

#### 4. Discussion

In the present study screening for existing injuries/skin aberrations on the hands has been undertaken by three methods that has naked eye examination, 10X magnifying lens and observation after application of sterile India ink.

Observation under 10X magnifying lens has been most effective methods. It is very simple less time consuming and readily acceptable to the supervisors as well as biomedical waste handlers. Out of all 187 biomedical waste handlers

41(21.1%) workers could be identified with naked eyes, 51(27.3%) after India ink application and 64(34.2%) by 10X magnifying lens.

Biomedical waste handlers have not been aware of the exposure due to injuries and skin aberrations on their hands and have not been using any personal protective devices (PPD) like hand glove and gum boots, mask, apron etc. After educational intervention and examination of hands with naked eye, 10X magnifying lens and observation after application of sterile India ink.

The awareness about the risk associated with injuries and skin aberration while handling biomedical waste management has increased from 41(21.1%) to 64(34.2%) and use of personal protective devices like gloves, mask and gumboots has also increased from 6 (3.2%) to 22(11.7%). This indicates that the knowledge and awareness and their practices have changed but there is a scope for farther improvement. Repeated educational intervention emphasizing the higher prevalence of diseases like HIV/AIDS, Hepatitis B & C etc. among HCWs should be undertaken. Simultaneously good quality personal protective devices should be made readily available.

#### 5. Summary

To find out aberrations on BMWHs hands three methods were used namely naked eye examination of hands with naked eye, 10X magnifying lens and observation after application of sterile India ink. It was observed that 10X magnifying lens was more feasible, acceptable and efficient method of identification of skin aberrations 64(34.22%) could be identified with as having aberration on skin.

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