




## Knowledge in Spill Management among Trained and Untrained Healthcare Workers in the Government General Hospital, Kakinada, India

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### ABSTRACT

**Introduction:** Blood and body fluid spillage continues to be a public health problem, despite, advances in our understanding and control of infections. So, this study was done to compare the knowledge in Spill Management among trained and untrained health care workers based on which measures can be taken to reduce the hazards in hospital.

**Methods:** A Cross-Sectional Study in Teaching Hospital, Kakinada was conducted from September to October 2019 using Semi-structured questionnaire & data was collected from a convenient sampling of 202 Health Care Workers consisting of Interns and Postgraduates PGs, Staff Nurses, Student Nurses and Lab Technicians, Male Nursing Orderlies, Sanitation Staff, and Others divided in to three groups. Data was obtained from those present in duty at that time and who gave consent. Frequency (percentage) and mean (standard deviation) were used to description and Chi square test used for data analysis. All statistical analysis were done in Excel 2016 and SPSS version 20 software and significant level were considered 5%.

**Results:** 86.14% (174) had knowledge about Hand hygiene. Knowledge on discarding used materials in the yellow bin was observed in 77.23% (156) overall. Only 27.23% (55) were aware of proper use of PPEs.

The right sequence of steps of Spill Management was mentioned by 16.34% subjects overall. 38.61% (78) received training on Spill Management. Hypochlorite was the most used disinfectant for cleaning the spill, as mentioned by 55.94% (113 out of 202). Only 30.2% (61) told they were aware of "Spill Management kit", of whom, 62.29% (38 of 61) received training ( $p = 0.002$ ).

**Conclusion:** Spill management is seen highest among Group 1 compared to Group 2. So, trainings must be conducted on Quarterly basis to update and sustain knowledge level among all groups of health care workers as this is a dynamic group.

**Keywords:** Spill Management, Health Care Workers, Infection Control

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### Introduction

Health is the foremost need and concern of any population throughout the world. Health care settings are places to restore health (1). In Health care settings like primary, secondary or tertiary care, in the process of patient care different types of wastes are generated which have the potential to put humans at risk of infectious diseases (2).

The waste generated in the course of health care activities carries a higher potential for infection and injury than any other type of waste. Therefore, it is essential to have safe and reliable method for handling these wastes. Appropriate management of health care waste is a crucial component of the health-care services (3).

Between 75 to 90 percent of the waste produced by the health-care providers are non-risk or "general" health-care waste, comparable to domestic waste. The remaining 10-25 percent health-care waste is regarded as hazardous and may create a variety of health risks (4). Health care settings are overburdened with the large amount of biomedical waste and so the patients visiting the facility are highly prone to acquire healthcare-associated infections (5).

Spills are part of Bio Medical Waste (BMW) Management rules. According to Bio Medical Waste (Management and Handling) Rules, 1998 of India, "Bio-medical waste" means any waste, which is generated during the diagnosis, treatment or immunization of human beings or animals, or in research activities pertaining there to or in the production or testing of biological (4).

First BMW rules were notified in July 1998, by Government of India, and were later modified to efficiently manage BMW in the country (6).

The importance of hands in the transmission of hospital infections has been well demonstrated and can be minimized with appropriate hand hygiene (7). Hand hygiene is vital to minimize the transfer of infections. Managing blood, body fluids, or other infectious material spills require more stringent measures, because of the associated higher potential risk of disease transmission. Hence it is essential to have certain standard protocols for cleaning spills and periodical training of all the Workers in

laboratories and in patient-care areas of the facility (8).

Blood and body fluid spillage continues to be a major worldwide public health problem, despite, advances in our understanding and control of these infections (9).

In a study done among health care personnel in a pediatric tertiary hospital in Kashmir valley, only 37.5% participants are aware of availability of blood spill kits in the hospital (2).

In a study done among health care providers in Tamil Nadu, appropriate use Personal Protective Equipment (PPE) was only 18.1%. The reasons for inappropriate use of PPE was non availability (78%) followed by lack of awareness of the importance (11%) (10).

A study done in a teaching hospital in South India reported that 66.24% nurses had proper knowledge regarding proper segregation & disposal of biomedical waste and 73.88% nurses had knowledge about hand hygiene. Regarding practice of standard precautions only 52.2% nurses practiced hand hygiene before and after patient care and only 39.4% nurses practiced use of sodium hypochlorite as the disinfectant in the management of blood & other body fluid spills (11).

Hand hygiene (HH) has been identified as one of the simplest, yet most important method to prevent cross-infection in healthcare facilities. In spite of this fact, the HH compliance rate remains low among healthcare workers (HCWs) (12).

A study done regarding infection control practices among health care workers in a hospital in Chennai, reported that 77% nurses practice moderately adequate hand washing practices, 58% had adequate practices in Personal protective equipment, and 58% had moderately adequate practices in disinfection of equipment and sterilization (13).

A study done in Iran among nurses found that the overall prevalence of blood and body fluid exposures were 79% and rate of exposure to sharps devices of 50%. Also, 38% employees were not using any protective equipment and only 65% of participants had been completely vaccinated against

HBV (Hepatitis B Virus)(14).

As per WHO reports, those vaccinated against HBV varies from 18% in Africa to 77% in Australia and New Zealand (15).

In one study done in a tertiary care hospital, in Delhi, 55.4% were reportedly vaccinated against Hepatitis B (16). In a tertiary care hospital in Bangladesh 47% of the subjects were vaccinated (17). In a study conducted in AIIMS, New Delhi it was reported that 52-59% of healthcare workers in different categories had taken hepatitis vaccine (15).

Few studies are reported on spill management in this part of the country. Hence an attempt has been made to find out the knowledge on spill management among health care workers in the tertiary hospital setting.

1. To assess the knowledge regarding Spill Management among health care workers.
2. To compare the knowledge between Trained and Untrained health care workers.

## Methods

The study was a cross sectional conducted in a tertiary care teaching Hospital from September to October 2019.

Data was collected from 202 Health Care Workers of the hospital selected by convenience sampling method.

demographic variables, nature of work, knowledge regarding routine cleaning practices, hand hygiene, awareness on spill management were collected using a pre-tested and semi structured questionnaire by interviewing the study participants during their free time (i.e., 11.30am to 2.00 pm).

The participants were divided into three groups based on their work designation as follows:

1. GROUP 1 : Compulsory Rotating Interns (C.R.I.s) and Postgraduates (P.G.s)
2. GROUP 2 : Staff Nurses, Student Nurses, (S.N.s) and Lab Technicians (L.T.s)
3. GROUP 3: Male Nursing Orderlies (M.N.O.s),

Sanitation Staff & Others.

Each Department in the hospital was visited only once, and data was obtained from those who were present in duty at that time and who had given consent to participate.

Validity and Reliability of the Questionnaire were assessed using Cronbach's Alpha. The Cronbach's Alpha value based on standardized items was 0.706, with number of items being 14 pertaining to the variables reported in results. The Cronbach's Alpha value between 0.7 and 0.8 is considered as acceptable, with regards to its internal consistency (18).

Ethical approval was taken from the Institutional Ethics Committee – vide Approval Certificate Reg. No. IEC/RMC/2019//462A dated 03/09/2019.

Also, Prior permission was taken from the Hospital Superintendent to conduct interviews in various departments in the hospital.

Written Informed Consent taken from participating study subjects.

Frequency (percentage) and mean (standard deviation) were used to description and Chi square test used for data analysis. All statistical analysis were done in Data Excel 2016 and SPSS version 20 software and significant level were considered 5%.

## Results

Out of the 202 participants, 116 (57.42%) belonged to Group 1, 47 (23.27%) belonged to Group 2, and 39 (19.31%) belonged to Group 3.

The mean age of the study participants was  $27.75 \pm 7.28$  years and majority (52%) of the study subjects were aged between 21 to 25 years.

The study participants were predominantly females (62.87%), and 49% belonged to Class 2 socioeconomic class of modified Kuppaswamy scale (Table:1).

**Table 1.** Distribution of study population by Socio-Demographic characteristics

Demographic Variables	Group 1		Group 2		Group 3	
	N	%	N	%	N	%
<b>Age</b>						
<20 Years	0	0.00	10	21.28	0	0.00
21-30 Years	112	96.55	8	17.02	14	35.90
31-40 Years	4	3.45	19	40.42	20	51.28
41-50 Years	0	0.00	10	21.28	5	12.82
<b>Gender</b>						
Male	44	37.93	12	25.53	19	48.72
Female	72	62.07	35	74.47	20	51.28
<b>Religion</b>						
Hindu	101	87.07	38	80.85	27	69.23
Christian	11	9.48	8	17.02	5	12.82
Muslim	4	3.45	1	2.12	6	15.38
Others	0	0.00	0	0.00	1	2.56
<b>Socio-Economic Scale Class</b>						
Class - 1	41	35.34	1	2.12	1	2.56
Class - 2	53	45.69	21	44.68	25	64.10
Class - 3	18	15.52	13	27.66	10	25.64
Class - 4	4	3.45	12	25.53	3	7.6

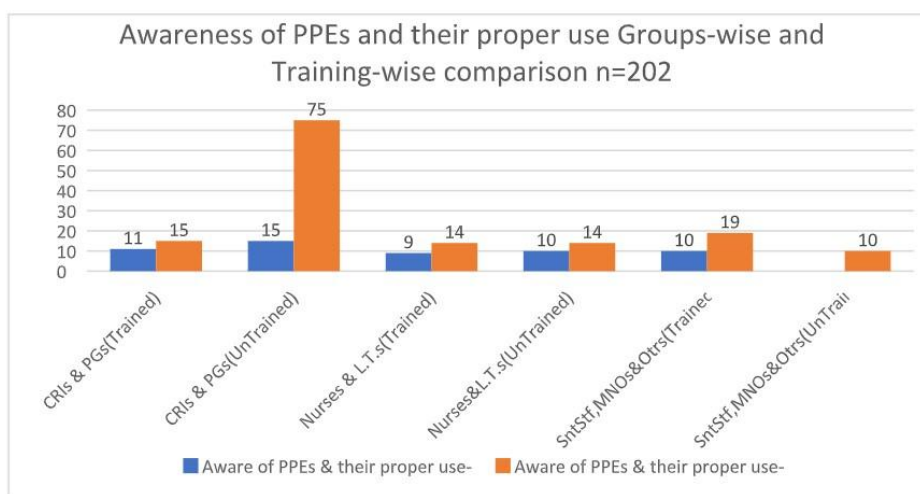
Knowledge about routine cleaning practices like sweeping and mopping was higher among Group 1 participants was 85.34%, followed by Group 3 (82.05%) and Group 2 (76.60%) participants, respectively ( $p < 0.001$ ).

Awareness on availability of Spill Management Kit was significantly higher among Group 2 subjects (51.06%) followed by Group 3 (35.90%) and Group 1 (19.83%) subjects ( $p < 0.001$ ).

The proportion of subjects aware about the proper use of Personal Protective Equipment

(P.P.E.s) was 40.43% in Group 2, followed by Group 3 (25.64%) and Group 1 (22.41%). The awareness regarding proper use between trained and untrained individuals was statistically significant among Groups 1 and 3.

Knowledge of access to P.P.E.s was 40.43% among Group 2 participants followed by 23.08% in Group 3 and 13.79% in Group 1 participants. ( $p < 0.001$ ). However, there was no significant difference between trained and untrained subjects of any group. (Figure 1).



(Original)Figure 1

**Figure 1.** Awareness of PPEs and their proper use Group-wise and Training-wise comparison n=202

Knowledge on discarding used materials in the yellow bin was observed in 77.23% of the study participants. This was significantly higher in Group 3 (92.31%), followed by Group 1 (74.14%) and Group 2 (72.34%) ( $p < 0.05$ ). There was a significant difference noted between trained and untrained subjects of Group 3. ( $p < 0.05$ )

Hand hygiene was practiced by 86.14% of the overall subjects. The knowledge on hand hygiene was highest in Group 1 (92.24%) followed by Group 3 (82.05%) and Group 2 (74.47%). ( $p < 0.01$ )

Knowledge on documentation of a spill incident was significantly higher in Group 3 (64.10%), followed by Group 2 (51.06%) and Group 1 (16.38%). ( $p < 0.001$ ). This knowledge significantly differed among trained and untrained subjects of Group 3 ( $p < 0.01$ ).

The right sequence of steps in Spill Management was mentioned by 16.34% of study participants.

Chlorine or sodium hypochlorite (Hypo) was mentioned as the most commonly used disinfectant for cleaning the spill by 55.94% of the study participants, followed by Phenol (18.32%) and Hydrogen peroxide (6.44%).

Majority of Group 3 subjects (51.28%) had the knowledge on the presence of Feedback mechanism regarding the spill incident, followed by Group 2 (42.55%) and Group 1 (11.21%). ( $p < 0.001$ ). In this regard, there was also a statistically significant difference among trained and untrained subjects in Group 3 ( $p < 0.05$ ).

Among the study participants who were exposed to blood and body fluids, 87.93% were exposed to blood, 3.45% to serum, and 1.72% each to blood and urine, HIV positive serum, and amniotic fluid.

The overall proportion of subjects who received Hepatitis-B Vaccination was 72.28%. This was lowest in Group 2 ( %) in comparison with Group 1 (75.86% ) and Group 3(76.92%)(Table:2).

**Table 2.** Distribution of Study Variables in relation to their Training

Variables	Group 1		Group 2		Group 3		p
	Trained	Untrained	Trained	Untrained	Trained	Untrained	
<b>Routine Cleaning Practices</b>							
Happening in the Hospital	25	74	17	19	25	7	
Not Happening	1	16	6	5	4	3	<0.001
<b>Awareness of availability of SMKIt</b>							
Aware	12	11	14	10	12	2	
Not Aware	14	79	9	14	17	8	0.029
<b>Extra Supplies kept – Buffer Stock</b>							
Aware	2	2	7	7	4	0	
Not Aware	24	88	16	17	25	10	<0.001
<b>Aware of PPEs and their proper use</b>							
Aware / Know about PPE s	11	15	9	10	10	0	
Not aware / Don't know about PPE s	15	75	14	14	19	10	0.062
<b>Access to PPEs</b>							
Yes / Open access	3	13	8	11	9	0	
No / Closed access / under Lock & Key	23	77	15	13	20	10	0.009
<b>Discarding used materials correctly to</b>							
Yellow coloured Bin	21	65	18	16	29	7	
Not in Yellow but in Other coloured Bin	5	25	5	8	0	3	0.042
<b>Knowledge about Hand Hygiene</b>							
Yes	26	81	16	19	25	7	
No	0	9	7	5	4	3	0.085
<b>Spill Incident Documentation</b>							

Yes	6	13	13	11	22	3	
No	20	77	10	13	7	7	<0.001
<b>Knowledge on presence of Sanitation Dept.</b>							
Know	16	54	18	19	18	4	
No Knowledge	10	36	5	5	11	6	0.048
<b>Knowledge on presence of Q.C.Team</b>							
Know	6	9	10	7	9	0	
No Knowledge	20	81	13	17	20	10	<0.003
<b>Knowledge on Feedback Mechanism</b>							
know	3	10	11	9	18	2	
No knowledge	23	80	12	15	11	8	<0.001
<b>Knowledge on Complaint reporting and Redressal Mechanism</b>							
Know	3	12	7	5	21	2	
No Knowledge	23	78	16	19	8	8	<0.001
<b>Knowledge on importance &amp; to undergo Hepatitis -B Vaccination</b>							
Yes	22	66	18	12	22	8	
No	4	24	5	12	7	2	0.246

### Discussion

In the present study, the overall awareness on the availability of Spill Management Kit was 30.20%. Similar finding has been reported in a study done in Jammu and Kashmir (2). High awareness on availability of Spill Management Kit among Group 2 subjects (51.06%) may be attributed to the fact that they are responsible for the indent and maintenance of these kits.

In the current study, 21.78% had open access to P.P.E.s, and 27.23% had awareness about the proper use of P.P.E.s. This is higher than that reported in a study done in Tamil Nadu, where the appropriate use of P.P.E. was seen in only 18.1%(10).

Knowledge on materials to be discarded in the yellow bin was present in 77.23% of the study participants in the present study. This is higher than that reported in studies done in Bangalore (66.24%) (11) and in Uttarakhand (21%)(19). In studies done in Bangladesh only 16% were aware of the correct category of waste to be disposed in “yellow” color coded container (20).

In the current study, the practice of hand hygiene was 86.14 %. This was higher when compared to the finding reported in studies done in other parts of India (13)(21). In a study done in Saudi Arabia, adherence to hand hygiene was seen in 70% of medical students, 18.8% of nurses, and 9.1% of senior medical staff, but the technique was

suboptimal in all (22).

Another similar study conducted in an accredited Tertiary Care Hospital in India showed that the average level of compliance with recommended Hand hygiene techniques among healthcare workers was 78%, which is below the benchmark of 90% for critical care areas (23). Recent studies done in Karachi, Pakistan have demonstrated that overall hand hygiene compliance was much lower( 12.3%) among the study participants (24).

In the present study, 74.47 % of participants of Group 2 mentioned the common disinfectant used for cleaning the spill as chlorine or sodium hypochlorite. This was much higher than that reported by studies done in similar settings (11).

Another study done in Pune , India reported 93.6% nurses were aware about the agent (Hypochlorite) used to clean spillage of body fluid like blood, serum etc (25). This might be attributed to periodical training and sensitization programmes conducted in this institution.

In the current study, the overall prevalence of exposure to blood and body fluids was 87.93%. Similar studies done in Iran (14) have reported lower prevalence than the present study and with various studies reported a prevalence of exposure to blood and body fluids ranging from 13.46% to 79%(26).

In a study done in Northwest Ethiopia, 58.5%



study participants had been exposed to BBFs splash in their lifetime. However, 39.0% of HCWs were exposed to BBFs splash in the past year (27).

Present study found out that 72.28% of HCWs having received the full course of Hepatitis B vaccination. Various studies reported findings ranging from 18% in Africa to 77% in Australia and New Zealand (15).

Studies done in Delhi, India (16) have reported 55.4% were vaccinated against Hepatitis B, and with a range of 52-59% of healthcare workers had taken hepatitis vaccine (15).

In a study done in China the complete hepatitis B vaccination rate was relatively low i.e. 60 % (28). In a study done in Libya (29) higher proportion of healthcare workers (72%) were fully vaccinated but studies done in North India reported a lower proportion of the health workers (38.8%) to have received the full three dose vaccination schedule (30).

### Conclusions

Based on these findings of this study, it can be concluded that despite having good knowledge regarding standard precautions among the

healthcare personnel, practices were not adequate.

Periodical trainings and sensitization programmes followed by regular supervision by administrators would be useful in identifying the gaps in spill management from time to time and taking necessary corrective measures.

### Conflicts Of Interest

None

### Author contribution

The authors all were involved in the whole article.

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