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A Survey of Knowledge of Antiseptic and Disinfectant Use in Staff Nurses in A Tertiary Care Hospital

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Introduction

There is an impending fear that the world is nearing the end of "antibiotic era" due to the growing concern of resistant pathogens. Hence, there is an emphasized need of infection control practices among health-care workers; along with search for newer molecules. Nosocomial infections is one of the important concern in hospitalized patients. An estimated 20%–40% of HAIs have been attributed to cross-infection via the hands of healthcare personnel, who have become contaminated from direct contact with the patient or indirectly by touching contaminated environmental surfaces.[1]

Disinfection and sterilization are essential for medical and surgical instruments to ensure that they do not cause such nosocomial infections. To be precise "*sterilization"* is defined as a process that destroys or eliminates all forms of microbial life and is carried out by physical or chemical methods whereas *"disinfection"* is defined as a process that eliminates many or all pathogenic microorganisms, except bacterial spores, on inanimate objects.[2] Antiseptic and disinfectants are therefore chemical agents that inhibit or destroy microorganisms on living tissue (antiseptics) and inanimate surfaces and objects (disinfectants). They are a crucial part of infection control practices. [3]Antiseptics and disinfectants are used at length in hospitals and other health care settings for a variety of topical and hard-surface applications. In specific, they play a fundamental role in infection control practices and help in the avoidance of numerous nosocomial infections.[4] Various types of antiseptics and disinfectants available in hospitals are phenol, glutaraldehyde, formaldehyde, sodium hypochl-orite, benzokonium chloride, povidone iodine etc. Various factors viz. risk of infection of the room/surface/ equipment must also be considered in the choice of the disinfectant, as well as its concentration and exposure time.[5]

An infection control team plays a vital role in the prevention of HAI in the healthcare setting. Among the healthcare workers, nurses have a critical role to play in the prevention measures and infection control and they should have opportunity for continuous professional development. A study done by Suchitra et al. stated that knowledge regarding standard infection control practices and universal precautions improved significantly and had a positive impact on knowledge and awareness of nursing staff.[6] Therefore this study was planned to assess knowledge of use of antiseptics and disinfectants among nurses of a

tertiary care government hospital, Pune, which would better guide to fulfill the gaps.

Purpose of the Study

Nosocomial infections are one of the important concerns in hospitalized patients. Sterilization and disinfection measures help to reduce the nosocomial infection rate. Thus this study was conducted to assess the knowledge regarding the use of antiseptics and disinfectants among the staff nurses of a tertiary care government hospital, Pune.

Objectives

1. To assess the knowledge of nurses about the use of various antiseptic and disinfectants.

Materials & Methods

This questionnaire-based cross-sectional study was conducted in a tertiary-care government hospital. Prior approval from Institutional Ethics Committee was taken. Pilot study was conducted on 10 nurses for the validation of questionnaire. Only validated questions were included in the questionnaire. From the total 1056 staff nurses working in Sassoon General Hospital ,Pune , 250 staff nurses working wards, O.T and OPDs were selected randomly using random number table. Written informed consent obtained from the staff nurses who were willing to participate. The questionnaire containing 20 questions were given to the nurses. The questionnaire consisted of multiple choice questions having four options for each question with only one correct answer to be marked.

Questions was based on various aspects like definition and use of antiseptic an disinfectant ,uses of phenol, uses of chloroxynol and regarding its potency in the presence of organic matter, uses of povidone iodine and as it is available as scrub, lotion , ointment, its uses according to its dosage forms. Some questions were on knowledge of that within how much time skin becomes sterilized after using alcohol swab before hypodermic injection administration and the minimal time required for alcohol based hand wash to kill most of the germs on hands. Some questions were based on knowledge about dilution of Benzalkonium chloride for washing and mopping the floor and walls. Some questions were regarding fumigation of OT .A few questions were on knowledge glutarldehyde and about its special precautions to be taken while handling it.

Each correct answer was given one mark and wrong answer or un- attempted question received zero marks.

- Marks obtained by each staff nurse, was calculated along with percentage marks obtained. Then percentage marks of these nurses were categorized as per grades obtained as per eight-point grade point averages (GPA) introduced by University of Mumbai.[7]
- Percentage of staff nurses who solved respective questions correctly was also calculated.

Inclusion criteria:

- Staff nurses working in the wards, operation theatre and out-patient departments were selected.

Exclusion criteria:

- Staff nurses working in the intensive care units of medicine, pediatrics and trauma were excluded.
- Senior nurses (matron) and sister in-charge, student nurses were not be included in this study

Results

The percent of nurses scoring grade B (good) was only 2.4% and 5.6% staff nurses got grade C (satisfactory work) respectively. 65.2% nurses scored grade D (i.e. got marks sufficient to pass) whereas 26.8% staff nurses failed in the above test as they scored grade E (not sufficient to pass) .It is notable that none of the nurses scored grade S (excellent) or even grade A (very good). (Graph-1,Table-1).

The question –wise analysis revealed that 93.6% nurses correctly attempted question 15 which assessed their knowledge about which agent is used to clean spillage of body fluid like blood, serum etc. 92% and 90.4% nurses were aware about the definition of the antiseptic and disinfectant which were asked in question one and two respectively. 80% nurses had knowledge about within how many days activated solution of Glutarldehyde has to be used. 75.6 % nurses had knowledge about uses of glutardehyde, but only 21.6% nurses were aware about special precautions to be taken while handling Glutaraldehyde.70.8% nurses were aware about of hand washing methods and which antiseptic is to be used (alcohol rubbing or chlorhexidine hand wash) before giving injection, after exposure to blood , before touching patients in the ward in between two beds and after removing gloves (question 9).

59.6% nurses were aware about uses of potassium permanganate and that it should not be used to disinfect surgical instrument as they rust due to chemical inetraction (question 5). Regarding Povidone iodine, 57.6% nurses were aware about uses, its dosage forms as scrub, lotion , ointment and its uses according to its dosage forms(question 6) . The knowledge regarding fumigation of OT which agents can be used was known to 52.4% nurses (question 13) but only 30.4% nurses had knowledge that ammonia is used to neutralize OT after fumigation with Formalin (question12).

The performance was not appreciable in remaining questions .Only 12.8% nurses were aware about uses of phenol (question 3). The knowledge about storage of Sanidex (question 18) was correctly answered by 29.6% nurses. 22.8% nurses were aware about uses of cresol (question 7). The precautions to be taken while handling glutraldehyde was known correctly only by 21.6 % nurses (question 17). and 20% nurses were aware that chloroxynol (dettol) loses its potency in the presence of organic matter (question 4) . 12.8% (question 3).11.2% nurses were having knowledge that in what dilution Benzalkonium chloride is used for washing and mopping the floor and walls (question 10).

Poor performance was seen in questions 8,11 and 19 . Only 8% nurses were aware that the minimal time required for alcohol based hand wash to kill most of the germs on hands is 20 sec (question 19).Only 4.8% nurses were have knowledge that within how much time skin becomes sterilized after using alcohol swab before hypodermic injection administration (question 8) and 2.4% nurses were aware about uses of chlorosan (medichlor) and it is not used to disinfect surgical instruments (question 11).

Graph.1

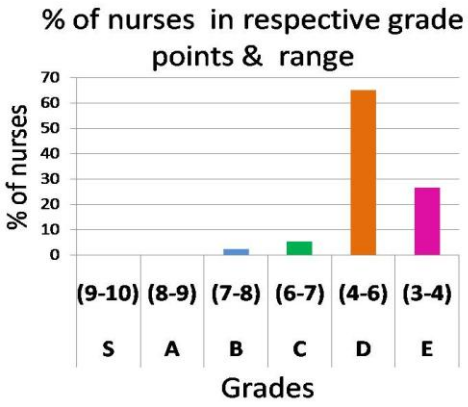
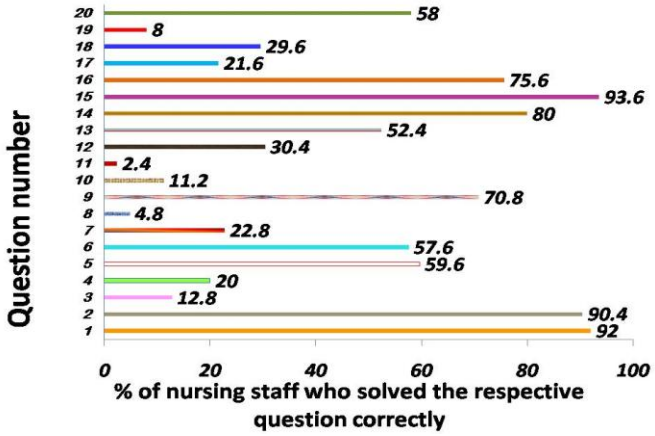


Table 1:

Letter Grade	Grade Points	in Words	Number of nurses	Percent of nurses
S	9-10	Excellent	0	0
A	8-9	Very Good	0	0
B	7- 8	Good	6	2.4
C	6-7	Satisfactory Work	14	5.6
D	4-6	Sufficient to pass	163	65.2
E	3-4	Not Sufficient to pass	67	26.8

Graph 2: Percentage of staff nurses who solved the respective question correctly



Discussion

Disinfection is an important strategy in prevention and control of cross contamination between surfaces and patients by direct or indirect contact. Healthcare settings are a strong platform for a fight against healthcare- associated infections HAIs. [8] Nursing staff play a pivotal role minimizing such HAI. Therefore their knowledge related to antisepsis and disinfection is important (Ref to find). In this study it was observed that nurses were aware about the definition of the antiseptic and disinfectant (92% and 90.4% respectively) which suggests that they were having the knowledge about appropriate agent is to be used on skin and mucous membrane i.e. on the living surface for anti-sepsis and which is to be used on inanimate object for disinfection.[2]

In the guideline for Disinfection and Sterilization in Healthcare Facilities, 2008.[9] it has been said that Organic matter in the form of serum, blood, pus, or fecal can interfere with the antimicrobial activity of disinfectants resulting in a complex that is less germicidal or nongermicidal, leaving less of the active germicide available for attacking microorganisms. Chloroxynol, chlorine and iodine containing disinfectants, in particular, are prone to such interaction. This emphasizes the importance of meticulous cleaning of medical devices before any sterilization or disinfection procedure because both organic and inorganic soils are easily removed by washing. In this study only 20% nurses were aware that chloroxynol (dettol) loses its potency in the presence of organic matter and that benzalkonium chloride (e.g. Saniquad) requires protection from sunlight was known to only 29.6% of nurses. Such gaps in knowledge may lead to inadequate disinfectant action by agents used; which may give a false sense of security while still promoting the spread of infection.

93.6% nurses were aware about which agent is used to clean spillage of body fluid like blood, serum etc. This may be because many trainings and workshops are taken in this tertiary care center by department of Microbiology, regarding management of biomedical waste, hand washing techniques and what precautions has to be taken when health care- worker (HCW) comes in contact with biological fluids. Hypochlorites (medichlor)are also the agent of choice in disinfecting surfaces or in bathrooms but the major disadvantage of hypochlorites include corrosiveness to metals in high concentrations (>500 ppm).[9] As very little as 2.4% nurses were aware about uses of Hypochlorites (medichlor) and that it should not be used to disinfect surgical instruments.

Researchers have recommended the preparation of skin prior to injections .Swabbing the injection site with a saturated 70% alcohol swab for 30 seconds and allowing to dry for 30 seconds is essential in order to reduce the number of pathogens.[10] Only 4.8% nurses were aware that within how much time skin becomes sterilized after using alcohol swab before hypodermic injection administration and only 8% nurses were aware that the minimal time required for alcohol based hand rub to kill most of the germs on your hands is 20 seconds. Noncritical environmental surfaces (e.g., bed rails, bedside tables and medical equipment that subsequently contacts patients like stethoscope and sphygmomanometer) are frequently touched by hands of health-care workers, potentially could contribute to secondary transmission by contacting. [9] Sanitizers are easily accessible — at the bed side, at the doorway, or as personal carriage. They are fast-acting, killing

germs in as little as 15 seconds.[11] Health care worker must have knowledge of sterilization time of when alcohol swab is used as antiseptic before hypodermic injection and alcohol based hand rub is used in between checking the patient or using same stethoscope or sphygmomanometer for different patient. Otherwise it may give false sense of safety from infections.

11.2% nurses were having knowledge about the appropriate dilution Benzalkonium chloride that is used for washing and mopping the floor and walls. Some disinfectants should not be diluted; those that are diluted must done in accordance with the manufacturers' recommendations and correctly to achieve optimal effect. The most important information to the end user of a chemical disinfectant is the use-dilution label. It is imperative that disinfectants must be diluted properly to effectively clean and disinfect environmental surfaces. Disinfectants that are diluted at a higher concentration than the label recommends can be toxic to individuals and/or the environment. The use of concentrated chemicals may cause skin and lung irritation and/or tissue damage. By contrast, a concentration of less than the recommended amount can also have deleterious effects by not achieving the proper kill. A disinfectant diluted to its proper concentration will be effective against all organisms listed on the label. [12]

A 37 % aqueous solution of Formaldehyde is called Formalin – which is used of fumigation of spaces. [2] Regarding knowledge about agents used for fumigation of OT 52.4% nurses answered correctly but only 30.4% nurses were aware that ammonia is used to neutralize OT after fumigation with Formalin. Formaldehyde is very toxic to humans. Inhalation of formaldehyde gas will cause irritation to the nose, eyes, mouth and throat sometimes respiratory distress swelling of the larynx and lungs or may cause the onset of asthma in sensitive individuals. Exposure of the eyes to vapors of formaldehyde solutions causes irritation with immediate stinging and burning, with spasm of the eyelids and tearing. Repeated or prolonged skin contact with solutions of formaldehyde can give rise allergic contact dermatitis. Formaldehyde has been classified by the International Agency for Research on Cancer as carcinogenic to humans. It produces nasal tumours following prolonged exposure by inhalation to levels producing chronic irritant effects.[13]

Regarding knowledge assessment on glutarldehyde, 80% nurses were aware about within how many days activated glutarldehyde solution has to be used ,75.6 % nurses were aware about its uses and its contact time but only 21.6% of nurses were aware about its special precautions to be taken while handling glutaraldehyde - which was of real concern. Healthcare personnel can be exposed to elevated levels of glutaraldehyde vapor when equipment is processed in poorly ventilated rooms, when spills occur, when glutaraldehyde solutions are activated or changed, or when open immersion baths are used. Acute or chronic exposure can result in skin irritation or dermatitis, mucous membrane irritation (eye, nose, mouth), or pulmonary symptoms. Epistaxis, allergic contact dermatitis, asthma, and rhinitis also have been reported in healthcare workers exposed to glutaraldehyde [.9,14]

The results of the studies of Allah-Bakhshian A Abdollahi et al showed that 26.5 percent of nurses had weak awareness, 69.3 percent of them had medium awareness and 9.5 percent of them had good awareness.[15] The results of a study also shows that 65.2% staff nurses received sufficient to pass marks. The recent global increase in HAI rates suggests that there is a critical need for improved periodic education and training of HCWs[.16] HAI takes a heavy toll on patients and their families by causing illness, prolonging hospital stays, reducing the quality of life, increasing the potential of disabilities, increasing the resistance of the microbes to antimicrobials, as well as leading to excess costs and sometimes death of the patient .Education and training of healthcare workers about standard infection control, as well as strict adherence by healthcare staff and students to aseptic practice, can reduce

the extent of risks of HAI.[17] Various studies suggest that that the training workshops have had a significant effect to improve awareness of nurses about hospital-acquired infections.[18] It is therefore important to identify the gaps in the knowledge of the health care workers before the implementation of any training programme.

Conclusion

Nursing staff play a pivotal role minimizing such HAI. Therefore their knowledge related to antisepsis and disinfection is important. This study emphasizes

the importance of implementing frequent training programme ,workshops to improve awareness of nurses about hospital-acquired infections. This study also tries to bridge the gap between the knowledge in the health care workers and its use for better infection control.

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