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RESEARCH ARTICLE

THE INCIDENCE OF NOSOCOMIAL INFECTIONS AND THEIR CAUSATIVE FACTORS IN ACUTE WARDS OF A TERTIARY CARE HOSPITALS

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Abstract

A nosocomial infection - also called "infection" can be defined as "An infection occurring in a patient in a hospital or other health care facility in whom the infection was not present or incubating at the time of admission." This includes infections acquired in the hospital but appearing after discharge, and also occupational infections among staff of the facility. Patient care is provided in facilities which range from highly equipped clinics and technologically advanced university hospitals to front-line primary health centers with only basic facilities. Despite progress in public health and hospital care, infections continue to develop in hospitalized patients, and may also affect hospital staff. Many factors promote infection among hospitalized patients: decreased immunity among patients; the increasing variety of medical procedures and invasive techniques creating potential routes of infection; and the transmission of drug-resistant bacteria among crowded hospital populations, where poor infection control practices may facilitate transmission.

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Introduction:-

One of the earliest records of hospital infections are perhaps those found in Egyptian papyrus written around 3000 B.C. Needless to say, mere absence of documentation of bacterial infection does not exclude its prevalence prior to this time. In the Indian context a similar account of hospital infection is available in the ancient Ayurvedic literature (660 B.C.). Florence Nightingale established important principles of nursing, hospital design and hygiene. The infections number approximately 5,00,000 per year, among an estimated 27 million surgical procedures, and account for approximately one quarter of the estimated 2 million nosocomial infections in the United States each year. Infections result in longer hospitalization and higher costs. A large number of studies quote varying incidence rates; they range from as low as 1.1 percent for clean surgeries to as high as 27 percent for contaminated surgeries. Pathogenic organisms are the cause of this infection. The source of these pathogens may be internal - from the patient's skin, mucous membranes, or hollow viscera or exogenous which include surgical personnel (especially members of the health care worker), the operating room environment (including air), and all tools, instruments, and materials brought to the sterile field during an operation. Nosocomial infection can be caused by bacteria, viruses, fungi or parasites. These microorganisms may already be present in the patient's body or may come from the environment, contaminated hospital equipments, health care workers or other patients. Depending on the causative agents involved, an infection may start in any part of the body. A localized infection is limited to a specific part of the body and has local symptoms. For example, if a surgical wound in the abdomen becomes infected, the area around the wound becomes red, hot and painful. A generalized infection is one that

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enters the blood stream and causes systemic symptoms such as fever, chills, low blood pressure or mental confusion. Nosocomial infections may develop from the performance of surgical procedures, from the insertion of catheters (tubes) into the urinary tract, nose, mouth, or blood vessels, or due to material from the nose, or mouth that is aspirated (inhaled) into the lungs. The most common types of hospital acquired infections are urinary tract infection (UTI), ventilator associated pneumonia and surgical wound infections. Three major forces are involved in nosocomial infections. The first is use of antimicrobial drugs in hospitals and long term care facilities. The increased concern about gram-negative bacilli infections in the 1970s to 1980s led to increased use of Cephalosporin antibiotics. Use of antimicrobial drugs in longer care facilities and transfer of patients between these facilities and hospitals have created a large reservoir of drug resistant strains of microorganisms in hospitals. Secondly, many hospital personnel fail to follow basic infection control, such as hand washing between contacts with different patients. In ICUs asepsis is often overlooked in the rush of crisis care. Thirdly, patients in hospitals are increasingly immuno-compromised. The shift of surgical care to out patients' centers leaves the sickest patients in hospitals, which are becoming more like large ICUs. This shift has led to the greater prevalence of vascular access associated bloodstream infections and ventilator associated pneumonia.

Material and Methods:-

The study was conducted in acute surgical ward, ICU and urology ward of Defence hospital at Lucknow from June 2007 to July 2008 to evaluate the incidence of nosocomial infection and locate / determine the possible sources of such infection. Research design selected for this study is exploratory case study, by observation method and there is no control group. 100 male patients were randomly selected with clean abdominal surgeries like gall stone disease, renal calculus, uretric calculus, appendicitis, inguinal hernia, and peptic perforation and they were studied. The particulars of the randomly selected patients were tabulated. The fact that the cases were clean abdominal surgeries was confirmed by PA check up notes, laboratory findings, doctors' notes, TPR charts as well as general condition of the patient.

On admission, the randomly chosen one hundred patients' blood (Hb, TLC, DLC, peripheral blood smear) and Urine Routine Examination was done and the tests were again repeated on the third day after the surgery. On the fourth day whosoever developed symptoms of infection the following additional tests like Urine culture, blood culture, wound swab culture, throat swab culture and X ray Chest PA view, ELISA for HCV, HBsAg., HIV and M Tb PCR were done apart from the routine tests. Wall swabs, floor swabs, cot swabs for culture were done routinely to find the growth of any organism. Basic vital parameters like TPR, BP were recorded six hourly for selected cases (those who had developed symptoms of infection) from the day of admission till the day of discharge. Among the many sources of infection of patients after surgery, one possible source is the health care workers and the class IV employees who come in contact with the patients. Questionnaires were given. Observing the practices and the nursing procedures of sixty health care workers and twenty class IV employees. The health care workers include 40 nurses, 20 nursing assistants and the class IV employees include 10 safaiwalas and 10 safaiwalis. The questionnaire consists of observation of the following:

1. Hand washing practice
2. Disposal of bio medical waste method
3. Usage of protective devices
4. Nursing procedures
5. Sterilization and disinfection
6. Dealing with blood spillage
7. Before and after insertion of peripheral catheters
8. Before and after insertion of urinary catheters

Results:-

The collected ungrouped quantitative data were grouped and arithmetic mean, variance were calculated out, to arrive at the Standard Deviation (σ) and Standard Error by using the statistical calculations. The unsafe practices and with its respective post operative symptoms were correlated statistically by using simple and 2 x 2 Chi-Square test, with permissible degrees of freedom and probability.

$$\text{Mean} = \frac{\text{sum of the x value}}{\text{—————}}$$

$$\begin{aligned} & \text{total number of samples studied} \\ & \sum x \\ & = \frac{\quad}{n} \\ & \sum fx \\ \text{Standard Deviation (SD)} &= \frac{\quad}{n} \quad \text{where } n = \sum f. \\ & \sigma \\ \text{Standard Error (SE)} &= \frac{\quad}{\sqrt{n}} \end{aligned}$$

where n is total number of samples studied.

$$\text{Chi-square test} = \frac{(O - E)^2}{E} \quad \text{where O is observed mean, E is expected mean.}$$

Methods of recording incidence of Nosocomial Infection

For the purpose of this study nosocomial infection is defined as the evidence of infection in a patient after admission to the hospital, noticed after 72 hours. The patient was suspected of nosocomial infection if he had any one of the following symptoms:

1. Post operative fever after 72 hours.
2. Cough with expectoration.
3. Post operative wound infection as evidence by purulent discharge.

Nosocomial infection was confirmed on the basis of clinical laboratory evidence and microbiological evidence which are given as below:

Laboratory evidence:

Any one of the following

1. TLC more than 11000 per cu mm.
2. Presence of toxic granules in the peripheral smear.
3. Abnormal urine examination with proteinuria, pyuria in the setting of dysuria.

Microbiological evidence :

Growth of micro organism.

Results:-

The analysis of the questionnaire collected from 60 health care workers and 20 class IV employees are done in this chapter. In this chapter study findings are grouped and statistically analysed and presented under the following headings.

The analysis of health care workers hand hygiene practices, universal practices, wearing of protective equipments is pictorially represented in Figure 1. The hand hygiene practices before any procedure was found to be on the lower side, however after the procedure most of them were found to follow the correct procedure. The nursing procedures like bed making, sponge bath, mouth care, steam inhalation, oxygen administration, recording TPR, BP were found

to be on higher side and is represented in Figure 2. Also the nursing practices before and after insertion of periphery catheters, urinary catheters, sample collection was also were seen to be on higher side and is represented in Figure 3. The nursing universal practices like sterilisation and disinfection procedures accident awareness, preventing from sharp injuries and blood spillage was observed and graphically represented in bar chart Figure 4. Method of disposal of biomedical waste is shown as pie chart in Figure 5. The working practices of class IV employees are shown in figure 6 and 7.

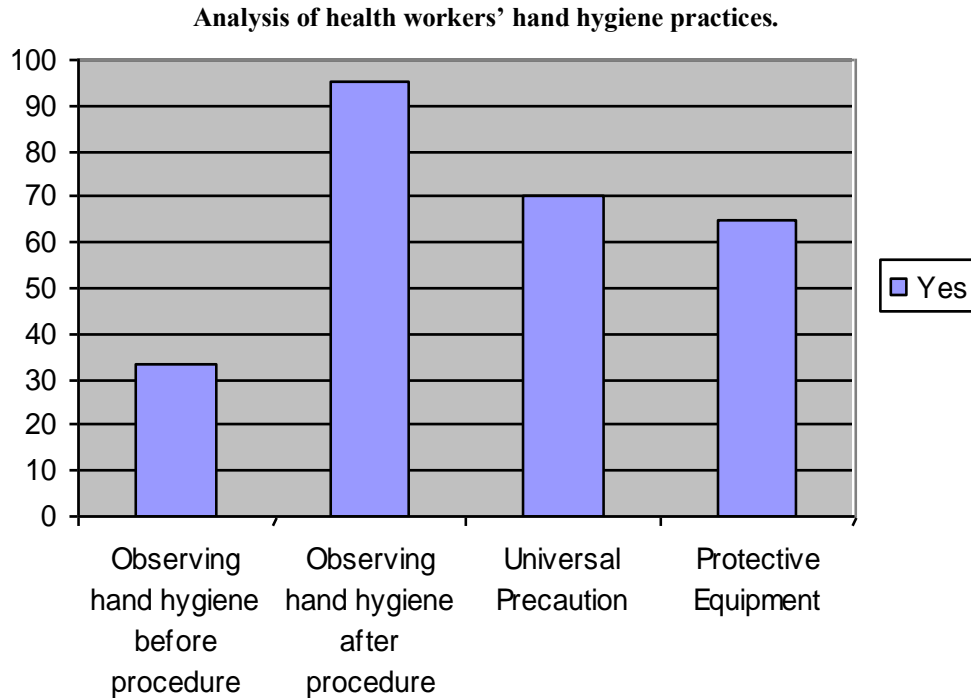


Figure 1:- Bar diagram analyzing health workers' hand hygiene practices.

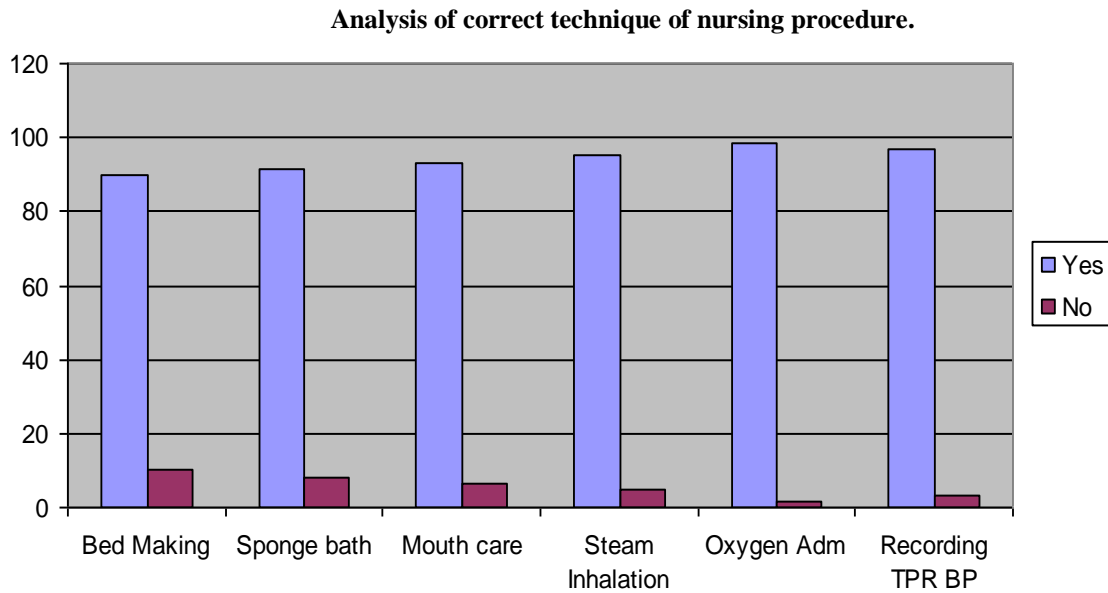


Figure 2:- Bar Diagram analyzing correct technique of nursing procedure. Analysis of correct technique of nursing procedure (sample collection, before and after insertion of urinary catheters, periphery catheter and wound dressing).

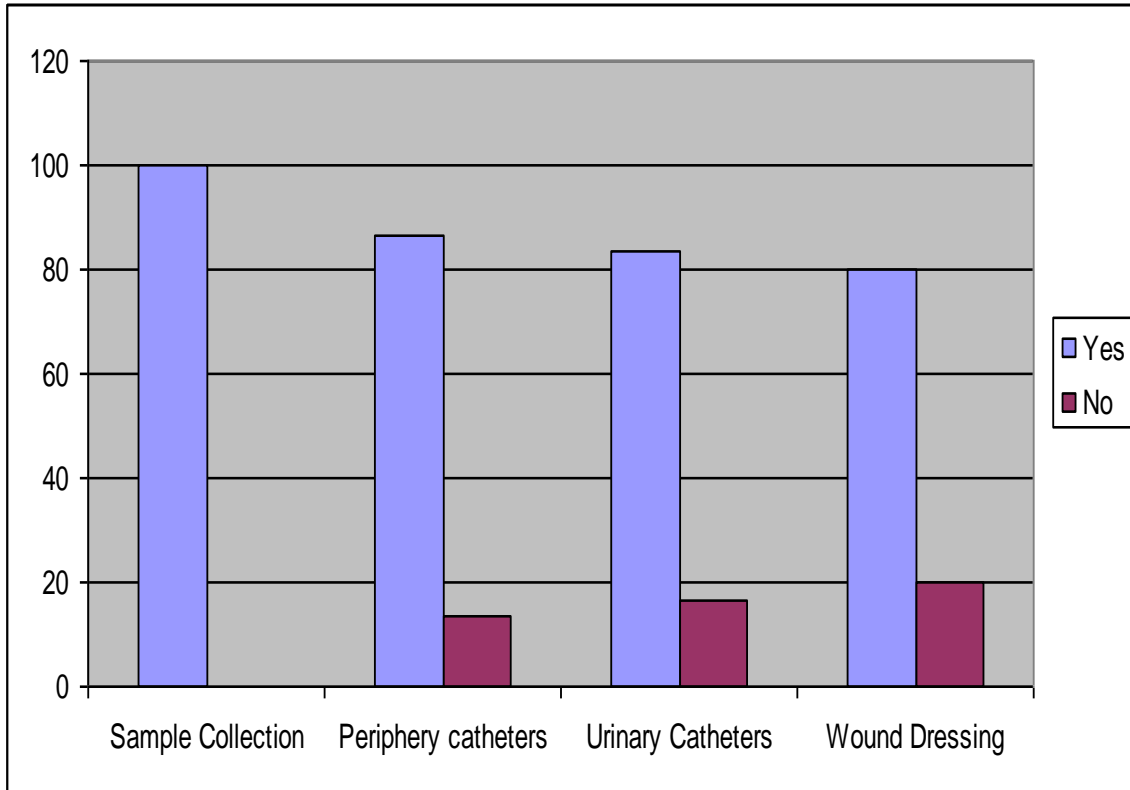


Figure 3:- Bar Diagram analysing correct technique of nursing procedure. Analysis of health workers sterilization and disinfection practices.

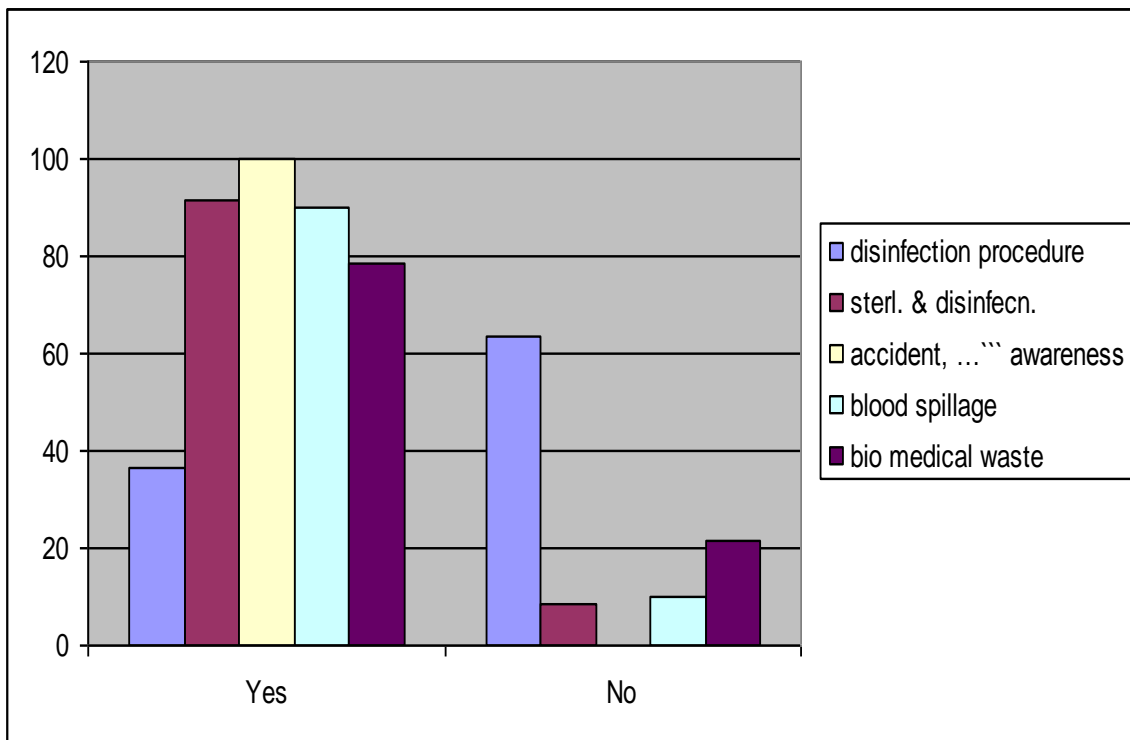


Figure 4:- Bar Diagram analyzing health workers' sterilization and disinfection practices.

Disposal of Waste.

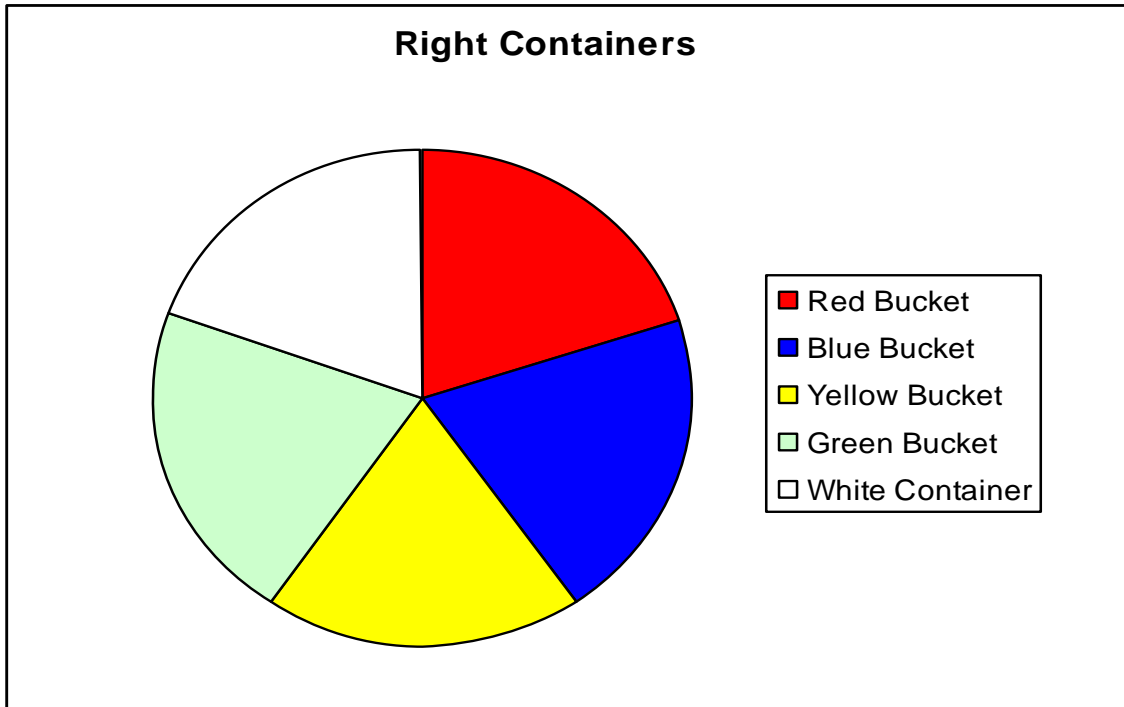


Figure 5:- Pie chart showing disposal of waste in the right containers.

Working Practice of Class IV Employees.

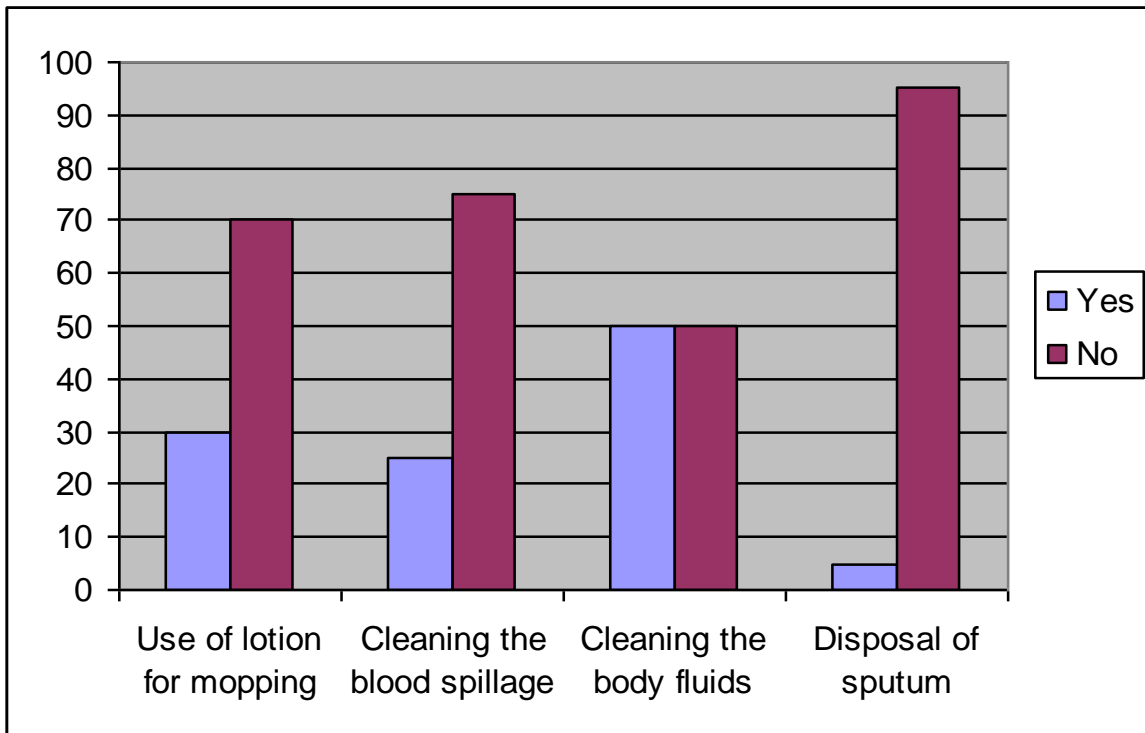


Figure 6:- Chart showing the working practice of Class IV employees. Bar Diagram showing extent of procedurally correct practice by Class-IV employees.

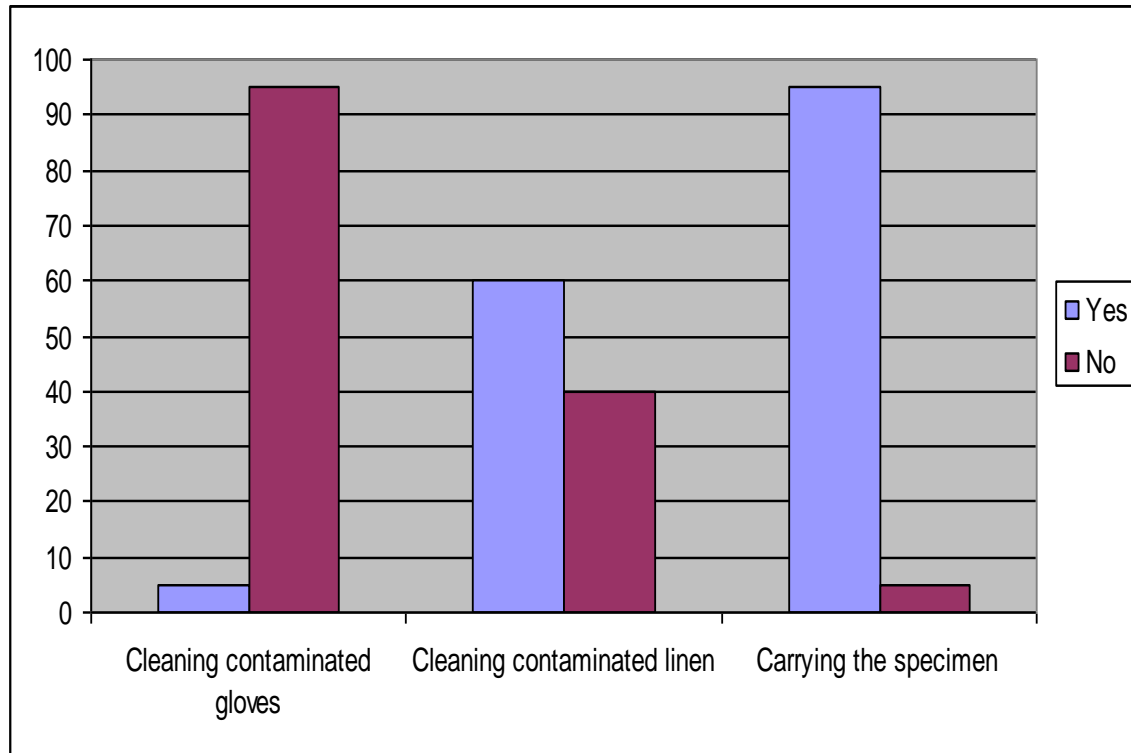


Figure 7:- Chart showing the working practice of Class IV employees.

Discussion:-

Recently much attention has focused on the increasing incidence of hospital acquired infection. Worldwide, at least 1 in 4 patients in intensive care will acquire an infection during their stay in hospital. In developing countries, this estimate may be doubled. Studies and reports have highlighted hospital cleanliness as a factor in this increase, and governmental pressure is being applied to improve hygiene standards. The most common complication threatening the hospitalized patients today is nosocomial infections. It affects approximately 2 million patients each year and kills 90,000. In acute care hospitals up to 10 % of patients acquire one or more these infections. To understand the causative pathogens of nosocomial infection was carried out, where they fall into the category of urinary Tract Infection (UTI), Upper Respiratory Tract Infection (URTI), Surgical Site Infection (SSI) which is correlating. Improper nursing procedures can result in colonisation with infectious bacteria and could play a role in hospital acquired infection. Surfaces near a patient with MRSA (Methicillin Resistant Staphylococcus Aureus) are commonly contaminated with MRSA. This transfer of bacteria from surface to surface means that infectious bacteria from one part of the hospital can be brought right up to a patient's bedside, circumventing any control measures in place. This study was conducted in Defence hospital at Lucknow to study the incidence of nosocomial infection and their causative factors. The sample population consists of 60 health care workers which include thirty nursing officers, 10 nursing assistants, 10 safaiwalas and 10 safaiwalis. The method of sample selection was done by randomly selecting 100 cases of surgical cases with clean abdominal surgeries and were observed from the date of admission till the date of their discharge. The nursing practices of the nursing officers working in ICU, surgical ward, urology ward and family wards in all three shifts were observed. Similarly the working practices of 10 safaiwalas from ICU, surgical ward and urology ward and 10 safaiwalis from family wards in all three shifts was observed. Among the health workers, class IV employees were reluctant in adhering the hand hygiene practices, 66 % of them were not following the hand hygiene practices before patients' care and procedure. But after the patient care 95 % of the class IV employees are following the hand hygiene practices. The concurrent practices and terminal disinfections in the ward is around 36 % among the health care workers. Though they are aware of the procedure of taking precautions for blood spillage, yet many do not adhere to the recommendations laid down. The same organism has affected more than one patient. This was evident as the antibiograms were similar. Due to the time constraint more number of sample could not be collected for this study. The nosocomial infection observed in Defence hospital at Lucknow is 21 % which is within the acceptable range of Indian national average of 10 - 25 %.

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