

Efficacy assessment for disinfection process in Buraidah Maternity Hospital – Saudi Arabia

ALI MOHIELDIN¹, KAMAL ELBSSIR², HAMID NOURAIN³, NAJLAA SIDDIQ NASIR⁴, MOHAMED THARWAT ALABBASY⁵

¹ King Khalid University, Abha, KSA *, ²Faculty of Public Health and Health Informatics, University of Hail, Saudi Arabia; ³Faculty of Public Health and Health Informatics, University of Hail, Saudi Arabia; ⁴Khartoum North, Faculty of Public Health, Alzaim Alazhari University, Sudan; ⁵Faculty of Public Health and Health Informatics, University of Hail, Saudi Arabia

Received 6 December 2017

Accepted 28 January 2018

Introduction

Disinfection is the process of killing or weakening of harmful or unwanted microscopic disease-causing organisms [1]. Disinfectants are chemicals used to inhibit or prevent the growth of microbes on inanimate objects. Usually disinfectant is bactericidal in that they kill the susceptible potential pathogenic agents [2]. Sterilization is a more practical approach and is particularly useful when the microorganisms at hand are resistant applied disinfectants, sterilization kills all microscopic life forms and is not restricted to the application of chemical sterilizing agents [1].

Transmission of healthcare-associated microorganisms and pathogens commonly occurs on the hands of healthcare workers while attending to patients with infections is of a public health concern, disinfection and efficient sterilization are essential in ensuring that all surgical instruments and medical equipment do not contact and transmit disease-causing organisms. Therefore, the preventive health care policies and procedures should emphasize the routine disinfection [3]. The nature and extent of sterilization in hospitals is a primary but often overlooked concern in healthcare. Hospitals and other health facilities present an enormous chance for the proliferation and spread of infections. These new infections are often attributed to minor and major surgeries, as well as contact with contaminated equipment, surfaces and body fluids.

Correspondence to: Dr. Ali Mohieldin

Email: almoibrahim@kku.edu.sa

ABSTRACT

Objective: This is a case study conducted in Buraidah Maternity Hospital in Kingdom of Saudi Arabia during the period of 2014-2015 to assess the efficacy of disinfection process using Hypochlorite and Dettol in the hospital.

Methods: 50 Swab samples were collected from different surfaces in operations rooms and hospital corridors before and after disinfection processes, followed by total bacterial count for all samples using Aerobic Plate Count (APC) technique according ISO 2004 of Horizontal methods for sampling techniques from surfaces using contact plates and swabs.

Results: The results of the study revealed significant reduction in the total bacterial count ranged from 91% to 96%.

Conclusion: The study concluded the use of Hypochlorite and Dettol are reliable disinfectants indicated by effectiveness and adequacy of disinfection process in the hospital.

KEY WORDS:

Efficacy Assessment
Disinfection
Maternity Hospital
Buraidah
KSA

Hypochlorite has been used as a disinfectant for more than 100 years. It has many of the properties of an ideal disinfectant, including a broad antimicrobial activity, rapid bactericidal action, reasonable persistence in treated potable water, ease of use, solubility in water, relative stability, relative no toxicity at used concentrations, no poisonous residuals, no color, no staining, and low cost [4]. Dettol which is a mixture of para-chlorometaxyleneol terpinol and iso-propanol, is an antiseptic used widely in homes and healthcare settings for various purposes including disinfection of skin, objects and equipment, as well as environmental surfaces [5].

Materials and methods

Sample collection and preparation

A limited area (100 cm²) were swabbed by using the swab method suggested protocol [6], 50 samples collected from

different surfaces in operations rooms and hospital corridors before and after disinfection processes, followed by total bacterial count for all samples using Aerobic Plate Count (APC) technique according ISO 2004 of Horizontal methods for sampling techniques from surfaces using contact plates and swabs.

The swab was first dipped into a screw-capped bottle containing 100 ml of 0.1% sterile buffered peptone water (Oxoid CM9) and well rubbed over the appropriate area of the surface to be examined. A second dry swab was also rubbed over the same area to collect the residual moisture. Both swabs were dropped into the bottle of peptone water and the wooden sticks were stripped off.

Collected samples were transferred to the laboratory with undue delay where they were subjected to the bacteriological examination.

One ml of each sample was transferred into sterile test tube contained 9 ml of 0.1% peptone water, then ten folds serial dilution were prepared up to 10^{-6} . The average number of colony forming units in countable plates was enumerated and the average number of organisms per cm^2 were calculated and recorded

Aerobic Plate Count:

This was done according to USA FDA's Bacteriological Analytical Manual (BAM-1998). Pipette 1 ml of each dilution into separate, duplicate, appropriately marked Petri dishes. Re-shake dilution bottle 25 times in 30 cm area within 7 second before it was pipetted into petri dish, samples dilutions and agar medium were mixed thoroughly and uniformly by alternate rotation, back and forth motion of plates on flat level surface and incubated for 48 ± 2 h at 35° C. then colonies were counted using colonies counter, plates containing 25 to 250CFU were considered [7].

Bacterial identification using MALDI-TOF MS

This was done according to Zenobi 1998. A loop from each dilution was sub cultured on MacConkey agar media and Mannitol Salt Agar media. Bacterial identification was carried out by using part of the bacterial colony to one of the circles of the device dish and then covers each bacterial colony by adding $1 \mu\text{l}$ from MALDI TOF MS mixture [8].

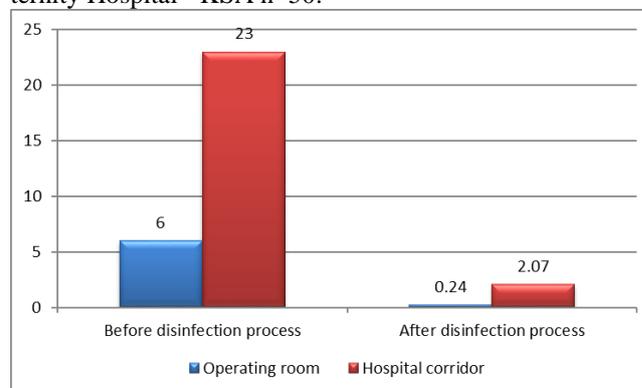
Statistical Analysis

Statistical analysis was conducted using statistical package for social science program (SPSS) was to calculate the frequencies and percentage and to generate table and figure which were presented below.

Results

Our results on the effectiveness of cleaning and disinfection of the floors of operating room and hospital corridors in maternity hospital in Buraidah in kingdom of Saudi Arabia. Using swab and Aerobic plate counts (APC) techniques reported 600 CFU/ cm^2 and 2300 CFU/ cm^2 before disinfection process for operating rooms and hospital corridors respectively. After disinfection process it was found 24 and 207CFU/ cm^2 , respectively with reduction percentages of 96% and 91%. *Staphylococcus saprophyticus*, *Staphylococcus epidermidis*, *Proteus*, *Staphylococcus aureus*, and *Citrobacter* are the major bacteria identified during our investigation.

Figure 1. Show the mean of Total Bacteria Counts (CFU/ cm^2) *102 before and after disinfection process Efficacy assessment for disinfection process in Buraidah Maternity Hospital - KSA n=50.



Discussion

This study evaluated the cleaning and disinfection of the floors of operating room and hospital corridors in maternity hospital in Buraidah in kingdom of Saudi Arabia. Significant reduction was reported in total bacteria count.

During this study bacterial contamination of surfaces in the operating rooms and hospital corridors in Buraidah Maternity Hospital has been investigated by swab method before and after disinfection process. Aerobic plate counts (APC) of the floors of operating rooms and hospital corridors were found 600 CFU/ cm^2 and 2300 CFU/ cm^2 before disinfection process, respectively. On the other hand, the mean

count of APC of floors for operating room and hospital corridors were significantly reduced after cleaning and disinfection process using Hypochlorite and Dettol with a mean value of 24 and 207CFU/cm², respectively with reduction percentages of 96% and 91%.

Table 1. Show Predominant bacteria isolated before and after disinfection process using MALDI TOF. Efficacy assessment for disinfection process in Buraidah Maternity Hospital - KSA n=50.

Samples	Microorganism	
	Before cleaning and disinfection	After cleaning and disinfection
Operating rooms	<i>Staphylococcus saprophyticus</i>	
	<i>Staphylococcus epidermidis</i>	Nil
	<i>Proteus</i>	
Hospital corridors	<i>Staphylococcus aureus</i>	<i>Staphylococcus</i>
	<i>Staphylococcus epidermidis</i>	<i>coccus</i>
	<i>Staphylococcus saprophyticus</i>	<i>saprophyticus</i>
	<i>Proteus</i>	<i>icus</i>
	<i>Citrobacter</i>	

Potential transmission of organisms from the environment to patients is a concern, especially in enclosed settings, such as operating rooms, in which there are multiple and frequent contacts between patients, provider's hands, and environmental surfaces. Therefore, adequate disinfection of operating rooms and hospital corridors is essential.

Bacterial species found from various surfaces were mainly coagulate-negative staphylococci, derived from human being's body. In the light of these findings the regular use of disinfectant for cleaning of the floors and other surfaces in operating rooms is advisable; this also was suggested by Suzuki and other [10].

The results of this study emphasized the vital role played by cleaning and disinfection to improve hygienic situation in healthcare facilities, the same results were concluded by Akabueze and other in 2014 [9].

It was reported by Rawat that there is a considerable burden of these infections in HD patient and effort should be made to minimize infections to improve morbidity and mortality profile [11].

Continuous surveillance of surgical site infections and study of factors that might increase the risk is important to reduce SSI rates if communicated to surgeons on time

Conflict of Interest

I declare that we have no conflict of interest.

References

- 1 Ayliffe G. Disinfection in healthcare. Hoboken, NJ: John Wiley & Sons.2008.
- 2 Rossoni, EMM, Gaylarde CC. (2000). Comparison of sodium hypochlorite and peracetic acid as sanitising agents for stainless steel food processing surfaces using epifluorescence microscopy. Int J food microbial. 2000; 61(1): 81-85.
- 3 Hoffman P, Bradley C. Disinfection in healthcare (3rd ed). Mass Blackwell Pub. Malden.2004.
- 4 Rutala, WA, Weber DJ. Uses of inorganic hypochlorite (bleach) in health-care facilities. Clin Microbiol Rev. 1997;10 (4):597-610.
- 5 Igbinsola, EO. Ibhazukor MA, Eribo OA, Ogofure, AG. Efficacy of household cleaning agents against some selected pathogenic bacteria. African J Clin Exp Microbiol.2015;16 (2): 73-78.
- 6 ISO. Microbiology of food and animal feeding stuffs- Horizontal methods for sampling techniques from surfaces using contact plates and swabs. Switzerland.2004.
- 7 FDA's Bacteriological analytical manual (BAM) (1998a): Aerobic Plate Count. 8th Ed. FDA. USA.1998.
- 8 Zenobi, R, Knochenmuss R. Ion formation in MALDI mass spectrometry. Mass Spectro Rev. 1998;17 (5): 337-366.
- 9 Akabueze EC, Obi SC, Nwankwo EO, Ojoru AB. Evaluation of the Efficacy of Disinfectants Using Standard Methods in Healthcare Facilities in Kogi State, Northcentral Nigeria. Asian J Biomed Pharm Sci.2014;3(27): 34-38.
- 10 Suzuki, A, Namba Y, Matsuura M, Horisawa A. Bacterial contamination of floors and other surfaces in operating rooms: a five-year survey. Journal of hygiene,1984; 93(03): 559-566.
- 11 Rawat N, Mathur N, Rawat K, Mathur M, Chauhan N, Kakkar R, et al. Prevalence of hepatitis B, hepatitis C and human immunodeficiency virus infection among hemodialysis patients in a tertiary health care center of Western. Int J Med Sci Pub health.2017;6(4):724-727.