

*Original Article*

# Identification of Bacterial Isolates from Stethoscope of Healthcare workers at Al-Zawia teaching hospital

Salma Alamari<sup>1</sup> , Abobaker kharbash<sup>2</sup>

1.Dept. of Anesthesia & Intensive care units, Faculty of Medical Technology – University of Zawia - Libya.

2.Dept. of Medical Laboratories, Faculty of Medical Technology – University of Zawia -Libya.

Salma Alamari ORCID number:- <https://orcid.org/0000-0003-1546-218X>

Email:- [S.alamari@zu.edu.ly](mailto:S.alamari@zu.edu.ly)

## Abstract

Nosocomial infections are caused for great number of mortality and morbidity. Contamination may result from healthcare workers' hands or by direct patient's shedding of bacteria which are able to survive up to several months on dry surfaces. The diagram of stethoscope may play significant role in bacteria colonization and transmission from the patient to patient. **Objective:** To isolated and identified bacterial contamination of stethoscope used by health care workers. **Materials and Methods:** Carried the study between (September - October) 2022, at Zawia Medical Center, 50 swabs were obtained from surface of diagram of stethoscope; the positive isolates were identified according to the standard microbiological techniques. **Result:** The 28 (56%) sample were contaminated by potential pathogens, 14 (28%) were Non-hemolytic staphylococci, 9 (18%) were Staphylococcus hemolytic, 2 (4%) were Klebsiella spp, 3 (6%) were non-lactose fermenters, which are serious enteric pathogens. **Conclusion:** The samples taken from the stethoscope were contamination with highly pathogenic bacteria may lead to prevalence the nosocomial infections. Therefore, we recommend to using disinfected agent after each examination with stethoscope.

**Keywords:** Bacterial, Nosocomial, Healthcare, Stethoscope, Contamination.

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## Introduction

Nosocomial infections ( NIs ) means any clinical infection manifested in a patient 48 hours or more after admission to the hospital. A nosocomial (derived from the

Greek words noso (disease) and Komein ( to care for ), and later the Latin word for hospital nosocomium ), the term also includes infections acquired in nursing

homes and other health care facilities. The most important ways of transmission of nosocomial infections is by contact, usually directly but sometimes indirectly [1].

Hospital infections are one of the major medical, social, and economic problems of developed and developing countries and have been known for centuries as a severe problem influencing quality of healthcare and as the main reason for the undesirable side effects of healthcare. Hospital infections are infections caused from 48 to 72 hours after hospitalization or, at the maximum, six weeks after discharge from hospitals. These infections are not latent in patients but rather develop in them for the first time [2,3]. Hospital infections prolong patient hospitalization, raise patient mortality rate, and, as a result, increase hospital expenses [3]. Hospital infections prolong patient hospitalization, necessitate additional treatment, raise patient mortality rate, and afflict healthy people and lower the level of health in the society. These infections spread not only to patients but also to anybody in contact with them such as hospital staff, visitors, and others.

Hospital-acquired infections, also known as healthcare-associated infections (HAI), are nosocomially acquired infections that are typically not present or might be incubating at the time of admission. These infections are usually acquired after hospitalization and manifest 48 hours after admission to the hospital. [4].

Some types of HAIs are related to the procedures or devices used to provide healthcare.

contaminated medical devices such as blood pressure cuffs, stethoscopes, latex gloves, masks, neckties, pens, white coats, computers and accessories like keyboards have been associated with outbreaks of HAI [3], and antibiotic-resistant bacteria may be transmitted from one patient to another through medical devices [5].

The stethoscope has been the centre of patient care and universally used by healthcare workers and is a bond between the patient and a doctor.

Stethoscope is an essential device of patient care, providing diagnostic and prognostic information with a repeatable and non-expansive manner. Detecting a heart murmur with auscultation is the easiest way to screen for valvular heart disease.

and has a significant impact on prognosis [6]. Additionally, the stethoscope is not merely a tool for physical examination but also serves as an icon of the medical profession, used by the medical staff [7].

Performed study (1999) at the Department of Paediatrics, Kasturba Medical College and Hospital were results High percentage of methicillin resistant *S aureus* (69.76%) and multi-drug resistant Gram-negative bacilli (20.93%) on regularly used stethoscopes. isolated bacteria predictable to be nosocomial infection. A verbal survey showed that regular cleaning is not prevailing among doctors [8].

Another study at the Department of Microbiology, Manipal College of Medical Sciences, Pokhara, Nepal, between (April - October) 2010 showed a total of 58 diaphragms, 52 (89.65%) were colonized by bacteria [9].

Between August 2015 and February 2016, Stethoscopes of 122 health care workers from different departments were included in this study. Out of a total 122 diaphragms, 88 (72.1%) were colonized. Only 71 (58.1%) bells and 152 earpieces (66.2%) were contaminated [10].

The main aim to isolate and identify the pathogenic bacteria from stethoscope and determine stethoscope-associated nosocomial infections at Zawia Medical Center.

## Material and methods

This study was carried out between (7 September - 21 October) in 2022, at Zawia Medical Centre.

### Samples collection

Fifty samples from diagram of HCWs including medical student, physicians, assistant physicians, staff nurses' residents and consultants at departments: Intensive Care Unit (ICU), Surgical, Internal medicine, Obstetrics and Gynaecology, Neonatal, Women internal medicine, Ambulance and Emergency, Medical Observation.

### Microbial assay

To determine bacteria contamination diaphragm of the stethoscope and bacteria frequency. Samples were collected by using sterile cotton tipped

swab were first moistened with normal saline to allow microbes to grow, swab was wiped over the diaphragm of the stethoscope, after that the samples transported to microbiology laboratory at Zawia Medical Center,

The samples were incubated for 48 hours at 37 °C to allow microbial growth, after that cultured in blood agar and McConkey agar, Salt Mantiol agar and incubated for 24 hours at 37 °C.

Suspected bacteria were grown to form colonies using the standard bacteriological procedures to identify bacterial phenotypically, and recorded the shape features of the colonies and the gram staining was done to identify the genera and species of the bacteria isolated by microscopic examination.

For family Enterobacteriaceae, the carbohydrate fermentation test was used in Triple Sugar Iron (TSI), the biochemical tests, Sulfide Indole Motility (SIM), Simmons' citrate and Christensen's Urea Agar growth mediums.

All the biochemical tests were used to identify and isolate bacteria, tests based on Oxidase and Polymyxin B were carried for the identification of glucose-non fermenting Gram-negative bacteria. The identification of Staphylococcus sp. was done by catalase, DNase and Novobiocin tests, Streptococcus sp. were identified through the characteristics of hemolytic activity on the blood agar, the use of Bile esculin agar, Brain Heart infusion (BHI) + NaCl 6.5% and optochin tests.

## Result and statically analysis

Stethoscopes of 50 health care workers from A Zawia Medical Center were sampled in the current study from Medical Outpatient Department (OPD) 14 (28%), Intensive Care Unit (ICU) 12 (24%), Surgical theatre 6 (12%), Department of Obstetrics and Gynaecology 6 (12%), Medical Department 5 (10%), Surgical Department 3 (6%) and Emergency Room 3(6%), Figure 1.

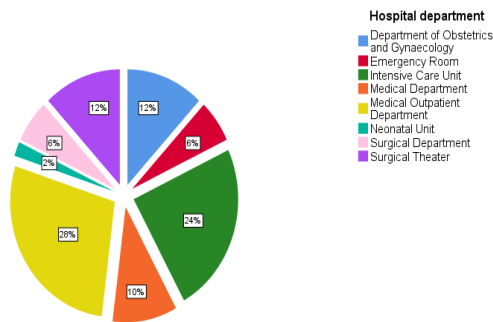


Figure 1 The percentages of isolated bacterial infection in the different departments

For 50 stethoscopes examined, 39 (78%) were considerably contaminated, and the rest 11(22%) were not contaminated. The maximum isolation per diaphragm was two species and the minimum was one bacterial specie species per diaphragm. Non pathogen diphtheria were the predominant isolates (24 (48%)). The rest were Non haemolytic staphylococcus (14 (28%)), Staphylococcus haemolyticus (9 (18%)), Non fermenting Gram-Negative Bacilli (3 (6%)), Klebsiella spp (2 (4%)), Table1.

**Table 1 :- Types of Bacteria isolates from stethoscopes**

Isolated bacteria	Frequency	Percent
No growth	11	22
<i>Klebsiella + Non pathogen diphtheria</i>	2	4
<i>Non hemolytic staphylococcus</i>	8	16
<i>Non hemolytic staphylococcus + Non pathogen diphtheria</i>	6	12
<i>Non pathogen diphtheria</i>	11	22
<i>Non pathogen diphtheria + Non fermenting Gram-Negative Bacilli</i>	1	2
<i>Non pathogen diphtheria + Staphylococcus haemolyticus</i>	3	6
<i>NLF Gram Negative Bacilli</i>	2	4
<i>Staphylococcus haemolyticus</i>	5	10
<i>Staphylococcus haemolyticus + Non pathogen diphtheria</i>	1	2

Distribution of the bacteria types found on diagram of stethoscopes at

departments, for Medical Outpatient Department 14(28%) and Intensive Care

Units 12 (24%) and found in the Gynaecology and Obstetrics Department 6 (12%), Surgical theatre 6 (12%). The

emergency, neonatal wards and Surgical Department, there were markedly less contamination, Figure 2.

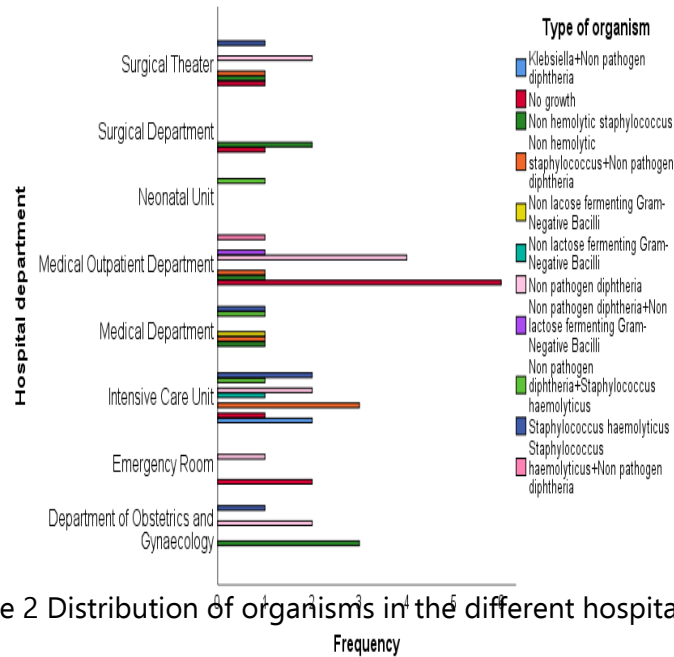
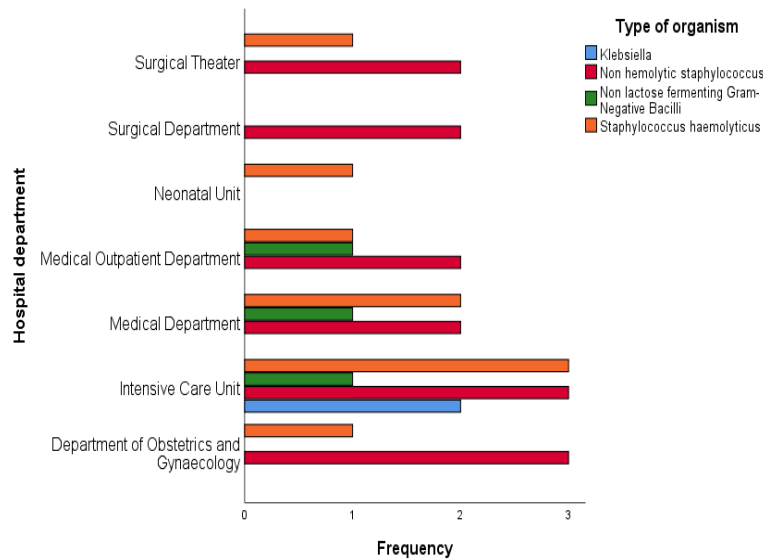


Figure 2 Distribution of organisms in the different hospital departments

28 (56%) isolates were potential pathogens, 14 (28%) were Non haemolytic staph. In addition, 9 (18%) were staph haemolytic and 3 (6%) were non-lactose fermenters, which are serious enteric pathogens. However; only

2 (4%) of the potential pathogens isolated were Klebsiella spp. The distribution of the pathogenic isolated per department presented in figure 3.



**Figure 3 The distribution of the pathogenic isolated per department**

## Discussion

The current study shows that stethoscopes are contaminated with potentially pathogenic microorganisms. After two days of incubation, the diaphragms of all stethoscopes examined from eight wards (figure 1). The 28(56%) isolates were potential pathogens,

For comparison between our results and the results of another study conducted at tertiary care teaching hospital in India by taking 50 samples similar to our study also in the way of work, their results were 30 (60%) stethoscopes were showing significant bacterial colonization, 7 (14%) showed insignificant colonization, and in 13 (26%) stethoscopes no growth was observed. The bacteria isolated were Methicillin Resistant *S aureus* (MRSA) (14%), Methicillin Sensitive *S aureus* (MSSA) (12%), Coagulase Negative *Staphylococcus* (CoNS) (14%), *Klebsiella*

species (20%) [11]. Our result shows only 2 (4%) of the potential pathogens isolated were *Klebsiella* spp, the contamination at AL Zawia teaching hospital less than India tertiary care teaching hospital.

Haemolytic and non-haemolytic *staphylococcus* are pathogenic bacteria able to gain the genes for antibiotic resistance and will become more potentially to cause the NIs. *Staphylococcus epidermidis* is one of haemolytic *staphylococcus* and common species of coagulase-negative *staphylococci* to be incriminated as a cause of infection, these infections are usually nosocomial bloodstream infections related to intravascular catheters, but skin and soft tissue infection, UTI, meningitis, endocarditis, and a variety of device-associated infections have been described [12].

Staphylococcus frequency in the samples in the same department see table 2 for example three sample contaminated with haemolytic staphylococcus at Obstetrics and Gynaecology department this repetition confirms poor cleaning for stethoscope between HCWs at this department , as well as Intensive Care Unit and others.

The other bacteria included in our results is Non Lactose fermenting Gram-Negative Bacilli NLFGB 2 ( 4% ) This species includes a group of bacterial species, including Shigella, Salmonella, Yersinia, Morganella, Serratia, Edwardsiella, Proteus, and Providencia which are high potentially pathogenic .

Non fermenting Gram-Negative Bacilli NFGNB 1 (2%) pseudomonas aeruginosa and acinetobacter baumannii were the common NFGNB are innately resistant to many antibiotics and are known to produce extended spectrum  $\beta$ -lactamases and

metallo  $\beta$ -lactamases. In recent years, due to the liberal and empirical use of antibiotics, NFGNB have emerged as important healthcare-associated pathogens. They have been incriminated in infections, such as, septicemia,

meningitis, pneumonia, urinary tract infections (UTI), and surgical site infections (SSI).[13]

klebsiella included in our result 2 (4%) which is potentially pathogenic klebsiella pneumoniae cause the pneumonia.

In this study samples were taken after the stethoscope was cleaned and used for one patient. The stethoscope contamination reasons probably from the owner stethoscope hands or examining the patient's skin, the sample show no growth 11(22%) were not contaminated, practice of cleaning the stethoscopes was poor, individuals had never cleaned their stethoscope, 39 (78%) were considerably contaminated.

The Neonatal Unit shows less contaminated than others, while Intensive Care Unit more contaminated than others with repeated the bacteria types on diagram of stethoscope figure 3 .

**Conclusion:** The samples taken from the stethoscope were contamination with highly pathogenic bacteria may lead to prevalence the nosocomial infections. Therefore, we recommend to using disinfected agent after each examination with stethoscope.

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