Stethoscope as potential occupational hazards for intra hospital carries of pathogenic microorganisms

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ABSTRACT

Background: The stethoscope is a tool that doctors use daily in the examination of patients and it can take part in the transmission of health care-associated infections. In a single day it may come in direct contact with multiple patients and the intra hospital environment may be contaminated by various type of bacteria and possibly transmit to others.

Objective:- The study was to know the attitude and knowledge about the stethoscope hygiene behavior among physicians and to determine the types of bacterial agents that can contaminate stethoscopes.

Type of the study: The study was a cross-sectional study

Methods:- It was conducted from 1st of July to end of October 2014 at AL-Emmamain Alkadhomain Medical City in which a convenient sample of 150 physicians were included. A semi constructed questionnaire was used to collect demographic data and hygiene practice among participants. Specimen was collected using moisten sterile cotton swab and then cultured following standard microbiological techniques.

The results:- showed a total of 121 (80.6%) of the stethoscopes had bacterial contamination only 29(19.40%) had negative cultures. There is statistically significant association between stethoscope contamination and frequency of cleaning it. Of the studied group only 26 subjects (17.3%) received education regarding stethoscope cleaning.

Conclusion:-There was evidence that bacteria can transfer from the skin of the patient to the stethoscope and from the stethoscope to the skin and there was poor education and assessing cleaning practices of stethoscopes.

Key words:- Contamination; Disinfection; physicians ,stethoscope.

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Infection transmission in the hospital environment (nosocomial infection) remains a significant hazard for hospitalized patients, and health-care workers are potential sources of these infections. Many pathogens can be transmitted on the hands [1]. which is a major reason that all health-care workers must wash their hands before and after seeing each patient [2]. Ttransmission of infections on contaminated medical devices is also possible and outbreaks of hospital-acquired infections have been linked to devices such as electronic thermometers, blood pressure cuffs, stethoscopes, latex gloves, masks, neckties, pens, badges and lanyards, and white coats [1,3-4].

Stethoscopes are commonly used to assess the health of patients and have been reported to be potential vectors for nosocomial infections in various parts of the world [3,5-6]. Following contact with infected skin, pathogens can attach and establish themselves on the diaphragms of stethoscopes and subsequently be transferred to other patients if the stethoscope is not disinfected [7-8].There are increasing reports of the risk of transmitting antibiotic resistant microorganisms from one patient to another on stethoscopes [3,9,10]. These antibiotic-resistant organisms are capable of initiating severe infections in a hospital environment and could require contact isolation and aggressive treatment to prevent the spread of the organism [11]. Examples of such antibiotic-resistant organisms are ceftazidime-resistant Klebsiella pneumonia, vancomycin-resistant enterococci, methicillin-resistant staphylococci, ciprofloxin-resistant Pseudomonas aeruginosa, gentamicin-resistant P.aeruginosa, and penicillin-resistant pneumococci [11-12].Medical equipments used in the non-critical care settingare less likely to have standard disinfection and cleaning protocols than equipments in the critical care setting Thus medical care equipments are more likely to carry Considerable number of pathogenic microorganisms [13].The contamination of stethoscope particularly the diaphragmis reported mainly due to lack of regular disinfection (before and after examining each patient). A study from India reported that, 45% of general practitioners disinfect their stethoscope once a year or never and 35%disinfect their stethoscope monthly [14].Infection prevention protocols are effective in reducingthe health care associated infections [15]. The use of70% propyl alcohol found to be effective in reducing contamination of

stethoscopes and other medical equipments than other agents like detergents [15-18]. However, a study conducted by Hayden and his colleagues shows that, the implementation of such programs were hindered by poor compliance of Physicians, Nurses and other health careworkers [19]. Inconvenience, time pressures, and skin damage from frequent washing are some of the reasons quoted by the health care personnel in that particular study [20].A routine

disinfection of stethoscope is hardly undertaken in most of the health care institutions worldwide [15,16,18].During auscultation stethoscope contamination is common;if the same stethoscope is used for the next patient without disinfection, it might bring risk of infection to thepatient and may continuously impose the risk serially toall patients [21]. Draping of stethoscopes around the neck is still a commonly seen practice, resulting in the risk of recontamination of the diaphragm of the stethoscope from the unclean earpieces, with normal flora and pathogenic bacterial strains harboring the ears of the HCWs.A single stethoscope often used for all in patients and outpatients [17,19].The universal and unavoidable use of the stethoscope and its direct contact with multiple patients makes it an important potential factor in the dissemination of microorganisms from one patient to another.Exposure of the already susceptible hospitalized patientto resident flora of the hospital environment (inmost cases are multidrug resistant pathogens unlessproved) may worsen the clinical condition of the patient.Periodic surveillance of medical equipments and hospital environments may help in identifying potential bacterial pathogens and associated factors.Numerous studies in the past decade have reported the level of bacterialcontamination on stethoscopes belonging to physicians and nurses). Thelarge majority of thestethoscopes examined in these studieswere contaminated: most withGram-positive organisms, primarilyStaphylococcus species.[22-28] In addition,in some studies the stethoscopes usedby physicians were found to be morecontaminated than those of nursesand others.[23 -24,27] Some of the studies examined the effectiveness of different cleaning agents and the self-reported frequency of clinicians cleaning their own stethoscope. The most effective cleaning agent identified was 70% isopropyl alcohol.[22 -23,25,26].

The reported frequency of stethoscope cleaning varied significantly ineach study but many participantsreported cleaning their stethoscopes infrequently [22,27].

Infection control education is an area receiving an increasing amount of attention both from government agencies and in the literature. It has now been well demonstrated that good infection control practices in the clinical workplace depend upon comprehensive education from the student level up, and from the senior leadership level down [29,30].

As a doctor a question arose while on clinical practice : is the humble and universal stethoscope perhaps more of an infection risk than anyone consciously realises? I observed stethoscopes placed on unclean skin, on the abdomen of patients with gastroenteritis, near colostomy openings, sternotomy wounds and onto the chest of newborns without ever witnessing a stethoscope being cleaned by any member of staff. Furthermore, reflecting on my medical education thus far, stethoscope hygiene had not once been formally raised as an issue of which to be mindful.

This review therefore sets out to investigate the issue of stethoscope hygiene. The aims are two-fold: firstly, to examine and systematically review the literature to evaluate whether stethoscopes constitute a clinically significant vector of healthcare-associated infection; and secondly, to explore medical students' behaviour, attitudes and beliefs about stethoscope hygiene.

Aim of the study:

The objectives of this study are to (i) explore the behaviour, attitudes and beliefs about stethoscope hygiene amongst doctors.(ii) determine the bacterial agents that can contaminate stethoscopes; (iii) outline the public health implications of stethoscope contamination

Documentation:

The main questions posed when beginning the background research on this topic included: Is the stethoscope a common vector of infection? If so, is the role modifiable through intervention with bactericidal cleaning measures? Beginning research on this topic included web searches with combinations of key words: stethoscopes as fomites, stethoscope disinfection, hospital-acquired infections(HAIs) and/or nosocomial infections. Article databases searched included:hinary,PubMED, andOVID.

Historical Background Data have supported the idea that stethoscopes can act as fomites for over thirty years[31] 31.(e.g., Gerken et al, 1972; Breathnach et al., 1992; Whittington et al., 2009). The majority of studies have focused broadly on the stethoscopes of nurses and physicians in the hospital setting. In one of the first studies, the stethoscopes of medical interns, residents, faculty, and nurses were cultured. Thirteen stethoscopes (26%) were reported as contaminated with a potential pathogen, meaning bacterial colonies that were not common skin flora .The same year, bacterial contamination of stethoscopes was reported again[ ]. These findings resound throughout each decade. Physician stethoscopes (N=29) were cultured and 26 (89%) yielded potentially pathogenicbacteria. In a study limited to one ICU, ear buds and the diaphragms of stethoscopes were examined. Out of the 24 stethoscopes tested, twodiaphragms (8.3%) contained pathogens. The results show that bacterial colonization with potential pathogens is a commonfinding.Common Bacteria Cultured from StethoscopesExpected bacterial growths on stethoscopes include common skin flora organisms Staphylococcus(non-pathogenic form) and Corynebacterium. There is little concern for the transmission of normal skin flora between individuals. However, stethoscopes may become contaminated with pathogenic bacteriasuch as Escherichia coli, Enterobacter, Klebsiella and Micrococcus luteus

Stethoscope Disinfection Practices

Current Practices Frequency of Cleaning. In self-reports of frequency of cleaning,the practice of stethoscope cleaning is infrequent in the majority of settingsand among all healthcare providers

Preferred cleaning method Wiping the stethoscope with saturated alcoholswabs has traditionally been the cleaning method of choice. The effectiveness of alcohol swabs, non-ionic detergent, and antiseptic soap was compared. Alcohol was reportedly the most effective, decreasing bacterial counts on the diaphragm by 94%as compared to antiseptic soap, which was reported to

decrease counts by 74%. Similarly, the effectiveness of isopropyl alcohol sodium hypochlorite,benzalkonium chloride, and soap and water were compared. In addition to beingeffective at reducing the bacterial load onthe diaphragm of stethoscopes, isopropylalcohol was reported as superior in cleaning the rim area.

Summary Common findings are reiterated throughout the literature. Colonization of stethoscopes by potential pathogens has been found (these include the various strainsof staphylococci, including MRSA). Isopropyl alcohol has been shown to be aneffective disinfectant for the diaphragm of stethoscopes, and cleaning of clinician's stethoscopes is described as "infrequent" inself-reports. This is in spite of recommendations that healthcareworkers clean their stethoscopes frequently.

Material and methods: This chapter discusses the methods employed in conduct of this study. It covers the methodological issues with regard to the study location, the study design and the statistical analyses employed to test the study hypotheses.

Study Location: This study was carried out at Al-Kadhemia teaching hospital at Baghdad Governorates, Iraq.

Study Design: This was a cross-sectional study which conducted to determine the the level of contamination of doctors stethoscopes working at different specialities departments. The study duration continued from April 2014 to June 2014.

Study Population: Doctors of the following specialities (internal medicine, gynaecology &obstetrics, general surgery, paediatrics and anaesthesiology departments) working in outpatient, inpatient departments and operation rooms of Al-Kadhemia teaching hospital at Baghdad Governorates represent study population. One hundred three stethoscope were examined during the time of study application. A structured questionnaire used to collect sociodemographicdata and the stethoscope cleaning practice from all participant doctors were performed for those patients at that clinic.

Data Collection: The Inclusion and exclusion criteria for those patients were as follows:

a) Inclusion criteria: all doctors working at AL_Kadhmiya teaching hospital in the desired departments .
b) Exclusion criteria: non.

Data was collected from all the eligible paticipants doctors who had given consent to participate by a questionnaire form which prepared to collect information The clinicians were not informed that the researcher would be assessing stethoscopes beforehand .

The samples taken from the stethoscopes were labeled with a numbered code and the names of doctors were not identified in any way .then their stethoscopes swabbed for culture by using pre-packaged sterile swab and were then taken to the local hospital microbiology lab for culture.

In each step of the procedure, the sample together with the questionnaire were labeled with a code that corresponded with the specialty and the job title of the stethoscope owner by giving letters for the specialty (I for internal medicine ,S for surgery , G for gynaecology, P for paediatrics and A for anaesthesiology. then given serial numbers for each speciality apart .

Study Variables:

a) **Dependent Variable** The dependent variable for this study was the contamination status of the stethosopes.

b) Independent Variables The independent variables of this study including the speciality , job title gender and cleaning practice of the participant doctors.

Instruments:

a) Material used: Sterial swab tubes,Culture,Inoculating loop,Bunsen burner, Distilled water in squirt bottle, Microscope with oil immersion objective,Lens tissue
b) Machine used:

Data Analysis: Statistical analysis was carried out using SPSS version 20. Categorical variables were presented as frequencies and percentages. Continuous variables were presented as (Means ± SD). Chi square test was used to compare between Categorical variables. A *p*-value of ≤ 0.05 was considered as significant.

Ethical Considerations:

- After brief explanation of the general purpose of the study and it is objectives, written consent was obtained from each participant
- Permission was obtained from centers were the information gathering from each one.

Limitation of study:

1. There was shortage time to get the data and included larger number of study sample.
2. There were no many researches similar to this subject.
3. There was limitation in get cultures 4 cases / day.

Results:

Distribution of Respondents by Specialty Figure (1) shows the distribution of respondents by specialty, (24.3%) of respondents were physicians as well as anesthesiologists.

Figure 1: Distribution of respondents by specialty

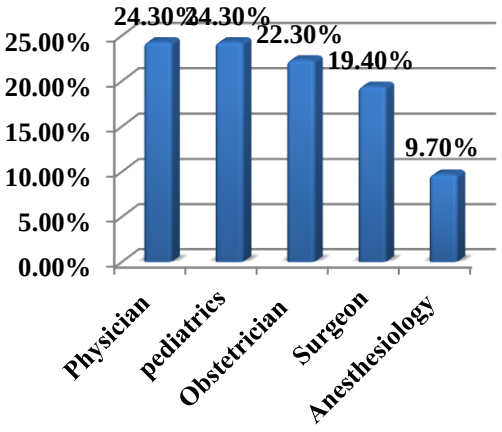

Figure (2) shows the distribution of respondents by job title, (69.9%) of respondents were resident doctors.

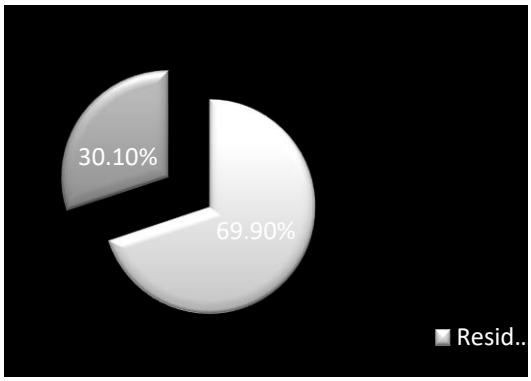

Figure (2): Distribution of respondents by job title

Figure (3) shows the distribution of respondents by gender, (68.9%) of respondents were males.

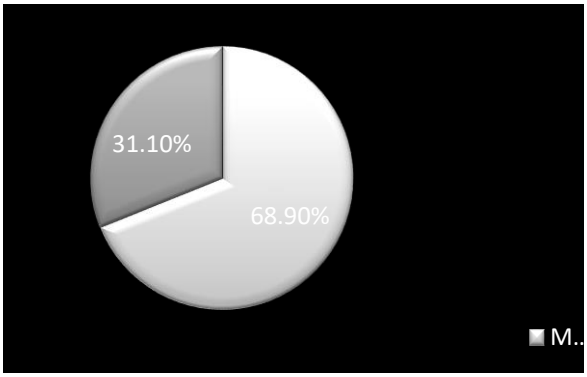

Figure (3): Distribution of respondents by gender

Figure (4) shows the distribution of respondents by time of cleaning stethoscope, (58.3%) of respondents never clean their stethoscope. 35 (34.0%) of respondents who clean their stethoscope use alcohol wipe (table 1).

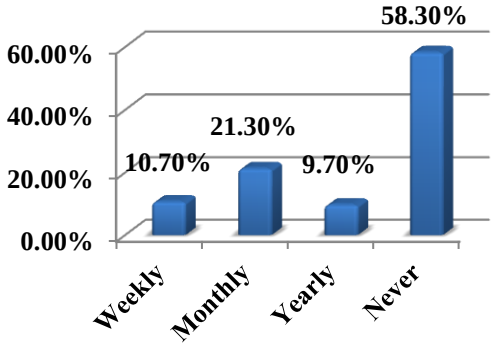

Figure (4): Distribution of respondents by time of cleaning stethoscope

Table (1): Distribution of respondents by way of cleaning their stethoscope

Cleaning Stethoscope	Frequency	Percent (%)
Alcohol wipe	35	34.0
Iodine	1	1.0
Other	7	6.8
Never clean stethoscope	60	58.3
Total	**103**	**100.0**

Figure (5) shows the proportion of receiving education regarding cleaning stethoscope among respondents, (16.5%) of respondents did not receive education regarding how to clean stethoscope

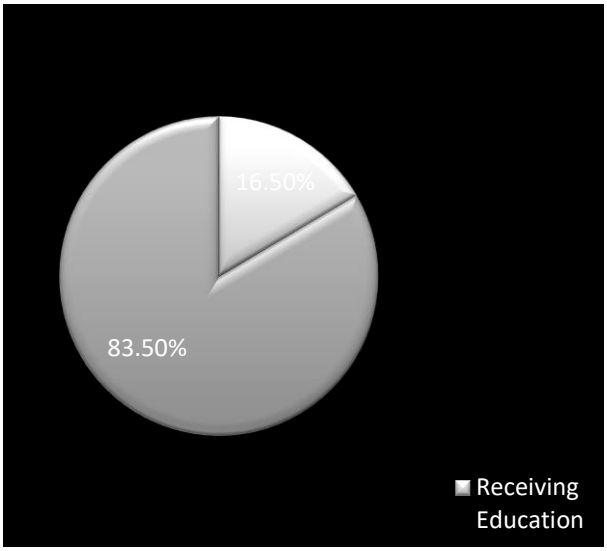

Figure (5): Proportion of receiving education regarding cleaning stethoscope among respondents

Figure (6) shows the distribution of respondents by bacterial culturing from their stethoscope, (81.6%) of culture were positives

Table(2) shows the association of receiving education regarding cleaning stethoscope with studied variables. There was significant association between receiving education with time of cleaning stethoscope, respondents who did not receive education were never clean their stethoscope

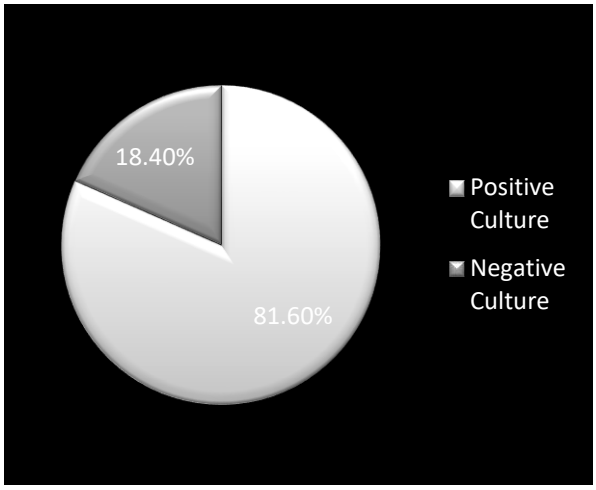

Figure (6): Distribution of respondents by result of bacterial culturing from their stethoscope

Table (3) shows the association of bacterial culturing from stethoscope with study variables. There was significant association between receiving education with time of cleaning stethoscope, respondents who did not receive education were never clean their stethoscope.
The most frequent bacteria type isolated was staphillococus aureus followed by CONS ,Klebsiella spp. P.aurogenosa and Micrococcus. distribution of cultures of each isolated bacteria with the departments are shown in table 4

Discussion

Stethoscope contamination is an important health problem for both medical workers and the patients examined by it. This study is a cross sectional based study that aimed to detect behaviors, about stethoscope hygiene among doctors and the bacterial agents that can contaminate the stethoscope. The sample of this study was only doctors who questioned about their stethoscope hygiene practices, their stethoscopes then cultured for bacterial contamination, while previous studies done in other countries included doctors as well as other health care workers in the study sample and had focus on the difference in the level of contamination of the two groups as in Uneke et al study[5] done in Ebony state in south-eastern Nigeria which state that the stethoscopes used by physicians were more contaminated than those used by other health workers. This is not applicable in our country as other health care workers generally don't use the stethoscope in daily practice.
The result revealed that as many as 81.60% of the stethoscopes surveyed were contaminated by bacteria; which is consistent with previous studies reported by Zuliani-Malufet al. (87%) [40]; Youngster et al. (85.7%) [20] , and Unekeet al. (79%) [5]. Whereas Marinellaet al(41) and Wood et al(42), reported 100% stethoscope contamination, which is higher than this finding. However, Africa-Purino and his colleagues [43] found that, lower rate (57%) of contamination than the present study.
Those variations could be due to the differences in hygienic practice and the application of the standard infection prevention protocols. The contamination rate was (80%) in both the surgery and anesthesia departments. A slightly higher contamination rates were found in the pediatrics and internal medicine departments (88%) and (84%) respectively, comparing to a lower contamination level found in the gynecology &obstetrics department (73%), this could be due to that the gynecology & obstetrics department deals more with females complaining from medical conditions other than infection as labor or other maternity conditions which traditionally requires more care about the patient personal hygiene. although it is consistent with study done byShiferawet al atJimma university specialized hospital [44], yet contamination level of the stethoscopes shows no statistically significant difference between the different specialties included in this study.
Regarding to the professional status of the participant the present study showed a contamination rates of (80.5%) for the residents stethoscopes and (83.8%) for the specialists, but it was statistically non-significant difference between the two groups. This may be due to that both were exposed to the same work environment, and both did not show difference in their stethoscope hygiene practice. In a study done by shiferawet al found that the specialists stethoscopes showed a contamination rate of 100% while the resident stethoscope showed (93%) [44].
Regarding the gender of the studied group the stethoscopes owned by the female participants has a lower contamination rate (74.19%) than the stethoscopes owned by the male participants (86.10%) which is statistically significant this may be due to the female better hygiene practices or due to the fact that the majority of the female doctors in this study (74.2%) worked at gynecology &obstetrics department which shows a lower contamination rate as mentioned previously. No similar studies had been found that compare the level of contamination of the stethoscope according to the gender of the owner.
Regarding the stethoscope cleaning practice in the present study, all studied subjects do not follow the standard protocol set by the WHO to prevent infections in using crucial medical equipment like stethoscopes. This finding is consistent with other previous studies that reported that about 97 to 100% of doctors did not follow a standard disinfection protocols [5,16,41,45]. This could be attributed to the finding that the majority of the studied group (83.50%) had not received any education about stethoscope cleaning, the lack of formal education received by students on this subject plays an important role together with the absence of stethoscope hygiene protocols at the teaching hospital, the shortage of time and the increasing work burden on doctors.
In the present study there was a statistically significant association between stethoscopes with no disinfection practice and frequently disinfected one's. This is in agreement with studies reported by Uneke and his colleagues and Shiferawet al[5,44] .
On the other hand the method of cleaning the stethoscope shows statistically non-significant difference which is inconsistent with Unekeet al(5) study that report a significantly lower levels of contamination were found on stethoscopes cleaned with alcohol than stethoscopes cleaned with other cleaning agents.it may be to the reason that in this study only 43 subjects clean

their stethoscopes and this small number cannot assess the effectiveness of different stethoscopes cleaning method.

Although most of the organisms isolated in this study were considered commensal bacteria, a significant percentage of the isolates were potentially pathogenic. The implication of the findings is that the stethoscope might be a vector playing an important role in the transmission of potential pathogenic microorganisms in the hospital environment[1].

Gram-positive isolates were more frequent than gram-negative isolates. This might be because of the direct contact of the stethoscope to human skin flora, which contains mostly gram-positive bacteria. Moreover, the lifespan of gram-negative bacteria is not more than six hours in vitro [27]. However, excessive bacterial colonization on stethoscope diaphragm enables them to remain alive for a longer period exceeding eight hours [34] whereas, gram-positive bacteria could remain alive for a longer period, even up to months [14,27].

*S. aureus*was the most common bacterial agent isolated from the stethoscopes studied (59.6%). Previous investigations have indicated its occurrence on 15.8% to 89% of stethoscopes surveyed [5, 41, 47-49].

S. aureus is gram positive bacteria, common flora of human skin; it is also well documented fact that S. aureus is a primary causative agent of HAI (50,51). In addition, it was the most common pathogenic organism isolated from stethoscopes, regardless of the difference in setup and sample size in several studies [5, 16, 41, and 52].

CONS is gram positive commensal bacteria but can cause severe infections in immune-suppressed patients and those with central venous catheters.

Two main types: *S epidermidis* is common flora of skin *S.saprophyticus*, is part of the normal vaginal flora. It had been isolated from (28.70%) of the cultured stethoscopes. Previous studied found a rate of contamination ranging from (4.00%) to (40.20%) [5, 41-44]. *Klebsiella* species they are gram negative bacteria routinely found in the human nose, mouth, and gastrointestinal tract as normal flora; however, they can also behave as opportunistic human pathogens[53]. *Klebsiella* had been isolated from (5.90%) of the cultured stethoscope this result was consistent with the results of Shiferawet al that found about (4.70%) of the cultured stethoscopes were contaminated with *Klebsiella* species[44], but the results of Unekeet al had not isolate *klebsiella* species in any of the stethoscope cultured [5].

Enterococci it is a gram- positive cocci that often occur in pairs (diplococci) or short chains , Two species are common commensal organisms in the intestines of humans: *E. faecalis* (90-95%) and E. faecium (5-10%). Rare clusters of infections occur with other species, including E. *casseliflavus E. gallinarum,* and *E. raffinosus*[56]. Enterococci had been isolated in (2.40%) of the cultures, Previous studies showed an rate ranging from (0.00%) to (58%) [44, 5].

P auroginosa is gram negative aerobic coccobacilli that could be found as skin flora but could cause opportunistic infection in immunocompromised patients typically infects the pulmonary tract, urinary tract, burns, wounds, and also causes other blood infections (54). It had been found in (1.20%) of the stethoscopes cultures This result is consistent with Shiferawet al which also report that *P.auroginosa* isolated from (1.20%) of the cultured stethoscope[44],,a higher result had been found in Uneke et al study (68.80%)[5].

Micrococcus is gram positive bacteria generally a commensal organism, though it can be an opportunistic pathogen, particularly in hosts with compromised immune systems, such as HIV patients [55]. It can be difficult to identify Micrococcus as the cause of an infection, since the organism is a normally present in skin microflora, and the genus is seldom linked to disease. It had been found in (1.20%) of the cultured stethoscopes. This is inconsistent with previous studies that reported a lower percent of micrococcus contaminated stethoscopes (0.40%) (44)to (0.00%) of the stethoscopes cultured [5,42].

Whether or not a contaminated stethoscope leads to the colonization of a patient with that organism is difficult to prove, however the risk-benefit balance for reducing the potential risk seems incontestable and greater emphasis needs to be placed on stethoscope cleaning as part of routine practice.

Conclusions

1. The contamination rate in this study was high.
2. Many of the strains isolated were potential pathogen and .
3. Most of the studied group reported they have no perception about stethoscope disinfection.
4. Stethoscope cleaning is infrequently performed by most of our studied group despite their specialty, professional status or gender.

Recommendations

1. Further studies may be needed in this subject to develop more comprehensive knowledge about stethoscope hygiene and the proper method of cleaning it.
2. Set a standard protocol to prevent infections in using crucial medical equipment like stethoscopes.
3. Start educational programs about the importance of washing hands and regular cleaning of medical equipment.
4. Develop more rigorous programs and protocols for stethoscope disinfection as a standard of care.

Table (2): Association of receiving education regarding cleaning stethoscope with studied variables

Variable	Receiving Education		χ^2	*P* values
	Yes (%)	**No (%)**		
Specialty			3.077	0.555[a]
Physician	2 (11.8)	23 (26.7)		
paediatricians	5 (29.4)	20 (23.3)		
Obstetrician	3 (17.6)	20 (23.3)		
Surgeon	5 (29.4)	15 (17.4)		
Anaesthesiologist	2 (11.8)	8 (9.3)		

Job title Resident doctors Senior doctors	 14 (82.4) 3 (17.6)	 58 (67.4) 28 (32.6)	1.500	0.221
Sex Male Female	 14 (82.4) 3 (17.6)	 57 (66.3) 29 (33.7)	1.712	0.191
Time of cleaning stethoscope Weekly Monthly Yearly Never	 2 (11.8) 5 (29.4) 4 (23.5) 6 (35.3)	 9 (10.5) 17 (19.8) 6 (7.0) 54 (62.8)	**8.984**	**0.047***
Ways of cleaning stethoscope Alcohol wipe Iodine Other ways Total	 10 (90.9) 0 (0.0) 1 (9.1) 11 (100.0)	 25 (78.1) 1 (3.1) 6 (18.8) 32 (100.0)	0.899	0.742[a]
Bacterial culture Positive culture Negative culture	12 (70.6) 5 (29.4)	72 (83.7) 14 (16.3)	1.627	0.202

*p value ≤ 0.05 is significant

[a:] Fisher Exact test

Table (3): Association of bacterial culturing from stethoscope with studied variables

Variable	Bacterial culture		χ^2	*P* values
	Positive (%)	**Negative (%)**		
Specialty Physician Paediatrician Obstetrician Surgeon anesthsiolgest	 21 (25.0) 22 (26.2) 17 (20.2) 16 (19.0) 8 (9.5)	 4 (21.1) 3 (15.8) 6 (31.6) 4 (21.1) 2 (10.5)	1.888	0.786[a]
Job title Resident doctors Senior doctors	 58 (69.0) 26 (31.0)	 14 (73.7) 5 (26.3)	0.158	0.691
Sex Male Female	 62 (78.4) 23(21.6)	 10 (52.6) 9 (47.4)	**3.891**	**0.049***
Time of cleaning stethoscope Weekly Monthly Yearly Never	 2 (2.4) 12 (14.3) 10 (11.9) 60 (71.4)	 9 (47.4) 10 (52.6) 0 (0.0) 0 (0.0)	**55.865**	**<0.001***
Ways of cleaning stethoscope Alcohol wipe Iodine Other ways Total	 19 (79.2) 1 (4.2) 4 (16.7) 24 (100.0)	 16 (84.2) 0 (0.0) 3 (15.8) 19 (100.0)	0.841	1.000[a]

*p value ≤ 0.05 is significant

[a:] Fisher Exact test

Table 4 :the distribution of cultures of each isolated bacteria with the departments

Specialty	S.aureus	CONS	Klebsiella	Enterococci	P.aurogenosa	Micrococcus
Internal medicine	16	9	2	2	-	1
Pediatrics	13	7	4	1	-	-
Gyn &ob	9	7	3	-	-	-
Surgery	11	6	2	1	1	-
Anesthesia	4	2	1	-	1	-
total	53	31	12	4	2	1

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