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Microbiological Infectivity in Medical Laboratory Benghazi, Libya

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Abstract: We surveyed environmental surfaces in our clinical microbiology laboratory one at Reference laboratory, Benghazi and other at Pediatric Hospital Laboratory to determine bacterial contamination during a routine working day. This study aimed to identify the extent of contamination of surfaces. Microbes may transmitte from surfaces to working staff in the Laboratories or the visiting people who visited to the laboratories for the purpose of delivering sample or receiving report. Sample of swabs were taken from some surfaces most frequently used by the workers from the reference laboratory, and some swabs taken from the Laboratory in Pediatric Hospital. The samples were cultured on the blood agar media. The contamination identified in the reference laboratory were 54(85.70%) out of 63 samples however, in Pediatric Hospital Laboratory were 15(71.40%) out of 21 samples. Conformity test was done for bacteria using Phoenix 100. The Recommendations includes personal protection and good hygienic condition of the Laboratory Environment.
Keywords: environmental surfaces, contamination, Microbes

INTRODUCTION:

Contaminations of microbial organisms have become increasingly prevalent in acute care hospitals, as well as in long-term care facilities as reported by Centers for Disease Control and Prevention [1]. In addition, these organisms raised the concern for potential contamination of the clinical microbiology laboratory [2]. Since these organisms persist on surfaces [3,4] and experts believe for sufficient evidence to state that inanimate surfaces likely play a role in transmission of microbial organisms[5].

Frequent environmental contamination within the microbiology laboratory poses three major risks for healthcare workers and patients. First, laboratory workers may become colonized with these organisms and inadvertently carry them to other parts of the hospital or to the community. Second, cross-contamination of specimens can occur so that false infection or colonization of patients is reported from the laboratory. Third, medical personnel visiting the laboratory for consultation or during teaching rounds may unknowingly contact a surface [6].

Nosocomial infections have been recognized, even more alarming in the 21st century for affecting the quality of health care. In the hospital at Alexandria University in 2003-04, the amount of contamination of microorganism from sputum, urine and blood was high in peoples working in intensive care units and 400 patients were with nosocomial infections in total and 38 people admitted were having nosocomial infections due to cross infection from the equipments used in surgery. Ventilators were contaminated causing associated pneumonia by Klebsiella & Pseudomonas. Catheter contamination causing urinary treat infections by E coli, Candida albican & klebsiella were also seen [7].

Today, nosocomial infections account for 50% of all major complications of hospital infection; the remainder are due to medication errors, patient false and other non-infectious adverse events constitutes a major problem globally , with major social , economic , moral and personal effects, that increases the morbidity and mortality of patients[8-11].

The study in hospitals at Tripoli in 2006-07, found contamination with bacteria and fungus in their hands of worker in repackaging of medicines and need for necessity to look to eliminate the bio hazards effects [12]**.** In the Great River Eye Hospital Benghazi (2007) OPD patients with corneal ulcer were having presence of bacterial growth mostly with S. aurous [13].

The presence of contaminants within the clinical laboratories in Benghazi and the extent by seriousness of spread inside and outside laboratories, and to the community are high as these contaminants transmit to

workers and sometimes to the peoples visiting the laboratory and affecting adversely. Laboratory working staff should understand why infection control is important, the approaches being taken by the hospital infection control program to meet its objective to reduce nosocomial infections, and how the laboratory can support and cooperate with the program [14].

So the present study attempts to assess the potential presence of contaminations of microorganisms on environmental work surfaces and adjacent clean areas in the clinical laboratory and to look at the magnitude for the success of the hospital infection control effort.

THE MATERIAL & METHODS

Place of study

We surveyed environmental surfaces in our clinical microbiology laboratory one at Reference laboratory, Benghazi and other at Pediatric Hospital Laboratory to determine bacterial contamination during a routine working day. Disinfectants, including isopropyl alcohol, sodium hypochlorite, and phenol and quaternary ammonium compounds were used for disinfecting the contaminated surfaces at the completion of work and after accidental spills

Period of study

The study was conducted from April, 2008 to June, 2008.

Collection of Sample and culture

For the purpose of the study, Surfaces were defined as those commonly contacted by the working staffs during a routine working day like bench tops, telephones, keyboards, door handles, biohazard waste containers, chairs, pipettes, gloves, and gowns etc. and also include desks, computer as well as restroom surfaces etc.

Swabs were collected from surfaces mostly used in the Laboratories by the working staff. Staining process was done to see the gram positive or negative cocci or bacilli. The collected samples were also cultured on blood agar media to see for microbial growth. Sub-culture and repeat the analysis for confirmation of growth was done on another blood agar plate and Phoenix 100 Test was used to identify the organism for confirmation[15-19].

Analysis of data

Analysis was projected in tables according to the aims of the study and in numbers of colonies of bacterial growth, number and percentage of culture positivity etc.

RESULTS

From the most used surfaces in the Reference laboratory & Pediatric hospital Laboratory, the total swab samples collected was 63 & 21 respectively from showing culture positivity of 82.1 %.(Table-1)

The contaminations identified were identified in 54(85.70%) out of 63 samples in Reference Laboratory, however in Pediatric Hospital Laboratory were 15(71.40%) out of 21 samples. Rate of growth which was high in places like the outer main door handles & keyboard of integer machine, the chair handles, door handles in biochemistry laboratory while in microbiology laboratory shows positive growth in eye base of microscope, microscope adjustment knob. In coffee room growth was present in door handle & food table and the highest growth was seen in outer door handle of the entry of laboratory (Table-2 & 3).

Comparing the rate of contaminants in both sampling places we found the presence of organisms were more in the Reference Laboratory, than in the El Fatah Pediatric Hospital Laboratory. The samples taken from the majority of the surfaces were found to be culture positive and highest growth in the door handles (Table-4).

The percentage of culture positive samples and the percentage were very high in all surfaces of Reference Laboratory (Table-5). Gram stain shows +ve gram stain and Diplococci were seen and probability expected was Acinobacter, Micrococcus and Staph. albus (Table-6 & Table-7). This conformity test was done with phoenix100 which shows Staph. albus and Escherichia coli organism.

Table-1: Swab showing Culture positive & negative result in Reference Laboratory and Pediatric Hospital Laboratory

Test	Reference Laboratory		Pediatric Hospital Laboratory		Total	
	No	%	No	%	No	%
positive	54	85,7	15	71,4	69	82,1
Negative	9	14,3	6	28,6	15	17,9
Total	63	100	21	100	84	100

Tables-2: shows presence and burden of contamination in surfaces in Reference laboratory

Samples by section	Growth	Burden of Growth
Immunology laboratory		
* keyboard	+	++
* Centrifuge	+	+++
* The incubator handle	+	++
* The refrigerator handle	+	++
* The door handle	+	+
* Mouse of the Table	+	++
* Head of chair	+	++
* The Table (Bunche)	+	+++
Hematology laboratory		
* Table of CBC	+	+++
* Microscope adjustment knob	+	+
* Centrifuge	+	+++
* The door handle	+	++
* Eye base	+	++
* Mouse on the Table	+	++
* Head of the refrigerator	+	+
* CBC machine	+	++
Parasitology laboratory		
* The door handle	N.G	N.G
* The Table	+	++
* Centrifuge	+	++
* Table of urine	N.G	N.G
* Table of stool	N.G	N.G
* Eye base	+	+
* Microscope adjustment knob	+	++
Coffee		
* The door handle	+	++
* Food Table	+	++
* The racks handles	+	+
* The chair handle	+	++

Tables-3: shows presence and burden of contamination in surfaces in Reference laboratory(Continued)

Samples by section	Growth	Burden of Growth
Biochemistry laboratory.		
* Data machine	+	+++
* Mouse on the Table	+	+++
* keyboard of integer	+	+++
* The chairs handle	+	+++
* Centrifuge	N.G	N.G
* The incubation handle	+	+
* The doors handle	+	+++
* The refrigerator handle	+	++
Microbiology laboratory.		
* The door handle	+	++
* Mouse on the Table	+	++
* The incubator handle	+	+
* The refrigerator handle	+	++
* The edge of the Table (Bunche)	N.G	N.G
* Eye base	+	+++

* Cropping Table	+	+
* Microscope adjustment knob	+	+++
Hormones laboratory		
* Head of incubation	+	++
* Mouse on the Table	+	+++
* The door handle	+	+
* The refrigerator handle	+	+
* The Table	+	+++
* Centrifuge	N.G	N.G
* The chair handle	+	+

Table-4: shows presence and burden of contamination in surfaces in Reference laboratory (Continued)

samples by section	Growth	Burden of Growth
The samples room		
* The door handle	N.G	N.G
* The tap	N.G	N.G
* The Table	+	+
* The banister handle	+	+++
Delivery of samples immunodeficiency		
***** The Table	+	++
* Mouse on the Table	+	+
* The door handle	N.G	N.G
* The outer rack	+	+++
Delivery results		
* The Table	+	+
* The door handle	+	+
* The outer rack	+	+++
The store office		
* The door handle	+	++
The outer entry of laboratory		
* The door handle	+	+++

N.G = No Growth, + = < 50, ++=50-100, +++ =>100.

Table-5: shows presence and burden of contamination in surfaces in the Pediatric Hospital Laboratory.

Samples by section	Growth	Burden of Growth
The outer entry		
* The door handle	+	++
The laboratory night		
* The door handle	+	++
* The Table of CBC	+	+
Hormones laboratory		
* The door handle	N.G	N.G
* The refrigerator handle	N.G	N.G
Cafeteria		
* The door handle	+	+
* The banister handle	+	+

Microbiology laboratory		
* The door handle	N.G	N.G
* keyboard of B.D machine	+	+
* Microscope adjustment knob	+	+
* Eye base	+	+
* The Bunche (1)	N.G	N.G
* The Bunche (2)	+	+
* The Bunche (3)	+	+
* The Bunche (4)	+	+
* The urine Bunche	+	+
Hematology laboratory		
* The door handle	+	+
* The phone	+	+

Table-6: shows presence and burden of contamination in surfaces in the Pediatric Hospital Laboratory. (Continued)

Samples by section	Growth	Burden of Growth
Biochemistry laboratory		
* The door handle	+	+
* The refrigerator handle	+	+
The rest room		
* The door handle	N.G	N.G

N.G = No Growth, + = <50, ++ = 50-100, +++ = >100.

Table-7: Comparison of contaminations in various surfaces in the Pediatric Hospital Laboratory and Reference Laboratory.

Samples by section	The Reference Laboratory		El Fatah Pediatric Hospital Laboratory	
	Growth	Burden of Growth	Growth	Burden of Growth
The outer entry				
The door handle	+	+++	+	++
Biochemistry Laboratory				
The door handle	+	+++	+	+
The refrigerator handle	+	++	+	+
Microbiology Laboratory				
The door handle	+	++	N.G	N.G
Hormones laboratory				
The door handle	+	+	N.G	N.G
The refrigerator handle	+	+	N.G	N.G
Hematology Laboratory				
The door handle	+	++	+	+
Coffee				
The door handle	+	++	+	+

N.G = No Growth, + = <50, ++ = 50-100, +++ = >100

Table-8: shows the percentage of contamination in surfaces from Pediatric Hospital Laboratory and Reference Laboratory.

The Places	Reference Laboratory			AL-Fatah Pediatric Hospital Laboratory		
	Number of samples	Number of samples (Positive)	%	Number of samples	Number of Samples (Positive)	%
The refrigerator handle	5	5	100	2	1	50
Mouse	6	6	100	/	/	/
Incubator	4	4	100	/	/	/
The chair handle	4	4	100	/	/	/
The Table	6	6	100	/	/	/
Eye base	3	3	100	1	1	100
Keyboard	2	2	100	1	1	100
Machine	2	2	100	/	/	/
The racks	3	3	100	/	/	/
Microscope adjustment knob	3	3	100	1	1	100
The banister handle	1	1	100	1	1	100
The phone	/	/	/	1	1	100
The door handle	12	9	75	8	4	50
Centrifuge	5	3	60	/	/	/
The Bunches	6	3	50	6	5	83.3

Table-9: Various microbes identified from the surfaces in Reference Laboratory.

Place that sample take	Gram Stain	Specie	Probability Expected	Confirmations test
The door handle in micro Laboratory	+	Diplococcic	N.A	N.A
Microscope lenses in Proctology Laboratory	—	Bacilli	Acinobacer	N.A
The refrigerator handle in Biochemistry Laboratory	–	Bacilli	N.A	N.A
The refrigerator handle in Hematology Laboratory	+	cocci	Micrococcus	N.A
Outer racks -Delivery results	+	cocci	*Staph albus*	*Staph albus*
Outer racks -Delivery of samples immunodeficiency	+	Diplococcic	N.A	N.A
Banister handle in The samples room	+	Diplococcic	N.A	N.A

N.A = Not Available.

Table-10: Various microbes identified from the surfaces in Pediatric Hospital Laboratory)

Place that sample take	Gram Stain	Species	Probability Expected	Confirmations test
The door handle in Micro Laboratory	+	cocci	Staph albus	Staph albus
Urine Bunches microbiology Laboratory	-	Bacilli	N.A	Escherichia coli

N.A = Not Available.

DISCUSSION

The present study found that most surfaces in the medical Laboratories are contaminated. The various study demonstrated that recovery of microbial organism from laboratory environment is common, confirming our findings [6].

However, this contaminant not expected to be in a large number, the working staff knows how protect themselves and protect their environment by using the appropriate disinfectants and everybody takes all necessary precautions and steps of hygiene safety in laboratories to reduce the risk expected as a general rule[14,20].

It was observed that the burdens of contamination in the Reference Laboratory are higher than in the El-Fatah Pediatric Hospital Laboratory (85.70% and 71.40% respectively). Reasons are many and one of them may be inadequate and poor methods of cleaning the surfaces with disinfectants. Lack of information and process of cleaning and detergents used are reasons as supported by many studies [21,22].

The study conducted in a hospital at Alexandria University showed that there are 38 people admitted to the hospital were having nosocomial infections due to cross infection from the equipments used in surgery. Ventilator associated pneumonia due to Klebsiella were 54.50% and Pseudomonas were 45.50%. Contamination with catheter causing urinary treat infections due to E coli, Candida albican, klebsiella were 53.30%, 36.70% and 6.70% respectively indicating that the hospital environment may be filled with the many causes of infection [7]. Studies conducted in Tripoli showed contamination on the hands of workers in packaging of medicine and the equipments used by workers, the need for precautions regarding the reduction of contamination are mentioned [12].

The medical laboratories are places known for high risk of transmission of pathogens which enforced specialists to create specialized committees in the fight against hospital infection involving a number of disciplines as recommended by various experts for control of spread from contaminations in medical laboratories [14,21,23].

25% of the 28 surfaces surveyed contained five E. faecalis and two E. faecium isolates. Study contamination of the outpatient clinic environment has been reported in areas caring for patients colonized with this organism[24]. The present study shows clearly that the surfaces, tools and equipment used in medical laboratories contains a large quantity of contaminants, which may be the cause of transmission to Laboratory worker or even visitors who visit the laboratory and the workers themselves may be a source of transmission.

A recent report from England found that infections acquired in laboratories were employees of microbiology laboratories [25]. Environmental contamination has been implicated in patient-to-patient transmission. [(26)] Colonization of healthy hospital employees has been recently documented [27]. Therefore, our results raise the possibility that transmission to workers or visitors in the clinical microbiology laboratory may occur.

Disinfectants, including isopropyl alcohol, sodium hypochlorite, and phenol and quaternary ammonium compounds were used for disinfecting the contaminated surfaces at the completion of work and after accidental spills. Many study demonstrated that many commonly used disinfectants were all highly effective at removing microorganisms from surfaces when used [28].

CONCLUSION

From the present study, the working surfaces in medical laboratory in Reference Laboratory & El Fatah Pediatric Hospital Laboratory, Benghazi are found to be contaminated. The situation need to be considered by the laboratory authority and working staff to protect themselves from this infections and to play role in protecting the people visiting the laboratory for one reason or another . The authority must pay more attention to provide laboratory with all protective equipments and procedure to reduce the risk of spreading microorganism in laboratory environment. Continuing surveillance and educating working persons are lacking.

RECOMMENDATIONS

In Medical laboratory surfaces must be disinfected at the completion of work and after accidental spills in order to minimize the potential acquisition of antimicrobial organisms.

We recommend that disposable lab coats and well-fitting gloves are worn at all times and for all work functions and that these be removed when personnel exit the microbiology laboratory. Additionally, strict daily cleaning must be done, since it will adequately decontaminate the environmental surfaces in the microbiology laboratory.

Everyone entering the laboratory should use good hand hygiene when leaving so that any transiently acquired organisms are removed from their hands before returning to patient care area. Such measures should be considered as a routine practice for microbiology laboratories that frequently recover pathogens from the clinical specimens that they process.

The doors design should be changed in all medical laboratories with electronically open and non-touch device to the doors hand.

There is need for awareness training for the working staff of the laboratories about the potential risks to the staff, the visiting people as well to patients.

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