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Original Research Article

Microbial Pathogens Harboured by Laboratory Instruments

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ABSTRACT

Background: The laboratory instruments harbor many microbial pathogens as the patient samples are processed by these instruments (microscope, incubator, refrigerator, laminar flow and centrifuge machine). The aim of the study was to find out the bacterial and fungal pathogens on laboratory instruments. **Materials and Methods:** This prospective study was conducted in a microbiology laboratory of N.C. Medical College and Hospital, Panipat, India. The period of study was 6 months from January 2017 to June 2017. Samples were collected from – various instruments of microbiology laboratory with moistened (pre-moistened with sterile peptone water) two cotton swabs. One swab was inoculated onto blood agar, MacConkey's agar media and incubated at 37ºC for 24 to 48 hours and other inoculated on Sabouraud's dextrose agar media and incubated for 1 to 7 days at 25-28°C. **Results:** Bacterial and fungal pathogens were isolated from the various instruments and indentified as standard microbiological procedure. In our study the distribution of microorganisms on laboratory areas were *Bacillus* species 30.56% followed by Coagulase negative *Staphylococcus* 16.67% *Staphylococcus aureus* 13.89%, *Diptheroids*, *Micrococcus* and *Aspergillus* species 11.11% each, and *Candida* species 5.56% was isolated. **Conclusion:** Our study showed that the laboratories in which patients samples are directly and rapidly processed are the major source of microbial pathogens and may infection from the hands of laboratory workers after touching the instruments are on risk of laboratory acquired infection.

INTRODUCTION

Laboratory associated infections (LAIs) occurs in health care workers because of bacteria, viruses, fungi, and parasites due to uncleanness of the laboratory instruments which frequently used. The largest survey of infections was reported in 1976 by Pike RM and he found that 4079 laboratory-acquired infections were due to involvement of 159 microbial agents. The mortality and morbidity rate due to the laboratory-acquired infection was 173 deaths which were reported by the workers [1-2].

Microorganisms are found everywhere and constitute a major part of every ecosystem. In these environments, they live either freely or as parasites. In some cases, they live as transient contaminants in fomites or hands where they constitute major health hazards and sources of community and hospital-acquired infections. The increasing incidence of epidemic outbreaks of certain diseases and its rate of spread from one community to the other has become a major public health concern.

One of the most implicated probable sources of infections are door handles of laboratories and washrooms. [3]

Microbial contamination of laboratory equipment, such as microscope, incubator, hot air oven, refrigerator, gas burner, centrifuge, rotator, balance, autoclave, biosafety cabinet, laminar air flow hood, pH meter, may pose a potential health risk to laboratory workers. [4-6] These laboratory equipments are commonly used by laboratory staff and several students every week, and the specific results indicated that the equipment was contaminated with microorganism, and students and staff were potentially exposed while working to these instruments, and therefore these microorganisms, which cause transmittable

diseases. As a result, microbiology laboratories are potentially critical for contamination to students. Survival of the microorganisms in such an environment is dependent on the type of the microorganisms and surface of the equipment [6].

LAIs is a major challenge to the health care system and results in significant mortality, morbidity, and economic burden to the patients [7]. These infections may result in substantial higher health care costs to government agencies [8]. Intensive care unit (ICU) patients are at great risk of acquiring nosocomial infections because of breaches in host defense as a result of trauma, invasive medical devices, and/or corticosteroid therapy [9-11].

MATERIALS AND METHODS

This prospective study was carried out at Microbiology laboratory, Department of Microbiology, N.C. Medical College and Hospital, Panipat, India over a period of six months from January 2017 to June 2017. Total 100 samples were taken from different parts of the laboratory equipment in the Microbiology laboratory.

Specimens were collected by sterile swabs moistened in peptone water from different parts of the microscopes (n= 30), incubators (n = 6), hot air oven (n=3), refrigerators (n=3), biosafety cabinet (n=5), laminar air flow (n=5), gas burner (n=2), balance machine (n=2), autoclaves (n = 5), centrifuge (n = 3), rotator (n = 2), shelves (n = 6), door handles (n = 5), ovens (n = 4), dust bin lids (n = 5), microscopy slide boxes (n=5), chairs (n = 16) and table (n=8). In addition, 26 swabs were collected from sink (n = 6) and floor (n=15).

Samples were collected using the swab-rinse technique of the American Public Health Association as described by Reynolds KA [9].

Instruments were swabbed with two sterile, cotton tipped applicator (swab stick) moistened with sterile peptone water. One swab inoculated on Sabouraud's dextrose agar slant with chloramphenicol antibiotic (to avoid bacterial contamination) and another swab was inoculated on blood agar, MacConkey's agar plate, and spread evenly over their entire surfaces using a sterile bent-glass rod. This was to allow quick recovery of all organisms picked up in the swab. The blood agar, MacConkey's agar plates were incubated aerobically for 24 hours at 37°C (Angelotti and Foter, 1958) [10], and Sabouraud's dextrose agar slant was incubated at 25-28°C for 1 to 7 days. Identification and characterization of microbial isolates were done by standard microbiological methods.

RESULTS

Total 13 samples were collected from different instruments of Microbiology laboratory i.e. 1) microscopes, 2) incubators 3), refrigerators, 5) laminar air flow and 6) centrifuge machine. Samples from each section were 2, 5, 3, 2, and 1 respectively. We found that all the swab sampled shows 100% contamination from microscope, incubator and centrifuge machine, however refrigerator showed 66.67% and laminar air flow 50% contaminations.

Distribution of microorganisms on laboratory areas were *Bacillus* species 11/36 (30.56%) followed by Coagulase negative *Staphylococcus* 6/36 (16.67%), *Staphylococcus aureus* 5/36 (13.89%), *Diptheroids*, *Micrococcus* and *Aspergillus* species 4 (11.11%) each and *Candida* species 2/36 (5.56%).

Highest bacterial isolates were observed in the instruments of bacteriology section (44.44%) followed by mycology section (22.22%), parasitology and serology section (16.67%) each.

DISCUSSION

In our study total 13 samples were collected from different instruments of Microbiology laboratory i.e. 1) microscopes, 2) incubators 3), refrigerators, 5) laminar air flow and 6) centrifuge machine. Samples from each section were 2, 5, 3, 2, and 1 respectively. We found that all the swab sampled shows 100% contamination from microscope, incubator and centrifuge machine, however refrigerator showed 66.67% and laminar air flow 50% contaminations.

In our study the distribution of microorganisms on laboratory areas were *Bacillus* species 11/36 (30.56%) followed by Coagulase negative *Staphylococcus* 6/36 (16.67%), *Staphylococcus aureus* 5/36 (13.89%), *Diptheroids*, *Micrococcus* and *Aspergillus* species 4 (11.11%) each and *Candida* species 2/36 (5.56%).

Table 1: Showing different instruments of the laboratory included in study.

Sr. No.	Surface of lab area	Sample tested	Growth N (%)
1	Microscope	2	2 (100)
2	Incubator	5	5 (100)
3	Refrigerator	3	2 (66.67)
4	Laminar Air Flow	2	1 (50)
5	Centrifuge machine	1	1 (100)
	Total	13	13 (100)

Table 2: shows bacterial and fungal isolates from laboratory instruments.

Sr. No.	Isolated organisms	Total No. of samples n=13 (%)
1	*Bacillus* species	11 (30.56)
2	Coagulase negative *Staphylococcus*	6 (16.67)
3	*Staphylococcus aureus*	5 (13.89)
4	*Diptheroids*	4 (11.11)
5	*Micrococcus*	4 (11.11)
8	*Aspergillus* species	4 (11.11)
9	*Candida* species	2 (5.56)
Total		36 (100)

In our study total bacterial isolates was highest in the instruments of bacteriology section (44.44%) followed by mycology section (22.22%), parasitology and serology section (16.67%) each.

No study was done on bacterial contamination of laboratory instruments however Mahmoudabadi AZ et al. (2006) from Iran, reported on fungal contamination of seven instruments (3.9%) revealed the presence of pathogenic fungi. The dermatophytes identified included three isolates 1.67%) of *Trichophyton schoenleinii*, one isolate (0.56%) of *Trichophyton violaceum* and one isolate (0.56%) of *Trichophyton verrucosum.* In the present study, one isolate (0.56%) of *N. asteroides* and one isolate of (0.56%) *Sporotrix schenckii*, were also identified. The isolates of *T. schoenleinii* were isolated from flame, balance and microscope. Isolates of *T. violaceum* and *T. verrucosum* were recovered from microscope and microscopy slide boxes, respectively. No*cardia asteroides* and *S. schenckii* were also isolated from a shelf and a lab coat. [17]

CONCLUSION

Our study showed that all the instruments used in bacteriology, mycology and parasitology are found contaminated with pathogenic/non pathogenic bacteria and fungi; however in serology section showed no microbial pathogens. It indicates that the laboratories in which patients samples are directly and rapidly processed are the major source of microbial pathogens and may infection from the hands of laboratory workers after touching the instruments are on risk of laboratory acquired infection.

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