MICROORGANISMS COLONIZING THE CADAVERS: THE NEED OF INFECTION CONTROL PROTOCOLS DURING DISSECTION

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ABSTRACT

Introduction: Microorganisms can colonize the surfaces of cadavers and may pose health hazards to the students and the staff handling them. The objective of the study was to study the spectrum of bacteria and fungi colonizing the surfaces of cadavers and to determine the need to follow infection control protocols during their handling.

Materials and methods: A total of 100 swabs were collected from superficial and deep surfaces of the cadavers and its surroundings. The swabs were cultured on blood agar and Mac Conkey's agar plates for isolation of bacterial species and Sabourauds Dextrose Agar (SDA) slants for isolation of fungal species. Identification of the bacterial and fungal isolates was done using standard bacteriological and mycological methods respectively.

Results: Overall culture positivity rate was 78%. There was predominance of isolation of bacterial species (50%). *Escherichia coli* and Coagulase negative Staphylococci [CoNS] (23.07 % each) were the predominant bacteria isolated and *Aspergillus* species (37.50%) was the predominant fungus isolated from human cadavers.

Conclusions: Various bacteria and fungi colonized the surface of cadavers. Therefore, the study emphasizes the need for practicing "Standard infection control protocols" in the dissection hall while handling the cadavers.

Keywords: Cadaver, Bacteria, Fungus, Standard precautions, Microorganisms

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INTRODUCTION

Dissection of the cadavers is a preferred method for training and skill development in learning anatomy. It is a part and parcel of first year MBBS training that every medical student has to undergo as part of their undergraduate curriculum [1,2,3]. Previous studies by Dinsmore *et al* in 2001 [4] and Shalika *et al* [5] have reported that working with cadavers in dissection hall (DH) creates an emotional stress among the medical students which induces both positive and negative experiences in these students. However, besides the emotional turmoil another aspect of unseen stress that persists while working in close proximity with the cadavers is the risk of transmission of infection. Previous studies have shown that microorganisms, both bacteria and fungi have a tendency of colonizing the surfaces of cadavers [6,7,8]. Another study by Tabaac *et al.* (2013) [9], also showed the presence of pathogenic bacteria in 10 fixed cadavers used in anatomy practices and teaching. However, only a few studies have addressed the biological risk of fixed cadaver manipulation and the likelihood of dissemination of microorganisms during dissection which may pose serious threat to the students, staff and the environment [10].

The 1st year medical students, who have just entered the course, howsoever, are unaware about the various microorganisms that colonize the cadaveric surfaces, their risk of transmission and the various infection control practices which must be followed by them during dissection. To the best of our knowledge, the infection hazards of handling human

cadavers are underreported in India. So, this study was carried out to determine the profile of microorganisms colonizing the cadavers and highlight the need to practice infection control protocols during their handling.

MATERIALS AND METHODS

The prospective study was carried out for a period of 3 months in the dissection hall of the Department of Anatomy in collaboration with the Department of Microbiology, Subharti Medical College, Meerut. The approval from the Institutional Ethical and Research Committee was obtained before conducting the study.

A total of 100 swabs were collected from superficial and deep surfaces of the cadavers and their surroundings. The samples were collected using pre-sterilized cotton swabs dipped in sterile saline before collection to preserve moisture. The regions sampled included both the axilla, ears, eyes, oral cavity, nasal cavities, inguinal and perianal region of 4 different cadavers and the dissection table.

The swabs collected (minimum of two cotton swabs) were immediately transported to the Clinical Microbiology laboratory under aseptic precaution for isolation and identification of bacterial and fungal species. First swab was cultured on blood agar (BA) and Mac Conkeys (MAC) agar plates and incubated at 37°C for 24 hours for isolation of bacteria. Identification of bacterial species was done by standard bacteriological technique [11]. The second swab was cultured on slants of Sabouraud Dextrose Agar (SDA) with chloramphenicol

(0.05%) and incubated at 25°C and 37°C for isolation of fungi. The fungal growth was identified by standard mycological technique [12]. (Fig.1)

RESULTS

A total of 78 (78 %) surface swabs were culture positive. Among the culture positive swabs, pure bacterial species was isolated in 39/78 (50 %) followed by pure fungal species in 24/78 (30.76%) and mixed organism (both bacteria and fungus) in 15/78 (19.23%) [Figure 2]. A variety of microorganisms were recovered and identified from superficial and deep surfaces of the cadavers and the surrounding table by culture and identification methods. *Escherichia coli* and Coagulase negative Staphylococci

(23.07 % each) was the predominant bacteria isolated followed by *Bacillus* species (15.38%). *Aspergillus* species was the predominant fungus growing on human cadavers (37.50%) followed by *Candida* species (25.00 %). Even in mixed growth *Aspergillus* was the predominant species (80%). Distributions of various other bacterial and fungal species isolated are shown in [Table 1]. However, association of two bacterial or two fungal pathogens were not seen in the present study.

DISCUSSION

Cadavers allotted to the students and the surrounding table are colonized with viable microorganisms on their surfaces. These microorganisms can be a source of

Fig. 1. Flow chart showing the processing of samples collected from the cadavers

Fig. 2. Distribution of microorganisms grown in cadaver surfaces (n=78)

contamination of hands, equipment and clothing and can pose as a health hazard to the students and staff. Similar finding published by Molina *et al* [6] identified bacterial and fungal species in human cadavers which can eventually compromise the health of the manipulators and students. Another study carried out by Kabadi *et al* in 2013 [13] have identified potentially pathogenic microorganisms like *Staphylococcus aureus*, *Enterococcus faecalis*, and *Streptococcus pyogenes* by sampling the clothes of students who handled the cadavers, but this study does not directly associate these microorganisms with cadavers.

The result of our study demonstrates that fixed cadavers have viable bacteria & fungi on its surfaces. *E. coli* and CoNS were the predominant bacteria; *Aspergillus* and *Candida*

species was the predominant fungi isolated from surface of cadavers and its surroundings both as pure culture and even as mixed etiology (Table 1). Similarly presence of fungal species like *Aspergillus*, *Trichophyton*, *Microsporum*, *Candida* and *Cryptococcus* in fixed cadavers has also been reported by previous workers [10].

Given the diversity of bacterial species cultured, preserved cadavers used for anatomy education must be considered a possible source for dissemination of microorganisms and they may pose hazards to those handling them [14]. Our study shows the colonization of cadaver surfaces by various microorganisms and emphasizes the need to practice infection control protocols during their handling. Both, the staff and the students, handling the bodies, should be adequately trained regarding the

Microorganism isolated		Number of samples	Percentage %
Bacterial species isolated (n=39)			
1.	<i>Escherichia coli</i>	9	23.07%
2.	<i>Coagulase negative Staphylococci</i>	9	23.07%
3.	<i>Bacillus species</i>	6	15.38%
4.	<i>Staphylococcus aureus</i>	5	12.82%
5.	<i>Micrococcus species</i>	5	12.82%
	<i>Streptococcus species</i>	3	7.70%
6.	<i>Enterococcus species</i>	2	5.13 %
	Total	39	100%
Fungal species isolated (n=24)			
1.	<i>Aspergillus species</i>	9	37.50%
2.	<i>Candida species</i>	6	25.00%
3.	<i>Alternaria species</i>	3	12.50%
4.	<i>Mucour species</i>	3	12.50%
5.	<i>Penicillium species</i>	3	12.50%
	Total	24	100%
Mixed Pathogen (Bacteria+Fungus) Isolated (n=15)			
1.	<i>Aspergillus+ Escherichia coli</i>	9	60.00%
3.	<i>Aspergillus +Bacillus species</i>	3	20.00%
4.	<i>Candida spp. + S. aureus</i>	3	20.00%
	Total	15	100%

Table 1. Profile of microorganism isolated from cadaveric surfaces and surroundings (n=78)

basic infection control protocols as part of the induction training.

As per the new competency based curriculum introduced by the Medical Council of India (MCI) and the stress on early clinical exposure (ECE) , the students of MBBS 2019 batch onwards, undergo such training as part of the foundation course which is a turning milestone in medical education in India [1]. The significance of undergraduates being introduced to “standard infection control protocols” at the commencement of their course is extremely relevant for their safety. MCI has recently introduced a pandemic management module for undergraduate students in August 2020 [15]. The 80-hour longitudinal module on pandemic management stresses on the development of different skill sets in medical students including Infection Control practices such as i) Hand washing [16] ii) PPE Donning & Doffing iii) Disinfection besides many other skills [17].

CONCLUSION

The surfaces of the cadavers are colonized with spectrum of microorganisms. This study intends to enlighten, the naïve 1st semester medical students and staff, regarding risks to which they are exposed during handling of Cadavers; reinforcing the importance of practicing “Standard Precautions”.

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