AEROBIOLOGICAL STUDY OF SHAHEED BENAZIR BUTTO TEACHING HOSPITAL ABBOTTABAD

Adil Hassan*, Ahmad ud Din, Ijaz Khan, Izhar Ali, Tahir Ali khan, Muhammad Naveed, Junaid Ali shah, Zaheer Ur Din, Abdul Majeed Khan, Beenish Naz.
Department of Microbiology, Hazara University, Mansehra- 21300, Pakistan

Abstract: - An aerobiological study of Shaheed Benazir Butto (SBB) teaching hospital was conducted during March, 2013. Nutrient agar was used to trap viable bacterial spores from air by using open plate gravitational method. These plates were incubated and mature colonies were then identified by biochemical analytical methods. Out of seven bacterial cultures 4 Gram positive and only 3 strains were found Gram negative. However, the bacterial strains were found comparatively valuable in six unit's i.e. medical wards, emergency ward, post-surgical wards intensive care unit (ICU) and emergency doctor room. The total counts for bacterial strains were noted. A comparison between indoor and outdoor was also noted. A variation was found in both bacterial shapes. Relatively bacterial strains were dominant in indoor as compared to outdoor samples. It was found that the total bacterial strains in emergency ward were highest in all the tested samples. The present investigation clearly indicated that bacterial population outside was more as compared to inside samples. Except emergency ward in which the inside population was noted high.

Key words: Open Plate Gravitational Method, Aerobiological Study, Microorganism, Nosocomial Infection,

***Corresponding Author:** Adil Hassan, E-mail: adilhassandawar91@gmail.com, Cell number: +92 3059568081; Department of Microbiology, Hazara University, Mansehra Pakistan

1 Introduction

Aerobiology is a scientific discipline that deals with the carry of microorganisms and biologically important tools through the environment [1]. The Aerobiology examined particles of biological origin, which are found in the atmosphere pollen, fungal spores, bacteria, algae and other their sources, their propagation and interaction with non-organic particles and their effects on humans. Aerobiology studies small particles from biological origin that are air borne in the air. They fly passively due to wind transport (airborne). These particles are mainly pollen grains from plants and spores from fungi [2]

The airborne pathogens cause various diseases in their concerned hosts. e.g. the important airborne animal pathogens include *Mycobacteium bovis, Actinobacillus mallei, Brucella spp,* and *Salmonella spp* in bacteria which causes tuberculosis, Glanders, Brucellosis and salmonellosis diseases respectively, while among fungal pathogens of animals are mostly *Aspergillus spp, Cryptococcus spp* and *Coccidioides immitis* which causes aspergillosis, cryptococcosis and coccidioidomycosis diseases respectively. while among viral pathogens that causes various diseases in different animals are *Herpes viridae, Alpha virus, Pesti virus, Influenza virus, Morbilli virus, Rhabdo viridae, Morbilli virus, Influenza others, Aptho virus* and *morbilli virus* causes canine herpes, eastern equine encephalo myelitis, hog cholera, influenza, feline distemper new castle disease, infectious bronchitis, foot and mouth disease and rhinderpeste, epidermal fever, infectious laryngotracheitis respectively [3]. The load of contamination in the hospitals atmosphere such as OT rises the incidence of hospital acquired infections [4.5.6]. Which may lead to the increase rate of illness and death which are admitted for post-operative surgery, in ICU patients which are multi drug resistance such as MRSA indicate deadly resister of these microorganism [7.8]. Between the surgical places the important problems of surgery contains the increase rate of infection [9]. In hygienic surgery the microorganism contamination of air in the room of operation is commonly measured to be a great issue for infection of surgical places [9.10].

In the biosphere of animals, nematodes, protozoa, mites and small insects can develop airborne through breeze stroke on soil, water, or plants or by mechanical activity [11].

Commonly, the airborne bacteria and fungi have different sources such as dust water introduced into the hospital.

Also stated the settlement of filter media via fungi more generally related with the spread of outside air [12.13]. It has demonstrated that the bio aerosol contaminants in hospital operating rooms were mostly linked with releases from skin, respiratory tract and human hair [14]

2 Materials and Methods

Samples are collected from Shaheed Benazir Bhutto Teaching Hospital. This Hospital is located in the center of Abbottabad on main Mansehra Road within the Supply Area. In present investigation we take the samples of microbial quality of indoor and outdoor air of ten wards/units of Shaheed Benazir Bhutto Teaching Hospital Abbottabad, this was conducted during March 2013.

Nutrient agar was used to trap viable bacterial and fungal spores from air by using open plate gravitational method. These plates were incubated for 24 to 48 hours after that mature colonies are seen there. Then we count these colonies by colonies counter and make a percentage value of each plate .then we differentiate these colonies on the bases of color and morphology so we obtain nine different types of colonies on these plates.

Then we made slants of agar media for pure culturing of each colony and incubated these slants for 24 hours, after 24 hours we obtained pure culture of these colonies, to differentiate between these colonies we subculture these pure colonies from slants on the plates prepared from different media i.e Blood agar, EMB agar and MeCkoncy agar and growth are absorbed on these plates.

To identify these colonies specifically we applied different microbial identification methods i-e first gram staining was done to identify these colonies either they are gram positive or gram negative. Second microscopy was done for identification either they are bacillus species, cocci species, or spiral species. For further identification we conduct biochemical tests. For gram positive bacteria we done catalase, oxidase and coagulase tests and for gram negative bacteria we run the biochemical sets i.e TSI (tiple suger iron), Urease and citrate.

3 Results

Sampling and Isolation of air born microorganisms were done in Shaheed Benazir butto teaching hospital Abbottabad, which were divided into six units

1) Surgical ward male inside /outside
2) Surgical ward female inside/outside
3) ICU inside/outside
4) Emergency ward inside/outside
5) Doctor room inside/outside
6) Male/Female medical ward inside/outside

3.1 Surgical ward male inside/outside

After giving an incubation period of 48 hours the growth were observed on the plates that were exposed to both inside and outside the male surgical ward. The number of bacterial colonies on the plate was shown in table 1and 2

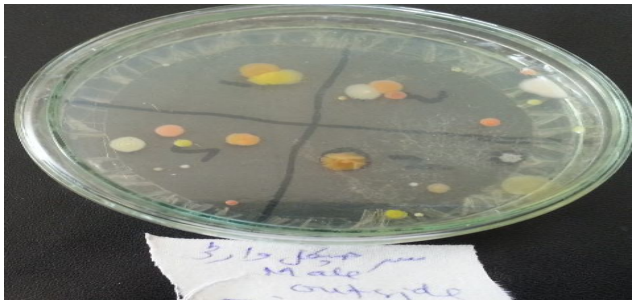
Table 1 Male Outside Surgical Ward

Male Outside surgical ward			
Morphology	Gram Staining	Species	%age
Yellow	+	Staphylococcus	21%
Pinkish	+	Bacillus Cereus	22%
Orange	+	Streptococccus	24%
Brownish	+	Enterococcus	19%
Whitish	–	Pseudomonas Aeruginosa	24%

Table 2 Male Inside Surgical Ward

Male Inside surgical ward			
Morphology	Gram staining	Species	%age
Yellow	+	Staphylococcus	23%
Pinkish	+	Bacillus cereus	18%
Orange	+	Streptococccus	14%
Brownish	+	Enterococcus	22%
Whitish	–	Pseudomonas Aeruginosa	13%

Figure 1 Male Outside Surgical Ward



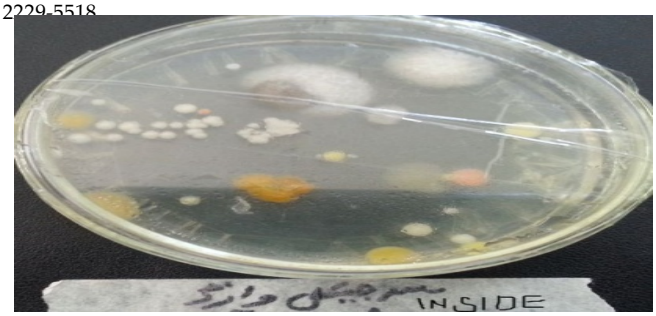


Figure 2 Male Inside Surgical Ward

3.2 Female Surgical ward inside/outside

The number of bacterial colonies on the plate that were exposed inside and outside were shown in table 3 and 4.

Table 3 Female Outside Surgical Ward

Female outside surgical ward			
Morphology	Gram Staining	Species	%
Yellow	+	Staphylococcus	21%
Pinkish	+	Bacillus Cereus	21%
Orange	+	Streptococccus	14%
Brownish	+	Enterococcus	19%
Whitish	-	Pseudomonas Aeruginosa	24%

Table 4 Female Inside Surgical Ward

Female inside surgical Ward			
Morphology	Gram Staining	Species	%
Yellow	+	Staphylococcus	14%
Pinkish	+	Bacillus cereus	09%
Orange	+	Streptococccus	16%
Whitish	-	Pseudomonas Aeruginosa	50%

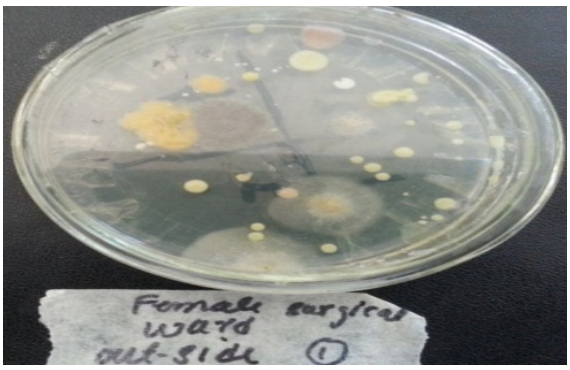


Figure 3 Female Outside Surgical Ward

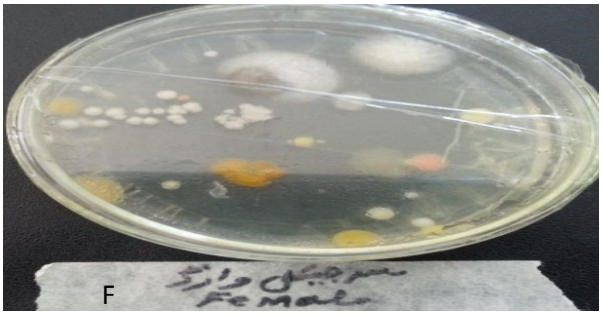


Figure 4 Female Inside Surgical Ward

3.3 ICU Inside/Outside

The number of bacterial colonies on the plate that were exposed inside and outside were shown in table 5 and 6.

Table 5 ICU Outside Ward

ICU Outside Ward			
Morphology	Gram Staining	Species	%age
Yellow	+	Staphylococcus	29.1%
Pinkish	+	Bacillus Cereus	13.5%
Orange	+	Streptococccus	22.6%
Brownish	+	Enterococcus	19.5%
Whitish	–	Pseudomonas Aeruginosa	15.3%

Table 6 ICU Inside Ward

ICU inside Ward			
Morphology	Gram Staining	Species	%
Light Yellow D	–	Proteus Mirabilis	72.1%
Pinkish	+	Bacillus cereus	4.2%
Orange	+	Streptococcus	13.1%
Whitish	–	Pseudomonas Aeruginosa	7.1%
Reddish	–	E. Coli	4.2%

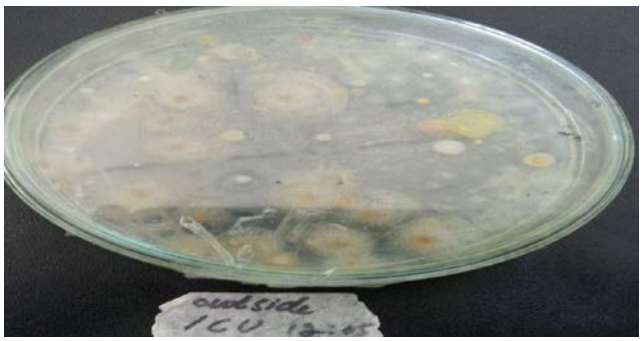


Figure 5 ICU Outside

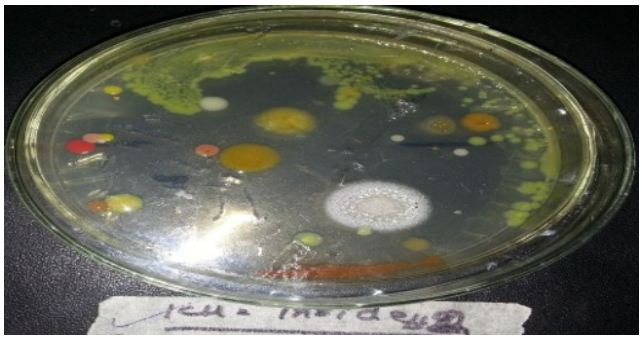


Figure 6 ICU Inside

3.4 Emergency wards Inside/outside

The number of bacterial colonies on the plate that were exposed inside and outside were shown in table 7 and 8.

Table 7 Emergency Ward Outside

Outside Emergency Ward			
Morphology	Gram Staining	Species	%age
Yellow	+	Staphylococcus	30.1%
Pinkish	+	Bacillus Cereus	17.2%
Orange	+	Streptococccus	21.4%
Brownish	+	Enterococcus	18.2%
Whitish	–	Pseudomonas Aeruginosa	13.1%

Table 8 Emergency Ward Inside

Inside Emergency Ward			
Morphology	Gram Staining	Species	%age
Yellow	+	Staphylococcus	21.8%
Pinkish	+	Bacillus cereus	25.7%
Orange	+	Streptococccus	16.6%
Brownish	+	Enterococcus	23.6%
Whitish	–	Pseudomonas Aeruginosa	21.1%

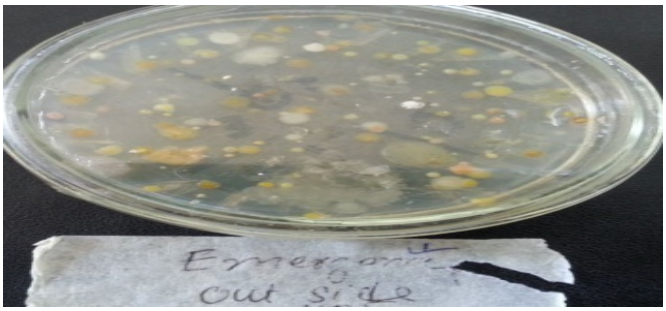


Figure 7 Emergence Ward Outside

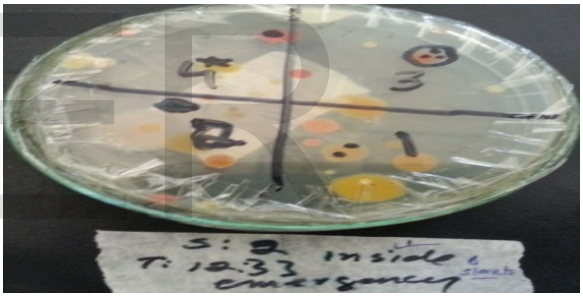


Figure 8 Emergence Ward Inside

3.5 Emergency Doctor Rooms Inside/Outside

The number of bacterial colonies on the plate that were exposed inside and outside are shown in table 9 and 10.

Table 9 Emergency Doctor Room Outside

Outside Doctor Room			
Morphology	Gram Staining	Species	%age
Yellow	+	Staphylococcus	22.2%
Pinkish	+	Bacillus cereus	21.1%
Orange	+	Streptococccus	10%
Brownish	+	Enterococcus	23.3%
Whitish	–	Pseudomonas Aeruginosa	23.3%

Table 10 Emergency Doctor Rooms Inside

Inside Doctor Room			
Morphology	Gram Staining	Species	%age
Yellow	+	Staphylococcus	21.2%
Pinkish	+	Bacillus cereus	9.5%
Orange	+	Streptococccus	19.1%
Brownish	+	Enterococcus	8.1%
Whitish	–	Pseudomonas Aeruginosa	41.9%

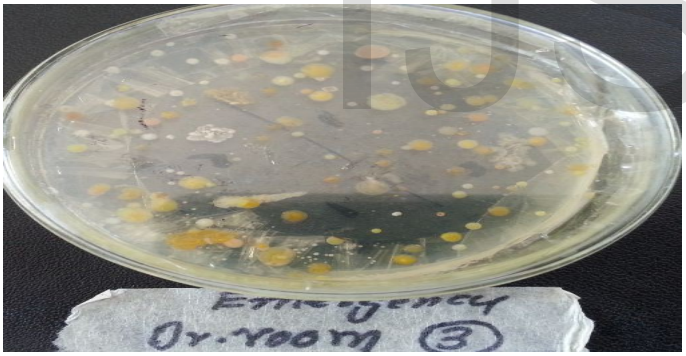


Figure 9 Emergency Doctor Room

Table 11 Male/ Female Medical Ward Inside

Female Medical Ward			
Morphology	Gram Staining	Species	%age
Yellow	+	Staphylococcus	12.9%
Pinkish	+	Bacillus cereus	61.2%
Brownish	+	Enterococcus	13.9%
Whitish	–	Pseudomonas Aeruginosa	11.8%

Table 12 Male/Female Medical Ward Outside

Male/Female Medical Ward			
Morphology	Gram Staining	Species	%age
Yellow	+	Staphylococcus	16%
Reddish	–	E. coli	4.05%
Brownish	+	Enterococcus	9.4%
Whitish	–	Pseudomonas Aeruginosa	97.5%
Orange	+	Streptococcus	2.7%

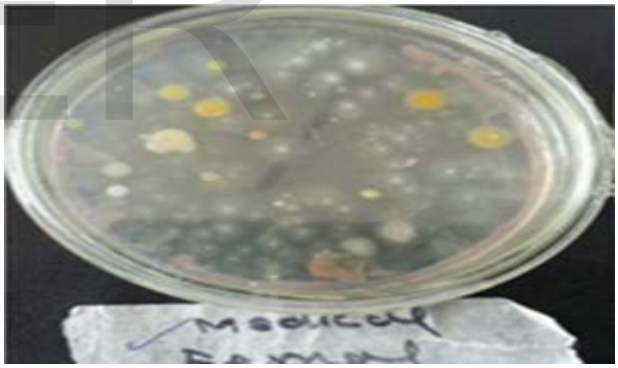


Figure 10 Female Medical ward

3.6 Male/Female Medical Wards

The number of bacterial colonies on the plate that were exposed were shown in table 11 and 12.

Figure 11 Male Medical Ward

4 Discussion

Our study exhibited that the air nearby SBBH is polluted and contain a huge amount of bacterial spores and about seven bacterial strains were isolated belonging to 7 genera from the air of SBBH. The bacterial strains belonging to the genera staphylococcus aureus, streptococcus, bacillus cereus, anterococcus, pseudomonoas aeruginosaa, E.coli, proteus mirbilis. In the air of selected sites the occurrence of some bacterial strains also presented some restrictions as in the air of some sites some bacterial strains are not present. The differences in the structure of aero mycoflora of particular places was clear as out of seven, 5 species were met in the air of surgical ward inside and outside, 5 and 4 species from female surgical ward respectively.7 species from ICU , five from causality ward , five from Doctor room in Emergency and six from male and female ward.

Some bacterial strains indicated their occurrence single in the air of a specific place for example in the air of ICU Proteus marbilis is only present while in the air Medical Ward E.Coli is present. Similarly some important bacterial strains like Micrococcus luteus, Arthrobacter,. Microbacterium,. Curtobacterium, Rhodococcus, were not present in the atmosphere of SBBH. The random sample from the air of SBBH also indicated that the species such as Cochliobolus spicifer, Aspergillus candidus, Rhizopus stonilifer, Fusarium culmorum, Geotrichum candidum, Curvularia lunata, Trichoderma, Epicocum purpurascens, sp. Aspergillus terrus, and Trichothecium sp. This studies shows that staphylococcus aureus, streptococcus, enterococcus, pseudomonas aerogenosa and bascillus species are present in most of the hospital units.

Airborne micro flora in the rooms of hospital has been the issue of several studies as a probable cause of nosocomial infections. Most of the studies were performed in intensive care units, surgical units, male/female medical wards, Male female post-surgical ward, emergency, Doctor Room and emergency ward where the risk of infections is greatest. The levels of microorganisms found in most rooms were 101-103 CFU/m3.

It is known to that entire microorganism is the main source of hospital acquired infection in hospitals. Our all study and discussion finding is same with Jaffal et al [16]and similar variety of aero-flora was isolated from the hospital of desert country.

5 Conclusions

A comparison between indoor and outdoor was also noted. A variation was found in both bacterial shapes. Relatively bacterial strains were dominant in indoor as compared to outdoor samples The aim of the current research clearly indicated that bacterial population outside was more as compared to inside samples. Except emergency ward where maximum load of microorganism was observed inside emergency ward.

6 Acknowledgments

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7 Competing interest

The author and co-authors of this manuscript do not have any conflict and competing interest

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