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Microbiology

SURVEILLANCE STUDY OF AIR CONDITIONING UNITS IN OPERATION THEATRES OF A TERTIARY CARE HOSPITAL, PUNE.

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ABSTRACT **Background**: Badly maintained air conditioners act as a source of Hospital infection. One of the important causes of post-operative fungal infections is discharge of spores from contaminated air conditioning (AC) units. The filters and/or vents of such units may act as a nidus for the growth of fungi. To formulate and initiate the control measures, an active surveillance of AC units in various operation theatres was carried out in Sassoon General hospital, Pune.

Materials and Method: Over a period of three months, ten operation theater AC units were screened for the fungal isolation by fungal culture and identification by macroscopic and microscopic examination.

Result: The overall fungal isolation rate of AC vent was 95 %. Aspergillus spp. was the commonest one followed by Mucor, Rhizopus and Penicillium.

Conclusion: The result of this surveillance study was used to educate the hospital about the need for routine cleaning of vents of AC units, so as to reduce the proliferation and dispersion of pathogenic fungi.

KEYWORDS : Air conditioning units, Operation theatre, Fungi, Nosocomial Infections, Surveillance.

Introduction:

Post-operative fungal infections remain the major cause of morbidity and mortality. Hospital associated infections caused by fungi have been documented. Fungi that can cause hospital acquired infections include Aspergillus spp., members of the order Mucorales and Moniliaceous moulds i.e. *Rhizopus, Fusarium, Mucor, Penicillium* (1,2). Bioaerosols of fungal spores are one of the major types of micro-organisms present in hospital environment and may be transmitted through air, outdoor air, visitors, patients, air conditioners and major construction work. Fungi proliferate in air conditioning units due to moist environment (2). The filters and/or vents of such units may act as a nidus for the growth and proliferation of fungus (3). Spores of *Aspergillus* and other pathogenic fungi can get inoculated at the site of operation and may lead to post-operative infections. Also the increased levels of the atmospheric dust and fungal spores during constructive work have been associated with clusters of healthcare acquired infections in immunocompromised patients (4).

Operating room is a highly specialized unit where strict asepsis should be maintained in order to reduce post-operative infections (1). All OTS have ACs installed in them so active surveillance study of air conditioners in various operation theatres was therefore carried out in Sassoon General hospital over a period of three months..

Materials and methods:

The surveillance study was carried out in various operation theatres of a tertiary care hospital, Pune, over a period of three months from February to April 2013. Operation theatres included in the study were Ophthalmology, Orthopaedics , Surgery, Gynaec, CVTS, MTP, ENT, Infosys (Neuro, Plastic and Uro). All the AC units were wall mounted.

The swabs were collected from the vents of air conditioning units of various OTs. The sterile swab stick was rolled from various sites of the vent of AC unit. The swabs were taken from the vent of each AC unit and were inoculated on two Sabouraud's Dextrose Agar (SDA) with antibiotics and incubated at 37^{0}C and room temperature.

The slants of SDA were examined everyday for the growth of fungus for one week and weekly thereafter for four weeks for the presence of any fungal growth. Macroscopic examination of growth was done and colony characters were noted.Microscopic examination was done by direct wet mounts in Lacto Phenol Cotton Blue (LPCB), which was used to identify the nature of fungal growth. (5)

Repeat swabs were taken from the vents of ACs of each OT after cleaning and disinfection with sporicidal disinfectant.

Results:

Table No 1: Total no. of swabs collected from the vents of AC units and positive for fungal growth.

Name of OT	No. of swabs collected from vents of AC	No. of swabs positive for fungal isolates
Ophthalmology OT	2	2
ENT OT	1	1
MTP OT	1	1
CVTS OT	3	3
Gynaec OT	4	4
Orthopedics OT	4	4
Surgery OT	2	2
Septic OT	1	1
Infosys OT(Neuro, Plastic, Urology)	2	No growth
Total	20 swabs	18 swabs were positive for fungal growth

Table No:2 Fungi isolated from the swabs collected from vents of AC units.

Name of OT	No. of swabs showing fungal growth	No. of Fungi isolated (LPCB)
Ophthalmology OT	2	*Aspergillus fumigatus, Aspergillus niger*
ENT OT	1	*Aspergillus fumigatus, Aspergillus niger(mixed growth)*
MTP OT	1	*Aspergillus niger*
CVTS OT	3	*Aspergillus fumigatus, Aspergillus niger, Mucor*
Gynaec OT	4	*Aspergillus niger, Aspergillus fumigatus, Penicillium, Rhizopus*
Orthopedics OT	4	*Rhizopus, Mucor, Aspergillus niger, Aspergillus fumigatus*

Surgery OT	2	*Aspergillus fumigatus, Aspergillus niger*
Septic OT	1	*Aspergillus fumigatus*
Infosys OT(Neuro, Plastic, Urology)	No growth	No growth
Total	**18**	**19 fungal isolates**

Out of 20 swabs collected from the vents of AC units, 18 swabs were positive for fungal growth. The fungal isolates yielded from vents of AC units were 19.

The *Aspergillus niger*(n=7), *Aspergillus fumigatus*(n=7), *Mucor*(n=2), *Rhizopus* (n=2), *Penicillium*(n=1)

Aspergillus spp was the commonest one followed by *Mucor, Rhizopus and Penicillium*.

The fungal isolation rate was 95%.

Discussion:

Maintenance of strict asepsis is essential to minimize the chances of post-operative infections and their consequences. Infective agent could be transmitted due to inadequately sterilized equipments, presence of shedder of pathogenic organisms amongst the hospital personnel, contaminated environment through air and surfaces. (2) Air conditioning units though present in all OTs are often neglected in the infection control practice of the hospital.

In the present study, overall 10 OTs were screened for fungal isolation and from nine OTs fungal isolates were obtained. So the rate of fungal isolation was 95 %.

Aspergillus spp was the commonest fungi isolated. This fungi occurs in soil, water and decaying vegetation. Other opportunistic fungi isolated in this study are also known to cause nosocomial infections (3).

The spores of *Aspergillus fumigates* have a diameter of 2 – 3.5 µm and a setting velocity of approximately 0.03 cm/s (1m/ hour) in still air. With this buoyancy, the spores which resist drying can remain in the air indefinitely (2). Spores of *Aspergillus* and other pathogenic fungi can settle into surgical wounds and initiate infection. The minimum number of spores required for initiating the infection however needs to be investigated (2)

The AC units which yielded fungi from the various AC filters, were cleaned by using sporicidal disinfectants such as Chlorine dioxide in adequate concentration(5). The AC units should be cleaned and disinfected once every 3 months thoroughly with the help of vacuum suction device followed by wet mopping. The AC units should be manually cleaned, washed with detergent followed by thorough washing with water. The filters should be sundried before re-installation. Thus simple measures like cleaning and disinfecting the AC units at regular intervals will help in the reduction of post-operative complications in various OTs. The hospital personnel should be given basic training of cleaning and disinfecting the vents of AC units (2).

In the present study, repeated swabs taken from the AC vents after cleaning with sporicidal disinfectant yielded no growth.

Most healthcare facilities in India do not have operating theatres with the recommended physical parameters required for conventionally ventilated operating theatres (3). AC units are often installed for comfort and not for the delivery of clean air. However other than ophthalmic infections due to fungi, reports of occurrence of other post-operative fungal infections are infrequently reported. Long term studies of post operative fungal infections are therefore necessary to investigate whether such infections are due to fungal colonization. (3).

Considering the disastrous consequences of such infections especially in ophthalmic operative units, it becomes extremely to maintain ACs meticulously and continuously for fungal spores.(2,3)

Conclusion:

AC vents can be a source of infection in Ots.

Effective maintenance program needs to be followed to minimize nosocomial infections generated by AC units.

Preventive measures for nosocomial infection includes regular cleaning of AC vents and educating hospital staff about routine cleaning and disinfection of AC units.

References :

1. Kelkar U, Kelkar S, Bal AM, Kulkarni S, Kulkarni S. Microbiological evaluation of various parameters in ophthalmic operating rooms. The need to establish guidelines. Indian J Ophthalmology. 2003; 51: 171-176
2. Kelkar U, Kulkarni S. Contaminated air conditioners as a potential source for contaminating operation theatre environment. International J of Infection Control. 2011;8 : 45-48
3. Kelkar U, Bal AM, Kulkarni S. Fungal contamination of air conditioning units in operating theatres in India. J of Hospital infection. 2005; 60 : 81- 84
4. Centers for Disease Control and Prevention, Health Care Infection Control Practices advisory committee, Draft guidelines for environmental infection control in healthcare facilities. Atlanta CDC 2003; Appendix F – 230
5. Koneman EW, Allen SD, Janda WM, Paul CS, Winn Jr. WC, Editors. Diagnostic Microbiology, 14th Edition. Philadelphia PA. Lippincott 1992; 983 – 1069
6. http://www.aspergillus.org.uk/secure/treatment/postoptxt.php