1. **TITLE OF THE PROJECT**: **Assessment of Inanimate objects as Reservoir Nosocomial Bacteria and efficacy of Disinfectants in their Management**

2. **NAME AND ADDRESS OF THE PRINCIPAL INVESTIGATOR:**
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3. **UGC APPROVAL NO. AND DATE:** File No. 47-1322/10 (WRO) dated 21st Sept 2010

OBJECTIVES & RESEARCH OUTCOME:

a. **To determine the risk factors for Nosocomial Infections by conducting systematic cultivation of bacteria from inanimate sources of critical area of hospitals:**
Swabs of floor, wall and door handle was taken from the 18 hospitals. Microbial load of the inanimate objects was done on Trypticase Soya Agar and Blood Agar plates. As expected load of microbes in the most hospital was found on floor, with $1.4x10^4$ cfu sq.cm. per being the highest and 34 cfu per ml being the lowest. Followed by the floor was the door handle which showed the next high counts, with $1.9x10^3$ cfu per sq.cm. being the highest and 12 cfu per sq. cm. being the lowest. Low counts were obtained from walls highest count 1900 cfu per sq. cm (log counts being 3.3383) for hospital 3 and lowest 12 cfu per sq. cm (being 1.071) for 1hospital.

b. **To identify the isolates by classical, API based and molecular method and determine the prevalence of groups/types of bacteria & determine the antibiotic susceptibility profiles of the isolates:**
A total of 453 isolates were obtained from the sampling, and all were identified up to the genus level. Majority of the cultures identified have been reported to be involved in the nosocomial infections. Resistant isolates were further identified by biochemical, API and 16sRNA method.
Out of 453 isolates 47% were *Staphylococcus* spp, 9% were *Micrococcus* spp, 7% *Streptococcus* spp., 2% *Proteus* spp., 2% *Edwarsiella* spp., 1% *Vibrio* spp., 31% *Actineobacter* spp., and 31% *Bacillus* spp. Thus, gram positive cocci dominated the hospital environment as can be observed.
A survey of ten physicians was done to look for the commonly prescribed antibiotics. Eight antibiotics were selected of four were used for Gram positive and four for Gram negative isolates. The antibiotic selected were Amoxycillin, Co-trimoxazole, Cephadroxil Chloramphenicol, Cefixime, Norfloxacin, Ofloxacin, and Amikacin of which first four were used for Gram positive and the last for Gram negative organism. Out of the 27 *Micrococcus spp* tested 3.7% were resistant to all four antibiotic and 40.74% sensitive to all the four antibiotics. Of the 122 *Staphylococcus* spp. tested 2.45% were resistant to all four antibiotic and 33.06% sensitive to all the four antibiotics. None of the 14 *Streptococcus* spp., 44 *Bacillus* spp tested were resistant to the four antibiotic. Out of the 26 Gram negative isolates tested none of them were resistant to all four antibiotic and none of them sensitive to all the four antibiotics

c. **Check the efficacy of commercial disinfectants in controlling the growth of hospital-borne bacteria & understand resistance pattern in some isolates**
Disinfectants were brought from the hospitals to check its efficacy. It was found that Phenolics disinfectant are the most commonly used disinfectants in the hospital settings. Out of the 18 disinfectant checked, 50% of disinfectants showed microbial growth in the disinfectant itself, which indicates that these disinfectants have failed the in-use test. 1% of the disinfectant concentration that is used by most of hospital fails to remove the microbial load of the isolates obtained from the hospitals. The antibiotic resistant strains are resistant to even 5% concentration of the disinfectant.

ACHIEVEMENTS FROM THE PROJECT:

The achievements of the study can be identified as follows:

- The study could successfully map the high microbial load on inanimate surfaces in nursing homes which could be a potential source of transferring nosocomial diseases amongst the in-house patients.
- The study could achieve the drug resistance pattern for the microorganisms isolated from these inanimate surfaces and thereby highlighting concerns on prevalence of antibiotic resistant strains in the hospital environment, having potential to spread in the hospitalized patients.
- The study could also determine inadequacy of the disinfectants in terms of their efficiency in removal of microbial load from inanimate surfaces resulting in development of multi drug, multi-disinfectant resistant microorganisms, posing a serious threat to the health safety of the patients, exposing them to graver secondary health hazard.

SUMMARY OF THE FINDINGS

- Nosocomial infections become obvious when the patient is in the hospital, but some are not recognized until after the patient has been discharged. This study was undertaken to evaluate the load and variety of micro-organisms found on the indoor surfaces of 18 small nursing homes in Mumbai suburbs and their antibiotic and disinfectant sensitivity profile.
- The highest microbial counts were obtained from the floor samples of most of the nursing homes ranging from 52 cfu/cm^2 to > 3x 10^6 cfu/cm^2; which was lower in case of walls ranging between 12 & 2.2 x 10^3 cfu/cm. Lesser counts for wall samples were observed in 16/18 nursing homes and similar level counts were for door handle samples from 9/18 nursing homes. Only one nursing home (no.4) passed the APHA standards for floor cleanliness[4].
- On the basis of cultural and morphological characteristics, 446 isolates were selected and identified upto genus level. Maximum isolates (63%) were gram positive cocci, followed by 31% gram positive bacilli and 6% gram negative coccobacilli. Identification of isolates showed presence of *Staphylococcus* spp, *Micrococcus* spp, *Streptococcus* spp, *Bacillus* spp, *Proteus* spp, *Edwarsiella* spp, *Vibrio* spp and *Acinetobacter* spp.
- Out of the 446 isolates obtained, 207 gram positive and 26 gram negative isolates were used for antimicrobial susceptibility tests. The antibiotics selected for testing susceptibility was based on prescription used by general physicians. 30 gram positive isolates (14.49%) & 2 (7.6%) gram negative isolates were multi drug resistant (MDR) strains of which 6 were also resistant to commonly used disinfectants.
- The 6 isolates, resistant to both disinfectants as well as antibiotics identified by API method were *Stenotrophomonas maltophilia, Rhizobium radiobacter, 2 strains of Staphylococcus saprohyticus, Staphylococcus sciuri, and Staphylococcus haemolyticus*.
- Microbiological standards for surface hygiene and routine screening to monitor levels of microbial dirt in the hospitals are essential for controlling hospital acquired infections. The large variety of disinfectants, available for surface cleaning, varies in their effective dilutions for use. In the present study, *Pseudomonas* spp, *Bacillus* spp and *Micrococcus* spp were found to be present in the in-use disinfectants of 9 nursing homes thus reflecting on their quality and method of use. Hence, the quality of in-use disinfectants needs to be monitored.

PRINCIPAL INVESTIGATOR