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Isolation of *Acinetobacter* spp in ICUs and from Frequently Handled Surfaces - Source of Cross Infection in a Tertiary Teaching Hospital

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A B S T R A C T

Acinetobacter baumanii can cause serious healthcare associated infections (HAI) and the incidence is increasing with many strains showing resistant to multiple antibiotics. *Acinetobacter* spp. are associated with various clinical cases which sometimes is often fatal. Their abundant occurrence in nature and minimal nutritional requirements make them a potent pathogen to cause well-formed infection. They occur mostly in the ICUs as most of the patients are on ventilator. MDR strains are associated with critically ill patients. *Acinetobacter* infection is associated with increased morbidity and a prolonged length of hospital stay. The duration of hospital stay is directly associated with the related infections caused by *Acinetobacter* spp and MDR *Acinetobacter* spp. An *Acinetobacter* can cause mild to severe illness but can be fatal. Most infections occur in healthcare facilities and particularly attack inpatients who are critically ill.

Introduction

Hospital acquired infections are mostly caused by gram negative organisms and is one of the major issues in patient's safety. These infections are often associated with the medical processes of the hospitals such as invasive medical devices and various surgical procedures. Gram negative organisms account for most infections in the hospital environment because of their ability to acquire resistant against multiple antibiotics. Most frequent agents are *Pseudomonas aeruginosa*, *Klebsiella pneumoniae*, *Acinetobacter baumanii*. [1] In the early 20th century (1911), a Dutch microbiologist, Beijerink isolated an organism from the soil by a culture medium that was enriched by calcium acetate and named it as *Micrococcus calcoaceticus*. Similar organisms were described and allotted to 15 different genera and species over the following years. However this was not widely accepted until Baumann *et al.*, concluded that the previously listed organisms belonged to a single genus for which the name *Acinetobacter* was proposed. [2]

Current taxonomic nomenclature defined as *Acinetobacter* is within the family Moraxcellaceae and other gamma proteo bacteria which includes the genera *Moraxcella, Acinetobacter, Psycheobacter* and related organisms. [3] *Acinetobacter spp*. are normal flora of skin and occasionally in the respiratory tract of healthy individuals. *Acinetobacter* spp. are susceptible to chlorine. So uses of disinfectants can limit the transmission of organisms. In an epidemiological survey performed to investigate the colonisation of human skin and mucous membrane with *Acinetobacter spp* up to 43% of non- hospitalised individuals were found to be colonised with these organisms while in hospitalised patients the carriage rate of *Acinetobacter spp* were comparatively high i.e., 75%. [4] Several studies have shown the prevalence of *Acinetobacter spp* in hospital environment, but their rate of occurrence vary widely depending on the protective actions and safety measures taken by different hospitals.

The presence of *Acinetobacter spp* has been found in almost all part of hospital which includes sinks, floor, cup boards, line, mattresses, ventilators and respirators. It suggests that these inanimate things play a role in transmission of *Acinetobacter spp* which contribute them to a potent nosocomial pathogen. [5] Their ability to survive in almost all inanimate substances and minimal nutritional requirements make them very common nosocomial pathogen associated with outbreaks. The outbreaks occur when the patient has underlying disease and various medical processes have been implicated (eg) intravenous catheters, respirators and peritoneal dialysis. [6] The present study was done after isolation of *Acinetobacter spp*. from the inpatients samples from various wards within a month in a teaching hospital to find out as a source of hospital acquired infection.

The present study was done keeping in mind the role of *Acinetobacter spp* in HAI and role of inanimate objects as a vehicle for cross infection.

Materials and Methods

Retrospective study was done after isolation of MDR *Acinetobacter* spp with same antibiotic profile from the patients' samples. The samples included ET secretions, sputum and urine from the inpatients from ICUs and wards (Neuro and Cardiac wards). Environment samplings were done after isolation of same organisms with similar antibiotic profile to look for inanimate objects as vehicles for the role of hospital acquired infection. Isolation of organism is done based on the biochemical reactions according to Clinical and Laboratory Standard Institute (CLSI2017). [7] The environmental sampling was done taking swabs from the surroundings like patient's cot, bed side table, injection trolley etc. The swabs were inoculated on blood and Mac conkey agar. The isolation of organism was done based on biochemical reactions. Antibiotic susceptibility was done according to CLSI guideline 2017. The organism was found to be multidrug resistant.

Results and Discussion

The study was done for a period of one month from various intensive care units after isolation of the same organism with the similar antibiotic pattern from various samples like urine, sputum, ET secretions. Once we isolated the same organism with similar antibiotic pattern, swabs were taken from the inanimate objects to rule out the possibility of cross infection from them. We isolated *Acinetobacter spp*. from cot railings of neuro post-operative intensive care unit, bed side locker of cardiac care unit and bed side locker of neuroward from where the organism was also isolated from patient

samples. Antibiotic susceptibility was done to correlate our findings. This showed cross infection from the inanimate objects to the patient which acts as a vehicle for hospital acquired infection.

The hands of health care can be colonized with *Acinetobacter baumanii* outbreak strains facilitating the spread to patients. Health care workers with damaged skin are at increased risk of developing hand colonization. with *A.baumanii*.[8] The potential mode of *A.baumanii* transmission into a ward are displayed through a colonized patient being the most likely mode after its diffusion into a ward. In our study, we isolated *A.baumanii* with same antibiotic profile from various samples in different wards within a month. The organism was also multidrug resistant. *A.baumanii* can be transmitted from the colonized patient to the surroundings and to other susceptible patients. Transfer of *Acinetobacter* to several patients is boosted by a combination of multiple site patient colonization, widespread environmental contamination persistence on dry surfaces and hands for long periods and the ability to develop or gain resistance to nearby all classes of antimicrobial agents. [9] Cross transmission and diffusion from the hospital environment are more likely than endogenous sources to be the source of infecting or colonising organisms in nosocomial infections. [10] The ability of *A.baumanii* to develop multidrug resistance and to persists in harsh environmental condition make infections by *Acinetobacter v*ery dangerous specially in individuals who have recently undergone major surgery, have malignant diseases or burns or immune suppressed patients with prolonged illness.[11] *Acinetobacter* outbreaks in health care settings have been proved difficult to stop because, *Acinetobacter* are robust survivors especially in intensive care settings and as *Acinetobacter* bacteria persist in the health care environment, they tend to acquire resistance to many antibiotics. *Acinetobacter* can spread from one person to another, by direct contact. The organism can also survive for a time on clothing or bedding, bedrails, ventilator surfaces and other surfaces in the environment including sinks and doorknobs. Careful hand washing with soap and water is always to be encouraged. *Acinetobacter* can cause pneumonia, bacteremia, wound infection or urinary tract infection. [12] In our present study, we isolated *Acinetobacter* form various samples. We also isolated the same organism from patient cot, dressing table etc (Table 1) which shows clear cut indication of hospital acquired infection which can be prevented by contact precautions.

Table.1 Isolation of *Acinetobacter* spp. from in animate objects

Samples	**Ward**	**Organism**	**Inanimate objects**
ET Secretion	ICU	*Acinetobacter* spp	Bed side table
Urine	Cardiac ward	*Acinetobacter* spp	Patient cot railing
Sputum	Cardiac ward	*Acinetobacter* spp	Patient cot railing
Urine	Neuro ward	*Acinetobacter* spp	Injection trolley
ET Secretion	Neuro ward	*Acinetobacter* spp	Patient cot railing

A number of factors have been suspected or identified as increasing the risk of pneumonia or colonisation of the lower respiratory tract by *Acinetobacter spp*. in the ICU. These

include advanced age, chronic lung disease, immuno suppression, surgery, use of antimicrobial agents, presence of invasive devices such as endo tracheal and gastric tubes and type of respiratory equipment. The outbreak of *A.baumanii* was traced to contamination of mattresses through breaches in plastic covers that allowed water penetration and persistence of the organism in wet foam of the mattresses.[5]

Acinetobacter spp. now account for a substantial proportion of endemic nosocomial infection. The increasing anti-microbial resistance of *Acinetobacter* isolates is posing a serious threat to hospitalised patients. [13] The variety of potential sources of contamination with *Acinetobacter spp*.in the hospital environment makes control of outbreaks caused by these organisms one of the most difficult challenges in the infection. Persistence of *Acinetobacter spp* on the environment provides ample opportunities for contamination of patients and staff and may explain continuing long term outbreaks. The emphasis of initial control measures should however be on strict isolation of infected or colonized patients to limit dissemination of outbreak strain in the environment. Isolation of infected patients helps in controlling the out breaks. It is useful to review hand washing policy and practices because cross contamination of the hands of staff has been demonstrated in several outbreaks.

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