

Carrier status of Acinetobacter among healthcare personnel and prevalence of the same in the environment

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Abstract

Background: Acinetobacter baumannii is an increasingly troublesome nosocomial pathogen, often with multidrug and pandrug resistant strains, mainly in intensive care units (ICUs), being responsible for different types of nosocomial infections. **Objectives:** The objective was to determine prevalence of carriers of Acinetobacter Spp. and predisposing risk factors among healthcare workers (HCWs) in ICUs and their role as source in nosocomial infection. **Materials and Methods:** Specimens from nose, throat, axilla and hands of all HCWs (55 (40 staff nurses, 15 attenders)) from ICUs and 30 HCWs from general wards were collected and processed by standard laboratory procedures. **Results:** Prevalance of A.baumannii carriers was 18.18%. Higher carrier rate was observed in male than female HCWs (12.72% Vs 5.5%). carrier rate was 22.2% and 18.75% in SICU and PICU respectively with none from general wards. Carrier rate was 7.3% at axilla and hands. **Conclusion:** Health care workers are responsible for colonization of hands by various hospital organism followed by spread to other contacts.

Key words: Acinetobacter, Carriers, Healthcare workers, ICUs, Nosocomial infections.

Introduction

Acinetobacter baumannii (A.baumannii) is an increasingly troublesome nosocomial pathogen, often with multi-drug and pan-drug resistant strains, mainly in intensive care units (ICUs) being responsible for different types of nosocomial infections with increasingly limited therapeutic options, higher mortality and morbidity [1]. Incidence of acinobacter has increased dramatically in last 2 decades specially in ICU settings. Their favourable growth environment in ICU further increases concern over this issue [2]. There are very few studies available on acinobacter despite of global concern.

Being an important organism related with hospital acquired infections specially in ICU setting it is important that health care staff should be fully aware about this [2]. It is largely identified from the hospital stall, environment & equipment used in hospital [2]. They are known for hospital outbreaks earlier also. Health care staff are solely responsible for spread of this resistant organism isolated from ICU settings mainly. Spread by hands & skin from hospital staff is

widely prevalent. The significant environmental reservoirs in the ICU include walls, ventilators, resuscitation bags, mattresses, hand-washing sinks, gowns and gloves [2].

Materials and Methods

Study Design and Setting- This prospective observational study was carried out from July 2015 to December 2015, in the tertiary care teaching hospital.

Study Population, Sample Size, and Sampling Strategy- The study population consisted of HCWs working in different ICUs of the hospital. A total of 220 random specimens were collected from 55 HCWs, consisting of 40 staff nurses, 15 attenders/ayyas from ICCU, NICU, surgical ICU (SICU). 120 specimens from 30 HCWs from general wards were also collected and processed to determine the carrier state.

The present carrier study among HCWs was conducted in ICUs of our hospital with the patients suffering from nosocomial infections namely; catheter associated urinary tract infection, ventilator associated pneumonia,

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lower respiratory tract infection (LRTI), chronic obstructive pulmonary disease with LRTI. Study was conducted in our ICUs witnessing higher incidence of culture proven nosocomial infections due to Acinetobacter species.

Specimen Collection- Four specimens per HCW were collected, namely web spaces of hands, axilla, throat, and nose by using a sterile swab soaked in sterile normal saline as per standard laboratory procedures [3].

Institutional ethical committee clearance was obtained for conducting the study. Informed consent was obtained from HCWs before sample collection.

HCWs with < 6 months experience in our hospital and HCWs suffering from an infectious disease were excluded from the study.

HCWs with isolation of Acinetobacter spp. from at least one of the body sites namely, nose, throat, axilla, and hands were considered as carriers for Acinetobacter spp.

Hospital samples were collected from ventilatory circuit, suction apparatus, beds, floor, air-conditioner vents, medicine/dressing trolleys, window sills, door handles, wash basins. Four swabs were collected from each site.

Microbiological Processing- Samples from health care workers were collected with pre moistened swabs. Environmental samples from dry surfaces were taken

Results

The present study reveals a prevalence of 18.18%(10/55) for *A. baumannii* carriers among HCWs (nurses and attenders/ayyas), working in different ICUs of our tertiary care hospital. None of the carriers for other Acinetobacter spp. were observed. Higher carrier rate was observed among male than female HCWs(8/55) vs (2/55), and higher rate in nurses than attenders (7/55) Vs (3/55).

Distribution of carrier rates in different ICUs was not statistically significant. Carrier rate of *A. baumannii* was highest in SICU, 22.2%(2/9) followed by ICCU, 20%(1/5) and MICU, 20% (3/15) and was least in NICU, 10%(1/10).

Carrier rate at axilla and hands was 7.27% (4/55) followed by throat 5.5% (3/55), nose 1.8% (1/55). Three antibiogram types of *A. baumannii* were observed and AB-1 (6 strains) were resistant to all drugs.

These strains were associated with majority of nosocomial infections. AB-2 (3 strains) were sensitive to meropenem, resistant to others, AB-3 (1 strain) was sensitive to all antibiotics.

Antibiotics used were AMC (Amoxicillin+clavulanic acid), GEN (Gentamycin), CIP (Ciprofloxacin), CTX (Cefotaxime), CXM (Cefuroxime), NT (Netilmycin), CAZ (Ceftazidime), PTZ (Pipracillin+ Tazobactam), CIS (Ceftrioxone).

with absorbent cotton-wool swabs, which were moistened with peptone water. The sample swabs were inoculated in enriched brain heart infusion broth and incubated for 24 hours at 37°C.

After incubation the broth was subculture on 5% sheep blood agar and MacConkey agar. The bacteria isolated from all these cultures were identified based on standard bacteriological techniques.

The susceptibility of Acinetobacter spp. isolates was performed on Muller-hinton agar by Kirby-bauer disc diffusion method as per clinical laboratory standards institute guidelines [4].

Antibiotics used were AMC (Amoxicillin+clavulanic acid), GEN(Gentamycin), CIP (Ciprofloxacin), CTX (Cefotaxime), CXM (Cefuroxime), NT (Netilmycin), CAZ(Ceftazidime), PTZ (Pipracillin + Tazobactam), CIS(Ceftrioxone).

Typing of Isolates From Carriers-Typing of Acinetobacter spp. was done by antibiogram typing. Association of Acinetobacter spp. carrier with different nosocomial infections in different areas of the hospital was done by identical antibiogram type of Acinetobacter spp. from carriers and patients.

Results were quantitated by analysing number of cases of nosocomial infections associated with antibiogram type of Acinetobacter spp. from carriers by retrospective review of case sheets and prospective observation.

Table-1: Distribution of Acinetobacter carriers in ICUs

Name of ICU	Total number of HCWs studied	Acinetobacter carrier rate (%)
ICCU	05	1(20)
MICU	15	3(20)
NICU	10	1(10)
SICU	09	2(22.2)
PICU	16	3(18.8)
Total	55	10(18.18)

Table-2: Distribution of carriers at different body sites

Body sites	Acinetobacter carrier rate (%)
Nose	1(1.8)
Throat	3(5.5)
Axilla	4(7.27)
Hands	4(7.27)

One strain of *A.baumannii* was isolated from ventilatory circuit, suction apparatus, wash basin each and two strains were isolated from medicine/dressing trolley.

Discussion

Acinobacter is becoming more common resistant organism isolated from hospital. Little is known about economic burden caused by this organism in comparison to others (eg, MRSA)[5].

Emerging infections due to Multidrug resistant strains of *Acinetobacter* spp. in the ICU is a growing therapeutic concern for clinicians worldwide. In spite of several large scale multicentric studies, the source/reservoirs, transmission dynamics and failure to control infections due to *Acinetobacter* spp. has remained an enigma in ICUs[1].

The present carrier study conducted in ICUs of tertiary care hospital highlights the role of apparently healthy HCWs as carriers of *A. baumannii*, acting as source or reservoirs of this nosocomial pathogen. The present carrier study reports a prevalence of 18.8% (10/55) of carrier state. Other studies have reported a variable carrier rates.

Present study highlights the role of carrier of *A.baumannii* at different body sites like, nose, axilla, hands and throat. Joseph et al, concluded that *A.baumannii* is known to survive in healthcare environment are very effective human colonizers[6]. Bayuga et al, have reported a very high prevalence of the carrier state for *A. baumannii* (26.66%) [10]. A. A. Hershan et al, reported a prevalence of carrier rate of 14.63% [1]. Few authors have been isolated *Acinetobacter* spp. in 27% of hospital sink taps and 20% of hospital floor swab

cultures[6]. Marchaim Dhor et al, screened six body sites nostrils, pharynx, skin, rectum, wounds and endotracheal aspirates, reported sensitivity of 55%, and sensitivities of single sites ranged from 13.5%-29%[7].

Lee et al, have reported a colonization prevalence of 0.5-4%[5]. Joseph et al, have isolated *A. baumannii* from suction apparatus, floor, dressing trolley, door handle and VAP patients and have found that it can be a very effective human colonizer [8].

The quantitative antibiogram typing revealed that there were two clusters of *Acinetobacter baumannii* of which the MDR cluster is large, while very few isolates belonged to the susceptible cluster[8].

A.baumannii has a higher propensity to be transmitted to HCWs than do other MDR bacteria. This may be a factor in nosocomial spread, explaining in part the recent worldwide emergence of MDR *A. Baumannii*[9].

It was observed that colonization of patients occur during admission in hospital specially in ICU setting. Later on it associated with spread of these organism by hand and skin contacts to other patients of health care staff [6].

The ICU environment and the equipment can get contaminated directly with the secretions/discharges from patients during various patient care activities or indirectly through the contaminated hands of HCWs[8].

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Limitation of the Study- There are some limitations of this study. Most common is that we have not studied effect of hand hygiene & other control measures during study period; therefore, further studies are required to examine the various infection control measures and evaluate the usefulness of such measures. We could not elucidate the exact mode of transmission of *Acinetobacter* between the environment and the patients.

Conclusion

Acinetobacter species are become more important organism responsible for hospital acquired infections. They adopt environment very rapidly and become resistant. It is expected that they will become more serious concern later on due to limited choice of antibiotics available. Awareness programmes for health care staff and need for better hygiene practices are core for prevention of HAI.

These practice including equipment decontamination, strict attention to hand washing and isolation procedures, and control of antibiotic usage, appears to be the combination of measures most likely to control the previously unabated spread of *Acinetobacter* spp. in hospitals.

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