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Microbiology

# An Outbreak of *Acinetobacter baumanii* sepsis in a Neonatal Intensive Care unit

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**ABSTRACT** **Background**- Acinetobacter species are ubiquitous in hospital environment. Multidrug resistant *Acinetobacter spp.* are emerging as a cause of nosocomial infections. An outbreak was suspected when *Acinetobacter spp* was isolated from blood cultures of 8 babies admitted in NICU. An investigation was carried out to identify the source.

**Method**- BACTEC blood cultures were collected from 14 babies with suspected sepsis. Positive bottles were plated on Blood Agar & MacConkey agar and isolates were identified. To identify the source of infection, swabs were collected from the infected babies to look for colonization. Samples were also collected from medicine trolleys, incubators, washbasin, and hands of health care workers in an effort to look for the source. They were plated on Acinetobacter Chrome agar. Settle plates were kept at a distance of 1 ft,2 ft and 3 ft from infected babies for ½ an hour. All isolates were confirmed by standard methods. Antimicrobial susceptibility was done as per CLSI guidelines.

**Results**- A total of 14 blood samples were received from NICU in the second week of Jan'16. Eight of the blood cultures grew *Acinetobacter baumanii*. They were also isolated from a medicine trolley, HCW's hand, and an incubator. One baby was colonized with Acinetobacter and the same bacteria was grown on an air settle plate also. Cohorting of the babies was done. NICU was asked to clean extensively with 1 % hypochlorite solution. Handwashing was enforced. The outbreak was then aborted.

**Conclusion** : This study highlights the role of environment in the spread of nosocomial Acinetobacter infections and the importance of supervised infection control measures to prevent such infections.

**KEYWORDS :** *Acinetobacter baumanii*, NICU, Outbreak

**Introduction-**

Low birth weight (LBW) neonates are prone to infections. Hence, they should be regularly monitored for development of infections.[1] Multidrug resistant Acinetobacter is ubiquitous in the hospital environment. So it is an important etiological agent of nosocomial infections especially in critically ill and immunocompromised patients.[2]

Identification of an outbreak- Our hospital has a twenty two bedded NICU where babies born in the hospital as well as outside born babies are admitted for critical care especially LBW and premature babies. We suspected an outbreak when Acinetobacter grew from blood cultures of 8 out of 14 babies admitted in the NICU in the 2nd week of January 2016. All the isolates (Acinetobacter) showed a similar antibiogram. So we decided to investigate the outbreak to find out the source.

Microbiological investigation of the outbreak- To find out the source of outbreak screening samples were obtained from 8 infected babies. The various body sites of babies like axillae, inguinal region, web spaces of fingers and toes were cultured. A thorough environmental sampling was done from various sites in NICU like Hand wash basin, baby warmers, medicine trolley. The samples were also collected from hands of health care workers in NICU. To access the actual burden of Acinetobacter in environment, air settle plates were kept around infected babies at a distance of 1 feet, 2 feet, and 3 feet.

Methodology- Blood cultures were collected from 14 babies in NICU in BACTEC blood culture bottles. Positive bottles were inoculated on Sheep blood agar (HIMEDIA) and MacConkey agar and incubated at 37$^0$C.Isoaltes were identified by standard microbiological techniques [3] and antimicrobial susceptibility testing was done by Kirby Bauer disk diffusion method as per CLSI guidelines.[4]

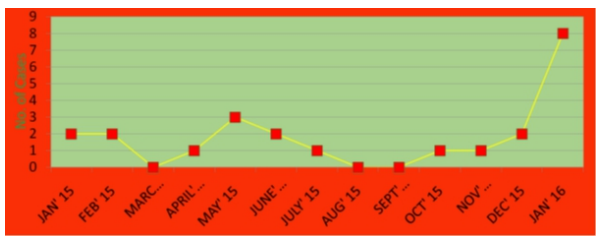
All the surveillance and environmental samples were plated on Acinetobacter chrome agar medium (HIMEDIA) and incubated overnight at 37$^0$C. Appearance of purplish pink coloured colonies on this medium were suggestive of Acinetobacter spp. The isolates were further tested by standard biochemical tests. The antimicrobial susceptibility test was done as per CLSI.[d]

The antibiograms of the patients' isolates were matched to that of environmental isolates.

Results-

Blood culture positivity over the last 12 months was studied & a sharp rise was noted in January 2016 (fig 1). *Acinetobacter baumanii* was isolated from 8 blood cultures from the 14 babies admitted to the NICU in the second week of January.

**Fig 1- Graph shows number of isolates of Acinetobacter spp from blood cultures from NICU-**




The environmental samples (fig 2) also showed growth of Acinetobacter (purplish pink colonies on chrome agar- fig 3). One baby was colonised with Acinetobacter as we could isolate it from axilla and inguinal area. We could isolate Acinetobacter from hand impressions from one HCW. Environmental samples from baby warmer and Medicine trolley could grew Acinetobacter. Air in the NICU was found to be burdened by Acinetobacter as we could isolate it from air settle plates kept at a distance of 1 feet from infected baby.

**Fig 2-Acinetobacter was isolated from-**

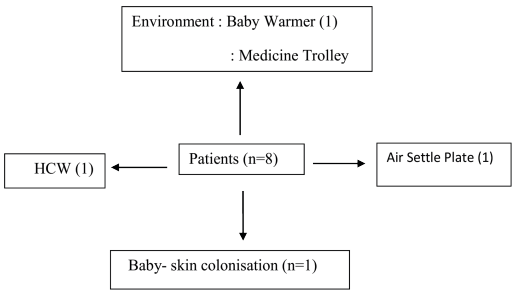
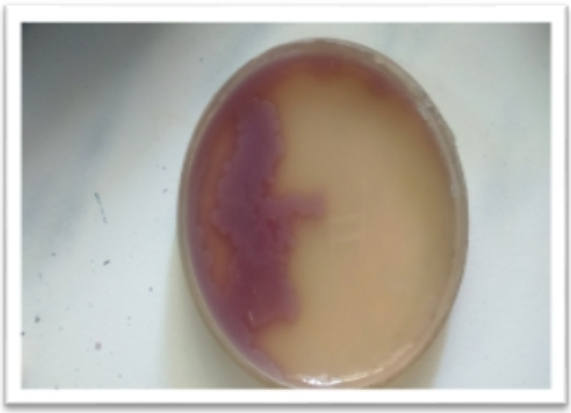



**Fig 3- Purplish pink colonies of Acinetobacter on Acinetobacter chrome agar.**



Isolates obtained from patients and environment showed same susceptibility pattern. All the isolates were resistant to first and second line drugs like ampicillin, gentamicin, ceftazidime, ciprofloxacin, co-trimoxazole, piperacillin/tazobactum,cefepime, Imipenem, meropenem. They were only sensitive to colistin (Minimum Inhibitory Concentration=1).

Control measures-
The reports were immediately informed to NICU. Infection control guidelines were given to NICU. Infected babies were cohorted in one room. A thorough cleaning of floors and walls of NICU was done .All objects s like medicine trolley, baby warmers were cleaned with 1% sodium hypochlorite. NICU was fumigated with silver nitrate and Hydrogen peroxide to decrease the environmental burden of Acinetobacter. Strict hand washing practices were enforced in NICU by giving hand washing trainings to HCWs. The outbreak was aborted in 5 days.

**Discussion-**
In the present study an outbreak of *Acinetobacter baumanii* septicaemia occurred in NICU in January 2016. Many Indian authors have reported outbreaks in NICU by different organisms like *Acinetobacter spp, Enterobacter cloacae, Burkholderia cepacia* .[5,6,7,8] . Muley et al has also reported outbreak in NICU due to *Salmonella warthington* in the past from the same institute [6]. Dolinger et al has also reported Acinetobacter outbreak in NICU in Brazil.[1]

In the present study, we could find the possible sources of the outbreak. They were like inanimate objects of NICU like baby warmers, Medicine trolley .The increase in acinetobacter count around the babies could result in Acinetobacter settling on various inanimate objects and was carried by HCW touching the objects and carrying bacteria to other neonates. Mittal et al (2003, India) has reported I.V.catheter contamination and wash basin as source of outbreak [5]. According to Ostwal et al hands and gloves of HCWs were responsible for the outbreak [7 ] while Shrivastav et al reported contaminated drug caffeine citrate as source of the outbreak [ 8 ].

In the present study, air contamination by *Acinetobacter spp* was one of the reason behind the outbreak. We could find air contamination upto 1 feet distance from an infected baby which is similar to finding of study by Brooks et al.[9] They have noted airborne transmission of Acinetobacter upto 11 ft from an infected patient (40%).Maximum air contamination(76%) was seen at a distance of 6 feet in their study. In the present study hand contamination of HCW by Acinetobacter was noted. Bauer TM et al has also noted contamination of hands of HCWs by gram negative bacteria. [10] They noted more hand contamination in nurses than doctors which is similar to the finding of the present study. Many objects in the hospital environment like bed railings,bed side tables, ventilators, mattresses, pillows,air humidifiers, stethoscopes, patient monitors, taps of sinks,ventilator surfaces,floor mops can get contaminated and can cause outbreaks.In our study baby warmers and medicine trolley were found to be contaminated due to *Acinetobacter spp.* Dettori et al has reported contamination of headboards of the beds as source of the outbreak.[11]

In our study, all the isolates of *Acinetobacter baumanii* from patients as well as environment were multidrug resistant which is similar to the findings of Dettori et al and Dolinger et al[1,11].

In the present study the outbreak was curtailed when source of infection was removed. In our case it was contaminated NICU environment which was corrected by thorough cleaning and disinfection practices. The second possible source was hand contamination of HCWs which was curtailed by strengthening of hand hygiene practices by repeated training of NICU staff. Melamed et al also reported successful control of Acinetobacter outbreak septicaemia in NICU by discontinuing use of hygroscopic bandages which was the source of outbreak [12].

Chen et al in their metaanalysis, has stressed importance of infection control programs and antibiotic control programs for successful control of outbreaks due to MDR *Acinetobacter baumanii.*[13]

Conclusion- Hospital environment plays very important role in spreading nosocomial Acinetobacter infections. The present study emphasises on supervised infection control measures to prevent such infections.

**Conflict of interest-** NIL

**Acknowledgement-** We acknowledge staff of NICU for their co-operation in investigation of the outbreak.

**References-**

1. Denise von Dolinger de Brito, Elias José Oliveira, Vânia O. Steffen Abdallah, Ana Lúcia da Costa Darini d Paulo P. Gontijo Filho. An Outbreak of Acinetobacter baumannii Septicemia in a Neonatal Intensive Care Unit of a University Hospital in Brazil. BJID 2005; 9 (August): 301-310
2. Wang S.H., Sheng W.H., Chang Y.Y., et al. Healthcare associated outbreak due to pan-drug resistant Acinetobacter baumannii in a surgical intensive care unit. J Hosp Infect 2003;53:97-102.
3. Forbes BA, Sahm DF, Weissfeld AS. In: Bailey and Scott's Diagnostic Microbiology. 12th ed. Missouri: Mosby Elsevier; 2007. p. 779.
4. CLSI performance standards for antimicrobial susceptibility testing.Twelfth international supplement. NCCLS document M100-S12 [ISBN1-56238-454-6]. CLSI, 940 West Valley Road, suite 1400, Wayne Pennsylvania 19087-1898 USA, 2002.
5. Mittal N, Nair D, Gupta N, Rawat D, Kabra S, Kumar S, et al. Outbreak of Acinetobacter spp septicemia in a neonatal icu. Southeast asian j trop med public health.2003; 34 (2): 365-366
6. Muley VA, Pol SS, Dohe VB, Nagdawane RB, Arjunwadkar VP, Pandit DP, Bharadwaj RS. Neonatal outbreak of Salmonella worthington in a general hospital. IJMM.2004;22(1):51-53
7. Ostwal KA, Joshi TA, Kadam PA,Karkhele RR, Iravane JA, Deshmukh LS, Damle AS. Outbreak of Neonatal Septicaemia at a Tertiary care Hospital due to Enterobacter cloacae. Journal of Dental and Medical Sciences. Nov 2014; 13(11): 09-12
8. Shrivatsava B, Sriram A, Shetty S, Doshi R, Varior R.An unusual source of Burkholderia cepacia outbreak in a neonatal intensive care unit.J of Hosp Infect.Dec 2016;94(4):358-360
9. Brooks SE, Walczak MA, Hameed R. Are We Doing Enough to Contain Acinetobacter Infections? (May )2000:304
10. Bauer TM, Ofner E, Just HM .An epidemiological study assessing the relative importance of airborne and direct contact transmission of microorganisms in a medical intensive care unit; Journal of Hospital Inf:15( 4), May 1990: 301-309
11. Marco Dettori, Andrea Piana, Maria Grazia Deriu, Paola Lo Curto, Andrea Cossu, Rosario Musumeci, et al. Outbreak of multidrug-resistant Acinetobacter baumannii in an intensive care unit.New Microbiologica, 37, 185-191, 2014
12. Melamed R, Greenberg D, Porat N, Karplus M, Zmora E, Golan A, Yagupsky P, Dagan R. Successful control of an Acinetobacter baumannii outbreak in a neonatal intensive care unit. J Hosp Infect. 2003 Jan;53(1):31-8
13. Chang-Hua Chen , Li-Chen Lin , Yu-Jun Chang , Yu-Min Chen , Chin-Yen Chang and Chieh-Chen Huang. Infection Control Programs and Antibiotic Control Programs to Limit Transmission of Multi-Drug Resistant Acinetobacter baumannii Infections: Evolution of Old Problems and New Challenges for Institutes.5. Int. J. Environ. Res. Public Health 2015, 12 8872