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A comparative study of antimicrobial sensitivity patterns in neonatal infections in 2011 and 2014 in a tertiary care hospital of east India

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ABSTRACT

Objectives: To compare the antimicrobial sensitivity patterns in neonatal infections in the year 2011 and 2014 in a Tertiary care Hospital in east India. **Methodology:** A retrospective study was done by collecting data from medical records of 150 neonates with positive cultures for blood, urine and cerebrospinal fluid in a Tertiary care hospital of Rourkela, Odisha. The antibiotic sensitivity patterns of the years 2011 and 2014 were tabulated. The data was analyzed using chi square test. **Results**: A statistically significant decrease in resistance to Ampicillin was seen in 2014 when compared to 2011 (p value=0.011) **Conclusion**: The advent of higher antibiotics has led to decreased use of baseline antibiotics like Ampicillin. The subsequent "drug vacation" may have led to the lower Ampicillin resistance.

Keywords: Ampicillin, Antibiotic Resistance, Drug Vacation, Neonate.

Introduction

The recent epidemic of emergence of drug resistant microbes was highlighted by the WHO world health day theme 2011- "Antimicrobial resistance and its global spread"[1]. Antibiotics target and inhibit essential cellular processes, retarding growth and causing cell death. However, if bacteria are exposed to drugs below the dose required to kill all bacteria in a population (the minimum bactericidal concentration or MBC), they can mutate and resist antibiotic treatment via natural selection for resistance-conferring mutations. These genetic mutations can arise from the adoption of a plasmid encoding a resistance gene or by mutation to the bacterial chromosome itself [2].There are various methods for spread antibiotic resistance worldwide. These include releasing large quantities of antibiotics into the environment through pharmaceutical manufacturing, during wastewater treatment, and presence of antibacterial in soaps and other products.

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Contact with infected farm workers or meat processors, drinking contaminated water, contacting air that is emitted from animal housing or is released during animal transport are also contributory[3,4]. Globally there are several reports of increase in incidence of antimicrobial resistance. [5-8]Antibiotic resistance is a major public health threat in India [9]. Alarming rise was seen in MRSA and carbapenem resistant Klebsiella in India[10]. Multidrug resistance (MDR) was found in 12.75 per cent of salmonella isolates in Odisha [11]. A high burden of infectious diseases, unregulated sale of antibiotics, financial incentives for healthcare providers to prescribe antibiotics, patient expectations and non compliance, rising incomes, and limited public health response have helped drive the emergence of resistance [12].A study entitled 'The State of World Antibiotics 2015', conducted by Centre for Disease Dynamics, Economics and Policy (CDDEP), New Delhi, also showed that in 2010, India was the largest consumer of antibiotics ahead of China and the USA [13].This matter is of particular concern in the neonates as more than one fifth of neonatal deaths are caused by infections [14]. And prevalence of drug resistant microorganisms is a major challenge in the management of neonatal sepsis.

Klebsiella pneumoniae was resistant to most of the antibiotics tested except amikacin and meropenem in the study conducted by Zachariya et al [15].According to Bhat and Baby, a high resistance to the commonly used antibiotics like ampicillin and gentamicin was observed[16]. In a study conducted by Panigrahi *et al*, a very high level of resistance to penicillin and ampicillin was observed [17].The impact of antibiotic resistance on healthcare sector is very alarming. Extended hospital stays, requirement of isolation wards, stringent infection control measures and treatment failures have repercussions on healthcare economy[18,19]. Even when effective treatments exist, data show that in most cases patients with resistant infections require significantly longer hospital stays, more doctors visits, and lengthier recuperations and experience a higher incidence of long-term disability[20].With the above background, this study was done to compare antimicrobial sensitivities in 2011 and 2014 in a tertiary care hospital in East India.

Materials and Methods

A retrospective study was conducted in the department of pediatrics in a tertiary care hospital. Antibiotic susceptibility patterns of positive cultures of blood, urine and CSF of neonates admitted in the NICU of the years 2011 and 2014 were tabulated. The data was analyzed using chi square test.

Results

The total number of culture positive cases of neonates was 58 in 2011 and the number was 92 in 2014 (all antibiotics together). The number of culture positive cases resistant to ampicillin dropped from 75% in 2011 to 56.9% in 2014 (Refer Table 1 below). A statistically significant decrease in resistance to Ampicillin was seen in 2014 when compared to 2011 (p value=0.011). There was no statistically significant increase in resistance to any other antibiotic in 2014 when compared to 2011.

Table 1: Percent of Resistance Cases

S. No	Antibiotic	% Resistant Cases		Changes
		2011	2014	
1	Ampicillin	75.00	56.90	Significantly less in 2014
2	Gentamicin	13.95	29.63	Not Significant
3	Cefotaxim	48.84	53.33	Not Significant
4	Ceftriaxone	58.62	50.00	Not Significant
5	Ciploflo	36.73	33.77	Not Significant
6	Chloramphenicol	15.79	8.45	Not Significant

Note : % Resistant Cases = (Resistant Cases *100) / (Resistant Cases +Sensitive Cases)

Details of Ampicillin Cases

	2011	2014
Resistant	15	33
Sensitive	5	25
Total cases	20	68

Discussion

A statistically significant lower ampicillin resistance in the year 2014 was seen when compared to the year 2011 in this study. (p=0.011). With the advent of newer antibiotics, the use of older antibiotics like ampicillin has decreased. The subsequent "drug vacation" may have led to decreased resistance. Similar results were seen in the study by Butler et al where reducing antibiotic dispensing at general-practice level was associated with reduced local antibiotic resistance to ampicillin and cotrimoxazole[21]. However, celebrations would be premature. Though the resistance rates plummet in the initial years after not using the antibiotic, the resistant strains persisted at levels enough to ensure reemergence if the drug was reintroduced [22].The adherence to strict antibiotic protocol following the world health day 2011 theme may be responsible for the insignificant rise in resistance to other antibiotics over a period of 5 years

in our hospital. Other methods to prevent the increase in antimicrobial resistance are interventions to educate healthcare professionals about prescribing antibiotics, developing infections control guidelines and keeping a control on the marketing and sales of antibiotics. Routine mixture of antibiotics in livestock feed should be banned. The importance of completion of antibiotic course has to be emphasized with the general population. [23, 24, 25]

Conclusion

Drug vacation may have led to decrease in resistance to ampicillin over a period of 5 years. Apart from drug holiday, antibiotic stewardship is necessary to curb the problem of antibiotic resistance.

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