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A comparative assessment of the risk factors for pediatric patients admitted with community acquired pneumonia: A case control study

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Abstract
Aim: The aim of the present study was to evaluate the risk factors associated with Community Acquired Pneumonia (CAP) in patients admitted to the Pediatric department at a tertiary care hospital.
Methods: This was a questionnaire-based case-control study conducted in Department of Paediatrics and 200 patients were included in the study. 100 were cases and 100 were controls respectively.
Results: In the present study, 70% of males were infected with CAP in contrast to 30% of females. The majority of the cases (65%) belonged to the urban locality. Lower socioeconomic status, lower maternal and paternal education, overcrowding and indoor air pollution were associated with CAP.
Conclusion: Concentrated efforts are needed to strengthen the health facilities and immunization coverage in the population. Public awareness should also be increased to improve the better utilization of available resources.

Keywords: Community acquired pneumonia, pediatrics

Introduction
Pneumonia is well recognized as the leading cause of death for children under the age of 5 years worldwide with more children in this age group dying from pneumonia than from AIDS, malaria and tuberculosis combined [1]. In this age group, pneumonia is responsible for about 19% of all deaths [1, 2]. Of all community acquired pneumonia (CAP) cases, an estimated 7–13% are severe enough to require hospitalization [1].
Community acquired pneumonia is defined as pneumonia that is acquired outside the hospital. The most commonly identified pathogens are *Streptococcus pneumoniae*, *Haemophilus influenza*, atypical bacteria (i.e. *Chlamydia pneumoniae*, *Mycoplasma pneumoniae*, and *Legionella* species) and viruses. Community acquired pneumonia (CAP) is the leading cause of mortality of under-five children in developing countries, including India. Annually there are 151.8 million new cases of CAP. Among these 8.7% (13.1 million) cases are severe enough to require hospitalization [1]. Minimizing unnecessary revisits is a priority for health care systems to provide high-value health care while minimizing excessive costs [3]. Return visits after a diagnosis of CAP increase total hospital costs, may result in unnecessary hospitalizations, and contribute to overall health care burden [4, 5]. Additionally, potential episode-based care models in medicine increase the attention of hospitals on reuse after discharge because hospitals are more likely to be "penalized" for a revisit [6, 7]. Among hospitalized children with CAP, ~8% are readmitted within 30 days, with readmissions accounting for 16% of total hospital costs of all pneumonia hospitalizations. Risk factors for hospital readmissions have included being <1 year of age, having a previous hospitalization, a longer index hospitalization, and complicated pneumonia [8].
CAP contributes to 0.44 million deaths of under-five children in South East Asian region [9]. Child Health Epidemiology Reference Group's (CHERG), a pneumonia working group published estimates on morbidity and mortality of clinical pneumonia for 192 countries including India [10]. Lack of reliable estimates of CAP from Indian states would hamper assessment of impact of various strategies for its prevention or treatment. Pneumonia can affect anyone however; it has been observed that children are at a higher risk of developing

the disease than others. There are many risk factors which have been associated with the increased chances of CAP in children [1] namely indoor air pollution, malnutrition, lack of breastfeeding, low maternal education, low socioeconomic status (SES), poor access to health care and concomitant illnesses etc.

The aim of the present study was to evaluate the risk factors associated with Community Acquired Pneumonia (CAP) in patients admitted to the Pediatric department at a tertiary care hospital.

Materials and Methods

This was a questionnaire-based case-control study conducted in Department of Paediatrics and 200 patients were included in the study. 100 were cases and 100 were controls respectively.

Patients of Community: Acquired Pneumonia aged 2 months to 60 months who were admitted to the Pediatric Department were taken as cases. One unmatched control per case was taken from healthy children between the ages of 2 months to 60 months of age.

Inclusion criteria: As per WHO classification [1], all patients with pneumonia and severe pneumonia aged 2 months to 60 months requiring admission.

Exclusion criteria: Infants aged less than 2 months, Children aged more than 60 months, Patients of WHO classified pneumonia as requiring admission but were denied by parents.

Written consent from the parents was taken before enrolling the child to the study and a questionnaire was administered. Risk factors that were evaluated included demographic, socioeconomic variables, housing, significant past and family history, birth variables, nutritional variables, immunization, delayed presentation, and previous treatments.

Statistical analysis- Data was compiled using MS Excel and analyzed using SPSS 20 software. Percentage and mean were calculated. A Chi-square test was applied to study the association.

Results

Table 1: Distribution of Demographic Variables

Variable		Case (100)	Control (100)	Total (%)
Age	<1 Year	60	70	130 (65)
	>1 Year	38	32	70 (35)
Gender	Male	70	58	128 (64)
	Female	30	42	72 (36)
Locality	Rural	35	15	50 (25)
	Urban	65	85	150 (75)

In the present study, 70% of males were infected with CAP in contrast to 30% of females. The majority of the cases (65%) belonged to the urban locality. Lower socioeconomic status, lower maternal and paternal education, overcrowding and indoor air pollution were associated with CAP.

Table 2: Association of Severity of Pneumonia with Different Risk Factors

Variable		Sever Pneumonia (60)	Pneumonia (40)	Total (100)
Significant past history	Present	29	17	46
	Absent	31	23	54
Weight For Age	>-2 Sd	24	16	40
	-2 To -3 Sd	20	12	32
	<-3sd	16	12	28
Overcrowding	Present	31	28	59
	Absent	29	12	41
Indoor Smoke	Present	32	23	55
	Absent	28	17	45
Available nearby health facilities	Present	24	25	49
	Absent	36	15	51
Previously Treated	Yes	39	24	63
	No	21	16	47
Duration of Illness before admission	1-3D	14	17	31
	4-7D	26	11	37
	>7D	20	12	32

Various risk factors were assessed like significant past history, weight for age, overcrowding, indoor smoke, nearby health facility availability, previous treatment and duration of illness before treatment. According to WHO classification, in our study, 60 had severe pneumonia while 40 had pneumonia.

Discussion

Pneumonia is the term used to describe inflammation of the lung. The World Health Organization defines pneumonia as an acute disease episode with cough combined with fast breathing with age-specific cutoff-values for increased respiratory rate [11]. Pneumonia is a common illness that affects millions of people each year globally [12]. Community-acquired pneumonia (CAP) is a major public health issue and a principal cause of morbidity and mortality in children under 5 years of age [13]. Pneumonia has been identified as the major "forgotten killer of children" by the United Nations Children's Fund (UNICEF) and the World Health Organization (WHO) [14]. There are many risk factors which have been associated with the increased chances of CAP in children namely indoor air pollution, malnutrition, lack of breastfeeding, low maternal education, low socioeconomic status (SES), poor access to healthcare, and concomitant illnesses etc.

In our study, most of the cases were infants similar to Cunha *et al.* 2008 which concluded lower age as a risk factor for developing pneumonia. This might be because in young children immunity is not well established, and they have narrow airways, relatively short bronchial trees, and

incomplete development of lungs [15]. C J Watkins 1979 reported fewer episodes of acute pneumonia in children who were breastfed than in children who were bottle-fed [16]. The synergism between malnutrition and pneumonia is well known [1]. Our study also concluded weight for age less than -3SD as a risk factor for developing pneumonia.

Mahalanabis *et al.* 2002 in Calcutta concluded that the poor economic status of parents was associated with a nearly fivefold increased risk of pneumonia [10]. In our study lower educational status of parents was found to be associated with CAP. Victoria *et al.* 1994 [18] also drew a similar association between the lower educational status of parents and the risk of pneumonia, hospitalizations, and mortality. Studies from different parts of the world had reported indoor air pollution caused by indoor smoking and the use of biomass as a cooking fuel increased respiratory morbidity in children. The present study also concludes indoor air pollution as a risk factor for CAP. In our study, 32% of pneumonia cases were exposed to indoor smoke in comparison to 23% in controls and this association was found to be significant. The severity of pneumonia was also analyzed in the present study for different risk factors, only previous treatment and delayed presentation were the two factors found to increase the severity of pneumonia. In the present study among those who were previously treated 39% landed up with severe pneumonia in comparison to 21% in those who presented directly. Those who were previously treated might be severely ill from the start of the illness itself which can explain higher severity among the previously treated children.

Conclusion

Concentrated efforts are needed to strengthen the health facilities and immunization coverage in the population. Public awareness should also be increased to improve the better utilisation of available resources. We should promote and ensure the implementation of several preventive measures that will have a major impact on the prevalence and complications of malnutrition and infection. Hence there is an urgent need for introduction of preventive strategies, improving health seeking behavior and quality of care for CAP.

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