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Original Article

Risk Factors of Community Acquired Pneumonia among Under Five Children in a Tertiary Level Hospital in Rajshahi

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Abstract

Introduction: Community acquired pneumonia (CAP) top the list of causes of under five children mortality in the world. Proper assessment of these risk factors and controlling them may help decrease the morbidity and mortality in under-five children suffering from CAP in Bangladesh and thereby help in improving the quality of life of our future generation.

Objective: To assess the risk factors of CAP among under five children (2-59 months) in a tertiary level hospital in Rajshahi.

Materials and methods: This is a case control study which was carried out in the department of Pediatrics and EPI center of Rajshahi Medical College Hospital, RMCH from January 2017 to December 2018 to determine the risk factors of CAP among under five children. For this study, total 246 children, aged 2 months to 59 months, were selected by purposive sampling technique. 123 were cases who were taken from indoor and 123 were healthy controls who were taken from out patients department & EPI centre. After taking written consent from guardians, history was taken and physical examination was done. All informations were recorded in a predesigned data sheet. Chi-square test and odds ratio were used to demonstrate level of significance.

Results: Among 246 children greater number of patients of both group were male and came from rural area. Cases were predominant under 12 months and came from lower socioechonomic status. A statistically significant association was found between social class and CAP (<0.001), father's literacy was inversely related to CAP (p value <0.001). Types of housing, ventilation of living room , overcrowding, types of fuel and cookers used for cooking, parental smoking , malnutrition, history of diarrhea and presence of anemia , prematurity and low birth weight were significantly associated with CAP (p value <0.05) .

Conclusion: Proper assessment of these risk factors and controlling them may help decrease the morbidity and mortality in under-five children suffering from CAP in Bangladesh and thereby help in improving the quality of life of our future generation.

Key words: Under five, Community acquired pneumonia (CAP), Risk factors.

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Introduction

Worldwide under five child mortality has decreased and Bangladesh has made significant progress in decreasing childhood mortality– between 1993 and 2017. According to the BDHS,

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the under-five mortality rate was 46/1000 live births in 2014 and 45/1000 live births in 2017.[1]

CAP has remained on the top on the list of causes of under 5 children mortality.[2] World's 44% of the children under 5 years live in Bangladesh. The highest incidence rate of CAP for children under - five is reported at 0.51episodes/ child-year in Bangladesh.[3]

Community-acquired pneumonia (CAP) is defined as a lower respiratory tract infection in a child who has not resided in a hospital or health care facility in the preceding 14 days.[4]

In a recent meta analytic systemic review study[5] found low birth weight, under nutrition, household air pollution, human immunodeficiency virus (HIV) infection, non-exclusive breastfeeding, household crowding and incomplete immunization are significantly associated with respiratory infections.[6]

Hemophilus inuenzae type B (Hib) and *Streptococcus pneumoniae* (SPN) are the two major bacterial causes of childhood CAP. The Bangladesh EPI introduced 10-valent PCV (PCV10) on a 6, 10, and 18 week schedule in March 2015[7] and Hib vaccine was introduced in 2009 with significant reductions of both pneumonia and meningitis.[8]

Low birth weight is a risk factor of pneumonia and death, can be preventable in the prenatal period.

Parents' educational level, particularly maternal education, is inversely related to morbidity and mortality from pneumonia in childhood.[9] Educated mother are presumably more capable of taking care of their children.

There is evidence of a causal relationship between poor socioeconomic conditions and pneumonia, greater frequency of CAP episodes in children from less privileged backgrounds. Exposure to cigarette smoke due to parental smoking in the first year of life doubled the risk for the infant of an attack of respiratory infections.[10]

Exclusively breast feed child had four times less chance of death from pneumonia than a child who was bottle feed.[11]

So, this study was under taken to find the risk factors of Community acquired pneumonia among under-five children (2-59 months children) at Rajshahi Medical College Hospital, Rajshahi. Proper assessment of these risk factors and controlling them may help decrease the morbidity and mortality in under-five children suffering from CAP in Bangladesh and thereby help in improving the quality of life of our future generation.

Objective:

To assess the risk factors of Community acquired pneumonia among under five children (2-59 months) in a tertiary level hospital in Rajshahi.

Materials and Methods

To find out the risk factors associated with CAP, a case-control study was conducted between January 2017 to December 2018 among the under-five children (2-59 months) in the department of Pediatrics and EPI center of Rajshahi Medical College Hospital, RMCH. A purposive sampling was done on 123 cases and 123 controls. Children suffering from CAP were selected from the inpatient department of Paediatrics of RMCH as cases, while 2-59 months children (not suffering from CAP) were selected from the Paediatrics Out Patient Department & EPI center of RMCH as control. All information including history, examination findings and investigation reports were recorded in a predesigned clinical format. CBC and X-ray chest were done. At the end, data were processed and analyzed by computer using SPSS 16 software.

Results

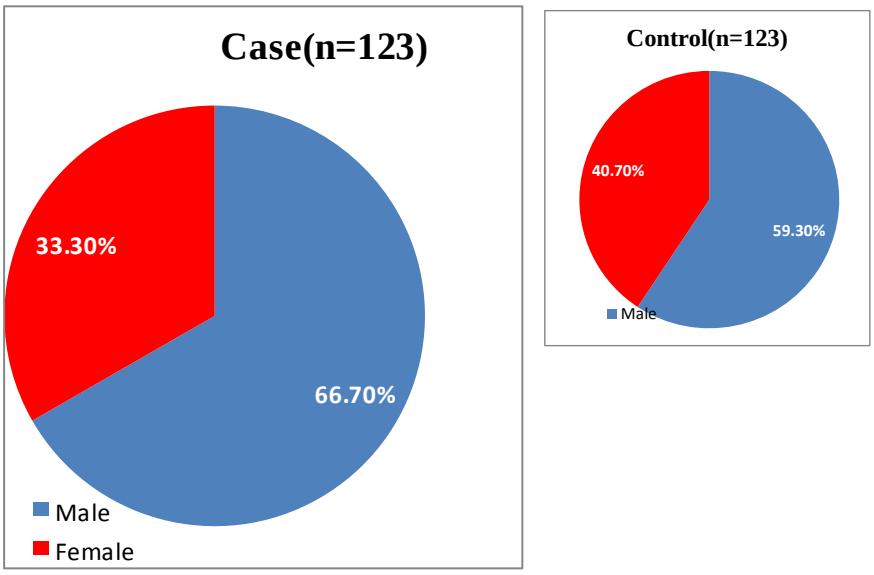

Figure -1: Gender distribution of the children (n=123 in each group)
This figure showing greater number of patients of both group were male.

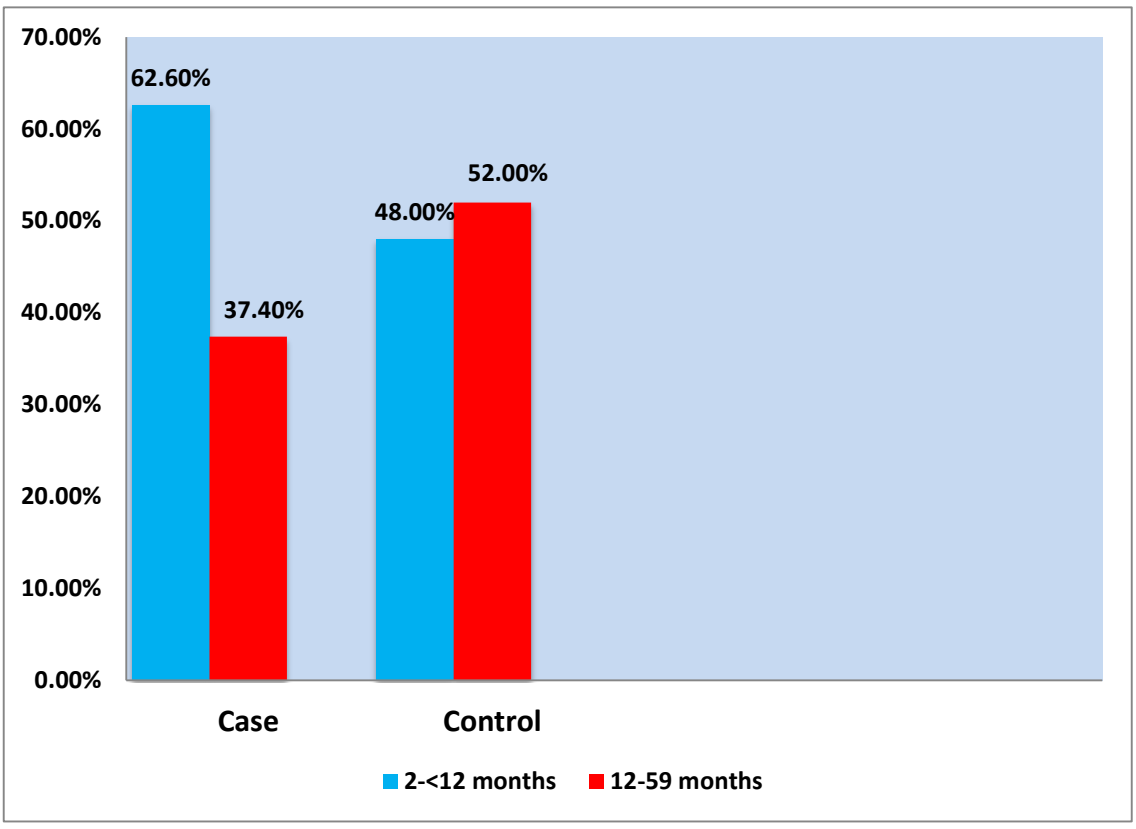

Figure -2: Distribution of cases and controls according to age groups (n=123 in each group)
The figure shows, cases were predominant between 2-<12 months of age (62.60%) where as controls were predominant between 12-59 (52%) months of age .

Table i: Socio-demographic factors of the study population (n=123 in each group)

Variable	Case(n=123)	Control(n=123)	Total	*p* value
Residence:				
Rural	93(75.60%)	85(69.10%)	178	
Urban	30(24.40%)	38(30.90%)	68	
Socioeconomic status:				x^2 =20.4
Poor	100(81.30%)	67(54.47%)	167(67.89%)	p <0.001,
Lower middle class	17(13.82%)	46(37.40%)	63(25.60%)	
Upper middle class	6(4.88%)	10(8.13%)	16(6.50%)	
Mother's literacy:				x^2=2.87,
Illiterate	55(44.7%)	42(34.1%)	97(39.4%)	*p*>0.05
Literate	68(55.3%)	81(65.9%)	149(60.6%)	(0.09)
Father's literacy				
Illiterate	64(52%)	38(30.9%)	102(41.5%)	x^2=11.322,
Literate	59(48%)	85(69.1%)	144(58.5%)	*p* <0.001
				OR =2.42

Table showed that, a greater number of patients of both groups came from rural area. Most of the cases and controls belonged to poor class and lowest number belonged to upper middle class. A statistically significant association was found between social class and CAP (<0.001).

Mother's literacy was not significantly associated with CAP (p value >0.05). Father's literacy was inversely related to CAP (p value <0.001).

Table ii: Housing condition of the cases and controls

Variable	Case(n=123)	Control(n=123)	Total(n=246)	p value
Type of housing:				
Kuchha	59 (47.97%)	87(70.73%)	187(76.02%)	
Semi pucca	53(43.09%)	27(21.95%)	80(32.52%)	x^2= 14.02
Pucca	11(8.94%)	9(7.32%)	20(8.13%)	p <0.01
Ventilation of living room:				
Bad	50(40.7%)	32(26%)	82(33.3%)	x^2 = 5.9
Good	73(59.3%)	91(74%)	164(66.7%)	p <0.05

Overcrowding:				
Yes	82 (66.7%)	62 (50.4%)	144 (58.5%)	x^2 = 6.69
No	41 (33.3%)	61 (49.6%)	102 (41.5%)	p <0.05
Condition of cooker:				
Smoke	100 (81.3%)	80 (65%)	18 0(73.2%)	x^2 = 8.28
Smokeless	23 (18.7%)	43(35%)	66(26.8%)	p <0.01

Types of housing, ventilation of living room and overcrowding and types of fuel and cookers used for cooking, all had significant association with CAP.

Table iii: Distribution of smoking habit of parents among case and control group (n=123 in each group)

Parenteral smoking (Only father)	**Case(n=123)**	**Control(n=123)**	**Total(n=246)**	**OR**	OR
Yes No	65(52.8%) 58(47.2%)	31(25.2%) 92(74.8%)	96(39%) 150(61%)	x^2=19.748, *p*=<0.001 (0.000)	3.32

Parental smoking was significantly associated with CAP (p value <0.001).

Table iv: Nutritional factors of the study population (n=123 in each group)

Variable	**Case (%)**	**Control (%)**	**Total (%)**	**OR**	***p* vaue**
Malnutrition:					
Yes No	98(79.7%) 25(20.3%)	61(49.6%) 62(50.4%)	159(64.6%) 87(35.4%)	3.9	x^2=24.346, *p*=<0.001 (0.000)
Exclusive breast feeding(EBF):					
No Yes	47(38.2%) 76(61.8 %)	30(24.4%) 93(75.6 %)	77(31.3%) 169(68.7%)	1.91	x^2=5.463, *p*=<0.05 (0.019)
Sign of Vitamin A deficiency:					
Yes No	01(0.8%) 122(99.2%)	00(0%) 123(100%)	01(0.4%) 245(99.6%)		x^2=1, *p*>0.05 (0.31)

History of diarrhea:					
Yes No	26(21.1%) 97(78.9%)	10(8.1%) 113(91.9%)	36(14.6%) 85.4%	3.02	x^2=8.330,p =<0.001 (0.004)
History of Measles:					
Yes No	00 123	00 123	00 246		
Anemia:					
Yes No	01(0.8%) 122(99.2%)	00(0%) 123(100%)	01(0.4%) 245(99.6%)	**1.87**	x^2=5.578, *p*<0.05 (0.018)

Most of the cases were malnourished. In contrast, majority of controls had normal nutritional status. Malnutrition was significantly associated with CAP (p value <0.001).

EBF was inversly associated with CAP (p value <0.05). Only one case (0.8%) had sign of vitamin A deficiency. Vitamin A deficiency was not significantly associated with CAP. History of diarrhea and presence of anemia was significantly associated with CAP (p value <0.05).

Table v: Distribution of cases and controls according to Gestational Age & Birth Weight

Risk factors		Case(n=123)	Control(n=123)	Total(n=246)	OR
Prematurity	Yes	71(57.7%)	52(42.3%)	123(50%)	1.86
	No	52(42.3%)	71(57.7%)	123(50%)	
Birth Weight of Child	LBW	72(58.5%)	53(43.1%)	125(50.8%)	1.86
	Normal	51(41.5%)	70(56.9%)	121(49.2%)	

Chi –Square =5.87, df = 1, p value <0.05(0.015)

This table showed, Prematurity and low birth weight were significantly associated with CAP

(p value<0.05)

Discussion

An attempt was made to find associations between the occurrence of CAP and its risk factors, particularly in the context of Bangladesh. In this study poor socioeconomic status and literacy status of father were found to be highly corelated, although the literacy status of mothers were not found to be related. Tobacco smoking of parents, overcrowding, exposure to cold and humidity and indoor air pollution were found to be positively related to the occurrence of CAP. Poor nutritional status were found to play an important role, the most significant being the presence of malnutrition, anemia, lack of exclusive breast feeding, prematurity and low birth weight. Past

history of diarrhea also was positively associated with the presence of CAP.

In this study,62.60% children of the case group and 48% children in control group were under 12 months age. Under 12 months age was a significant risk for CAP. Studies by Srivastava et al.[12] also found same association. Amorium et al.[13] found no relationship between age and complicated pneumonia.

In our study more male (66.7%) children affected with CAP. This study had some similarities with other studies by Chatterjee[14] and Srivastava et al.[12]Amorium et al.[13] found no such association. In our study residency in rural area had no significant role on CAP (p value >0.05). But study by Rudan et al.[15] found residency in rural area were important risk factors for complicated pneumonia in childhood.

The study showed low socio-economic status was significantly associated (p value <0.05, OR = 1.95) with CAP. Children came from low socioeconomic status were a poor house can also be directly linked to pneumonia because of dampness, lack of ventilation and large fluctuations of day and night temperature, all of which predispose a child to acute respiratory infections. Socio-economic status is also an important factor for treatment seeking from qualified doctor. This is also supported by other studies by Foneseca et al.[6] and Azab et al.[16]

Our study did not show any relationship with education of mother (p value >0.05) on the occurrence of CAP in children. While this findings are similar to study by Fonseca et al.[6]

But there was significant association (p value <0.001, OR = 2.42) between the level of father's education and occurrence of CAP in children. This study co-related with a case control study by Victoria et al.[17]

In our study, the association between parent's cigarettes smoking and CAP was statistically significant (p value <0.001, OR =3.33). Azab et al.[16] showed parents' smoking habits was significantly associated with the risk of severe CAP.

Overcrowding contributes to the transmission of infection through respiratory droplet. In the study, there was statistically significant association between overcrowding with CAP (p value <0.05, OR =1.96). This was in agreement with a study by Cardoso et al.[18].

In our study ventilation of house was significantly associated (p value <0.05, OR=1.95) to CAP in children. This study co-related with the study by Xiaohong et al.[19] In this study use of biomass for cooking was found to be significant risk factor for CAP (p value < 0.001, OR =2.33). Biomass fuels (wood, crop residues, charcoal) and others like kerosene are important contributors to indoor air pollution. Study by Bruce et al.[20] have shown that indoor air pollution by biomass fuels increases the risk of pneumonia.

In this study, out of the total 246 children only 35.4% had normal nutritional status. The number was more in controls as compared to cases. In this study found a highly significant (p value < 0.001, OR = 3.98) association between CAP and malnutrition. Rudan et al.[15] and Srivastava et al.[12] found similar association. No such association was found in the study conducted in industrialized nations by Jackson et al.[5]

There was statistically significant difference (p <0.05, OR = 1.92) between breast feed and partially breastfed children in developing CAP. Partially breastfed were found to be more prone to developed CAP than those who were breast fed. Study by Shams Arifeen et al.[21] was observed same association.

In this study Vitamin A deficiency was not significantly associated (p value >0.05) with CAP under five children. This could be attributed to high proportion of subject with complete vitamin A supplementation (99.6%), there were no differences between cases (99.2%) and controls (100 %). Similar finding found by Srivastava et al.[12] But study by Fitch & Neville[22] showed Vitamin A deficiency with acute respiratory infections has a close relationship.

In this study H/O diarrhea in the past three months is significantly associated (p value < 0.001, OR = 3.02) with CAP in children. This finding is

supported by study by Rudan et al.[15]. But study by Lassi et al.[23] found children whose mothers reported their having diarrhea in the past few 3 months were less likely to present with pneumonia.

Past history of measles was not a risk factor of CAP in this study. Measles vaccination works as a preventive measure against pneumonia and diarrhea, only if both diseases occur either as a measles complication. In our study, there was a statistically significant association between anemia and risk of CAP (p value <0.05, OR = 1.87) which was similar to other study by Allwyne.[24]

This study showed significant association between CAP with LBW and prematurity (p value <0.05, OR =1.86). This result is in agreement with Park.[25] In our study 100% cases and controls were fully immunized according to age.

Conclusion

CAP is a concern in under five children.Some risk factors for CAP are modifiable and preventable, family members and trained specialists can play significant roles to reduce CAP. Proper assessment of these risk factors and controlling them may help decrease the morbidity and mortality in under-five children suffering from CAP in Bangladesh and thereby help in improving the quality of life of our future generation. The incidence of CAP could be reduced by improving the nutritional status, promote the knowledge and practice of mothers about proper care of their children. Reduced exposure to smoke needs to be promoted by introducing more efficient and less polluting stoves, keeping children away from smoky environments and discouraging parental smoking.

Conflict of interest: None declared

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