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Risk Factors Associated to Acute Respiratory Tract Infection in Children between 3 Months to 5 Years

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Abstract: ***Background and Aim: Acute respiratory tract infections (ARTI) are one of the most common causes of illness in children and also major cause of death globally. Various socio-demographic, nutritional and environmental factors have been associated with ARTI. The objectives of this study were to identify the risk factors associated to Acute Respiratory tract infection in children between 3 months to 5 years. Methods: A cross sectional study conducted at Birat Medical College, Biratnagar, Nepal. The total number of sample was 280. All diagnosed cases of ARTI as per WHO. A semi-structured Performa was used as a tool to identify associated risk factor in ARTI. Data were analyzed by using Chi-Square test and level of significance at p value <0.05. Results: Among the cases LRTI and URTI constituted 83.9% and 16.08% respectively. Among the cases male to female ratio was 1.8:1 and the proportion of infants was 51.8%. In socio-demographic analysis low level of maternal education, low socioeconomic status, presence of overcrowding and positive family history of RTI (P=.003) were identified as potential risk factor of ARTI. Nutritional variables, low birth weight, anemia, malnutrition (wasting), breastfeeding were significantly associated with ARTI. In environmental variables, wood as cooking material (p=.000) was identified as significant factor for ARTI.***

Keywords: Acute respiratory tract infection, risk factor, under five

1. Introduction

Acute Respiratory Tract Infection (ARI) may cause inflammation of respiratory tract from nose to alveoli with a wide range of combination of symptoms and signs.

Upper respiratory tract infections are illnesses cause by an acute infection which involves the upper respiratory tract including the nose, sinuses, pharynx or larynx. This commonly includes nasal obstruction, sore throat, tonsillitis, pharyngitis, laryngitis, sinusitis, otitis media, and the common cold.[1]

In the process of developing ARTI, firstly bacteria gain entry into the upper respiratory tract through inhalation, and often establish asymptomatic colonization. From the nasopharynx, the bacteria may spread into the middle ear causing acute otitis media (AOM), or to the respiratory tract and lung parenchyma, causing lower respiratory tract infections.

There are a number of symptoms that are characteristic of lower respiratory tract infections. They range from acute infections such as pneumonia, bronchiolitis and bronchitis, to chronic conditions such as asthma and chronic obstructive pulmonary disease. [2]

The World Health Organization used term "acute respiratory infection" synonymously to describe lower respiratory infections. In IMCI programme WHO labeled ALRTI cases as pneumonia although it is recognized that children identified include those with pneumonia, brochiolitis and a proportion of those with reactive airways disease, and for practical purposes ALRI cases are labeled as pneumonia. [3]

Child Health Epidemiology Reference Group (CHERG) concentrates on Pneumonia and Brochiolitis because these are considered as a major component of global burden of disease from acute respiratory infection among young children.[3]Bronchiolitis is a common, self-limiting, respiratory tract infection characterized primarily by a cough lasting less than 3 weeks.[4]

Pneumonia:

Pneumonia An acute disease that is marked by inflammation of lung tissue accompanied by infiltration of alveoli and often bronchioles with white blood cell (such as neutrophils) and fibrinous exudates, is characterized by fever, chills, cough, difficulty in breathing (fast breathing of >60/min in less than 2 months of age, > 50/min in 2 to 12 months of age and > 40/min in 12 months to 5 years), fatigue, chest pain, and reduced lung expansion, and is typically caused by an infectious agent (such as a bacterium, virus, or fungus) [5]

Early diagnosis and treatment with antibiotic can reduce the number of death caused by ARIs, particularly from pneumonia. Despite using major resources on control, prevention and treatment program it is the leading cause of death in less than 5 years children. So there is a clear issue to search those factors and formulate further modified plan and policies that could help in controlling or minimize mortality risk. Multiple studies has been done to elicit the risk factors, however these risk factors cannot be generalized to our population due to diversity of ethnic

group, socio economic condition and geographical location. Hence estimating the risk factors through a well designed study, we may easily reduce the morbidity and mortality of acute respiratory tract infection and overall disease burden of this area.

Problem Definition

Acute respiratory tract infection are one of the leading cause of childhood morbidity and mortality especially under five, various risk factor make these children prone to ARI, presence of risk factors need to be managed early for better outcome**.**

2. Literature Survey

The proportion of mild to severe disease varies between high and low-income countries. Acute respiratory infections are among the top five childhood killer disease. Due to specific etiologies and risk factors, the severity of LRIs in children under five is worse in developing countries, resulting in a higher case-fatality rate.[6]

A study conducted by Ujunwa, FA, and CT Ezeonu. to identify Risk Factors for Acute Respiratory Tract Infections in Under-Five Children in Enugu Southeast Nigeria in 2014 found that Children less than 20 months accounted for 60.9% (84/138 cases) of pneumonia, 86.7% (26/30 cases) of bronchiolitis, and 64.5% (173/268 cases) of acute upper respiratory tract infections. Pneumonia was noted in about 75.7% (56/74) of inadequately nourished children compared to 22.6% (82/362) in adequately nourished children. Other risk factors identified in the study include inadequate breast feeding, poor immunization statues, attendance to daycare centers, large family size, poor parental educational statues, parental smoking, living in the urban area and use of biofuels.[7]

A study conducted by Rudan I, Boschi-Pinto C, Biloglav Z, Mulholland K, Campbell H. for Epidemiology and etiology of childhood pneumonia revealed that the leading risk factors contributing to pneumonia incidence are lack of exclusive breastfeeding, under nutrition, indoor air pollution, low birth weight, crowding and lack of measles immunization. It was also identified that Streptococcus pneumoniae, Haemophilus influenza and respiratory syncytial virus as the main pathogens associated with childhood pneumonia.[8]

A study conducted by Harerimana, Jean-Modeste et al. on Social, Economic and Environmental Risk Factors of Acute Lower Respiratory Infections among Children under Five Years of Age in Rwanda 2016 revealed that the factors independently associated with acute lower respiratory infections were: child's age, anemia level, and receipt of Vitamin A; household toilet type and residence, and season of interview. In multivariate regression, households, rainy season was positively associated with acute lower respiratory infections, while urban residence and being age 24–59 months versus 0–11 months negatively associated with acute lower respiratory infections. [9]

Thapa P et al. "Risk of ARI among Non-Exclusively Breastfed Under-Five Passive Smoker Children". A Hospital-Based Cross-Sectional Study of Nepal in 2016 shows that Non-exclusive breastfeeding may increase the chances of deleterious effects of household passive smoking, such as ARI, among under-five children. [10]

A community based longitudinal study was conducted in Maple, a coastal village of Udupi district, Karnataka state, to investigate acute respiratory infections (ARI) in children. A cohort of 91 children under 3 years of age were followed up for 1 year, leading to 2047 fortnightly observation. On an average every child had 11.3 months of follow up. The overall incidence of ARI was 6.42 episodes per child per year. Most of the ARI episodes in children (91.3%) were of simple Cough & Cold (no pneumonia). However, 8.2% developed pneumonia and only 0.51% had severe pneumonia. Incidence of ARI was almost same in male and female children. There was no significant difference in incidence among various age groups. But the incidence of pneumonia was significantly higher among infants ($p<0.00002$). Children of poor housing with smoke producing conditions suffered more frequently (p, 002). [11]. Similar, a case control study was conducted in 2006 at India, among104 ALRI cases who among 1 month to 5 years. Socio demographic variables like parent illiteracy, low socio economic status, overcrowding and partial immunization, kerosene lamps, biomass fuel pollution and lack of ventilation were significantly associated with ALRI.[12]

In a population based case-control study, 127 Brazilian infants who died due to a respiratory infection were compared with 254 neighborhood controls. The main risk factors associated with mortality were low socioeconomic status (including low levels of parental education) and after adjustment for socioeconomic status--lack of breastfeeding, lack of supplementation with non-milk foods, crowding, the number of under-fives in the family, lack of a flush toilet, low birth weight, low weight-for-age and having a young mother. In a multivariate analysis, the variables found to be most closely associated with mortality were breastfeeding, education of the father, the number of under-fives, family income and birth weight. Having a low weight-for-age was also strongly associated with mortality. [13]

Similarly case control study conducted in central Nepal in 2013 among 200 case and 200 controls hospitalized under five children in central Nepal. The various risk factors associated with ARI on stepwise logistic regression were male gender, rural residency, overcrowding, history of ARI in any family member within two weeks and malnutrition. The statistically insignificant risk factors were infancy, economic status, illiterate parents, cooking fuel other than LPG, low birth weight prematurity, lack of exclusive breast feeding, vitamin A deficiency and incomplete immunization. They concluded various risk factors of ARI identified in this study were male gender, rural residency, overcrowding, history of ARI in any family member within two weeks and undernutrition[14]

3. Methodology

General Objective

To identify the risk factors associated to acute respiratory tract infection in children between 3month to five years.

Specific Objectives

- To identify risk factor like low birth weight, malnutrition, overcrowding, breastfeeding, socioeconomic condition, passive smoking, indoor-pollution, outdoor- pollution, anemia, maternal education, responsible for acute respiratory tract infection.
- To identify the specific microorganism responsible for acute respiratory tract infection.

Place of Study

The study was conducted in Children ward of Birat Medical College, Biratnagar Nepal**.**

Study Population

Children aged between 3months to 5 years those diagnosed with ARTI.

Duration of Study

The total duration of the study was fourteen month from April 2019 to March 2020.

Study Design

It's a Descriptive cross- Sectional Study to estimate risk factor of acute respiratory tract infection among the children between three months to five years of age.

Sampling

Non probability sampling: Purposive sampling method.

Sample Size Calculation

Sample Size: -

$$n = \frac{t^2 \times p(1-p)}{m^2}$$

Description:

n = required sample size
t = confidence level at 95% (Standard value of 1.96)
p = estimated prevalence of ARTI in previous year = 25%
m = margin of error at 5% (standard value of 0.05)

Thus:

$$n = \frac{(1.96)^2 \times 0.25\ (1- 0.25)}{0.05^2}$$

n = 280

DoHs, Annual report of Nepal 2070/71(2013-2014)[24]

Selection Criteria

Inclusion criteria

- Children diagnosed as ARTI aged between 3 months to five years attending OPD/ ER/ WARD at BMCTH.

Exclusion criteria:

- Less than 3 months of age and more than 5 years of age.
- Children with concomitant Heart Disease.
- Children with other concomitant serious illness.
- Chronic lung disease patient.

Ethical Consideration

For this study ethical approval was taken from institutional review committee (IRC) of BMCTH, Kathmandu University. Informed and written Consent was taken from the participants before including them in the study. Confidentiality was maintained. Every participant was provided with the right to withdraw from the study at any time.

4. Results and Discussion

Results:

Table 1: Distribution of Age and Sex

Age in Months	Male	Female	N	Percent
3m-12m	102 (70%)	43 (29%)	145	51.8
13m-24m	30 (62.5%)	18 (37.5%)	48	17.1
25m-36m	18 (60%)	12 (40%)	30	10.7
37m-48m	17 (68%)	8 (32%)	25	8.9
49m-60m	15 (46.8%)	17 (53.1%)	32	11.4
Total	**182**	**98**	**280**	**100.0**

The above table 1 shows the age and sex distribution of cases. Mean age of the case group was 22.3±19.45 (M±SD). Among them 51.8% (n=145) were below 12 months of the age were 102 (70%) were male and 43 (29%) were female likewise 17.1% (48) were below 24 months of age where 30 (62.5%) were male and 18 (37.5%) were female. 10.7% were below 36 months of age where 18 (60%) were male, 12 (40%) were female. 8.9% (25) were below 48 months of age where 70(68%) were male and 8 (32%) were female. 11.4% (32) were below 60 months of age where 15(46.8%) were male and 70 (53.2%) were female. The ratio of a male and female was 1.8:1.

Table 2: Distribution of Age and Diagnosis

Age in Months	Diagnosis		N	Percent
	LRTI	URTI		
3m-12m	144 (51.42%)	1(0.35%)	145	51.8
13m-24m	45(16.07%)	3 (1.07%)	48	17.1
25m-36m	20(7.14%)	10(3.57%)	30	10.7
37m-48m	13(4.64%)	12(4.28%)	25	8.9
49m-60m	13(4.64%)	19(6.78%)	32	11.4
Total	**235 (83.92%)**	**45 (16.07%)**	**280**	**100.0**

The table 2 shows the age wise distribution of children having LRTI and URTI. The total numbers of children with LRTI was 83.92% (n=235) and URTI was 16.07% (n= 45). In LRTI the frequency was high in age group between 3 months to 12 months which was 51.42% (n=144). Similarly the frequency in other age group was 16.07% (n=95) in 13 months to 24 months age. 7.14% (n=20) in 25 months to 36 months, 4.64% (n=30) in 37 months to 48 months, 4.64% (n=13) in 49 to 60 months, in this age group the frequency was less in compared to URTI. Similarly the frequency of URTI was 6.78% (n=19) in age group 49 to 60 months, 4.28% (n=12) in 37 months to 48 months, 3.57% (n=10) in age group 25 months to 32 months, very list was noted in age 13 months to 24 months and 3 months to 12 months i.e., 1.07% (n=3) 0.35% (n=1) respectively.

Table 3: Parental Smoking and ARTI

Diagnosis	Parental Smoking		N	
	Present	Absent		
LRTI	100(42.5%)	135(57.4%)	**235**	**P=.321**
URTI	15 (33.3%)	30 (66.6%)	**45**	
Total	**115 (41.0%)**	**165 (58.9%)**	**280**	

The above table 3 shows parental smoking in respiratory tract infection. In this study the total 41.0% (n=115) parents were found to be smoker. Among them 42.5% (n=211) were diagnosed with LRTI and 33.3% (n=15) were diagnosed with URTI. Parents who were not smokers were 58.9% (n=165). The presence of smoking was high among the parents whose children were diagnosed as LRTI compared to URTI. The test applied showed that the difference is statically insignificant (p=.321).

Table 4: Wood Exposure and ARTI

Diagnosis	Wood Exposure		N	
	Present	Absent		
LRTI	212 (90.2%)	23 (9.78%)	235	**P=.000**
URTI	15 (33%)	30 (66.6%)	45	
Total	**227 (81.07%)**	**53 (18.9%)**	**280**	

The above table 4, total 81.07% (n=227) cases were exposed to wood. Out of 83.9% (n=235) patients with LRTI wood exposure was found present in 90.2% (n=212) cases and 33% (n=15) cases out of 16.07% (n=45) cases with URTI. It was shown that wood exposure was associated with higher risk of LRTI. The test apply shows the difference was statically significant (p=.000).

Table 5: Over Crowd and ARTI

Diagnosis	Over Crowd		N	
	Present	Absent		
LRTI	214 (91%)	21 (8.9%)	235	**P=.000**
URTI	21 (46.6%)	24 (53.3%)	45	
Total	**235 (83.9%)**	**45 (16.07%)**	**280**	

The above table 5 shows overcrowded family in children's diagnosed with ARI. Overcrowding was found in 83.9% (n=235) cases and was absent in 16.07% (n=45). Out of 235 cases diagnosed as LRTI overcrowding was present in 91% (n=214) and 46.6% (n=21) cases diagnosed as URTI. The highest frequency of over crowd was noticed in LRTI compared to URTI. The difference was statically significance (p=.000).

Table 6: Anemia and ARTI

Diagnosis	Anemia		N	
	Present	Absent		
LRTI	205 (87.2%)	30(12.7%)	235	**P=.000**
URTI	16 (35.5%)	29 (64.4%)	45	
Total	221(78.9%)	59 (21.07%)	280	

The above table 6 shows the presence and absence of Anemia in ARI. We had assessed anemia on the basis of clinical examination alone with Hemoglobin level of children. 78.9% (n=221) children of case group were anemic while 21.07% (n=59) children were non anemia. The higher incidence of anemia was found it LRTI compare to URTI. The difference was statically significance (p=.000)

Table 7: Outdoor Pollution and ARTI

Diagnosis	Outdoor Pollution		N	
	Present	Absent		
LRTI	96 (40.85%)	139 (59.14%)	**235**	**P=.249**
URTI	23 (51.1%)	22 (48.8%)	**45**	
Total	**119 (42.5%)**	**161 (57.5%)**	**280**	

The above table 7 shows findings of outdoor pollution in ARI. The total 40.85% (n=96) LRTI patients were found exposed to outdoor pollution and likewise 51.1% (n= 23) children those diagnosed with URTI. The difference was found statically insignificant at p=.249 level.

Table 8: Socio Economic Status and ARTI

Diagnosis	Socio Economic Status					N%
	U	UM	LM	UL	L	
LRTI	0	25 (10.6%)	122(51.9%)	60 (25.5%)	28(11.9%)	**235**
URTI	0	7 (15.5%)	20 (44.4%)	11(24.4%)	7(15.5%)	**45**
Total	0	32 (11.4%)	141(50.35%)	71(25.35%)	35(12.5%)	**280**

The above table 8 shows findings of socioeconomic status based on Kupposwamy's scales classification. It was found that none of the family was there from upper socioeconomic status. The highest member of cases falls in the lower middle class. The frequency of both LRTI 51.9% (n= 122) and URTI 44.4% (n=20) was noticed high in this group of socioeconomic status.

Table 9: Low Birth Weight and ARTI

Diagnosis	Low Birth (<2500gm)		N	
	Present	Absent		
LRTI	51 (21.7%)	184 (78.29%)	235	**P=.003**
URTI	5 (11.10%)	40 (88.8%)	45	
Total	**56 (20.0%)**	**224 (80.0%)**	**280**	

The above table 9 shows that 21.7% (n=51) cases with LRTI and 11.1o% (n=5) cases with URTI where weighing < 2500 gm (i.e., low birth weight). The test used shows that difference was statically significant (p=.003).

Table 10: Breast Feeding and ARTI

Diagnosis	Breast Feeding		N	
	Present	Absent		
LRTI	51(21.7%)	184(78.2%)	235	**P=.000**
URTI	40(88.8%)	5(11.11%)	45	
Total	**92(32.8%)**	**188(67.14%)**	**280**	

The above table 10 shows the effect of breastfeed in ARI. Out of 235 cases of LRTI exclusive breast feeding was found absent in 78.2% (n=184) cases. Where it was found absent in 11.11% (n=5) cases with URTI. The prevalence of ARI was seen more in the cases who were not exclusively breastfeed i.e. 67.14% (n=188).

Table 11: Malnutrition and ARTI

Diagnosis	Malnutrition		N	
	Present	Absent		
LRTI	212 (90.2%)	23 (9.7%)	235	**P=.000**
URTI	15 (33.33%)	30 (66.6%)	45	
Total	**227**	**53**	**280**	

The above table 11 shows 9.7% (n=23) of children with LRTI were normal for weight for height where malnutrition was present in 90.2% (n=212) children compared to URTI where 66.6% (n= 30) were normal and 33.33% (n=15) were malnourished according to WHO grow chart. Significant difference was noticed (p=.000)

Table 12: Positive Family History of RTI and ARTI

Diagnosis	Malnutrition		N	
	Present	Absent		
LRTI	**87(37.02%)**	**148 (62.9%)**	**235**	**P=.003**
URTI	**7(15.5%)**	**38 (84.4%)**	**45**	
Total	**94(33.5%)**	**186(66.4%)**	**280**	

The above table 12 shows the association of positive family history of respiratory tract infection where 33.5% (n=94) children of the case group had family history of respiratory tract infection in the p[receding two weeks. There was higher risk of ARI in children where the family member had recent history of RTI. The test applied shows significant difference (p<.003).

Table 13: Maternal Education and ARTI

Diagnosis	Maternal Education				N
	Graduate or Intermediate	High or Middle school	Primary or literate	Illiterate	
LRTI	1 (0.42%)	23 (9.78%)	60 (25.5%)	151(64.2%)	235
URTI	3 (6.6%)	7 (15.5%)	10 (22.2%)	25 (55.5%)	45
Total	**4 (1.4%)**	**30 (10.7%)**	**70(25%)**	**176(62.85%)**	**280**

5. Discussion

This study was aimed to find out the risk factors of acute respiratory tract infection (ARI) among children of age 3 months to 5 years. ARI is the most common infection seen in under five children.

A total of 280 children form 3 months to 5 year were selected in our study. In our study male predominance was found with male and female ratio of 1.8:1. Similar results were found in different studies conducted in different countries like India, Bangladesh, Nepal which showed 64.42% vs 51.92%[32,] 73.1% vs. 64%[36] and 63.5% vs 52%[15] respectively. Another study also reported higher proportions of boys (62.9%) to have ARI as compared with girls (55.1%). [65] While a study conducted in India (Assam) showed females were more affected with ARI (27.35%) than males (25.69%) [16], the possibility of male gender bias in seeking medical care may be the cause. In the present study there was higher risk of ARI in those who lived in overcrowded houses 91% p=0.000. There are many studies in concordance with these results related to overcrowding 91.35% 32, 43.5% 44, 81.44%.[17] An Article from southern part of India also emphasized overcrowding as one of the risk factor of ARI.[18] Another study also concluded that there was a gradual increase in attack rate of ARI with increase in the number of family members.[19]A cross-sectional study conducted during October 2013 to February 2014 in Pondicherry, India concluded overcrowding was significantly associated with ARI.[20]

Biswas A, et al in their study showed that overcrowding was present in 67.4% of household, which was significantly associated with ARI.[19] Another study conducted in India (Assam) reflected an association of overcrowding (81.44%) with risk of ARI. [15]

In the present study there was higher risk of ARI in those who lived in overcrowded houses 91% p=0.000. There are many studies in concordance with these results related to overcrowding 91.35%[12,] 43.5%[14,] 81.44%[17]. An Article from southern part of India also emphasized overcrowding as one of the risk factor of ARI.[18]Another study also concluded that there was a gradual increase in attack rate of ARI with increase in the number of family members.[19]A cross-sectional study conducted during October 2013 to February 2014 in Pondicherry, India concluded overcrowding was significantly associated with ARI.[20] Another study conducted in India (Assam) reflected an association of overcrowding (81.44%) with risk of ARI.[15]

According to modified kuppuswamy's scale for use in Nepal, 11.9% of children of patients were from lower socioeconomic status showing higher incidence of ARI in lower socioeconomic status. This is in concordance with other studies conducted in different part of India, which had also reported higher percentage 59.62%, and significant association of ARI.[12] Similar finding was seen in study conducted in Nepal 38.5% with 2.5 times at higher risk of ARI[14]

The assessment of malnutrition was done, according to WHO classification of malnutrition. Weight for height (length) and height (length) for age and presence of edema were taken as criteria of wasting and stunting respectively, labeling as with and without edema. References standard charts used for assessment were those published by WHO in 2007. Use of Z- score for evaluating anthropometry data was considered, a score of -2 to -3 was taken as indicative of moderate malnutrition and <-3 as severe malnutrition. In our study 81.0% children of case were moderately wasted without edema i.e. malnourished (as wt for ht was between -2 to -3 Z score value). Presence of malnutrition (wasting) was significantly associated with ARI (p=.000). Similar observation was made by other researchers [12, 14]

6. Conclusion

The vast majority of children from case were infants (51.8%) with male predominance i.e. 1.8:1.Majority of children were found to be suffering from LRTI (pneumonia) followed by URTI. The significant socio-demographic risk factor was low level of maternal education, low socioeconomic condition, over-crowding, positive family history of RTI. The significant nutritional risk factors were low birth weight, exclusive breastfeeding, anemia and malnutrition. The significant environmental risk factor was wood as cooking material.

7. Future Scope

Parenteral education should be improved and prioritized by government so as to uplift socioeconomic condition and overall impact of ARTI. Measures should be taken to decrease overcrowding in houses to keep children away from family members who is suffering from respiratory tract infections. Indoor air pollution should be minimized by using proper cooking material, keeping separate kitchen and prohibiting smoke in house. Government should formulate proper integrated plan to address identified non-modifiable and modifiable risk factors of ARTI. This research finding could contribute to increase scientific body of knowledge in medical science to manage ARI.

References

[1] Pokorski, M. Pulmonary infection; (2015) Cham: Springer. ISBN 978-3-319-17458-7.
[2] Broor S, Pandey RM, Ghosh M, Maitreyi RS, Lodha R, Sighal T, et al. Ris factors for severe acute lower respiratory tract infection in under five children. Indian Pediatr 2001:38:1361-69.
[3] Rudan I, Tomaskinic L, Pinto CB, Camphell H. Global estimate of the incidence of clinical pneumonia among children under five years of age. Bull of the world health organ. 2004; 82:895-903
[4] Irwin RS, Baumann MH, Bolser DC, et al. Diagnosis and management of cough executive summary: ACCP evidence-based clinical practice guidelines. Chest. 2006; 129(suppl 1):1S-23S. Wenzel RP, Fowler AA 3rd. Clinical practice. Acute bronchitis. N Engl J Med. 2006; 355(20):2125-2130.
[5] "Pneumonia." Merriam-Webster.com. Merriam-Webster, n.d. Web. 15 Nov. 2017
[6] Johnson A-W BR. Acute respiratory infections. In: Azubuike JC, Nkanginieme KE, editors. Paediatrics and Child Health in Tropical Region. 2nd ed. Owerri African Educational Services; 2007. pp. 396–425.
[7] Ujunwa, FA, and CT Ezeonu. "Risk Factors for Acute Respiratory Tract Infections in Under-Five Children in Enugu Southeast Nigeria." Annals of Medical and Health Sciences Research 4.1 (2014): 95–99. PMC. Web. 30 June 2017.
[8] Rudan I, Boschi-Pinto C, Biloglav Z, Mulholland K, Campbell H. Epidemiology and etiology of childhood pneumonia. Bull World Health Organ. 2008; 86:408.
[9] Harerimana, Jean-Modeste et al. "Social, Economic and Environmental Risk Factors for Acute Lower Respiratory Infections among Children under Five Years of Age in Rwanda." Archives of Public Health 74 (2016): 19. PMC. Web. 30 June 2017.
[10] Thapa, Pushpa et al. "Risk of ARI among Non-Exclusively Breastfed Under-Five Passive Smoker Children: A Hospital-Based Cross-Sectional Study of Nepal." Frontiers in Public Health 4 (2016): 23.
[11] Acharya D, Prasanna KS, Nair S, Rao RS. Acute respiratory infections in children: A community based longitudinal study in south India. Indian J Public Health. 2003; 47:7–13.
[12] Savitha MR, Nandeeshwara SB, Pradeep Kumar MJ, ul-Haque F, Raju CK. Modifiable risk factors for acute lower respiratory tract infections. Indian J Pediatr. 2007; 74:477–82.
[13] Victora CG, Smith PG, Barros FC, Vaughan JP, Fuchs SC: Risk factors for deaths due to respiratory infections among Brazilian infants. Int J Epidemiol. 1989, 18: 918-925. 10.1093/ije/18.4.918.
[14] Yadav S Khinchi Y, Pan A, Gupata SK, Shah GS, Baral DD, et al. Risk Factor for Acute Respiratory Infection in Hospitalized Under Five Children in Central Nepal. J Nepal PaediatrSoc 2013; 33(1):39-44.
[15] Tromp I, Kiefte-de Jong J, Raat H, Jaddoe V, Franco O, et al. (2017) Breastfeeding and the risk of respiratory tract infections after infancy: The Generation R Study. PLOS ONE 12 (2): e0172763. https://doi.org/10.1371/journal.pone.0172763.
[16] Islam F, Sarma R, Debroy A, Kar S, Pal R. Profiling Acute Respiratory Tract Infections in Children from Assam, India. Journal of Global Infectious Diseases. 2013; 5(1):8-14. doi:10.4103/0974-777X.107167.
[17] Islam F, Sarma R, Debroy A, Kar S, Pal R. Profiling acute respiratory tract infections in children from Assam, India. J Global Infect Dis. 2013; 5:8–14.
[18] Bhat R Y, N. Manjunath. Correlates of acute lower respiratory tract infection in children under 5 years of age in India. Int J Tuberc Lung Dis 2013; 17(3):
[19] Tupasi Thelma E, et al. Determinants of Morbidity and Mortality due to Acute Respiratory Infections: Implications for Intervention. The Journal of Infectious Diseases. 1988; 157(4):615–22.
[20] Kumar SG, Majumdar A, Kumar V, Naik BN, Selvaraj K, Balajee K. Prevalence of acute respiratory infection among under-five children in urban and rural areas of puducherry, India. Journal of Natural Science, Biology, and Medicine. 2015; 6(1):3-6. doi:10.4103/0976-9668.149069