



INFLUENCE OF NUTRITION ON RECURRENT LOWER RESPIRATORY TRACT INFECTION AMONG UNDER FIVE CHILDREN

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ABSTRACT

BACKGROUND: From the time immemorial, lower respiratory tract infection is main cause of morbidity and mortality among under five children. The risk factors associated with recurrent lower respiratory tract infections (RLRTI) are not studied widely. Hence, the present study was undertaken to identify the modifiable nutritional risk factors among children aged 1 to 5 years, admitted with RLRTI.

MATERIALS AND METHODS: This is a case control study done over a period of 3 years among 54 children aged 1 to 5 years, admitted with at least 3 or more episodes of bronchitis/bronchiolitis/pneumonia in a year. Data was collected using pretested, predesigned proforma to assess the nutritional risk factors and compared with healthy matched controls. Children with anatomical malformations, wheezers, primary immunodeficiencies and congenital heart diseases were excluded. SSPS 25 software was used to analyse the data and was considered statistically significant if p value <0.05.

RESULTS: The total study population was 54 children, of them, 60% were male and 40% were female. Nutritional factors such as providing pre-lacteal feeds (p=0.011, 2.969 [1.343-6.563]), early introduction of complementary feeds (p=0.022), severe malnutrition (p=0.002, 8.244 [1.760-38.607]), low birth weight (p=0.000, 11.946 [2.601-54.871]), bottle feeding (p=0.000, 6.738 [2.315-19.610]) and junk food intake (p=0.004, 3.950 [1.501-10.390]), practice of folk remedy (p value= 0.000, 4.490 [1.981-10.178]) were significantly associated with RLRTI.

CONCLUSION: Modifiable nutritional risk factors such as junk food, bottle feeding, prelacteal feeds, etc. are more common in children from rural areas admitted with recurrent lower respiratory tract infection. Awareness regarding the same would bring down morbidity and mortality significantly.

KEYWORDS : modifiable risk factors, nutrition, recurrent lower respiratory infection.

INTRODUCTION:

Acute respiratory infection (ARI), predominantly lower respiratory tract infection (LRTI) is one of the leading cause of morbidity and mortality in children under the age of five^[1]. British Medical Journal (BMJ) defines Recurrent lower respiratory tract infection as "three or more annual episodes of bronchitis or bronchiolitis or pneumonia"^[2]. On an average each year, every child in a developing country is affected with 5 episodes of ARI constituting 20-30% of admissions^[3]. The world health organisation claims that ARI accounts for 6% among all the global burden of diseases. Suboptimal breastfeeding and underweight are found to be a major risk factors for mortality due to ARI in under 5 children^[4]. Recurrent LRTI is uncommon in healthy children; nevertheless, social factors and faulty feeding habits in the community such as bottle feeding, prelacteal feeds, early complementary feeds, malnutrition etc. compromise the developing immature immune system making them prone to recurrent LRTI. Tendency to acquire ARI, majorly depends on one's own immune status, which is highly dependent on macro and micro nutrients^[5]. During early years of life, RLRTI creates significant impact on the vascular and broncho-alveolar development^[6]. Although practically, environmental and social factors are hard to be addressed, identification of the merely modifiable nutritional factors would cut down morbidity and mortality remarkably. Though multiple studies have assessed the association of nutritional risk factors with ARI, only a limited with RLRTI. Hence we aim to identify associated risk factors with RLRTI which are modifiable in day today life.

METHODOLOGY:

This study is a case control observational study, carried out for a span of 3 years, (September 2019 to September 2021) among 54 children aged 1 to 5 years, who were admitted with RLRTI at Cuddalore Government Medical College, a tertiary care centre, Chidambaram, India. Age matched children admitted with else reasons were selected as controls. Children with any of the following conditions were excluded from the study:

1. Episodic or Multitrigger wheezer.
2. Congenital heart disease.
3. Chronic lung disease.
4. Congenital lung malformation
5. Primary immunodeficiency

After obtaining informed written consent from child's caregiver, the data was collected using a predesigned pretested proforma which includes demographic profile, history and physical examination pertaining to modifiable risk factors. A case of RLRTI is defined as "three or more annual episodes of bronchitis/bronchiolitis/pneumonia". Malnutrition was graded by WHO standards as moderate and severe malnutrition. Microsoft excel was used to enter the collected data and analysis was done using SSPS 25. Student's t test and Chi square test were used to analyse quantitative and categorical variable respectively and Statistical significance was considered for values with p <0.05.

RESULTS:

Table 1:

FACTORS	CASE n (%)	CONTROL n (%)	p VALUE	ODDS RATIO [95% Confidence Interval]
PRELACTEAL FEEDS				
YES	30 (55%)	16 (29.6%)	0.011	2.969 [1.343-6.563]
NO	24 (44.4%)	38 (70.4%)		

COMPLIMENTARY FEEDS				
<4MONTHS	11(20.4%)	3(5.6%)	0.022	4.349 [1.139-16.601]
4-6 MONTHS	33(61.1%)	23(42.6%)	0.054	2.118 [0.982-4.567]
>6 MONTHS	10(18.5%)	26(48.1%)	0.001	0.245 [0.103-0.584]
PALLOR				
YES	45(83.3%)	22(40.7%)	0.000	7.273 [2.962-17.857]
NO	9(16.7%)	32(59.2%)		
MALNUTRITION				
ABSENT	9(16.7%)	22(40.7%)	0.006	0.291 [0.118-0.714]
MODERATE MALNUTRITION	32(59.2%)	30(55.56%)	0.697	1.079 [0.733-1.588]
SEVERE MALNUTRITION	13(24.1%)	2(3.7%)	0.002	8.244 [1.760-38.607]
BIRTH WEIGHT				
<2.5 KG	17(31.5%)	2(3.7%)	0.000	11.946 [2.601-54.871]
>2.5KG	37(68.5%)	52(96.3%)		
BOTTLE FEEDING				
YES	49(90.7%)	32(59.3%)	0.000	6.738 [2.315-19.610]
NO	5(9.3%)	22(40.7%)		
ASPIRATION HISTORY				
YES	5(9.2%)	8(14.8%)	0.375	0.587[0.179-1.924]
NO	49(90.7%)	46(85.2%)		
PASSAGE OF WORMS				
YES	13(24.1%)	23(42.6%)	0.065	0.427 [0.187-0.975]
NO	41(75.9%)	31(57.4%)		
JUNK FOOD INTAKE				
YES	47(87.0%)	34(63.0%)	0.004	3.950 [1.501-10.390]
NO	7(13.0%)	20(37.0%)		
H/O FOLK REMEDY				
YES	33(61.1%)	14(25.9%)	0.000	4.490 [1.981-10.178]
NO	21(38.9%)	40(74.1%)		

Our study population was male preponderant (60%) and most (79.6%) were under the age of 3 years. The children under the age of 3 carried risk of developing RLRTI compared to ones above the age of 3. Children who were provided pre-lacteal feeds (p-0.011) had 2.9 times risk of acquiring the disease. Complimentary feeds started before the age of 4 months was a significant risk factor (p-0.022) towards development of RLRTI, while exclusive breastfeeding till 6 months was a protective factor (p-0.001). Children who were anaemic acquired LRTI frequently compared to those who weren't (p-0.000).

Children who did not have malnutrition were found to be safe against the disease (0.291[0.118-0.714]), whereas children with severe malnutrition, had 8 times risk of developing (p-0.002, 8.244 [1.760-38.607]). Children whose birth weight <2.5 kg constituted 32% of cases and were susceptible of developing RLRTI (p value-0.000, 11.946 [2.601-54.871]), compared to those weighted >2.5Kg. Other risk factors associated with RLRTI were bottle feeding (p-0.000), junk food intake (p-0.004) and folk remedy (p-0.000).

DISCUSSION:

We observed that most of the affected study population were males (60%) and rest (40%) were females; this might be due to preferential treatment given to male infants in rural areas. Children under the age of 3 years were more affected than the older children (p value 0.002) owing to their immature immune system and their curiosity to explore new place and people exposing them to infections. Higher the socioeconomic status, lower the disease. According to modified kuppusamy scale-2019, 65% belonged to class IV (upper lower) followed by 18% to class V (lower class), may be because many of the inhabitants are cultivators and agricultural labourers. This picture (p value 0.000) may reflect their ignorance regarding disease and low access to health services. Similar finding were noted in a studies on acute LRTI by savitha et al. and Agarwal et al (p value <0.001 in both studies)^{[7][8]}.

Infants fed with Prelacteal feeds in the form of honey/ghee/jaggery water had 2.9 times risk of developing RLRTI. This is supported by Phung Ngyyen et al. who observed that, prelacteal and early formula feeds are associated with at

least 1 episode of lower respiratory infection by 1 year age^[9]. The explanation could be: Prelacteal feeds cause early satiety that hamper adequate breast milk intake, thus hindering the beneficial effects of breast milk such as antiviral property against various viruses, especially Respiratory syncytial virus^[10]. Furthermore, infants are predisposed to harmful contaminants in prelacteal feeds which creates physiological disruptions in their immature Gastrointestinal and renal system^[11].

According to WHO, complimentary feeding is very important for infants after six months of age, as the nutrients and energy requirements exceed those of breast milk. However early complimentary feeding practises (less than 6 months of age) may render the children susceptible to respiratory infection and diarrhoeal illness. In our study, children initiated on complimentary feeds before the age of 4 months were associated with RLRTI (p-0.022); however, those instituted during or after 6 months, did not develop RLRTI (OR 0.245,[0.103-0.584]). The role of breast milk in child's growth and development cannot be replaced by any. Kalaiselvi et al. in their study observed 30-42% less incidence of acute LRTI among exclusively breastfed infants^[12]. Similarly, Cesar JA et al. and Hai-Feng et al. in their studies showed that infants who lacked adequate breastfeeding were prone to acquire pneumonia^[13] and RLRTI respectively (p-0.03).¹⁴

Malnutrition is an independent risk factor for the development of recurrent respiratory infection and recurrent diarrhoea probably due to defective mucosal barrier^[15] and cell mediated immunity^[6]. According to WHO, around the globe, 45% of under 5 deaths are due to under nutrition^[16] Our study results were coherent with the previous statement in the way that children who had severe malnutrition were 8 times prone to develop RLRTI, whereas children with no malnutrition were safeguarded (p-0.006 [0.291[0.118-0.714]) . Similar study by Ujunwa et al. demonstrated that 75.7% of inadequately nourished, developed pneumonia; while only 22.7% of adequately nourished had pneumonia^[17].

We observed that the children with anaemia, have a 7 time risk of developing RLRTI; the cause might be due to the fact that iron is needed in various immunological functions, deficiency

of which might lead to decreased immunity of host leading to recurrent infection. Agarwal et al. in their study, identified anaemia as an independent risk factor for the development of acute lower respiratory tract infection^[8]. Study done by Morad S et al. among Lebanese children admitted with acute lower respiratory tract infection found anemia in 32% of cases, while only 16% of controls had the disease^[18].

Low birth weight in children were significantly associated with RLRTI (p-0.000, 11.946 [2.601-54.871]). Poor immunological response might be a contributing factor towards the same. Similar observation was demonstrated by Dharmage SC et al.^[19]. Relation between junk food intake and RLRTI is not widely studied. But we found, RLRTI was significantly associated with frequent junk food intake such as high sugary, processed foods (p-0.004). Zhang et al. found similar association among children aged less than 3 years, who took high sugar containing foods (57.8%) acquired RLRTI (p-0.001). High sugar and heavy molecular weight diet may present an antigen which can disrupt the immune system of the child causing recurrent infections.^[20]

Native malpractices such as instillation of oil in infant nose to prevent nasal congestion, blowing into nasal cavity for incessant cry and usage of commercially available gripe water etc make child more prone for infections, especially of respiratory tract. We observed that majority (61%) children's family had a practise of these hazardous folk remedies and had significant association with RLRTI (p-0.000). In initial few months, anything other than breast milk, makes the baby prone for infections and allergy.^[21] Sas D et al. studied about hazards of gripe water and stated it was associated with pseudomonas^[22] and FAO in 2007 made a news release stating cryptosporidium infections were associated with their usage.^[23]

CONCLUSION:

Most common modifiable nutritional risk factors of RLRTI that are proven to be detrimental for health of under 5 children in rural areas are faulty feeding habits, low birth weight and malnutrition. Recurrence of respiratory infection is ease to be prevented than treated by simple interventions. The key route to achieve it is by education and awareness. Proper knowledge, attitude and practise about healthy nutrition prevents recurrence of lower respiratory tract infections among children under age of 5.

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