RISK FACTORS OF ACUTE LOWER RESPIRATORY TRACT INFECTION:A STUDY IN HOSPITALLIZED CENTRAL INDIAN CHILDREN UNDER 5 YEAR AGE

PANDEY DEEPTI[1], PANDIT ABHA[2]

1Department of Otorhinolaryngology, Institute of Medical Sciences. Banaras Hindu University.Varanasi.Uttar Pradesh.2Department of Medicine, Index Medical College,Indore.Madhya Pradesh. Email : drabhaindore@gmail.com

ABSTRACT

Objective: Preventive measures of regional relevance can be conceived based on understanding of predominant risk factors.Present observational study endeavoured collection of evidence on hierarchy of risk factors for acute lower respiratory infection(ALRI), in under 5 year age children hospitalized in a city in central India.

Method.A prospective transactional case control observational study was carried out in 100 hospitallized under 5 year age children of ALRI and 100 healthy babies of similar age and sex composition selected as controls concurrently from immunization and well baby clinic.Hierarchial order of risk factors was elucidated.

Result. Low birth weight,incomplete immunization,faulty breast feeding and weaning practices,poor living condition and malnutrition,prematurity and cesarian birth were prominent risk factors for ALRI.First year of life reveals as most vulnerable period in the regard.

Conclusion. Risk factors defined by the study are consistent with other reports but,with a variant hierarchial pattern.Good antenatal and immunization care,good breast feeding and nutrition care,restriction of overcrowding and infection ferom family contacts emerged as key prevention perspects.Effective health education and access to basic mother child health services,specially to prematures and those under 1 year age appeared as pertinent preventive interventions against ALRI in preschool babies in specific regional context.

Keywords: Acute lower respiratory infection;Bronchiolitis;Pneumonia;Risk factors

INTRODUCTION

Acute lower respiratory tract infection(ALRI) is leading cause of hospitalization and mortality among children under 5 year age in developing societies[1].The incidence of ALRI is high in developed world as well but more severe forms of disease and mortality is disproportionately high among developing countries[2].Variety of factors as, low birth weight, time of initiation of breast feeding, weaning with complementary food, immunization status etc are shown to impact the ALRI risk in children under 5 year age. Knowledge of risk factors would help prevention through proper health education efforts and other interventional community development initiatives. Generation of local evidence base should guide steps to keep check on risk determinants to empower management by avoiding severe form of disease and improve outcome in victims. Present case control observational study is based in central Indian hospitalized ALRI patients under 5 year age and healthy controls. It endeavourers to identify significance and hierarchy of various known determinants that influence ALRI incidence in the specific regional context and contemplate evidence based preventive interventions.

Patients and method

Children under age of 5 years, diagnosed of ALRI and admitted between January 2013 to March 2014 were enrolled as study cases. Healthy children attending immunization and well baby clinic of similar age were selected as controls. Parents were explained that information on health condition of their ward would be used for research without revealation of identity and their verbal consent was obtained prior to induction in this pure observational cross sectional case control study. The study protocol was approved by departmental research committee.

ALRI was defined as presence of cough with fast breathing of more than 60/min in babies under 2 month age; more than 50/min in those between 2-12 months of age and more than 40/min in the 1to

5 year aged[3] .The controls were healthy babies without any respiratory or other complaints.

Both in the cases and controls, detailed health history and relevant epidemiological informations were elicited from mother. Physical examination was carried out. Both history and physical examination were oriented at eliciting potential risk factors. History of respiratory infection in a family member over past 2 weeks; information of any smokers in family; number of individuals sharing the room with baby etc were collected. Children older than 2 years were weighed on bathroom spring weighing scale in standing straight position. Children under 2 years were weighed in lying on cradle spring scale..Malnutrition was graded utilizing Gomez classification with reference to WHO international standards of weight for age. Thus malnutrition was graded as nil for weight for age >90%;I if wfa 89-76%;IIif wfa 75-60% and II when wfa <60%[4-5].Routine hematological, urine and stool exams were requisitioned for cases and controls both. Other specific investigations in cases were as per needs and were part of management not under preview of the study.

A total of 100 cases of ALRI and 100 healthy concurrent controls of roughly similar age and gender composition were enrolled for study. The prevalence of probable risk factors among the two compared groups were contrasted and analyzed by chi square statistic. Depending on level of statistical significance and magnitudes of differences depicted by odds ratios, working hierarchy of the risk factors was drawn.

Observations and results

Relative prevalence of epidemiological determinents among cases and controls are the focus of study..Table1,depicts familial and maternal factors. There was no significant difference among age and education profile of mothers in two groups. Significantly more

mothers of case group were working outdoors and incidence of smokers in family was also higher than the control group. Even more significant was the higher prevalence of family members with respiratory infection in preceding fortnight of the case group. The case group also had significantly higher prevalence of more than two members sharing childs room in home.

Maternal factors further indicated significantly high proportion of case group patients being 3rd or later in birth order. There was no difference in two group in respect of interval of preceding birth. Preterm labour and cesarian deliveries were significantly high for the cases than controls.

Table.1Familial and maternal epidemiological determinents in ALRI cases and controls

Familial factors

	ALRI Cases(n.100)	Controls(n.100)	p
Mothers current age <25 years	55	42	
>25 years	45	58	
Mothers education. Up to middle school	48	36	
Higher beyond middle school	52	64	
Mothers outdoor employment: Yes	16	07	*
No	84	93	
Smoker/s in family Yes	31	19	*
No	69	81	
Respiratory Infection in Family Yes	43	27	**
No	57	73	
Members sharing babys room <2	39	57	**
>2	61	43	
Maternal factor			
Order of pregnancy <2	75	87	*
>2	25	13	
Birth interval <24 months	59	48	
>24 months	41	52	
Term at labour <37 week	17	07	*
>37 weeks	83	93	
Type of labour Vaginal	73	91	*
Cesarian	27	09	

- **Indicate statistically significant differencesP *=<0.05;**=<0.01**

Table 2,presents the distribution of child related determinents likely to impact ALRI.Very significant about 3 fold higher proportion of case group were born underweight,i.e.2500g or less.The males outnumbered females by 64 to 36 numbers in case group.This did not appear significant in comparison to control which were selected for sex match.Vast proportion among the cases(81 of 100) were under one year age.Again,due to age matched selection of controls,this does show difference with controls.

Significantly higher proportion of cases had delayed start of breast

feeding .Very significantly,higher proportion among the cases also had inadequate(less than 4 month) duration of exclusive breast feeding..There was also significantly more frequent delay in introduction of complementary foods in cases as opposed to the control group.Significantly hogher proportion of cases were moderately to markedly underweight for age.Very significantly higher prevalence of hemoglobin under 11g% was also observed among the cases..Cases had also very significantly greater prevalence of incomplete immunization for the age.

Table 2.Child specific epidemiological determinents in ALRI cases and controls

Child Specific Factors

	ALRI cases (n.100)	Controls(n.100)	p
Birth weight <2500 g	31	11	****
>2500g	69	89	
Gender Male	64	56	
Female	36	44	
Age in months <12	81	74	
>12	19	26	
Initiation of breast feeding in <72 hours	78	91	**
>72 hours	22	09	
Duration of exclusive breast feeding <4 months	36	16	***
>4months	64	84	
Start age of complementary foods <6month	52	69	**
>6month	48	31	
Current weight as % wt.for age >75%	77	89	*
<75%	23	11	
Haemoglobine g/dl <11	57	34	***
>11	43	66	
Immunization status for age Complete	81	96	***
Incomplete	19	04	

- Indicate statistically significant difference P: *=<0.05;**=<0.01;***=<0.001;****=<0.0001

DISCUSSION

The endeavourer was to generate clinical evidence base at the regional level on determinants of ALRI risk among under 5 year age children. For this, hundred hospitalized ALRI cases of children and even number of age and sex matched healthy control group of children selected from immunization and well baby clinic, were compared. data on demographic, environmental and biological factors were elicited through interviewing mothers and direct examination.

Higher age and education of mothers is expected to result in better care and hence, health in young children under 5 years..Proportion of mothers younger than 25 years and under educated were roughly 10% higher among the cases compared to controls, although the difference is not statistically significant. Outdoor job of mother is expected to compromise quality of baby care. Proportion of working mothers was twice as high significantly, in case group as in the controls and is consistent to finding this as risk factor for ALRI in other studies[6,7].Significantly, higher proportion of cases had smoker/s in the family and passive inhalation of smoke is ALRI risk factor in studied age group[8-13].

Among the cases, there was significantly high prevalence of respiratory infection in family members in preeciding fortnight, that could possibly serve as source of infection, and hence a recognized risk factor[14].Significant majority among the cases had their rooms shared by more than 2 family members in contrast to controls,and overcrowding is known risk factor for ALRI[6,7,15-19].

Preceeding pregnancies take toll of mothers health and would negatively impact care and health of babies. ALRI cases had significantly high proportion with late birth order, an accredited risk factor [7,20].Shorter birth interval was more often observed among the cases but difference with control was not statistically significant. Shorter birth interval carries similar risk for ALRI as late birth order[6-8,20].Rate of premature births under 37 weeks of gestation was higher among the cases and is known to increase vulnerability to infection on many accords[9,11,15].Significantly high cesarian delivery rate seen in cases should cause instances of impaired establishment of healthy gut and other microbiome, serving immune function protective against infection[8,21,22].

Very significantly high prevalence of low birth weight among the cases contributed to ALRI risk, as per inferences drawn by many studies[6,9,13,15].Low birth weight in term infants is surrogate marker of intrauterine growth restriction. It imparts high ALRI risk due to structural deformations compromising lung health and impaired immune competence [23-26].The selection of controls was deliberate for matched age and sex composition. This precluded significant differences in regard to the same. Among the cases however, male babies outnumbered females by 64 to 36.Several other reports also state male dominance in ALRI[6,10,27,28].81 of the studied 100 cases were under 0ne year age, making evident such as as most vulnerable to ALRI causing viruses[29].

Very significantly higher proportion of cases had history of delayed initiation of breast feeding, suggesting deprivation of colostrums feed. Colostrum serves to transfer sound passive immunity safeguarding babies against infections [30,31].Delayed initiation of breast feeding therefore, showed up as significant risk factor. The proportion of cases not receiving minimum 4 months of exclusive breast feeding was significantly twice as high in contrast to the controls. Several studies indicate such deficiet to increase vulnerability to ALRI[6,9,14,16,18,20,32-35].Mother to infant transfer of innate immune effectors,viz, lactoferin, lysozyme, secretory IgA, leukocytes etc is through breast feeding and breast milk promotes maturation of babys immune system[36].Introduction of complementary foods was delayed in significantly higher proportion of cases in contrast to controls. Complementary foods make for the deficiet of trace elements ,vitamins etc in human milk[37-41],and thus support protective immune function.

Significantly high proportion among the cases were low in weight for age, indicating higher prevalence of malnutrition ,an established risk factor for ALRI[6,9,16,18,20,32-34,42-44].Hemoglobin level is rough indicator of nutritional status and relates to iron and folate status.The later bear significant role also in immune competence and their deficiency increases risk of ALRI[18,27,42,45-47].Significantly high proportion of cases exhibited low hemoglobin profiles compared to controls ,implicating possibly the iron-folate deficit as risk factor for ALRI. Significantly high,fifth of the cases in contrast to bare twentieth of controls were found to be incompletely immunized for age. Serious risk implication of incomplete immunization status is proven for ALRI by several studies [7,10,11,14,19,28,30,48-50].

The evidence gathered by present study is by and large consistent with understanding on risk factors for ALRI in under 5 year children. There is overt variance however, in respect of quantitative contribution of risk factors in this study and other reports. The working hierarchy of ALRI risk factors of regional relevance is attempted in table 3,taking in to consideration the level of statistical significance of differences of prevalence of risk factors between cases and controls and their degrees displayed as odds ratios.

Table 3.Working Hierarchy of risk factors for ALRI based on this study

Risk Factor	Stat.Significance of Difference	Odds Ratio
1.Low birth weight <2500 g	****	3.63
2.Incomplete immunization status	***	5.63
3.Less than 4 month exclusive br.feeding	***	2.95
4.Low hemoglobin status<11g%	***	2.57
5.Delayed initiation of breast feeding>3 days	**	2.85
6.Over crowding >2 persons sharing room	**	2.07
7.Delaed introduction of complementary food >6 months	**	2.05
8.Respiratory infection in family member in 2 weeks	**	2.04
9.Cesarian birth	*	8.74
10.Preterm birth<37 weeks	*	2.72
11.Working mother(outdoor)	*	2.53
12.Low weight for age status <75% of std.	*	2.42
13.Late order of pregnancy>2	*	2.23
14.Smoker/s in family	*	1.92
15.Younger mother <25 year age	NS	1.69
16.Under educated mother<high school	NS	1.64
17.Birth interval <24 months	NS	1.56

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.Babies under 12 months age constituted 81 cases among the studied 100.Majority of 64 in 100 ALRI cases were males.

Going by the working hierarchy drawn in table 3,good antenatal and immunization care;good breast feeding and nutrition care of babies;restriction of overcrowding in babys room avoidance of infection source in family are conceivable as measures of prime

significance to bring down risk of ALRI in the under 5 age group in the region.Infants born preterm and by cesarian birth need extra care and first year of life is most vulnerable period for ALRI.

Intriguingly,low weight for age was much lower in hierarchy of risk factors contrary to many reports,but less divergent profiles in reference controls may be responsible.Outdoor working of mothers and smoker family members posed but less risk.Probably families handle these more aptly.Some other risk factors reported in other studies did not have significant consequences in studied sample.

CONCLUSION

As manifest from study observations ,effective health education and access to antenatal and immunization care ,proper infant nutrition practices and special care of immature babies specially during first year of age emerge as worthwhile interventions to reduce risk of ALRI in north Indian infants and children under 5 year age.

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