

Factors associated with Reactive Airway Disease in under 5 Children attending SAT Hospital, Thiruvananthapuram

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ABSTRACT

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Background: Pediatric Reactive Airway Disease is a chronic, multifactorial, airway disease that affects 5-15% of children worldwide. Though the prevalence is more in the developed countries, the developing countries have a higher total burden of the disease due to differences in population. In India this burden is about 15 million among children. The scenario in Kerala is also not very different. Prevalence rates and mortality rates of RAD are on the rise in Kerala

Objective: To study the factors associated with Reactive Airway Disease in Under 5 children attending Sree Avittom Tirunal (SAT) Hospital, Thiruvananthapuram

Method: The study adopts a case control study design, where the characteristics of each group are described and a comparison of those characteristics is made at a later stage. The study variables include demographic profile of the respondent, socio economic status of the parents, antenatal, natal and postnatal history, past medical conditions, environmental factors and specific triggers of RAD. The study has covered a sample size of 50 respondents from each group. The cases were selected from among the children less than 5 years of age diagnosed with RAD attending SAT hospital during the period of our study. The controls were selected by individual matching taking into account the gender and age of each case. Quantitative variables are expressed in terms of mean and standard deviation and qualitative variables in terms of proportions.

Results: It has been observed that Immunization status of the child ($p < 0.006$), Antenatal complications of the mother($p < 0.002$), Exclusive breastfeeding(0.001), formula feeds, bottle feeding($p < 0.005$), family history of asthma($p < 0.005$), exposure to irritants like dust, carpets, curtains, mosquito repellants, incense sticks($p < 0.005$), history of atopic dermatitis($p < 0.006$), changes in weather conditions and excessive physical exertion($p < 0.005$) increased the risk of RAD attacks among cases as compared to controls.

Conclusion: After analysis Family History, Passive Smoking, lack of Exclusive breast feeding and Past Respiratory Infections showed significant association with RAD. Approaches like Baby Friendly Hospital Initiative to promote Exclusive breast feeding, Early diagnosis and treatment of Respiratory Infections, Prevention of passive smoking, Provision of proper smoke outlet and prevention of exposure to triggers can control attacks of Reactive Airway Disease.

Keywords: Reactive airways disease, Children, Factors.

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INTRODUCTION

Reactive airways disease (RAD) is a term used to describe breathing problems in children up to 5 years old. Recurrent wheezing was often called asthma in the past and more recently, is called Reactive Airways Disease or RAD. This new term attempts to get across the points that the wheezing is a reaction that can be triggered by many factors (such as viral upper respiratory infections, inhalant allergies to pollens and molds, cold air, exercise, emotion, cigarette smoke,

paint fumes, ozone) and that the site of the problem is obstruction to airflow in the lower airways of the lungs (as opposed to noisy breathing due to nasal drainage or laryngitis). The obstruction to airflow is due to narrowing of the airways by constriction of muscles around the airways as well as swelling of the lining of the airway and collection of secretions within the lumen of the airway.

The symptoms of RAD may include any of the following:

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- Wheezing: Wheezing is a high-pitched whistling sound heard when a person breathes out.
- Trouble breathing: Child may tell that his chest feels tight. His nostrils may flare out as he tries to breathe. His stomach muscles or the skin over his ribs may move in deeply while he tries to breathe. He may also take shorter, faster breaths than usual.
- Cough: child may have a cough that does not go away. You may hear crackles when he breathes or coughs.
- Fast heartbeat: When a child cannot breathe as well, his heart may beat faster than usual.
- Runny nose: child may have a runny nose along with other signs and symptoms of RAD.

Diagnosis of Reactive Airway Disease

RAD is always diagnosed from the history. Any history of exposure to any of the triggers or any history of associated risk factors is significant. Some of the Tests which may be used in the diagnosis are listed below

- Pulse oximeter:
- Spirometry
- Mucus samples
- Blood tests
- Chest x-ray

TREATMENT OF RAD

Treatment of RAD involves treatment of an acute attack and prophylaxis to prevent attacks in the future. The commonly prescribed drugs for RAD include:

- Short-acting bronchodilators: These medicines are used to relieve sudden, severe symptoms, such as trouble breathing. These medicines may be called relievers or rescue inhalers.
- Long-acting bronchodilators: Long-acting bronchodilators may be called controllers. This medicine helps open the airways over time, and is used to decrease and prevent breathing problems. Long-acting bronchodilators should not be used to treat sudden, severe symptoms
- Corticosteroids: These medicines help decrease swelling and open air passages so he can breathe easier.
- Oxygen: Oxygen inhalation may be required in the management of an acute attack
- Breathing treatments: Child may need to use a nebulizer or an inhaler.

RISK FACTORS OF RAD

- Family history of allergy or asthma
- Lung infection in the recent past
- Presence of second hand smoke around the child or smoking habit in the mother while she was pregnant
- Weather Changes
- Physical Activity
- Exposure to irritants which can trigger an allergic response such as dust, pollen, pets
- Lack of Breastfeeding or Exclusive Breastfeeding for less than 3 months

Prevention of Reactive Airway Disease

- Do not let anyone smoke around the child: Cigarette smoke can harm the child's lungs and cause breathing problems. Do not let anyone smoke inside the house.
- Keep all follow-up visits: Tell healthcare providers about the child's symptoms. For example, tell them how often and how badly the child is wheezing or coughing. Make sure the child gets all of the vaccines suggested by his healthcare provider.
- Avoid triggers: A trigger is anything that starts your child's symptoms or makes them worse. If you know that your child is allergic to a certain food, do not let him have it. The allergy can cause his airways to close. This can be life-threatening. Avoid areas where there is pollution, perfume, or dust. Remove pets from your home.
- Breastfeed the infant: Breast milk protects from allergies that can trigger wheezing and other problems.
- Help the child get enough exercise and eat healthy foods: Follow healthcare providers' orders for how to manage the child's cough or shortness of breath while he is active. If the symptoms get worse with exercise, the child may need to take medicine through an inhaler 10 to 15 minutes before exercise. Give the child healthy foods. Ask the child's healthcare provider what the child should weigh
- Avoid spreading illness: Keep the child away from others if he/she has a fever or other symptoms. Do not send him to school or daycare until his fever is gone and he is feeling better. Keep the child away from large groups of people or others who are sick. This decreases his chance of getting sick.
- Make changes to your home: The child's signs and symptoms may get worse when he is around dust

mites, cockroaches, or mold. Keep your home free from these triggers. Keep the humidity (moisture level in the air) low. Fix leaks, and remove carpets where possible. Use mattress covers, and wash bedding every 1 to 2 weeks in hot water. Wash tables and other surfaces with weak bleach (1 tablespoon of bleach in a gallon of water).

- Ask healthcare providers to create an asthma action plan: An asthma action plan may help you and your child manage his RAD symptoms at home. The plan will include signs to watch for that mean your child's symptoms are getting worse. The plan will state what to do if this occurs, and list emergency phone numbers. Your child's triggers will be on the plan so that you both know what to avoid. The plan will list any medicines your child takes. It will also state when your child should see his healthcare provider for a follow-up visit.

Risk factors and various triggers may show variation in different geographical settings. Kerala has shown a rising trend in the prevalence and mortality rates of RAD. Through our study we wish to find the strength of association of the known risk factors and also identify new factors associated with RAD, if any, in our setting. We assess the strength of association of factors like

- Immunization Status
- Socioeconomic Background
- Antenatal History
- Natal History
- Travel History
- Irritants Like Mosquito Repellants and Incense Sticks
- Food Allergy
- Atopic Dermatitis

Knowledge of these factors can contribute to prevention of Reactive Airway Disease and thereby control the prevalence and mortality rates.

REVIEW OF LITERATURE

GLOBAL SCENARIO

RAD affects 5-15% of children worldwide. Though the prevalence is more in the developed countries, the developing countries have a higher total burden of the disease due to differences in population.

INDIAN SCENARIO

The burden of RAD in India is estimated to be 15 million. There was a constant and variable increase in

asthma prevalence worldwide in the last two decades and the same is being observed in India.

Urban and male predominance with wide inter-regional variation in prevalence was also observed by us in different Indian studies, with a wide variation (4 – 20%) and an increase in mortality in younger age groups.

Environmental factors, including increasing exposure to pollution, allergies, tobacco smoke, and sedentary lifestyle were identified as risk factors for asthma. The proportion of Indian school children suffering from Rad had increased to more than double in the last 10 years and reached the highest-level ever.

There was low prevalence of RAD (1 – 3.3%) in the children surveyed in Lucknow, Ludhiana, and Punjab, while in Delhi the prevalence of Rad was 11.6%. Rise in prevalence over time in Bangalore had been associated with environmental pollution, urbanization, and change in the demography of the city. These factors might be responsible for inter-city variation in the prevalence of Childhood RAD.

Among the children who reported as ever wheezers, one-fourth of them confirmed to be suffering from Asthma in later life. The rest of the children with reported wheeze might have either misclassified wheeze or had episodes of lung infection with bronchospasm or an attack of RAD without recurrence.

The Bangalore study showed increasing trend of 9 and 29.5% prevalence of asthma in 1979 and 1999, respectively. Boys had a significantly higher prevalence of current asthma as compared to girls (12.8 and 10.7%, respectively). Prevalence rates in Kerala are also on the rise.

METHODOLOGY

- **Design:** Case control design
- **Setting:** Casualty and Pediatric wards of SAT Hospital, Thiruvananthapuram
- **Population:**
- **Cases:** Under 5 children diagnosed with RAD (Casualty and Pediatric wards of SAT Hospital)
- **Controls:** Under 5 children without RAD (Pediatric wards in SAT Hospital)
- **Sample size:** 100 (Cases-50, Controls-50)
- **Tool:** Semi-structured questionnaire.
- **Period:** October-November 2016
- **Variables:** Age, sex, Weight, Immunization Status, Residence, Mother's Educational Status, Socioeco-

conomic Background, Antenatal Complications, Mode of Delivery, Breastfeeding, Bottle feeding, Formula feeding, Previous RAD episodes, Recent travel History, Past Respiratory Infections, Family History, Exposure to Irritants, Pets, History of food/drug allergy, Atopic dermatitis, Exposure to Passive smoking, Variation in pattern of attacks with weather conditions or Physical Exertion

- **Analysis:** Data entered into Microsoft Excel and analyzed using SPSS software. Qualitative variables are expressed in terms of percentage and represented in pie and bar diagrams. Quantitative variables are expressed in terms of mean and standard deviation. Chi square was used as the test of significance.
- **Ethics considerations:** Informed written consent was obtained from the study participants. Clearance for conducting the study was obtained from the head of Department of Community Medicine and Department of Pediatrics.

RESULTS

		Age in months
Case	Mean	30.72
	Median	30.50
	Mode	24
	Std. Deviation	10.486
	Minimum	14
	Maximum	50
Control	Mean	29.42
	Median	30.00
	Mode	30
	Std. Deviation	10.467
	Minimum	12
	Maximum	53

Mean (SD) age of the case group is 30(10) months and Mean (SD) age of the control group is 29(10) months (table 1)

	Males	Females	Total
Case	27(54%)	23(46%)	50
Control	28(56%)	22(44%)	50

54% of cases and 46% of controls are males. Females account for 46% of cases and 44% of controls (table 2).

100% of controls were immunized for their age while only 86% were immunized for their age as shown in table no 3.

Immunization status	Case	Control	Total
Immunized for age	43(86%)	50(100%)	93
Not immunized for age	7(14%)	0	7
	50	50	100

68% of the cases were living in rural areas as compared to 64% of controls as shown in table 4.

Case or control	Residence	Frequency	Percent
Case	Rural	34	68.0
	Urban	16	32.0
	Total	50	100.0
Control	Rural	32	64.0
	Urban	18	36.0
	Total	50	100.0

Figure 1 shows the percentage distribution of cases & controls in rural and urban areas

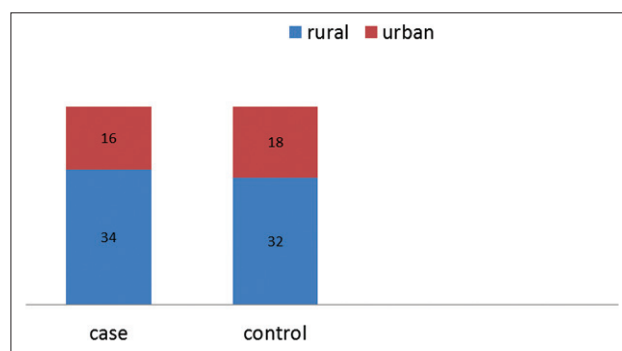


Figure 1. Place of Residence of Cases and Controls

16% of the cases have industries near their place of residence as compared to 12% of controls (table 5).

Case / control	Industries nearby		No Industries nearby	
	Frequency	Percentage	Frequency	Percentage
Cases	8	16	42	84
Controls	6	12	44	88

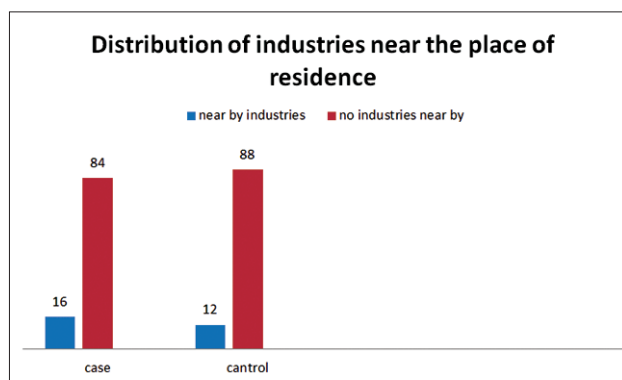


Figure 2. Distribution of industries near the place of residence

Figure 2 shows that majority (84%) of the cases and controls (88%) do not have industries near their place of residence

Table 6. Mother's Educational Status						
Education status	primary	SSLC	Pre degree	degree	Post graduate	total
case	5 (10%)	16 (32%)	16 (32%)	10 (20%)	3 (6%)	50
control	0	11 (22%)	22 (22%)	11 (22%)	6 (12%)	50

Table 6 shows that majority (74%) of cases have mothers with only primary or pre degree education

Table 7. Socioeconomic Status				
Socioeconomic status	Cases		Controls	
	Frequency	Percentage	Frequency	Percentage
APL	11	22	12	24
BPL	39	78	38	76
Total	50	100	50	100

78% of cases and 76% of controls are from BPL families (table 7)

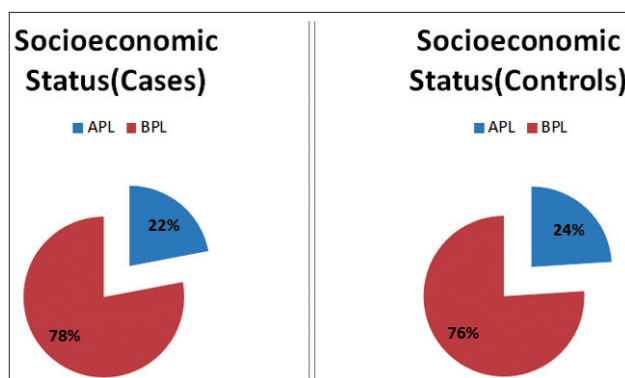


Figure 3. Socioeconomic Status

Table 8. Housing Conditions of Cases & Controls						
Case/Control	Kucha House		Pucca House		Kucha Pucca House	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Cases	34	68	12	24	4	8
Controls	12	24	35	70	3	6

As shown in table 8, most(68%) of the cases live in kucha houses. Only 24% of the cases live in pucca houses in contrast to 70% of controls.

Table 9. Overcrowding in Houses				
Cases/Controls	Overcrowding		No Overcrowding	
	Frequency	Percentage	Frequency	Percentage
Cases	14	28	36	72
Controls	12	24	38	76

Majority of the cases(72%) and controls(76%) live in houses that do not have overcrowding (table 9)

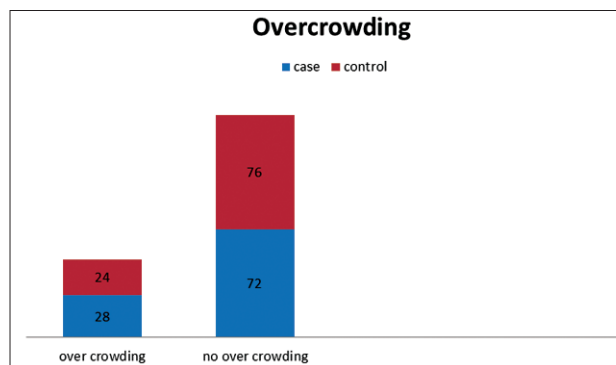


Figure 4. Overcrowding

Figure 4 only 28% of cases and 24% of controls live in overcrowded houses

Table 10. Antenatal Complications		
Antenatal Complications	Cases	Controls
Nil	24 (48%)	39 (78%)
Gestational Hypertension	3 (6%)	0
Gestational Diabetes	1 (2%)	3 (6%)
Fever in 1st Trimester	3 (6%)	1 (2%)
Urinary Tract Infections	3 (6%)	0
Thyroid Abnormalities	5 (10%)	3 (6%)
Abnormal Scan Reports	1 (2%)	1 (2%)
Amniotic Fluid Abnormalities	3 (6%)	2 (4%)
History of Antibiotic Intake	2 (7%)	1 (2%)
Others	5 (10%)	0

- Others Include Acute fatty liver of pregnancy, fungal infections, genital tract infections, hepatitis B, HIV.
- As shown in table 10, most of the cases (48%) and majority of controls (78%) had no antenatal complications

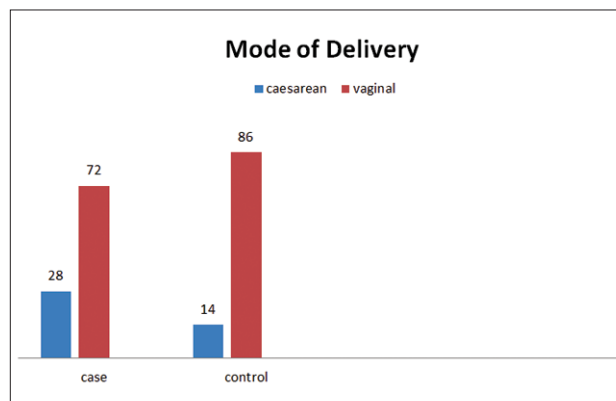


Figure 5. Mode of Delivery

28% of cases and 14% of controls were born from caesarean section (figure 5)

Term or preterm	Case	Control
Term	39 (78%)	47 (74%)
Preterm	11 (22%)	3 (6%)
Total	50	50

22% of the cases and only 6% of controls were preterm deliveries (table 11)

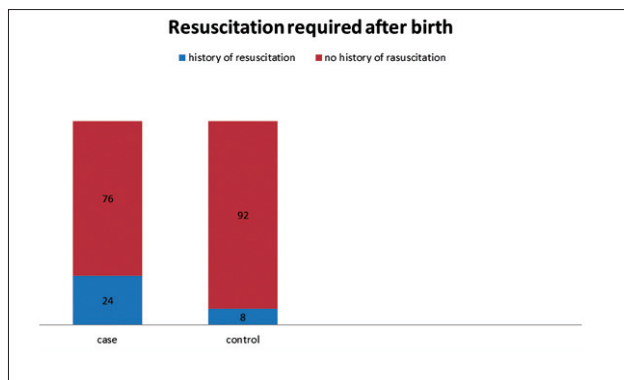


Figure 6. Resuscitation required after birth

76% of the cases and 92% of the controls gave no history of resuscitation after birth (figure 6)

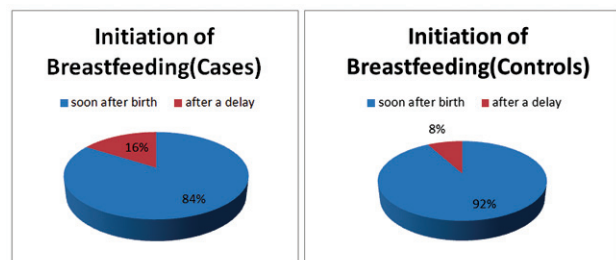


Figure 7. Initiation of Breastfeeding in Cases & Controls

In Majority of Cases (84%) and Controls (92%), Breastfeeding was initiated soon after birth (figure 7)

Exclusive breast feeding	case	Control
Less than 6 months	22 (44%)	6 (12%)
6 months or more	28 (56%)	44 (88%)
Total	50	50

56% of the cases and 88% of the controls were given exclusive breastfeeding. While 44% of cases and 12% of controls were breastfed for less than 6 months (table 12)

History of bottle feeding	case	control
Present	18	4
Absent	32	46
Total	50	50

18% of cases as compared to 4% of controls gave history of bottle feeding (table 13)

History of formula feeding	case	control
Present	22	3
Absent	28	47
Total	50	50

44% of the cases and only 6% of controls gave history of bottle feeding (table 14)

Past history of similar episodes	Case	Control
present	50	0
absent	0	50
total	50	50

All the cases had previous episodes of RAD (table 15)

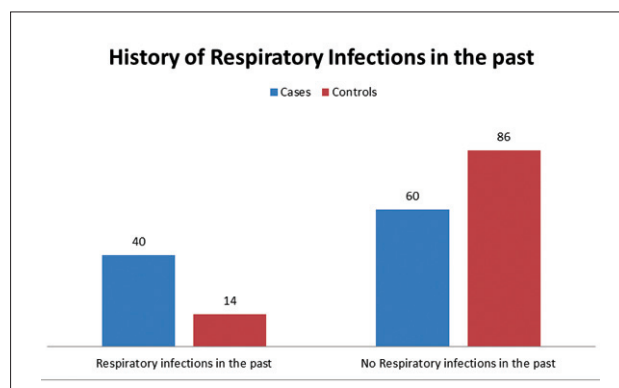


Figure 8. History of Respiratory infections in the past

40% of cases as compared to only 14% of controls gave history of Respiratory infections in the past as shown in the above figure 8.

History of travel	Cases	Control
present	9(18)	6(12)
absent	41(82)	44(88)
Total	50	50

18% of cases has history of travel in the week prior to the attending the hospital (table 16 & 17)

Mode of travel	Case	Control
No Travel history	41	44
Bus	8	3
Train	1	3
Total	50	50

72% cases and 28% controls have family history of reactive airway diseases (table 18.1)

Table 18.1. Family history of Allergy/Asthma

Cases/Controls	Positive Family History (Frequency)	Positive Family History (Percentage)	Negative Family History (Frequency)	Negative Family History (Percentage)
Cases	36	72	14	28
Controls	7	14	43	86

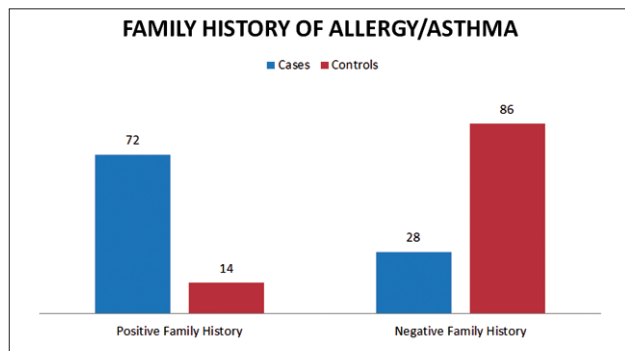


Figure 9. Family history of Allergy/Asthma

Table 18.2. Family History in Parents

Case/Control	Family History Positive in Parents		Family History Negative in Parents		No Family History	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Cases	18	36	13	26	19	38
Controls	2	4	5	10	43	86

36% cases have history of Reactive airway disease in parents (table 18.2)

Table 18.3. Family History in Siblings

Case/Control	Family history Positive in Siblings		Family History Negative in Siblings		No Family History	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Cases	17	34	17	34	16	32
Controls	0	0	7	14	43	86

17% cases have history of RAD in siblings (table 18.3)

Table 18.4. History in Grandparents

Case/Control	Family History Positive in Grandparents		Family History Negative in Grandparents		No Family History	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Cases	10	20	18	36	22	44
Controls	2	4	5	10	43	86

10% of cases have history of RAD in grandparents (table 18.4)

Table 18.5. Family History in First Degree Relatives

Case/Control	Family History Positive in First Degree Relatives		Family History Negative in First Degree Relatives		No Family History	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Cases	3	6	25	50	22	44
Controls	3	6	4	8	43	86

3 % of cases have history of RAD in 1st degree relatives (table 18.5)

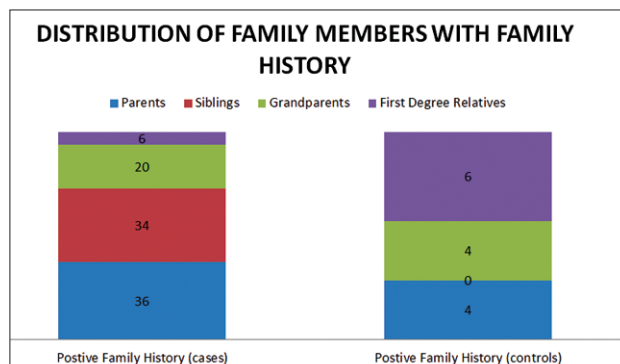


Figure 10. Positive Family History in Parents/Sibling/Grandparents/First Degree Relatives

Most of the cases have parents with history of RAD (figure 10)

Table 19. Attacks Triggered by Irritants

Case/Control	Are Attacks triggered on Exposure to any Irritant			
	YES		NO	
	Frequency	Percentage	Frequency	Percentage
Cases	45	90	5	10
Controls	0	0	50	100

90 % of cases have their attacks triggered by the irritants mentioned in the questionnaire (table 19)

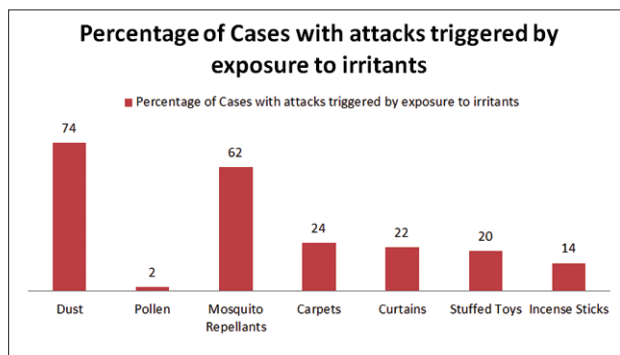


Figure 11. Percentage of Cases with attacks triggered by exposure to irritants

74%, 62% and 14 % cases have their attacks triggered by dust, mosquito repellants and incense sticks respectively (figure 11)

Table 20. Are there any Pets Kept at Home?

Case or Control	Frequency	Percent
Case	Yes	13
	No	37
	Total	50
Control	Yes	15
	No	35
	Total	50

13% of cases have pets at home (table 20)

Table 21. Type of pet kept at home

Case or Control		Frequency	Percent
Case	No pets	37	74.0
	Dog	6	12.0
	Cat	4	8.0
	Birds	1	2.0
	Cattle	2	4.0
	Total	50	100.0
Control	No Pets	36	72.0
	Dog	7	14.0
	Cat	5	10.0
	Cattle	2	4.0
Total	50	100.0	

Table 22. Frequency table of history of food allergy in patients

Case or Control		Frequency	Percent
Case	Yes	5	10.0
	No	45	90.0
	Total	50	100.0
Control	Yes	6	12.0
	No	44	88.0
	Total	50	100.0

5% of cases have history of food allergy, 6% of controls reported history of food allergy (table 22)

Table 23. Frequency table for history of atopic dermatitis in patients

Case or Control		Frequency	Percent
Case	Yes	7	14.0
	No	43	86.0
	Total	50	100.0
Control	No	50	100.0
	Total	50	100.0

14% of cases have history of atopic dermatitis (table 23)

Table 24. Frequency table of history of drug allergy

Case or Control		Frequency	Percent
Case	Yes	2	4.0
	No	48	96.0
	Total	50	100.0
Control	Yes	3	6.0
	No	47	94.0
	Total	50	100.0

2% of cases and 3% of controls reported history of drug allergy (table 24)

Provision of Smoke Outlets at Home

60% of cases and 80% of controls have proper smoke outlets provided at their homes (table 25)

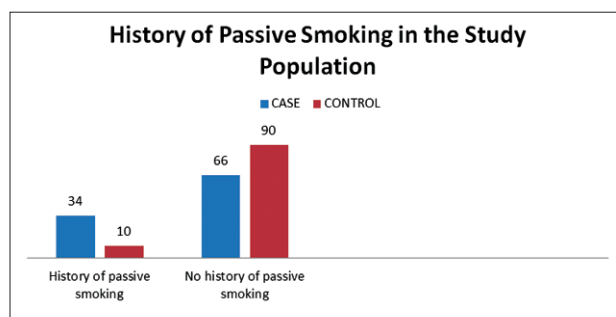


Figure 12. Percentage of patients with exposure to passive smoke

Table 25. Frequency table of provision of proper smoke outlets at home

Case or Control		Frequency	Percent
Case	Yes	30	60.0
	No	20	40.0
	Total	50	100.0
Control	Yes	40	80.0
	No	10	20.0
	Total	50	100.0

Relationship of Attacks with Changes in Weather Conditions

Table 26. Frequency table for relationship of RAD attacks with changes in weather patterns

Case or Control		Frequency	Percent
Case	Increase in monsoon or winter	29	58.0
	No significant change	21	42.0
	Total	50	100.0
Control	No significant change	50	100.0

29% cases have changes in their attack patterns with variation in weather conditions (table 26)

Exacerbation of RAD with Physical Exertion

Table 27. Frequency table for exacerbation of attacks with physical exertion

Case or Control		Frequency	Percent
Case	Yes	12	24.0
	No	38	76.0
	Total	50	100.0
Control	No	50	100.0

24% cases have exacerbation of RAD with physical exertion (table 27)

Bivariable Analysis

Table 28. Summary of Factors associated with RAD			
Variable	P Value	Odd's Ratio	Confidence Interval
Sex	0.8	0.9	0.4-2
Immunization status	0.006	0.4	0.3-0.5
Housing(kucha)	0.001	7.3	3-17
Overcrowding	0.6	1.2	0.5-3
Mother's Education (Degree& Above)	0.032	0.389	0.16-0.9
Antenatal Complications (absent)	0.002	0.26	0.1-0.6
Mode of Delivery (Caesarean)	0.8	2.3	0.8-6.5
Term Delivery	0.02	0.226	0.05-0.8
Exclusive Breast Feeding	0.001	0.175	0.0625-0.5
Bottle Feeding	0.001	6.4	2-21
Formula feeds	0.001	12.3	3-44
Family History of Allergy	0.001	15.7	5.7-43
History of Atopic Dermatitis	0.006	2.1	1.7-2.6
Passive smoking	0.004	4.6	1.5-13.8
Proper Smoke outlet provided	0.02	0.3	0.1-0.9
Relationship with weather (Increase in Monsoon or winter)	0.001	3.3	2.3-4.8
Exacerbation with Physical exertion	0.001	2.3	1.8-2.9

DISCUSSION

As per the literature and studies available, the factors associated with Reactive Airway Disease included Family History of Allergy or Asthma, Lung Infection in the recent past, Presence of second hand smoke around the child, Weather Changes, Physical Activity. This study has covered the above mentioned risk factors and their prevalence in the population seeking treatment in the SAT Hospital, Thiruvananthapuram.

Some additional factors that we assessed in our study:

- Immunization Status
- Socioeconomic Background / Housing Conditions
- Mother's Educational Status
- Antenatal Complications
- Term / Preterm
- Delayed initiation of breastfeeding
- Bottle feeding / Formula feeds
- Irritants like Mosquito Repellants, Incense Sticks
- Lack of Proper Smoke outlets in the Kitchen
- History of Atopic Dermatitis
- History of food allergy
- History of recent travel

After analysis, we have arrived at the following conclusions (table 28)

Age

Cases and Controls were selected by group matching. The mean age of patients in case group is 30.72 months and that of controls is 29.42 months.

Among cases, maximum age is 50 months and minimum 14 months with most cases clustering around 24 months.

Among controls, Maximum age is 53 months and minimum 12 months.

Sex Distribution

Sex is the second variable that we used for group matching.

Among Cases, There are 27 males and 23 females.

Among Controls, There are 28 males and 22 females.

Immunization Status

Out of the 50 cases, 7 were not immunized for age whereas in the Control group, all 50 were immunized. After statistical analysis, p value obtained is 0.006 and strength of association indicated by Odds Ratio of 0.86.

Place of residence

Among cases, 32% are urban dwellers and 68% reside in rural areas.

Among Controls, 36% and 64% reside in urban and rural areas respectively.

Residence (p 0.673 and Odd's ratio 1.195)

Industries near place of residence

16% of cases and 12% of controls have industries near their places of residence.

p (0.564) and Odds (1.397)

Socioeconomic Status

The mothers of the patients were asked to identify their socioeconomic status based on the poverty line.

Among Cases, 78% are from BPL families and among Controls, 76% from BPL families (figure 3).

p(0.812) and Odd's(0.893)

Housing Conditions

Kucha, pucca and Kucha pucca were the types of houses that we included in our questionnaire. From their responses, we obtained the following data.

Cases- kucha(68%), Pucca(24%), Kucha pucca(8%)

Controls- Kucha(24%), Pucca(70%), kucha pucca(6%)

Overcrowding

Among cases, 28% live in overcrowded houses and

among controls there are 24% with overcrowding in their houses.

p(0.648) and Odd's(1.231)

Mother's Educational Status

Among cases, 74% of the patients have mothers with school education whereas in Controls this accounts for only 44%

Education (p value 0.095)

Antenatal Complications

p value for antenatal complications was found to be 0.040.

48% of cases and 78% of controls have mothers who had no antenatal complications

Mode of Delivery

14 cases and 7 controls were delivered by Caesarian section

36 cases and 43 controls were delivered by Vaginal delivery

p(0.086) and Odd's (2.389)

Term or Preterm

11 cases and 3 controls were preterm babies at the time of birth.

p(0.021) and Odd's(0.226)

Resuscitation required after birth

12 cases and 4 controls required resuscitation after birth

p(0.029) and Odd's(3.632)

Initiation of Breast feeding

42 cases and 46 controls were initiated breastfeeding soon after birth

p(0.218) and odd's (0.457)

Exclusive Breast feeding

22 cases were given exclusive breastfeeding for less than 6 months whereas in controls only 6 fall into this category

p(0) and odd's (5.762)

Bottle feeding

36% of cases gave a positive history of bottle feeding and only 8% of controls have a history of bottle feeding

p(0.001) and odd's (6.469)

Formula Feeds

History of formula feeds was positive for 44% cases and only 6% of controls

p(0) and odd's (12.310)

Past Respiratory Infections

40% of cases had respiratory infections in the recent past while only 14% of controls fell into this category

p(0.003) and Odd's (4.095)

History of Travel in the past

9 Cases gave a history of travel in the week before they attended the hospital

Family History

72% of cases gave a positive family history of allergy or asthma while only 14% of controls have family history [p(0) and Odd's(15.796)] (**figure 9**)

- Family History in parents- positive in 36% of cases
- Family History in siblings- positive in 34% of cases
- Family History in grandparents -positive in 20% cases
- Family History in first degree relatives- Positive in 6% of cases

Exposure to irritants

90% of cases gave history of exposure to irritants [p<0.05]

Percentage of cases who had exposure to the following irritants

- Dust- 74% [p<0.05]
- Pollen- 2% [p(0.315)]
- Carpets- 24% [p<0.05]
- Curtains- 22% [p<0.05]
- Stuffed toys- 20% [p(0.001)]
- Mosquito Repellants- 62% [p<0.05]
- Incense Sticks- 14% [p(0.006)]

Exposure to pets

26% of cases and 30% of controls have pets at home (**table 15**)

History of Food Allergy in Patients

10% of Cases and 12% of controls gave a positive history of food allergy

History of Atopic Dermatitis

14% of Cases and 0% of Controls gave history of atopic dermatitis

p(0.006) and Odd's(0.860)

History of Drug Allergy

4% cases and 6% controls gave a positive history of drug allergy

History of Passive smoking

34% of Cases and 10% of controls gave history of passive smoking (figure 12)

$p(0.004)$ and Odd's(4.636)

Provision of Smoke Outlet at home

Only 60% of cases in contrast to 80% of controls have proper smoke outlets provided in their houses.

Relationship of Attacks with weather conditions

58% of cases show increased frequency of attacks with changes in weather patterns [$p<0.05$]

Relation with Physical Exertion

24% cases have exacerbation of attacks with physical exertion [$p,0.05$]

CONCLUSIONS

The study of Factors associated with Reactive Airway Disease among under 5 children attending Sree Avittom Tirunal (SAT) Hospital, Thiruvananthapuram was conducted using a case control study design. After analyzing the data using descriptive statistics like Bivariate tables, Chi square test and Risk estimate, we can come to the following conclusion.

- Children unimmunized for age have a higher prevalence of RAD
- From our study we find that health conditions are better in children with mother's of higher educational status
- Children delivered by Caesarian section have a higher prevalence of RAD
- Antenatal Complications of Mothers are found to have an association with incidence of RAD in those children
- Preterm Babies are more prone for developing RAD than their term counterparts
- Complications during delivery and resultant resuscitations increase the risk of RAD in later life
- Breast Feeding is a determining factor of the immunity of the child. From our study children with exclusive breastfeeding for less than 6 months have greater prevalence of RAD
- Bottle feeding and Formula feeds increases the risk of RAD
- Respiratory Infections in the past increase the susceptibility to RAD
- Family History has been found to be a very strong risk factor of RAD. Respiratory illnesses in parents

among all the other family members is found to have strongest association with occurrence of RAD in children

- Majority of the cases have their attacks triggered by one or the other irritants. From our study the most significant trigger is dust.
- Mosquito Repellants and Incense Sticks are two additional triggers that we included in our study. 62% and 14% of cases reported that their attacks have been triggered by Mosquito repellants and Incense sticks respectively
- Atopic Dermatitis has been found to be a significant factor associated with RAD
- Exposure to second hand smoke increases the risk of RAD substantially
- Changes in weather conditions influenced the pattern of RAD attacks in many of the cases
- Physical Exertion was also found to be a significant factor associated with RAD.

RECOMMENDATIONS

- Improve the immunization coverage
- Early detection and management of antenatal complications.
- Encourage exclusive breastfeeding through various approaches like baby friendly hospital initiative, motivation.
- Discourage bottle feeding as much as possible.
- Reduce dependence on formula feeds as far as possible.
- Early and adequate management of past respiratory infections.
- Identification of cases with positive family history and prevent exposure to triggers.
- Reduce the use of mosquito repellants and incense sticks in the houses those with susceptibility to RAD.
- Special care of those with history of atopic dermatitis.
- Prevent exposure of children to second hand smoke.
- Care of children during changing weather conditions.
- Prevent over exertion of such children.

LIMITATIONS

- Sample size was taken arbitrarily. No formulae were used to calculate it.
- Non probability sampling was used.
- Kuppaswami scale was not used.

APPENDIX

QUESTIONNAIRE

Name	Age	Sex	Weight
Immunization status:	1. immunized for age 2. not immunized for age		
Residence:	1. rural	2. urban ;	
Industries nearby	1. Y	2. N	
Parent's educational status:	1. illiterate 2. primary 3. sslc/equiv. 4. predegree/equiv. 5. degree 6. PG 7. professional		
Socioeconomic status:	1. APL	2. BPL	
Housing conditions:	1. kuccha	2. pucca	
Overcrowding:	1. Y	2. N	
Life history			
Antenatal complications: Fever in 1st trim/ UTI/ hist. of antibiotics intake/ scan reports/ GDM/ GHTN/ Thyroid/ Amniotic fluid/ infections			
Mode of delivery: 1. caesarean 2. vaginal a. normal/unassisted b. assisted			
Term/preterm	Birth weight:		
Resuscitations/ICU admissions if any:			
Prelacteal feeds:	Initiation of breastfeeding:		
Exclusive breast feeding till age:	1. <6months	2. >6 Months	
Bottle feeding	1. Y	2. N	
Formula feeds	1. Y	2. N	
if Yes, From what age:	1. <6 mo	2. >6 mo	
Presenting complaints:	Wheeze/ cough/ breathlessness/ incessant cry, irritability		
Similar episodes in the past	1. Y	2. N	
if YES, No. of episodes?	No. of hospitalizations?		
History of travel in the past week?	1. Y	2. N	
Mode of travel:	1. Bus	2. Car	3. Train
Any past resp. infections?	1. Y	2. N	
Family History of allergy or asthma:	1. Y	2. N	
If Yes,	1. Parent(s) 2. Sibling(s) 3. Grandparent 4. 1 st degree relatives		
Are attacks triggered on exposure to any irritants?	1. Y	2. N	
If yes, What?	1. dust 2. pollen 3. mosquito repellants 4. carpets 5. curtains 6. stuffed toys		
Are there any pets at home?	1. Y	2. N	
if yes, what?	1. dogs 2.cats 3. birds 4.domestic animals		
h/o food allergy:	1. Y	2. N	
h/o atopic dermatitis	1. Y	2. N	
h/o drug allergy	1. Y	2. N	
Passive smoking?	1. Y	2. N	
Mode of cooking:	1. LPG	2. Firewood	3. Kerosene
Whether proper smoke outlet provided:	1. Y	2. N	
Relationship of attacks with weather conditions:	1. Increase in monsoon/winter 2. No significant change		
Exacerbation with physical exertion?	1. Y	2. N	

END NOTE

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Editor's Remarks: Reactive airways disease affects a considerable number of children and has long term implications. It is hence imperative that correct and current knowledge about the causative factors is available to the treating physician. This exhaustive original research was conducted by medical students and the subject has been analysed in detail.

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