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Prevalence of Respiratory Discomforts among School going Children (10-14 years) in Puducherry and Karaikal, India: An Epidemiological Study

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Abstract

The incidence of respiratory discomforts has been increasing worldwide in the last few decades, in urban areas as well as rural areas. Only few studies have examined the prevalence of respiratory discomforts among school going children (10 – 14 years) in the Puducherry and Karaikal. To study the prevalence of respiratory discomforts among the target group using PEFR and pulse oxymetry as indicators. Two hundred school going children (10 – 14 years) were selected from Puducherry and Karaikal. An interview schedule was designed to elicit socio-economic, demographic and cultural conditions. Anthropometric measurements like height, weight and chest circumference were studied. Peak expiratory flow rate, oxygen saturation (SpO2) and pulse rate were measured. The mean PEFR and oxygen saturation values of boys in Puducherry were higher (297.08 and 98.23 respectively) than that of Karaikal (260.68 and 97.30 respectively). Higher values of mean PEFR and oxygen saturation (283.85 and 97.35 respectively) were found in girls of Puducherry than of Karaikal (174.64 and 96.98 respectively). The mean peak expiratory flow rate and oxygen saturation were higher among the school going children of Puducherry than Karaikal due to various socio-economic, demographic and environmental factors. The PEFR was found to be high among the boys of both the regions than girls.

Keywords: PEFR, Pulse oximetry, SpO_2, Respiratory discomforts, School going children.

Introduction

Respiratory disease is the second biggest killer globally after cardiovascular diseases (British Lung Function (n.d.)[1]. The European Lung Function (n.d.a)[2] predicts that in 2020, there will be 11.9 million (Community and occupational) deaths worldwide caused by lung disease. The incidence of respiratory discomfort has been increasing worldwide in the last few decades, in urban areas as well as rural areas.

According to WHO, children aged around 6 to 10 years develop many respiratory problems either due to increase or decrease in BMI.

Respiratory disorders are a major group of illness affecting children especially in India and are the important causes of childhood morbidity and mortality. The burden of allergic diseases in India has been on an uprising trend in terms of prevalence as well as severity. A multi-centre study by the Asthma Epidemiology Study Group of the Indian Council of Medical Research found the prevalence of allergic rhino-conjunctivitis in 3.3% of children aged 6-7years and 5.6% of children aged 13–14 years in India[3]. In particular, obstructive airway diseases rise in children due to environmental pollution and other causes.

As per the National Health Profile report, air pollution is emerging as a major health hazard in India with the number of cases related to Acute Respiratory Infection[4]. In spite of the prevalence of respiratory discomfort among school children soaring year after year due to pollution, climate change, increase in motor vehicles, urbanization and also due to altered food habits only few epidemiological studies on respiratory discomforts among school children (10 -14 years) have been carried out in Pondicherry and Karaikal so far.

Hence this study aims to focus on a wide range of factors responsible for the prevalence of respiratory discomforts among school children (10 – 14 years) of both sexes living in rural and urban areas of Pondicherry and Karaikal.

When compared to other non-communicable diseases like cardiovascular disease and diabetes, the available literature on respiratory discomforts are few and hence the awareness among the community is also poor. A comparative study on the prevalence of respiratory discomfort among the school going boys and girls (10 – 14 years) in the rural and urban area of Puducherry and Karaikal has not been carried out so far. PEFR is compared with a wide range of attributes keeping the variations between schools almost similar.

The present study is the modest attempt to assess the prevalence of respiratory discomforts among school going children (10 – 14 years) and its associated attributes. It is the pilot study of the major research project of the ICSSR, New Delhi.

Methodology

This study is an exploratory study done using cross-sectional survey methodology. The location of the study was rural and urban school each from Puducherry and Karaikal. The sample size was 200 (100 each from both the selected regions). Stratified, proportionate random sampling of the procedure was adopted to pick the samples. The inclusive criteria were age, type of school and location of residence children. An interview schedule was administered for eliciting information on socio-economic, demographic and cultural conditions. Prescribed standardized tools were used for anthropometric measurements. Peak expiratory flow meter (PEFR) and pulse oxymeter were used to measure PEFR, SpO2 and pulse rate. The independent variables for the study were socioeconomic, demographic and cultural attributes. The dependent variables were PEFR, SpO_2 and pulse rate.

This study was spread over 3 months between November and January 2016. The correlation was done using percentages and mean as comparable measures and were supplemented with illustrations.

Results and Discussion

A cross-sectional survey methodology was used to select 200 school going children in the age group of 10 – 14 years (92 boys and 108 girls) from the rural and urban regions of Puducherry and Karaikal. The results are given in Table-1.

The mean anthropometric measurements compared with the mean PEFR, SpO_2 and pulse rate values are shown in Table-1.

The height of the children increased with age except for girls. The mean height of the Karaikal girls (143.96 cms) was below the ICMR standards (154.94 cms).

It is evident from the results that the mean weight of boys and girls increased with increase in age and was in par with the ICMR standard except for the girls residing in Karaikal whose weight was 38.84 against the ICMR standards of 44.54. The greater gain in chest circumference and height among the girls of Puducherry may be attributed to "pubertal growth spurt". The pulse rate of girls was found to be greater than boys. Oxygen saturation was found to be high in boys than girls.

Results of Table-1 revealed that the anthropometric measurements of the boys were higher when compared to the girls. The mean height and weight of the boys were meeting the ICMR standards and hence showed a positive correlation in PEFR and SpO2 values. The boys of Puducherry recorded the highest values for PEFR and SpO_2 (297.08 and 98.23 respectively) when compared to others which may be attributed to the greater chest volume in the taller subjects. The growth of the airway passages and the expiratory muscle effort also increases with an increase in height.

It is well known that age, height and weight are the main factors which affect the PEFR, Forced Expiratory Volume in first second (FEV1) and forced vital capacity (FVC)[5]. Thus the results showed that the values of PEFR and SpO_2 were higher among the school going children of Puducherry (in both the sexes) when compared to Karaikal.

Table-1
Mean height, Weight, chest circumference Vs. PEFR, SPO2 and Pulse rate

Location	Mean Age (years)	Mean Ht (cms)	Mean Wt (Kg)	Mean chest circumference (cms)	Mean PEFR	Mean SpO_2	Mean pulse rate
Pondicherry							
Boys	12.3	149.500	38.25	27.463	297.08	98.23	83.31
Girls	11.33	148.312	37.71	27.769	283.85	97.35	92.77
Karaikal							
Boys	13.50	155.886	44.11	29.1	260.68	97.30	89.50
Girls	12.96	143.964	38.84	26.25	174.64	96.98	94.52

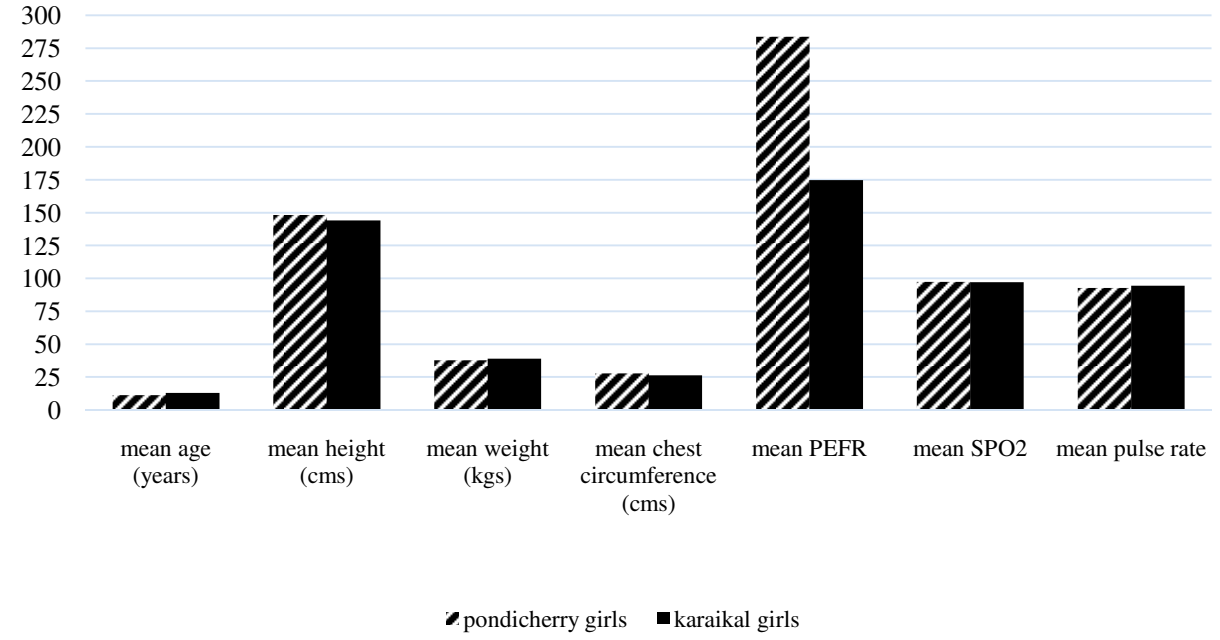

Figure-1
Comparative study of anthropometric measurements vs. PEFR, SpO2 and pulse rate of girls

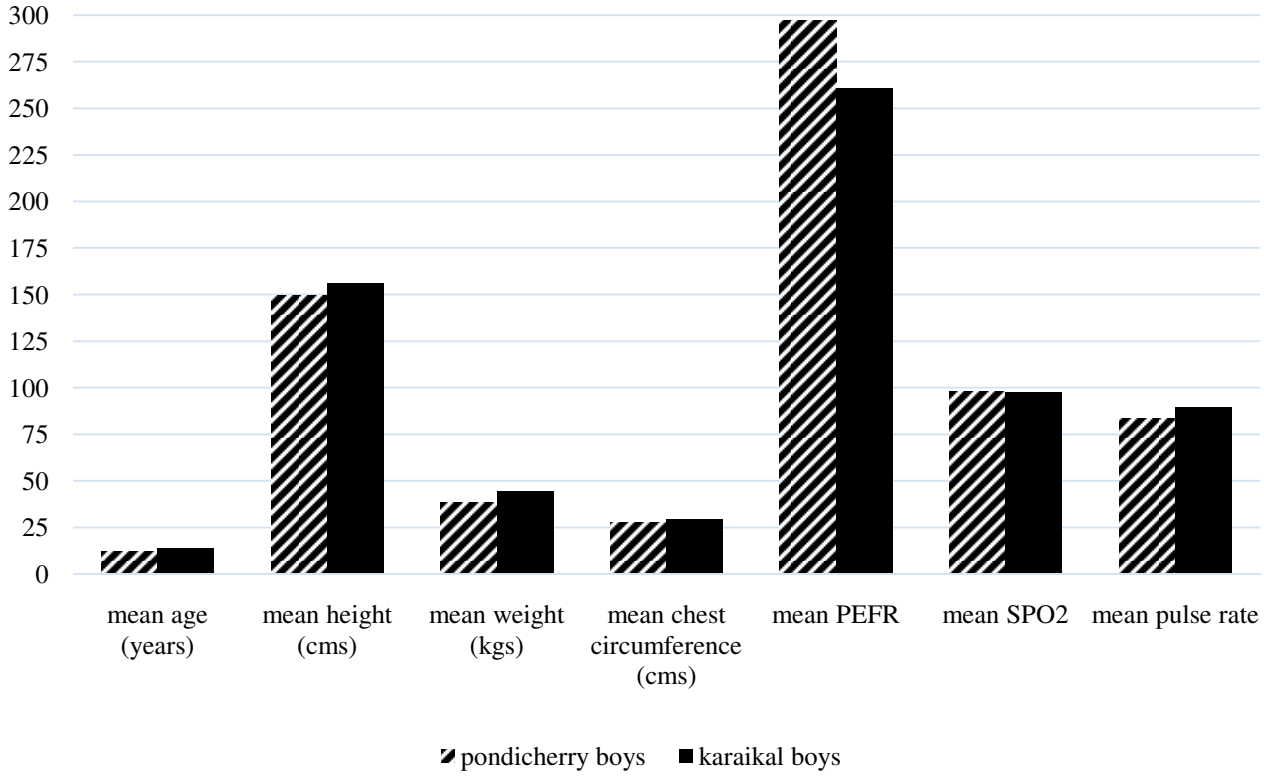

Figure-2
Comparative study of anthropometric measurements Vs. PEFR, SpO2 and pulse rate of boys

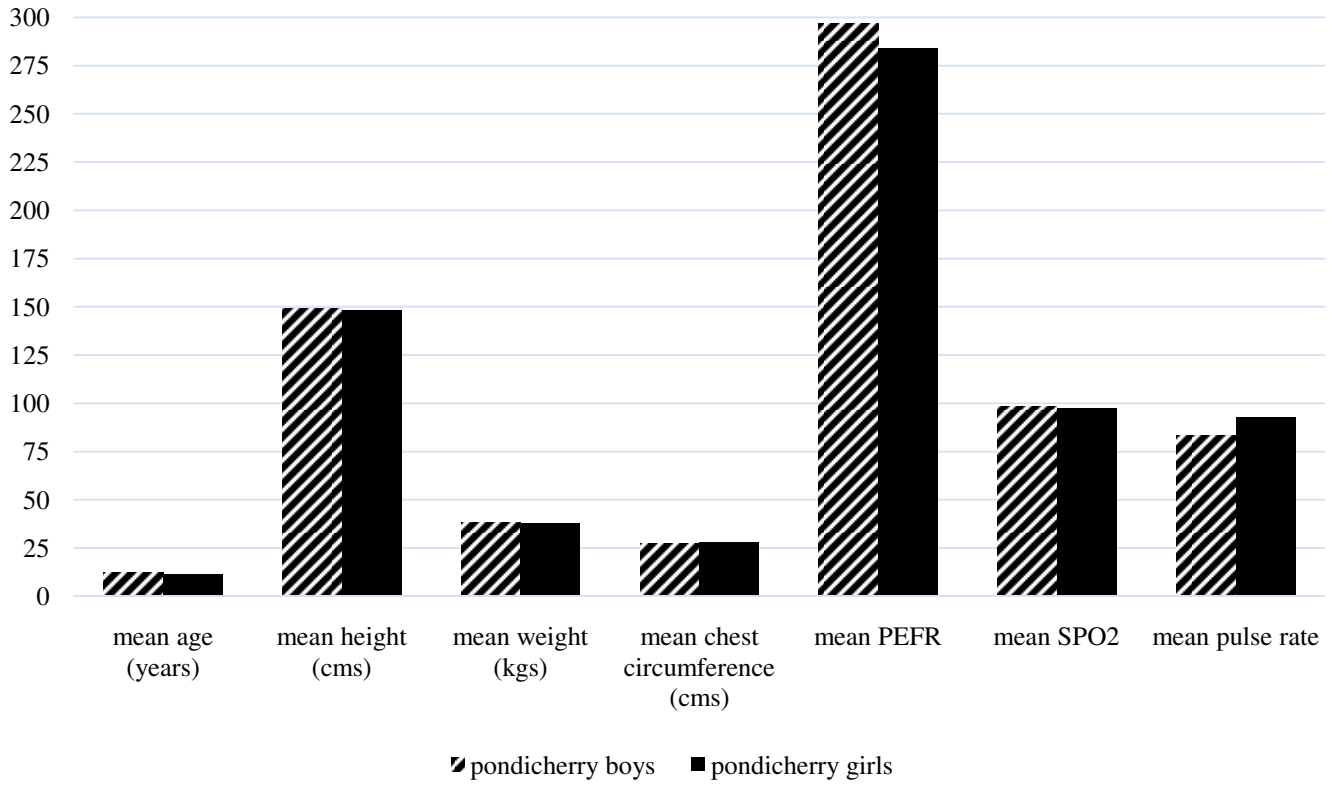

Figure-3
Comparative study of anthropometric measurements Vs. PEFR, SpO2 and pulse rate in Pondicherry

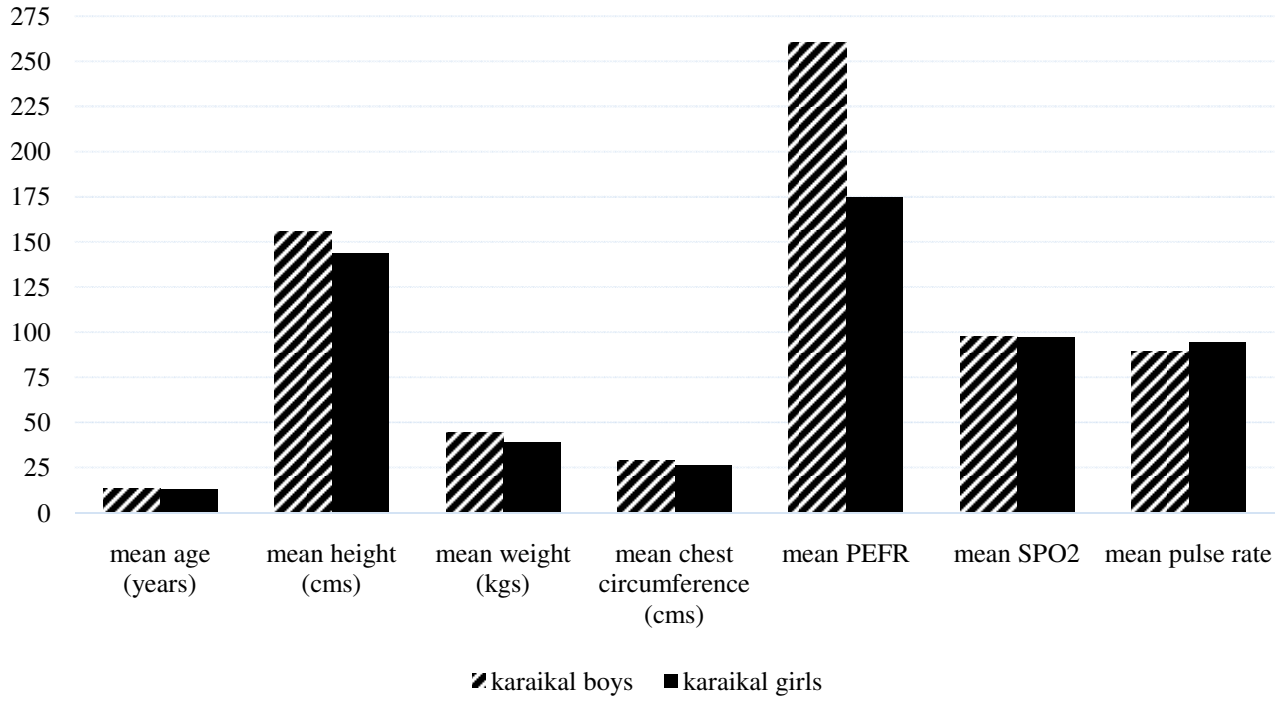

Figure-4
Comparative study of anthropometric measurements Vs. PEFR, SpO2 and pulse rate in Karaikal

Table-2 shows the comparison of PEFR values of school going children in Pondicherry and Karaikal with the standard height and standard PEFR. The result showed that the PEFR values in Puducherry were high but that of Karaikal was very low. It is evident from the data that as height increases the PEFR values also increases. This observation was consistent with the findings of previous studies[6].

Table-2
Comparison of PEFR values with Standard height and Standard PEFR

Standard height	Standard PEFR	PEFR Pondicherry	PEFR Karaikal
130-134.9	212	242.5	170
135-139.9	233	235	150
140-144.9	254	258	188
145-149.9	276	281	186
150-154.9	299	309	218
155-159.9	323	329	271

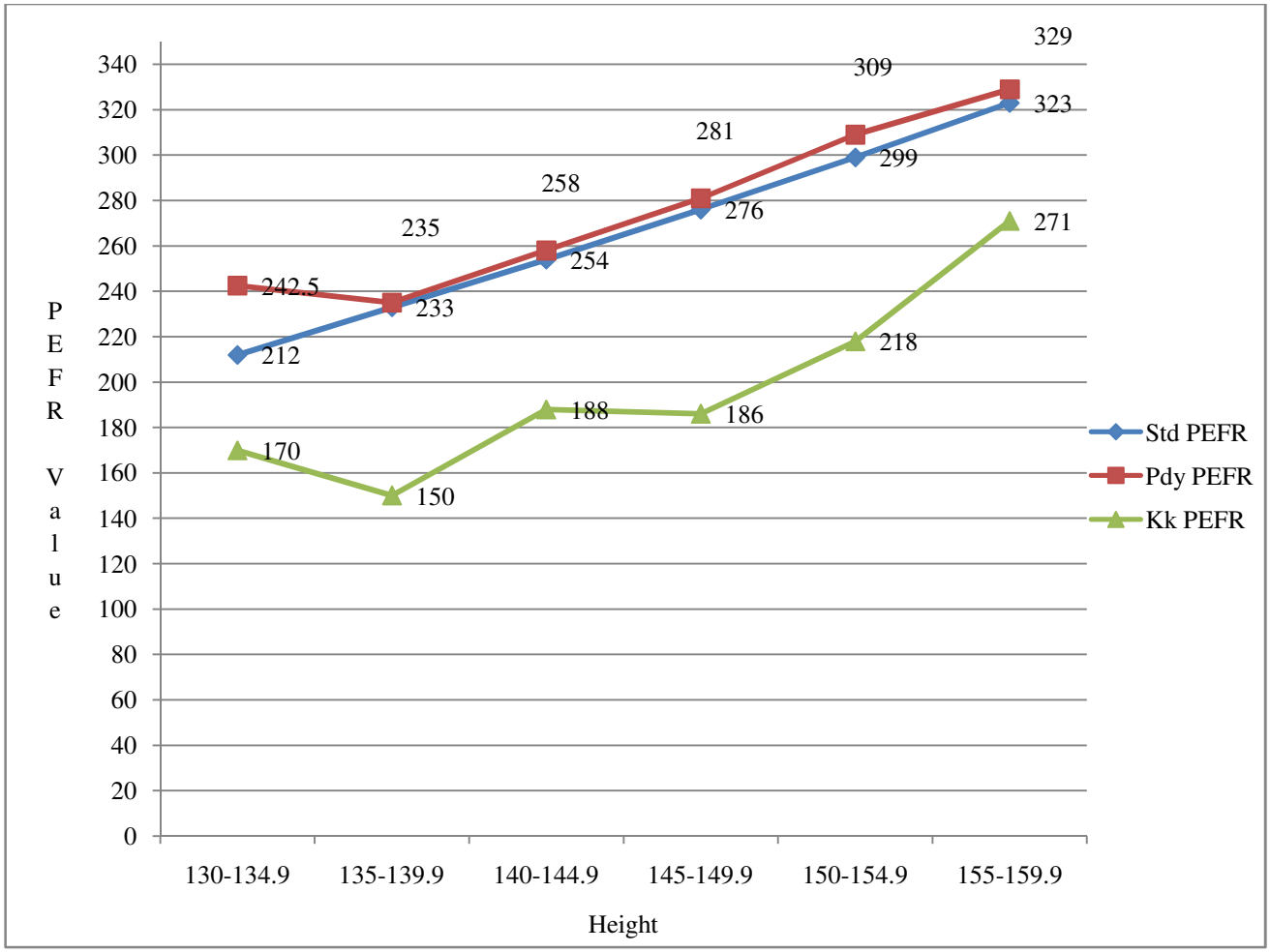

Figure-5
Comparison of PEFR values with Standard height and Standard PEFR

Table-3
Comparison between different variables and mean PEFR values among boys and girls

Variables		Boys(n = 92)		Girls (n= 108)	
		Number	**Mean PEFR**	**Number**	**Mean PEFR**
Location	Rural	57	280.75	38	218.8
	Urban	35	288	70	229.5
Religion	Hindu	85	275.6	05	228.8
	Christian	05	316.6	92	220
	Muslim	02	350	10	257.7
Caste	FC	04	295	08	323.75
	OBC	64	278.9	76	230.85
	MBC	05	298	05	178.75
	SC	17	295.45	17	204.3
Ordinal position	First Child	46	276.75	43	230.15
	Middle Child	13	285.75	25	216.2
	Last Child	33	279.1	33	229.3
	Twin child	-	-	06	190
Birth Weight	Above Normal	08	289.15	06	208.1
	Normal	79	279	95	230.4
	Low birth weight	03	277.5	05	223.3
Breast feeding practice	< 6 years	20	285.35	16	269.15
	6 – 1 year	48	328.4	67	228.1
	1 -2 years	09	309.35	06	247.6
	>2 years	09	263.3	11	228.7
Immunization	Yes	80	278.77	105	228.5
	No	04	270.6	03	242.5
Family Type	Nuclear	68	234.35	79	225.6
	Joint	21	245.45	25	230.6
	Extended	03	215	04	223.3
Ventilation in home	Yes	61	232.6	91	230.75
	No	31	244.15	17	231.1

Variables		Boys(n = 92)		Girls (n= 108)	
		Number	**Mean PEFR**	**Number**	**Mean PEFR**
Type of road	Muddy road	29	230	58	207.5
	Pucca road	63	240	79	237
Fuel used	LPG	62	280.8	54	232
	Combination	16	230	41	170.6
	Wood	07	289	06	217
	Kerosene	06	271.5	07	219.5
Tobacco Smoking	Inside Home	04	250	05	226.2
	Inside and outside home	01	250	01	210
	Outside home	15	277.3	22	214.9
	Not smoking	72	279.5	80	231.5
Pet animals at home	Yes	46	236.07	37	225.8
	No	46	234	71	230.21
Environment	Heavy traffic area	06	260	16	231.85
	Heavy traffic + Market place	02	310	13	230.1
	Industrial area	04	231.65	02	255
	Market place	07	253.3	08	217.5
	None	73	285.7	63	229.9
Respiratory discomfort in the past 1 year	Yes	61	233.85	69	246.9
	No	41	234.05	54	273.65
Dietary pattern	Vegetarian	07	275	19	236.9
	Non-vegetarian	84	236.1	89	223.3

Table - 3 shows the comparison of different variables with the mean PEFR of boys and girls. The data shows that the mean PEFR were higher for boys than girls. Both boys and girls living in urban areas showed higher PEFR than rural area. The Muslim children showed a higher PEFR followed by Christian boys and Hindu girls. The PEFR were found to be highest among the girls belonging to forward caste compared to the forward and scheduled caste boys. The middle born boys and the first born girls showed the highest PEFR while the least values measured in twin girls. Highest PEFR were seen in boys who had above normal birth weight and in girls who had normal birth weight. The values were low in low birth weight children of both the sexes. Breast feeding practice for a period of 1–2 years showed a positive correlation in PEFR among boys and a negative correlation among girls. The PEFR were high among the boys who were immunized unlike the girls.

Joint family system seemed to have a positive correlation on PEFR than nuclear and extended family system. Ventilation at home did not have a positive correlation on PEFR on both the sexes. Pucca road had a positive correlation on PEFR. The most commonly used fuel for cooking was found to be LPG followed by combination of fuel. The highest and lowest PEFR have been shown in LPG and combination of fuel users respectively. In both the sexes there was a positive correlation in the PEFR and non-smoking in the family.

This study showed that the PEFR decreased in girls who had pets at home unlike boys. The highest PEFR was recorded among boys living near heavy traffic and market area and among girls living in industrial area. A higher ratio of children in both the sexes who experienced respiratory discomforts in the past one year showed low PEFR. However the PEFR was high in girls when compared to boys. When compared to vegetarians, non-vegetarians showed low PEFR in both sexes. Majority of the children were non-vegetarians. The number of vegetarians was high in girls than boys.

Conclusion

This study was set to analyze the prevalence of respiratory discomforts, lung function and related attributes among school going children (10 – 14 years) in Puducherry and Karaikal. The study showed that the prevalence of respiratory discomforts was high in Karaikal when compared to Puducherry. The PEFR was found to be high among the boys of both the regions than girls.

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