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Passive Smoking and its Effects among Children of a Rural Population in South Tamilnadu, India

Article by Pethuru Devadason[1], Arya Rajendran[2], Akhila Vinod[3], Annu Ann Zachariah[4], Anoop S.[5], Aarthy T.[6], Annie Rexalin Pradeepa T.[7], Akhila PM[8]
[1]*Professor, Department of Community Medicine, Sree Mookambika Institute of Medical Sciences, Kulasekharam, Kanyakumari Dist., Tamilnadu, India*
[2]*Junior Consultant(OG), Samad IVF Hospitals, Attingal, Trivandrum, Kerala, India*
[3]*Third year Resident, Physiology, JJM Medical College, Davangare, Karnataka, India*
[4]*Third year Resident, Pathology, Mahatma Gandhi Medical College & Research Institute, Pondicherry, India*
[5]*Third Year Resident, Orthopedics, Yenepoya Medical College, Mangalore, Karnataka, India*
[6]*RBSK Medical Officer, Govt. PHC Samayanallur, Madurai, Tamilnadu, India.*
[7,8]*Sree Mookambika Institute of Medical Sciences, Kulasekharam, Kanyakumari Dist., Tamilnadu, India*
E-mail: [1]drpethuru@rediffmail.com, [2]aryarajendran@gmail.com, [3]akhila_vinod@rediffmail.com, [4]annu.zac@gmail.com, [5]anoopsuresh88@gmail.com, [6]aarthysivaraman01@gmail.com, anniethomas.jes@gmail.com, [8]pmakhila@gmail.com

Abstract

Tobacco kills nearly 6 million people each year. Passive smoking is a major hazard to the health of millions of children worldwide. Globally, an estimated 40% of children are reported to be exposed to passive smoke. Adverse effects of smoking in rural population are well studied in any parts the world. But the impact of passive smoking on the children is not widely studied.

Objectives: This study was carried out with the following two objectives: 1) To determine the prevalence of passive smoking among children in a rural population in South India and 2) To find out the effects of passive smoking on children in the study population.

Methodology: This is a community based cross sectional study. It was carried out in Marappadi village in Kulasekharam Panchayat, Kanyakumari District, Tamilnadu in October 2014. 150 children under 15 years in the village were approached at their houses, with questionnaire for socio demographic details and passive smoking history. Apart from this the history of Low birth weight, Growth retardation, and number of URTIs, LRTIs, Ear Infections, Allergy and Asthma episodes were elicited. Data collected was entered in Excel spreadsheet and Analysis was done using SPSS version 16.

Results: There were 150 under 15 children in the study which were collected from 96 households. They were 82 (54.7%) males and 68 (45.3%) females. Passive smoking was present in 32 (21.3%) children. Overcrowding was present in 61 (40.7%) children's houses. 64 (42.7%) children didn't have adequate ventilation. Smoke from kitchen was present in 126 (84.0%) houses. 40 (26.7%) of the households were having anti mosquito usage in their house. The number of URTIs was significantly more with children having history of passive smoking as denoted by significant p- value is 0.002. Asthma was present in 20 (13.3%) of children; ear infection was there in 6 (4.0%) children and Allergy was present in 18 (12.0%) children at the time of study. They were more with children having history of passive smoking by looking at the simple percentages. But they were not statistically significant (p – value > 0.05).

Conclusion: 1) The prevalence of Passive Smoking in the study population is 21.3%. 2) Environmental risk factors like Overcrowding, Lack of adequate ventilation, Smoke from

kitchen and Anti Mosquito smoke are significantly more associated with children having Passive Smoking. 3) Upper Respiratory Infections are more significantly associated with those who have history of Passive Smoking.

Keywords: *Passive Smoking, Rural Population, Smoking among Children, Smoking complications, Rural India.*

Introduction

Tobacco kills nearly 6 million people each year. More than five million of those deaths are the result of direct tobacco use while more than 600 000 are the result of non-smokers being exposed to second-hand smoke. Unless urgent action is taken, the annual death toll could rise to more than eight million by 2030. Nearly 80% of the world's one billion smokers live in low- and middle-income countries.

Passive smoking refers to breathing tobacco smoke that is breathed out by a smoker or comes from the end of a burning cigarette[1]. Breathing in other people's tobacco smoke is known as passive, involuntary or secondhand smoking (SHS). It may also be called environmental tobacco smoke exposure[2]. Secondhand smoke (SHS) is inhalation of other people's tobacco smoke. SHS is also commonly known as 'passive smoking', 'environmental tobacco smoke' and 'involuntary smoking'. Inhaling SHS is an unavoidable consequence of being in a smoke-filled environment.

Globally, an estimated 40% of children are reported to be exposed to SHS. In the UK around 2 million children are estimated to be regularly exposed to SHS in the home. The home is now the main source of exposure to SHS for children (9). These disorders generate over 300,000 UK GP consultations and about 9,500 hospital admissions every year, costing the NHS about £23.3 million. Passive smoking is a major hazard to the health of millions of children worldwide. Children from socio-economically disadvantaged backgrounds are generally more heavily exposed to SHS[3]. Almost half of children regularly breathe air polluted by tobacco smoke in public places. Over 40% of children have at least one smoking parent. In 2004, children accounted for 28% of the deaths attributable to second-hand smoke.

Prevalence of passive smoking is much higher in the developing countries esp. SEAR than in developed nation. The burden of ARI, other infectious diseases, growth failure and impaired school performance are also correspondingly higher. Passive smoking may also have a role in contributing to this health disparity, in addition to various other factors.

Effects of passive smoking on children

Children are at higher risk of damage from passive smoking than adults because of their smaller bodies, higher breathing rates and less developed respiratory and immune systems. They are most likely to be exposed to cigarette smoke in the home or car, but exposure also occurs in such places as shopping centres, other people's homes and social meeting places[1].

SHS in the home is a major source of exposure because children spend most of their time at home and indoors. Unlike adults who can choose whether or not to be in a smoky environment, children have little choice or control over their SHS exposure. They are far less likely to be able to leave a smoke-filled room if they want to: babies cannot ask, some children may not feel confident about raising the subject, and others may not be allowed to leave even if they do ask[2].

A review of 79 studies reported that exposure to pre or post-natal SHS was associated with between 30-70% increased risk of incidents of wheeze, and 21- 85% increase risk in asthma in children[4]. Lower respiratory tract infections affect the airways and lungs, and include flu, bronchitis and pneumonia. A review of 60 research studies found that SHS exposure in the home increased young infants' risks of developing lower respiratory tract infections by 20% to 50%[5].

A systematic review and meta-analysis on parental and household smoking and the increased risk of bronchitis, bronchiolitis and other lower respiratory infections in infancy which identified 60 studies suitable for inclusion in the meta-analysis. Smoking by either

parent or other household members significantly increased the risk of LRI; odds ratios (OR) were 1.22 (95% CI 1.10 to 1.35) for paternal smoking, 1.62 (95% CI 1.38 to 1.89) if both parents smoked, and 1.54 (95% CI 1.40 to 1.69) for any household member smoking. Pre-natal maternal smoking (OR 1.24, 95% CI 1.11 to 1.38) had a weaker effect than post-natal smoking (OR 1.58, 95% CI 1.45 to 1.73). The strongest effect was on bronchiolitis, where the risk of any household smoking was increased by an OR of 2.51 (95% CI 1.96 to 3.21)[5].

Environmental tobacco smoke is an important respiratory tract irritant in young children. To identify factors associated with respiratory disease and determine the main source of smoking exposure in the household, a cross-sectional study of 2,037 children who were immunized in primary health care clinics was conducted (in a sample of 10 out of 38 clinics with 200 children each). Parents answered a questionnaire about children's birth, passive smoking, former and current respiratory morbidity, socio-demographic characteristics, and living conditions. Analysis was based on hierarchical logistic regression. Prevalence of respiratory symptoms was 59.9% for children who live with smokers. Asthma and bronchitis showed the strongest association with smoking (OR = 1.58; 95%CI: 1.18-2.11)[6].

Considerable evidence supports an association between parental smoking and an increased risk of child health problems. Indeed, in a one-year period, children of parents who smoked inhaled the same amount of nicotine as if they had smoked 60–150 cigarettes[1].

Some of the specific effects of passive smoking on children include:

- Sudden infant death syndrome (SIDS)
- Croup, bronchitis, pneumonia and ear infections
- Increased likelihood of childhood asthma
- Learning difficulties
- Behavioural problems
- Heart disease
- Meningococcal disease

In addition, children of smokers are four times more likely to become smokers themselves[1].

In a study to the impact of exposure to cigarette smoke on blood pressure of elementary school children in Kermanshah, Iran indicates that systolic and diastolic blood pressures are higher in those elementary school children exposed to cigarette smoke compared to those who are not[7].

Parental smoking affects children and neonates, and is associated with low birth weight, sudden infant death, asthma, bronchitis, pneumonia, otitis media, increased risk of contracting tuberculosis on exposure, Crohn’s disease, learning disorders, development retardation and dental caries[8].

Chronic exposure to cigarette smoke is harmful to ocular tissues through ischemic or oxidative mechanisms. A study by Amany Abdel-Fattah El-Shazly et al in Egypt shows that passive smoking represents a significant risk factor of dry eye in children comparable to that shown with active adult smoking[9].

Passive smoking may be implicated in the development of cardiovascular disease (CVD) in children because of their partially developed physiological systems. A Systematic Review on passive smoking and the development of Cardiovascular Disease in Children which identified a total of 42 relevant articles (30 reviews and 12 observational) revealed that passive smoking may be implicated in deteriorating cardiovascular status in children in terms of unfavorable high-density lipoprotein levels and deteriorated vascular function[10].

A large study performed on 9090 adolescent school children demonstrated environmental tobacco smoke (ETS) exposure to be associated with an increased risk of asthma. The odds ratio for being asthmatic in ETS-exposed as compared to ETS-unexposed children was 1.78 (95% CI: 1.33–2.31)[11]. Another study demonstrated exposure to ETS was a significant trigger for acute exacerbation of asthma. Several adverse pulmonary effects of passive smoking, similar to those described from the western and developed countries, have been described from India[12].

Passive smoking effects are of two types

- *Negative health outcomes for children:* There is considerable evidence to suggest an association between parental smoking and an increased risk of health problems in children, including Sudden Infant Death Syndrome, croup, bronchitis, pneumonia, ear infections, asthma, learning difficulties, behavioural problems and heart disease.
- *Smoking uptake later in life:* In a one-year period, children of parents who smoke inhale the same amount of nicotine as if they had smoked 60–150 cigarettes. Children of smokers are four times more likely to end up being smokers themselves, due to nicotine inhalation in childhood[1].

Additionally the impact of passive smoking on children is affected by the following three factors:

- *Amount of exposure:* Smoking in a car can be 23 times more toxic than in a house because it is a small, enclosed space.
- *Whether smoking occurs outside or inside of house:* Exclusive smoking outside with the door closed results in lower nicotine exposure levels for children (although higher than that for children from homes where no smoking occurred) than when smoking occurs anywhere indoors, including indoors near either a kitchen fan or an open door.
- *Proximity to a smoking area:* Well ventilated non-smoking areas still contain at least half the amount of smoke found in adjacent smoking areas.

Passive smoking may increase the risk of infection and disease in adults and children exposed to Tuberculosis. In a study at Medan among children who had household contact with a TB patient, those who exposed to passive smoke are more likely to have M. tuberculosis infection compared to those who not exposed to passive smoke[13].

Preventing the effects on children

There is a significant public policy agenda to reduce cigarette smoking with regulation in place to prevent adult exposure to smoke in the workplace. However, it is important to recognize that for children, the home is the equivalent of the workplace, and children remain vulnerable to the effects of passive smoking.

Parents are concerned about the effects of passive smoking on their children and are likely to be willing to make changes to improve children's health. Indeed, research has shown that three of every four adults who smoke would like to give up if they could, and more than half of the rest think about it[1].

Furthermore, a survey conducted by the Cancer Council of New South Wales of households where at least one parent smoked found that:

- 86 per cent of respondents agreed with the statement 'because children don't have a choice, it's up to adults to think about whether there is tobacco smoke around the children'.
- 24.7 per cent believed that minimising exposure to tobacco smoke was likely to make the biggest difference to children's health (in comparison with a list of other factors).

The strategies that follow focus particularly on the smoking behaviours of parents around children. Most smoking intervention strategies have been focused on adults with far fewer particularly focused on parent specific interventions. Some intervention strategies to reduce passive smoking in children have been trialed and include:

- Intensive counselling
- Non-intensive counselling
- School-based programs.

The following key messages can also be reinforced with parents[1]:

- Smoking in another room or by an open window is not enough to avoid exposure to environmental tobacco smoke (it's like urinating in a swimming pool!).
- An increasing number of smokers are making their homes and cars smoke-free in order to protect their children from the effects of environmental tobacco smoke.
- Parents who insist on a household free of smoke should be positively encouraged.

Jyoti Sanghvi et al studied the effectiveness of discontinuation of passive smoking on lung function of children by Peak Expiratory Flow Rate (PEFR) in Indoor, India. There was a significant improvement seen in PEFRs after the discontinuation of passive smoking in 3 months interval. Alterations of the smoking behavior of family member's results in improved PEFR of their children[14].

Parents can help protect their children from secondhand smoke by taking the following actions[15]:

- Do not allow anyone to smoke anywhere in or near your home.
- Do not allow anyone to smoke in your car, even with the window down.
- Make sure your children's day care centers and schools are tobacco-free.
- If your state still allows smoking in public areas, look for restaurants and other places that do not allow smoking. "No-smoking sections" do not protect you and your family from secondhand smoke.

Adverse effects of smoking in rural population are well studied in any parts the world. But the impact of passive smoking on the children is not widely studied. Also these kinds of studies have been done rarely in India. That is the reason for considering this study in this rural population.

Objectives

This study was carried out with the following two objectives:

1) To determine the prevalence of passive smoking among children in a rural population in South India.
2) To find out the effects of passive smoking on children in the study population.

Materials and methods

Study Design: This is a community based cross sectional study.

Study Area: This study was carried out in Marappadi village in Kulasekharam Panchayat, Kanyakumari District, Tamilnadu.

Study Period: This study was carried out in October 2014. The data collection was done every Saturdays when children will be available for interview.

Study Population: All eligible children under 15 years in the village according to the following Inclusion and Exclusion criteria were considered as study population.

- *Inclusion Criteria:*

1) Children residing in Marappadi village, the service area of Rural Health Centre of SMIMS.
2) Age between 1-15 years of both genders.

- *Exclusion Criteria:*

1) Children who were absent on the day of survey.
2) Children / whose parents were not willing to participate in the study.

Sample size: 150 children residing within the service area were considered as sample size. This sample size (n) was calculated based on the prevalence of passive smoking p = is 40%. Using the formula N= 4pq/d2 where q = 100 – p; d= 20 % of p, sample size was considered as 150.

The study protocol was approved by the faculty of the Department of Community Medicine, SMIMS. A structured questionnaire was applied to get the socio demographic details of the children after getting informed consent from their parent(s) / guardians.

Children were approached at their houses, starting from the health centre, travelling to all 4 directions with 4 teams of volunteers, each house one by one till we get the required 150 samples based on the inclusion and exclusion criteria.

A child having either a parent or any other household member with smoking habit was considered as having passive smoking. Apart from the socio demographic details and passive smoking history, the history of Low birth weight, Growth retardation, and number of URTIs, LRTIs, Ear Infections, Allergy and Asthma episodes were elicited. Height and weight of the

children were measured by stadiometer and bathroom weighing scale respectively. Children under 1 year were excluded from the study. Data collected was entered in Excel spreadsheet and Analysis was done using SPSS version 16.

Results

There were 150 under 15 children in the study which were collected from 96 houses. They were 82 (54.7%) males and 68 (45.3%) females. 31 (20.7%) were in the 1-5 years group; 71 (47.3%) were in the 6-10 years group and another 48 (32.0%) were in the 11-15 years age group.

Altogether passive smoking was present in 32 (21.3%) children. Overcrowding was present in 61 (40.7%) children's houses. 64 (42.7%) children didn't have adequate ventilation. Smoke from kitchen was present in 126 (84.0%) houses. 40 (26.7%) of the households were having anti mosquito usage in their house. Regarding present complications mean episode of Upper Respiratory Tract Infections (URTIs) per child in one year was 4.9 and mean episode of Lower Respiratory Tract Infections (LRTIs) per child in one year time was 0.2. Asthma was present in 20 (13.3%) of children; ear infection was there in 6 (4.0%) children and Allergy was present in 18 (12.0%) children at the time of study.

The following tables show the distribution of above particulars distributed between the group of children having passive smoking and children not having passive smoking. Appropriate statistical tests show the relationship between the parameters and passive smoking.

Table1. Distribution of Socio Demographic factors and Passive Smoking

Factor	Category	Passive Smoking		Total (N=150)
		Yes (N=32)	No (N=118)	
Age Group	0-5 Years	5 (15.6%)	26 (22.0%)	31 (20.7%)
	6-10 Years	15 (46.8%)	56 (47.5%)	71 (47.3%)
	11-15 Years	12 (37.6%)	36 (30.5%)	48 (32.0%)
Gender	Male	12 (37.5%)	70 (59.3%)	82 (54.7%)
	Female	20 (62.5%)	48 (40.7%)	68 (45.3%)
Religion	Hindu	15 (46.9%)	65 (55.1%)	80 (53.3%)
	Christian	15 (46.9%)	51 (43.2%)	63 (42.0%)
	Muslim	2 (6.2%)	2 (01.7%)	7 (04.7%)

The above table shows the distribution of socio demographic factors between passive smoking. It is almost equally distributed between the groups.

Table2. Passive Smoking and Household Environmental Risk Factors

Household Environmental Risk Factors		Passive Smoking		Chi^2 Value	DF	p - Value
		Yes (N=32)	No (N=118)			
Overcrowding	Yes (61)	26 (42.6%)	35 (57.4%)	20.008	1	*0.0001**
	No (89)	6 (6.7%)	83 (93.7%)			
Adequate Ventilation	Yes (86)	5 (5.8%)	81 (94.2%)	17.993	1	*0.0001**
	No (64)	27 (42.2%)	37 (57.8%)			
Smoke from Kitchen	Yes (126)	31 (24.6%)	95 (75.4%)	4.762	1	*0.021*∞
	No (24)	1 (4.2%)	23 (95.8%)			
Anti Mosquito Smoke	Yes (40)	4 (10.0%)	36 (90.0%)	3.666	1	*0.045*∞
	No (110)	28 (25.4%)	82 (74.6%)			

*Statistically significant at 1%; ∞ Statistically significant at 5%.

The above table shows that Household environmental associated risk factors are significantly more associated passive smoking as denoted by the significant p – values.

Table 3. Passive Smoking and Morbidity – t- Test

Parameters	Passive Smoking		t - Value	p - Value
	Yes (N=32)	No (N=118)		
Height in Cm (Mean ± SD)	131.75 ± 18.98	123.35 ± 29.98	2.117	0.149
Weight in Kg (Mean ± SD)	29.15 ± 12.54	25.25 ± 13.51	1.369	0.245
Number of URTIs in a year (Mean ± SD)	7.10 ± 7.04	4.36 ± 1.74	9.939	*0.002**
Number of LRTIs in a year (Mean ± SD)	0.15 ± 0.37	0.18 ± 0.71	0.023	0.879

*Statistically significant at 1%

The above table shows that number of URTIs was significantly more with children having history of passive smoking as denoted by significant p- value less than 0.05.

Table 4. Passive Smoking and Morbidity – Chi2 - Test

Morbidity Conditions		Passive Smoking		Chi^2 Value	DF	p - Value
		Yes (N=20)	No (N=80)			
Asthma	Yes (20)	5 (25.0%)	15 (75.0%)	0.088	1	0.766
	No (130)	27 (20.8%)	103(79.2%)			
Ear Infection	Yes (6)	2 (33.3%)	4 (66.7%)	0.065	1	0.799
	No (144)	30 (20.8%)	114(79.2%)			
Allergy	Yes (18)	4 (22.2%)	14 (77.8%)	0.088	1	0.766
	No (132)	28 (21.2%)	104(78.8%)			

From the above table, it is observed that morbidity conditions were more with children having history of passive smoking by looking at the simple percentages. But they are not statistically significant as denoted by p – values more than 0.05.

Discussion

This community based cross sectional study was carried out in a rural population in southern part of Tamilnadu, India. More than five million of those deaths are the result of direct tobacco use while more than 600 000 are the result of non-smokers being exposed to second-hand smoke or otherwise called passive smoking. The prevalence of passive smoking in the present study is only 21.3%. This is less compared to the global estimate of 40%. The reason for this is already the prevalence of smoking itself is less as compared other parts of India due to many factors especially the literacy[16].

The household environmental associated risk factors are significantly more associated passive smoking as denoted by the significant p – values from the table 2. This shows that the passive smoking is adding fuel to the fire of already existing household environmental risk factors which are detrimental to children's health.

From the table 3, the number of URTIs was significantly more with children having history of passive smoking as denoted by significant p- value less than 0.05. This is consistent with the observations from other studies. A systematic review and meta-analysis on parental and household smoking and the increased risk of bronchitis, bronchiolitis and other lower respiratory infections in infancy which identified 60 studies suitable for inclusion in the meta-analysis. Smoking by either parent or other household members significantly increased the risk of LRI; odds ratios (OR) were 1.22 (95% CI 1.10 to 1.35) for paternal smoking, 1.62 (95% CI 1.38 to 1.89) if both parents smoked, and 1.54 (95% CI 1.40 to 1.69) for any household member smoking[5].

From table 4 it is observed that morbidity conditions were more with children having history of passive smoking by looking at the simple percentages. But they are not statistically significant as denoted by p – values more than 0.05. A review of 79 studies reported that exposure to pre or post-natal SHS was associated with between 30-70% increased risk of incidents of wheeze, and 21- 85% increase risk in asthma in children[4].

A large study performed on 9090 adolescent school children demonstrated environmental tobacco smoke (ETS) exposure to be associated with an increased risk of asthma. The odds ratio for being asthmatic in ETS-exposed as compared to ETS-unexposed children was 1.78 (95% CI: 1.33–2.31) [b]. Another study demonstrated exposure to ETS was a significant trigger for acute exacerbation of asthma. Several adverse pulmonary effects of passive smoking, similar to those described from the western and developed countries, have been described from India[12]. The reason for not showing any significant p values in the present study may due to the lesser sample size.

Conclusion

1) The prevalence of Passive Smoking in the study population is 21.3%.
2) Environmental risk factors like Overcrowding, Lack of adequate ventilation, Smoke from kitchen and Anti Mosquito smoke are significantly more associated with children having Passive Smoking.
3) Upper Respiratory Infections are more significantly associated with those who have history of Passive Smoking.

Significance / recommendations

1) Morbidity conditions are more with those who have the history of Passive Smoking. So the concerned children to be motivated to avoid passive smoking and their parents also to be motivated to stop smoking especially inside house and while their children are around.
2) Children usually who have the history of passive smoking are already having other environmental risk factors like Environmental risk for like Overcrowding, Lack of adequate ventilation, Smoke from kitchen and Anti Mosquito smoke. They should be specifically motivated to avoid these factors as much as possible.

Limitations

1) Though it is a community based cross sectional study, the sample were not randomly selected from throughout the village; instead they were selected from the nearby houses from the health centre by convenient sampling.
2) Sample size should have been more to generalize the observation as the prevalence of passive smoking here in the study area is only 20 % as compared to 40 % as proposed from the literature review.

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