

# Association between respiratory diseases and passive smoking at home in children from the age of 6 to 10 years old assisted by the primary healthcare in Araguaína, Tocantins

Associação entre doenças respiratórias e fumo passivo domiciliar em crianças de 6 a 10 anos atendidas pela atenção primária em Araguaína/TO

*Asociación entre enfermedades respiratorias y tabaco pasivo en hogares con niños entre 6 y 10 años atendidos por atención primaria en Araguaína-TO*

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## Abstract

**Introduction:** smoking is defined as the physical and psychological dependence of tobacco, passive smoke consists of inhaling the smoke and tobacco derivatives by non-smokers. Children are especially vulnerable to exposure to tobacco smoke. **Objective:** identify the association between passive smoking at home and respiratory tract morbidity in pre-school children from the age of 6 to 10 years old, utilizing data gathering in Primary Healthcare units from Araguaína – TO. **Methods:** cross-sectional descriptive research with quantitative character conducted within three Basic Healthcare Units. A sample comprised of 72 interviewed subjects was determined, selected in random fashion at the healthcare units. **Results:** The Odds Ratio test obtained the result of OR 3.06, with 95%CI 1.16–8.11 and  $p < 0.05$ , thus evidencing the existence of a correlation between the development of respiratory diseases and the secondhand smoke in children aged 6 to 10 years. The prevalence of passive smoking at home was 44,4%, exposing, this way, the children to cigarette smoke, leading to the manifestation of symptoms such as dry cough, wheezing, fast breathing, pain, and auricular secretions. **Conclusions:** the association between passive smoking at home and respiratory tract morbidity in children from the age of 6 to 10 years old was proved. No connection between passive smoking and the increase of respiratory tract-related hospitalizations was obtained.

**Keywords:** Tobacco smoke pollution; Respiratory tract diseases; Respiratory System.

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## Resumo

**Introdução:** O tabagismo é definido como a dependência física e psicológica de tabaco, e o fumo passivo consiste na inalação da fumaça de derivados do tabaco por não fumantes. As crianças são especialmente vulneráveis à exposição à fumaça do tabaco. **Objetivo:** Identificar a associação entre fumo passivo domiciliar e morbidade respiratória em pré-escolares de seis a dez anos, por meio de coleta de dados na Atenção Primária à Saúde em Araguaína/TO. **Métodos:** Estudo de perfil descritivo, com corte transversal de caráter quantitativo, conduzido em três unidades básicas de saúde. Foi determinada uma amostra de 72 entrevistados, selecionados de forma aleatória em meio às unidades básicas. Os resultados foram colhidos de questionários respondidos por familiares ou responsáveis das crianças. **Resultados:** O teste de *Odds Ratio* (OR) obteve o resultado de 3,06, com intervalo de confiança de 95% — IC95% 1,16 – 8,11 e  $p < 0,05$ , revelando assim a existência de correlação entre o desenvolvimento de doenças respiratórias e o fumo passivo domiciliar em crianças de seis a dez anos. A prevalência do tabagismo passivo domiciliar foi de 44,4%, expondo à fumaça do cigarro as crianças, que manifestam sintomas como tosse seca, chiado no peito, respiração rápida, dor e secreção no ouvido. **Conclusões:** Foi comprovada a associação entre tabagismo passivo domiciliar e morbidade respiratória entre crianças de seis a dez anos. Não se obteve a conexão entre o tabagismo passivo e o aumento do número de internações por causa respiratória.

**Palavras-chave:** Fumo passivo; Doenças respiratórias; Sistema respiratório.

## Resumen

**Introducción:** El tabaquismo se define como la dependencia física y psicológica al tabaco, el humo de segunda mano consiste en la inhalación del humo del tabaco por parte de los no fumadores. Los niños son especialmente vulnerables a la exposición al humo del tabaco. **Objetivo:** Identificar la asociación entre el humo de segunda mano en el hogar y la morbilidad respiratoria en niños preescolares de 6 a 10 años, a través de la recolección de datos en la Atención Primaria de Salud en Araguaína-TO. **Métodos:** estudio descriptivo de perfil, de corte transversal cuantitativo, realizado en tres unidades básicas de salud. Se determinó una muestra de 72 entrevistados, seleccionados aleatoriamente entre las unidades básicas. **Resultados:** la prueba de Odds Ratio obtuvo el resultado de OR 3.06, con IC95% 1,16–8,11 y  $p < 0,05$ , evidenciando así la existencia de una correlación entre el desarrollo de enfermedades respiratorias y el humo de segunda mano en niños de 6 a 10 años. La prevalencia de tabaquismo pasivo en el hogar fue del 44,4%, exponiendo así a los niños al humo del cigarrillo, manifestando síntomas como tos seca, sibilancias, respiración acelerada, dolor y secreción en el oído. **Conclusiones:** se comprobó la asociación entre el tabaquismo pasivo en el hogar y la morbilidad respiratoria en niños de 6 a 10 años. No hubo relación entre el tabaquismo pasivo y el aumento del número de hospitalizaciones por causas respiratorias.

**Palabras clave:** Contaminación por humo de tabaco; Enfermedades respiratorias; Sistema respiratorio.

## INTRODUCTION

Smoking is defined as the physical and psychological dependence on tobacco, one of the addictions that affects not only the health of users, but also brings harm to close people. Although in Brazil a drop from 34.8 to 14.7% was observed in the number of smokers between 1989 and 2013<sup>1</sup>, smoking is the second leading cause of preventable death in the country<sup>2</sup>. Among the various forms of tobacco consumption, cigarettes are the main ones. Its composition is diverse, presenting four thousand substances and, of this group, 250 are toxic and 50 are carcinogenic; to the examples of nicotine, carbon monoxide and tar which, when exposed at the moment of combustion in a cigarette, promote the appearance of morbid conditions and early death<sup>3</sup>. Thus, these elements are responsible for the physiological dismantling of the body at a general level, mainly from the hyperplasia and metaplasia of the squamous and goblet cells of the respiratory tract, resulting in thickening of the laryngeal epithelium, accumulation of pigmented alveolar macrophages, and atrophy of the olfactory epithelium<sup>4</sup>. The result of exposure to these substances is an increase in mucus secretion and a reduction in its elimination. Among the various consequences of exposure to cigarette smoke, neoplasms, favoring pulmonary infections, chronic obstructive pulmonary diseases (COPD), diseases related to atherosclerosis, and the induction of atopic conditions stand out.

Secondhand smoke consists of inhaling tobacco smoke by non-smokers. Smoke from cigarette burning is made up of two components: central and lateral smoke<sup>5</sup>. The central one is the means of outlet

for active smokers, while the lateral one, which spreads throughout the environment, is the one inhaled by passive smokers<sup>6</sup>.

This study aimed to evaluate the association between symptoms, morbidity, and hospitalizations for respiratory causes in children aged six to ten years and passive smoking in the home environment. The hypothesis studied is that children exposed to passive smoking have more respiratory morbidity.

## METHODS

A descriptive, quantitative cross-sectional study was carried out in three basic health units (chosen by lot) in the municipality of Araguaína, in the state of Tocantins, belonging to the North Region of Brazil during the period from June 2021 to April 2022.

The sample was prepared by convenience, aiming at an “n” of sixty (60), with an increase of 20%, considering the risk of possible losses and resulting in a sample “n” of 72. Inclusion criteria consisted of parents or guardians of children aged between six and ten who used the basic health system. Parents or guardians residing in rural areas, who were sick or with cognitive abilities that prevented them from signing the Informed Consent and children with comorbidities not related to the respiratory system were excluded.

For data collection, a questionnaire prepared by the researchers was used, consisting of closed questions, according to the research problem, in addition to a Fagerström Test<sup>7</sup> used to assess the respondent's degree of nicotine dependence. The questionnaires were given to parents and/or guardians who agreed to participate in the research and answered by themselves. The questions in the first questionnaire referred to the characteristics of the child, the respondent, the economic class of the family, the number of children in the household, the time the respondent spends with the child, the history of respiratory symptoms, and morbidities and hospitalizations due to respiratory reasons. The Fagerström Test, on the other hand, contains questions regarding the respondent's nicotine dependence and was answered only by those who claimed to be smokers.

The variables considered to characterize respondents and their families were: gender, age, ethnicity, education, family income.

Passive smoking was the independent variable, defined as the relationship between a child and a smoker (family member or not) who lives in the same house. The dependent variables studied were: number of children living in the same house, time spent with the child per day, smoking habits, type of cigarettes smoked, money spent exclusively on cigarettes per month, knowledge about the harms of passive smoking, knowledge about the ailments of active smoking, respiratory signs/symptoms (cough, wheezing, rapid breathing, pain or discharge from the ear, retraction below the ribs), noticed in the child(ren) in the last three months, respiratory diseases (bronchiolitis, bronchitis, asthma, otitis, and pneumonia) that the child(ren) have or have had and how many hospitalizations caused by respiratory causes the children have already been submitted to.

The collected data were stored in a Microsoft Excel for Windows 2016 spreadsheet, and analyzed in the Bioestat 5.0 software, in which a descriptive analysis of continuous variables with means was performed.

The research project was submitted and approved by the Research Ethics Committee of Universidade Presidente Antônio Carlos (Opinion No. 4.726.809). All study participants, after explaining and clarifying doubts, agreed and signed the Informed Consent.

## RESULTS

For data collection, 72 forms were delivered, each containing two questionnaires. In addition, two more copies of the Informed Consent, retained by the researcher and interviewee. At the end of data collection, 72 forms were obtained, corresponding to 72 parents/guardians of children in the studied age range.

As for the questionnaire respondents, 23.6% were male and 76.6% were female. Respondents of brown ethnicity prevail (46%), followed by black (32%), white (17.8%), indigenous (2.8%) and, finally, yellow (1.4%).

The total number of children exposed to passive smoking was 65, while the number of children not exposed was 88. The prevalence of passive smoking in the sample was 44.4%, that is, 32 individuals exposed children to cigarette smoke in the home environment.

According to the data obtained in relation to the time spent with children per day, non-smokers are those who spend the most time with children, with more than 90% spending more than 4 hours a day with them. About half of the smokers (50%) spend less than 3 hours a day with children, while only 16% spend more than 10 hours a day with them.

With regard to the amount of time that smokers remained in the same environment where the children are, 49.9% remained for more than 10 hours, 21.87% remained between 1 and 3 hours, 15.62% remained from 4 to 6 hours, 6.26% stayed for 7 to 9 hours, and 6.25% stayed for less than 1 hour.

Information regarding the education of the parents/guardians, according to the presence of smoking, the distribution of symptoms regarding the child's exposure or not to passive smoking and the distribution of respiratory diseases in children exposed and not exposed to passive smoking are expressed, respectively, in the data in Table 1, Table 2, and Table 3.

**Table 1.** Education of parents/guardians divided between smokers and non-smokers in percentage, Tocantins, Brazil, 2022.

| Education   | Smokers (n=32) (%) | Non-smokers (n=40) (%) |
|---|--------------------|------------------------|
| Uneducated or incomplete elementary school            | 56.25              | 22.5                   |
| Complete elementary school and incomplete high school | 18.75              | 20                     |
| Complete high school and incomplete higher education  | 21.85              | 42.5                   |
| Complete higher education                             | 3.12               | 15                     |

Source: Research authors (2022).

**Table 2.** Presence of respiratory signs/symptoms in children exposed and not exposed to passive smoking in percentage, Tocantins, Brazil, 2022.

| Signs/Symptoms               | Exposed children (n=65) (%) | Unexposed children (n=88) (%) |
|------------------------------|-----------------------------|-------------------------------|
| Cough                        | 56.92                       | 44.18                         |
| Wheezing                     | 21.42                       | 27.27                         |
| Fast breathing               | 21.42                       | 17.04                         |
| Pain or discharge in the ear | 3.57                        | 9.09                          |
| Retraction below the ribs    | 0                           | 3.40                          |

Source: Research authors (2022).

**Table 3.** Distribution of respiratory diseases in children exposed and not exposed to passive smoking in percentage – Araguaína, Tocantins, Brazil, 2022

| Diseases                   | Exposed children (n=65) (%) | Unexposed children (n=88) (%) |
|----------------------------|-----------------------------|-------------------------------|
| No diseases                | 46.88                       | 43.48                         |
| Bronchiolitis              | 3.13                        | 4.35                          |
| Pneumonia                  | 18.75                       | 19.57                         |
| Treated ear disease/otitis | 15.63                       | 17.39                         |
| Bronchitis                 | 9.38                        | 6.52                          |
| Asthma                     | 6.25                        | 8.70                          |

Source: Research authors (2022).

The data contained in Table 2 show that there was a greater perception by parents/guardians of coughing and rapid breathing in children who were exposed to passive smoking when compared to the perception in those who were not exposed. However, regarding retraction below the ribs, there was no reported episode in the last three months.

Seeking a correlation between secondhand smoke at home and the development of respiratory diseases in the age group of six to ten years, the Odds Ratio (OR) test was performed, whose result was OR 3.06, with a confidence interval of 95% — 95%CI 1.16–8.11 and  $p < 0.05$ . Thus, it could be shown in this study that there is a correlation between the development of respiratory diseases and secondhand smoke at home in children aged six to ten years.

With regard to hospitalizations for respiratory causes, there were 13 in the group of unexposed children and nine in the group of exposed children. When looking for the correlation between smoking and child hospitalization for causes arising from the respiratory system, OR 1.16 was obtained with 95%CI 0.43–3.26 and  $p = 0.94$ . Therefore, it was not possible to demonstrate a correlation between secondhand smoke and hospitalizations for respiratory causes in the age range studied.

## DISCUSSION

This study involved 72 parents/guardians of children aged six to ten years. The prevalence of passive smoking was 44.4%, with 65 children exposed to cigarette smoke at home. Data showed that non-smokers spend more time with children than smokers, and most smokers spend more than 10 hours in the same environment as children. Respiratory symptoms, such as coughing and rapid breathing, were more common in children exposed to passive smoking. A significant correlation was found between passive smoking and the development of respiratory diseases, but there was no correlation with hospitalizations for respiratory causes. This may indicate that passive smoking is not a determining factor for the severity of respiratory diseases in children, but it is still important to highlight the risks associated with exposure to cigarette smoke at home. These results emphasize the importance of measures to reduce passive smoking and protect children's respiratory health.

The pollution resulting from cigarette burning is called environmental tobacco pollution (ETP) and, in addition to being the leading cause of indoor pollution in the world, it is the third leading preventable cause of death<sup>8</sup>. It is estimated that smoking kills around 8 million people a year. Of these deaths, 1.25 million are people passively exposed to cigarette smoke and, among these, 65,000 children die from diseases that can be attributed to secondhand smoke<sup>9</sup>.

In addition to neoplasms, smoking is related to 50 different diseases, mainly related to the respiratory system, such as COPD and cardiovascular diseases<sup>10</sup>.

Exposure to toxic substances in tobacco smoke causes active inflammation with accumulation of neutrophils, macrophages, and lymphocytes in the lung. Elastases, cytokines and oxidants are released, causing proteolysis of the extracellular matrix and epithelial injury<sup>11</sup>. Chronic inflammation can lead to conditions such as asthma, emphysema, and bronchitis.

Children exposed to passive smoking demonstrate an increased risk for respiratory symptoms such as tachypnea, subdiaphragmatic retraction, in addition to respiratory morbidities<sup>6</sup>. Studies show that children with asthma exposed to secondhand smoke are twice as likely to be hospitalized when compared to children with asthma who are not exposed to secondhand smoke<sup>12-15</sup>. Children's fragility, in relation to exposure to passive smoking, occurs not only due to short airways, immunological immaturity and longer time at home<sup>6</sup>, but also due to lack of knowledge of parents, especially in the less privileged socioeconomic classes, about passive smoking and its deleterious effects on the health of children<sup>13</sup>.

Data in the study reveal a prevalence of passive smoking at home of 45.83%. This result is higher than those found in a study carried out in São Paulo (15.3%), which, in 2010, evaluated 215 children<sup>6</sup>, however it is lower than a study carried out in Portugal, which revealed a prevalence of 62.9%<sup>13</sup>. Thus, it is possible to observe that the prevalence of passive smoking at home varies in different locations and can be influenced by cultural and social factors. As for the higher prevalence observed in Araguaína, this can be explained by the fact that the municipality has low levels of schooling<sup>16</sup>. These data can be useful to understand how schooling can influence the smoking habit and can be compared with data from the group of non-smokers to analyze this relationship more deeply. This finding is compatible with data observed in other studies<sup>17,18</sup>, establishing education as an important factor for smoking prevention.

Regardless of the level of education of smokers and non-smokers, it is possible to observe that the group of non-smokers has a higher level of education compared to the group of smokers. More specifically, the group of non-smokers has a rate of 73.75% of people with complete high school or higher education, while the group of smokers has a rate of 25% of people with the same level of education. Individuals with low education are more likely to smoke compared to those with higher levels of education, thus establishing educational inequality as a predisposing factor to smoking.

The results of the study show that children exposed to passive smoking at home had respiratory symptoms such as coughing, wheezing, rapid breathing, and pain or discharge in the ear. In the age group studied here, cough was the most prevalent symptom, affecting more than half (53.75%) of children exposed to passive smoking. Wheezing in the chest and rapid breathing were reported by about a fifth (21.42%) of children, while pain or discharge in the ear affected only a small percentage (3.57%). In comparison, a previous study carried out in São Paulo with children in the preschool age group reported even higher prevalences of coughing (78.8%) and wheezing (31.1%), in addition to 6.5% of children presenting pain or secretion in the ear<sup>6</sup>. This comparison can help to understand the variation of symptoms between different locations and age groups, as well as highlight the severity of the problem and the need for prevention and control actions. With regard to the occurrence of respiratory diseases, the present study demonstrated that children exposed to passive smoking at home are three times more likely to develop respiratory diseases compared to children who are not exposed to this disease, corroborating previous research<sup>6-16-20</sup>.

The Brazilian government spends BRL 56.9 billion per year on health and loss of productivity related to smoking, while collecting only BRL 13 billion from taxes on cigarette sales, which covers only 23% of expenditures<sup>20</sup>. In 2005, Brazil ratified the World Health Organization Framework Convention on Tobacco

Control, whose objective was to control the tobacco epidemic worldwide<sup>9</sup>. National actions to control smoking include educational measures, such as prevention of smoking in children and young people. Despite all the efforts that have been made to stop smoking, this addiction continues to cause leaks in public coffers and enormous damage to the health of the population, especially children.

Aiming to help reduce the incidence of passive smoking in children, anti-smoking promotions could include activities to generate tobacco-free home environments, in order to prevent the development of respiratory diseases in children, who are currently passive smokers.

## CONCLUSION

The study carried out identified a high prevalence of passive smoking at home in the studied population, which means that many people were exposed to cigarette smoke in their own homes. This type of exposure can have serious consequences for respiratory health, especially in children.

The survey results showed that cough was the main respiratory symptom present in children exposed to passive smoking, followed by wheezing and rapid breathing. These symptoms may be indicative of respiratory diseases such as asthma.

In fact, exposed children were three times more likely to develop respiratory diseases when compared to unexposed ones. This means that passive smoking at home can be an important risk factor for the development of respiratory diseases in children.

In addition, an inverse relationship was found between the level of education and smoking habit in the studied population. It is important to point out that increasing the level of schooling can be an effective intervention measure to combat passive smoking. Individuals with a higher educational level are less likely to expose their families to secondhand smoke, in addition to being more aware of the risks of smoking and more likely to seek help to quit smoking. It is necessary to implement measures to reduce children's exposure to passive smoking, such as encouraging parents to smoke outside the home and educating children about the dangers of tobacco.

## CONFLICT OF INTERESTS

Nothing to declare.

## AUTHORS' CONTRIBUTION

DNCM: Conceptualization, Data Curation, Formal Analysis, Writing – Original Draft, Writing – Review & Editing. RLA: Data Curation, Formal Analysis, Writing – Original Draft, Writing – Review & Editing. AGNC: Conceptualization, Data Curation, Formal Analysis, Writing – Original Draft, Writing – Review & Editing.

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