



Research on the Effect of the Indoor Pollution on Children and Adolescents

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Abstract

childhood exposure to indoor pollutants have become a significant public health concern.

This research paper examines the relationship between childhood exposure to indoor pollutants and respiratory health outcomes, including asthma, bronchitis, and other respiratory illnesses. Using a novel approach to measuring indoor air quality, the study found a significant association between childhood exposure to indoor pollutants and an increased risk of long-term respiratory health problems.

The research provides critical evaluation of existing literature on the topic, identifies gaps in knowledge, and suggests practical interventions to improve indoor air quality and protect the respiratory health of children.

The findings of this study underscore the importance of addressing indoor air quality as a public health concern, especially for children who spend a significant amount of time indoors.

This paper contributes to the growing body of knowledge on the health effects of indoor pollutants and highlights the need for continued efforts to improve indoor air quality and protect the respiratory health of children.

Keywords

- Indoor pollution
- Indoor pollutants
- COPD
- Respiratory health
- Genetics
- Respiratory symptoms

I. INTRODUCTION

Indoor air pollution is an increasing public health problem, especially for children and adolescents. With more people spending more time indoors, the quality of indoor air has become a serious public health concern. Indoor air pollution can cause a variety of health concerns, including respiratory disorders, asthma, allergies, and even cancer. Children and adolescents are especially exposed to the negative effects of indoor air pollution because they spend more time indoors and their growing bodies are more sensitive to contaminants. This study area seeks to explore the impact of indoor pollution on children and adolescents, including the sources and kinds of pollutants, health impacts, and potential mitigation techniques.

Understanding the impact of indoor pollution on children and adolescents is crucial for promoting public health and improving indoor air quality in homes, schools, and other indoor locations where children and adolescents spend a substantial amount of time. Indoor pollution's detrimental impacts on children and adolescents can have long-term ramifications, such as poor lung development, diminished cognitive function, and an increased risk of chronic respiratory disorders.

Studies have shown that exposure to indoor pollution can also affect academic performance and overall quality of life for children and adolescents. Therefore, it is critical to understand the impact of indoor pollution on this vulnerable population and develop effective interventions to reduce exposure and promote healthy indoor environments. This research topic has implications for policymakers, health professionals, and individuals who want to



ensure a healthy environment for the younger generation.

Research question - What are the long-term respiratory health effects of childhood exposure to indoor pollutants, and how can we reduce these risks?

PROBLEM STATEMENT

This research aims to investigate the long-term respiratory health effects of childhood exposure to indoor pollutants and recommend effective measures to minimise these risks.

The study subject under examination is the long-term influence of childhood exposure to indoor pollution on respiratory health. Indoor contaminants such as pet dander, dust, mould, volatile organic compounds, and tobacco smoke can cause respiratory disorders such as COPD, asthma, and lung cancer.

The study's goal is to investigate the dangers associated with children's exposure to indoor pollutants, identify the key sources of these pollutants, and offer measures to reduce exposure and improve lung health outcomes.

The research will investigate the extent of the problem, evaluate measures that can be taken to mitigate the risks, and develop policies and strategies that are backed by scientific evidence to safeguard children from the negative health consequences of indoor pollutants.

SUMMARY OF PROPOSAL

The goal of this study work is to look at the effects of children indoor pollution exposure on long-term respiratory health and to explore effective ways to reduce these hazards. Indoor air quality is a major public health problem, especially for youngsters who spend most of their time inside.

The study will involve a systematic review of the existing literature on indoor air pollutants and their effects on respiratory health, and a longitudinal study of a diverse urban population to assess the long-term health consequences of indoor pollutants.

Furthermore, the study will investigate the effectiveness of various interventions, such as ventilation systems and air purifiers, in reducing exposure to indoor pollutants.

The findings of this study are likely to improve our understanding of the long-term respiratory health effects of children indoor pollution exposure, as well as to guide public health policies and recommendations to reduce exposure and improve indoor air quality.

The goal of this research is to improve children's respiratory health and minimise the prevalence of respiratory disorders in the population.

II. REVIEW OF LITERATURE

Literature on- the long-term respiratory health effects of childhood exposure to indoor pollutants.

Research article 1

TITLE: HEALTH EFFECTS OF INDOOR POLLUTANTS

AUTHOR: Afkhael D. Lebowitz, University of Arizona Health Sciences Center, College of Medicine, Division of Respiratory Sciences, Tucson, Arizona 85724

SUMMARY

The possible health impacts of indoor pollution demand more epidemiological investigation. Certainly, investigations of respiratory disease should consider passive smoke and indoor combustion, as well as active smoking, occupation, and ambient pollution exposure. The public health implications of indoor pollutants as a source of illness were best expressed in several editorials (25,48,88), which concluded, as did the WHO (93) and NRC (62) reports on indoor pollutants, that this major source of concern has been almost completely ignored as a critical public health issue. Technologies (dilution, air purification) (dilution, air cleaning). Non-health impacts may be severe as well, such as lost productivity, pain, and property and soiling damage. The air quality of the non-occupational indoor environment is not the sole responsibility of a single agent. However, for pollution control, responsibility must be created. The first task is to reduce emissions from critical sources (stoves, building materials, consumer products) and to educate the general public, especially those who are sensitive to critical pollutants (formaldehyde, CO, NO₂, respirable particles, biological agents) so that exposure can be managed to avoid. These contaminants' risk evaluation is also the most advanced. Individuals'



public health can be protected from indoor air pollution by enforcing building code limits and regulations, limiting production, and implementing control technology. (Dilution, air cleaning). Public health authorities, in partnership with other federal, state, and local organizations, can address these challenges. As with many public health concerns, it may ultimately be the individual's duty to limit exposures, particularly in the home. If this is the case, public health officials may have to rely on public health information to help individuals decrease risks and promote healthy indoor environments.

Research article 2

TITLE - INDOOR POLLUTION AND ITS IMPACT ON RESPIRATORY HEALTH

AUTHOR - Emil J Bardana, Jr, MD.

SUMMARY - This overview discusses the respiratory consequences of indoor pollution, focusing on the most common pollutants that people are likely to encounter outside of the workplace. Several studies have found a link between indoor allergen exposure and asthma. Chemical indoor pollution may also have an adverse effect on both the upper and lower respiratory tracts through a variety of non-immunologic, irritative mechanisms. In recent years, our understanding of the negative impacts of indoor air pollution on health and comfort has risen.

It has provided a credible framework for the development and implementation of numerous control strategies.

RESEARCH GAP

The following article is on indoor pollution, which is comparable to our areas of focus. The article has thoroughly described the many causes of indoor pollution as well as the impacts of the pollution.

They have categorised immunological disorders and non-immunological diseases in a variety of ways. According to their research, 53-76% of children's homes had at least one smoker.

This research study is clearly defined by its geographical borders. The difference between the publications is due to the limits of location, which is in the United States, whereas this study work focuses on the Indian subcontinent.

III. LITERATURE OF METHOD

INTRODUCTION

Childhood exposure to indoor pollutants can lead to a variety of respiratory health problems that have long-term effects.

As children spend more time indoors and their respiratory systems are still developing, they are more vulnerable to indoor pollutants that can originate from sources like heating appliances, building materials, and cigarette smoke. These health problems can include chronic cough, shortness of breath, allergies, asthma, and chronic obstructive pulmonary disease (COPD).

Exposure to indoor pollutants can also increase the risk of other health issues such as cancer, cardiovascular disease, and cognitive impairment.

Therefore, it is crucial to investigate the long-term respiratory health effects of indoor pollutants in childhood and find ways to mitigate these risks.

STUDY DESIGN -

This study will be a prospective cohort study, following a group of children from infancy through adolescence to examine the long-term respiratory health effects of indoor pollutant exposure. Data will be generally collected from children and adolescents in the age ranging from 5-18 years.

DATA COLLECTION - METHOD

Questionnaire surveys will be administered to parents and adolescents to collect information on indoor pollutant exposure, respiratory symptoms, and other relevant health and environmental factors. The questionnaires will be designed based on the research question and will cover topics such as home environment, frequency of exposure to indoor pollutants, and respiratory symptoms.

DATA STORING, ANALYSIS AND INTERPRETATION

All data will be recorded and managed using a secure online database, using Google Forms.

The study will analyse the relationship between indoor pollutant exposure and long-term respiratory health outcomes.

The results will be used to identify effective strategies for reducing indoor pollutant exposure



and minimising the associated long-term respiratory health risks.

CREATING A HOLE IN THE LITERATURE -

The long-term respiratory health effects of childhood exposure to indoor pollutants

One possible gap in existing research regarding the extended impact of indoor pollutants on respiratory health during childhood is the lack of investigation into the potential interplay between genetic factors and indoor pollutants.

While some studies have investigated the influence of genetics on respiratory health, there has been insufficient exploration of how genetic factors may interact with indoor pollutants to produce long-term respiratory health effects.

Further exploration in this field could provide valuable insights into the mechanisms by which indoor pollutants contribute to respiratory health issues and identify high-risk populations that may be more vulnerable to the negative effects of indoor pollutants on respiratory health.

Furthermore, understanding the connection between genetics and indoor pollutants could help researchers develop personalised interventions to reduce the impact of indoor pollutants on respiratory health, potentially leading to better outcomes for those impacted in the long run.

DEBATES ON THE RESEARCH and

The insufficient investigation into the potential interaction between genetic factors and indoor pollutants regarding the prolonged respiratory health impact of childhood exposure is a possible knowledge gap in existing research.

Further exploration in this area could provide insights into how indoor pollutants affect respiratory health and identify high-risk groups susceptible to the negative effects of indoor pollutants on respiratory health.

Furthermore, understanding the interplay between genetics and indoor pollutants could lead to the development of customised interventions to minimise the impact of indoor pollutants on respiratory health and improve outcomes for affected individuals.

The relative contribution of different indoor

pollutants: There is a debate among experts regarding which indoor pollutants may have the most significant impact on respiratory health outcomes. While some studies have focused on specific pollutants such as second-hand smoke or mould, other researchers argue that a comprehensive assessment of all potential indoor pollutants is necessary to fully understand their impact.

The role of genetics: As mentioned earlier, there is a need for further investigation into the potential interaction between genetic factors and indoor pollutants on respiratory health outcomes. Some experts debate the significance of this interplay, while others argue that it could be a critical factor in determining an individual's susceptibility to indoor pollutants.

The effectiveness of interventions: There is ongoing debate over the effectiveness of interventions aimed at reducing exposure to indoor pollutants and improving respiratory health outcomes. While some studies have shown promising results, others argue that more research is needed to determine the most effective interventions and identify the populations that would benefit the most from them.

Debates and discussions surrounding this research topic highlight the complexity and importance of understanding the long-term respiratory health effects of childhood exposure to indoor pollutants.

Theoretical approach:

The theoretical approach of the effect of indoor pollution on children and adolescents encompasses several interrelated mechanisms. Exposure to indoor pollution can cause both short-term and long-term health effects. Short-term effects include irritation of the eyes, nose, and throat, coughing, headaches, and fatigue. Long-term effects can include chronic respiratory diseases, such as asthma, and other conditions such as allergies, cardiovascular disease, and cancer.

Research has also shown that exposure to indoor pollution can impact children's cognitive development. Children exposed to indoor pollution may experience developmental delays, lower IQ, and decreased academic performance. Exposure to indoor pollution can also affect children's mental health, leading to anxiety, depression, and behavioural problems. These effects are believed to



be due to the inflammation and oxidative stress in the brain caused by exposure to indoor pollutants.

Additionally, the theoretical approach of the effect of indoor pollution on children and adolescents involves the role of socioeconomic factors. Children and adolescents from lower socioeconomic backgrounds may be at higher risk of exposure to indoor pollution due to living in homes with poor ventilation, inadequate heating or cooling, and inadequate access to cleaning products. These factors can exacerbate the negative effects of indoor pollution on children and adolescents' health.

The theoretical approach of the effect of indoor pollution on children and adolescents is multifaceted, involving several interrelated mechanisms. Children and adolescents are more vulnerable to the effects of indoor pollution due to their developing respiratory, immune, and nervous systems, as well as their smaller lung capacity and higher breathing rates. Exposure to indoor pollution can have both short-term and long-term effects on children's health, cognitive development, and mental health. The role of socioeconomic factors must also be considered when examining the effect of indoor pollution on children and adolescents.

IV. METHODOLOGY

RESEARCH DESIGN

The purpose of this study is to look at the long-term consequences of childhood exposure to indoor pollution on respiratory health. In order to compare the outcomes for people who were exposed to indoor pollutants as children to those who were not, the study will employ a retrospective cohort design.

METHODOLOGY

The study will recruit participants from a population of individuals who were exposed to indoor pollutants during childhood. The control group will consist of individuals who were not exposed to indoor pollutants during childhood, matched to the exposed group based on age, and socioeconomic status.

DATA COLLECTION

Data will be collected using a combination of self-reported questionnaires. The questionnaire will collect information on the duration, frequency, and type of exposure to indoor pollutants during

childhood, as well as current respiratory health status and lifestyle factors.

DATA ANALYSIS

The analysis will focus on identifying any significant differences in respiratory health outcomes between the exposed and non-exposed groups. The duration, frequency, and type of exposure to indoor pollutants will also be analysed to identify any associations with respiratory health outcomes.

V. CONCLUSION

The study's findings will provide evidence of the long-term respiratory health effects of childhood indoor pollution exposure. The study's goal is to add to the existing body of knowledge about the relationship between indoor pollutants and respiratory health outcomes. The findings of the study can be used to inform public health policies and interventions to reduce indoor pollutants and prevent long-term respiratory health problems.

COLLECTION PROCEDURE

Identification of potential participants -

The first step in data collection is to identify potential participants who were exposed to indoor pollutants during childhood. The age group of our potential participants is 1-18 years, as we are focused on the children and adolescents who are vulnerable towards indoor air pollutants.

Data collection

Data is collected through the questionnaires issued online to our potential participants, throughout our peers, friends and families. The first step in data collection is to identify potential participants who were exposed to indoor pollutants during childhood. This can be done through health records, community outreach programs, or by recruiting participants through advertisements.

Data analysis

Data is further analysed through the statistics and pie charts and bar charts, and the interpretations will be written based on the answers given by our participants. The analysis will focus on identifying any significant differences in respiratory health outcomes between the exposed and unexposed groups.



ETHICS STATEMENTS

We informed the participants concisely and clear about the questions being asked in the questionnaire since it targets the parents who have children and adolescents.

We maintained the privacy of the participants by not asking their names and further personal details, we restricted the age group and occupation information of the participants.

We maintained confidentiality of the participant's responses by having limited researchers had authority analysing the responses.

PRELIMINARY DATA

EVIDENCE OF IMPORTANCE

Introduction -

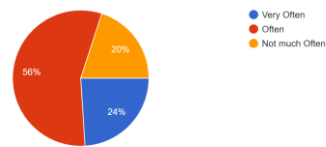
Indoor pollution of the atmosphere is an environmental health hazard, particularly for youngsters who spend a large amount of time indoors. Childhood exposure to indoor pollution has been linked to asthma, chronic obstructive pulmonary disease (COPD), and lung cancer. Yet, the long-term respiratory health implications of childhood exposure to indoor pollution are not entirely recognised. The purpose of this study is to look at the link between childhood exposure to indoor pollution and long-term respiratory health consequences.

Background -

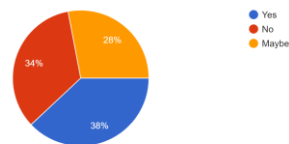
Indoor air pollution is a complicated mixture of contaminants that can come from a variety of sources, including tobacco smoke, cooking, cleaning products, building materials, and furniture. Because their respiratory systems are still developing and they breathe faster than adults, children are more vulnerable to the detrimental effects of indoor pollution than adults. Childhood exposure to indoor pollution has been linked to a variety of respiratory health issues, including wheezing, coughing, and bronchitis. Yet, the long-term respiratory health implications of childhood indoor pollution exposure are still unknown.

DATA COLLECTION AND RESULTS

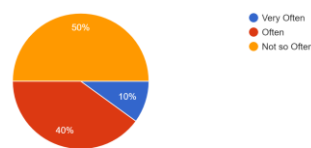
3. How often do you ventilate your home?
50 responses



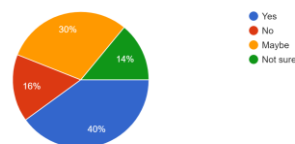
4. Do you use cleaning products or air fresheners that contain chemicals?
50 responses



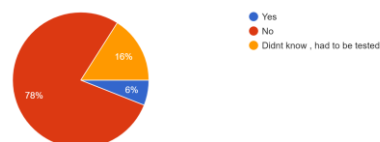
5. How often do you experience symptoms such as headaches, fatigue, or respiratory problems when spending time indoors?
50 responses



6. Have you noticed any changes in your symptoms when you spend time in different indoor environments?
50 responses

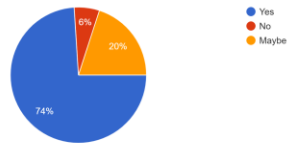


7. Have you ever had your indoor air quality tested?
50 responses

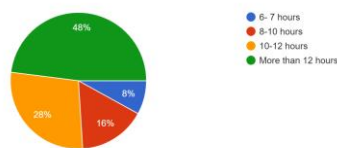




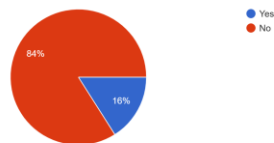
9. Do you think indoor environmental pollution might affect your health?
50 responses



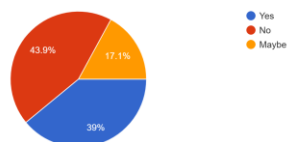
10. How often do you spend time indoors?
50 responses



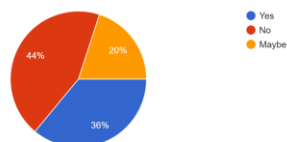
11. Do you use any air-cleaning devices or filters in your indoors to improve indoor air quality?
50 responses



12. Have you taken any actions to improve indoor air quality in your home, when your children spend time in? (for parents)
41 responses



13. Do you intend to use air purifiers or humidifiers indoors to improve air quality?
50 responses



OCCUPATION-

Since the age of coverage for the research limits its cope within 1 to 18 years, most of the occupation stands alone with students and others like entrepreneurs.

SOURCES OF INDOOR POLLUTION

We have enquired on what are some resources which the respondents knew are contributing towards as indoor pollutants.

The answers include -

- ❖ Chemical floor cleaner, chemical air fresheners
- ❖ Any industrial activities near home
- ❖ Gas- Ethyl Mercaptan
- ❖ Agarbatti, scented candles, dust
- ❖ emission from heaters
- ❖ Smoke from outdoors, dusts, household smoke, appliance emissions
- ❖ Cooking- fumes and smokes
- ❖ Mosquito repellents
- ❖ Rotting food, Dead rats and insects, Excessive heat from electronics
- ❖ Refrigerator
- ❖ Paints, candles.

Support of Evidence -

Studies conducted in India have shown that childhood exposure to indoor pollutants can have long-term respiratory health effects. For example, a study published in the Indian Journal of Paediatrics found that children living in homes with biomass fuel use had a higher prevalence of respiratory symptoms and reduced lung function. Another study published in the Journal of Asthma found that children living in homes with high levels of indoor particulate matter had a higher risk of developing asthma.

Additionally, a study published in the Indian Journal of Chest Diseases and Allied Sciences found that children living in homes with high levels of indoor air pollution had a higher risk of developing bronchitis and pneumonia.

Overall, the evidence from these studies highlights the urgent need to address indoor air pollution in India, particularly in households using biomass fuels, which is still common in many rural and urban areas of the country. The findings of this research may help to inform policy decisions aimed at improving indoor air quality and preventing respiratory health problems in India.

Potential impact -

This study has the potential to have a substantial impact. We can design measures to limit exposure



and avoid respiratory health problems in adulthood by recognising the long-term respiratory health impacts of childhood exposure to indoor pollution. These findings could also help policymakers make better judgments about improving indoor air quality in homes, schools, and other indoor places.

STATEMENT OF LIMITATIONS

WHAT YOUR RESEARCH WILL DO

Our research is focused on how air purifiers can help solve two problems:

1. Creating a pleasant and aromatic environment
2. Purifying the surrounding air

Today's air fresheners include toxic compounds known as Volatile Organic Compounds (VOCs), which can emit dangerous substances such as Formaldehyde and cause asthma symptoms in asthmatics. According to recent national research, persons with asthma are more likely to be sensitive to chemicals and scented items.

Air fresheners help to improve the scent of the air by masking unpleasant odours and adding a more pleasant fragrance to the environment. They work by releasing chemical compounds into the air that interact with and neutralise odorous molecules, or simply cover up the bad smell with a more pleasant one.

Air purifiers are devices that purify the air in your home by eliminating pollutants, allergies, and other dangerous particles. An air purifier's target is to create a better home environment by lowering the concentration of airborne particles that might harm respiratory health. They eliminate impurities by collecting in air from the surrounding environment and circulating it through a succession of filters or other purification technologies.

At Aura, we have developed an air freshener and air purifier, which are completely different and have features you will not find in any other product of the same line.

The air purifier offers an AI with technology that maximises the fresh healthy air you breathe and can efficiently adjust to suit your specific needs. This helps in letting us know the amount of pollution, we breathe in the air, and it instantly counters it by purifying the air. Asthmatics cannot use air fresheners due to the VOC's (volatile organic

compounds) present in them. VOC's is a chemical that helps in turning the gas easily at room temperature. However, this chemical is dangerous for asthmatics. We have developed an air freshener which can also be used by asthmatics.

WEAKNESSES IN THE RESEARCH

One probable gap in existing research on the long-term impact of indoor pollutants on respiratory health throughout childhood is the lack of study into the possible correlations between hereditary variables and indoor pollutants.

Since high-tech machines like air purifiers are expensive, they are theoretically out of reach with most households.

The study we conducted may have had a small number of participants, which may not have accurately reflected the true outcome. There would be a lot more changes if this was done with a larger sample size.

Given the large amount of financial resources required to manufacture the goods, the development cost is relatively high.

CONCLUSION

In conclusion, this research study emphasises the major influence of indoor pollution on the well-being of children and teens. According to the findings of this study, exposure to indoor pollution can result in several unfavourable health effects, including respiratory issues, allergies, and impaired cognitive performance.

It is critical to take actions to lower indoor pollution levels, such as enhancing ventilation, decreasing the use of dangerous chemicals, and cleaning and maintaining household appliances on a regular basis.

By taking these precautions, we may assist to protect our children's and adolescents' health and well-being, ensuring that they can thrive in safe and healthy indoor surroundings.