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Impact of Indoor Air Pollution on Women's Health: A Study on Sylhet City

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ABSTRACT: Indoor air pollution is a significant and often overlooked environmental concern that has far-reaching implications for human health. In Bangladesh, indoor air pollution is one of the greatest environmental health risks. The study aims to provide insights into the specific ways in which indoor air pollution affects women's health and well-being, as well as to identify potential strategies for mitigating these effects. With a focus on the diverse sources of indoor pollutants and their potential health effects. This qualitative research paper describes the impact of indoor air pollution on women's health, focusing on the experiences, perceptions, and challenges faced by women in relation to their indoor living environments. This research used a qualitative approach, descriptive type research, purposive sampling strategy, and utilizing semi-structured interviews as the primary data collection method. A sample size of 50 women is targeted, with data saturation as the criterion for stopping data collection. Thematic analysis is used to analyze the interview transcripts. A critical analysis of the health effects of indoor air pollution on women is presented, encompassing consequences. The effects include exacerbation of respiratory conditions, allergies, eye and skin irritations. In conclusion, this research paper emphasizes the urgent need for a comprehensive understanding of the intricate relationship between indoor air pollution and women's health. It underscores the importance of interdisciplinary collaboration among public health experts, environmental scientists, policymakers, and advocates to develop effective strategies that safeguard women's well-being.

KEYWORDS: Eye and nose irritation, Indoor air pollution, Proper ventilation, Pollutant particles, Respiratory infection, Women's health.

1.0 INTRODUCTION

In developing countries, household energy consumption has environmental impacts similar to those in more developed nations. However, while developed countries often view energy-related issues on a broader scale, such as global warming, nuclear waste management, and unsustainable fuel extraction, the environmental challenges in developing countries are experienced more directly. (Alharthi et al., 2022). 90% of rural households and use solid fuel for indoor cooking, heating, and lighting (Kuvmar et al., 2023). Biomass (wood and agricultural waste), coal, and kerosene used in open fires and inefficient stoves are the main types of solid fuel. Most of these individuals are underprivileged and reside in low- and middle-income nations. Wood, animal dung, and crop residue are examples of renewable organic matter that can be obtained from animal and plant remains (Ali et al., 2021).

Due to the low quality of fuel, limited combustion scale, inefficient stoves, and inadequate ventilation, burning biomass can pose significant health risks. These include lung diseases, eye issues, and burns. Additionally, young children who stay in the kitchen with their mothers are at high risk of developing acute respiratory infections, pneumonia, tuberculosis, chronic obstructive pulmonary disease, and cardiovascular problems, all of which are influenced by smoke particles. (Fullerton et al., 2008). Particulate matter, chemical substances, and biological materials are all components of air pollution, which is a complex and ubiquitous mixture of pollutants. Domestic pollution affects health because people spend the majority of their time indoors. In today's world, nearly half of the global population is exposed to significant levels of smoke from solid fuels like biomass, coal, and wood. This issue predominantly affects rural areas in developing nations, where inefficient open fires are commonly used. (Perez-Padila et al., 2010). Household air pollution results from using inefficient and polluting fuels and technologies in and around homes. These sources release various harmful pollutants, including fine particles that can penetrate deep into the lungs and enter the bloodstream, posing significant health risks. Indoor air pollution poses a major public health concern, especially in developing nations like Bangladesh. It refers to the presence of harmful pollutants in indoor environments that can negatively impact human health. Most households rely on biomass fuels like wood, dung, and agricultural waste for cooking and heating. When these fuels are burned, they emit dangerous pollutants such as carbon monoxide, nitrogen dioxide, particulate matter, and volatile organic compounds. (Dey et al., 2017).

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In Bangladesh, a study conducted by the World Health Organization (WHO) in 2016 reported that 97,000 premature deaths occur every year due to indoor air pollution. Indoor air pollution that is rapidly unfolding with significant bearing on human health specially women's health. Despite the growing importance of pollution issues like indoor air pollution and its impact on human health specially women and girl. Despite this, the topic hasn't received much research. As a result, the purpose of this study is to investigate the effects of indoor air pollution on women's health in Sylhet City and suggest potential interventions to reduce the health risks associated with it. The problem addressed in this study is the limited understanding of the specific health risks faced by women due to indoor pollution. While research on indoor pollution has provided valuable insights into its overall health effects, the gender-specific impact on women's health remains understudied. This knowledge gap hampers the development of targeted interventions and policies to mitigate the health risks faced by women.

1.1 Statement of the problem:

Women and children are particularly susceptible to the health impacts of indoor air pollution because they spend more time exposed to it. This type of pollution represents a significant health threat, with women being disproportionately affected for various reasons. Firstly, women often spend more time indoors, especially in developing countries, where they perform household chores such as cooking, cleaning, and childcare. Women, being more exposed to indoor environments due to their roles and responsibilities, are particularly vulnerable to the adverse effects of indoor air pollution. They are usually responsible for cooking and other household chores, are more exposed to these pollutants and smoking, building materials, and other sources (WHO, 2022). Secondly, women's physiological traits, including smaller lung capacity and hormonal variations, could heighten their sensitivity to the harmful effects of indoor air pollution. Moreover, pregnant women and infants are especially at risk, as exposure to indoor pollutants may result in negative birth outcomes and developmental problems. Indoor air pollution can affect women's health in multiple ways. Women exposed to indoor pollutants frequently report respiratory issues, such as asthma, chronic obstructive pulmonary disease (COPD), and respiratory tract infections. Additionally, exposure to indoor air pollution has been linked to a higher risk of cardiovascular conditions, including hypertension and heart disease, among women. Other potential health effects may include allergies, eye and skin irritation, reproductive issues, and an elevated risk of certain cancers.

1.2 Rationale of the study:

Research on indoor air pollution's impact on women's health is crucial due to their disproportionate exposure from household activities. This exposure can cause respiratory diseases, cardiovascular issues, and adverse pregnancy outcomes. Understanding these risks helps develop targeted interventions and policies to improve women's health. By identifying how indoor pollutants affect women, interventions can focus on reducing exposure and enhancing indoor air quality. Moreover, this research offers insights into the intersectional dynamics of health, considering biological, social, and environmental factors. Addressing indoor air pollution becomes imperative for broader public health efforts. The findings can inform policymakers, healthcare professionals, and individuals about the importance of mitigating indoor pollution and implementing appropriate interventions to safeguard women's health. Therefore, conducting a thorough investigation into this topic will provide critical insights into the specific health impacts of indoor air pollution on women, leading to more targeted interventions, policy recommendations, and public awareness campaigns to reduce the associated risks.

1.3 Objective of the Study:

The broad objective of this study is to know impacts of indoor air pollution on women's health in the Sylhet district in Bangladesh.

Specific Objective:

- To identify the causes and forms of indoor air pollution.
- To investigate the risk factors that make women vulnerable due to indoor air pollution.
- To propose potential strategies and actions to reduce the adverse health effects of indoor air pollution in Sylhet City.

1.4 Research Questions:

- What are the common respiratory symptoms experienced by women due to exposure to indoor air pollution in Sylhet City?
- What are the other health-related issues associated with indoor air pollution experienced by women in Sylhet City?
- What are the potential interventions to reduce indoor air pollution and its health effects on women in City?

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1.5 Review of Relevant Literature:

Fine particulate matter (PM) from indoor air pollution (IAP) contributes to over a million deaths globally each year. (Junaid et al., 2018). Globally almost 3 billion people depend on charcoal, animal dung, agriculture waste etc., for cooking and heating (Chaudhury et al., 2022). The concentration of indoor air pollutants has been associated with the use of different types of fuels for kitchen stoves and the ventilation systems used. (Sidhu et al., 2017). Most of these stoves have very incomplete combustion, which produces significant emissions that, combined with poor ventilation, result in extremely high levels of indoor pollution (Bruce, 2000). More than 75% of households in Bangladesh still cook with solid fuels, and it was discovered that the indoor air pollution brought on by this caused more than 94,800 deaths in just 2019 alone (Molla, 2022) . Air Pollution and respiratory diseases are deeply connected. Lung cancer, respiratory allergies and acute respiratory infections are all associate to air pollution exposure (Mannucci et al., 2015). The use of smoky fuels has been related to respiratory distress symptoms in studies conducted in West India, Ladakh, and China among various age groups, some with large population samples (Chen et al., 1990).

Zhang and Smith (2003) highlighted that inefficient burning of solid fuels in rudimentary stoves strains fuel resources due to low energy efficiency, primarily resulting in incomplete combustion yielding harmful byproducts like CO, particulate matter, and organic compounds (Zhang & Smith, 2003). Women and children bear the highest health burden from using polluting fuels and technologies in homes, as they are usually responsible for tasks such as cooking and gathering firewood. (WHO, 2022). To decrease household air pollution and safeguard public health, it is crucial to increase the use of clean fuels and technologies. This includes biomass stoves that comply with the WHO emission guidelines, as well as energy sources likes solar power, electricity, biogas, liquefied petroleum gas (LPG), natural gas, and alcohol-based fuels (WHO, 2020). Cow-dung use in indoor kitchen produces four time more pollutants than LPG kitchen (Sidhu & Ravindra, 2017).

Nonetheless, homes are dangerously polluted by particulate matter (PM). PM is primarily produced indoors by open fires and leaky stoves burning conventional fuels like coal, kerosene oil, dung, household waste, and crop residues (Barnes & Smith, 1994). Some equipment that uses kerosene releases large amounts of fine particulates, carbon monoxide (CO), nitric oxides (NOx), and sulfur dioxide (SO2) (Nicholas L. Lam, 2012). Significant health risks like acute and chronic respiratory illnesses, lung malfunctions, asthma, and preterm births are caused by indoor PM emissions (Zaidi et al., 2011); (Yamamoto et al., 2014). According to certain types of literature, women over 30 who are exposed to coal smoke have a significant increased risk of developing lung cancer and COPD. (Smith, 2004).

Nahian et al. (2023) investigated the detrimental effects of air pollution on pregnant women's health, specifically preterm births and low birth weights. Indoor Air Pollution has been connected to low birthweights and infant mortality (Bruce, 2000). Due to air pollution, there is a significant gender difference in the risks of Low Birth Weight and Premature Birth, with males being more likely to experience Premature Birth than female fetuses. Air pollution contributes to adverse pregnancy outcomes (Nahian et al., 2023). Khan et al. (2017) assess the association between Household Air Pollution and the risk of selected adverse birth and maternal health outcomes. Indoor cooking and the use of solid fuel in households increase the risk of Acute Respiratory Infection, Low Birth Weight, cesarean delivery, and pregnancy complications. To lessen such detrimental health effects, it is recommended to promote the use of clean fuels and structural home design changes like adding stove ventilation (Khan et al., 2017). Acute Respiratory Infections are the biggest killer of children under five and responsible for 9% of the global burden of disease (Rouse, 2005).

Agarwal et al. (2020) found that pregnant women who used solid fuels or biomass for cooking had a higher risk of developing preeclampsia and eclampsia. The study assessed the exposure of pregnant women to indoor air pollution. (Agarwal et al., 2020). Even though the use of biomass fuel has decreased in recent years, about 80% of India's domestic energy is still produced by burning biomass (Suresh et al., 2016). Thornburg et al. (2022) carried out a feasibility study to assess personal exposure measurement techniques to fairly assess decreases in exposure to household air pollution. The researchers gathered questionnaires and observational data about the use of kerosene lamps, mosquito coils, and biomass fuel for household heating, as well as other possible sources of residential air pollution. (Thornburg et al., 2022). Rouse, J. R (2005) gives a summary of the problems associated with indoor air pollution (IAP), explains the significance of addressing IAP, and examines the lessons that have been applied internationally and their relevance to Bangladesh. (Rouse, 2005). Numerous indoor air contaminants, including odorous and non-odorous gases and vapour as well as particles, have been identified by some studies. While it has been hypothesized that some of these contaminants may have adverse health effects, establishing causality is incredibly challenging even in situations where there are elevated levels of potentially toxic substances.

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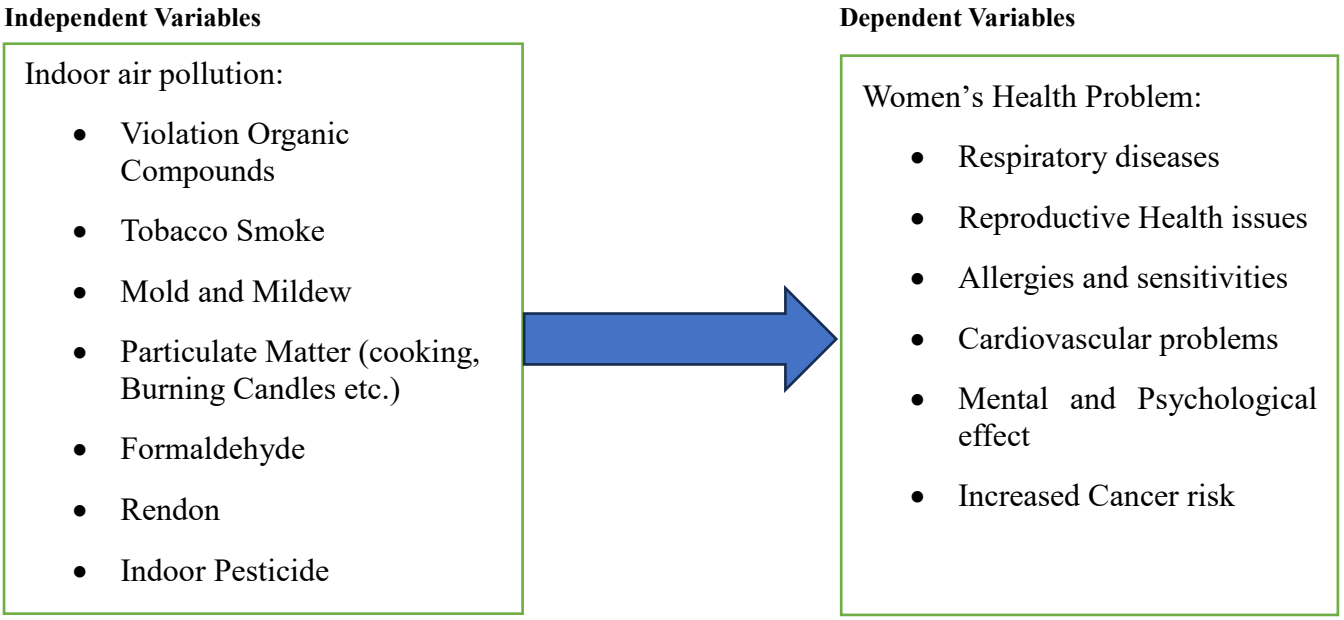
The majority of the research papers attempt to draw a picture of the impact of Indoor Pollution and Women's and Children Health with the different divisions and developing countries with different dimensions. But there is limited research conducted on Sylhet District as it is comparatively newer than the other ones. Furthermore, because Bangladesh's various regions have diverse socioeconomic environments, the effects of indoor air pollution will also vary. This study aims to close the knowledge gap regarding the effects of indoor air pollution on women's health in the district of Sylhet.

1.6 Conceptual Framework:

Conceptual framework refers to the relationship between two variables which have been studies. It comprises of independent variables and dependent variables.

Independent Variable: Independent variables are the variables that are free of any effect by the other variables. In this study, Independent variables are identified according to the relevant literature, newspaper sources and objectives of the study, and the variables related to different form of indoor pollution these are, Violation Organic Compounds, Tobacco Smoke, Mold and Mildew, Particulate Matter (cooking, Burning Candles etc.), Formaldehyde, Rendon, Indoor Pesticide etc.

Dependent Variable: Dependent variables are Women's health which are affected by other variables or dependent on them. Dependent Variable are Respiratory infections, Chronic bronchitis and chronic obstructive lung disease, Acute lower respiratory infection, Cardiovascular diseases, Low birth weight and infant mortality.



1.7 Operational Definitions:

- **Impact:** The noun "impact" can denote a physical force, such as a collision, an influence, like that of a negative role model, or a significant effect.
- **Indoor Air Pollution:** The term "indoor pollution" describes the existence of pollutants in enclosed areas or buildings that may be harmful to both the environment and human health. That means that indoor air pollution is the term used to describe the various pollutants that can have a negative impact on human health that contaminate indoor air.
- **Women's Health:** The field of medicine known as "women's health" focuses on the treatment and diagnosis of illnesses and conditions that have an impact on a woman's physical and mental health.

1.8 Research Design:

1.8.1 Research type: The study uses a descriptive research design in order to determine the impact of indoor air pollution on women's health in Sylhet City.

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1.8.2 Approach of the Research: The study is an inductive attempt to explore the effect of indoor air pollution on women's health. Thus, it is conducted with a qualitative approach. The qualitative approach is used so that a deeper understanding of the context, and experience of different health problems of women to indoor air pollution can be identified.

1.8.3 Area of the Research: For conducting the study, out of 39 wards of Sylhet City Corporation, Ward no. 25 is chosen on purpose as it is more convenient, both cost and time effective for the researcher. Mominkhola, Godrail, Khojarkhola, Barokhola, Musargoan, Lawai, Daudpur, Kajirkhola, Ganguare the areas under ward 25 of Sylhet City Corporation (Wikiwand, 2023). The study area has been selected based on geographical settings and distance to the researcher's residence. On the other hand, budget is another factor to selecting area of the study.

1.8.4 Population of the Study: The population is a distinct group of individuals or items having common features under a study. In this study, the inhabitants of the wards under Sylhet City Corporation are the population.

1.8.5 Sample and Sampling Method: Sampling is the process of collecting sample from the population. Convenience sampling, a type of non-probability or purposive sampling is chosen. Using a sampling technique known as "purposive sampling," participants are selected from the entire population based on the goal of the research. This sampling method is also known as judgmental sampling. And 50 respondents chosen on purpose have been interviewed to know whether the effect of indoor pollution on women's health.

1.8.6 Research Methods: For this research, Interview method is used as the research method to collect information from selected respondent. From interview via semi-structured questionnaire were chosen to obtain necessary information.

1.8.7 Sources of Data: Primary Sources of Data are collected directly from the field. The data for the study are collected from the primary source in the form of face-to-face interview. Some of the data of this study are collected from secondary sources. Secondary Sources of Data are collected from the journals, books, newspapers, magazines, internet etc.

1.8.8 Data Collection Tools and Technique: In this study, primary data has been collected through semi-structured interview. Interviews were taken by following a semi-structured questionnaire composed of open ended question and secondary data was collected from different books, journals, articles, and websites. The interviews were conducted by using face to face interview. The independent variables, which are contained in the conceptual framework were used to create a semi-structured questionnaire which was developed to conduct the interviews, and the average duration of an interview was about 10-15 minutes. After completing, the interviews translated into a transcribed.

1.8.9 Data Analysis: In the process of face-to-face interview, the responses of women to open ended questions are written down or recorded and also a quality check is done right after the completion of the task. They transcribed into words later. Following the transcription of the audio and analysis of the field notes, multiple themes and sub-themes were identified, aligned with the research objectives, questions, and conceptual framework.

In a brief to analyze the qualitative data, thematic analysis was followed. A qualitative data analysis method called thematic analysis entails coding the data in order to find recurrent themes and patterns that show up in the participant narratives. So, the data collected from the women has been analyzed using thematic analysis. And the raw data was codes based on some similar keywords which was grouped into different categories. The categories from the codes grouped into different themes that helped to construct our findings of this study.

1.8.10 Ethical Consideration: This study prioritized ethical and moral factors. The consent of participants was obtained by assuring their participation is free from pressure and their identities wasn't revealed. All sensitive, confidential, and personal information was strictly protected. Participants were assured their involvement was voluntary, devoid of coercion, and their anonymity preserved. Also, this study was conducted from a certain point of impartiality. For the purpose of conducting the study, all research ethics have been upheld.

1.8.11 Limitations of the Study: Some challenges faced by the researcher while conducting the study are given belows:-

- As the population of Sylhet City Corporation is large, interviewing 50 respondents is not enough to generalize the result.
- Time and money restrictions is an impact on this study.
- Some respondents did not provide sufficient information. Thus, this paper lacks being informative enough.

1.9 Data Analysis and Findings

Indoor air quality is essential for the health and well-being of occupants, especially since people, particularly women, often spend a large amount of time indoors. Numerous elements, such as air pollution particles, ventilation, cooking smoke, and various

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household activities, can have an impact on the quality of indoor air. So, Indoor air pollution has become a very sensitive issue in present time. Because it can include a variety of pollutants like dust, pet dander, mold spores, volatile organic compounds (VOCs), and even chemicals from cleaning products, indoor air pollution is dangerous. Extended exposure to these pollutants can cause a number of health concerns, such as headaches, exhaustion, and worsened cardiovascular health, in addition to respiratory problems like allergies and asthma. Those with pre-existing conditions, the elderly, and children are especially at risk. In some cases, women are facing various respiratory problems even after staying at home all the time and they suffer from various air related health problem. So, regularly ensuring good indoor air quality helps prevent these health risks and promotes a healthier living environment.

1. Proper Ventilation and controlling concentrations in Households:

Ensuring proper ventilation and managing pollutant levels are essential for maintaining a healthy and comfortable indoor environment. Effective ventilation plays a key role in sustaining high indoor air quality. Ventilation ensures the exchange of indoor and outdoor air, diluting indoor pollutants and replenishing oxygen. Insufficient ventilation can lead to the accumulation of pollutants and reduced oxygen levels. A participant said,

"I wake up in the morning and open all the windows
so that the cool and clean air from outside can easily enter the room.
After opening the window in the morning, there is a distinct sense of relief to breathe."

Monitoring and controlling pollutant concentrations indoors is critical for protecting the health of occupants. Over time, breathing problems, allergies, and more severe health conditions can result from exposure to high concentrations of pollutants like particulate matter, radon, and volatile organic compounds (VOCs).. Various VOCs are consistently present in higher concentrations indoors than outdoors. Some sources of VOCs are air fresheners, cleaning products, smoking, cooking, burning wood, foam, carpet, varnishes, cosmetics etc. It's may make symptoms worse for people with asthma or who are particularly sensitive to chemicals. Reducing the concentrations of allergens such as dust mites, pollen, and pet dander can be achieved through proper ventilation and air circulation. People with allergies or respiratory sensitivities should pay particular attention to this. One participant said:

"*I clean all the rooms everyday because I have allergic to dust.*
The dust makes me sneeze and catch a cold."

2. Source for Cooking:

The different type of stove used in Bangladesh can vary greatly based on factors such as location, urbanization, infrastructure, energy availability, and individual preferences. Traditional methods like Chula are still prevalent in many rural areas, while gas and electric stoves are more common in urban households.

Figure: Traditional Clay Stove and Cylinder Gas Stove

In Sylhet City, various types of stoves are used for cooking, ranging from traditional methods to more modern appliances. The types of stoves commonly used in Sylhet City. Such as:

- traditional clay stove (Chula)
- portable/ cylinder gas stove

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- gas stove
- electric stove

As the study area is urban, it is seen that most of the women use gas stoves. However, there are some local-residents and poor people who still use traditional clay stoves whose experience is different from that of gas stove or portable gas stove users. We found that some local residents use multiple stoves, but in nearly every instance, all of them are traditional models. When people can cook both inside and outside during the dry season, more people use multiple stoves. Most of the women in this area, use portable gas stove for cooking, some use electric stoves and some use clay stoves and wood burning stoves. Some of the households use multiple stoves like as cylinder gas and wood stove.

One respondent said,

"Most of the time I use wood stove for cooking
but sometimes I used cylinder gas for heating food or cooking for a short period of time.
Gas stove is better than wood burning stove."

3. Proper Ventilation in the Kitchen:

To get an idea about the stoves and kitchens that are currently used in the study areas, a number of issues were incorporated in the questionnaire such that types of stoves in use, condition of the kitchens and its ventilation, etc. Indoor air pollution is more harmful to health than outdoor air pollution. Although most people believe that being indoors is safe, we have discovered that indoor air pollution poses a health risk to humans because urban kitchens are typically very small and have inadequate ventilation. Thus, various kitchen ventilation options have a big impact on air exchange. Exhaust fans are an example of an active facility, which is rare. Moreover, women have been disproportionately responsible for household chores, including cooking and kitchen-related tasks. Most of the respondent said they spent most of the time working in the kitchen. Most of the houses have no exhaust fan in the kitchen or bathroom for ventilation. Maximum are used window for ventilation but most of the time these small windows are not enough for proper ventilation. Some kitchen has exhausted fan or window for proper ventilation. One participant said,

"As our kitchen is quite small and space is limited. So, we put very small window for the smoke to come out but it is not enough for proper ventilation in the kitchen."

Another participant expressed,

"We have a bedroom, a little kitchen and washroom. So, you can understand what arrangements have been made for ventilation in the kitchen. Chimneys are provided for the release of smoke. But sometimes the smoke spreads throughout the full house."

4. Use of Cleaning Agent:

Cleaning products emit a variety of volatile organic compounds (VOCs) and particulate matter into the air, which contributes to indoor air pollution. Most of the women do not know about the negative effect of cleaning agent. Some women have been using these products for long time without knowing it. Most of the women are use different types of cleaning agent for cleaning purpose. They use bleaching power, ammonia, toilet cleaner, air freshener, aerosol sprays or coils to repeal mosquitoes. Cleaning products, even those labeled as "green" or "natural," can emit these pollutants, leading to reduced indoor air quality and potential health risks. Here's how different cleaning agents contribute to indoor air pollution in different way:

a) **Volatile Organic Compounds (VOCs):** Many cleaning products contain solvents and fragrances that release VOCs into the air. Many women are used air freshener and spray cleaners. VOCs can react with other chemicals in the air and sunlight to form ozone, a component of smog that can cause respiratory problems. Some respondent said that they use air freshener to remove bad odors from inside the house and washroom. But they had no problem using it.
b) **Toilet cleaner and Bleaching Powder:** Mixing products that contain ammonia and chlorine can create harmful gases like chloramine and chlorine gas, which are dangerous to inhale. Many respondents are used bleaching powder for disinfection, sanitation, and cleaning purposes. It releases chlorine gas when mixed with water, which is a strong oxidizing and disinfecting agent. can release fumes that are irritating to the respiratory system. Most of the women said that they did not have any problem using this cleaning agent, only the smell of bleaching powder remained in the household air for long time.

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c) **Aerosol Sprays/ Coils Smoke:** Most of the households use coils or aerosol to repel mosquitoes. Aerosol products release fine particles into the air that can be inhaled and cause respiratory irritation. They can also contain VOCs that contribute to indoor air pollution. Some of the respondents said that they use aerosol because of the problem in breathing due to coil smoke. Some local-residents say they use a method of their own to repel mosquitoes. They wood powder and plastic to create smoke which is very effective in repelling mosquitoes.

One respondent opined,

"At first, I used to coil, but now I use aerosol because of the smoke.
The smoke from the coil makes it a bit difficult to breathe so I no longer use the coil."

d) **Fragrances and Perfumes:** A very small number of respondents mentioned that they use perfumes and different type of cosmetics when they go out for any occasion. Most of the participant use various things such as detergent powder, dish liquid to clean clothes and other household items. Many cleaning products, including laundry detergents and air fresheners, contain synthetic fragrances that can emit VOCs and other chemicals. These fragrances can cause allergic reactions and worsen respiratory conditions.

e) **Particulate Matter:** Some cleaning methods, such as sweeping, dusting, and vacuuming, can stir up dust and particles in the air. This can include allergens, mold spores, and other particles that can lead to respiratory issues, especially in people with allergies or asthma. One participant told,

"Every day I have to sweep and dusting the rooms and clean the dust from other furniture. While cleaning these, the problem of runny nose, itchy eyes arise."

f) **"Green" Cleaning Products:** One participant said that they can use natural cleaning agent. While some eco-friendly or natural cleaning products may be safer for the environment, but they can still release VOCs and other pollutants. Many women are using thinking that, it is not harmful for our health. Ingredients like citrus oils and vinegar, while natural, can emit VOCs when used in concentrated forms.

From respondent opinion we can consider the following steps to reduce indoor air pollution caused by cleaning agents:

- Choosing cleaning products labeled as low-VOC or VOC-free.
- Using cleaning agents in well-ventilated areas or open windows when cleaning.
- Avoiding mixing different cleaning products, especially those containing ammonia and chlorine.
- Considering own cleaning solutions utilizing simple ingredients like baking soda, vinegar, and water.

5. Health problem of Women for different indoor pollutants particles:

In this study we see that, Indoor air pollution is a common issue that many families faced to varying health issues. But they do not understand why they are facing those problem. Virtually every home has indoor air pollution sources. The sources of these pollutants can come from both inside and outside the building. Common sources of indoor air pollution includes: Tobacco Smoke, Household Cleaning Products, Cooking and Heating, Building Materials and Furnishings, Pollen and Allergens, Inadequate Ventilation and other activities of household specially activities of kitchen.

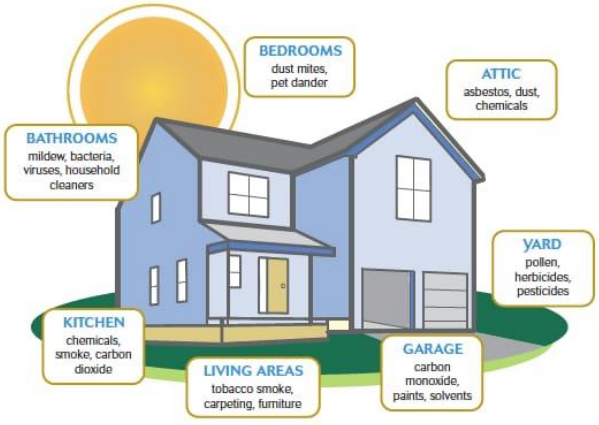

Figure: Sources of indoor air pollution

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Most of the participant are busy for cooking in the kitchen in a part of the day. For this reason, they absorb different pollutants particles and they face eye and nose irritation, headache, increased respiratory problem etc. A respondent said,

"Before I never feel had any breathing problems while cooking or doing households activities.
But last year suddenly doctor detected lung problem.
Now it is often difficult to breathe in kitchen smoke."

Men in several family smoke cigarettes at home. Therefore, women in almost all families suffer from secondhand smoke problem. One participant highlighted, for this cigarette smoke sometimes they feel respiratory irritation. She said,

I don't stay in the room where my husband smokes.
Because I can't suffer cigarette smoke, it's hard to breathe.

For the use of cleaning materials the women face eye and nose irritation. One of the Respondents said,

"When I clean the bathroom floor with bleaching powder
then the smell of bleaching powder irritates my nose."

Most of the respondent said that now they often go to the doctor for eye, nose or throat irritation, sneezing problems. Most of the time these problems are more common in children. However, there were fewer women suffering from chronic problems.

"A few days ago, while visiting the doctor, he was diagnosed with a lung problem,
due to which he sometimes had mild respiratory irritation."

6. Knowledge on indoor air pollution:

In some cases, women in Sylhet city do not know about of indoor air pollution. But many cases we find that they know about indoor pollution but they do not concern about it. They do not know, cooking and managing household activities, which can expose them to higher levels of indoor air pollution. Their awareness of the associated health risks is based on different factors such as education, socioeconomic status, geographic location, and access to information. One participant said,

"I first learned about indoor air pollution today.
I didn't know that the air in the house was being polluted by work inside the house."

Another participant said,

"I know something about indoor air pollution, but I never thought about its harmful side. To be honest, I never gave it that much importance."

1.10: Discussion

We collected and carefully analyzed data from Sylhet City Corporation on the women members that demonstrates the causes and effects of indoor air pollution on women's health. This study supported and advanced some empirical findings from earlier research on the same topic conducted in other parts of the world. The results of the study clearly show how various indoor pollutants affect female members who are more vulnerable to health problems. Pollution level is important, but the duration of exposure to air pollution determines the overall exposure level and has a greater impact on health.

Most of the respondents used gas stove and some used traditional clay stove with solid fuel like as wood. Within the living room, they burned solid fuel. Cooking indoors has been linked to an increase in various health risks. Whatever the cooking location and cooking smoke decreased lung function, irritates the eyes, increases the risk of respiratory infections, and causes headaches. Compared to participants who reported cooking the less ventilated kitchen, the risk of respiratory infection, eye irritation was significantly high among those who performed cooking the well-ventilated kitchen. A study conducted by Smith (2009) indicated the same situation regarding indoor air pollution on women's respiratory symptoms and lung function. Living in an improperly ventilated environment is extremely dangerous and may be the main cause of the high mortality rates. If this is the case, women who breathe in the smoke for several hours each day develop respiratory illnesses. If there isn't a proper ventilation system, the kitchen, where women frequently move to prepare meals, is the biggest source of pollution, which is one of the reasons housewives are more susceptible to illnesses. Another study conducted by Bruce et al. (1998) indicated the same situation regarding Indoor biofuel air pollution and respiratory health (Bruce et al., 1998).

Most of the respondent expressed that poor ventilation and the use of indoor cleaning agents can reduce to indoor air quality and negatively affecting the overall health of women and their families. Consequences of cleaning agent can be influenced by factors such as the types of cleaning agents used, the frequency of exposure, ventilation, personal protective measures, and individual

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sensitivities. Some women suffer from several problem such as respiratory problem, eye irritation, nose irritation, as a result of using cleaning agent. However, in most of the cases, it has been seen that those who are not aware of the use of these substances suffer more problems.

Women are taking in polluted air from their living rooms. Air of living room can be polluted by various sources, including household activities, furnishings, cleaning products, tobacco smoke, secondhand smoke and more. These pollutants can have a range of effects on women's bodies, particularly if they are exposed to them over extended periods. Most of the respondent mentioned they face some trouble for secondhand smoke, coils smoke etc. To maintain a healthy indoor environment, it's important to minimize the apply of aerosol products that release dangerous particles into the air. Additionally, regular maintenance of HVAC systems, including cleaning and servicing coils, can help prevent the negative impacts associated with dirty coils. Some respondent face allergic problem for dust and pet dander. Dust mites, pet dander, and other allergens can accumulate in living room furniture and carpets. Exposure to these allergens can trigger allergic reactions, asthma symptoms, and respiratory discomfort. Prior research has examined the effects of household air pollution, solid fuel use, and multidimensional energy poverty on the health of women. Other studies have noted that technological devices have an impact on household air pollution as well. For example, using humidifiers frequently can give you a headache, but using dirty humidifiers can cause respiratory illnesses. Similarly, in my research, I also find almost same result.

Due to lack of awareness in most of the households, they are constantly polluting the indoor air through their activities. This is the picture of most families in Bangladesh. There is less space of movement in a house and most of the people build their houses without following the rules. As a result, it was not possible to maintain proper ventilation of the room and the kitchen. Due to these, there is less clean air in the house. And that polluted air has a negative impact on the members of the house especially women and children. And they are suffering from various problems like cold, sneezing, cough, breathing problem, eye and nose irritation.

1.11: Recommendation and Conclusion

As shown in the study, women faced many health challenges for poor indoor air quality. Minimizing the negative health impacts of indoor air pollution requires a combination of strategies and measures that focus on improving cooking practices, using cleaner fuels, and adopting better ventilation and technologies. Some effective strategies are identified to reduce indoor air pollution and negative health impacts. These are:

1. **Promote Clean Cooking Technologies:**
    - Introduce and promote improved cook stoves that burn fuels more efficiently and produce fewer pollutants.
    - Encourage the use of modern cooking appliances such as LPG stoves, electric cookers, and induction cooktops, which produce fewer indoor pollutants.
2. **Switch to Cleaner Fuels:**
    - Encourage households to transition from solid fuels like wood, crop residues, and dung to cleaner fuels such as LPG, biogas, or electricity.
    - Provide subsidies or incentives to make cleaner fuels more affordable and accessible, particularly for low-income households.
3. **Improve Ventilation:**
    - Enhance natural ventilation by designing homes with larger windows, cross-ventilation, and air vents to allow indoor air pollutants to escape.
    - Use exhaust fans or chimneys while cooking to remove cooking fumes and to minimize the release of indoor air pollutants.
4. **Regular Cleaning:**
    - Regularly clean surfaces, carpets, and furnishings to minimize dust, allergens, and particulate matter in the living space.
5. **Plants:**
    - Include indoor plants with air-purifying abilities, such as spider plants and peace lilies, to improve indoor air quality.

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6. **Control Humidity:**
    - Maintain indoor humidity levels between 30-50% to prevent mold growth. Use dehumidifiers if necessary.
7. **Raise Awareness and Education:**
    - Educate communities about the health risks connected with household air pollution and the benefits of adopting cleaner cooking practices and technologies.
    - Promote behavior change by explaining how certain practices can reduce exposure to pollutants.
8. **Support Behavioral Changes:**
    - Encourage cooking outdoors or in well-ventilated spaces whenever possible to reduce indoor air pollution exposure.
9. **Healthcare and Monitoring:**
    - Establish healthcare programs to screen and treat respiratory illnesses caused by indoor air pollution.
    - Monitor indoor air quality to assess the effectiveness of interventions and make necessary adjustments.
10. **Policy and Regulations:**
    - Implement and enforce regulations on emissions and indoor air quality standards for stoves and fuels.
    - Advocate for policies that promote the use of cleaner fuels and technologies.
11. **Research and Innovation:**
    - Invest in research to develop and promote innovative, affordable, and culturally appropriate cooking solutions.
    - Collaborate with local communities to identify solutions that meet their specific needs.

Minimizing the negative health impacts of indoor air pollution is a difficult task that requires a multi-faceted strategy involving governments, NGOs, communities, and individuals. By combining these strategies and measures, it is possible to significantly increase indoor air quality and the health of those impacted by indoor air pollution.

This study offers valuable insights into the impact of indoor air pollution on women's health, emphasizing the need for target strategies to address this issue. Recognizing women's roles in household maintenance and caregiving, policymakers and public health advocates can work toward creating healthier indoor environments that promote the well-being of women and their families. Further research and collaboration are essential to develop effective interventions and policies that safeguard women's health from the hazards of indoor air pollution.

REFERENCES

1. Agarwal, S., Sing, T. F., & Yang, Y. (2020). The impact of transboundary haze pollution on household utilities consumption. Energy Economics, 85, 104591. https://doi.org/10.1016/j.eneco.2019.104591
2. Alharthi, M., Hanif, I., & Alamoudi, H. (2022). Impact of environmental pollution on human health and financial status of households in MENA countries: Future of using renewable energy to eliminate the environmental pollution. Renewable Energy, 190, 338–346. https://doi.org/10.1016/j.renene.2022.03.118
3. Ali, M. U., Yu, Y., Yousaf, B., Munir, M. a. M., Ullah, S., Chen, K., Kuang, X., & Wong, M. H. (2021). Health impacts of indoor air pollution from household solid fuel on children and women. Journal of Hazardous Materials, 416, 126127. https://doi.org/10.1016/j.jhazmat.2021.126127
4. Barnes, J., & Smith, K. (1994). What makes people cook with improved biomass stoves? A comparative international review of stove programes. Energy serise, 1247, 45-90. doi:https://doi.org/10.1007/BFb0051529
5. Browna, E. F., Gonzaleza, R. R., Burkmana, T., & Perez, T. (2020). Comparing nutritional levels in a commercially-availablesingle-serve meal using microwave versus conventionaloven heating. JOURNAL OF MICROWAVE POWER AND ELECTROMAGNETIC ENERGY, 99-109.
6. Bruce, N. (2000). Indoor air pollution in developing countries: a major environmental and public health challenge. PubMed Central (PMC). https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2560841/
7. Bryant, K. (1996). Impact of air pollution on women's health. Society for the Advancement of Women's Health Research. Otolaryngology-Head and Neck Surgery, 114(2), 267–270. https://doi.org/10.1016/s0194-59989670181-x

8. Chaudhary, E., Dey, S., & Ghosh, S. (2022, August). Reducing the burden of anaemia in Indian women of reproductive age with clean-air targets. Nature Sustainability, 5(11), 939-946.
9. Chen, B. H, Hong, C. J, Pandey, Mrigendra Raj & Smith, Kirk R. ((1990 .Indoor air pollution in developing countries .)43 ;1990 World health statistics quarterly3) 138-127 :https://apps.who.int/iris/handle/10665/51744
10. Dey, N. C., Ali, A. R., & Ahmed, a. S. (2017, December). Women's Knowledge and Perceived Health Effects from Exposure to Indoor Air Pollution: Findings from a Population-based Cross- sectional Survey in Rural Bangladesh. Journal of Health Science & Education, 1(1), 1-5. doi:10.0000/JHSE.1000105
11. Fullerton, D., Bruce, N., & Gordon, S. B. (2008). Indoor air pollution from biomass fuel smoke is a major health concern in the developing world. Transactions of the Royal Society of Tropical Medicine and Hygiene, 102(9), 843–851. https://doi.org/10.1016/j.trstmh.2008.05.028
12. Junaid, M., Syed, J. H., Abbasi, N. A., Hashmi, M. Z., Malik, R. N., & Pei, D. (2018). Status of indoor air pollution (IAP) through particulate matter (PM) emissions and associated health concerns in South Asia. Chemosphere, 191, 651–663. https://doi.org/10.1016/j.chemosphere.2017.10.097
13. Khan, N., Nurs, C. Z. B., Islam, M. M., Islam, R., & Rahman, M. (2017). Household air pollution from cooking and risk of adverse health and birth outcomes in Bangladesh: a nationwide population-based study. Environmental Health, 16(1). https://doi.org/10.1186/s12940-017-0272-y
14. Kumar, P., Singh, A., Arora, T., Singh, S., & Singh, R. (2023). Critical review on emerging health effects associated with the indoor air quality and its sustainable management. Science of the Total Environment, 872, 162163. https://doi.org/10.1016/j.scitotenv.2023.162163
15. Mannucci, P. M., Harari, S., Martinelli, I., & Franchini, M. (2015). Effects on health of air pollution: a narrative review. Internal and Emergency Medicine, 10(6), 657–662. https://doi.org/10.1007/s11739-015-1276-7
16. Molla, M. A. (2022, June 4). Over 90,000 deaths in Bangladesh caused by indoor air pollution in 2019. The Daily Star. https://www.thedailystar.net/environment/pollution/air-pollution/news/invisible-killer-our-homes-3038686
17. Nahian, M. A., Ahmad, T., Jahan, I., Chakraborty, N., Nahar, Q., & Streatfield, P. K. (2023). Air pollution and pregnancy outcomes in Dhaka, Bangladesh. The Journal of Climate Change and Health, 9, 100187. https://doi.org/10.1016/j.joclim.2022.100187
18. Lam, N. P., Smith, K. R., Gauthier, A., & Bates, M. (2012). Kerosene: A Review of Household Uses and their Hazards in Low- and Middle-Income Countries. Journal of Toxicology and Environmental Health-part B-critical Reviews, 15(6), 396–432. https://doi.org/10.1080/10937404.2012.710134
19. Perez-Padilla, R., Schilmann, A., & Riojas-Rodriguez, H. (2010). Respiratory health effects of indoor air pollution. National Center for Biotechnology Information, 14(9).
20. Rouse, J. R. (2005). Indoor Air Pollution: Issues for Bangladesh. Water, Engineering and Development Centre (WEDC), UK.
21. Sidhu, M. K., Ravindra, K., Mor, S., & John, S. (2017). Household air pollution from various types of rural kitchens and its exposure assessment. Science of the Total Environment, 586, 419–429. https://doi.org/10.1016/j.scitotenv.2017.01.051
22. Suresh, R., Singh, V. K., Malik, J., Datta, A., & Pal, R. (2016). Evaluation of the performance of improved biomass cooking stoves with different solid biomass fuel types. Biomass & Bioenergy, 95, 27–34. https://doi.org/10.1016/j.biombioe.2016.08.002
23. Thornburg, J., Islam, S., Billah, S. M., Chan, B., McCombs, M., Abbott, M., Alam, A., & Raynes-Greenow, C. (2022). Pregnant women's exposure to household air pollution in rural Bangladesh: a feasibility study for Poriborton: the CHANge Trial. International Journal of Environmental Research and Public Health, 19(1), 482. https://doi.org/10.3390/ijerph19010482
24. WHO. (2020). World Health Organization.
25. Yamamoto, S., Phalkey, R., & Malik, A. (2014). A systematic review of air pollution as a risk factor for cardiovascular disease in South Asia: Limited evidence from India and Pakistan. International Journal of Hygiene and Environmental Health, 217(2–3), 133–144. https://doi.org/10.1016/j.ijheh.2013.08.003.

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IJCSRR @ 2024
www.ijcsrr.org

26. Zaidi, S. M. A., Moin, O., & Khan, J. A. (2011). Second-hand smoke in indoor hospitality venues in Pakistan. International Journal of Tuberculosis and Lung Disease, 15(7), 972–977. https://doi.org/10.5588/ijtld.10.0524
27. Zhang, J. J., & Smith, K. R. (2003). Indoor air pollution: a global health concern. British Medical Bulletin, 68(1), 209–225. https://doi.org/10.1093/bmb/ldg0

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