

# Challenges of Second-hand Smoke: Are We Asking the Right Questions?

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## Abstract

Second-hand tobacco smoke as defined by WHO is the smoke emitted by a smoker or released from a burnt cigarette or any tobacco product. It is highly prevalent all over the globe but its serious health implications are often neglected by the public and the scientific community alike. Second-hand smoke has everlasting impact on all the body's major organs, especially among the vulnerable population of children, pregnant ladies, people with chronic diseases and senior citizens. Although India started its war against this menace earlier than other countries, all its efforts remain bootless as its approach and implementation have a wide range of lacunae. This review aims to give a big picture of second-hand smoke, highlighting its pathophysiological changes in the body, socioeconomic impact, various strategies, and the gap that prevents these strategies from finding a favorable result in India. It becomes all the more important to reduce its impact owing to the increase in prevalence among youth reducing their vitality, derailing the society and the nation. It is recommended that the health authorities approach this health problem with utmost seriousness as a laid-back approach could welcome this silent killer's known and unknown repercussions.

**Keywords:** Smoke, Second hand smoke, Cancer, Stroke, Cardiovascular disease, Chronic Obstructive Pulmonary disease, Sudden Infant Death Syndrome, COTPA

## INTRODUCTION

A silent killer that remains to evade public attention is exposure to second-hand smoke which is a major public health challenge that accounts for significant mortality worldwide. It is estimated that more than 8 million people die annually because of it and a quarter of these deaths are among non-smokers owing to second-hand smoke.<sup>[1]</sup> According to a survey conducted in 2017, more than 200 million tobacco users which account for 29% of the world's total adult population, are from India.<sup>[2]</sup> Smoking threatens not just the life span but also the quality of life which are beyond repair and cure. It harms the people who are directly smoking it and other innocents in close vicinity who bear its detrimental effects. In India, 38.7% of adults have exposed themselves to second-hand smoke at home and 30.2% at the workplace.<sup>[3]</sup> It is even implied by different scientific studies that second-hand smoke is far more

hazardous to health than first-hand smoke.<sup>[4]</sup> Tobacco usage whether directly or indirectly, has a huge economic burden. According to a study published in 2021, the cost of tobacco use is 1.04% of India's gross domestic product (GDP), whereas the excise tax revenue from tobacco in its previous year was only 12.2% of its total economic costs.<sup>[4]</sup> The direct medical costs were 5.3% of total expenditure on health.<sup>[5]</sup> Indian Public Health Authorities should make strict policies and ensure that concerned officials execute these policies to save public from the inexplicably dangerous effects of second-hand smoke.

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In India, second-hand smoke kills around 200,000 people every year, contributing more than 20% of total deaths caused by tobacco.<sup>[2]</sup>

## MATERIAL AND METHODS

An exploration of all the literature was performed in the PubMed and google scholar databases using the MeSH term 'Second-hand smoke'. A total of 30 articles were shortlisted and reviewed. The MeSH terms: 'Cancer', 'Stroke', 'Cardiovascular disease', 'Chronic obstructive pulmonary disease', 'Sudden infant death syndrome', and 'COTPA', were added to narrow down the literature. Studies older than 2010 were not included. We focused more on the studies from India and South East Asia region. We limited our search to english studies. We attained the full-text articles of the selected studies.

## RESULTS AND DISCUSSION

### Second-hand Smoke and the Risk Factors Among Vulnerable Population

All research articles related to the reviewed implications of second-hand smoke revealed a consistent finding. It is evident that everyone exposed to second-hand smoke has an increased risk of contracting different diseases like that of a direct smoker.<sup>[6]</sup> According to the WHO, tobacco use accounted for 8 million deaths worldwide. More than 1.2 million of these deaths were among non-smokers who were exposed to second-hand smoke.<sup>[7]</sup> According to a GBD study published in 2017, there were a total of 200,000 deaths in India due to exposure of second-hand smoke in the year 2015 which revealed a sharp increase of 11% deaths compared to deaths in 1990 due to the same.<sup>[8]</sup> These deaths are caused by life-threatening diseases whose risk in people get exponentially increased due to exposure to second-hand smoke. These diseases include Lung cancer, Leukemia, Chronic pulmonary obstructive disease, and cardiovascular disorders such as hypertension and stroke.<sup>[9]</sup> According to a study, the risk increases by 25–30% in people exposed to second-hand smoke than those safe from this detrimental toxin.<sup>[10]</sup>

Annually thousands of infants die due to ante-natal exposure to tobacco directly or indirectly through second-hand smoke. Those infants that survive have low birth weight, respiratory difficulties and are more prone to contract diseases.<sup>[11]</sup> Exposure of second-hand smoke in early life also causes increased frequency of ear infections, asthma, cold, and respiratory problems.<sup>[12]</sup> Some cases of brain tumor have also been reported which may develop later in life, long after the exposure occurred.<sup>[13]</sup> It is worth mentioning here that babies in utero, neonates and old-aged people are slightly more prone to incur harmful effects as their immunity have not yet fully developed or have worn off, respectively.<sup>[14]</sup>

According to research conducted in 2017, antenatal tobacco exposure was present in 9% of women in India; whereas, exposure to second-hand smoke was even higher,

around 25%.<sup>[15]</sup> Different factors such as age, socioeconomic conditions, education, relationship status, and awareness quotient contributed to fluctuations of these percentages. Women of reproductive age belonging to poor socioeconomic households or single mothers were more exposed to tobacco and second-hand smoke.<sup>[16]</sup>

### Second-hand Smoking Among Smokers and Non-smokers

The burden of tobacco has been a global problem. A cigarette is the most common form of tobacco consumption. Cigars, bidis, water pipes (commonly known as hookah) and various chewing and sniffing products are also available in the global market each to his own preference. As per survey conducted in 2016-2017, 29% of the total adult population of India was consuming tobacco in any one of the forms.<sup>[16]</sup> A number this huge not only posed risks on consumers but also everyone who was present in their vicinity as they were being exposed to dangerous toxins through second-hand smoke unknowingly and unintentionally. Unsurprisingly so, it was estimated half a decade back, that approximately 13% of all deaths in India would be contributed by tobacco.<sup>[17]</sup>

Second-hand smoke, also known as passive smoke, refers to the smoke polluting the air from burning tobacco products, i.e., cigarettes, cigars, etc. The term also includes the smoke that a smoker is exhaling out. This pollutant-filled smoke mixes with the air and pollutes the environment for everyone around. Many people are exposed to this harmful smoke in their homes, vehicles, workplaces, and other public areas like casinos, bars, bus and train stations.<sup>[18]</sup> Many people may not have heard of thirdhand smoke, but it also exists as a residue from first hand and second-hand smoke on clothes, furniture and household surfaces. This affects health adversely too but our main concern for now is second-hand smoke, its implications and why smoke-free policies need to be made. The risk of morbidity is high among non-smokers as smokers smoke through a filter, whereas non-smokers take in the raw, unfiltered smaller suspended particles. Secondly, second-hand smoke tends to be more contaminated as it has passed through another human's respiratory tract.<sup>[19]</sup> Thirdly, chronic smokers have all the adaptive mechanisms in their bodies to counteract the harmful effects of chemical toxins they are being exposed to, in contrast to non-smokers who suffer more damage as no such adaptation has yet occurred. In the long run, their vessels, heart and blood are stopped from functioning properly.<sup>[20]</sup> These facts stress the need for stringent policies in India to stop innocent people in public from acquiring diseases they did not ask for.

### Pregnancy and Infancy

To explain the dire need of these policies, it is important to look at all the injurious effects of second-hand smoke on people of different age groups. Pregnant females who smoke directly or are exposed to second-hand smoke during gestational periods are at high risks of miscarriage, abortion

and stillbirth. Approximately, thousand infants die annually due to the same.<sup>[21]</sup> If they survive the ante-natal life and are delivered alive, they have lower birth weight, making them more vulnerable to diseases and complications. These children also suffer from diseases like asthma, bronchitis, chronic cough and other respiratory difficulties, making their life miserable.<sup>[17]</sup> Sudden infant death syndrome (SIDS), also referred as cot/crib death, is sudden death of an infant during sleep without any apparent reason. According to some scientific studies, it appears that chemical toxins in tobacco smoke inhibit the normal functioning of the breathing center in the brain; hence, infants die of asphyxia. In another study, nicotine (an important component of smoke) and cotinine (a biological marker used to detect tobacco exposure) were raised significantly in lungs of infants exposed to tobacco or second-hand smoke.<sup>[22]</sup> These findings show that not just tobacco but second-hand smoke also increases infant mortality rate.

### Arthritis

Healthy adults with a good immune system are also subjected to harmful effects of second-hand smoke. Cancer, inflammatory arthritis and cardiovascular diseases are some of the health problems associated with smoking directly or indirectly. Arthritis is a term used to describe inflammatory condition of joints. This disease came into existence after the seventeenth century. Tobacco use and second-hand smoke are found to be major risk factors that contribute to its development.<sup>[23]</sup> The mechanism of tobacco in causing this disease is not yet very clear but some studies imply that aromatic hydrocarbons, a constituent of tobacco, could be responsible for inducing this harmful condition. These hydrocarbons activate inflammatory cytokines (chemicals mediating inflammation in humans) which ultimately leads to dysfunction and pain in joints.<sup>[24]</sup> This causes severe morbidity in the person suffering.

### Cancer

Cancer is a life-sucking disease that leads to great mortality and morbidity of life. It is by far the most common manifestation of smoke either directly or indirectly. Tobacco smoke has been involved in laryngeal, lung, oropharyngeal, gastric, pancreatic, uterine and hepatocellular carcinomas.<sup>[25]</sup> However, lung cancer is the most common cancer caused by exposure to smoke, and it is one of the foremost causes of death globally. Around 70% of lung cancer patients are smokers or have exposure to second-hand smoke.<sup>[26]</sup> Since the non-smokers in close periphery of smokers are also exposed to similar or even larger amounts of carcinogens, the risk of cancer development remains the same in both these groups. The amount of suffering and agony that cancer cause to patients and their close family is beyond measure. Besides, the treatment of cancer requires a lot of fortune which is a burden on majority of the population that earns hardly enough for survival. Its treatment depends on the stage of diagnosis and the most effective treatments are available only if diagnosed in early or primary stages. All of this becomes a wretched

but avoidable story as the cause of this disease is one's own reckless lifestyle. Henceforth, policies limiting the exposure of general public to second-hand smoke should become a need of the hour.

### Pulmonary and Cardiovascular Diseases

Another most important threat that second-hand smoke poses to life quality is cardiovascular dysfunction. It is proven that people exposed to tobacco toxins at first hand or second-hand are four times more prone to suffer from a stroke.<sup>[27]</sup> Chemicals that one inhales damage the blood vessels by causing inflammation in them. This leads to chronic hypertension, further aggravating the vascular inflammation.<sup>[28]</sup> Thus, vessel walls are subjected to continuous stress and injury. This may also result in the development of atherosclerotic plaque and clots that can occlude the vessel and result in myocardial infarction or cerebral stroke. Hypertension also increases the stress on heart as its workload is enhanced trying to pump blood in inflamed damaged vessels. Heart failure may result more often than it does in non-smokers.<sup>[29]</sup> These risks are intensified in alcoholics, women taking birth control pills and patients of other chronic diseases.

Tobacco smoke makes every breath of its victim difficult, painful and bind them to a moribund condition. Chemicals of smoke induce inflammation of lung, leading to damage of respiratory epithelium and destruction of lung tissue. In an attempt to repair these tissues, the body's immune system deposits collagen in damaged areas that form a scar tissue. The collagen causes thickening of respiratory walls.<sup>[30]</sup> This change obstructs the air whenever the person inhales or exhales and it manifests as symptoms of chronic obstructive pulmonary disease like shortness of breath or wheezing.

Considering all these life-threatening conditions and their increased incidence in non-smokers exposed to second-hand smoke, it becomes a huge responsibility for authorities to take immediate actions and strategize policies that will make the environment 100% smoke-free. All the reports show that exposure to even a small amount of second-hand smoke for a short time can leave its abominable mark.<sup>[31]</sup>

### Initiatives to Control Second-hand Smoke in India

Keeping these hazardous outcomes of second-hand smoke in view, in 2003 the government of India designed a law named Cigarettes and other tobacco products act (COTPA 2003) for control of tobacco epidemic. The law prohibits smoking at public places and calls for the display of signs that prohibit smoking at public places.<sup>[32]</sup> However good the law might be in theory, the implementation of this law and compliance of the general public decide the effectiveness in controlling the deleterious effects of second-hand smoke. Furthermore, the first global policy for tobacco control was designed in 2005 by WHO. This was known as framework convention on tobacco control (FCTC). This stresses on making public places smoke-free and hence safer and India was one of the first countries to join this movement.<sup>[33]</sup>

In India, statutory warnings regarding the harmful health effects of paan *masala* and chewable tobacco were made mandatory under the Prevention of Food Adulteration Act of 1990.<sup>[34]</sup> In 1992, tobacco use in all dental devices was banned under the drugs and cosmetics act of 1940.<sup>[32]</sup> Tobacco advertising in state electronic media and publications, including cable television, are prohibited under the cable television networks act 2000.<sup>[34]</sup> Later in 2003, an important law that drove India's fight against tobacco use was designed. This was called cigarettes and other tobacco products Act (COTPA 2003). The act strictly prohibits smoking at all public places and the owners or in-charge of such places must display proper signs and labels that prohibits smoking.<sup>[35]</sup> Smoking is banned in almost all the public places such as stadiums, auditoriums, health institutions, restaurants, educational places, etc. Moreover promotions, advertisements and sponsorships of tobacco products are banned at all mass media forums like television and radio.<sup>[35]</sup> The act prohibits the purchase of tobacco products to individuals under 18 years of age or within 100 yards from the outer border of any educational establishment. Packaging of these products should contain pictorial health warnings along with its nicotine and tar contents. All labels on tobacco products should contain the text "SMOKING KILLS" in both English and Hindi. Anybody violating the law are sentenced to jail where the punishments can vary from the imprisonment of 2 years to 5 years, heavy fines or both. Most importantly, government made tobacco products unaffordable by imposing hefty taxes. Almost 70% of retail prices of tobacco products are taxed.<sup>[35]</sup> To streamline the execution of the tobacco control initiatives under COTPA and various policies of tobacco control under the WHO FCTC, the Government of India commenced National Tobacco Control Programme (NTCP) from 2007-2008. In September 2019, the Indian government banned E-cigarettes with flavoring and additive agents that are harmful for their health. Electronic smoking devices also emit second-hand aerosol that have deleterious effects on human health.<sup>[36]</sup> The disposal of waste accumulated from usage and production of e-cigarettes can also pose potential environmental hazards.<sup>[36]</sup>

### Lacunaes in Strategies

The impact of such laws is highly dependent on how strictly they are executed. A vital step that can scale down smoke epidemic is the absolute termination of smoking in public places. Complete and efficient control has not yet achieved because of the vague policies. A study conducted in schools and colleges across 5 states in 2004 found that 85% of educational institutions violated COTPA Section 4 which prohibits smoking in public places. Around 69% of educational institutions violated COTPA Section 6b which prohibits sale and purchase of tobacco products near educational campuses.<sup>[37]</sup> Currently, the need is to focus on youth and design more creative and definite policies that target specific age group as increasing number of adolescents are becoming smokers and they put their families and children

at equal risk of health problems through exposure to second-hand smoke.<sup>[38]</sup> Community and school-based programmes can be integrated with tobacco control steps like public awareness campaigns, peer group sessions, life and leadership coaching classes, local, social and mass media influencers' conclaves at the community level for effective motivation to discourage tobacco usage and increase cessation rates among youths. In addition, there is a paucity of data on the effectiveness of various tobacco control measures, their feedback mechanisms, re-evaluation and corrective plan of action. Conduction of scientific enquiries and studies on smoking especially second-hand smoking, whether funded or otherwise, should be encouraged for a more robust and updated understanding of the ever-changing dynamics of this health situation for its better prevention and control.

### CONCLUSION

Second-hand smoke was implicated in a number of public health hazards. These included deaths of infants, neonates with low birth weight, cancers, hypertension, chronic obstructive pulmonary disease, cardiac failure, etc. Henceforth, it is right to conclude that policies regarding smoking at public places need to be more stringent. Implementation of these policies and educating people about the ill effects of tobacco are other necessary steps to achieve the desired effect. These are the crucial ways to limit exposure of non-smokers to second-hand smoke and to control the increasing health menace caused by it.

### Limitations of the Study

The studies selected for the review were included from PubMed and published in English; some information were gathered from search engines like google and bing. The publications from other databases and languages have not been analysed for the review.

### Relevance of the Study

The study highlights the neglect, serious health, socioeconomic implications of second-hand smoke, and the urgent need to fill the gap that prevents the control strategies from successfully reducing its impact on the people.

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