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Review Article

Review on Effects of Passive Smoking

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Abstract

Smoking is injurious to health. Mainstream and Side stream smoking both are actively and passively injurious to health. Ill effects of secondhand smoking are more commonly underrated in the society. Side stream smoking also causes hazardous health effects. Smoking not only affects the smoker, but also affects non-smokers and children. Passive smokers are people exposed to cigarette smoke in two ways: by direct exposure to the smoke of passively burning cigarette and exposure to the smoke breathed out by the smoker. Second-hand smoke is the mixture of direct smoke from burning a cigarette along with the smoke breathed out from the smoker's lungs. As a result, sidestream smoke has higher concentration of some toxic and carcinogenic substances than the mainstream smoke. When exposed to second hand smoke, non-smokers inhale 60-80% of airborne nicotine similar to that absorbed by smokers So this review paper will elaborate about the effects of passive smoking.

Keywords : Passive smoking, Lung cancer, Children, Pregnant women

INTRODUCTION

Tobacco is a product derived from the plant Nicotiana tabacum. A Smoker is defined as, "an adult who has smoked 100 cigarettes in his lifetime and who currently smokes them" (1). Passive smoking, also known as second-hand smoking (SHS), or environmental tobacco smoke exposure, which means the inhalation of smoke that has been smoked or exhaled, by smoker (2). Cigarette smoke consists of 4,720 different toxic substances such as carbon monoxide, ammonia, ketones, formaldehyde, acetaldehyde, acrolein, nicotine, and tar, many other substances which are known to be carcinogenic (3). Few examples of gases in tobacco smoke are carbon monoxide, benzene, ammonia, dimethylnitrosamine, formaldehyde, hydrogencyanide and acrolein(4).

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Approximately 65.1% of non-smoking healthy persons are exposed to SHS, Moreover, 600,000 people die annually from diseases caused by SHS exposure accounting for average of 1.0% of global mortality (5). Ill effects of passive smoking are discussed in this article.

Effects of Passive Smoking on Pulmonary Diseases

Pathophysiology of Respiratory Infections

Second-hand smoke is composed of (85%) by sidestream smoke (SS), which is the product of incomplete combustion, released from the burning tip of a cigarette, and only a small part (15%) of mainstream smoke (MS), which is breathed out by smokers. The size of the particle in SS components is ten times smaller than the particle diameter of MS and, which implies that, SS components have high potential to reach the distal most alveoli from where they cannot be expelled quickly (2). Tobacco smoking has an adverse effect on the immune system, which results in leukocyte dysfunction that is found in children with smoking parents (6). Tobacco Smoke causes increase in number of macrophages in respiratory area. Macrophages releases an enzyme that attracts leucocytes in the lung. Those leucocytes further releases enzyme known as proteases and elastase which attack elastic connective tissue in lung, which is necessary for elasticity and extensibility property of lung tissue. Alpha-1antitrypsin is a protein produced in liver tissue which is inactivated by oxygen radicals released from the leucocytes, it causes imbalance between protease and antiprotease functional activity leading to destruction of lung tissue (7).

Bronchial Asthma

It was found that 35,800 deaths were caused due to asthma in non-smoker, Adults with asthma have higher bronchial hyperresponsiveness after being exposed to SHS (2). Prolonged working duration with a smoker is directly associated with an increased risk of developing asthma (2). The odds ratio for asthma incidence in Environmental Tobacco Smoke exposed as compared to ETS-unexposed children was 1.78 (8). A Cross sectional studies revealed that increased effect of asthma severity in children with smoking parents, especially maternal smoking (8). Cotinine is a metabolite and biomarker of nicotine that provides information about the duration of passive smoke exposure (3). There is gradual increase in cotinine levels in urine and serum IgE levels from grade 1 to grade 4 in people with asthma. Passive smoking worsens asthma with the higher number of cigarettes smoked indoors (3).

COPD (Chronic Obstructive pulmonary disease)

Bronchial hyper responsiveness (BHR) is an important factor that gradually declines lung function in normal subjects and those with chronic bronchitis (8). ETS exposure is an important risk factor for causation of obstructive lung disease (8) being exposed to second-hand smoke often (SHS) increases the risk of mortality rate in chronic obstructive pulmonary disease (COPD) patients (6). Forced Vital Capacity test is the most important and sensitive pulmonary function test, that detects the diseases that affects lung elasticity and its mechanical properties (1). FEV1 is the definite indicator to distinguish between obstructive and restrictive disease (1). In obstructive disease the ratio of FEV1/FVC% is less (FVC normal and FEV1 decreased) and in restrictive disease FEV1/FVC% ratio is more (FVC is reduced more than FEV1) (1) the increased level of tobacco exposure, measured by cotinine urine level, was associated with COPD severity and increased risk of mortality from COPD in non-smokers, exposed to passive smoking (2).

Lung Cancer

Passive smoking exposure is as hazaradous as active smoking, non-smoking people are exposed to the same carcinogens as active smoking, which is the leading cause of lung cancer (9). Passive smoking is considered as an important etiology of lung cancer in non smokers (9). The biological plausibility for this association is that, the carcinogens and many other toxic substances seem to remain more in passive smoking (9). Atleast 17 carcinogenic chemicals present in tobacco smoke are released at higher concentrations in side stream smoke when compared to mainstream smoke, with an example like benzo(a)pyrene diol epoxide, which shows a direct etiological factor associated with lung cancer, which is found in both mainstream and side stream smoke (2). Passive smoke exposure is associated with an excess relative risk of lung cancer, smoking increased the risk of NSCLC (Non small cell lung cancer) and SCLC (Small cell lung cancer), approximately 30 % and 200% (2).

Tuberculosis

Increased risk of Mycobacterium tuberculosis infection in children under age 14 was more, due to childhood exposure of second-hand smoking and from contacts of people infected with tuberculosis. It is found that being exposed to passive smoking by a case of tuberculosis acts as an effect modifier, which can further increase the rate and risk of Mycobacterium tuberculosis infection in children (3).

Cardiovascular Disease

The risk of hypertension was significantly more in passive smokers when compared with non-passive smokers (10). Smoking indirectly increase the blood pressure through its adverse effects on vasoconstriction and/or vessel dilation, and inactivating baroreceptors or impairing the function of arterial walls (10). Peoples exposed to environmental smoke for 1–10 cigarettes per day had a marginally increased risk of developing hypertension when compared with non-passive smokers, and the adjusted OR was 1.43 (10).

Hearing Defects

Passive smoking also increases the risk of middle ear infection in children in young age such as recurrent otitis media, middle ear effusion, and glue ear (11). Children exposed to tobacco smoke are at increased risk of developing Otitis Media (OM), and few other respiratory infections (3). Children exposed to passive smoking are also at risk of middle ear infections, sudden infant death syndrome (SIDS) and other lower respiratory illnesses (12).

Effects On Pregnant Woman

Maternal smoking also causes health problems in the new born, infants, as carbon monoxide one of the toxic gasses released from tobacco smoke results in abnormal placental vascularization, placental hypertrophy and local hypoxia in placenta which affects the uterine blood flow and eventually increases the complications and restriction in intrauterine growth (13). Babies are more likely to be born with pre-term low-birth weight with mother exposed to passive smoking, during first trimester are more at increased risk of miscarriage(13) and there is an inversely proportional relationship between the infants birth weight and their mothers being exposed to passive smoking(3), Passive smoking is associated with increased risk factor for miscarriage, congenital malformations and stillbirths, lower mean birth weight, heart disease, lung cancer and maternal depression(14).

Effects On Children

Children those who are predominantly exposed to passive smoking are at risk of middle ear diseases, sudden infant death syndrome (SIDS) and few other lower respiratory illnesses (3). Smoking has ill effects on both

maternal and foetal health, during pregnancy because of nicotine, a harmful tobacco product diffuses in fetal blood, breast milk and amniotic fluid and its ill effect on neurological development (14). Approximately 40%–50% kids in worldwide are regularly exposed to second hand smoking (15). Exposure to second hand smoke is associated with numerous diseases in children, such as elevated blood pressure level, dental decay, otitis media with effusion, childhood respiratory diseases such as paediatric asthma, pneumonia, and a heightened risk for sensorineural hearing loss (15). Maternal depressive symptoms, which is predominantly associated with childhood exposure to secondhand smoke and behavioral outcomes in children (3). The levels of key enzymes such as catalase, thiol, myeloperoxidase was used to measure the antioxidant and oxidant levels in the children, while the levels of total cholesterol and LDL cholesterol were used to determine the changes in the lipid profile (3). Children who were predominantly exposed to environmental tobacco smoke exposure had higher levels of IL1β, regardless of age, sex, and diagnosis. Passive smoke exposure increases proinflammatory immune responses in children and interferes with native immune responses which in turn reduces the ability to heal and fight infection (3). Prolonged exposure to ETS in children increases their future risk of developing cardiovascular diseases. Few Cardiovascular risk factors includes obesity, overweight, low high-density lipoprotein cholesterol (HDL-C), and high low-density lipoprotein cholesterol (LDL-C) (6). Neurological and neurobehavioral developmental defects are more prevalent in passive smoking children as there is 50% higher chance of developing at least any two neuro-behavioural disorders, which includes autistic disorders and attention deficit hyperactivity disorder (ADHD) (6).

Effects on Mental Health

Passive smoking also has negative effective on mental health in children who were exposed to any duration of ETS, they had a higher risk of developing psychological symptoms and their response regarding emotional symptoms, behavior problems, attention deficit hyperactivity disorder, peer relationship problems and pro-social behaviors than those who were not exposed to passive smoking (3). The results of the passive smoking group compared to the unexposed group suggested that passive smoking is more commonly associated with depression, stress, suicidal thoughts, suicide planning, and suicide attempt (3). Second hand smoking exposure was also related with lower psychological health, higher violence, anxiety, stress and depression, and inappropriate living conditions of children and adolescent (6).

Allergic Conditions

People exposed to second hand smoking, were more prone to have certain allergic condition such as wheezing, rinitis and eczema (3). Children with persistent allergic rhinitis had significantly increased levels of enzymes sNOX2-dp and isoprostanes, lower flow-mediated dilation and reduction in nitric oxide bioavailability. Serum sNOX2-dp levels were significantly higher in children with allergic rhinitis exposed to passive smoke compared to children with allergic rhinitis not exposed to passive smoking (3).

Effects On Oral Health

The increased risk of developoing periodontal disease was 1.6 times higher in people with second-hand smoking than with people not exposed to passive smoking (16). The risk for developing severe periodontal disease has significantly raised by 29% among people those who are exposed to passive smoke (16). Salivary inflammatory markers and microbiological markers found significantly higher risk of having periodontal disease in both active and passive smokers compared to people who are non-smokers and people not exposed to second hand smoking. Non-smokers with passive smoking exposure only at home or both at home and other places showed a significantly higher risk of developing periodontal disease compared to non-smokers without exposure to passive smoking, after controlling for other potential risk indicators for periodontal disease (16). The mechanism of periodontal disease: nicotine suppresses the production of fibroblasts, which

inturn decreases collagen production, and clinically, there is development of deep fibrous periodontal pocket. Nicotine also suppresses the immune infection, which indirectly worsens the risk of periodontal disease (17). Non-smokers exposed to passive smoke absorb nearly more than one-third of the amount of nicotine present in one cigarette compared to nicotine that absorbed by active smokers, cigarette smoke increases the risk of periodontal disease both locally and systemically, local effects include vasoconstriction, which is caused by nicotine and it gradually decreases oxygen tension, which causes increase in subgingival anaerobic bacterial colonization (16). Cotinine, a product present in tobacco increases the toxic potency of periodontopathogen bacteria such as Prevotella intermedia, Prevotella nigricans, Treponema denticola, and Porphyromonas gingivalis, which enhances the progression of periodontal disease (16). The biological mechanisms for the development of caries development in passive smoking include: the increased metabolic activity of Streptococcus mutans, which is associated with risk of caries development and is increased by the presence of nicotine, which promotes plaque accumulation, resulting in greater decalcification of dentin (17).

CONCLUSION

Smoking is injurious to health in either active and passive ways. Second hand smoking affects the children more adversely and causes severe health hazards. Moreover, it can attribute to lung cancer and other alarming systemic infection along with oral infections. Passive smoking is more hazardous than active smoking, it progressively affects pregnant women and infants. More awareness regarding passive smoking should be educated via public health programs, social media platform and television. Since, children are more prone to infection, health hazards regarding passive smoking must be educated in schools. Increased consumption and production of tobacco products must be considered and reduced, because of its harmful effects.

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Conflicts of interest

There are no conflicts of interest

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