ADVERSE EFFECTS OF PASSIVE SMOKING ON PREGNANCY, WHICH IS A GLOBAL CONCERN: A SYSTEMATIC REVIEW

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***Abstract*: Various studies have been conducted on the effects of passive smoking and the environmental factors affecting pregnancy. But not many studies have been done on the passive smoking effects on pregnancy. The importance of this study is to show active smoking and passive smoking have similar effects, especially on pregnancy. Normal effects of active smoking are on the cardiovascular system and respiratory system. The major effects of second hand smoking or passive smoking on pregnancy and foetus are low birth weight and growth retardation. The advantages of stopping active smoking can control and improves health and lifestyle for the betterment of our youth. The awareness of the common affects that exists between passive and active smoking are very low among the society, so the aim of this review is to spread as much awareness and knowledge on passive smoking as possible.**

***Keywords*: PREGNANCY, SECOND HAND SMOKING, PASSIVE SMOKING, CHILDREN**

Introduction

Passive smoking or secondhand smoking (SHS) is the involuntary inhalation of tobacco smoke from an active smoker or an environment [1]. Getting exposed to secondhand smoking does have adverse effects on the human body and has high risks of developing diseases and even death.

When a person smokes, the smoke stays in the air for up to 2.5 hours, even if we do not smell it. Tobacco smoke has many sources, each source is equally harmful; cigarettes, cigars, pipe tobacco, hand-rolling tobacco and sheesha pipes (also called hookahs or waterpipes).

Tobacco smoke contains three main deadly components; nicotine, tar and carbon monoxide. Nicotine is an addictive substance in tobacco that is quickly absorbed in the blood stream [3]. When it enters the brain it causes release of adrenaline which gives a quick sensation of pleasure. Since this sensation quickly fades away, it stimulates the person to have a quick smoke again. Tar is the harmful residue that is left behind once the cigarette is burnt, it is a sticky and forms yellow or brown residue [4]. It acts as a major precursor for third- hand smoking. Due to its sticky and tacky nature, the residues stay on the surfaces of objects and can be easily passed on when someone touches it, especially in children. Carbon monoxide is a toxic gas present in tobacco smoke. The haemoglobin in red blood cells has a higher affinity for carbon monoxide than oxygen. In the presence of carbon monoxide, less oxygen will be carried by the blood and therefore to the cells in the body, leading to severe heart problems and death. Other chemicals present are asbestos, arsenic, benzene, radon, and other carcinogens [1].

Secondhand Tobacco smoking can cause various health problems, such as; lung cancers, heart problems like myocardial ischemia, angina and myocardial infarctions, in children it leads to cot death, developing asthma, serious respiratory conditions like pneumonia and bronchitis, coughs and colds and middle ear infections [3]. This generates more interest and concern on exposure of second hand smoking in pregnancy and therefore infants. Smoking or being exposed to smoke during pregnancy has lots of adverse effects on the foetus, such as growth retardation, preterm birth, low birth weight, miscarriage, congenital malformation, hereditary diseases, short stature, cognitive delays and neurologic disorders.

To reduce this type of exposure, we need to reconsider the causes of exposure and promote smoke-free environment [6]. We need to provide further education on smoking, establish quit-smoking programmes and re-evaluate the importance of prenatal smoking. This is gaining a global concern because there are lots of deformities and diseases occurring in children which has led to decrease in their immune response, therefore leading to death of hundreds children in the recent history. This has motivated and elevated people's concerns on passive tobacco smoking, which has lead to a stricter workplace and indoor places. Therefore, progressively leading to banning and avoiding as much smoking as possible in the environment.

Method

The search for the respective articles was done using the website databases, NCBI along with PUBMED and MIDLINE. First, the search was done in order to find similar articles, so the direct title of this perceived topic was added. Then the search was constricted to free full texts, review articles, peer reviewed articles, published within the last 10 years in English. The search phrases used in the advanced section were, passive smoking AND pregnancy, (passive smoking OR secondhand smoking) AND pregnancy and these phrases were combined with infants, low birth weight, lung cancer and diseases.
The criteria of the article was looked predominantly, whether the abstract talked about the exposure of tobacco on pregnancy and its effects. Articles were excluded based on the way title and abstract, articles that did not have any association with exposure of tobacco and pregnancy were excluded and active smoking during pregnancy were excluded.

Exposure to Second Hand Smoking

Most of the studies relied on self-report on the exposure of SHS by using biomarkers such as nicotine to confirm the status of exposure. A study in California, Ghosh et Al, did a study on two groups of exposed mothers, mothers with low or no ventilated windows and mothers with high or moderate ventilated windows and this was associated with birth weight [8]. So exposed mothers with no ventilated windows had higher risk of having low birth weight children than exposed mothers with high ventilated windows. In a study conducted in Greece [9], the volunteers reported that their partners who smoked more likely smoked throughout their pregnancy. Both non-smoking women and smoking women confirmed that they were exposed to high rates of tobacco. In a study conducted in New York City included non-smoking women with exposure to SHS [10]. Women who were African American and who had less than 12 years of education were at a higher risk of SHS exposure (66.7%) than foreign or US born women with more than 12 years of education (63.2%). A study done in China, states that women in Sichuan province are more likely to be exposed than in urban China [11]. And also reported that younger women (48.2%) are more likely to be exposed to SHS than older woman (25.8%).

Harmful effects of smoking

Smoking is said to cause chronic oxidative lung damage. A study was done using GFP mouse model to see the exposure of smoke on fetomaternal cells. First possibility is that the micro chimeric cells in the maternal lung during pregnancy reduced in size when exposed to smoke. Second possibility is that it prevents movement and retention of damaged cells, therefore they stay in the lungs [12]. Third possibility is that the damaged macrophages cannot remove these cells and fourth possibility is that it disables the movement of fatal cells to other organs. But the article concluded that further studies should be conducted in order to find more details on the biological function and activity of micro chimeric cells. Smoking is also accountable as an ageing factor, because it induces an imbalance between the highly reactive oxygen species and the ability to repair their damage, especially in organs such as the brain and is involved in the causation of many neurodegeneration-related diseases [13]. Increase in smoking increases cerebrovascular diseases and also has a direct link with stroke. Cardiovascular diseases is very commonly caused due to smoking and usually its treatment is overwhelming. Its affects are more confined to the vascular system and cause vascular homeostasis. When sufficient smoke is inhaled, it disrupts the endothelial cells leading to inactivation of nitric oxide.

Effect on women

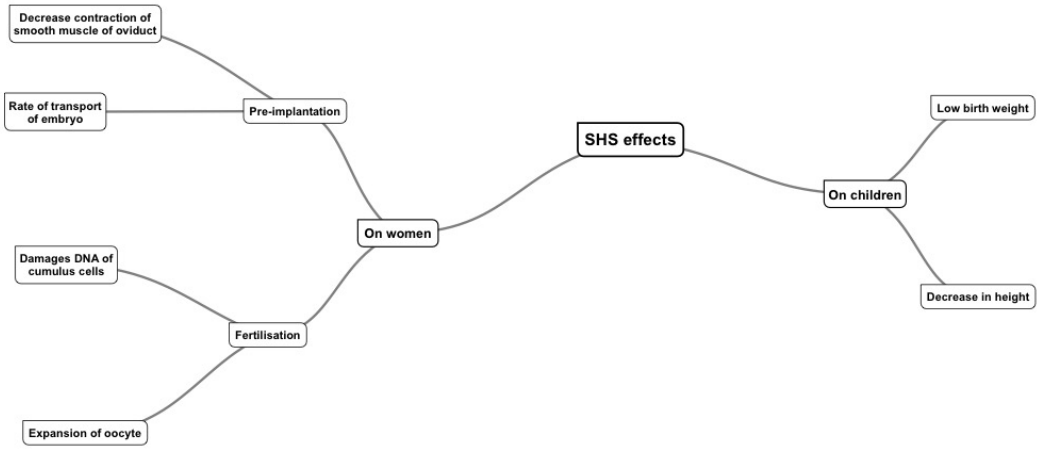
Cigarette smoke effects fertilisation and pre-implantation development in women. Ovulation and fertilisation are important processes that occur before pregnancy. Ovulation is the process that causes the release of oocyte complex from the mature follicle and once this is accomplished successfully then the sperm can attach to the oocyte[22]. A study was done at in vitro fertilisation using human gametes [5]. In the process of cumulus expansion, the hormone LH cause the cumulus cells surrounding the oocyte to secrete extra cellular matrix which causes the cells to hydrate, splitting them into two and increasing their size to be ovulated from the mature follicle [21]. Mice that lack matrix stabilising factors become infertile. Cumulus matrix is sensitive to components of cigarette smoke. It disrupts the expansion of oocyte and damages DNA of cumulus cells. Once the oocyte is ovulated, it is taken up by the oviduct and transported to the ampulla by the cilia. For this to happen the cilia needs to stick to the cumulus matrix, so factors affecting this are in turn affected by smoke. In pre-implantation factors of cigarette smoking can affect the rate of transport of the embryo in the oviduct can either move quickly or very slowly[15]. If the embryo moves too quickly then it undergoes expulsion from the uterus, if slow causes attachment to an ectopic site. Smoking mainly causes a reduction in the rate of transport of embryo which is further correlated to decreased contraction of smooth muscle of the oviduct [20]. Smoking affects one of the four main processes that occur during prenatal development, such as; survival, attachment, proliferation and apoptosis. If these processes do not occur properly then it puts the embryo and the fatal growth at a critical stage [14].

Effect on children

The main effect on children getting exposed to SHS is low birth weight. There have been lots of studies conducted to prove this relation. Some studies associated extent low birth weight with exposure of SHS[25]. Some showed a direct causation between SHS and birthweight saying that SHS decreases birthweight significantly [24]. While others just showed an association. In a cohort study done in Brazil, they associated exposure of SHS to growth of children from birth to adulthood. Keeping all the other factors constant, such as; age, sex, maternal height, schooling, socioeconomic position at preschool age, and breastfeeding, children who were

exposed to smoking during pregnancy and preschool age showed a decrease in height (coefficient: −0.32, $p < 0.001$) [16]. In another cohort study conducted in Malaysia, with two groups of postnatal women, one exposed to partners who smoke and others who do not smoke. There was a significant decrease of 12.9 g of weight in infants when exposed to an increase in 1 cigarette each time. There was a higher risk of 10% of low birth weight in exposed women than non-exposed with 4.7% [23].

Figure 1



Why should we stop?

The reasons for controlling or stopping SHS is almost the same as the reasons needed to stop or control active smoking, since SHS cannot happen without active smoking and both give out almost the same symptoms and consequences. There are three main categories to stop smoking; for health and appearance, lifestyle and loved ones. Firstly, The chances of having heart attacks, strokes, heart diseases and lung cancers will decrease, improved immune system, decreased blood pressure, no stains on finger nails and teeth and overall young and youthful look [2]. Secondly, the smell and taste abilities will improve. Thirdly, overall health will improve, so more time can be spent with loved ones and less exposure of smoke for children.

How can we stop?

The first step to reduce exposure of SHS is to avoid the exposure. In the study conducted in China, the avoidance of their partners by exposed women at home ranged from 10% - 70.2% [17]. The percentage of exposed women asking their partners to stop smoking temporarily ranged from 31.4% to 69.4%. Exposed women who opened their windows ranged from 10% to 43%. 75.4% of the exposed women to SHS in public places moved away and 18.8% considered changing restaurants when they found smokers inside. Another way to reduce exposure to SHS is to reduce the number of active smokers, so start quit-pack or quit-line programmes to help and make it easier for smokers to quit smoking [18]. The reason smokers find it hard to quit is the due to the presence of the addictive substance nicotine. So nicotine is the primary target. Therefore, there are nicotine replacement therapies and substitution of nicotine in form of chewing gums and patches. Drugs can be used to reduce the extent of tobacco withdrawal, but not necessarily help to stop smoking, such as; receptor antagonists, Angiotensin converting enzymes (ACE) inhibitors, and antidepressants. Currently, the best therapy is the use of bupropion, it is an antidepressant and stops the uptake of norepinephrine and dopamine [19]. Since these two substances are neurotransmitters, when their uptake decreases, the feeling of pleasure of smoking also decreases and therefore your addiction to smoking decreases. Brain activity can be improved by taking brain supplements, nutritional factors that improve the activity of the brain, such as; vitamins E, C, and A, antioxidants, fish oil, cur-cumin and green tea.

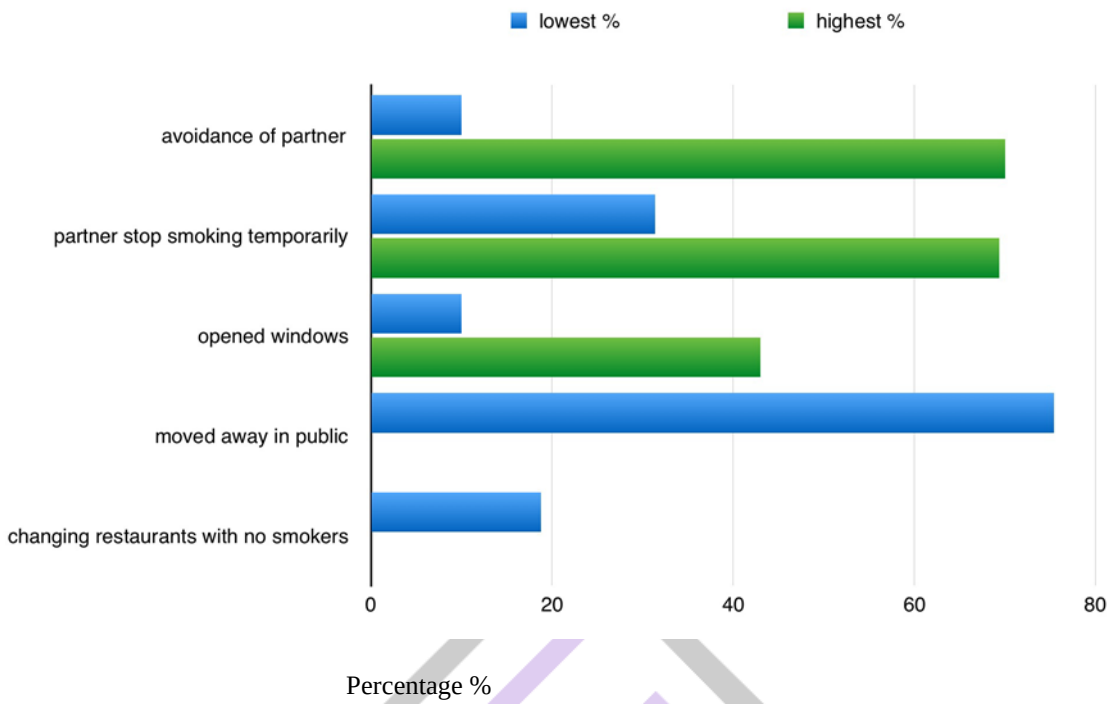


Figure 2

Conclusion

As a conclusion we can say that SHS has various adverse effects. Mainly effects children and pregnant women. The effects of SHS are very closely linked to processes in pre-pregnancy, during pregnancy and also post pregnancy. Since it is not taken as seriously as active smoking, most people are not aware that inhaling the smoke from tobacco is almost equally harmful as smoking. It is important that more and more details and information about this topic is implied to the society, health care providers, patients and general public, especially women and more importantly to pregnant women. Educational programmes should be conducted and directed both the general public and to particularly pregnant women, so both direct and indirect risks can be minimised to create more awareness and understanding on the harmful effects of SHS. Further studies should be done to reduce exposure of pregnant women to SHS by identifying more common places for SHS exposure and increasing smoke-free policies.

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