Father's Role in Secondhand Smoke Exposure During Pregnancy: A Systematic Review

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Abstract

Background: The effects of smoke from tobacco products are harmful to pregnant mothers and their unborn children. The problem is not limited to mothers who themselves smoke; fathers who are smokers expose expectant mothers to secondhand smoke. This review identifies and examines the role fathers play in exposing pregnant mothers to passive smoke that leads to secondary medical conditions for women and their children. **Methods:** The study examined 70 articles from peer-reviewed journals in the following databases: Scopus, Science Direct, Wiley Online, MEDLINE, ProQuest Central, and PsycINFO. The literature search focused on articles with publication dates from 2006 to 2016. **Results**: A total of 10 articles provided evidence for various effects of secondhand smoke such as asthma, spontaneous abortions, stillbirths, congenital malformations, and low birth weight. Furthermore, the literature presented an extensive background regarding the paternal role in a pregnant mother's exposure to smoke. **Conclusion:** Paternal smoking during pregnancy has a significant effect on the health of the mother and the child during pregnancy. Health care professionals should reinforce safety measures for pregnant women to prevent medical disorders resulting from exposure to smoking.

Keywords: paternal smoking, secondhand smoke, pregnancy, impacts

Introduction

Tobacco use, especially in terms of smoking, is a contemporary global challenge that can affect humans regardless of age, gender, and geographical background (Leonardi-Bee, Britton, & Venn, 2011). Pregnant women are no exception; the effects of smoking on a pregnant woman include the circumstance that harmful chemicals may be transferred to her unborn child (Simonetti et al., 2011). Consequently, the child as well as the woman can suffer from secondary health issues related to tobacco smoke. In addition, pregnant women are affected by both active smoking and passive smoking (secondary smoke). According to Andriani and Kuo (2014), exposure to secondary smoke is very prevalent in pregnant women, and husbands and fathers-to-be are the major source of this passive smoking. In addition, Campollo et al. (2015) cited a variety of scholars who asserted that father-to-be plays a significant role in pregnant women's exposure to secondary smoke, inflicting the effects of smoking on both the women and their unborn babies. Thus, a father who smokes will negatively affect his family unless he applies strict self-control such as stepping outside the home and smoking away from the family. However, according to Moritsugu (2007), very few fathers apply self-control to reduce secondhand smoke at home. Furthermore, fathers not only influence pregnant women's exposure to secondhand smoke by the men's own active smoking, but can also play a role in stimulating active smoking in other family members, leading to further secondary effects on the pregnant women (Pineles, Park, & Samet, 2014). The present literature review examines various scholarly studies to support the hypothesis that paternal smoking of tobacco has a significant impact on the health condition of a woman during pregnancy as well as on the newborn. In the context of paternal contribution, the literature review analyzes multiple studies to determine the effect on the mother and infant resulting from the exposure to secondhand smoke.

Methods

Parameters

The present literature review focused on peer-reviewed journals published between the years 2006 and 2016. Six databases—Scopus, Science Direct, Wiley Online, MEDLINE, ProQuest Central, and PsycINFO—were used to access peer-reviewed articles. In addition, several keyword searches were used to locate relevant articles. Keywords included "paternal smoking impacts on pregnancy," "secondhand smoke and effects on the unborn child," "medical impacts of paternal smoking during pregnancy," and "effects of secondhand smoke on unborn babies." These search terms were the most used search phrases; however, the most crucial keywords were paternal smoking, secondhand smoke, pregnancy + secondhand smoke, and impacts + secondhand smoke + pregnancy. The criteria for selecting articles required an extensive search to identify peer-reviewed journals that contained secondhand smoke data relating to paternal smoking. For an article to qualify for this literature review, it had to provide a method of examining data from a primary source.

Results

Of 100 studies identified from 6 databases, 30 were removed due to duplication. A total of 70 articles were screened for the second round. Articles that did not contain secondhand smoke data relating to paternal smoking were removed. Articles that did not examine data from a primary source were also removed. Finally, 10 articles were selected for meta-analysis. The following categories were identified from the chosen articles to classify the role of paternal secondhand smoke in maternal health, pregnancy outcome, fetal mortality, and fetal health.

Table 1.

Summary of Reviewed Articles

Authors	Aims/Objectives of study	Methods	Major Findings
Leonardi-Bee, Britton, & Venn, 2011	To determine the risk of adverse fetal outcomes of secondhand smoke exposure in nonsmoking pregnant women.	Quantitative study N=19 studies	Secondhand smoke exposure significantly increased the risk of congenital malformation (OR: 1.13 [95% CI: 1.01–1.26]).
Campollo et al., 2015	To assess the prevalence of tobacco smoking and of exposure to second hand smoke among pregnant women.	Mixed methods study N= 1481	Secondhand smoke from paternal smoking of fewer than 10 cigarettes per day did not cause a significant effect on the mother`s health that could result in a spontaneous abortion.
Pineles, Park, & Samet, 2014	To characterize the relationship between smoking and miscarriage.	Prospective observational study N= 1603	Secondhand smoke exposure during pregnancy increased the risk of miscarriage by 11% (OR: 2.11 [95% CI: 0.95-1.31]).
Florescu et al., 2009	To determine the risk of adverse fetal outcomes of secondhand smoke exposure in nonsmoking pregnant women.	Quantitative study N=20,059	Secondhand smoke exposure significantly increased the risk of stillbirth (OR: 1.23 [95% CI: 1.09–1.38]).
Newman et al., 2010	To estimate the effect of active and passive household cigarette smoke exposure on neonatal outcomes in pregnant women.	Prospective observational study N=2210	Secondhand smoke exposure caused an 11.2 % increase in stillbirth risk.

Table 1 (cont'd)

Salmasi, Grady, Jones, & McDonald, 2010	To determine to the effect of environmental tobacco smoke on perinatal outcomes.	Quantitative study N=48,439	Environmental tobacco smoke exposure increased risks of congenital anomalies (OR 1.17 [95% CI: 1.03-1.34]).
Haberg, Stigum, Nystad, & Nafstad, 2007	To determine the relationship between paternal/maternal smoking and effects on infants.	Quantitative study N= 22,390	There was a significant increase of malfunction related to secondhand smoking during pregnancy (OR 1.17; [95% CI: 1.03–1.34]).
Abu-Baker, Haddad, & Savage, 2010	To investigates how secondhand smoke exposure influences neonatal birth weight.	Quantitative study N= 300	Women who reported a higher average number of SHS exposure hours per week from home and outside were at significantly greater risk for having a low birth weight neonate (OR 1.075; [95% CI: 1.029–1.124]).
Honein et al., 2007	To examine the association between maternal smoking exposure and and birth defects.	Quantitative study N=933	Infants exposed to maternal smoking are more likely to exhibit deficits in birth weight (OR 1.7; [95% CI: 1.0–3.0]).
Simonetti et al., 2011	To determine the role of parental smoking in childhood blood pressure.	Quantitative study N=4236	Statistical significance of the relationship between exposure to maternal secondhand smoke and low birth weight (OR: 1.0 [95% CI: 0.5-1.5]).

Role of Paternal Secondhand Smoking in Maternal Health

In a 2010 study, Newman et al. studied the effects of secondhand smoking on maternal health. As smoking is known to aggravate the symptoms of respiratory disease, Newman et al. (2010) assessed the effect of active versus passive smoking on symptoms of asthma and the exacerbation of asthma in pregnant women. Of the nonsmokers examined in the study, nearly 36% of the women experienced exposure to secondhand smoke at home. Newman et al. reported that symptoms of asthma and the number of exacerbations of asthma slightly increased in mothers who were exposed to secondhand smoke. However, the increase was not significant compared with the mothers who were not exposed to secondhand smoke. This study provided limited evidence for the role of paternal-produced secondhand smoke on the health of the mother. In their discussion of the results, the researchers reported that the lack of a significant difference between the two groups might also have been a result of the small sample size and inconsistent reporting of passive smoking (Newman et al., 2010).

Role of Paternal Secondhand Smoking in Pregnancy Outcome

Three articles analyzed the outcomes on pregnancy when mothers are exposed to secondhand smoke (Campollo et al., 2015; Leonardi-Bee et al., 2011; Pineles et al., 2014). The researchers compared women affected by secondhand smoke to those not affected by secondhand smoke to determine any difference in the rate of spontaneous abortions. Apparently, the risk of undergoing a spontaneous abortion was higher in the women who were exposed to secondhand smoke compared to those who were not exposed. Two of the articles (Leonardi-Bee et al., 2011; Pineles et al., 2014) included a discussion of the significant correlation between spontaneous abortions and paternal smoking (OR: 1.17 [95% CI: 0.88-1.54];OR: 2.11 [95% CI: 0.95-1.31]). One of the articles (Campollo et al., 2015) did not provide sufficient information to guarantee its inclusion in the overall analysis of the report. The researchers also reported that secondhand smoke from paternal smoking of fewer than 10 cigarettes per day did not cause a significant effect on the mother`s health that could result in a spontaneous abortion (Campollo et al., 2015).

Role of Paternal Secondhand Smoking in Fetal Mortality

The term stillbirth refers to giving birth to a dead infant, typically occurring after the first 28 weeks of conception, whereas neonatal mortality occurs within the first 28 days after birth (WHO, 2018). Secondhand smoke is one cause of stillbirth (Newman et al., 2010), therefore, the present literature review focused on gathering information about maternal exposure to paternal secondhand smoke that causes stillbirth. Two articles analyzed the relationship between stillbirths and secondhand smoke (Florescu et al., 2009; Newman et al., 2010). The result indicated that secondhand smoke exposure caused an 11.2 % increase in stillbirth risk (Newman et al., 2010). The risk of stillbirths, as examined in the two articles, converted to a value of 95% CI: 1.09–1.38; $I^2 = 0\%$. Secondhand smoke has been causally linked to restricted fetal growth, which in turn increases the risk of death (Florescu et al., 2009). Thurs, there is a significant relationship between paternal secondhand smoking and stillbirth (Florescu et al., 2009; Newman et al., 2010).

Role of Paternal Secondhand Smoking in Fetal Health

Congenital malfunctions are medical abnormalities that occur during pregnancy, such as those affecting the bones, the spine, and the head's soft tissue, including neural tube defects like spina bifida (Khoury, 1989). Two articles were specific as to the types of malfunctions (Leonardi-Bee et al., 2011; Salmasi, Grady, Jones, & McDonald, 2010) and identified that congenital malfunctions are the results of paternal secondhand smoking (OR: 1.13 [95% CI: 1.01-1.26]; OR: 1.17 [95% CI: 1.03-1.34]). Haberg et al. (2007) generalized the malfunction and revealed a significant increase related to secondhand smoking during pregnancy (OR 1.17; [95% CI: 1.03–1.34]).

In addition, all three examined studies stated that paternal smoking played a significant role in the mothers' exposure to secondhand smoke (Leonardi-Bee et al., 2011; Salmasi, Grady, Jones, & McDonald, 2010; Haberg et al., 2007). Haberg et al. (2007) approximated the average father's role in generating secondhand smoke at a minimum level of 80%. However, the cases varied according to the consistency and rate of smoking. According to Haberg et al (2007), the severity of these congenital malfunctions rose with the increase in the father's rate of smoking.

An analysis revealed that exposure to secondhand smoke had a significant effect on infant birth weight. Four of the studies (Leonardi-Bee et al., 2011; Simonetti et al., 2011; Abu-Baker, Haddad, & Savage, 2010; Honein et al., 2007) recorded and analyzed the discrepancy in infant weight as a result of exposure to secondhand smoke. Nicotine may reduce the supply of nutrients, thus limiting the optimum amount that the fetus should receive, causing low birth weight (Honein et al., 2007). Leonardi-Bee et al. (2011) examined 58 studies and concluded that that the infants suffered a range of 33–40g decrease in weight as a result of exposure to secondhand smoke. Simonetti et al. (2011) indicated the statistical significance of the relationship between exposure to maternal secondhand smoke and low birth weight (OR: 1.0 [95% CI: 0.5-1.5]). Abu-Baker, Haddad, & Savage (2010) found that women who reported a higher average number of secondhand smoke exposure hours per week from home and outside were at significantly greater risk for having a low birth weight neonate (OR 1.075; [95% CI: 1.029–1.124]).

Discussion

The present literature review indicates that the mothers exposed to secondhand smoke experienced various types of conditions that affect the outcomes of pregnancy and health of the child significantly. The risk of undergoing a spontaneous abortion was higher in the women who were exposed to secondhand smoke compared to those who were not exposed. There is a significant relationship between paternal secondhand smoking and stillbirth. Congenital malfunctions are the results of paternal secondhand smoking.

The articles have revealed that paternal secondhand smoking exposure is a major contributor of spontaneous abortion (Leonardi-Bee et al., 2011; Pineles et al., 2014). Although

not active smokers, pregnant women with exposure to secondhand smoke are associated with increased risk of spontaneous abortion by 11% (Pineles et al., 2014). In the context of stillbirth studies, research shows that exposure to secondhand smoke increases the chances of having a stillbirth during pregnancy by 11.2 (Newman et al., 2010). Secondhand smoke during pregnancy has been linked to restricted fetal growth and preterm delivery which are the risk factors of stillbirth (Florescu et al., 2009).

The articles have also examined the congenital malformations that occur due to the use of or exposure to tobacco smoke. Reduced birth weight was the most prevalent condition of congenital malformations directly linked to secondhand smoke in most of the reviewed articles (Leonardi-Bee et al., 2011; Simonetti et al., 2011). It was apparent that mothers who were not exposed to smoke gave birth to babies who were heavier than were those of the exposed women (Leonardi-Bee et al., 2011). In particular, Abu-Baker et al. (2010) noted that the nicotine element in smoke reduces the metabolic efficiency of both the mother and the unborn child, leading to reduced weight. Nicotine may also reduce the supply of nutrients, thus limiting the optimum amount that the fetus should receive, causing low birth weight (Honein et al., 2007).

From the present literature review, it is clear that the evidence identifying the effects of paternal secondhand tobacco smoking on maternal health is limited. Available information regarding the extent of secondhand smoke and number of hours pregnant women were exposed to secondhand smoke, both of which affect maternal health, is lacking (Newman et al., 2010). This gap needs to be addressed to significantly advance our understanding of the effects of paternal secondhand tobacco smoking on maternal health.

Limitations of the Study

The present literature review encountered several challenges including contradictory findings and lack of coverage of contemporary issues. Contradictory findings emerged in the research: Various articles supported the research topic, whereas others countered the information or failed to discuss the topic. Although some scholars linked the paternal role to pregnancy complications, some research studies provided other information that showed no association between paternal smoking and certain medical complications such as spontaneous abortions (Holliday, Moore, & Moore, 2009). More research studies are needed in order to draw strong conclusions.

Conclusion

Past researches have suggested that paternal smoking plays a significant role in a pregnant mother's exposure to secondhand tobacco smoke. This exposure generates various medical complications such as miscarriages, stillbirths and neonatal mortality, congenital malformations, and decreased birth weight (Salmasi et al., 2010). The effects are not predetermined, varying according to the rate and amount of exposure to secondhand smoke. This present literature review examined the articles critically facilitated determining the dangers of secondhand smoke to both the infant and the mother (Leonardi-Bee et al., 2011). Because paternal smoking is a major contributor to pregnancy-related medical conditions resulting from secondhand exposure, it is vital that heath care professionals should implement and enforce safety measures for pregnant mothers.

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