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The potential impact of tobacco use on female fertility and pregnancy outcomes: An invited scientific review by EBCOG

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ABSTRACT

Tobacco use in pregnant women remains prevalent with an estimated prevalence of 8.1 % in the European region. In whatever form it is partaken, tobacco use is associated with significant short- and long-term consequences for both the mother and the progeny thus making the habit an important obstetric and public health concern. It is recommended that an active intervention policy should be adopted by healthcare providers to promote preconception smoking cessation and provide services for counselling with behavioural modification support, and the provision of smoking cessation pharmaceutical services. Women who continue to smoke should have closer antenatal surveillance throughout the whole of pregnancy.

Introduction

Smoking and tobacco use is the leading cause of preventable disease, disability, and death in the world. In the EU, in 2019, 14.8% of women aged 15 years or more were reported to be smoking cigarettes on a daily basis. The rate varied between various countries with the lowest percentage in Iceland (6.5%) and the highest in Serbia (24%). The share of EU 15+ years women smoking 20 or more cigarettes a day was 3.4%. The daily use of electronic devices of vaping in EU 15+ years women was reportedly 1.1% with rates varying from 0.2% [Romania and Turkey] to 3.2% [Iceland]. The share of EU women aged 15 years or more who are exposed to tobacco smoke on a daily basis was reported at 13.3% with a reported range of 3.4% in Iceland and 46.3% in Serbia [1].

Tobacco

Tobacco consumption during pregnancy is a common situation,

although the current trend is favourable of becoming less frequent in high-income countries and more, on the contrary, in low to middle-income countries. Smoking during pregnancy prevalence varies across countries and studies show that it is becoming increasingly common among young women [2]. A systematic review and meta-analysis of the literature have shown that in the European Region, the prevalence of smoking during pregnancy was 8.1%. Furthermore, the proportion of European women who smoked daily and continued to smoke daily during pregnancy was 30.6% [3]. The Male-Female gender difference of cigarette smokers in the EU was reportedly 7.5% with males reporting higher rates of smoking [1].

Vaping

Vaping is an alternative to smoking where the consumer inhales nicotine and a variety of flavourings as an aerosol. The vaping user does not appear to be exposed to the carcinogenic and harmful ingredients of

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tobacco, while a report from the National Academies of Sciences, Engineering, and Medicine found no conclusive evidence that vaping contributed to adverse pregnancy outcomes and fetal development [4]. There are currently no studies on the reproductive outcome of pregnant women who vaped; however, animal studies have demonstrated the potential harm of vaping's nicotine exposure to birth defects and altered birth weight [5,6]. The effects of nicotine contained in vaping should theoretically be the same as those from conventional cigarette smoking [7], though the nicotine levels, as well as the rest particle and metal concentrations detected in e-cigarette fluid, are lower than those observed in conventional cigarettes [8]. Moreover, it has been suggested that vaping negatively affects ovarian function and uterine receptivity, so the potential impact of e-cigarette utilization on female reproduction does seem to be present [9].

Smokeless tobacco (Chewing, snuff and suns, gutka)

Besides vaping, other types of smokeless tobacco use include tobacco chewing, snuff, snus, and gutka. Snuff is dry ground tobacco placed between the gum and the cheek, while snus refers to moist ground tobacco placed behind the upper lip. The difference between snuff and snus is that the latter may have a lower content of tobacco-specific nitrosamines. Gutka is a tobacco preparation containing spices that can be chewed, sucked, or placed between the gum and cheek. Studies of smokeless tobacco use in pregnancy suggest a negative effect on pregnancy outcomes such as preterm delivery, preeclampsia, lower birth-weight, and stillbirth [10,11].

Hookah

Hookah or Waterpipe smoking has become a favourite among younger adults since they mistakenly assume that it is safer than conventional tobacco use. However, Hookah smokers are exposed to both nicotine and heated charcoal components, which seem to increase the risk of growth restriction and stillbirth [12].

Smoking during pregnancy consequences

Tobacco, whether through direct use or second-hand smoke, is a known human development toxicant and teratogen with significant overall adverse effects. Smoking can complicate the pregnancy process and is associated with potentially avoidable short- and long-term consequences for both the mother and the progeny. Tobacco use therefore represents an important obstetric and public health concern. Besides the effects of tobacco on pregnancy outcomes, smoking has also been suggested to negatively influence and delay conception [13]. In addition, it appears that women who had an ectopic pregnancy had a greater than fourfold increase in the risk in women who reported smoking >20 cigarettes per day during pregnancy [14].

Smoking cessation during pregnancy

There is an overall agreement about the importance of preconception smoking cessation counselling with behavioural modification, individualization of the need for smoking cessation pharmaceutical services, and screening for comorbidities in improving pregnancy outcomes. Women who smoke or used to smoke till the onset of pregnancy should be screened for birth defects and have closer antenatal surveillance [15–17].

It is generally recommended that pregnant women should be screened as to their smoking habits at their first booking antenatal visit and subsequently counselled to cease smoking. It is important that questions regarding smoking habits should be asked in a nonjudgmental way. Healthcare providers should provide detailed counselling regarding the potential harm of continuing maternal smoking during pregnancy and the possible adverse pregnancy outcomes. The clinical

history can be supplemented by performing a breath test measurement to assess the level of exposure to carbon monoxide [15–17].

Interventions such as pharmacotherapy and nicotine replacement therapy (NRT) have been proposed to support smoking cessation during pregnancy. NRT in the form of gum, mouth spray, and inhaler are preferred to other delivery forms to avoid delivering higher doses to the fetus. These interventions seem to reduce smoking in the third trimester of pregnancy and improve its perinatal implications [18], however pregnant women do not generally adopt their use [19]. The use of combined pharmacotherapy and behavioural interventions has been reported to have a greater cigarette smoking quitting rate when compared to non-pharmacotherapy interventions in both the general population and in pregnant women. [20,21].

Effect of smoking on pregnancy

Smoking tobacco may result in serious short- and long-term complications for women and their offspring. The effect of tobacco use is throughout the three trimesters of pregnancy and is dose dependent [22]. Smoking has been related to higher maternal complications during pregnancy, fetal growth restriction, preterm birth, low birth weight, stillbirth, sudden infant death syndrome, and neurodevelopment consequences [23]. Smoking has been shown to provoke damage at the vascular level leading to uteroplacental insufficiency and placental abruption [24]. Nicotine appears to influence the rate of fetal growth and the gestational age at delivery.

Nicotine passes freely through the placenta and nicotine fetal concentrations can be more than 15% higher than maternal blood levels. Nicotine has been found to be present in fetal blood, amniotic fluid, and breast milk postpartum. Indirectly, nicotine affects maternal pulse and blood pressure, which in turn may affect uterine blood flow. Prenatal nicotine exposure, even through vaping, is a risk factor for low birth weight, premature delivery, and stillbirth [25,5]. In addition, smoking further produces carbon monoxide which combines to form carboxyhaemoglobin which reduces the oxygen-carrying capacity of haemoglobin thus inhibiting the release of oxygen into fetal tissues [22]. There are at present no consistent protocols regarding fetal surveillance, monitoring, timing and mode of delivery, and postpartum follow-up for women who smoke.

Effects on early childhood

There is growing supporting literature on the harmful effects of smoking during pregnancy extending into childhood and later in life. Smoking has been associated with childhood and early adulthood development of obesity, hypertension, asthma, decreased lung function, and behavioural disorders [13,26,27]. Children exposed to prenatal nicotine have been reported to have smaller head circumferences and heights [18,22]. Maternal smoking during pregnancy has been shown to be an independent risk factor for reduced academic achievement and cognitive abilities in childhood [27].

Postpartum care and counselling

During the postpartum period, the women who are smoking should be encouraged to breastfeed while encouraged to quit smoking. If the woman persists with her smoking habit, she should be advised to smoke only after the baby has been fed and settled and to smoke away from the baby to reduce its second-hand exposure to nicotine. These women should also be counselled regarding their contraceptive options as recommended by the W.H.O. eligibility criteria for contraceptive use [28], since tobacco use increases the risk of venous thrombosis, myocardial ischaemia, and stroke from combined oral contraceptive use. The combined oral contraceptives should be avoided in women over 35 years who smoke, with severe dyslipidaemia or obesity. Transdermal or intrauterine routes can be more safely prescribed [29].

Standards of care during pregnancy for chronic smokers

All maternity service providers should work in collaboration with local health authorities to provide pre-pregnancy advice that includes the avoidance and cessation of smoking. Quitting a smoking habit is beneficial at whatever stage of pregnancy. Smoking cessation information should be offered at all healthcare services dealing with reproductive health, including antenatal and postpartum clinics. A non-judgmental conversation by the clinicians would facilitate a full disclosure regarding current smoking habits by pregnant women. The options and available support to quit smoking should be offered and explained. Chronic smokers should be counselled regarding the poor perinatal outcomes due to smoking during pregnancy and its impact on a child's health and neurodevelopment.

Postpartum strategy for smoking cessation

EBCOG Recommends

1. Tobacco smoking during pregnancy is an important risk factor for maternal and perinatal morbidity with a constantly rising global prevalence among reproductive-aged women. It remains of paramount importance to discourage smoking during pregnancy and subsequently improve pregnancy outcomes.
2. Health education should always be offered by all healthcare professionals. Besides initiatives addressing lifestyle changes to obesity, exercise prescribing, maternal and child health, and public and global health, healthcare providers should also address the need for smoking cessation. Health promotion and public health campaigns should offer accessible information about smoking cessation services, adequate-consistent support, and resources from healthcare professionals to enhance smoking cessation as a public health concern [30].
3. Pre-pregnancy and antenatal health campaign – EBCOG considers it important that obstetrician–gynaecologists and other obstetric care professionals should ask about smoking habits and advise women about the risks of smoking during pregnancy, as well as the potential side effects on their health and the health of their infants. Clinicians should individualize care by offering all possible interventions and encourage women to seek smoking cessation services and other resources, which should be available in all maternity care facilities.

This scientific review has been peer reviewed by Professor Wladimiroff (United Kingdom), Professor Helle Karro (Estonia), Professor Basil Tarlatzis (Greece), and Dr Sambit Mukhopadhyay (England).

This scientific review has been approved by the Executive Board of the European Board and College of Obstetrics and Gynaecology on 31st July 2023 by virtual consultation process.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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