



IMPACT OF MATERNAL SMOKING ON PREGNANCY OUTCOME

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Abstract

Background: Studies have discovered that if a pregnant person is around tobacco smoke, it could be harmful to their baby. This could lead to a higher chance of the baby not surviving, a lower weight when born, and a greater possibility of being born too early. This research wants to discover how smoking during pregnancy can affect the baby's health and growth.

Methods: In 2023, researchers conducted a study in Iraq on 200 pregnant women who were near the end of their pregnancies. They were divided into two groups: Group I had women who smoke, and Group II had women who do not smoke. The research examined different information such as people's age, gender, and the results of their births. We used a program called IBM SPSS 25 to examine the information. Different ways of studying data were used for various kinds of patterns and how good the data was. The number we considered significant was less than 0.05.

Results: There were clear differences between two groups in terms of how their babies were born, how far along they were in their pregnancies, and how much they weighed when they were born. Out of the women who smoked, 71% had cesarean sections, while in the group of women who didn't smoke, only 44% had cesarean sections. Only 6% of women who smoke had endometritis, while there wasn't a big difference in chorioamnionitis between the two groups. Preeclampsia happened more often in the group of people who smoke, with 59% of them getting it compared to only 10% of people who don't smoke. The analysis of data shows that there is a big difference between the groups being compared, and this difference is very unlikely to have occurred by chance.

Conclusion: New studies found that pregnant women who smoke may have smaller and earlier babies. We need to do more research to know how smoking affects pregnancy. It's also important to find ways to help people quit smoking before they become pregnant, and to create environments where pregnant women don't breathe in smoke.

Keywords: pregnancy, trimester, smoking , fetal

Background

Using cigarettes can make adults sick with serious diseases like heart disease, lung disease, cancer, and other long-lasting illnesses. But, it can take a while for these health problems to show up, so smokers, especially young ones, may not feel like quitting right away. (Tarasi B et al.,2022)In 2019, experts guessed there were 1. There are 14 billion people who smoke worldwide. This caused 7. 69 million deaths and 200 million years of disability-adjusted life. Across the globe, fewer women smoke compared to men.66.2% of women are smokers, while 32.7% of men smoke. But, more women in wealthy countries are smokers compared to men. 17.6% of women smoke while 26.9% of men smoke. (He H et al.,2022)

There is proof that women are likely to stop smoking when they are pregnant. Across the world, about 1.7% of women smoke during their pregnancy. These numbers should be looked at carefully because about 25% of pregnant women who smoked before getting pregnant wrongly said they stopped smoking during pregnancy. Women who are pregnant, and didn't finish a lot of school or didn't plan to get pregnant are more likely to smoke and less likely to stop smoking. (Claire R et al.,2020)

Many studies have looked at the effects of smoking while pregnant and found that it can cause many negative outcomes for the baby and mother. Specifically, when a pregnant person is regularly exposed to tobacco, it can lead to negative outcomes such as giving birth too early, having a smaller baby, needing extra care for the baby in intensive care, and even the baby dying before birth. Smoking during pregnancy can also cause problems with the baby's lungs and breathing. Pregnant women who smoke may cause problems in the stomach and intestines of their babies if they continue smoking for a long time. (Sequí-Canet JM et al .,2022)

Patients and Methods

The study took place in Iraq in 2023 and included 200 pregnant women in their third trimester. The women were split into two groups: Group I consisted of active smokers, and Group II consisted of non-smokers.

The requirements for participating in the study were: - Being in the last three months of pregnancy - Having only one baby - Not having any long-term illnesses like heart disease, kidney problems, or hormonal disorders - Not having any pregnancy-related complications like high blood pressure or diabetes Everyone who takes part is doing it by choice, and anyone can decide to leave the interview whenever they want. A form was made to ask the people if they wanted to be interviewed. Only the ones who said yes were interviewed for the study. The consent form did not allow for any unfair tricks, unwanted pressure, or fear. The agreement was signed only after the people who might be affected were given enough information. The choice they made about joining did have an impact on the relationship between the doctor and patient, as well as any other advantages they may receive. We will never share personal information about people, and the data we collect will be kept private.

Methods

The things that were studied included information about the mother (age, education, if she worked, where she lived, if she smoked, and her thoughts on smoking), the mother's history of pregnancies (how many times she has been pregnant and how her babies were delivered), and what happened during the pregnancy (how much the baby weighed at birth, how healthy the baby was at 1 and 5 minutes after birth, and if the baby needed to go to the intensive care unit).

Statistical analysis

We used a computer program called IBM SPSS 25 to analyze data. We looked at numbers and measured how they are spread out. We found the average value with a range of values where we are 95% confident the true average falls within. Researchers conducted a study to see how two different groups compare in terms of one or more qualities. At least one group had a distribution that didn't follow the usual pattern, or the type of distribution wasn't studied. The research examined if the average scores were similar using a statistical test called the Mann-Whitney U-test. The information

from the tables was analyzed using a statistical test called chi-square (χ^2) to check if there were any important differences in the numbers. The Fisher exact test was used when there were less than 5 happenings. The threshold for deciding if something is statistically important was set at a number smaller than 0.05

RESULTS

200 women were included and were divided according to: smoking group 100 women and non smoking 100 women both group were matched as regard demographic data with insignificant differences between two groups as shown in table 1 , in smoking group the mean duration of smoking was 6 ± 4.5 years

Included women were in third trimester and we're followed up till delivery and as regard maternal outcome

There was a big difference between the two groups in terms of the way the babies were born. In the group of people who smoked, most of them had their babies delivered through a cesarean section, around 71%. On the other hand, in the group of people who didn't smoke, only 44% had their babies delivered through a cesarean section , endometritis occurred only in smoking women 6% , chorioamnionitis were insignificant differ between two groups , as regard preeclampsia significantly higher in smoking group 59% than non smoker 10% with p value < 0.0001 as shown in table 2

Regarding fetal outcome there was significant lower in gestational age at delivery in smoking group than non smoking also as regard birth weight there was significant lower in birth weight in smoking group than non smoking

There were not many differences between two groups in terms of apgar score, neonatal sepsis, IVH or ROP, but there were differences in terms of NICU admissions, RDS, BPD, PDANEC, and neonatal mortality. The number of smokers is much higher than the number of non-smokers, as shown in table 3.

Table (1): Demographic data in the studied groups.

	Non-smoking N = 100	Smoking N = 100	P value
Age	30.7 \pm 5.6	29.5 \pm 6.4	0.1598
BMI (kg/m²)	24.4 \pm 4.8	23.2 \pm 4.3	0.0641
Alcohol use	1 (1%)	6 (6%)	0.0543
Nulliparity	57 (57%)	46 (46%)	0.1196

Table (2): Maternal outcomes in the studied groups.

	Non-smoking N = 100	Smoking N = 100	P value
Delivery type			
C-section	44 (44%)	71 (71%)	0.0001
Vaginal	56 (56%)	29 (29%)	
Endometritis			
Yes	0	6 (6%)	0.028
No	100(100%)	94 (94%)	
Chorioamnionitis			
Yes	18 (18%)	22% (22)	0.4795
No	82 (82%)	78% (78)	
Latency(days)	6.0 (4.0, 8.0)	8.5 (6.0, 25.0)	0.8
Median(IQR)			
Pre-eclampsia (PET)	10 (10%)	59 (59%)	< 0.00001

Table (3): Neonatal outcomes in the studied groups.

	Non-smoking N = 100	Smoking N = 100	P value
Gestational age at delivery (weeks) (Mean ± SD)	38.96 ± 0.40	37.88 ± 0.58	0.003
Birth weight (g) (Mean ±SD)	3.2 ± 0.12	3.0 ± 0.12	0.019
APGAR at 1 minute Median(IQR)	8 (7,9)	9 (7,9)	0.8
APGAR at 5 minutes Median(IQR)	9 (8,9)	9 (9,9)	0.8
NICU admission			
Yes	11 (11%)	(100%)	0.0007
No	89 (89%)	0	
RDS			
Yes	47 (47%)	67 (67%)	0.0042
No	53 (53%)	33 (33%)	
BPD			
Yes	6 (6%)	29 (29%)	0.00001
No	94 (94%)	71 (71%)	
PDA			
Yes	11 (11%)	24 (24%)	0.0155
No	89 (89%)	76 (76%)	
Sepsis			
Yes	6 (6%)	12 (12%)	0.204
No	94 (94%)	88 (88%)	
IVH			
Yes	6 (6%)	11 (11%)	0.1382
No	94 (94%)	89 (89%)	
NEC			
Yes	0	24 (24%)	<0.0001
No	(100%)	76 (76%)	
RoP			
Yes	18 (18%)	22 (22%)	0.479
No	82 (82%)	78 (78%)	
Neonatal death			
Yes	0	12 (12%)	0.0003
No	(100%)	88 (88%)	
Neonatal hospital stays (days) Median(IQR)	24.0 (11, 49)	24.0 (13, 43)	1

GA: Gestational age; NICU : Neonatal intensive care unit; RDS : Respiratory distress syndrome; BPD : Bronchopulmonary dysplasia; PDA : Patent ductus arteriosus; IVH : Interventricular hemorrhage; NEC : Necrotizing enterocolitis; RoP : Retinopathy of prematurity.

Discussion

We know for sure that smoking while pregnant can lead to many health problems and developmental disorders for the baby. (Bruin JE et al., 2010). Since nicotine can pass through the placenta, it may have an impact on a foetus' development (Lisboa PC et al., 2012).

Other chemicals in tobacco smoke, like CO, can disrupt the baby's oxygen, and other substances like polycyclic aromatic hydrocarbons and tobacco-specific nitrosamines can pass through the mother's placenta and reach the baby's blood system. (Schneider S et al., 2010)

The goal of this study is to find out how smoking during pregnancy can impact the progress of the pregnancy.

In this study, there was a big difference in the way babies were born between the two groups. In the group of people who smoked, 71% of the deliveries were done through caesarean sections, but in the group of people who didn't smoke, only 44% of the deliveries were done that way.

Li and her colleagues in 2019 discovered that mothers who smoke are more likely to have a caesarean section because their baby's condition is not satisfactory. This matched with what we discovered.

We don't know exactly why smoking during pregnancy is linked to a lower risk of preeclampsia. However, there are some possible explanations that have been suggested, which partially help us

understand this connection. In this study, researchers found that preeclampsia was much more common in women who smoked (59%) compared to those who didn't smoke (10%).

According to earlier research (Levine RJ et al., 2004; 2006), Factors that prevent the growth of blood vessels, such as sFlt1 and sEng, might play an important role in the development of preeclampsia. In tests, carbon monoxide, a very harmful substance in smoking, reduces the production of soluble endoglin and sFlt1 in placental cultures and endothelial cells. (Cudmore et al.,2007)

In a recent study, it was found that babies born to mothers who smoke had a lower gestational age at birth compared to babies

The study found that people who smoke themselves were more likely to have their babies earlier than people who are around others smoking or people who don't smoke at all. Many studies have looked at the chance of having a baby too early in mothers who smoke. (Kelkay B et al., 2019; Liu B et al., 2020) also point to this conclusion.

Maternal smoking is connected to a higher chance of having a miscarriage, problems with the placenta during pregnancy, difficulties during childbirth, giving birth earlier than expected, and having a baby with a lower weight than normal. (Andres RL et al.,2000).

Numerous studies support the link between mother smoking during pregnancy and premature birth (Cuk D et al, 2000).

Regression analysis provided information about why gestational age at delivery varies by 1.5-31%It also looked at how mother smoking affects birthweight, taking into account factors that cannot be changed. However, it was found that smoking's effect on how a baby grows in a mother's womb was the main reason why birthweight increased after quitting smoking. (Secker-Walker RH et al., 2003). Maternal smoking during any trimester of pregnancy significantly increased the chances of giving birth prematurely, as found by a study on 1194 Japanese newborns. Babies who were carried to full term and whose mothers only smoked during the last three months of pregnancy weighed less at birth compared to babies of mothers who did not smoke. (Ohmi H et al.,2002)

Other studies have not found any noticeable effects on the likelihood of giving birth prematurely. In one study, they found that the effect only happened in pregnancies with twins and in women who drank less than 400 mg of caffeine every day. (Wisborg K et al., 1996; Lang JM et al., 1996). Overall, Wisborg K et al. (1996) found no difference in preterm birth risk between smokers and nonsmokers. We don't know exactly how being born prematurely is related to being exposed to tobacco smoke. The effects of blood vessels constricting in mothers can be serious and could cause the breaking of the sac around the baby too soon because of pressure on the sac. This pressure can harm the sac and cause it to break.

In this study, there were big differences between two groups in terms of the weight of the babies when they were born.

According to a long study done in the USA, there are more cases of babies with low birth weight born to mothers who smoke compared to mothers who do not smoke. (Ventura SJ et al., 2003). A study in Bristol, UK found that babies born to mothers who smoked were smaller than babies born to non-smokers. (Ong KK et al.,2002)

Based on a study done by Kataoka, M. C The birth weight of babies who were carried to full term decreased as the number of cigarettes smoked per day increased. There was a significant drop in weight between smoking 6 and 10 cigarettes per day. Babies whose moms smoked 6 to 10 cigarettes a day during pregnancy had an average birth weight 320 grams lower than babies whose moms didn't smoke. Babies of moms who smoked 11 to 40 cigarettes a day had an average birth weight 435 grams lower than babies of non-smoking moms. (Kataoka M.C et al.,2018)

In this study, there were no significant differences between two groups when it came to apgar score, neonatal sepsis, IVH, or ROP. However, there were differences when it came to NICU admissions, RDS, BPD, PDANEC, and neonatal mortality. The number of smokers is much greater than the number of non-smokers.

A recent study found that by the end of March 2012, 332,386 children had been admitted to the hospital, 40,492 babies were born too early, 56,588 babies were smaller than expected, and 1,074 babies died after being born. There were 56,615 young children under 5 years old who were admitted to the hospital for bronchiolitis at least once. Additionally, 24,088 children were admitted for acute respiratory infections, and 7,549 for asthma. When mothers smoke, their babies have a much higher chance of getting bacterial meningitis and need to be hospitalized for treatment. (HR 1.49, 95% CI 1.30 to 1.71, PAF 11.8%), acute respiratory infections (adjusted HR 1.29, 95% CI 1.25 to 1.34, PAF 6.7%), bronchiolitis (HR 1.43, 95% CI 1.38 to 1.48 under 1 year, PAF 10.1%), asthma (HR 1.29, 95% CI 1.22 to 1.37 age 1-5 years, P (Lawder R et al.2019)

According to Cheraghi M. et al. (2009), Smoking while pregnant can increase the chances of your child having bronchitis, wheezing, asthma, and sensitive airways.

A review of many studies found that when a baby is exposed to tobacco smoke while still inside the mother, they are more likely to have asthma and wheezing problems as they grow up. This risk lasts until they are 18 years old. The biggest risk is for babies under the age of two, who are more likely to develop asthma. (Burke H et al.,2012).

Maternal smoking is strongly linked to various health issues in babies. These include problems with the heart, muscles and bones, fingers and toes, and the development of the face, eyes, and digestive system. Smoking during pregnancy can also cause issues like hernia and undescended testes. Skin abnormalities and a condition called hypospadias had a reduced chance of occurring. Because of including abnormalities with a lower chance of risk and those that are not related (like chromosomal defects), the overall OR for all combined defects was 1.01 (with a range between 0.96 and 1.07) (Hackshaw A et al.,2011).

Conclusion

The latest study demonstrated that smoking during pregnancy causes babies to be born smaller and with shorter gestational ages. The results of our study underscore the need for additional research on the impact of smoking on perinatal outcomes, the development of preconception cessation programmes, and the assessment of effective measures to improve a smoke-free environment throughout pregnancy.

References

1. Hackshaw A, Rodeck C, Boniface S. Maternal smoking in pregnancy and birth defects: a systematic review based on 173 687 malformed cases and 11.7 million controls. *Hum Reprod Update*. 2011 Sep-Oct;17(5):589-604. doi: 10.1093/humupd/dmr022. Epub 2011 Jul 11. PMID: 21747128; PMCID: PMC3156888.
2. Ohmi H, Hirooka K, Mochizuki Y: Fetal growth and the timing of exposure to maternal smoking. *Pediatr. Int.* 2002;44(1), 55–59
3. Wisborg K, Henriksen TB, Hedegaard M, Secher NJ. Smoking during pregnancy and preterm birth. *Br. J. Obstet. Gynaecol.* 1996;103(8), 800–805
4. Lang JM, Lieberman E, Cohen A. A comparison of risk factors for preterm labor and term small-for-gestational-age birth. *Epidemiology.* 1996; 7(4), 369–376
5. Andres RL, Day MC. Perinatal complications associated with maternal tobacco use. *Semin. Neonatol.* 2000;5(3), 231–24
6. Cuk D, Mamula O, Frkovic A. The effect of maternal smoking on pregnancy outcome. *Lijec Vjesn.* 2000; 122(5–6), 103–110
7. Secker-Walker RH, Vacek PM. Relationships between cigarette smoking during pregnancy, gestational age, maternal weight gain, and infant birthweight. *Addict. Behav.* 2003; 28(1), 55–66
8. Ventura SJ, Hamilton BE, Mathews TJ, Chandra A. Trends and variations in smoking during pregnancy and low birth weight: evidence from the birth certificate, 1990–2000. *Pediatrics.* 2003; 111(5 Pt 2), 1176–1180

9. Ong KK, Preece MA, Emmett PM, Ahmed ML, Dunger DB. Size at birth and early childhood growth in relation to maternal smoking, parity and infant breastfeeding: longitudinal birth cohort study and analysis. *Pediatr. Res.* 2002; 52(6), 863–867
10. Kataoka M.C, Carvalheira A.P.P, Ferrari A.P, *et al.* Smoking during pregnancy and harm reduction in birth weight: a cross-sectional study. *BMC Pregnancy Childbirth* .2018;**18**, 67
11. Sequí-Canet JM, Sequí-Sabater JM, Marco-Sabater A, Corpas-Burgos F, Collar Del Castillo JI, Orta-Sibú N. Maternal factors associated with smoking during gestation and consequences in newborns: Results of an 18-year study. *J Clin Transl Res.* 2022 Jan 3;8(1):6-19. PMID: 35097236; PMCID: PMC8791242.
12. Claire R, Chamberlain C, Davey MA, Cooper SE, Berlin I, Leonardi-Bee J, Coleman T. Pharmacological interventions for promoting smoking cessation during pregnancy. *Cochrane Database Syst Rev.* 2020 Mar 4;3(3):CD010078. doi: 10.1002/14651858.CD010078.pub3. PMID: 32129504; PMCID: PMC7059898.
13. Tarasi B, Cornuz J, Clair C, Baud D. Cigarette smoking during pregnancy and adverse perinatal outcomes: a cross-sectional study over 10 years. *BMC Public Health.* 2022 Dec 21;22(1):2403. doi: 10.1186/s12889-022-14881-4. PMID: 36544092; PMCID: PMC9773571.
14. He H, Pan Z, Wu J, Hu C, Bai L, Lyu J. Health Effects of Tobacco at the Global, Regional, and National Levels: Results From the 2019 Global Burden of Disease Study. *Nicotine Tob Res.* 2022 Apr 28;24(6):864-870. doi: 10.1093/ntr/ntab265. PMID: 34928373.
15. Cheraghi M, Salvi S. Environmental tobacco smoke (ETS) and respiratory health in children. *Eur J Pediatr.* 2009;168:897–905.
16. Burke H, Leonardi-Bee J, Hashim A, Pine-Abata H, Chen Y, Cook DG, *et al.* Prenatal and passive smoke exposure and incidence of asthma and wheeze: systematic review and meta-analysis. *Pediatrics.* 2012;129:735–44
17. Lawder R, Whyte B, Wood R, Fischbacher C, Tappin DM. Impact of maternal smoking on early childhood health: a retrospective cohort linked dataset analysis of 697 003 children born in Scotland 1997-2009. *BMJ Open.* 2019 Mar 20;9(3):e023213. doi: 10.1136/bmjopen-2018-023213. PMID: 30898797; PMCID: PMC6475204.
18. Li R, Lodge J, Flatley C, Kumar S. The burden of adverse obstetric and perinatal outcomes from maternal smoking in an Australian cohort. *Australian & New Zealand Journal of Obstetrics & Gynaecology.* 2019; 59(3): 356–361. DOI: <https://doi.org/10.1111/ajo.12849>
19. Liu B, Xu G, Sun Y, *et al.* Maternal cigarette smoking before and during pregnancy and the risk of preterm birth: a dose-response analysis of 25 million mother-infant pairs. *PLoS Medicine.* 2020; 17(8): e1003158
20. Lisboa PC, de Oliveira E, de Moura EG. Obesity and endocrine dysfunction programmed by maternal smoking in pregnancy and lactation. *Front Physiol.* 2012;3:437
21. Bruin JE, Gerstein HC, Holloway AC. Long-term consequences of fetal and neonatal nicotine exposure: a critical review. *Toxicol Sci.* 2010;116:364–74
22. Schneider S, Huy C, Schütz J, Diehl K. Smoking cessation during pregnancy: a systematic literature review. *Drug Alcohol Rev.* 2010;29:81–90.
23. Cudmore M, Ahmad S, Al-Ani B, Fujisawa T, Coxall H, Chudasama K, Devey LR, Wigmore SJ, Abbas A, Hewett PW, Ahmed A. Negative regulation of soluble Flt-1 and soluble endoglin release by heme oxygenase-1. *Circulation.* 2007;115:1789–1797.
24. Levine RJ, Maynard SE, Qian C, Lim KH, England LJ, Yu KF, Schisterman EF, Thadhani R, Sachs BP, Epstein FH, Sibai BM, Sukhatme VP, Karumanchi SA. Circulating angiogenic factors and the risk of preeclampsia. *N Engl J Med.* 2004;350:672–683.
25. Levine RJ, Lam C, Qian C, Yu KF, Maynard SE, Sachs BP, Sibai BM, Epstein FH, Romero R, Thadhani R, Karumanchi SA. Soluble endoglin and other circulating antiangiogenic factors in preeclampsia. *N Engl J Med.* 2006;355:992–1005
26. Kelkay B, Omer A, Teferi Y, Moges Y. Factors associated with singleton preterm birth in Shire Suhul General Hospital, Northern Ethiopia, 2018. *Journal of Pregnancy.* 2019; 4629101.