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Impact of Passive Smoking on Low Birth Weight among Pregnant Women in Active Labor

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ABSTRACT

Passive smoking during pregnancy, also called second-hand smoke exposure or environmental tobacco smoke, pretenses a substantial threat to fetal and maternal health. **Objectives:** To evaluate the association between passive smoking exposure and adverse birth outcomes in low birth weight in pregnant women. **Methods:** A case-control study was conducted at the Department of Obstetrics and Gynecology, Sughra Shafi Medical Complex, Narowal, from January 2024 to June 2024, involving 150 pregnant women presenting in active labour. Non-probability consecutive sampling techniques were used. Passive smoker's women were assessed for adverse birth outcomes like low birth weight. Data were analyzed using SPSS-23.0. The chi-square test was used to calculate associations between exposure and outcomes. Odds ratios were calculated with 95% confidence intervals, with $p \leq 0.05$ considered statistically significant. **Results:** 56.7% of the study population was exposed to passive smoking, of which 48.7% delivered Low Birth Weight infants as compared to 25.3% preterm births. Passive Smoker women had significantly higher odds of preterm births (OR: 2.7, $p<0.05$) and low birth weight (OR: 2.08, $p<0.05$). Additional risk factors for low birth weight included abnormal BMI (OR: 2.79, $p<0.05$), multiparity (OR: 6.43, $p<0.05$), and maternal age over 30 years (OR: 5.7, $p<0.05$). **Conclusions:** It was concluded that a significant association between passive smoking and adverse birth outcomes was found, especially Low Birth Weight and preterm. The risks were markedly higher among women over age 30 years, those with multiparity and abnormal BMI. Results highlight the need for directed interventions to decrease passive smoking exposure in pregnant women.

INTRODUCTION

Passive smoking, also known as secondhand smoke or environmental tobacco smoke (ETS), occurs when non-smokers inhale smoke exhaled by active smokers or smoke produced by the lit end of a cigarette between puffs. The detrimental effects of active and passive smoking on pregnancy, including preterm birth, stillbirth, congenital anomalies, low birth weight (LBW), and perinatal mortality, are well-documented--. LBW, as the World Health Organization (WHO) defines as a birth weight of less than 2.5kg (<2500g), is a significant public health concern worldwide due to its association with growth failure in newborns, which in turn increases the rate of morbidity and mortality---. LBW is linked with infection susceptibility, cognitive deficits, and chronic diseases especially in low- and middle-income countries with inadequate maternal and neonatal care resources. Passive smoking exacerbates these problems, causing 600,000 deaths yearly, including pregnancy-related complications---. The

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detrimental effects of passive smoke on the developing fetus are profound, as substances like nicotine and carbon monoxide can cross the placental barrier, damaging oxygen and nutrient oxygen supply to the fetus-----. Various studies have documented a robust association between passive smoking during pregnancy and adverse outcomes. For instance, a meta-analysis confirmed that passive-smoking women had a 1.52-fold increased risk of delivering LBW babies . Similarly, studies suggested that maternal exposure to passive smoke increases the possibility of preterm delivery-'. Moreover, it was observed that pregnant women exposed to passive smoking had infants with considerably low birth weights, regardless of maternal intake of iron or folic acid supplements. The repercussions of ETS during pregnancy extend beyond LBW, as it is also associated with an increased risk of spontaneous abortion, stillbirth, and sudden infant death syndrome (SIDS). In under-developed countries, LBW causes a significant proportion of infant deaths, highlighting the critical role of passive smoking in aggravating poor health outcomes. The WHO has recognized passive smoking as a persistent public health issue, associated with a myriad of adverse concerns---. A study emphasized that mothers exposed to passive smoking had significantly higher odds of having LBW infants in comparison to unexposed mothers. Addressing the issue of passive smoking during pregnancy requires comprehensive health interventions and policy restructurings aimed at decreasing ETS exposure. Socioeconomic factors ominously influence the prevalence of passive smoking and associated congenital defects, with lower-income families often experiencing higher exposure rates, particularly in regions lacking strict smoking regulations. Additionally, social standards and insufficient education regarding the risks of smoking perpetuate the predominance of passive smoking among pregnant women. Pregnant women exposed to passive smoking face high risks of delivering preterm LBW infants; however, public awareness and preventive measures are often inadequate, especially in areas with limited tobacco control strategies. Regardless of widely acknowledged risks linked with passive smoking in pregnancy outcomes, the impact of passive smoking on pregnancy outcomes, particularly LBW and preterm delivery, remains a lack of data explicitly addressing its impact on low birth weight within our local population. Pregnant women exposed to passive smoking are at a greater risk of delivering low-birth-weight infants compared to those not exposed.

This study aims to explore the effects of passive smoking on low birth weight among pregnant women presenting in active labour for delivery.

METHODS

This case-control study was carried out at the Department of Obstetrics and Gynecology, Sughra Shafi Medical Complex, Narowal from January 2024 to June 2024. Ethical clearance was obtained from the ethical committee of Sahara Medical College, Narowal (Ref: SMC/0108). A sample of 150 cases was calculated by using the sample size formula, n=Z2 (p)(1-p)/d2 and n= (1.96)2(0.11) (0.89)/0.052=150. Non-probability consecutive sampling technique was used for data collection. Female aged 18-40 years, parity <5, gestational age >32 weeks, singleton pregnancy (on ultrasonography (USG)) presenting in active labour for delivery were included in the study while Female with uterine or adnexal pathology, ovarian cyst or Abnormal amniotic fluid index (AFI) (<5cm or >21cm) (on USG) and those with chronic or gestational diabetes (Blood Sugar Random (BSR)>186mg/dl), chronic or gestational hypertension (Blood Pressure (BP)≥140/90mmHg), preeclampsia (BP≥140/90mmHg, with proteinuria>+1 on dipstick method) or eclampsia (convulsions with preeclampsia), deranged Liver function tests (LFT) (Aspartate Aminotransferase (AST)>40 International Unit (IU), Alanine aminotransferase (ALT)>40IU), renal problem (creatinine>1.2mg/dl) were excluded from the study.150 female who fulfilled the selection criteria were enrolled in the study from the emergency Department of Obstetrics and Gynecology, Sughra Shafi Medical Complex, Narowal. Informed consent was obtained. Demographic information including name, age, gestational age, parity and Body Mass Index (BMI) was also noted. The female was asked for exposure to passive smoking and two groups were formed i.e. group I with passive smoking and group II without passive smoking. Delivery was conducted by the researcher herself. After delivery weight of the baby was noted on the weighing machine in terms of grams. Birth weight <2500gm (5.5 pounds) which is measured within the first hour of birth despite gestational age, then LBW was labelled. All this information was recorded through a pre-designed proforma. This study analyzed how passive smoking affects birth outcomes among pregnant women by purposively selecting 150 respondents who were in active labour to ensure that we are targeting those women who have been exposed to second-hand smoke. Data were entered and analyzed using SPSS version 23.0. The data analysis used was a combination of descriptive and inferential statistics, such as chi-square tests, to establish whether passive smoking increases the chances of adverse birth outcomes and odds ratios to further explain the observed risks. Stratified analysis was further conducted to evaluate maternal factors such as age, BMI, and parity to the specified risks. This study aimed to establish the impact of passive smoking on pregnancy outcomes using a threshold for statistical significance of $p<0.05$.

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RESULTS

A total of 150 female exposed to passive smoking were evaluated for adverse birth outcomes. The number of those presenting in active labour was nearly balanced between those exposed (85) and those not exposed (65), indicating significant exposure to passive smoking during pregnancy. Specifically, 85 (56.7%) exposed patients, leading to 38 (25.3%) preterm births indicate significant exposure to passive smoking during pregnancy explaining it as contributing factor. Data indicate a considerable number of infants i.e. 73 (48.7%) with Low Birth Weight (LBW)(<2.5kg). LBW was higher in women aged <30 years in 46 cases as compared to older mothers. Moreover, maternal BMI shows that LBW cases were equally distributed between those of normal (40) and abnormal BMI (33). Results show that a considerable number of infants (73) were born with LBW. Primiparity (41 cases) shows a higher occurrence of LBW compared to multiparity (32 cases). But, the nearby numbers recommend parity only might not be a strong forecaster, and factors like BMI or maternal health could be contributing. Notably, 3 (2%) infants experienced sudden death and 5 (3.3%) were born with congenital defects (Table 1).

Table 1: Prevalence of Adverse Birth Outcomes among Females Exposed to Passive Smoking

Characteristics	Yes	No	Total
Females Exposed to Passive Smoking Presenting in Active Labour for Delivery	85	65	150
Preterm Birth	38	112	150
LBW<2.5 kg	73	77	150
LBW with Maternal Age≤30 Years	46	43	89
LBW with Maternal Age>30 Years	27	34	61
LBW with Abnormal Maternal BMI	33	42	75
LBW with Normal Maternal BMI	40	35	75
LBW with Primary Parity	41	33	74
LBW with Multiple Parity	32	44	76
Sudden Infant Death	3	147	150
Congenital Birth Defect	5	145	150

Pregnant women exposed to passive smoking during active labour showed significantly increased risks of adverse birth outcomes, with 2.7 times higher odds of preterm birth (OR: 2.7, p<0.05) and 2.08 times higher odds of LBW (OR: 2.08, p,0.05). Moreover, the risk is increased in women over age 30(OR: 5.7, p<0.05). Abnormal BMI (OR: 2.79, p<0.05) or multiple parity (OR: 6.43, p<0.05) is associated with a greater risk of LBW however, primary parity does not show significant correlation with birth outcomes. There is a modest risk increase for congenital birth defects (OR=3.27, p=0.018), necessitating further investigation. These findings emphasize the critical need to reduce passive smoking exposure among pregnant women to prevent adverse birth outcomes (Table 2).

Table 2: Risk Factors of Adverse Birth Outcomes among Pregnant Women Exposed to Passive Smoking

Characteristics	Exposed	Un exposed	Chi-square	p-value	OR	95% CI
Preterm Birth	28 (19)	10 (7)	24.54	<0.0001	2.7	1.24-4.02
LBW<2.5 kg	48 (32)	25 (17)	13.69	0.0002	2.08	1.05-3.36
LBW with Maternal Age≤30 years	29 (19)	17 (11)	0.01	0.91	1.01	1.05-3.36
LBW with Maternal Age>30 years	19 (13)	8 (5)	26.6	<0.0001	5.7	2.07-15.06
LBW with Abnormal Maternal BMI	26 (17)	7 (5)	8.43	0.0036	2.79	0.35-2.95
LBW with Normal Maternal BMI	22 (15)	18 (12)	5.29	0.021	2.07	0.35-2.36
LBW with Primary Parity	24 (16)	17 (11)	1.97	0.16	0.61	0.23-1.63
LBW with Multiple Parity	24 (16)	8 (5)	14.53	0.0001	6.43	2.23-12.23
Sudden Infant Death	2 (1)	1 (1)	-	0.603	2.67	0.29-24.55
Congenital Birth Defect	4 (3)	1 (1)	5.59	0.018	2.27	2.53-4.91

DISCUSSION

This study shows that 56.7% of passive-smoking pregnant women during active labour experienced adverse birth outcomes. Particularly, this group had a considerably higher prevalence of low birth weight (LBW) at 48.7% and preterm births at 25.3%. Moreover, a study by Wang et al., corroborated our findings, validating a positive association between maternal exposure to passive smoking and low birth weight, with a reported 2.35 times greater possibility of LBW, further supporting our results [15]. This study in terms of the relationship between maternal age, LBW, and abnormal maternal body mass index (BMI) is consistent with recent studies. Liu et al., and Lewandowska et al., acknowledged maternal age over 30 years and abnormal BMI as significant factors contributing to LBW in newborns. They noted that older maternal age increases this risk, which is consistent with the findings of our study [16]. The association between LBW and parity in the current study indicated that women with primary parity had a higher prevalence of LBW infants. This finding contrasts with a 2023 study by Devarugu et al., which highlighted an increased risk of adverse birth outcomes in multiparous women [17]. Our results suggest that younger, primary parous mothers are particularly at risk of delivering LBW babies, specifically when combined with exposure to passive smoking. We found an increased possibility of preterm births (odds ratio OR: 2.7, p<0.05) among passive smokers, which is steady with findings from N. Rang's study. Their research confirmed a similar positive relationship between preterm delivery and passive smoking during pregnancy (OR: 1.92; 95% confidence

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interval CI: 1.31, 2.81). They demonstrated that pregnant women exposed to passive smoking had a considerably higher incidence of preterm labour [18]. Furthermore, another research discovered the molecular mechanisms by which secondhand smoke adds to preterm labour. It indicated that exposure to nicotine and tobacco leads to oxidative stress and placental inflammation, which may explain the increased risk observed in our study population [19]. Our study also reported a small number of congenital birth defects (OR: 3.27, p=0.018) and cases of sudden infant death syndrome (SIDS) (OR: 2.67, p=0.603). It is important to recognize that research in this area is still emerging. A recent study suggested a potential link between passive smoking and congenital anomalies, particularly cardiovascular defects, highlighting the need for further investigation [20]. The current study highlights the importance of better clinical practices and public health interventions to decrease passive smoking exposure in pregnant women. Clinically, healthcare professionals should focus on evaluation for passive smoking and offer psychotherapy to women at risk. Moreover, executing smoking termination programs that involve family members can help create smoke-free surroundings. These actions could considerably decrease the risks of preterm birth and LBW, improving maternal and neonatal outcomes

CONCLUSIONS

It was concluded that a significant association between passive smoking and adverse birth outcomes was found, especially LBW and preterm. The risks were markedly higher among women over age 30 years, those with multiparity and abnormal BMI. These results highlight the need for directed interventions to decrease passive smoking exposure in pregnant women.

Authors Contribution

Conceptualization: AA
Methodology: AH, AK, MAC
Formal analysis: SJ
Writing review and editing: MH, AR, RA

All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

All the authors declare no conflict of interest.

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