



## **Second Hand Smoke Exposure among Pregnant Women in Nigeria**

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### **Authors' contributions**

*This work was carried out in collaboration among all authors. Authors OFO and SARA designed the study and wrote the manuscript. Author HOS developed the questionnaire and conducted data analysis. All authors read and approved the final manuscript.*

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### **ABSTRACT**

**Background:** Despite the ban on smoking in public places in Nigeria, second-hand smoke exposure is common across the country. It is increasingly being viewed as a severe women's issue because of the high prevalence among women, and its harmful effects on pregnant women. However, second-hand smoke exposure among pregnant women in Nigeria is hugely under-researched.

**Aim:** This study aims to determine the prevalence of second-hand smoke exposure among pregnant women in Nigeria, and determine their knowledge and avoidance behavior towards second-hand smoke.

**Methodology:** This cross-sectional study was conducted among 314 pregnant women in ten health facilities in Sokoto state, Nigeria. The health facilities were selected through simple random sampling.

**Results:** The prevalence of second-hand smoke exposure was 72.9%. The majority of the respondents (61.1%) were exposed to second-hand smoke in homes of others, 20.4% in school,

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18.5% in restaurants, 43.3% in their own homes, 49.7% in public transport, 20.4% at work, and 15% in health facilities. Factors significantly associated with second-hand smoke exposure included knowing it causes miscarriage (OR=0.39, 95% CI=0.23 – 0.64,  $P < .001$ ), and being able to keep a distance from smokers (OR=0.5, 95% CI= 0.28 – 0.76,  $P = .002$ ).

**Conclusion:** This study revealed a high prevalence of exposure to second-hand smoke. Knowledge about the harmful effects of second-hand smoke was one of the significant factors associated with exposure. These findings indicate the need for appropriate education of all pregnant women about the harmful effects of second-hand smoke and adequate enforcement of the ban on smoking in public places.

*Keywords: Second-hand smoke; exposure; pregnant women; avoidance-behavior; Sokoto; Nigeria.*

## 1. INTRODUCTION

Second-hand smoke (SHS) also referred to as environmental smoke is the inhalation of tobacco smoke by non-smokers. SHS constitutes a major public health problem globally. Although children are particularly more exposed and susceptible to some of the deleterious effects of SHS, adults are not immune to these health risks. Among non-smokers, SHS has been linked with cardiovascular diseases, lung cancer, respiratory diseases, infertility in men and women, sudden death syndrome, and low birth weight in pregnant women [1]. Globally, SHS accounts for 600,000 deaths each year [2]. The burden of SHS is exacerbated by the high prevalence of smoking, poor smoke-free regulations in most countries, and the fact that there is no harmless level of exposure to SHS [1].

SHS is prevalent in most countries. However, the prevalence differs across countries and within different population subgroups. Martinez-Sanchez et al. [3] in a study conducted in Italy reported a prevalence of 31.2%. Age, smoking history, gender, and place of residence were associated with SHS exposure. A study by Abdullah et al. [4] in Bangladesh reported a prevalence of 43% at home. Factors associated with SHS in this study included gender, age, income, smoking status of the father, and knowledge about the health risk of SHS exposure.

Despite the ban on smoking in public places in Nigeria, SHS exposure is still common across the country. Studies on SHS in Nigeria have reported different prevalence rates. A study by Desalu et al. [5] reported a prevalence of 38.8%, and exposure was greatest in public places (24.4%). The study also reported an association between SHS exposure and place of residence, spouses' smoking status, smoking restrictions at home, and alcohol consumption. Another study by Onigbogi et al. [6] conducted in Osun state in

Nigeria reported a prevalence of 95.5% among participants. The global adult tobacco survey conducted in Nigeria in 2012 reported prevalence rates of 17.3% at the workplace, 6.6% at home, and 29.3% in public places [7]. Another study by Omaduvie and Adisa [8] conducted in Abuja reported prevalence rates of 24.1% at home and 43.0% at public places.

Previous studies have reported that women are more exposed to SHS when compared to men particularly at home [4]. Also, of the 600,000 deaths attributed to SHS exposure each year, women account for 47%, while men and children account for 26% and 28% respectively [2]. Furthermore, in pregnant women, SHS is associated with an increased risk of having low birth weight babies, stunted fetal growth, and impaired lung growth and development [1]. Consequently, SHS is increasingly being viewed as a severe women's issue. However, SHS exposure among pregnant women in Nigeria remains hugely under-researched. It is therefore paramount to determine the SHS exposure among pregnant women in Nigeria. This study aims to determine the SHS among pregnant women in Nigeria, and their knowledge and avoidance behaviors. Findings from this study could highlight the need for better enforcement of the ban on smoking in public places. Also, knowledge of this could help guide interventions aimed at encouraging pregnant women to avoid SHS exposure.

## 2. MATERIALS AND METHODS

### 2.1 Study Setting and Sampling

This cross-sectional study was conducted in health facilities in Sokoto metropolis, Sokoto state, Nigeria. Using a prevalence of 24.4% from a previous study [5], a degree of accuracy of 0.05, and a standard normal deviate of 1.95 (95% confidence level), the sample size was determined to be 285. After adding a non-

response rate of 10%, the sample size became 314. A total of 10 health facilities were selected for this study through a simple random sampling, using a sampling frame of public health facilities in Sokoto metropolis. Data collection in each health facility occurred in one day during antenatal care (ANC) clinic day. All pregnant women attending ANC in each facility, and meeting the inclusion criteria participated in the study.

## 2.2 Study Instruments and Data Collection

Data was collected using a structured close-ended questionnaire. The first section collected data on socio-demographic variables such as age, ethnicity, religion, marital status, level of education, and employment status. The second section collected data on exposure to SHS by asking respondents if they have been exposed to SHS "in their homes, restaurants, at work, school, home of others, public transportation, and health facilities" in the past 30 days. The third section collected information on knowledge on the dangers of SHS and the last section collected information on the avoidance behaviors. The study instrument was translated into Hausa, back-translated into the English language, and retranslated into Hausa by independent language experts not associated with the study. Following this, a focus group discussion was held with the community members in the state to check for conformity and religio-cultural acceptance of local terminologies. The study instrument was pretested firstly by subject matter experts after which a field test was conducted. Data were collected by trained research assistants proficient in English and Hausa languages through face to face interviews.

## 2.3 Data Analysis

Data analysis was carried out using the Statistical Package for Social Sciences (SPSS) version 20.0 for Microsoft Windows. The continuous variables were expressed as means and standard deviations, while the categorical variables were expressed as proportions and frequencies. A Chi-square test was used to assess the association between the variables. A *P* value of less than .05 was considered statically significant.

## 3. RESULTS AND DISCUSSION

Three hundred and fourteen respondents participated in this study. The minimum age was

16, and the maximum was 45. The mean age was 24.5 ( $\pm 5.6$ ). Table 1 shows the socio-demographic characteristics of the respondents. About 75.5% of the respondents were Hausa, 10.2% were Fulani, 7.6% were Yoruba, and 7% were from other ethnic groups in Nigeria. The religion of participants also varied, 75.2% were Muslims, 21.1% were Christians, and those practicing traditional religion, and those not affiliated with any religion constituted 0.3% each. About 84.7% of the respondents were married, while 15.3% were either single, widowed, separated, or divorced. Approximately half of the respondents (50.6%) had attained either secondary or tertiary education. Thirty-six percent (36%) were unemployed, 30.2% worked in the government sector, and 33.8% worked in the non-government sector. The majority of the respondents have had at least three visits to the health facility for ante-natal services.

Table 2 shows the prevalence of SHS in this study. The overall prevalence of SHS exposure in this study was 72.9% (95% CI: 67.6 – 77.7). Exposure to SHS was highest in the homes of others (61.1%). Exposure in school was 20.4% (95% CI: 16.0 – 25.2). About 18.5% (95% CI 14.3 – 23.2) of respondents were exposed to SHS in restaurants, 43.3% (95% CI: 37.7 – 48.9) in their homes, 49.7% (95% CI: 44.0 - 55.3) in public transport, 20.4% (95% CI: 16.0 – 25.2) at workplaces and 15% (95% CI: 11.2 – 19.4) in health facilities. Various studies have reported different prevalence rates of SHS exposure. A study by Eisner et al. [9] in the US reported a 76% prevalence of SHS, 38% was reported in a study by Desalu et al. in Nigeria [5], and Abdullah et al. reported a prevalence of 43% in the home of participants [4]. The high prevalence rate of SHS exposure reported in this current study could be because of the high prevalence of tobacco smoking in the north-western region of Nigeria. This study was conducted in Sokoto state located in the north-western region of Nigeria, and this region has a higher prevalence of tobacco smoking compared to other regions. The other regions of Nigeria have higher prevalence rates of smokeless tobacco, and lower rates of tobacco smoking compared to this region [7].

Table 3 shows the knowledge of the respondents on the dangers of smoking and SHS. The majority of the respondents (89.5%) knew smoking is dangerous to the smoker. The majority (79.3%) also knew SHS harms the non-smoker. This is probably because this study was conducted among pregnant women attending

ANC clinic, and they have likely been informed about the dangers of SHS during their visit to the clinic. Only 20.1% thought SHS does not harm the unborn child, and 40.8% knew SHS could cause miscarriage. Other studies [10,11] have also reported good knowledge about the dangers of SHS among respondents.

**Table 1. Sociodemographic characteristics of the respondents**

Variable	n	%
<b>Age</b>		
≤ 20 years	101	32.2
< 20 years	213	67.8
<b>Ethnicity</b>		
Hausa	236	75.2
Fulani	32	10.2
Yoruba	24	7.6
Others	22	7.0
<b>Religion</b>		
Islam	246	78.3
Christianity	66	21.1
Traditional	1	0.3
None	1	0.3
<b>Marital status</b>		
Married	266	84.7
Single (widowed, separated, divorced)	48	15.3
<b>Level of education</b>		
None, Primary, Quranic	155	49.4
Secondary/Tertiary	159	50.6
<b>Employment status</b>		
Government	95	30.2
Non-government	106	33.8
None	113	36.0
<b>Number of antenatal visits</b>		
≤ 3 visits	281	89.5
≥ 4 visits	33	10.5

As indicated in Table 4, the majority of the respondents (59.2%) did not keep a distance from smokers while 63.4% were able to ask

people to refrain from smoking if they could not leave.

Table 5 shows the association between socio-demographic variables and exposure to SHS. Age (OR=0.7, 95% CI= 1.45 – 1.29, *P*=.32), marital status (OR=1.5, 95% CI=0.83 – 3.06, *P*=.16), level of education (OR=0.8, 95% CI= 0.53 – 1.44, *P*=.61), and number of ANC visits (OR=0.5, 95% CI= 0.16 – 1.20, *P*=.15) were not significantly associated with SHS exposure. This could also be attributed to the fact that this study was conducted among women attending ANC clinic. Health education provided to these women during the clinic normally emphasizes ways of promoting the health and well-being of the mother and fetus, and this could cover the dangers of SHS exposure. This could negate the impact of socio-demographic variables on this study population. Several studies [3,4,8] have found a statistically significant association between socio-demographic variables and SHS exposure.

Table 6 shows the univariate analysis between exposure to SHS, knowledge about danger signs of SHS, and avoidance behaviors. Those who thought SHS does not harm non-smokers were more likely to be exposed to SHS but this association was not statistically significant (OR=1, 95% CI=0.57 – 1.97, *P*=.88). Those who indicated that SHS does not harm the unborn child (fetus) were more likely to be exposed to SHS compared to those that indicated that it can harm the fetus. However, this association was also not statistically significant (OR=1, 95% CI= 0.54 – 1.87, *P*=.99). Respondents that knew SHS could cause miscarriage were significantly less likely to be exposed to SHS compared to those that did not know (OR=0.39, 95% CI=0.23 – 0.64, *P*= <.001). Previous studies [4,12,13] have found an association between knowledge of the harmful effects of SHS and exposure to SHS.

**Table 2. Prevalence of SHS exposure among pregnant women**

Places	Number of respondents exposed to SHS (n)	Prevalence of SHS (%)	95% Confidence interval
Overall	229	72.9	67.6 – 77.7
School	64	20.4	16.0 – 25.2
Restaurant	58	18.5	14.3 – 23.2
Home	136	43.3	37.7 – 48.9
Home of others	192	61.1	55.5 – 66.5
Public transport	156	49.7	44.0 – 55.3
Work	64	20.4	16.0 – 25.2
Health facilities	47	15.0	11.2 – 19.4

**Table 3. Knowledge of dangers of smoking and SHS among pregnant women**

Variable	n	%
<b>Smoking is dangerous to the smoker</b>		
Yes	281	89.5
No	33	10.5
<b>SHS does not harm non-smoker</b>		
Yes	65	20.7
No	249	79.3
<b>SHS does not harm the unborn child (fetus)</b>		
Yes	63	20.1
No	251	79.9
<b>SHS can cause miscarriage (death of the unborn child)</b>		
Yes	128	40.8
No	186	59.2

These findings accentuate the need to increase the knowledge of pregnant women on the dangers of SHS. This education should inform them of the dangers of SHS to the fetus which could include death. Respondents who were able to keep their distance from smokers were significantly less likely to be exposed to SHS compared to those who did not (OR=0.5, 95% CI= 0.28 – 0.76, P=.002).

There was no association between those who asked people to refrain from smoking when they could not leave and those who did not (OR=0.6, 95% CI= 0.38 – 1.10, P=.12). Being able to ask people to refrain from smoking does not necessarily mean they would oblige. Although this study did not directly measure the efficacy of

this avoidance behavior, however, the findings suggest that respondents were still exposed to SHS despite requesting the smokers to refrain from smoking around them. This highlights the need for enforcement of the ban on smoking in public places and appropriate sanctions for defaulters. It is also necessary to teach pregnant women negotiation skills to enhance their ability to speak to people smoking in their environment when they cannot leave.

**Table 4. Avoidance behavior**

Variable	n	%
<b>I keep a distance from smokers</b>		
Yes	148	40.8
No	166	59.2
<b>I ask people to refrain from smoking if I can't leave</b>		
Yes	199	63.4
No	115	36.6

Table 7 shows univariate analysis between knowledge about danger signs of SHS and avoidance behaviors. Those who thought SHS does not harm non-smokers were less likely to keep a distance from smokers (OR=0.6, 95% CI=0.36 – 1.12, P=.13), and less likely to ask people to refrain from smoking if they could not leave (OR=0.7, 95% CI=0.44 – 1.34, P=.39), compared to those who knew SHS could harm non-smokers. Similarly, those who thought SHS does not harm the fetus were less likely to keep a distance from smokers (OR=0.8, 95% CI=0.48 – 1.49, P=.034), and less likely to ask people to refrain from smoking if they could not leave

**Table 5. Association between SHS between SHS exposure and socio-demographic variables**

Variable	SHS exposure n (%)		OR	95% CI	P value
	Yes	No			
<b>Age</b>					
≤ 20 years	70 (69.3)	31 (30.7)	0.7	0.45 – 1.29	.32
> 20 years	159 (74.6)	54 (25.4)			
<b>Marital status</b>					
Married	198 (74.4)	68 (25.6)	1.5	0.83 – 3.06	.16
Single	31 (64.6)	17 (35.4)			
<b>Level of education</b>					
None/primary/quaranic	111 (71.6)	44 (28.4)	0.8	0.53 – 1.44	.61
Secondary/tertiary	118 (74.2)	41 (25.8)			
<b>Number of ANC visits</b>					
≤ 3 visits	201 (71.5)	80 (28.5)	0.5	0.16 – 1.20	.15
> 3 visits	28 (84.8)	5 (15.2)			

**Table 6. Association between SHS exposure and knowledge about danger signs**

Variable	SHS Exposure n (%)		OR	95% CI	P value
	Yes	No			
<b>Smoking is dangerous to the smoker</b>					
Yes	203 (72.2)	78 (27.8)	0.7	0.3 – 1.7	.54
No	26 (78.8)	7 (21.2)			
<b>SHS does not harm non-smoker</b>					
Yes	48 (73.8)	17 (26.2)	1.0	0.57 – 1.97	.88
No	181 (72.7)	68 (27.3)			
<b>SHS does not harm the unborn child (fetus)</b>					
Yes	46 (73.0)	17 (27.0)	1.0	0.54 – 1.87	.99
No	183 (72.9)	68 (27.1)			
<b>SHS can cause miscarriage (death of the unborn child)</b>					
Yes	79 (61.7)	49 (38.3)	0.39	0.23 – 0.64	<.001
No	150 (80.6)	36 (19.4)			
<b>I keep a distance from smokers</b>					
Yes	96 (64.9)	52 (35.1)	0.5	0.28 – 0.76	.002
No	133 (80.1)	33 (19.9)			
<b>I ask people to refrain from smoking if I can't leave</b>					
Yes	139 (69.8)	60 (30.2)	0.6	0.38 – 1.10	.12
No	90 (78.3)	25 (21.7)			

**Table 7(a). Association between avoidance behavior and knowledge of dangers of SHS**

Variable	I keep a distance from smokers		OR	95% CI	P value
	Yes	No			
<b>SHS does not harm non-smoker</b>					
Yes	25 (38.5)	40 (61.5)	0.6	0.36 – 1.12	0.13
No	123 (49.4)	126 (50.6)			
<b>SHS does not harm the unborn child (fetus)</b>					
Yes	38 (60.3)	25 (39.7)	0.8	0.48 – 1.49	0.34
No	161 (64.1)	90 (35.9)			
<b>SHS can cause miscarriage (death of the unborn child)</b>					
Yes	86 (67.2)	42 (32.8)	4.0	2.53- 6.60	<0.001
No	62 (33.3)	124 (66.7)			

(OR=0.8, 95% CI=0.48 – 1.49,  $P=.66$ ) compared to those who knew SHS was harmful to the fetus. Respondents who knew SHS could cause miscarriage were four times more likely to keep a distance from smokers (OR=4, 95% CI= 2.53 – 6.60,  $P= <.001$ ), and twice more likely to ask people to refrain from smoking if they could not leave (OR=2.0, 95% CI=1.04 – 2.70,  $P=.003$ ),

compared to those who did not know SHS could cause miscarriage. This association was statistically significant. This finding suggests that the more knowledge people have about the dangers of SHS, the more likely they are to take deliberate steps to avoid being exposed to it. This finding was consistent with that of previous studies [10,14].

**Table 7(b). Association between avoidance behavior and knowledge of dangers of SHS**

Variable	I ask people to refrain from smoking if I can't leave		OR	95% CI	P value
	Yes	No			
<b>SHS does not harm non-smoker</b>					
Yes	38 (58.5)	27 (41.5)	0.7	0.44 – 1.34	0.39
No	161 (64.7)	88 (35.3)			
<b>SHS does not harm the unborn child (fetus)</b>					
Yes	38 (60.3)	25 (39.7)	0.8	0.48 – 1.49	0.66
No	161 (64.1)	90 (35.9)			
<b>SHS can cause miscarriage (death of unborn child)</b>					
Yes	90 (70.3)	38 (29.7)	1.6	1.04 – 2.70	0.003
No	109 (58.8)	77 (41.4)			

**4. CONCLUSION**

This study found a high prevalence of SHS exposure (72.9%) among pregnant women. Knowledge about danger signs of SHS, particularly the effect on the unborn child (fetus) was significantly associated with exposure to SHS, and avoidance behavior of respondents. These findings highlight the need for education and health promotion about the dangers of SHS to non-smokers and smokers. The ban on smoking in public places should also be enforced with appropriate sanctions for defaulters.

**CONSENT**

Before the actual study interview, the research assistants explained the purpose of the study to the participants, and written informed consent was obtained from each participant. Pregnant women who did not understand the study language (English and Hausa) and those who did not give consent were excluded.

**ETHICAL APPROVAL**

The Health Research Ethics Committee of the State Ministry of Health Sokoto State approved this study. Project number SKHREC/019/016

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**COMPETING INTERESTS**

Authors have declared that no competing interests exist.

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