WESTERN NIGERIA JOURNAL OF MEDICAL SCIENCES (WNJMS)

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PUBLISHED BY: UNIOSUN TEACHING HOSPITAL, OSOGBO, NIGERIA

PUBLICATION DATE: July-December, 2023

VOL. 6 (ISSUE 2) 2023

Western Nigeria Journal of Medical Sciences **ORIGINAL ARTICLE**

Publication Date: December 31, 2023; Vol. 6, Issue 2

KNOWLEDGE, ATTITUDE AND DETERMINANTS OF INDOOR AIR POLLUTION AMONG PREGNANT WOMEN ATTENDING ANTENATAL CLINICS IN OSOGBO METROPOLIS

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ABSTRACT

Introduction: The nature of air indoors affects the quality of life and the general population's well-being and exposure to higher levels of ambient air pollution in pregnancy is linked to adverse birth outcomes. As majority of women spend most time working indoors, exposure to various pollutants may result in an increased risk of various respiratory ailments. This study assessed the level of knowledge, attitude, and determinants of Indoor air pollution (IAP) among pregnant women in Osogbo Metropolis.

Methods: This study employed a cross-sectional study design among 432 pregnant women in Osogbo metropolis via multistage sampling. A semi-structured interviewer-administered questionnaire was used for data collection and analyses were done using IBM SPSS software version 20.0. The statistical level of significance was set at *P<0.05*.

Results: The respondents' mean age was 26 ± 5 years. More than three-quarters were aware of indoor air pollution. Correspondingly, about three-quarters were found to have adequate knowledge of indoor air pollution while the majority (89.4%) had positive attitude towards indoor air pollution. There was a significant relationship between respondent's age and ethnicity as independent variables, and knowledge of indoor air pollution as a dependent variable (p=*0.019* and p=*0.024* respectively).

Conclusion: The knowledge and attitude towards indoor air pollution were good. However, the proportion with poor knowledge and negative attitudes cannot be overlooked particularly among pregnant women. Joint efforts from the citizens and the government to allocate more resources towards the provision of appropriate and affordable facilities to minimize indoor air pollution are recommended.

Keywords: Knowledge, Attitude, Determinants, Indoor, Air Pollution, Pregnant women, Antenatal Clinics

INTRODUCTION

Pollution is defined as either the manifestation in the environment of products of human actions which may possess detrimental or intolerable effects, or as the introduction of these products through natural events including volcanic eruptions and dust.[1] Air pollution is the contamination of outdoor or indoor environment by physical, chemical or biological agent that alters the atmosphere's natural features.[2]

Indoor Air pollution refers to the physical, chemical as well as biological characteristics

Date Submitted: 02 October, 2023

Date Accepted: 11 December, 2023

of air in the indoor environment in a building, home, commercial facility or institution, that is capable of causing discomfort, disease or even death, as well as damaging other living organisms such as food crops or damage the natural environment.[3] The nature of air indoors affects the quality of life and the welfare of the population in general. Exposure to various indoor pollutants results in an increased risk for developing various ailments mainly affecting the respiratory system. Currently, people spend most of their time working indoors where they can get affected depending upon the quality of the air present indoors.[4]

Indoor air pollution (IAP) is gaining increasing prominence as a public health hazard in developing countries.[5] IAP is an important risk factor for morbidity and mortality as it accounts for about 4% of the global burden of disease.[6] Almost two million people die each year from causes related to IAP.[7] About 4.3 million people die annually from exposure to household air pollution. Most of these deaths occur in developing countries including Nigeria and are majorly attributable to cooking and home heating with open fires using traditional kerosene stoves or solid fuels such as firewood or charcoal.[8,9] Other sources of indoor pollution in developing countries include smoke from nearby houses, burning of forests, fossil fuel, household waste; and tobacco smoke.[10]

In some developing countries women use biomass as cooking fuel and those pregnant are therefore exposed to substances that may affect the foetus and result in spontaneous abortions, reduced birth weights, and also increase the incidence of perinatal mortality, as indoor air pollution has been revealed to have associations with those conditions.[11]

People staying mostly indoors including young women as well as pregnant women are in danger as they are in constant exposure to various indoor pollutants particularly those who engaged in domestic works often with the use of solid fuels for cooking and heating.[4] According to the World Health Organization (WHO), poor air quality is directly linked with stroke, heart disease, lung cancer, and acute respiratory diseases.[12] Recent studies have reported that exposure to a high level of air pollution could adversely affect development and IQ levels in children.[13] Because they often stay indoors compared to men and school age children, women of child-bearing age and young children are perhaps more heavily exposed to pollution. Women usually continue with their domestic and cooking roles throughout pregnancy, so the developing foetus is also indirectly exposed.[14]

The association between Indoor Air Pollution (IAP) due to solid fuel use and acute lower respiratory tract infection and chronic obstructive lung disease has been established.[15] Coal smoke has also been associated with lung cancer. IAP increases the risk of otitis media, asthma, tuberculosis, low birth weight, stillbirth, and neonatal mortality. Maternal exposure to second-hand tobacco smoke during pregnancy has been found to cause a reduction in birth weight, and exposure of infants to second-hand smoke is causally linked to sudden infant death syndrome (SIDS).[7] As the majority of pregnant women have been found to utilise primary health care centres for the antenatal services, this may have direct or indirect influence on health related practices including IAP.[16]

Only few studies have focused on the level of knowledge, attitude, and determinant of indoor air pollution in Osogbo.[17,18] Studies on the exposure of pregnant women to IAP in middle income countries are also few.[19] There is paucity of data on IAP among pregnant women in Osogbo. If the knowledge, attitude, and determinants of IAP among pregnant women are assessed, strategies to help in the enlightenment/reinforcement on the dangers associated with IAP and the foetus and also ways to help to improve the indoor air quality will be formulated and implemented. Hence, this study aims to assess the knowledge, attitude, and determinants of indoor air pollution among pregnant women in Osogbo metropolis.

METHODS

This study was conducted in two (Osogbo and Olorunda) local government areas (LGAs) in

Osogbo. Osogbo, the capital city of Osun State, is located in the south-western part of Nigeria. Its population is about 156,694 people, based on the report from the 2006 census. The city is largely dominated by the Yoruba ethnic group. It has an area and population density of 47.0km^2 and 4,557km^2 respectively. There is one teaching hospital, one general hospital, and numerous Primary Health Care centres and private hospitals providing primary care services in the state. Four out of 11 wards in Olorunda and six out of 15 wards in Osogbo were selected. At least one PHC was selected from the selected wards using simple random sampling via balloting. All the pregnant women who attended ANC were recruited for the study using total sampling.

This study employed a descriptive cross-sectional design among 432 participants. The sample size of this study determined using Leslie fisher's formula n= Z^2pq/d^2 with p as 50%, based on the proportion from a previous study and z as 1.96 representing a 95% confidence interval, the sample size was 384.16 and was increased to 432 after 10% non-response rate was considered.

An interviewer-administered questionnaire pretested at Obokun LGA was used to obtain data from participating pregnant women. Information obtained included socio-demographic characteristics, knowledge of pregnant women on indoor air pollution, the attitude of pregnant women towards indoor air pollution, and determinants of indoor air pollution. Section A had eight statements on socio-demographic variables. Section B was on indoor air pollution knowledge and had 12 statements with 'Yes', 'No' and 'not sure' options. Section C had 6 questions relating to the attitude of participants towards indoor air pollution with options based on the scale: Strongly agree, Agree, Undecided, Disagree, and Strongly Disagree. Section D had 10 statements on determinants of Indoor air pollution.

For the Knowledge section, correct answers were scored as 1 while incorrect answers were scored as zero; using the mean of the total statements of 12, respondents who scored below 6.68 were regarded as having poor knowledge and those who scored above the mean were deemed to have good knowledge. The maximum score for Attitude was 12. For questions whose statements were either strongly agree, agree, undecided, strongly agree, or disagree, correct answers which are either strongly agreed or agree were scored as 2 and 1 respectively while incorrect answers were scored as 0. Respondents who score below the mean were adjudged to have a supportive attitude while those who score above the mean were regarded as having a unsupportive attitude.

Approval for the conduct of the study was obtained from the Ethics and Research Committee of Osun State University, Osogbo, Nigeria.

Data Analysis

Data analysis was done using IBM SPSS software version 20.0. Univariate analysis results were presented using charts and tables while chi-square and logistic regression for test of significance were done as appropriate with significant differences at p less than 0.05.

RESULTS

Four hundred and thirty-two respondents participated in this study; their mean age was 26 ± 5 years. More than half 243 (56.3%) of the respondents were young adults. More than four-fifth 420 (97.2%) were Yoruba while about three-quarters 301 (69.7%) of the respondents were Muslims. The majority 425 (98.4%) of the respondents were currently married; those whose level of education was low contributed the most proportion 292 (67.9%). In terms of the husbands' level of education, only 186 (43.1%) of the husbands had a low level of education. More than half 223 (51.6%) of the participants were artisans and contributed the largest proportion of the respondents' occupations (Table 1).

More than three-quarters 336 (77.8%) of the respondents have heard about IAP while less than half 206 (47.7%) had experienced IAP (Figure 1). Overall, about three-quarters, 320 (74.1%) of the respondents add a good level

of knowledge on IAP as more than four-fifths 410 (94.9%) had a positive attitude (Figure 2).

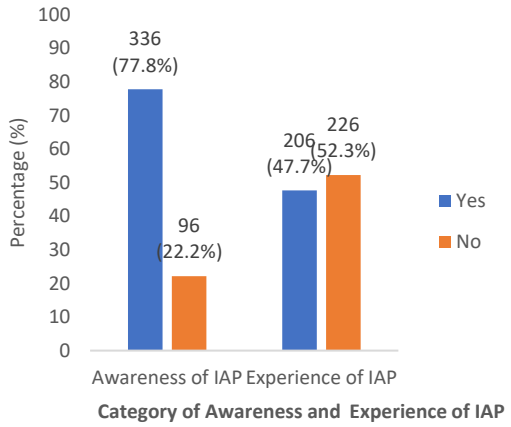

Figure 1: Categorized Awareness and Experience of IAP among pregnant women (n=432)

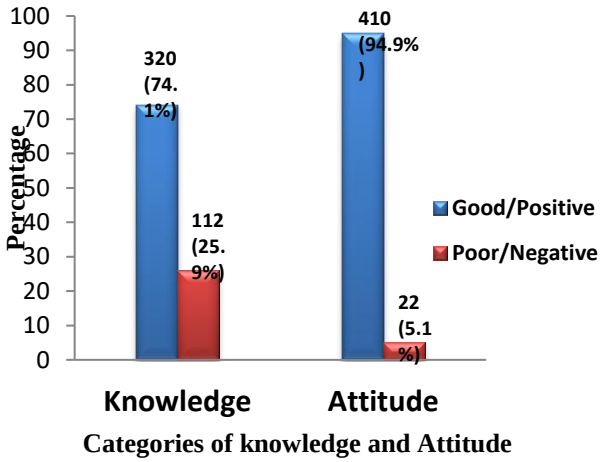

Figure 2: Categories of Knowledge and Attitude of respondents on indoor air pollution

In terms of Attitude, every eight out of ten respondents were found to have positive attitude towards IAP. Furthermore, more than four-fifths of the respondents responded in affirmative when asked if they were worried that smoke emitted from indoor sources could harm them, whether they were concerned about their health when someone is smoking in or around the house and if they usually allowed the fumes of the smoke from cooking or mosquito coil to disperse before sleep. Only 12% preferred kerosene stove/firewood to other sources. While less than one-sixth preferred cooking inside the room to the kitchen; 5.6% said only visitors are allowed to smoke in their house (Figure 3).

Table 1: Respondents' socio-demographic characteristics (n=432)

VARIABLES	FREQUENCY (N= 432)	PERCENTAGE (%)
Age group (Mean = 26 (5.02)		
Youths	167	38.7
Young adults	243	56.3
Middle-aged	22	5.0
Ethnicity		
Yoruba	420	97.2
Others	12	2.8
Religion		
Christianity	131	30.3
Islam	301	69.7
Marital status		
Currently married	425	98.4
Not currently married	7	1.6
Respondents level of education		
High level of education	140	32.4
Low level of education	292	67.6
Husband's level of education		
High level of education	246	56.9
Low level of education	186	43.1
Respondents' occupation		
Artisan	223	51.6
Civil Servant	28	6.5
Self-employed	145	33.6
Professionals	13	3.0
Unemployed	23	5.3
Occupation of husband		
Artisan	162	37.5
Civil Servant	70	16.2
Self-employed	149	34.5
Professionals	36	8.3
Unemployed	15	3.5

Table 2: Categories of Knowledge and attitude and selected socio-demographic characteristics

Socio-Demographic Variables and Their Categories		Knowledge On Indoor Air Pollution (N=432)		Statistics	Attitude Towards Indoor Air Pollution (N=432)		Statistics
		Poor (%) N=112	**Good (%) N=320**		**Negative (%) N=22**	**Positive (%) N=410**	
Age	Young Adults	111 (27.1)	299 (72.9)	$x^2 = 5.518$	22 (5.4)	388 (94.6)	$x^2 = 0.381$
	Middle-Aged	1 (4.5)	21 (95.5)	**p = 0.019**	0 (0.0)	22 (100.)	p = 0.537
Ethnicity	Yoruba	105 (25.0)	315 (75.0)	$x^2 = 5.126$	21 (5.0)	399 (95.0)	$x^2 < 0.001$
	Others	7 (58.3)	5 (41.7)	**p = 0.024**	1 (8.3)	11 (91.7)	p = 1.000
Religion	Christianity	38 (29.0)	93 (71.0)	$x^2 = 0.930$	6 (4.6)	125 (95.4)	$x^2 = 0.102$
	Islam	74 24.6)	227 (75.4)	p = 0.335	16 (5.3)	285 (94.7)	p = 0.749
Marital Status	Currently Married	109 (25.6)	316 (74.4)	$x^2 = 0.551$	21 (4.9)	404 (95.1)	$x^2 = 0.062$
	Not Currently Married	3 (42.9)	4(57.1)	p = 0.355	1 (14.3)	6 (85.7)	p = 0.804
Level of Education	Lower Education	10 (32.3)	21 (67.7)	$x^2 = 0.697$	4 (12.9)	27 (87.1)	$x^2 = 2.654$
	Higher Education	102 (25.4)	299 (74.6)	p = 0.404	18 (4.5)	383 (95.5)	p = 0.103
Husbands' Level of Education	Lower Education	4 (26.7)	11 (73.3)	$x^2 < 0.001$	1 (6.7)	14 (93.3)	$x^2 < 0.001$
	Higher Education	108 (25.9)	309 (74.1)	p = 1.000	21 (5.0)	396 (95.0)	p = 1.000

In Table 2, more middle-aged respondents, 21 (95.5%), had knowledge on indoor air pollution compared to young adults and this was statistically significant (p=*0.019).* Likewise, Yorubas had significantly more knowledge 315 (75.0%) than non-Yorubas (p=*0.024).* Muslims were found to have more knowledge 225 (75.4%). The higher the education of the respondents the higher their knowledge of indoor air pollution and this applies to both pregnant women and their husbands (Table 2).

Regarding the attitude of the respondents towards indoor air pollution, Table 2, shows that except for religion where more Christians 125 (95.4%) were found to have a positive attitude than Muslims, respondents who had good knowledge were also found to have a favourable attitude towards indoor air pollution. (Table 2)

Table 3: Binary logistic regression of the respondents on indoor air pollution and selected potential determinants. (n = 432)

Variables	Sub- variables	P value	Odd's ratio	95% Confidence Interval	
				Lower	**Upper**
Respondents level of education	Low level of education (Reference)	0.332	1.262	0.789	2.020
Kitchen location	No kitchen (Reference)	0.145	1.175	0.322	1.718
	On the corridor/passage	0.850	1.108	0.382	3.218
	In a room beside the bedroom	0.200	2.036	0.687	6.036
	In a room beside the sitting room	0.836	1.112	0.407	3.039
	In the bedroom	0.453	0.372	0.028	4.922
	Outdoor	0.679	0.810	0.299	2.193
Saw-dust	No (Reference)	0.999	0.000	0.000	1.228
People whose windows allowed cross-ventilation	No (Reference)	**<0.001****	0.258	3.002	9.022

**Statistically significant

Table 3 shows the binary logistic regression of the respondents on indoor air pollution and selected potential determinants. This revealed that those who allowed or practiced cross-ventilation were about four times less likely to experience indoor air pollution. *(p < 0.001, OR 0.258 CI 3.002 - 9.022)* and this finding was statistically significant.

DISCUSSION

Four hundred and thirty-two pregnant women with the mean age of 26 ± 5.02 and predominantly Yoruba ethnic group participated in this study. This being the usual and expected findings as the study was conducted in south-western Nigeria, which is preponderantly Yoruba tribe.

More than three-quarters were aware of indoor air pollution which corroborates another study on indoor air pollution but is contrary to another south-western Nigeria study on awareness of indoor pollution which has lower awareness level (62.8%) compared to this study(77.8%).[20,21] The awareness level of this study is higher compared to that of an Indian study on indoor air pollution where more than four-fifths of the respondents were reported to have had poor awareness.[5] The higher awareness level could also mean that the IAP is common in the study area or that most respondents might have experienced it.

This study revealed that about three-quarters of the pregnant women had good knowledge of indoor air pollution. This finding is in line with Jafarian et al., (2018) study on Indoor air pollution where about two-thirds of pregnant women had good knowledge and a Jordanian study on indoor Air Quality where women were found to have moderate knowledge.[22,23] However, this study is at variance with

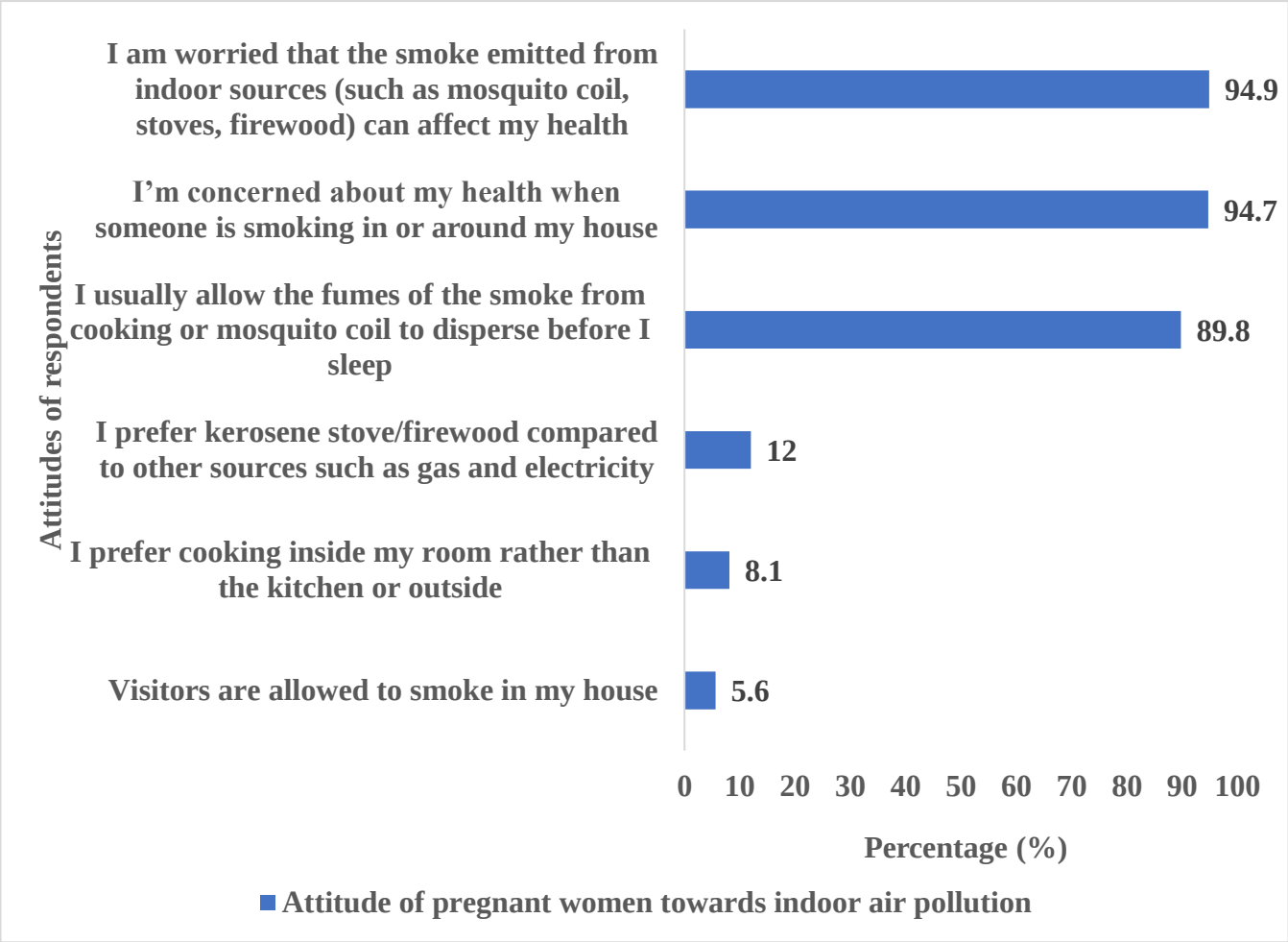

Figure 3: Proportion of pregnant women who answered in the affirmative regarding attitude-based questions (n=432)

another study where poor knowledge was reported.[5] The higher knowledge could be attributed to the higher awareness level of IAP in the study population.

There was a significant association between the respondents' age and their knowledge on indoor air pollution as middle-aged adults were found to have more knowledge compared to young adults, which is in keeping with a Chinese study on air pollution where the respondents' knowledge varies significantly with age.[24] This is possibly because older respondents are likely to have experienced IAP more than younger ones and thereby have more knowledge on it. Yorubas had significantly more knowledge on Indoor air pollution compared to non-Yorubas. This may be due to methodological differences and characteristics of the study participants

Overall, majority of the respondents had positive attitude towards indoor air pollution. This could be attributed to their adequate knowledge of indoor air pollution and this finding is similar to a study conducted in Mangalore where more than four-fifths of the participants were found to have demonstrated a favourable attitude towards indoor air pollution, but differ from another study conducted in India where the respondents had more of negative attitude towards indoor air pollution.[4,5]

More than a quarter had their kitchen located near the room, while less than one-fifth were still using kerosene/stove which is liable to generate smoke and air pollutants indoors.

Similarly, the respondents' choices of energy sources especially for cooking and their indoor air pollution experiences may be due to their lack of financial wherewithal to procure alternative fuel that generates little or no smoke and air pollutants and their inability to operate the alternate forms of energy.

CONCLUSION

The study assessed the knowledge, attitude, and determinant of indoor air pollution among pregnant women attending Antenatal Clinics in the Osogbo metropolis. The findings of this study revealed a high level of knowledge significantly associated with some factors including age and ethnicity, and positive attitude towards indoor air pollution. However, despite good knowledge and positive attitude, a greater proportion of the respondents significantly experience indoor air pollution due to low socioeconomic status. Strong health education on the IAP consequences and encouragement to use modern utensils that emits less or no harmful substances indoor are recommended.

Financial support and sponsorship: Nil.

Conflicts of interest: There are no conflicts of interest

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