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## Traders' perception of cooking smoke as a risk factor for childhood pneumonia

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**Abstract:** *Background:* Childhood pneumonia is the foremost killer of under-fives. Indoor air pollution by smoke from cooking fuel is a major risk factor for childhood pneumonia. The knowledge of caregivers about risk factors can facilitate the practice of appropriate preventive measures. This study set out to evaluate the perception of traders about cooking smoke as a risk factor for childhood pneumonia.

*Methodology:* A researcher administered, questionnaire based, cross-sectional study was carried out at a major market in Benin City prior to a market rally to celebrate World Pneumonia Day 2014. The respondents were traders. Information on biodata, place of cooking, fuel for cooking and presence of under-fives in the cooking area of homes of respondents was sought.

*Results:* There were 1374 respondents of which 1192(88.5%) were females. Only 67(4.9%) respondents considered smoke from cooking fuel a risk factor for

pneumonia while 99(7.2%) considered avoidance of smoke as a method for preventing pneumonia. Firewood (biomass fuel) was utilized by 272(19.8%) respondents. Respondents with no education were significantly more likely to use firewood ( $p < 0.000$ ).

All respondents with under-fives reported having them in the cooking area. Having a child who had suffered pneumonia in the past was not significantly associated with knowing that smoke was a risk factor for childhood pneumonia  $p > 0.05$ .

*Conclusion:* There is poor awareness of smoke as a risk factor for childhood pneumonia while the use of unclean fuel is significant. As part of health education on childhood pneumonia, smoke as a risk factor should be emphasized. Government should make cleaner fuels more available, accessible and affordable.

**Keywords:** traders, cooking smoke, risk factor, childhood pneumonia

### Introduction

Pneumonia is a major killer of under-fives, being responsible for up to 15% of under-five mortality<sup>1</sup>. In Nigeria, pneumonia resulted in over 121,000 deaths in 2013 making her one of the high burden countries for childhood pneumonia<sup>1</sup>. Many risk factors contribute to childhood pneumonia. These include young age (<5years), malnutrition, lack of immunization against measles, pre-existing disease such as Human immunodeficiency virus infection, overcrowding, parental smoking and indoor air pollution<sup>1,2</sup>.

Indoor air is the air within an indoor environment<sup>3</sup>. Indoor air pollution can result when biomass fuels are burnt in open fires and in poorly ventilated environ-

ments. The incomplete combustion of these fuels leads to air pollution and for this reason they are considered unclean fuels<sup>3,4</sup>. Smoke from the burning of biomass fuels contains large amounts of particulate matter and gaseous pollutants, the inhalation of which have health consequences. Health consequences of indoor air pollution include low birth weight, acute respiratory infections, cataracts, chronic obstructive pulmonary disease and cancer<sup>5</sup>.

Biomass fuels include wood, animal dung, crop residues and sawdust<sup>3</sup>. In rural areas of Nigeria, biomass fuels are the primary means of energy with about 80million metres of fuel wood used annually for cooking and other domestic activities<sup>3</sup>. In homes where biomass fuels are burnt for household energy use, the air pollution levels

are often higher than the World Health Organisation guideline values for 24 hour indoor levels set at  $25\mu\text{g}/\text{m}^3$ . They also have higher mean annual levels of particulate matter ( $\text{PM}_{2.5}$ ), carbon monoxide levels, and sulphur dioxide levels<sup>3</sup>. In a study among rural dwellers in Nigeria, it was found that the mean values of given pollutants were all higher than the recommended National ambient air standards<sup>6</sup>. Elevated levels of particulate pollution have been associated with increased incidence of respiratory symptoms and diseases including acute lower respiratory infections in children.<sup>7</sup>

Women are the primary caregivers for children in most developing countries. It is, thus, important that programmes targeting reduction in child morbidity and mortality must necessarily include them. Also women and children are more disproportionately affected by indoor air pollution as they tend to spend more hours indoor and women are directly involved in preparation of meals<sup>4</sup>. Health education is known to be important in improving knowledge and reinforcing desired behavior<sup>8</sup>. Thus, health education could be an important strategy in limiting indoor air pollution. Health education should be predicated on the knowledge and practices of the target population. This study targeted traders because many women are involved in trading and the market place can be an important arena for the dissemination of information.

Studies evaluating the perception of caregivers about pneumonia have often focused on identification of signs and symptoms and care seeking behavior<sup>9-11</sup>. In studies which examined knowledge of cause of pneumonia, smoke as a risk factor was not evaluated<sup>10,11</sup>. As part of a larger study on pneumonia the perception and knowledge of traders about smoke and pneumonia was evaluated. The larger study was conducted as part of an assessment to determine the areas of knowledge deficit prior to a market rally to celebrate world pneumonia day 2014.

## Methodology

The study was carried out at Edaiken market in Benin City. Respondents were traders who were aged 18 years and above. Verbal consent was obtained after the purpose of the study was explained to them. The interviews were conducted in Pidgin English. Ethical consent for the study was sought from the University of Benin ethical review committee. The instrument was developed and validated in the ICH after extensive literature review. Thereafter it was pretested among mothers attending the ICH child welfare clinic for childhood immunization.

The instrument was interviewer administered and sought information on the biodata of the respondents, place of cooking, fuel for cooking and the presence of under-fives in the cooking area. Respondents were also asked about their perception of smoke as a risk factor for pneumonia and control of smoke as a method of prevention of childhood pneumonia. Socioeconomic status for

married traders was determined using the level of education of the female and occupation of the male partners as described by Olusanya et al<sup>12</sup>.

The instruments were administered by research assistants who were trained on how to administer the questionnaire. Data was entered into SPSS spreadsheet. Association of variables was determined using chi square, significance level was set at  $<0.05$

## Results

There were 1374 respondents of whom 1192(88.5%) were females. Of the 1316 who responded to the question on marital status, 1096 (79.8%) were married. The age range of the respondents was 18 to 82 years. More than half 785(60.1%) of those who responded to the question on level of education had secondary education while 85(6.5%) had no formal education. Table 1: Majority of the respondents 601(54.8%) were in the middle socioeconomic class.

**Table 1:** Demographic characteristics of the study population

Characteristic	n	%
<i>Gender</i>		
Male	155	11.5
Female	1192	88.5
<i>Level of Education</i>		
None	85	6.5
Primary	243	18.6
Secondary	785	60.1
Tertiary	194	14.8
<i>Socioeconomic class</i>		
Upper	192	17.5
Middle	601	54.8
Low	303	27.7
<i>Have a child</i>		
Yes	708	53.1
No	626	46.9
<i>Any Under-five</i>		
Yes	301	22.6
No	1033	77.4

Some of the totals do not add up to total number of respondents because of missing data

About half of the respondents 708(53.1%) had children and of these 301(22.6%) had at least an under-five. Of these 301, 285(94.7%) had one under five while 15 (5.0%) and 1(0.3%) had two and three under-fives respectively. Only 67(4.9%) respondents considered smoke as a factor in childhood pneumonia. Of the 70 respondents with no education only 1(1.4%) knew that smoke was a risk factor for pneumonia compared to 18 (8.7%), 32(4.5%) and 12(6.5%) of those with primary, secondary and tertiary education respectively. This difference was statistically significant  $p=0.04$  Table 2. Avoidance of smoke in the home was considered a prevention method for pneumonia by only 99(7.2%) respondents. The proportions of respondents with different levels of education (11.1% no education, 9.5% primary, 7.3% secondary and 10.2% tertiary) who considered avoidance of smoke as a method of prevention of

other low income countries. The lack of emphasis on smoke as a potential risk factor may suggest that authors do not consider smoke an important risk factor. This is very important giving the fact that 50% of premature death in under-fives is due to pneumonia caused by particulate matter (soot) inhaled from indoor air Pollution<sup>5</sup>.

The poor knowledge about smoke as a risk factor for pneumonia documented in this study is, however, in contrast to that of a study from Zaria, in which close to 70% of those studied knew that cooking fuels were sources of indoor air pollution.<sup>14</sup> In that study, respondents were also aware that air pollution was detrimental to health. The better knowledge may be due to methodological differences, in that this study did not ask about general health consequences of smoke but as a specific risk factor for childhood pneumonia.

The role of formal education in health information is exemplified by the fact that respondents with any education were more likely than those with no education to know that smoke is a risk factor in childhood pneumonia. Health information on the risks of smoke and biomass fuel is one of the strategies that could be used in getting people to start using cleaner fuels. Almost a fifth of the study population use biomass fuel for cooking. This is much lower than the proportion reported for rural communities in Sub Saharan Africa, where up to 80% of the population use biomass fuel for cooking and heating purposes. The difference may be because rural areas have more access to biomass fuel and it is more affordable. The proportion of respondents using biomass fuel in this study was thus more comparable to that from an urban city in northern Nigeria.<sup>14</sup> Although this study did not evaluate ventilation in the homes of the respondents some studies have shown that poor ventilation increases the risk of indoor air pollution.

Majority of the respondents carried out their cooking in the kitchen. This is similar to findings from the Zaria study.<sup>14</sup> The use of biomass fuel in confined spaces such as the kitchen presupposes that the indoor air pollution in such a space will be high. Thus the presence in this study of under-fives in the kitchen places them at risk for acute respiratory infections including pneumonia. Even when biomass fuels are used outdoors, studies have shown that indoor air becomes polluted because of the way houses are constructed and the layout of the houses.<sup>3</sup> Also the fact that majority of the respondents do not consider smoke a risk factor, and its avoidance a method of prevention, further increases the risk of their children for acute respiratory infections including pneumonia as they would be unlikely to undertake specific acts of prevention directed at reduction of exposure to smoke.

Respondents with no formal education were more likely to use biomass fuel for cooking. Although bivariate analysis indicated that this may be associated with economic power as those from upper and middle class were significantly less likely to use fire wood logistic regres-

sion indicated otherwise. Education was an independent predictor for the use of firewood while socioeconomic class was not. This highlights the importance of education. Female education is an important strategy to improve standard of living. With more than 75% of the respondents also using kerosene stoves there is a potential for encouraging them to use kerosene which is a cleaner fuel. It should however be pointed out that the World Health Organization discourages the use of kerosene because it has been shown to produce high levels of pollutants exceeding recommended levels especially when used with simple unvented combustion technologies like wick cookstoves, in addition to the risks for fires, burns and poisoning associated with its use in low and middle income countries.<sup>15</sup> The low use of clean fuels( gas and electricity ) may be due to these fuels being more expensive and the erratic supply of electricity. This is supported by the finding of socioeconomic class being an independent predictor for the use of gas and electricity for cooking.

Respondents whose children had suffered pneumonia in the past were not significantly different in terms of their knowledge of smoke as a risk factor or its avoidance as a method of prevention. This may be because many health workers do not provide health information concerning children's ailment to the caregivers.<sup>16</sup> In a study on Bangladeshi mothers whose children had recently been hospitalized for pneumonia, it was found that they lacked appropriate knowledge about pneumonia.<sup>11</sup> They attributed the pneumonia to such factors as dust, unhealthy household condition, cold allergy and heavy sweating during the hot summer months. The lack of knowledge of risk factors and methods of prevention mean that the same child or siblings will continue to be at risk as their caregivers will not take appropriate preventive steps due to ignorance.

It is concluded that the low level of knowledge of smoke as a risk factor for childhood pneumonia and the significant proportion of respondents using unclean fuels means that the children of the studied respondents are at risk for pneumonia. We recommend that as part of creating awareness on childhood pneumonia smoke as a risk factor should be emphasized. The government should also make cleaner fuels more available, accessible and affordable. This is needed to effect a change in the type of fuel communities use for domestic purposes.

#### **Limitation of study**

This study did not explore respondents' perception of smoking and other forms of smoke (such as lantern smoke) as potential risk factors for childhood pneumonia. The population studied is highly selective although they may not be significantly different from the general population with regards to the subject under study. The study also did not evaluate ventilation or the proximity of the cooking area to the living and bedroom.

pneumonia were not significantly different  $p=0.42$ . All those with under-fives usually have them in the cooking area while cooking. Of those responding, 188 (16%) had had a child who suffered pneumonia in the past. Having a child who had suffered pneumonia was not significantly associated with knowing that smoke was a risk factor for pneumonia and that avoidance of smoke could prevent pneumonia in children  $p>0.05$ . Table 2.

**Table 2:** Relationship between level of education, previous experience of pneumonia in child and perception of smoke as a risk factor and avoidance of smoke as a preventive action

Variable	Knows smoke is a risk factor				Pvalue	Knows avoidance of smoke is preventive				Pvalue
	Yes		No			Yes		No		
	n	%	n	%		n	%	n	%	
<i>Level of Education</i>										
None	1	1.4	70	98.6	0.04	8	11.1	64	88.9	0.42
Primary	18	8.7	187	91.3		19	9.5	182	90.5	
Secondary	32	4.5	681	95.5		53	7.3	668	92.7	
Tertiary	12	6.5	172	93.5		19	10.2	167	89.8	
<i>Child had pneumonia</i>										
Yes	6	3.2	182	96.8	0.12	11	5.6	177	94.4	
No	61	6.3	902	93.7		86	9.0	868	91.0	0.20

Some of the totals do not add up to total number of respondents because of missing data

Majority of the respondents 1146(83.4%) do their cooking in the kitchen. Outside the house 8.3%, in the passage 3.7% and in the bedroom 0.3% were other cooking areas mentioned by respondents. Biomass fuel is utilized by 272(19.8%) –firewood and 54(3.9%) sawdust.

Figure 1 shows the distribution of respondents by their level of education and the type of cooking fuel they use. Significantly more respondents with no formal education use firewood 28(34.1%) compared to respondents with primary 66(28%), secondary 142(18.3%) and tertiary 30(15.8%) education  $p<0.000$ . The use of Gas and Electricity was significantly higher among those with any education( primary-9.6% and 4.0%, secondary 28.5% and 1.8%, tertiary 39.4% and 18.5% for gas and electricity respectively) compared to 17.3% and 0% for gas and electricity respectively among those with no education  $P<0.000$ .

Table 3 shows the distribution of respondents by their socioeconomic status and their cooking fuel. Respondents from low socioeconomic class 77(26.8%) were statistically significantly more likely to use firewood compared to those from middle 101(17.0%) and upper 26(13.0%) socioeconomic classes  $p=0.000$ . Respondents from middle socioeconomic class 454(95.9%) were more likely than those from upper 123 (65.4%) and lower 200(67.6%) socioeconomic classes to use kerosene  $p=0.002$ . The use of sawdust was not significantly associated with socioeconomic class. Those from upper socioeconomic class were statistically significantly more likely to use gas and electricity than those from low and middle socioeconomic classes  $p<0.0001$ .

The logistic regression with level of education and socioeconomic class entered into the model as independ-

ent variables for cooking fuel showed that socioeconomic status was an independent predictor for the use of gas and electricity while level of education was an independent predictor of use of firewood. Table 4

**Table 3:** Distribution of respondents by socioeconomic status and cooking fuel

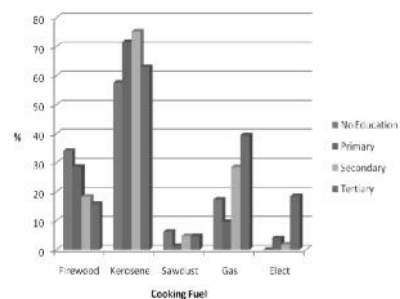
Cooking Fuel	Socioeconomic class						pvalue
	Upper		Middle		Low		
	n	%	n	%	n	%	
<i>Firewood</i>							
Yes	26	13.6	101	17.0	77	26.8	
No	165	86.4	492	83.0	210	73.2	0.000
<i>Kerosene</i>							
Yes	123	65.4	454	76.2	200	67.6	
No	65	34.6	142	23.8	96	32.4	0.002
<i>Sawdust</i>							
Yes	11	5.8	24	4.1	6	2.1	
No	180	94.1	568	95.9	276	97.9	0.112
<i>Gas</i>							
Yes	105	55.3	173	29.2	38	13.3	
No	85	44.7	419	70.8	247	86.7	0.000
<i>Electricity</i>							
Yes	33	17.3	10	1.7	6	2.1	
No	158	82.7	582	98.3	276	97.9	0.000

Some of the totals do not add up to total number of respondents because of missing data

**Table 4:** Logistic regression on predictors of cooking fuel choices

Cooking fuel	Socioeconomic class			Level of Education				
	Exp	CI	pvalue	Exp	CI	pvalue		
Firewood	-0.22	0.80	0.51,1.27	0.45	-0.66	0.52	0.36,0.75	0.00
Kerosene	0.11	1.12	0.75,1.68	0.59	0.12	1.12	0.79,1.59	0.52
Gas	-0.94	0.39	0.25,0.60	0.00	0.11	1.11	0.75,1.66	0.60
Electricity	-1.20	0.30	0.12,0.79	0.01	0.58	1.78	0.70,4.53	0.23

**Fig 1:** Distribution of respondents by level of education and their type of cooking fuel



## Discussion

This study has demonstrated that majority of the respondents do not consider smoke as a risk factor in pneumonia and accordingly did not think that avoiding smoke in their homes could prevent pneumonia in their children. The poor knowledge of smoke as a risk factor for pneumonia (only 4.9% of respondents) is in keeping with findings in a Nigerian study which found that mothers knowledge about pneumonia was poor.<sup>13</sup> In that study it was suggested that the focus of health education campaign should be on germs as the cause of pneumonia, immunizations, hand washing and exclusive breastfeeding as potent preventive measures. While these are unarguably important areas of focus, the authors failed to mention smoke as a contributing factor giving the context of the high use of biomass fuel in Nigeria and

**Author's contribution**

This study is part of an institutional research by the Institute of Child Health, University of Benin.

**Conflict of interest:** None

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