

## Household tobacco smoking and otitis media in Konduga Area of Northeast, Nigeria

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### Abstract

**Introduction:** Otitis media represents one of the commonest illness in childhood. Studies have been conducted to identify the risk factors for this disease. However, the true prevalence of otitis media may remain elusive because community based studies are few. Investigation of household exposure to tobacco smoke and occurrence of otitis media had also not been extensively explored in the Nigerian context.

**Methods:** A community based study was conducted in Konduga Local Government. A multi-staged sampling procedure was used to select 400 mother-child dyads. Using an interviewer administered questionnaire, information was obtained on child's history of otitis media, socio-demographic characteristics, and household tobacco use and exposure. Bivariate analysis and logistic regression were used to explore associations and predictors.

**Results:** Majority of the mothers had either Quranic 194 (48.5%) or no formal education 137 (34.3%) and were predominantly artisans/traders 123(30.8%) or full housewives 221 (55.3%). Only 79(19.8%) had more than two families living together, 16% of the fathers were current daily smokers while in 31.3% of households, smoking was done on a daily basis. About a quarter (24.8%) of the children in the study had experienced otitis media while only 11.7% had more than one episode. Household daily tobacco smoking increased the odds of having otitis media up to five times (OR 4.8; 95% CI 2.5 – 9.2).

**Conclusion:** Household level tobacco smoke exposure was significantly associated with otitis media. Mothers and children often have no control over household smoking decision, therefore proactive community awareness should be encouraged.

**Keywords:** *Smoking, otitis media, household smoking, children*

### Résumé

**Contexte:** L'otite moyenne représente l'une des maladies les plus courantes chez les enfants. Des études ont été menées pour identifier les facteurs de risque de cette maladie. Cependant, la véritable prévalence de l'otite moyenne peut rester évasive parce que les études communautaires sont peu nombreuses. L'enquête sur l'exposition à la fumée du tabac au ménage et la survenue d'otites moyennes n'a pas été étudiée de manière approfondie dans le contexte nigérian.

**Méthodes:** Une étude communautaire a été menée dans la mairie de Konduga. Une procédure d'échantillonnage en plusieurs étapes a été utilisée pour sélectionner 400 dyades mères-enfants. À l'aide d'un questionnaire administré par intervieweur, on a recueilli de l'information sur les antécédents d'otite moyenne chez les enfants, les caractéristiques sociodémographiques, et l'usage et l'exposition au tabac du ménage. L'analyse bi-variée et la régression logistique ont été utilisées pour explorer les associations et les prédicteurs.

**Résultats:** La majorité des mères avaient soit des études Coraniques 194 (48,5%) ou pas d'éducation formelle 137 (34,3%) et étaient principalement des artisans / commerçants 123 (30,8%) ou des femmes ménagères 221 (55,3%). Seulement 79 (19,8%) avaient plus de deux familles vivant ensemble, 16% des pères étaient des fumeurs quotidiens actuels alors que dans 31,3% des ménages, le tabagisme est fait sur une base quotidienne. Environ un quart (24,8%) des enfants de l'étude avaient souffert d'otite moyenne alors que seulement 11,7% avaient plus d'un épisode. Le tabagisme quotidien des ménages augmente la probabilité d'avoir une otite moyenne jusqu'à cinq fois (OR 4,8; IC 95% 2,5 - 9,2).

**Conclusion:** L'exposition à la fumée de tabac au niveau du ménage était significativement associée à l'otite moyenne. Les mères et les enfants n'ont souvent aucun contrôle sur la décision de fumer à la maison, par conséquent une sensibilisation proactive de la communauté devrait être encouragée.

**Mots clés:** *Tabagisme, otite moyenne, tabagisme domestique, enfants*

## Introduction

Otitis media is one of the commonest illnesses in the pediatric age group and it is responsible for great distress and considerable out of pocket expenditures on health. Across countries, prevalence can range from 6.7% in China to 9.2%, in India and Nigeria and 10% in Egypt [1]. However, Lasisi *et al* in their hospital based study in Ibadan reported that 72% of the children studied had suffered from otitis media during the 1st year of life [2].

The occurrence of otitis media is associated with considerable social and economic cost. Ibekwe *et al* in their review noted that in Low-and Middle-Income Countries (LMIC), poverty, ignorance, inadequate specialists contribute to the worsening of its clinical course [3]. A study in Northern Nigeria estimated that the initial cost of treatment is usually higher than the minimum wage of \$47.5 USD; thus placing effective treatment out of the reach of many households [4]. Otitis media may also result in hearing impairments which are associated with the complications of chronic suppurative otitis (CSOM); defined as otorrhea lasting six weeks or more [5]. The onset of these complications may require prolonged treatment and/ surgery which may be difficult to access especially in resource poor settings.

Risk factors that have been associated with this condition include: male gender, orofacial abnormalities, feeding in a supine position, passive smoke exposure and young age of onset; before the age of 6months, allergies, being formula fed and having siblings [6, 7]. Another risk factor commonly associated with otitis media is tobacco smoke which increases the development of otitis media and respiratory tract infections in infants and children [8, 9]. However, breastfeeding protects infants exposed to tobacco smoke from infections [9]. Another study evaluating exposure to cigarette smoke and development of otitis media with effusion, found a statistically significant association [10]. Despite these studies, a review of existing evidence averred that the association can be faulted on the basis of methodological issues such as small sample sizes and failure to delineate fathers from mothers smoking [11].

In the Nigerian context, only a few community based studies had been done on otitis media. However, one of such community based study found otitis media occurring more amongst children of mothers with lower educational status, children exposed to wood smoke and in situations where more than four children sleep in the same room [12]. The

paucity of such studies makes it expedient to conduct more community-based studies in Nigeria to properly document the true prevalence of otitis media associated with tobacco smoke and to investigate the contribution of preventable causes such as tobacco smoke.

## Methods

This study is part of a larger study on integrated management of childhood illnesses and was located in Konduga Local Government Area (LGA) of Borno State in the North-east region of Nigeria. As at the time of the study, the LGA had a population of 189,745 according to the 2016 census and factoring in the annual growth rate of 3% [13]. Konduga is a rural LGA and majority of the inhabitants are Muslims with few Christians and traditionalists. Sample size for the cross sectional study was calculated using the proportion of children (0.37) exclusively breastfed from a study by Ebuehi [14]. Degree of precision was set at 5% and 'no response' rate anticipated not to exceed 10%.

The calculated effective sample size was 397; which was rounded off to 400. Mother-child dyads were selected using a multi-stage sampling technique. By simple random sampling, four out of eleven wards were selected in Konduga LGA, namely: Konduga, Kawuri, Malari and Dalori with estimated under-five population of 9689, 3741, 3924 and 5431 respectively [15]. In Kawuri and Malari, the settlements were estimated to have 40 households each while in Dalori and Konduga, the settlements were estimated to have 80 and 160 households respectively. The number of questionnaires to be administered in each ward were proportionally allocated based on the estimated number of households. The number of households defined as a 'unit consisting of people who eat from the same pot' were selected in each ward through a systematic sampling technique. We included all mothers in each selected household with under-five children and the reference child was the youngest child if mother had more than one under-five children.

Interviewer administered questionnaires were used to obtain information from mothers on socio-demographic characteristics, child based characteristics (including immunization history by recall), personal smoking history, smoking within households and history of otitis media in children. Current cigarette smoking was defined as smoking within the last 30 days preceding interview while otitis media was defined as presence of cloudy or pus-like ear discharge with or without fever.

Ethical approval was obtained from the Research and Ethical Committee of University of Maiduguri Teaching Hospital. Permission was also sought from village head and head of houses in each individual house visited.

Analysis was done using SPSS. Univariate and bivariate analysis was done. Outcome measure was history of otitis media (dichotomous outcome). Otitis media associations identified from literature were explored using Chi-Square test at the 5% level of significance. Likely predictors of otitis media were examined using binary logistic regression. The regression model was built by considering factors significant at the 25% level and factors known to be associated with or confounders for otitis media. The final model had a good fit and explained 19.5% of the variation in outcome as well as predicted 75.3% of the outcomes (Nagelkerke R<sup>2</sup> - 0.195; Predicted - 75.3%).

## Results

As shown in table 1, respondents consisted of 400 mothers. Almost all (95.0%) were married, majority had either Quranic education 194 (48.5%) or no formal education 137 (34.3%) and were predominantly artisans/traders 123(30.8%) or full housewives 221 (55.3%).

**Table 1:** Parental socio-demographic characteristics

Variable	N=400	n (%)
<i>Marital Status</i>		
Single		2 (0.5)
Married		380 (95.0)
*Others		18 (4.5)
<i>Mothers education</i>		
No formal		137 (34.3)
Quranic		194 (48.5)
Primary		33 (8.3)
Secondary and above		36 (9.0)
<i>Mothers occupation</i>		
Civil servant		23 (5.8)
Farmer		33 (8.3)
Artisan/trading		123 (30.8)
Full housewife		221 (55.3)
<i>Number of families in household</i>		
1 - 2		321 (80.3)
>2		79 (19.8)
<i>Fathers current smoking pattern</i>		
Daily		64 (16.0)
Less than daily		13 (3.2)
Not currently/never		323 (80.8)
<i>Frequency of smoking within household</i>		
Daily		125 (31.3)
Less daily		20 (5.0)
Never		255 (63.7)

Majority (80.3%) of the households had 1-2 families living together as part of a household while only 79(19.8%) had more than 2 families living together as part of a household. Only 64 (16%) of the fathers were current daily smokers while 13 (3.2%) do not smoke every day, even though they were current smokers. Up to 125 (31.3%) reported a history of at least somebody smoking within the house on a daily basis.

**Table 2:** Child related characteristics

Variable	N=400	n (%)
<i>Age in months</i>		
0 - 11		125 (31.3)
12 - 23		93 (23.3)
24 - 59		182 (45.5)
<i>Sex</i>		
Male		201 (50.2)
Female		199 (49.8)
<i>Number of Under-fives in household</i>		
1 - 3		190 (47.5)
3 - 4		210 (52.6)
<i>Exclusive Breastfeeding at current age</i>		
Yes		48 (12.0)
No		352 (88.0)
<i>Had immunization appropriate for age</i>		
Complete immunization for age		18 (4.5)
Incomplete immunization for age		382 (95.5)
<i>Otitis Media</i>		
Yes		99 (24.8)
No		301 (75.2)
<i>Episodes of ear discharge</i>		
Only once		52 (13.0)
Recurrent (> 1)		47 (11.8)
None		301 (75.2)

Table 2 reveals that up to 182 (45.5%) of the children under study belonged to the 24-59months age group and 210 (52.6%) households had up to 4 under-fives and above living within. In addition, only 48(12%) of the children were exclusively breastfed and even a smaller number (18; 4.5%) had complete immunization for age. Furthermore, 99 (24.8%) of the children under study had suffered from otitis media with 47 (11.8%) having more than one episode. Only one mother reported ever smoking.

In table 3, the associations with otitis media are shown. More children within the age group 12-23months, 25(26.9%) were reported to have experienced otitis media compared to other age groups. Similarly, a greater proportion of children of civil servants (30.4%) had otitis media compared to children whose mothers had other occupations.

**Table 3:** Associations with Otitis Media

Variable	Otitis Media		P- Value
	Yes n (%)	No n (%)	
<i>Age</i>			
0 – 11	32 (25.6)	93 (74.4)	0.76
12 – 23	25 (26.9)	68 (73.1)	
24 – 59	42 (23.1)	140 (76.9)	
<i>Sex</i>			
Male	50 (24.9)	151 (75.1)	1.00
Female	49 (24.6)	150 (75.4)	
<i>Mothers education</i>			
No formal	39 (28.5)	98 (71.5)	0.38
Quranic	45 (23.2)	149 (76.8)	
Primary	5 (15.2)	28 (84.8)	
Secondary and above	10 (27.8)	26 (72.2)	
<i>Mothers occupation</i>			
Civil Servant	7 (30.4)	16 (69.6)	0.72
Artisan/Trader	33 (26.8)	90 (73.2)	
Farmer	9 (27.3)	24 (72.7)	
Full housewives	50 (22.6)	171 (77.4)	
<i>Number of families in household</i>			
1 – 2	77 (24.0)	244 (76.0)	0.47
More than 2	22 (27.8)	57 (72.2)	
<i>Number of Under-Fives in household</i>			
1 – 3	44 (23.2)	146 (76.8)	0.49
≥4	55 (26.2)	155 (73.8)	
<i>Exclusive breastfeeding at current age</i>			
Yes	8 (16.7)	40 (83.3)	0.21
No	91 (25.9)	261 (74.1)	
<i>Complete immunization for current age</i>			
Yes	9 (17.6)	42 (82.4)	0.29
No	77 (25.3)	227 (74.7)	
<i>Husbands current smoking history</i>			
Does not smoke currently	60 (18.6)	263 (81.4)	<0.001
Husband currently smokes	39 (50.6)	38 (49.4)	
<i>Smoking frequency within household</i>			
Daily	61 (48.8)	64 (51.2)	<0.001
Less than daily	2 (10.0)	18 (90.0)	
Never	36 (14.1)	219 (85.9)	

Likewise, more children of mothers with no formal education 39(28.5%) had experienced otitis media compared to children of mothers with other forms of education. The same pattern was reported for children from households with more than 2 families 22 (27.8%) compared to those from single family households, children from households with up to 4 or more under-fives 55 (26.2%) compared to those from households with 1-3 under-fives, children who were not exclusively breastfed 91(25.9%) compared to those exclusively breastfed, and children with incomplete immunization for current age 77(25.3%) compared to those who completed appropriate immunization for current age. All aforementioned

associations were not statistically significant at the 5% level.

However, children whose fathers currently smoked 39 (50.6%) at the time of interview were more likely to be reported as having experienced otitis media compared to those whose fathers did not currently smoke 60 (18.6%); this difference was statistically significant. Also children from households where smoking was done in-house on a daily basis 61(48.8%) had otitis media more than households with less than daily smoking and households where no smoking was done. These differences were statistically significant.

Table 4 shows that after adjusting for age and sex, households where smoking was observed in-

Table 4: Predictors of Otitis Media

Variable	AOR	P value	95% CI
<i>Immunization appropriate for age</i>			
Complete immunization	1.0		
Incomplete immunization	1.97	0.58	0.40 – 5.47
<i>Exclusive breastfeeding at current age</i>			
Exclusive breastfeeding	1.0		
Non-exclusive breastfeeding	1.50	0.36	0.64 – 3.53
<i>Smoking frequency within household</i>			
Never	1.0		
Daily	4.80	<0.001	2.50 – 9.20
Less than daily	0.64	0.56	0.14 – 2.89
<i>Husband's current smoking history</i>			
Does not smoke currently	1.0		
Currently smokes	1.36	0.40	0.67 – 2.75

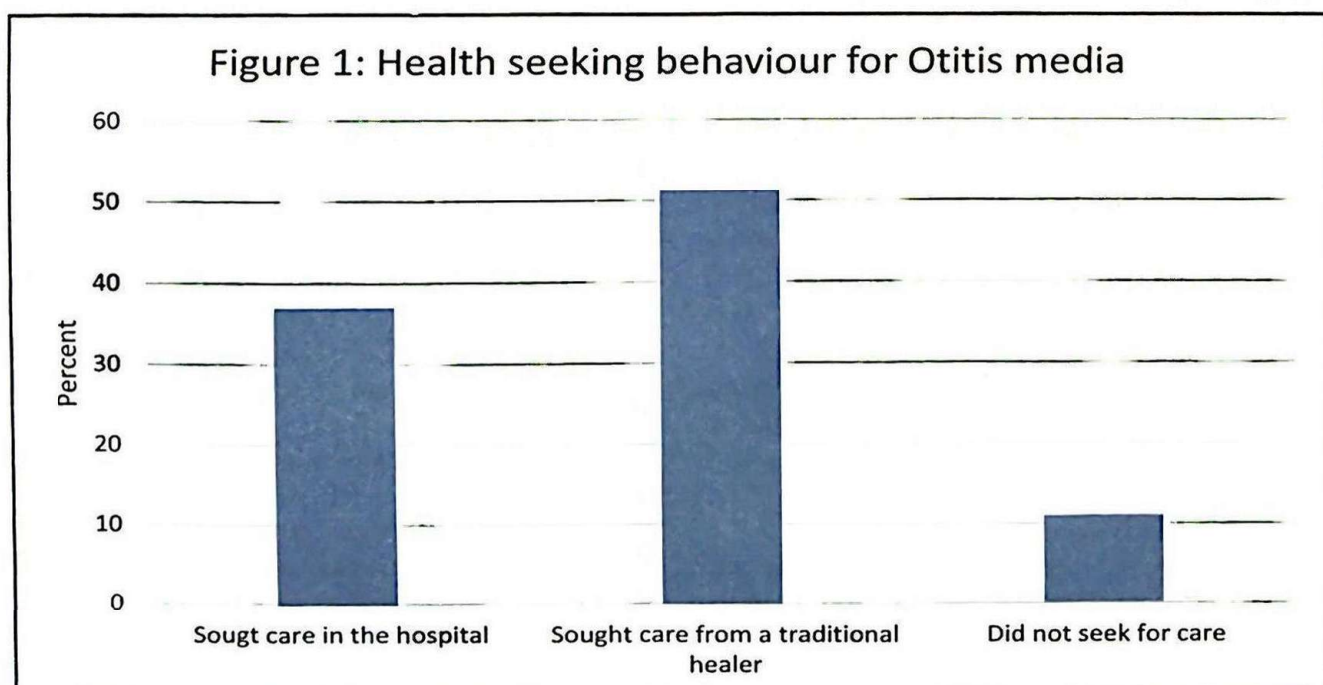
Nagelkerke  $R^2$  - 0.195; Predicted - 75.3%

house on a daily basis were up to five times more likely to have children come down with otitis media compared to households where smoking in-house was not observed. The model was well fitted and up to 19.5% of the observed variation was explained by the model

Figure 1 shows that slightly more than half (51.5%) of the mothers sought care for their children's otitis media from traditional healers, 37.4% sought for care in the hospital while 11.1% did not seek any care.

majority of the mothers interviewed in the study had less than primary education. The National Demographic Survey 2013 documents that in the North Eastern region, up to 61.1% of females have no formal education [16]. More than half of the respondents were also full housewives which reflects the power structure of the community studied which is not different from that in most northern part of the country [16].

Amongst the children constituting the mother-child dyad studied, only 12% had been exclusively



## Discussion

The study was conducted in the Northeastern part of Nigeria, and as such, it was not surprising that

breast fed at their current age which was lower than the national average of 17% in children less than 6 months [16]. Similarly, less than 5% had received

complete immunization appropriate for their age which is much far lower than that documented by the NDHS [16]. The Boko Haram insurgency in Konduga Local Government around the time of the study may account for the observed pattern.

A quarter of the respondents affirmed that their index child had experienced at least one episode of otitis media. This is lower than the 72% reported by Lasisi et al in their hospital based study [2]. However, it is higher than the 14.7% from a community based study conducted in Osun State [12]. The difference may be due to the different age of children (0-12years) considered in the Osun based study [12]. Slightly higher than a tenth of the children in our study had repeated episodes which is in keeping with the evidence that up to 17% of children will have a minimum of three episodes of acute otitis media (AOM) during the first year of life [17].

Contrary to other studies [18,19] which found exclusive breastfeeding and immunization to be protective factors against otitis media, we could not demonstrate a statistically significant association in this study probably due to the small numbers of children who had complete immunization for age and those who were breastfed exclusively [18,19]. Although, more mothers who were employed had children with otitis media compared to those unemployed, the difference was not statistically significant. However, it has been documented that mothers employment status is a risk factor for otitis media [20]. This is likely linked to the higher probability of children of employed mothers attending day care centres; a factor that increases the risk of otitis media in children [21]. Tobacco smoke has been associated with the development of otitis media in children and this had been established in several studies done elsewhere [22-24]. Our finding was not different from that of the aforementioned studies; we found that smoking exposure within households was significantly associated with otitis media. Additionally, smoking exposure on a daily basis within households increased the odds of having otitis media by almost five times compared to no exposure within the household. The relatively large effect size seen in this study may be due to the young age of those exposed i.e., 0-59months.

Self-report alone may be fraught with misclassification of events. We therefore urge that this likely misclassification be taken into consideration in the interpretation of our findings. However, mother's positively-reported child symptoms have been found to be moderately sufficient for a diagnosis of otitis media [25].

## Conclusion

Exposure to tobacco smoke at a relatively young age has a negative effect on the health of children. Our study documented the association of otitis media with the exposure to tobacco smoking within households in Konduga Local Government Area. Children have no control over what happens within households; therefore, it becomes important that a pro-active community awareness programme be launched in this locality and other similar backgrounds to protect the health of children from the deleterious effects of exposure to tobacco smoke.

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