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## Prevalence of Pneumonia in Children under Five Years Old Attending the Federal Medical Centre, Makurdi, Nigeria



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### ABSTRACT

Pneumonia is a form of acute respiratory infection that affects the lungs. It is a leading cause of death in children worldwide. Pneumonia kills approximately 1.1 million children yearly – more than AIDS, malaria and tuberculosis combined. Unfortunately, information on the prevalence of pneumonia in children in Makurdi is very scarce. This hospital-based investigation was conducted at the Paediatrics Department of the Federal Medical Centre, Makurdi, from December 2013 to November 2014, on under five children admitted at the paediatrics ward of FMC, Makurdi. Within this period, a total of 784 children under five were admitted. Out of these, 217 children were diagnosed and treated for pneumonia, representing 27.68% of all admissions. 125 out of 217 children were included in the study. 39 children (31.2%) yielded bacterial growth of *Staphylococcus aureus* 24(19.2%), *Pseudomonas aeruginosa* 9 (7.2%), Klebsiella spp 4 (3.2%), and coliforms 2 (1.6%), while 86 (68.8%) did not yield any bacterial growth. The pattern of distribution of pneumonia among children showed that children in the age group of 1-11 months (70; 56%) were mostly affected. There were more male pneumonia positive children (85; 68%) than the female children (40; 32%). Pneumonia cases were more in the month of October 2014 (45.07%) and least in the month of June 2014(13.64%). There was however, no significant difference in prevalence of pneumonia in relation to the socio-demographic and environmental factors. Of all the possible risk factors, it was discovered from the study that lack of exclusive breastfeeding and lack of immunization were statistically significant (Spearman's rho at  $P \leq 0.01$ ). All the 125 children at presentation had fever and cough, and 90 children had difficulty in breathing. The mortality rate was 8% as 10 children died as a result of pneumonia while on admission. It is recommended that efforts at educating caregivers on the importance of exclusive breastfeeding and regular and adequate immunization during antenatal and postnatal periods be strengthened in Makurdi, Benue state.



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## INTRODUCTION

Pneumonia is a form of acute respiratory infection that affects the lungs (WHO, 2013). The lungs are made up of small sacs called alveoli, which are filled with air when a healthy person breathes. When an individual has pneumonia, the alveoli are filled with pus and fluid, which makes breathing painful and limits oxygen intake (WHO, 2013). Pneumonia is a leading cause of morbidity and mortality in children (Abdulkarim *et al.*, 2013; Wardlaw *et al.*, 2006; UNICEF, 2014; WHO, 2013). Pneumonia kills an estimated 1.1 million children every year, more than AIDS, malaria and tuberculosis combined (WHO, 2013). It is the single largest cause of death worldwide (WHO, 2013). Pneumonia accounts for 16% of all under-five deaths globally and killed about 940,000 children in 2013 (UNICEF,2014) and another 922,000 in 2015;this means a loss of 2,500 children lives every day, or over 100 every hour (UNICEF,2016). There are 15million cases of pneumonia each year in children, with as many as 20 million cases severe enough to require hospital admission (Rudan *et al.*, 2008).Out of this 156 million new episodes each year worldwide, 151 million episodes are in developing world (Rudan *et al.*, 2008). Most cases occur in India (43 million), China (21 million), and Pakistan (10 million), with additional high numbers in Bangladesh, Indonesia and Nigeria (6 million each) (Rudan *et al.*, 2008). Pneumonia alone claims the lives of approximately 177,000 children under five years yearly in Nigeria (WHO, 2014). According to World Health Organization (WHO) (2013), the presenting features of viral and bacterial pneumonia in children are similar. These include: cough and/or difficult breathing; with or without fever; fast breathing; lower chest wall in drawing; unable to feed or drink; sometimes unconsciousness; hypothermia and convulsions, etc. Substantial evidence according to Rudan *et al.* (2008) revealed that the leading risk factors contributing to pneumonia incidence are: lack of exclusive breastfeeding, under-nutrition, indoor air pollution, low birth weight, overcrowding, lack of measles immunization, etc.

## METHODOLOGY

### Study Area:

This hospital-based investigation was conducted at the Pediatrics Department of the Federal Medical Centre (FMC), Makurdi from December 2013 to November 2014. Makurdi is the capital of Benue State, North Central, Nigeria. Makurdi is located at the North Eastern part of Benue State and lies on latitude 7°30'N and longitude 8°35'E. It shares boundaries with Gwer

West and Guma Local Government Areas including Nasarawa State. The town is divided by the River Benue into the North and South banks, which are connected by two bridges: the railway bridge and the dual carriage bridge. The southern part of the town is made up of several wards including Central Ward, Old GRA, Ankpa Ward, Wadata Ward, High Level, Wurukum and new GRA. Makurdi lies in the tropical guinea savanna zone of Central Nigeria, experiences a typical climate with two distinct seasons. The dry season lasts from late October to March and the rainy season which begins in April to October is the period of intensive agricultural activities by the inhabitants mostly Tivs, Idomas, Jukuns and Igedes. The area has an annual rainfall of 1000mm and temperature fluctuates between a minimum of 27°,38 C to 28°,00 C and a maximum of 30°,10 C to 34°,09 C (Amuta *et al.*, 2008). Makurdi has a population of 300,377 as at the last census of 2006 (National Population Commission, 2006); and has an annual growth rate of 3% (UNPFA, 2006); and therefore has an estimated population of 380,509 in 2014.

#### **Statistical Analysis:**

The sample size was determined using a computer-based sample size estimator software, based on acceptable standard error of 5% with confidence interval of 95% (Raosoft Sample Size Calculator, 2014). For this research, a minimum sample size of 384 children would be required. The total sample size of 784 children was however used for this study.

The FMC is a referral centre being a tertiary institution for the nearby LGAs, towns and villages.

The study was carried out on under five children on admission at the pediatrics wards of the FMC, Makurdi. The children were first reviewed by the attending pediatricians prior to assessment by the researcher. The study was cross-sectional and the sampling technique was systematic. The socio-demographic data was collected with the aid of questionnaire administered to the mothers/caregivers of the children, while blood samples were collected from the children for culture. The demographic variables and identifiable isolates were analyzed using Statistical Package for Social Sciences (SPSS) 20.0 version. Descriptive statistics was used to determine means and percentages.

**Ethical Clearance:**

Ethical clearance was obtained from the University of Agriculture, Makurdi, the Health Research Ethics Committee of the Federal Medical Centre, Makurdi, and informed consent from caregivers.

**RESULTS:**

A total of 784 children under five years were admitted at the pediatrics wards. Out of these, 217 children were diagnosed and treated for pneumonia, representing 27.68% of all admissions. 125 out of 217 children were included in the study; the remaining 92 children could not be included either because the mother did not consent, blood samples could not be obtained or the data from the questionnaire were not comprehensively obtained. 39 children (31.2%) yielded bacterial growth of *Staphylococcus aureus* 24(19.2%), *Pseudomonas aeruginosa* 9 (7.2%), klebsiella spp 4 (3.2%), and coliforms 2 (1.6%), while 86 (68.8%) did not yield any bacterial growth. The pattern of distribution of pneumonia among children showed that children in the age group of 1-11 months (70;56%) were mostly affected. There were more male pneumonia positive children (85;68%) than the female children (40; 32%). Pneumonia cases were more in the month of October, 2014 than the other months; although there were no admissions in July and August, 2014, due to the nationwide strike by the Nigerian Medical Association (NMA). There was however, no significant difference in prevalence of pneumonia in relation to the socio-demographic and environmental factors. Of all the possible risk factors, it was discovered from the study that lack of exclusive breastfeeding and lack of immunization were statistically significant (Spearman's rho at  $P \leq 0.01$ ). All the 125 children at presentation had fever and cough, and 90 children had difficulty in breathing. The mortality rate was 8% as 10 children died as a result of pneumonia while on admission.

**Table 1: The Monthly Admissions at the FMC, MAKURDI, From Dec. 2013-Nov. 2014**

Month	No. of Admitted children	No. of Pneum. + children (%)	No. of pneum.-children(%)
Dec. 13	84	32(38.1%)	52(61.9%)
Jan. 14	44	19(43.18%)	25(56.82%)
Feb. 14	57	24(42.11%)	33(57.89%)
Mar. 14	153	37(24.18%)	116(75.82%)
April 14	108	24(22.22%)	84(77.78%)
May 14	103	15(14.56%)	88(85.44%)
June 14	110	15(13.64%)	95(86.36%)
July14	0	0(0.00%)	0(0.00%)
Aug. 14	0	0(0.00%)	0(0.00%)
Sept. 14	26	8(30.77%)	18(69.23%)
Oct. 14	71	32(45.07%)	39(54.93%)
Nov. 14	28	11(39.29%)	17(60.71%)
<b>Total</b>	<b>784</b>	<b>217</b>	<b>567</b>

Note: No. means number; pneum. means pneumonia

**Table 2: Age, Sex and Religious Distribution of the Pneumonia Positive Children**

Characteristics	Distribution	Number of Children	Percentage (%)
<b>Age</b>	1-11 months	70	56
	12- 23 months	25	20
	24-35 months	15	12
	36-47 months	5	4
	48-60months	10	8
	<b>Total</b>		<b>125</b>
<b>Sex</b>	Male	85	68
	Female	40	32
	<b>Total</b>	<b>125</b>	<b>100</b>
<b>Religion</b>	Christianity	118	94.4
	Islam	7	5.6
	<b>Total</b>	<b>125</b>	<b>100</b>

**Table 3: Ethnic and Settlement Status of Pneumonia Positive Children**

Characteristics	Distribution	Number	Percentage (%)
<b>Ethnicity</b>	Tiv	65	52
	Idoma	25	20
	Hausa	5	4
	Igbo	10	8
	Yoruba	5	4
	Igede	10	8
	Others	5	4
	<b>Total</b>	<b>125</b>	<b>100</b>
<b>Place of Stay</b>	Urban	80	64
	Rural	45	36
	<b>Total</b>	<b>125</b>	<b>100</b>

**Table 4: Occupation, Educational Background and the Average Monthly Income of Caregivers of Pneumonia Positive Children**

Characteristics	Distribution	Number of children	Percentage (%)
<b>Occupation</b>	Not Employed	5	4
	Petty Trader	15	12
	Farmer	10	8
	Civil Servant	65	52
	Self-Employed	30	24
	<b>Total</b>	<b>125</b>	<b>100</b>
	<b>Education Status</b>	No Formal Edu.	5
Primary		10	8
Secondary		45	36
Tertiary		35	28
Others		30	24
<b>Total</b>		<b>125</b>	<b>100</b>
<b>Average Monthly Income</b>		10,000-20,000	40
	21,00-30,000	15	12
	31,000-40,000	15	12
	40,000-50,000	5	4
	50,000-Above	50	40
	<b>Total</b>	<b>125</b>	<b>100</b>

**Table 5: Parental Smoking, Source of Cooking Fuel and Source of Drinking Water**

Characteristics	Distribution	Number of children	Percentage (%)
<b>Parental Smoking</b>	Yes	25	20
	No	100	80
	<b>Total</b>	<b>125</b>	<b>100</b>
<b>Fuel Source</b>	Coal	45	36
	Firewood	10	8
	Kerosene	60	48
	Gas	10	8
	<b>Total</b>	<b>125</b>	<b>100</b>
<b>Drinking Source</b>	Sachet water	60	48
	Borehole	10	8
	Water vendor	25	20
	Well water	5	4
	Others	25	20
	<b>Total</b>	<b>125</b>	<b>100</b>

**Table 6: Immunization Status, Exclusive Breastfeeding Status and Family Disease History**

Characteristics	Distribution	Number of children	Percentage (%)
<b>Immunization Status</b>	Yes	15	12
	No	110	88
	<b>Total</b>	<b>125</b>	<b>100</b>
<b>Exclusive Breastfeeding</b>	Yes	55	44
	No	70	56
	<b>Total</b>	<b>125</b>	<b>100</b>
<b>Family Disease History</b>	Yes	65	52
	No	60	48
	<b>Total</b>	<b>125</b>	<b>100</b>

**Table 7: Signs and Symptoms Following Pneumonia**

Symptoms	Number of Children
Fever	125
Cough	125
Fast Breathing	30
Difficulty in breathing	90
Noisy breathing	25
Excessive Crying	20
Diarrhea	35
Vomiting	45
Feeding problem	10
Convulsions	0
Others	10

**Table 8: Bacteria from Blood Culture and Mortality from Pneumonia Disease**

Characteristics	Distribution	Number of children	Percentage (%)
<b>Bacterial Agent</b>	<i>Staphylococcus aureus</i>	24	19.2
	<i>Pseudomonas aeruginosa</i>	9	7.2
	<i>Klebsiella spp.</i>	4	3.2
	Coliforms	2	1.6
	Negative	86	68.8
	<b>Total</b>	<b>125</b>	<b>100</b>
<b>Mortality</b>	Death	10	8
	Discharged	115	92
	<b>Total</b>	<b>125</b>	<b>100</b>

## DISCUSSION

From the study, the prevalence of pneumonia at the Federal Medical Centre, Makurdi, was 27.68% of all admissions. This was in agreement with the prevalence in Malaysia reported to be between 28% - 39.3% (Azizi and Norzila, 2002) but in contrast to the findings in Ilorin, Nigeria, where prevalence of pneumonia was 13.3% (Abdulkarim *et al.*, 2013). This may be attributed to the fact that most of the children that attended the FMC, Makurdi, during these periods were not adequately immunized and exclusively breastfed (88% of the children not immunized and another 56% not exclusively breastfed).

There were more pneumonia cases in children in the age bracket of 1-11months from the study than the other age brackets under study. This was in agreement with similar studies in Ilorin, Nigeria (Abdulkarim *et al.*, 2013) and another study in Jos, Nigeria (Yilgwan *et al.*, 2012), but in contrast to the findings in Malaysia, where they had more pneumonia cases in children of 2 years (Sufahani *et al.*, 2012). This may be because most healthy children can resist and fight the infection with their natural defences if they were exclusively breastfed and adequately immunized. However, their immune systems were compromised already from the study, and thus, they were predisposed to pneumonia infections. Also, the age group of 1-11 months is more predisposed to viral pneumonia infection than the other age groups.

From the study, there were more male children that were infected with pneumonia than the female children. This agrees with the findings in Tanzania, Jos and Ilorin, Nigeria (Forsberg, 2012; Yilgwan *et al.*, 2012 and Abdulkarim *et al.*, 2013), respectively.

There was however, no significant difference with Spearman Rho's correlation test at P-value of  $\leq 0.01$  in prevalence of pneumonia in relation to the age of children, settlement area (be it



urban or rural), ethnicity (be it Tiv, Idoma, Hausa, Yoruba, Igbo, etc), gender (either males or females), nor religion. There was also no significant difference in the prevalence of pneumonia in relation to the occupation of caregivers, educational level of respondents, average monthly income, smoking status and source of cooking fuel. This means that pneumonia at FMC, Makurdi, affected the children irrespective of the socio-economic status of parents, whether they parents smoked or not, and also irrespective of the family's source of cooking fuel.

There was also no significant difference in the prevalence of pneumonia in relation to number of rooms of the parents/caregivers of pneumonia infected children, number of windows, number of people in a room, and source of drinking water.

Of all the possible risk factors of pneumonia, it was discovered from the study that lack of exclusive breastfeeding and lack of immunization were statistically significant ( Spearman Rho's correlation test at P-value of  $\leq 0.01$ ), and may have contributed immensely to the high prevalence of pneumonia cases at the FMC, Makurdi.

There were 39 (31.2%) bacterial growth recorded in the study from the blood culture of children with pneumonia, with *Staphylococcus aureus* being the most common organism with 24 (19.2%) present in the children, *Pseudomonas aeruginosa* 9 (7.2%), *Klebsiella* spp 4 (3.2%), Coliforms 2 (1.6%); while 86 (68.8%) did not yield any bacterial growth. This agrees with the findings of Abdulkarim *et al.* (2013) in Ilorin, Nigeria, and Forsberg (2012) in Tanzania, where *Staphylococcus aureus* was the predominant organism isolated.

All the children at presentation at the hospital had both fever and cough, while 90 children had difficulty in breathing, 30 had fast breathing, 25 had noisy breathing, 20 cried excessively, 35 had diarrhea, 45 vomited, 10 had feeding problems, none convulsed, and 10 had other signs and symptoms like ear discharges.

The mortality rate from the study was 8% as 10 children died while on admission, as a result of pneumonia. This was 1.4% above a similar study in Ilorin, where the case fatality was 6.6% (Abdulkarim *et al.*, 2013).

## CONCLUSION/RECOMMENDATIONS:

It is recommended that efforts at educating caregivers on the importance of exclusive breastfeeding and regular and adequate immunization during antenatal and postnatal periods be strengthened in Makurdi, Benue state. The new pneumococcal conjugate vaccine (PVC) recently launched in the country by WHO should as a matter of urgency be intensified in the routine immunization schedule, especially in Makurdi and its environs.

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**Conflict of Interest:** None.

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