

## Fever among Children in Calabar, Nigeria: Malaria, the Predominant Precursory Medical Condition

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### Abstract

The study was aimed at elucidating the yearly total hospital admittances due to fever among children under 13 years and the associated underlying medical conditions between the years 2000 and 2011. Records of cases of fever among children under 13 years who presented with fever-associated medical condition and attended the General Hospital, Calabar between 2000 and 2011 were collated. The causes of the fever, age and sex of children were collected and collated. A total of 3663 children were admitted into the General Hospital Calabar with fever-associated medical condition between the year 2000 and 2011. Of these, males were 1520 (41.5%) while females were 2143 (58.5%). The sex-related difference was significant (x<sup>2</sup>-test;  $p < 0.05$ ). The relative proportion of total annual fever cases ranged from 8.7% to 17.0% between 2000 and 2005, and 2.8% to 5.0% between 2006 and 2011. There are significantly higher number of cases between 2000 and 2005 than between 2006 and 2011 in all the categories of sex and age (t-test;  $p < 0.05$  for all the tests). Malaria was associated with more than a third of the fever cases (39.3%) recorded. This was followed by Respiratory Tract Infection (RTI) which was associated with a fifth of all fever cases recorded (20.1%). In all, 25 medical conditions were found to be associated with fever among the children. The control of malaria and RTI would significantly reduce the burden of fever in Calabar.

**Keywords:** Fever, malaria, Hospital attendance, Under 13 years children

### 1. Introduction

Fever is one of the major and most common concerns for which parents bring their children to hospitals. It is a prominent symptom of many different disease processes and may manifest as the only sign of significant underlying infection. Fever may indicate the presence of serious illness or just a rise in body temperature. The hypothalamus increases the body's temperature as a way to fight the infection resulting in fever (Smitherman and Marcias (2012).

Although, there has been progress in the understanding of the causes and management of fever, it remains one of the most important symptoms of diseases globally. This is probably because parasitic and microbial infections present fever as symptom. The intensity of fever varies regionally, even in the same country.

Neonates and young infants may manifest fever than at any other time in childhood. The incidence of serious bacterial infection is higher in infants who are less than three months of age, particularly those under 28 days. Similarly, these young patients do experience significant morbidity from viral infections (Byington, 2004).

In Nigeria, more than 80, 000 children die annually as a result of fever (Babaniyi, 1991). The prevalence of notable fever in infants younger than three months is approximately 6-10% (Pantell, 2004). Fever can be triggered by various infections such as bacterial, viral, and parasitic infections, as well as appendicitis, among others. Fever from bacterial meningitis is more common in the first month of life than at any other time (Brook, 2003). In spite of the enormous burden imposed on the primary health care delivery system by febrile infants fever in the country, there is still much to be unraveled about this clinical manifestation. There is need to have comprehensive longitudinal data on the epidemiological dynamics of fever among the children to ascertain the more significant medical conditions that are precursory to fever. This is essential as the dynamics of fever varies regionally, hence the findings from this study would assist us to have better understanding and achieve better management of fever in the country. This study is therefore aimed at filling these gaps and would attempt to achieve this by elucidating the yearly total hospital admittances due to fever among children under 13 years and the associated underlying medical conditions between the years 2000 and 2011. The yearly total cases of fever will be further analyzed for possible relationship with environmental factors such as rainfall, humidity, and temperature.

### 2. Material and methods

#### 2.1 Study area

The study area was conducted from May, 2012 through December 2012 in Calabar, Nigeria. Calabar is located between longitude 4°57'0" and latitude 8°19'0"E ([www.collinsmaps.com](http://www.collinsmaps.com)). The climate is tropical and the vegetation is predominantly semi-tropical rain forest. The area experiences an average annual rainfall of about

1600mm and an average atmospheric temperature of between 28° C and 30°C.

There are two distinct seasons, the wet and dry seasons. The former is between April and October while the latter is between November and March.

The area is traversed by a number of rivers which include the Great Qua River, Calabar River, and Nsino River. These rivers drain the city and also serve as the major source of water supply in the city (National Resource center for African studies, 2006).

### *2.2 Study population and design*

Data on children aged 0 - 13years presenting fever which attended the General Hospital, Calabar, for medical attention between 2000 and 2011 were collected and collated for the study. This hospital was chosen because of its general acceptability and patronage by vast majority of inhabitants of Calabar. As a government-subsidized hospital, it is relatively affordable. Records of cases of fever among children under 13 years between 2000 and 2011 were collated. The causes of the fever, age and sex of children were collected. Only information on the causes of fever as certified by the doctors was used. This information was collated and analyzed to obtain the number of cases per month and year in relation to age and sex. The associated underlying medical conditions were analyzed to ascertain the relative importance of each of them as precursors of fever based on the magnitude of their co-occurrence with fever among the children.

### *2.3 Ethical consideration*

The study was approved by the Ethical Committee of the Cross River University of Technology Calabar and the Management of the General Hospital Calabar.

### *2.4 Analysis of data*

The SPSS 2010 Version was used to enter the data while Epi Info was used to analyze data. The Chi square test was employed to ascertain significance of proportions.

### *2.5 Acknowledgement*

We appreciate the Medical Superintendent and Head of Department of Records for their permission for us to access the data bank. We appreciate our field assistants among others for their various contributions towards the success of this study.

## **3. Results**

### *3.1 Number of children presenting fever from 2000 through 2011*

A total of 3663 children were admitted into the General Hospital Calabar with fever-associated medical condition between the year 2000 and 2011. Of these, males were 1520 (41.5%) while females were 2143 (58.5%). The sex-related difference was significant ( $\chi^2$ -test;  $p < 0.05$ ). The relative proportion of total annual fever cases ranged from 8.7% to 17.0% between 2000 and 2005, and 2.8% to 5.0% between 2006 and 2011 (see Table 1).

Further comparison of the fever cases is presented in Table 2. There are significantly higher number of cases between 2000 and 2005 than between 2006 and 2011 in all the categories of sex and age (t-test;  $p < 0.05$  for all the tests).

In each of the 12 years, the highest proportion of the annual total of fever cases was recorded among either the 0-24 months age group or among the 25-60 category (see Table 3). Most of the time the proportion of fever cases was least among the 61-156 age group.

One major difference between the pattern among males and females was that among the former, the proportion was highest among the 0-24 months age group, while in the latter, it was highest among the 24-60 age group (see Figure 1).

### *3.2 Medical conditions associated with fever among children in Calabar between the year 2000 through 2011*

Medical conditions associated with fever among children in Calabar between the year 2000 and 2011 are presented in Table 4. Malaria was associated with more than a third of the fever cases (39.3%) recorded. This was followed by Respiratory Tract Infection (RTI) which was associated with a fifth of all fever cases recorded (20.1%). Typhoid was diagnosed in only 5.7% of the fever cases. In all, 25 medical conditions were found to be associated with fever among the children.

The medical conditions pooled together as "Others" were 11 and comprised of those with percentage occurrence less than 1.0%. They are flu, filariasis, cold/ internal cold, acute headache, cholera, inflammatory infection, anaemia, chicken pox, Tinea corporis infection, NNT, enteric/ acute fever.

## **4. Discussion**

The results obtained in this study indicate that the number of female children admitted into the General Hospital Calabar with fever associated medical conditions over twelve years was significantly higher than that of male children. Fever is not gender-related clinical manifestation (Dagan, 2003); therefore the simple explanation for this result could be from the fact that the overall population of Calabar is predominantly female (National

Population Commission, 2006).

The relative proportion of annual total fever cases varied considerably between 2006 and 2011. This is understandable as some of the medical conditions that precursor fever such as parasitic infections is significantly influenced by climatic factors (for example rainfall, humidity and temperature) which are subject to yearly variability (Baptista et al., 1997; Bomblies and Eltahir, 2009; Loha and Lindtjorn, 2010). Furthermore, these precursory medical conditions are further influenced by the unpredictable human behavior and many interacting demographic and transient epidemiological factors.

The variability exhibited in the various annual total number of fever cases over the 12 years studied was very striking. The number of fever cases in the first six years (2000 – 2005) was three times higher than the number of cases recorded in the second six years (2006 – 2011). Perhaps, this could be as a result of improvement in health services and sanitation. Probably the positive effects democratic government inaugurated in 1999 had started impacting on healthcare and environmental sanitation. On the other hand, the disparity in the number of fever cases between the first and second years could be a result of variability in climatic factors. Malaria, which the most common underlying causes of fever in the area, has strong positive correlation with both rainfall and humidity (Uttah and Uttah, 2013). Temperature had a positive relationship with malaria in China (Li et al., 2013) and southeast Asia (Valerie et al., 2013) but negative relationship in Calabar, a city close to the Equator (Uttah and Uttah, 2013).

The infants of 0 – 24 months of age had the highest proportion of the annual total fever cases. Neonates and young infants manifest fever as the only underlying infection, and the incidence of serious bacterial infection is higher in infants less than three months of age (Brook, 2003). They also experience significant morbidity from some viral infections (Richardson et al., 2008). Similarly, malaria afflicts this age group particularly severely because of their low or non-existent immunity to the disease resulting in between 675,000 and 1,000,000 deaths among children attributed to malaria each year in sub-Saharan Africa (AAAS, 1991).

Analysis of the medical conditions associated with fever indicates that malaria was the infection precursory for a third of all the fever cases among under 13 years old children for 12 years at General Hospital Calabar. Malaria is a recognized public health problem globally, accounting for about 300 million clinical cases yearly in health facilities worldwide (WHO, 2008). It is also responsible for more than one million deaths annually, with majority of the deaths occurring in sub-Saharan Africa (WHO, 2008). Malaria causes considerable morbidity and is a leading cause of hospital attendance in resource limited countries. It account for up to 40% of public health expenditures and a decrease of the gross domestic products of many African countries by as much as 1.3% annually (WHO, 2000). In Nigeria, it is responsible for loss of about 132 billion naira (US \$ 880 million) annually to treatment cost, loss of man-hours, school absenteeism and other indirect costs (Federal Ministry of Health, Nigeria, 2005).

RTI accounting for a fifth of all causes of fever cases among the children shows how significant this medical condition is becoming among important infections in resource limited countries such as Nigeria. Surprisingly typhoid fever, a bacterial infection by *Salmonella typhi* was responsible for only 5.7% of all fever cases considering the reportedly high prevalence in the study area due to paucity of potable water for domestic use (Akubuenyi et al., 2013).

Our findings further indicate as high as 85.5% of the precursory medical conditions originated from pathogenic micro-organisms and parasites. Most of the causes of fever were either parasitic, bacterial, or viral. This is in tandem with the conclusions of Bourvillon (1999) that the most common causes of fever in infancy and early childhood originated from infections. However in his study area viral infections were predominant while parasitic protozoan infection was the dominant cause of fever in Calabar.

## 5. Conclusion

Fever is still a major cause for hospitalization of children in Calabar. Malaria and RTI together was responsible for most (59.4%) of fever cases, therefore successful control of both infections would significantly reduce the burden of fever among children in Calabar. Therefore the following recommendations have become inevitable: the public awareness campaign for better acceptability of Insecticide Treated Nets (ITN) by Calabar inhabitants should be re-invented for better results. Environmental control measures to eradicate mosquito breeding sites and destroy adult mosquito resting places should be incorporated in the municipal health strategic plan. Similarly, construction of drainages should be properly monitored by appropriate authorities to ensure that they are built with the correct gradient for zero retention and zero percolation of water. Prevention measures against RTI should be followed. Awareness drive to educate inhabitants on the epidemiology of RTI should be intensified

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Table 1. Number and relative proportion of fever cases among infants admitted into General Hospital, Calabar between 2000 and 2011 in relation to sex.

Year	Males		Females		Total	
	No. of cases	Percentage (%)	No. of cases	Percentage (%)	No. of cases	Percentage (%)
2000	234	15.9	341	15.9	575	15.7
2001	206	13.6	416	19.4	622	17.0
2002	158	10.4	159	7.4	317	8.7
2003	176	11.6	202	9.4	378	10.3
2004	139	9.1	286	13.3	425	11.6
2005	194	12.8	250	11.7	444	12.1
2006	65	4.3	105	4.9	170	4.6
2007	71	4.7	85	4.0	156	4.3
2008	51	3.4	51	2.4	102	2.8
2009	63	4.1	78	3.6	141	3.8
2010	94	6.2	56	2.6	150	4.1
2011	69	4.5	114	5.3	183	5.0
Total	1520	100.0	2143	100.0	3663	100.0

Table 2. Comparison of fever cases between the first half of study period (2000 – 2005) and the latter half (2006-2011).

	Age in months	2000 to 2005	2006 to 2011
Males	0-24	425	132
	25-60	367	163
	61-156	315	118
	Total	1107	413
Females	0-24	512	163
	25-60	657	198
	61-156	485	128
	Total	1654	489
Total	0-24	937	295
	25-60	1024	361
	61-156	800	246
	Total	2761	902

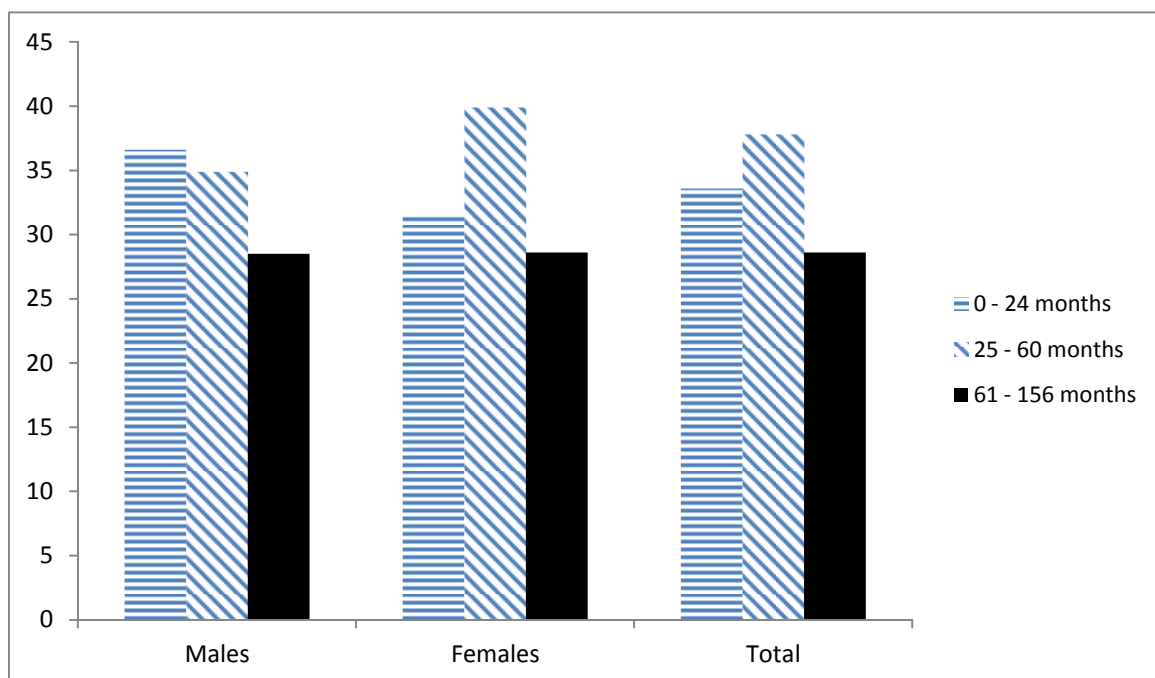


Figure 1. Percentage of fever cases among children in Calabar between 2000 and 2011 in relation to age and sex.

Table 3. Number of fever cases among children admitted into the General Hospital Calabar in relation to age

Year	0 – 24 months old		25-60 months old		61-156 months old		Total
	No. of cases	Percentage	No. of cases	Percentage	No. of cases	Percentage	
2000	149	25.9	237	41.2	189	32.9	575
2001	216	34.7	204	32.8	202	32.5	622
2002	116	36.6	118	37.2	83	26.2	317
2003	117	31.0	154	40.7	107	28.3	378
2004	229	53.9	119	28.0	77	18.1	425
2005	110	24.8	192	43.2	142	32.0	444
2006	54	31.8	71	41.8	45	26.5	170
2007	48	30.8	67	42.9	41	26.3	156
2008	32	31.4	39	38.2	31	30.4	102
2009	51	36.2	57	40.4	33	23.4	141
2010	56	37.3	54	36.0	40	26.7	150
2011	54	29.5	73	39.9	56	30.6	183
Total	1232	33.6	1385	37.8	1046	28.6	3663

Table 4. Medical conditions associated with fever among children in Calabar between the year 2000 and 2011.

Medical condition	Number of cases	Percentage (%)
Malaria	1440	39.3
Respiratory tract infection	738	20.1
Furunculosis	153	4.2
Enteritis/ Gastroenteritis	252	6.9
Typhoid	207	5.7
Blood pressure	126	3.4
Conjunctivitis	43	1.2
Bronchopneumonia	144	3.9
Bronchitis	47	1.3
Diarrhea	90	2.5
Impetigo	38	1.0
Neonatal sepsis	54	1.5
Mumps	36	1.0
Measles	71	1.9
Others	224	6.1

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