BACTERIOLOGICAL AND CLINICAL CHARACTERIZATION OF LEPROSY CASES IN PARTS OF SOUTH-SOUTH NIGERIA

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ABSTRACT

The types and distribution of leprosy cases in Akwa Ibom state were investigated. A total of 98 persons comprising males (53) and females (45) aged between 6 and 70 years (mean: 35±15.9 years) with signs and symptoms of leprosy, referred to Qua Iboe Church Leprosy Hospital, Ekpene Obom were studied. Smears were collected from various body sites and stained for acid fast bacilli using Ziehl-Neelsen technique. Cases were classified according to field bacteriological index (BI) and clinically by the number of major nerve trunks involvement (left and right great auricular, median, ulnar, radial, cutaneous, peroneal and posterior tibial nerves). The leprosy types encountered were tuberculoid (TT), borderline tuberculoid (BT), midborderline (BB), borderline lepramatous (BL) and lepromatous (LL). Patients with 1-5 clinical lesions plus one nerve trunk and BI=0 to 2 were classified as having paucibacillary (PB) form. Those with >5 lesions plus many nerve trunks and BI= 3 to 5 were classified as multibacillary (MB) form. Out of the 98 suspected cases, 42(42.9%) comprising 22(52.38) males and 20(47.6%) females tested positive for leprosy giving a prevalence rate of 0.09 case per 10,000 population. Early adult age group, 15-45yrs, was the most affected (64.3%), and males (33.32%) predominate. MB forms accounted for majority (71.4%) of cases, and were mostly BL (14) and BB (12) cases. Few (9.5%) LL cases, were detected. Three cases presented with TT lesions. Patients from Mkpat Enin LGA had the highest number of leprosy cases (n=11) followed by Ini and Oruk Anam LGA with 5 cases each. Ikono, Uyo, Essien Udim, Nsit Ibom and Ukanafun LGAs had between 2 and 4 cases, while others had 1 case each. Leprosy is endemic in Akwa Ibom state and calls for serious public health concern.

INTRODUCTION

The complexities and chronic nature associated with leprosy have greatly affected its complete elimination in many nations especially in resource poor communities. The disease dynamics and chronicity have stimulated researches on how to lessen its burden through early diagnosis at the acute stage of infection to enable timely treatment and prevention of visible irreversible deformities. The differential diagnosis of leprosy often confused many health care providers with other dermatologic conditions such as psoriasis, vitiligo, Tinea versicolor, molluscum contagiosum, cutaneous leishmaniasis, onchocerciasis, plague etc. (Lewis *et al.*, 2012).

Even though the major route of transmission is uncertain, most workers have reported that person to person spread though respiratory droplets or nasal discharge of individuals who remain untreated for years is the main cause of infection (WHO, 2000; FMOH, Nigeria, 2010). In addition, exposure to insect vectors, open water bodies used for recreation and contaminated wet soil have been documented as possible mode of transmission (Truman *et al.,* 2011). Water has been repeatedly suggested as a reservoir for *Mycobacteria leprae* since the early days of leprology (Sterne *et al*., 1995). Some researchers have also suggested the existence of more intriguing modes of transmission (Visschedijk *et al*., 2000). *Mycobacteria leprae* can persist

and proliferate in association with certain plants and animals and these may cause prolonged and repeated exposure of an individual to viable bacilli in these environmental sources (Kazda, 2000; Desikan and ng Sreevatsa, 1995). A study in Malawi had reported among other factors, low educational level, socioeconomic factors and low frequency of changing bed linen as possible risk factors of acquiring leprosy (Ligia *et al*., 2006). These researchers reported out that previous vaccination with BCG vaccines could be protective having vaccine effectiveness of 52%.

Akwa Ibom state is located in the Niger Delta area of Nigeria and there is dearth of information on the epidemiology of leprosy disease in the area even as many established risk factors have confirmed the existence of the infection. This study aimed to determine the types and distribution of leprosy cases among patients at the referral leprosy hospital, Ekpene Obom, and their locations in Akwa Ibom State.

MATETIALS AND METHOD

Study Population

Akwa Ibom State (Figure 1) lies between latitude 40.32´ and 50.53´ North, and longitude 70.25´ and 80.25´ East of the equator. The state has a population of 4,805,457 as at 2005 National Population Census in Nigeria (NPC, 2005) and has 31 local government areas. It is a crude oil rich state located in the Niger Delta Region and ranked the 9th most populated state in Nigeria. The inhabitants are predominantly peasant farmers. There are many swampy areas where various crops are cultivated all year round. Some of the food crops including rice are grown in paddy fields.

Figure 1: The Map of Akwa Ibom state showing location of local government areas

The study was conducted between April 2012 and March 2013. Study population included 98 suspected leprosy patients comprising males (53) and females (45) aged between 6 and 70 years (mean age: 35±15.9 years). They were suspected with signs and symptoms of leprosy and referred from other hospitals in the state to Qua Iboe church leprosy hospital, Ekpene Obom, Etinan Local Government Area of Akwa Ibom State, which serves as the only leprosy referral hospital in the state. Socio-demographic data and location of patients were derived from the patient's case notes.

Ethical Approval
Ethical approval for the study was obtained from the authorities of Qua Iboe Church Leprosy Hospital, Ekpene Obom, Etinan Local Government Area, and informed consent was obtained from patients or patient relatives (in cases involving minor) using informed consent form.

Samples Collection
As described by Cheesbrough (2010), smears were collected from suspected patients by a trained and experienced health care worker using aseptic technique. The sites sampled were the edge of a lesion. Adequate precautions such as wearing of face mask to protect the mouth and nose, and hand gloves to protect the hands were taken.

Ziehl – Neelsen Staining Technique for *M. leprae*
This is the primary test for the identification of the bacillus. Each of the smeared slides were properly labelled and stained for *M. leprae* using the Ziehl Neelsen technique (Cheesbrough, 2010).

Classification of Subjects Based on Clinical Features and Field Bacteriological Index (BI)
Subjects with leprosy were classified into tuberculoid (TT), borderline tuberculoid (BT), midborderline (BB), borderline lepramatous (BL) and lepromatous (LL) types according to clinical features in patient's case notes such as number of major nerve trunks (left and right great auricular, median, ulnar, radial, cutaneous, peroneal and posterior tibial nerves) involvement (FMOH, Ethiopia, 2008) using the criteria of Ridley-Jopling (1966). Also, classification of leprosy types into Multi-bacillary (MB) (bacilli in masses) and Pauci-bacillary (PB) (bacilli in singles) were done using standard criteria (Cheesbrough, 2010; WHO, 2005). Patients who had between 1-5 clinical lesions plus one nerve trunk were classified under PB form and those who had more than 5 lesions plus many nerve trunks were classified under MB form.

Field bacteriological index was calculated as follows: where no bacillus was seen in 100 oil immersion fields was considered as BI=0; BI=1: 1-10 bacilli, on average, in 100 oil immersion fields; BI=2: 1-10 bacilli, on average, in 50 oil immersion fields; BI=3: 1-10 bacilli, on average, in 25 oil immersion fields; BI=4: 10-100 bacilli, on average, in 25 oil immersion fields; BI=5: 100-1000 bacilli, on average, in 25 oil immersion fields; BI=6: ≥1000 bacilli, on average, in 25 oil immersion fields. Based on BI, the spectrum of leprosy types were further classified into PB form: IL (BI = 0), TT (BI = 1) and BT (BI = 2); MB form: BB (BI = 3), BL (BI = 4) and LL (BI = 5) according to Cheesbrough (2010).

Data Analysis
The data in this study were analysed using descriptive statistical tools and expressed in simple percentages, Charts and Tables. Percentages and Charts were used to determine proportions of infected cases. Differences in infection rates by gender and age groups were determined statistically using Odds Ratio (OR) and probability at 95% Confident Interval (CI). Chi square test analysis was done using Epi Info Version 17 statistical package.

RESULTS

Distribution of Patients with Leprosy Symptoms at Leprosy Hospital, Ekpene Obom
The distribution of patients diagnosed with leprosy at leprosy hospital, Ekpene Obom is presented in Table 1. Out of 98 patients who were referred to the leprosy control unit for screening, 42 tested positive for leprosy indicating a case detection rate of 0.09 per 10,000 in Akwa Ibom state. Of these, 22(53.4%) were males and 20(47.6%) females. There was no gender difference in the infection rates among persons with leprosy (P>0.05; Odds Ratio, 1.13(95%CI 0.505 – 2.515). Those in the age bracket of 15-45 years (early adult group) were mostly infected and males were predominant. There was no age difference in the infection rates observed in children <14years of age and the older population (>14 years of age) (P>0.05; Odds Ratio, 1.14(95%CI 0.30 – 4.33).

Table 1: Age-specific and Gender Distribution of New Leprosy cases at Ekpene Obom, Akwa Ibom State

Age group (years)	No. Tested	No. of Cases	Male (%)	Female (%)
< 9-14	10	4	2(4.76)	2(4.76)
15 – 45	60	27	14(33.32)	13(20.96)
≥ 46	28	11	6(14.29)	5(11.91)
Total	98	42	22(52.38)	20(47.62)

Classification of Leprosy Based on Clinical Features and Bacteriological Index (BI)

The classification of leprosy patients according to leprosy forms and types based on clinical features and bacteriological index (BI) is presented in Table 2.

Table 2: Clinical Classification and Bacteriological Indices of Leprosy Cases/types in Leprosy Hospital, Ekpene Obom (N= 42)

Clinical Features	Leprosy type and Bacterial index (BI)	No. of positive cases	Leprosy form	Percentage of Leprosy form
Skin lesion on the shoulder	Intermediate Leprosy (IL) BI = 0	1	Paucibacillary (n =12)	28.6
Numbness both hands, legs and ulcer	Tuberculoid Leprosy (TT) BI = 1	3		
Hypo-pigmented macular lesion on the body and loss of sensation, Numbness	Borderline Tuberculoid (BT) BI = 2	8		
Patches (right hand and foot), 3 major nerves involvement and multiple lesions (chest, back and thigh).	Borderline Borderline (BB) BI = 3	12	Multibacillary (n = 30)	71.4
Hypo-pigmented lesions (face, both hands, shoulder, back, major nerves involvement) ulcer	Borderline Lepromatous (BL) BI = 4	14		
Multiple lesions (face, ears, both hands, both legs, back) *8 major nerves involvement, ulcer, paralysis of the left pupil and Plagues	Lepromatous Leprosy (LL) BI = 5	4		

Patients with MB form of leprosy were the majority, 30 (71.4%) while those with PB form were 12 (28.6%). Of the 30 cases with MB leprosy, those having BL lesions were the most common (14 cases) followed by BB type (12 cases). Among those with PB form, BT cases were the majority (8 cases) and those with TT lesions were 3. Table 3 shows distribution of leprosy types by gender. Among those with MB leprosy, few had LL type 4(9.5%) lesions compared to the prevalent BL type 14(33.3%) with male predominance. The ratio of male to female with LL was 1:1.

The classification of leprosy cases according to age group and type of lesions is shown in table 4. Most of the cases with BL, 10(28.81), were within the early adulthood (15-45 years) and they also formed the majority of cases, 27(64.28), seen at the referral hospital. Children with TT and BT lesions were 1 and 2 cases, respectively.

Table 3: Frequency of leprosy types in leprosy hospital Ekpene Obom by gender

Leprosy Class/Type	No. of Cases	Males (%)	Females (%)	Total (%)
Paucibacillary (n=12)				
Indeterminate leprosy (IL)	1	1(2.38)	0	1(2.38)
Tuberculoid leprosy (TT)	3	1(2.38)	2(4.76)	3(7.14)
Borderline tuberculoid (BT)	8	4(9.53)	4(9.52)	8(19.06)
Multibacillary (n=30)				
Borderline borderline (BB)	12	6(14.28)	6(14.29)	12(28.57)
Borderline lepromatous (BL)	14	8(19.06)	6(14.28)	14(33.34)
Lepromatous leprosy (LL)	4	2(4.76)	2(4.76)	4(9.52)
Total (%)	42	22(52.38)	20(47.62)	42(100)

Table 4: Frequency of Leprosy forms/types at Ekpene Obom by Age group

Age group (years)	PB	MB					Total (%)
	IL (%)	TT (%)	BT (%)	BB (%)	BL (%)	LL (%)	
< 9 – 14	0	1(2.38)	2(4.76)	1(2.38)	0	0	4(9.52)
15 – 45	1(2.38)	1(2.38)	5(11.90)	7(16.66)	10(28.81)	3(7.14)	27(64.28)
≥ 46	0	1(2.38)	1(2.38)	4(9.52)	4(9.52)	1(2.38)	11(26.20)
Total	1(2.38)	3(7.14)	8(19.05)	12(28.57)	14(33.34)	4(9.52)	42(100)

Distribution of Leprosy Cases according to their Local Government Area of origin in Akwa Ibom State

The distribution of leprosy patients according to their Local Government Area of origin in Akwa Ibom State is shown in Figure 2.

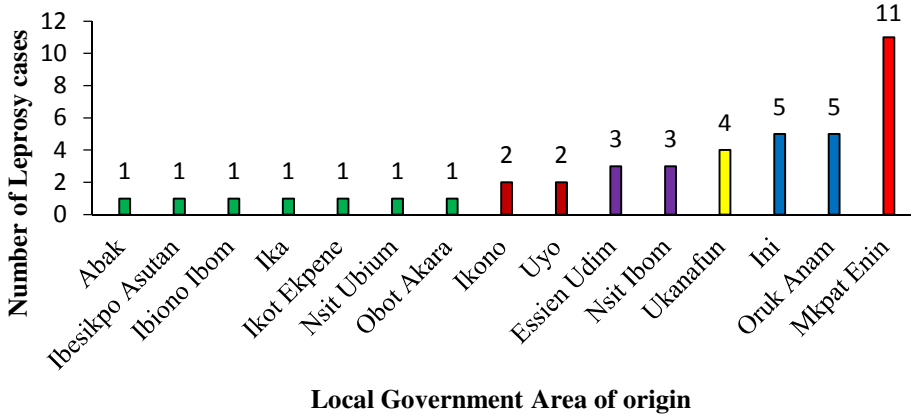

Figure 2: Distribution of 42 Leprosy cases by LGA of origin in Akwa Ibom State, Nigeria

The highest number of leprosy cases (11) were patients that hail from Mkpat Enin LGA, closely followed by patients from Ini and Oruk Anam Local Government Areas having 5 cases each. Those that had between 2 and 4 cases were Ikono, Uyo, Essien Udim, Nsit Ibom and Ukanafun Local Government Areas while others had 1 case each. The frequency of leprosy types by LGA is shown in Figure 3. Patients characterized with MB lesions were from Essien Udim, Nsit Ibom, Ukanafun, Ini, Oruk Anam and Mkpat Enin LGAs, and were at least 3 cases per LGA. The affected LGAs clustered by senatorial districts is presented in Table 5. All the senatorial districts had at least one LGA having ≥3 cases of leprosy and Ikot Ekpene was the most affected senatorial district with 4 LGAs having leprosy cases, while more women than men in Uyo senatorial district were mostly seen with the multibacillary type of leprosy (5 vrs. 3 cases).

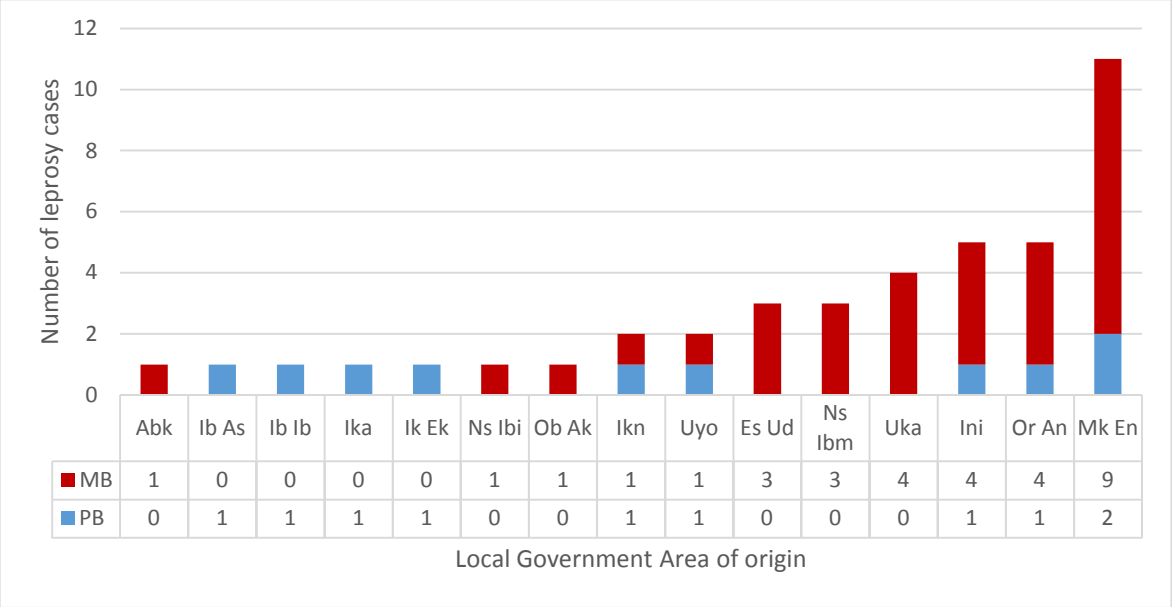

Figure 3: Distribution of leprosy forms according to LGA of origin of patients
Key: Abk= Abak, Ib As=Ibesikpo Asutan, Ib Ib=Ibiono Ibom, Ik Ek=Ikot Ekpene, Ns Ibi=Nsit Ibom, Ob Ak=Obot Akara, Ikn=Ikono, Es Ud=Essien Udim, Ns Ibm=Nsit Ibom, Uka=Ukanafun, Or An=Orukanam, Mk En=Mkpat Enin

Table 5: Distribution of Leprosy cases and types by senatorial district of origin of patients

			Paucibacillary type		Multibacillary type	
Senatorial District	Local Government Area	No. of Cases	Male	Female	Male	Female
Ikot Ekpene	Abak, Ika, Ikot Ekpene, Obot Akara, Ikono, Essien Udim, Ukanafun, Ini, Oruk Anam	23	3	2	9	9
Uyo	Ibesikpo Asutan, Ibiono Ibom, Nsit Ubium, Uyo, Nsit Ibom	8	3	0	0	5
Eket	Mkpat Enin	11	1	1	6	3
Total		42	7	3	15	17

DISCUSSION

Patients with clinical features suspected of leprosy in Akwa Ibom state are often referred to Qua Iboe Church Leprosy Hospital, Ekpene Obom for further investigations and confirmation of the disease. This study has shown that the prevalence of newly diagnosed leprosy cases in the state is 42.9%. This represents a case detection rate of 0.09 per 10,000 in Akwa Ibom State, based on the general population of 4,805,457 (NPC, 2005). This finding supports the report of Lewis *et al*. (2012) in the United States who estimated the worldwide prevalence of leprosy to be just less than 1per 10,000 populations and 86% of the affected persons live in the tropics and subtropics including Nigeria. The result of this study therefore suggests that Akwa Ibom State of Nigeria may likely contribute to the global burden of reported leprosy cases.

Among suspect cases of leprosy referred to the hospital, majority were male (54%) and female 46% and laboratory investigations indicated that males with leprosy disease (52.4%) were more than female (47.6%) but the difference was not statistically significant. The study also revealed that there was no disparity in the infection rates among children, <9-14years and those in the early adulthood, 15 – 45 years even though they accounted for the highest percentage of leprosy cases (45%) detected. The reason for this observation may be because these are the active age group that are constantly exposed to the bacilli in recreational waters, wetland farms,

and other risky behaviours associated with leprosy transmission. This finding is in agreement with other reports within and outside Nigeria (FMOH, Nigeria, 2010; WHO, 2005; Lewis *et al.,* 2012). Leprosy was rare among infants unlike in adults as revealed by Lewis *et al*. (2012) and most children with leprosy (3 of 4 cases) had TT and BT lesions. These are consistent with observations of Lewis *et al*. (2012) that they tend to have the tuberculoid form.

According to WHO (2005), the clinical features in leprosy patients can be classified in the spectrum IL, TT and BT pooled under the PB form, while the clinical leprosy type BB, BL and LL are pooled under the MB form for purposes of administering multi-drug therapy (MDT). Our study has shown that, the highest number of leprosy cases were of the MB form, 30 (71.4%) and most of lepromatous types. Pai *et al.* (2011) reported 8 out of 11 leprosy cases as belonging to the MB form. These findings is consistent with the reports by WHO (2012), and Lewis *et al.* (2012) who suggested that lepromatous leprosy is becoming more common even as more new MB cases are being recorded annually than PB forms. The findings in the study where 3 of the 42 newly diagnosed cases with extreme spectrum of LL was lower than that reported by Thomson *et al*. (1985) who had 19 of 21 newly diagnosed cases to be lepromatous leprosy. The ratio of adult male-to-female with LL observed was 1:1 contrary to male-to-female ratio of 2:1 reported by Lewis *et al.* (2012).

The number of leprosy cases detected in this study based on their local government area of origin revealed that Mkpat Enin with 11 cases was the most affected LGA may not be unconnected with some socioeconomic factors existing in the area. This area is rural and inhabitants are predominantly farmers. These factors are associated with the epidemiology of leprosy disease (Lewis *et al.*, 2012). Previous reports indicated that the risk of person to person transmission of the disease is 5-10 times higher in families where primary case of leprosy is lepromatous type, but lower in cases of tuberculoid leprosy (Fine *et al*., 1997, van Beers *et al*., 1999, Visschedijk *et al*., 2000). A study in Malawi suggested other possible factors such as poverty, existence of other reservoirs of leprosy such as water or wet soils, and some behavioural and socioeconomic variables that can be linked to the spread of leprosy disease (Kerr-Pontes *et al*., 2006). Frequent contact with water bodies including rivers, ponds, streams and lakes have been suggested to have strong association with leprosy (Kerr-Pontes *et al.*, 2004; Sterne *et al*., 1995). Other possible intriguing modes of transmission such as insect vectors, including cochroaches have been suggested (Truman *et al.,* 2011; Moiser, 1947).

In this study, patients that had predominantly MB type of leprosy hailed from Essien Udim, Nsit Ibom, Ukanafun, Ini, Oruk Anam and Mkpat Enin LGAs. At least 3 cases per LGA were seen presenting with MB lesions. When cases were clustered by their senatorial districts, cases recorded in women were more than men in Uyo where 5 and 3 cases respectively were detected and the 5 women had the multibacillary type. Reasons for this observation are not clear. However, FMOH, Nigeria (2010) has reported that factors associated with poverty increases the risk of developing the disease. It has also been documented that persons living in close contact with patients who have untreated, active, predominantly MB leprosy are at increased risk of infection (FMOH, Nigeria, 2010 and WHO, 2005).

CONCLUSION AND RECOMMENDATION

The results of this study have shown that leprosy is endemic in Akwa Ibom state occurring in all age groups and gender, especially male population and is of immense public health concern. This report should therefore instigate an elaborate survey to unravel the main risk factors associated with the pattern of infection reported here. Awareness creation, and prevention and control measures are urgently needed to stem the tide of the disease in the affected areas, particularly Mkpat Enin LGA.

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