Nigerian Journal of Clinical Practice
March 2007 Vol.10 (1) 41-46

A TEN-YEAR STUDY OF MEASLES ADMISSIONS IN A NIGERIAN TEACHING HOSPITAL.

*M B Fetuga , **O F Njokanma, *O.B Ogunfowora , *Runsewe- Abiodun .
*Department of Paediatrics, Obafemi Awolowo College of Health Sciences, P.M.B.2022, Sagamu, Nigeria
**Department of Paediatrics and Child Health, Lagos State University College of Medicine, Ikeja, Lagos.

SUMMARY

Background: Measles remains a major cause of childhood morbidity and mortality in Nigeria despite the availability of safe and effective vaccines. The last report on measles from our center was about 15 years ago. A review of the current status is necessary in order to strengthen interventional strategies.

Objectives: To study the burden and epidemiological correlates of measles admissions in a Nigerian teaching hospital.

Design: Retrospective.

Subjects: Children admitted with measles infection and/or complications.

Methods: A review of medical records of measles admissions over the 10-year period, May 1994 and April 2004.

Results: One hundred and sixty four children (6.1% of paediatric admissions) aged 4 months to 12 years (28.4 $\pm$ 28.82 months) were admitted with measles. Sixty-three infants ($\leq$ 12 months old) accounted for 39.4% of patients with about half of them younger than nine months. History of vaccination against measles was obtained in 43 (29.5%) subjects. Forty- eight (32.9%) children were underweight weighing between 60-80% of the expected weight for age and six (4.1%) of them were marasmic weighing below 60% of expected weight for age. None of the patients had oedema.
The commonest complication was bronchopneumonia (55.5%). Major complications were less commonly associated with children who weighed more than 80% of expected weight ($p = 0.011$). The case fatality rate was 7.5 % accounting for 0.4% of childhood mortality. Children without prior measles vaccination, those of low socio-economic status and those weighing less than 80% of expected for age all had significantly higher mortality rates. ($p < 0.05$ in each case)

Conclusion: Measles incidence has risen in the last ten years in Sagamu and its environs but it is still largely a disease of young children. Therefore routine immunization and disease surveillance should be strengthened. Supplemental immunization activities should also be considered.

Key Words: Measles, Sagamu, supplemental immunization. *(Accepted 17 February 2006)*

INTRODUCTION

Measles is an acute, highly contagious disease, caused by an RNA virus of the paramyxovirus family.[1] The diagnosis is usually clinical with a predictable sequence of events in affected children. [1] The infection occurs worldwide but it is endemic in developing countries where severe morbidity and high mortality are associated with underlying malnutrition, poverty and inadequate vaccination services.[1,2-5]

Correspondence: Dr M B Fetuga
bolanlefetuga2000@yahoo.com

Potent vaccines against measles have been available for the past four decades.[5] However vaccine coverage has been very poor in Nigeria. In 1998, for instance, with the national coverage of 26%, Nigeria was among countries in the African region, which failed to reach the 50% mark.[6] Empirical observation indicates that the situation has not changed much. This is borne out by the continued high rate of measles presentations and hospitalization in our center and others.[3,7,8] It is not surprising therefore, that the disease remains a major cause of preventable childhood morbidity and mortality in developing countries [1,5,7] with most cases occurring in young

children and infants.[3,8-10] In 2000, Africa was responsible for 58% of global measles death of which approximately 80% occurred in West and Central Africa.[7] The West African sub region reported the highest measles morbidity between 19921997. The reported measles incidence in Nigeria and some other countries during the same period was 33/100,000 inhabitants.[6,7]

Case fatality rates have however decreased in countries with improved socioeconomic conditions, availability of effective vaccine and antibacterial therapy for treatment of secondary infections.[1] Countries in America and Southern Africa have achieved significant reduction in reported measles incidence and near zero measles death using supplemental immunization activities (SIA).[11,12] Recent implementation of this strategy in line with the WHO/UNICEF goals also resulted in a decline in three West African countries namely Burkina Faso, Mali and Togo.[13]

Given the unacceptably high burden of measles in Nigeria, it might be worthwhile considering adopting this strategy particularly in the light of the new national initiative for measles control in Nigeria. However, baseline information on various aspects of the epidemiology of the disease would be required in order to make meaningful recommendations.[7] In this study we aim to quantify the measles burden among hospitalized patients, evaluate the role of various epidemiologic factors associated with the disease, its complications and related mortality.

Patients and Methods

The study was conducted at Olabisi Onabanjo University Teaching Hospital, a tertiary health institution in Ogun State, Southwestern Nigeria.

A retrospective analysis was made of all cases of clinically diagnosed measles among hospitalized children over a 10-year period from May 1994 to April 2004. Departmental criteria for hospitalizing children with measles include the presence of a severe complication, vomiting, profuse diarrhoea and a markedly reduced appetite. Relevant data obtained from case files of the patients included age, sex, weight, date of admission, duration of symptoms before presentation, immunization status, complications observed, duration of hospital stay and the outcome of the disease.

Social status of each child was determined based on parental education and occupation according to Oyedeji's criteria.[14] The nutritional status of the patients was determined according to Wellcome's classification.[15]

Descriptive analyses of the data were made using EPI-INFO 6. Statistical analysis included chi-square tests, Fisher exact test and odds ratios with 95% confidence intervals as applicable. Level of significance was set at $p < 0.05$.

RESULTS

One hundred and sixty four children with a diagnosis of measles were hospitalized during the 10-year study period accounting for 6.1% of 2,672 paediatric admissions. There were 79 females and 85 males giving a female: male ratio of 1:1.1. The patients were aged 4 months to 12 years with a mean of 28.4 ($\pm$ 28.82) months and a median of 18 months for the 160 subjects with relevant data set.

The age distribution of study subjects is shown in Table I. Infants ($\leq$ 12 months) accounted for 39.4% of patients with about half of them aged nine months or younger. The number of children aged 5 years and above was proportionately smaller (7.5%).

Of the 125 subjects whose social classes could be derived, 81 (64.8%) were of low socioeconomic class (SEC), 36 (28.8%) in the middle SEC and 8 (6.4%) in the high SEC.

In 43 (29.5%) of 146 cases, the parents claimed that their affected children had received routine measles vaccination while the majority 103 (70.5%) admitted to not having been vaccinated. The mean duration of symptoms before presentation at OOUTH was 6.65 $\pm$ 3.54 days with a range of 1day to 28 days. The mean duration of hospital stay was 6.55 $\pm$ 5.89 days with a range of 12 hours to 63 days.

The nutritional status of the patients was assessed using percentage of expected weight-for-age based on Wellcome Trust classification. (Table II). Forty-eight (32.9%) children were underweight weighing between 60-80% of the expected weight for age while six (4.1%) of them were marasmic weighing below 60% of expected weight for age. None of the patients had oedema.

One hundred and forty (85.4%) of the patients had one or more complications of measles. The major complications identified are shown in Table III. The commonest complication was bronchopneumonia in 91patients (55.5%). Twelve of the children with diarrhoea and/or vomiting were moderately or severely dehydrated. Of the seven children with keratitis, one had evidence of corneal ulceration and one had obvious uveal prolapse. Two patients each had lobar pneumonia and oral thrush.

The following problems were identified in only one patient each: unclassified seizures, myocarditis, otitis media, orbital cellulitis, pan-ophthalmitis, tuberculosis, tonsillitis and brain damage.

Further analysis of the frequency of complications with respect to percentage weight-for-age showed that the prevalence of major complications was higher in children who weighed below 80% of the expected weight-for-age (17 of 76 Vs 1 of 40: $?^2$ with Yates correction = 6.45, p = 0.011).

Eleven patients died, 10 were discharged against medical advice and 143 were discharged. The case fatality rate was therefore 7.5% accounting for 0.4% of deaths among paediatric admissions. The mean age of fatal cases was 22.27 (± 14.55) months with a median of 18 months and a range of 11 months to 60 months. Corresponding figures for those who survived were 28.86 (± 26.34) months, 20 months and 5months to 144 months respectively.

Table IV shows the age-specific fatality rates. The highest fatality rate was found in the second year of life and the lowest in children older than two years. None of the twenty-seven children younger than nine months died. The observed differences were not however, statistically significant:

The degrees of association of some selected variables with mortality are shown in Table V. There was no significant gender difference in mortality rate even though affected males were one and a half times more likely to die than females (Odds ratio = 1.53, Confidence limits: 0.37 to 7.46). Children without a history of vaccination against measles, those of low SEC and those weighing

less than 80% of expected for age all had significantly higher mortality rates. Major complications identified with fatal cases were bronchopneumonia in seven (63.6%), cardiac failure in three patients and keratitis and septicaemia in one patient each.

Table I: **Age distribution of 160 patients with measles**

Age group (months)	no	%
≤ 12	63	39.4
12 to 24	43	26.8
> 24 to 36	21	13.1
> 36 to 48	14	8.8
> 48 to 60	7	4.4
> 60	12	7.5
Total	**160**	**100.0**

No records of age for 4 patients. They were excluded from the analysis.

Table II: **Nutritional status of 146 patients with measles**

%Expected WFA	n	%
< 60	6	4. 1
60 to 80	48	32.9
>80	92	63.0
Total	**146**	**100.0**

Records of age and/or weight were missing for 18 patient WFA = weight for age

Table III: **Major complications identified in study patients**

Complication	number	% of 164
Bronchopneumonia	91+	55.5
Dehydration	15	9.2
Croup	12	7.3
Febrile convulsion	11	6.7
Keratitis	7	4.3
Encephalitis	5	3.1
Septicaemia	4	2.4
Lobar pneumonia	2	1.2
Others	7	4.3
No major complication	24	14.6

+ -12 of these were in congestive heart failure.

Multiple complications were noted in 18 patients.

Others include myocarditis, otitis media, orbital cellulitis,

pan-ophthalmitis, tuberculosis, tonsillitis and brain damage.

Table IV: **Measles mortality according to age**

Age group of cases	Number	Number Dead	Case fatality rate
A: ≤ 12 (< 9)	56 (27)	4 (0)	7.1 (0.0)
B: > 12 to 24	39	5	12.8
C: > 24	51	2	3.9
Total*	**146**	**11**	**7.5**

*Excludes 10 cases discharged against medical advice, 4 for whom records related to outcome were missing and 4 others without record of age.

A Vs B: Fisher exact test: p = 0.48 (Odds ratio = 1.92, Confidence limits 0.1 to 2.64)

B Vs C: Fisher exact test: p = 0.26 (Odds ratio = 3.60, Confidence limits 0.54 to 39.34)

A Vs C: Fisher exact test: p = 0.68 (Odds ratio = 1.88, Confidence limits 0.26 to 21.59)

Table V: **Relationship between mortality and selected characteristics of patients**

	Number of cases	Number dead	Case fatality rate	p-value
Gender				
Male	80	7	8.75	
Female	68	4	5.88	0.51+
Vaccination status				
Yes	40	0	0.0	
No	96	11	11.5	0.033*
Socioeconomic class				
Low	73	8	11.0	
Medium	35	0	0.0	
High	7	0	0.0	0.026*
% Expected weight-for-age				
< 80	48	8	16.7	
> 80	88	2	2.3	0.004*

The data sets were complete for 159,147,123 and146 subjects with respect to gender, vaccination status, socioeconomic class and expected weight for age respectively.
+ Chi-square test
* Fisher exact test

DISCUSSION

Measles accounted for 6.1% of all paediatric admissions representing an increase of 74.3% above a prevalence rate of 3.5% reported over 10 years ago from the same institution.[8] Other centers in Nigeria [16,17] have similarly reported increases. The implications are rather serious considering that the period covered by the report coincides with the period of National Programme on Immunization (NPI).[18]

In our study 39.4% were infants with almost 50% of them less than 9 months. This underlines the known fact of predilection of the disease for infants.[3,8-10] Therefore of importance to our center and perhaps our country is the issue of timing of measles vaccination. The current NPI recommendation is to vaccinate children at nine months.[18] The option of vaccinating at a lower age is attractive to cover those infants who might otherwise get infected before nine months of age. The main argument against reducing the age at vaccination, say to six months is the interference from maternally acquired antibodies.[1,19] Nevertheless, there are increasing demands for vaccination programmers that placed measles vaccination at six months.[3,20] This may not be applicable to our center as only 16.5% were infants less than nine months of age. One issue closely related to early measles vaccination and probably more pertinent to us is the need for a second dose through Supplemental immunization activities (SIA), which have been found beneficial in America and some other parts of Africa, which had adopted this strategy.[11,12] Although the repeat dose is to protect those children whose first vaccine may have been invalidated by high levels of transplacentally acquired antibodies and those with missed opportunities, it could therefore serve, as another opportunity for a large proportion of children who as in this study (70.5%) were previously not vaccinated. In this study, 43 (29.5%) children were said to have received measles vaccine yet they still had measles infection. Although there was no documentation or verification by inspection of vaccination cards nevertheless the phenomenon of disease despite measles vaccination is well known.[19] Indeed in Malawi the figure was as high as 80%.[21] It is granted that vaccine failure may result from cold chain failures or poor nutritional status.[3,22,23] Therefore, the existence of this group of children provides additional reasons for a second dose of the vaccine, even if the cause of failure of the first vaccine was not known. The cost effectiveness of repeat doses of vaccine has been well documented in studies from Zambia.[24]

Most of the patients (93.6%) were of low and middle socioeconomic classes. This is in keeping with 93.1% incidence recorded previously reported from this center.[8] The link between measles and poverty has been highlighted.[1,2-5] In our study, body weight

less than 80% expected for age was significantly associated with the occurrence of a major complication and mortality. This is also in keeping with earlier reports of increased measles morbidity among malnourished patients and corroborates the link between malnutrition and measles.[1,3-5]

The commonest complication encountered was bronchopneumonia and this agrees with previous reports [2,8,16]. Pneumonia occurring in children who have measles may be viral in aetiology or may represent secondary bacterial infection. Unfortunately, there is no routine clinical method of assigning aetiology, so we treat all affected children with antibiotics.

The case fatality rate of 7.5% obtained in the present study is much lower than 18.3% previously obtained in this center, 14.6% in Ilorin, and 23% in Sudan.[6,19,20] It is rather difficult to speculate on the wide differences in fatality rates because of the difficulty in quantifying or standardizing the degrees of illness in the various study populations. Thus the relative roles of quality of care, late

presentation and severity of illness are difficult to comment upon. For example in the Kenya study, in which only children with secondary complications were admitted, overall mortality was 17.5/ 1000 admitted cases.[4] In our study the highest fatality rate was found in the second year of life, low in children older than two years and zero in infants less than nine months. In a similar retrospective series in Sudan, death rate was lowest in the first nine months of life and increased with age, as did the incidence of malnutrition.[20] Absence of mortality in children younger than nine months may have been due to protection by persistence of maternally acquired transplancental measles antibodies in these infants resulting in milder forms of illness.[1]

CONCLUSION

Given the current status of measles in our center as highlighted in this study calls for a need to strengthen interventional strategies. Therefore there is a need for a renewed national effort to strengthen interventional strategies such as routine immunization and disease surveillance. The option of re-vaccination through supplemental immunization activities should also be considered. These should go simultaneously with other programs to improve the socioeconomic status of the populace.

REFERENCES

1. **Maldonado Y.** Measles. In: Behrman RE, Kliegman RM, Jenson HB (eds) Nelson Textbook of Paediatrics 17th Edition. Philadelphia. Saunders (Publishers) 2004; 1026 1031.
2. **Morley DC, Woodland M, Martin WJ.** Measles in Nigerian children: a study of the disease in West Africa, and its manifestations in England and other countries during different epochs. J Hyg Camb 1963; 61: 115 33.
3. **Commey JO, Dekyem P.** Measles in southern Ghana: 1985 1993. West Afr J Med. 1994; 13: 223-6.
4. **Alwar AJ.** The effect of protein energy malnutrition on morbidity and mortality due to measles at Kenyatta National Hospital Nairobi (Kenya). East Afr Med J. 1992; 69: 415 8.
5. Update: Global measles control and mortality reduction worldwide, 1991 2001. MMWR Morb Mortal Wkly Rep. 2003; 52: 471 5.
6. Health and Community Care: Measles in Africa. Bulletin of the International Federation of Red Cross and Red Crescent Societies. ARCHI 2010.
7. **Stein C, Birmingham M, Kurian M, Duclos P, Strebel P.** The global burden of measles in the year 2000 a model. J Infect Dis 2003 Suppl1 15; 187: S8 14.
8. **Olowu AO Obasa T.** Clinical Presentation of Measles in Sagamu, Nigerian Medical Practitioner1991; 21: 59 61.
9. **Osinusi K Oyejide CO.** Measles at the University College Hospital Ibadan An update. Nig J Paediatr 1986; 13: 53 57.
10. **Taylor WR, Mambu RK, ma-Disu M Weinman JM.** Measles control efforts in urban Africa complicated by high incidence of measles in the first year of life. Am J Epidemiol 1988; 127: 788 792.
11. **de Quadros CA, Olive J-M, Hersh BS et al.** Measles elimination in the Americas- evolving strategies. JAMA 1996; 275: 224-9.

12. **Biellik R, Madema S. Taole A et al.** First five years of measles elimination in Southern Africa: 1996 2000. Lancet 2002; 359: 1564 8.

13. Measles Mortality Reduction - West Africa, 1996-2002 CDC. MMWR Weekly 2004: 53; 28-30.

14. **Oyedeji GA.** The effect of socio-economic factors on the incidence and severity of gastroenteritis in Nigerin children. Nig Med J 1987; 17; 229-232.

15. Well come Trust Working Party. Classification of Infantile Malnutrition. Lancet 1970; ii: 302.

16. **Ojuawo A, Bello M.** Measles in Ilorin. Nig J Med 2000: 9: 101 3.

17. **Etuk IS Ekanem EE, Udo JJ.** Comparative analysis of measles morbidity and mortality in Calabar during the Expanded Programme on Immunization and the National Programme on Immunization eras. Nig J Paediatr 2003; 30 :81-85.

18. **Julo SA.** The State of the Nation. In: The Progress of Nigerian Children, POS/UNICEF, 1996: 17-20.

19. **Gans H, Yasukawa L, Rinki M et al.** Immune response to measles and mumps vaccination of infants at 6, 9 and 12 months. J. Infect Dis 2001, 184: 817 826.

20. **A/Wahab MM, Ismail AM, Rais MA, Ishag YA.** Measles in Equatorial region South Sudan. Ann Trop Paediatr 1988; 8: 31-4.

21. **Yamaguchi S, Dunga A, Broadhead RL, Brabin BJ.** Epidemiology of measles in Blantyre, Malawi: analyses of passive surveillance data from 1996 to 1998. Epidemiol Infect. 2002 129: 361-9.

22. **Adu FD, Akinwolere OA, Tomori O et al.** Low seroconversion rates to measles vaccine among children in Nigeria. Bull World Health Organ 1992; 70: 457-460.

23. **Bautesta-Lopez N, Vaisberg a, Kanashiro R et al.** Immune response to measles vaccine in Peruvian children. Bull World Health Organ 2001; 79:1038 1046.

24. **Dayan GH, Caions L, Sandrujee N et al.** Cost-effectiveness of three different strategies against measles in Zambian children. Vaccine 2004; 22: 475-84.