Clinical Reviews and Opinions Vol. 5(2), pp. 18-23, February, 2013
Available online http://www.academicjournals.org/cro
DOI: 10.5897/CRO12.008
ISSN 2141-2553 ©2013 Academic Journals

Full Length Research paper

Measles complications in a Nigerian hospital setting

Onoja, A. B.*, Adeniji, A. J. and Faneye, A.

Department of Virology, College of Medicine, University of Ibadan, Nigeria.

Accepted 14 February, 2013

In spite of active measles vaccination efforts in 2005 in southern Nigeria, re-emergence continues to occur. This study was carried out to ascertain the incidence of measles, severity, mortality and its complications, in order to enhance treatment and reduce under-five child mortality. Secondary data from the records in the measles ward of Oni Memorial Children's Hospital, Ibadan was used. The period under investigation was 2005 to 2008, following the catch-up and follow-up measles vaccination exercise. Four hundred children between the ages of 5 months and 14 years were clinically diagnosed with measles from 2005 to 2008, of which 124 (31%) had complications. Among those with complications, 70 (56.5%) mortalities were observed, and as the children approached 14 years of age, incidence of measles reduced to 0%. Measles is still a major childhood problem in the southern part of Nigeria, even as the burden is more in northern Nigeria. This will invariably hamper global measles mortality reduction initiatives and the attainment of the fourth millennium development goal of reduction of under-five child mortality by 2015, hence the need for a coordinated and strategic mass vaccination effort to target unimmunized children.

Key words: Measles in children, complications, clinical diagnosis, mortality, mass vaccination.

INTRODUCTION

Measles is a major childhood problem which is of serious medical concern in Africa, Latin America, Europe, south-east Asia and eastern Mediterranean (World Health Organization (WHO), 2011). In Africa, about 13 million cases and 650,000 deaths occur annually, with sub-Saharan Africa having the highest morbidity and mortality (Muller et al., 1999). Nigeria has the largest population in Africa with over 140 million people (Nigerian Medecins Sans Frontieres (NMSF), 2006) and measles is the fifth leading cause of under-five child mortality (WHO, 2006).

Despite the comprehensive WHO and United Nations International Children Emergency Fund's (UNICEF's) measles-reduction strategy, and the partnership of international organizations supporting measles mortality reduction, certain states continue to face recurrent epidemics (Grais et al., 2007). The optimal age for infantile measles vaccination is an important health issue since maternal antibodies may neutralize the vaccine antigen before a specific immune response develops. Delaying vaccination on the other hand may increase the risk of complicated disease (Gagneur et al., 2008). In Nigeria, children are given monovalent measles vaccine at 10 months of age. In 2005 and 2006, the Federal Government of Nigeria (FGN) through the National Programme on Immunization (NPI) conducted an integrated catch-up measles campaign in the south and north, respectively (WHO, 2007) and a nationwide follow-up campaign in 2008 (Goitem et al., 2011), this was in collaboration with local and state governments.

The death toll of measles epidemics has been either under-reported or over-blown by different media accounts. As researchers, the onus lies on us to give professional/scientific and unbiased accounts of the measles situation. Furthermore, reports of measles vary disproportionately between the northern and southern parts, with a high incidence rate reported in northern states (Integrated Regional Information Networks (IRIN),

*Corresponding author. E-mail: bernardonoja@yahoo.com. Tel: +2348034676227.

Table 1. Proportion of clinically diagnosed measles cases from 2005 to 2009.

Age	Percentage (%)				
	2005	2006	2007	2008	2009
5-11 months	25	27	32	18	25
1-2.11 years	58	55	38	64	57
3-4.11 years	13	14	17	14	7
5-6.11 years	2	1	13	2	11
7-8.11 years	1	2	0	2	0
9-10.11 years	1	0	0	0	0
11-12.11 years	0	1	0	0	0
13-14.11 years	0	0	0	0	0

Table 2. Measles mortality in children at Oni Memorial Children's Hospital, Ibadan from January, 2005 to December, 2008.

Month	Mortality				
	2005	2006	2007	2008	Total (monthly)
January	3	3	4	-	10
February	2	1	-	-	3
March	1	3	-	-	4
April	2	4	-	-	6
May	1	1	3	1	6
June	2	-	2	1	5
July	3	-	1	2	6
August	4	-	-	3	7
September	4	-	-	3	7
October	2	-	1	1	4
November	3	-	2	2	7
December	-	-	1	4	5
Total (annually)	28	12	16	14	70

2005; Orude, 2011; Sani, 2012). The study investigated measles incidence, severity, mortality and its complications especially with the mass vaccination exercise of 2005 in order to enhance treatment and reduce under-five child mortality in Oyo State. This will contribute to existing body of knowledge which is scanty and guide policy makers in intervention strategies. It is useful for any measles eradication initiative.

MATERIALS AND METHODS

Study design

This study was conducted between January, 2005 and July, 2009 in Oni Memorial Children's Hospital Ibadan which is the largest children's hospital in Oyo State, south-west Nigeria. There is a dedicated measles ward that is staffed with pediatricians and nurses that are trained to identify clinical signs and manage cases of measles.

Study population

Five hundred children who were admitted with classical measles were enrolled for this study. They belonged to different socio-economic status. The study was performed following approval by the Ethics Committee of Oyo State Ministry of Health and the Consultant in Charge of Oni Memorial Children's Hospital Ibadan, Oyo State.

Diagnosis

Measles cases were ascertained using the standard WHO clinical case definition (any person presenting with a history of fever (39 to 41°C), generalized maculo-papular rash and one of the following, coryza, croup or conjunctivitis) (WHO, 1999; Wharton et al., 1990). A confirmed case is one that is either laboratory-confirmed or meets the clinical case definition and is epidemiologically linked to a confirmed case (Center for Disease Control and Prevention (CDC), 2007). Complications such as bronchopneumonia, gastroenteritis/diarrhea, encephalitis, dehydration, heart failure and protein losing malnutrition were attributed to measles if they occurred within 30 days of rash onset. These were based on doctors' diagnosis which was obtained from case files. Diarrheal complications were based on the WHO's definition for diarrhea (WHO, 1999). For each measles-related death, the pediatrician confirmed that the death met the WHO definition of death due to measles: death in a person meeting the measles case definition within 30 days of rash onset, unless there was another clearly stated non-related cause (WHO, 1999). Clinical presentation of koplik spots in the buccal mucosa was also used as a clinical sign.

RESULTS

In all, 500 children between the ages of 5 months and 14 years were clinically diagnosed (Table 1) with classical measles. Of this number, 265 (53%) were males while 235 (47%) were females. Of the total number of children studied up till 2008, 124 (31%) had complications. Seventy (56.5%) mortalities were observed among the children with complications. Mortalities were as follows: 28 in 2005, 12 in 2006, 16 in 2007 and 14 in 2008 as shown in Table 2. Mortality rate for the four year period was 17.5%. As the children approached 14 years, the incidence of measles reduced to 0%. Table 2 shows the highest monthly mortality aggregate to be in January. An Industrial action by health workers in 2006 accounts for the absence of records during this period. Out of the 124 children with complications, 74 (60%) had bronchopneumonia, 15 (12%) had heart failure, 14 (11%) had gastroenteritis, 10 (8%) had protein losing malnutrition, 6 (5%) had encephalitis, 3 (2%) had croup and 2 (2%) were dehydrated as shown in Figure 1.

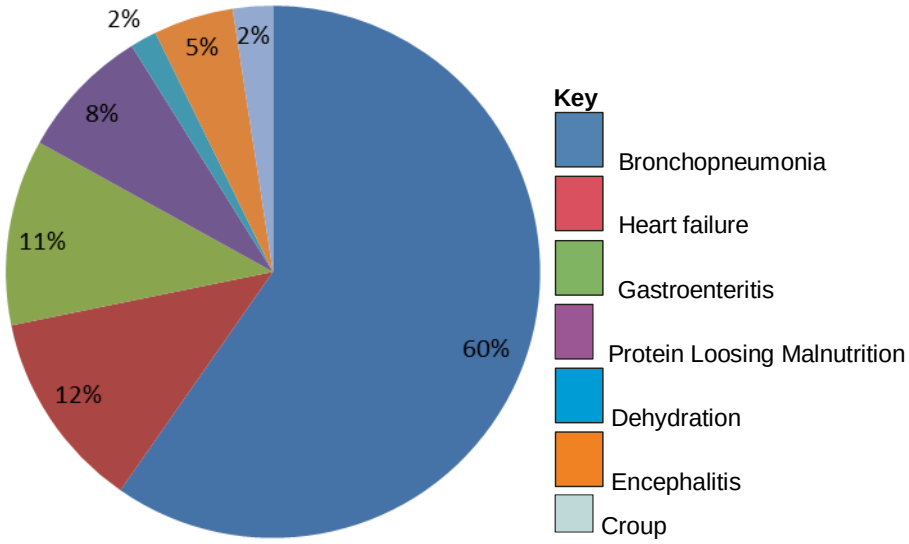

Figure 1. Measles complications at Oni Memorial Children's Hospital, Ibadan from 2005 to 2008.

DISCUSSION

Cases of measles that require hospitalization is a good marker of the burden of clinically severe measles (Lee et al., 2004). The study was carried out following the catch-up measles vaccination of 2005 in Oyo State, Nigeria. Vaccination history of children was not documented in the hospital's records as many could not produce vaccination cards due to improper keeping of children's/wards' vaccination records, coupled with the high illiteracy level. Others presented as emergencies upon admission, at which point their parents cared less about vaccination status, they were overwhelmed by anxiety.

Professor Hugo R. Mendoza and his associates reported 6% measles vaccination history among children attending the Hospital de Nifios Robert Reid Cabral, Santo Domingo (Cieres et al., 1986) which may not be unconnected with anxiety and a carefree attitude, occasioned by the emergency that greeted the children's admission. In this study, the 56% mortality in complicated cases as against 17.5% in the total children studied supports the assertion that mortality is rare in uncomplicated cases (Hussey and Clements, 1996). With such mortalities occurring after a nationwide mass vaccination and follow-up campaign, the implications is dire for the Nigerian child as it will hamper the achievement of the fourth Millennium Development Goal (MDG) by 2015 (MDGs, 2008).

An increase in measles resurgence was reported in Nigeria from 383 cases in 2006 to 2,542 in 2007 and 9,510 in 2008 (Weldegebriel et al., 2011; WHO, 2009). About 19,184 measles cases were suspected in 2011, out of which 17,248 were confirmed to be measles, with an annual incidence rate of 18.2 per 100,000 children (WHO, 2011). Several deaths have been reported in 2013 in Kebbi and Kaduna States, northern Nigeria. These show that measles burden is still heavy and severe in Nigeria, even as measles case fatality rate in 2008 was 1.2% (Weldegebriel et al., 2011). Several deaths have been reported in Kebbi State, northern Nigeria in 2013. Suboptimal routine coverage and a wide interval between the follow-up campaigns likely led to an accumulation of children susceptible to measles (Weldegebriel et al., 2011).

Figure 1 shows bronchopneumonia as the most common complication followed by gastroenteritis. This is attributable to the fact that measles virus initially infects the respiratory epithelium and then seeds the draining lymph nodes during the first 2 to 4 days after infection. Subsequent viral dissemination leads to increasing viremia which results in infection of several organ systems, especially the epithelial surfaces of the respiratory and gastrointestinal tracts, the conjunctivae, and skin (Esolen et al., 1993).

Bronchopneumonia is responsible for majority of deaths occurring during measles outbreaks (Fagbami, 2008), whereas bacterial complication is the usual cause of death when measles kills malnourished children (White and Fenner, 1994). This may be true with the high mortality resulting from measles; as Nigeria ranks among India, Bangladesh, Peru and Pakistan on the basis of countries where half of the worlds' malnourished children

live (Augoye, 2012). This is corroborated by the claim of about a quarter (27%) parents in Nigeria that their children go without food for a day, according to a survey conducted by Charity Save the Children Group (Augoye, 2012). Figure 1 also shows encephalitis 6 (5%) which is in line with the findings of many researchers (Litvak et al., 1943; Miller et al., 1995).

There is indirect evidence that the virus frequently affects the central nervous system (CNS) in the prodromal and early clinical stages of measles that is, frequent electroencephalographic abnormalities (Gibbs et al., 1959; Pampiglione, 1964) and cerebrospinal fluid (CSF) pleocytosis (Hanninen et al., 1980). Mental retardation, deafness, and motor deficits are the common sequelae of the resulting encephalomyelitis (Johnson et al., 2000). Encephalitis and pneumonia have however been observed as complications most associated with measles death (Gindler et al., 2004). Figure 1 shows croup 3 (2%) which is in line with a report of 0.1% croup in 390 students attending a religion affiliated elementary school which was opposed to vaccination (CDC, 2000). Fifteen (12%) heart failure reported is actually not a complication in itself but a sequelae from other complications. Protein loosing malnutrition (8%) in Figure 1 could have been as a result of the diarrhea resulting from the localization of the measles virus in the gastrointestinal tract causing sloughing off of the mucosal cells and protein loss, just as 2% of children were dehydrated.

In this study, it was observed that children with measles were predominantly between 5 months to 2 years and that measles declined steadily among children ≥ 7 years. The high attack rate among infants under 9 months old could be attributed to the waning passive immunity in early infancy. The active transfer of maternal antibodies (IgG) via the placenta to the fetus begins at about 6 months of intrauterine life and thereafter increases rapidly. After birth, these antibodies undergo an exponential clearance, with a half-life of 35 to 40 days (Sato et al., 1979).

A study among Swiss infants to investigate the decay of maternally derived antibodies to measles, mumps, and rubella viruses showed that by 9 to 12 months of age, only 5 of 58 infants (8.6%; 95% confidence interval, 2.9 to 19.6) were antibody positive for the measles virus (Nicoara et al., 1999). Therefore, we suggest that the measles vaccine should be given to infants at less than 9 months of age because of the high level of malnutrition experienced by Nigerians in order to reduce the number of susceptible infants. Studies among well-immunized populations in many countries have shown evidence to suggest increasing susceptibility of infants to clinical measles after 6 months of age (Dagan et al., 1995; Altintas et al., 1996; Dabis et al., 1989).

In Nigeria, measles vaccination is administered to infants at the completion of their ninth month of life, in conformity with recommendations of the World Health Organization (Expanded programme on immunization (EPI), 1982). They represent a high risk age group whose cellular immunity is not fully developed, therefore predisposing them to grave danger. This further confirms measles as the most contagious of childhood exanthemas (Berggren et al., 2005).

CONCLUSION AND RECOMMENDATIONS

Measles infection and mortality was found to occur all year round in this study irrespective of whether it was rainy or dry season, reinforcing measles endemicity in this part of West African (Adu et al., 1992). However, as children approached 14 years, incidence of measles reduced to 0% confirming the position of the World Health Organization that measles is a childhood problem and of huge concern in developing nations such as Nigeria (WHO, 2011). More budgetary provision should be made for measles vaccination efforts in Nigeria so that infrastructures will be in place that will also serve as a framework for other vaccine-preventable disease interventions, as the health institutions are weak at the primary and secondary levels, especially in remote and rural areas.

Maintenance of cold chain for vaccines should be a priority as diurnal temperatures vary, and so does the time taken to get to some vaccination locations which reduces vaccine quality as a result of thawing. Ultralow freezers should be made available in all 36 states of the Federation, with steady power supply to them. Another strategic annual three-year national mass vaccination plan should be put in place to reduce the wide interval between follow-up campaigns in order to increase herd immunity to 94%, which is needed to completely stamp out Measles virus (MV).

Advocacy strategy should include identifying key messages concerning measles eradication, forming coalitions of partners (including those in the private sector), and identifying advocates for fund-raising. Consistency in messages about each aspect of measles eradication is essential to the success of the advocacy strategy (CDC, 1997a, b, 1998, 2008a, b).

Immunization strategies should be designed specifically to improve measles control and reduce death from measles in densely populated urban/rural areas and should be developed and supported by the Federal government, WHO, and UNICEF. These strategies should be towards vaccinating populations not covered by routine vaccination services or previous catch-up vaccination campaigns. Supplementary vaccination campaigns should be conducted in high-risk urban areas, and all children in the target age range should be vaccinated regardless of measles vaccination status or history of previous disease. Disease surveillance is essen-

tial for monitoring impact of supplementary vaccination activities and should be developed as part of these strategies (CDC, 1997a, b, 1998, 2008a, b), this is where the budget should focus more on.

LIMITATIONS OF THE STUDY

The socio-economic and nutritional status of children was not found in the hospital's records, so it was difficult to investigate whether the deaths and complications in this study is more frequent in some status compared to others.

ACKNOWLEDGMENTS

We appreciate Drs. Campbell (Consultant-in-Charge), Abiona, Adejumo and the nurses in the measles ward of Oni Memorial Children's Hospital Ibadan for their kind support.

REFERENCES

Adu FD, Akinwolere OAO, Tomori O, Uche LN (1992). Low seroconversion rates to measles vaccine among children in Nigeria. Bull World Health Org. 70(4):457-60.

Altintas DU, Evliyaglu N, Kilinc B, Senan DI, Guneser S (1996). The modification in measles vaccination age as a consequence of the earlier decline of transplacentally transferred anti-measles antibodies in Turkish infants. Eur. J. Epidemiol. 12(6):647-8.

Augoye J (2012). Nigerian children among the most malnourished-Survey. The Punch Newspaper February, 2012. http://www.punchng.com?feature?nigerian-children-among-the–most-malnourished-survey.

Berggren KL, Tharp M, Boyer KM (2005). Vaccine-associated "wild-type'' measles. Pediatr. Dermatol. 22(2):130-32.

Centers for Disease Control and Prevention (1997a). Measles eradication: Recommendations from a meeting cosponsored by the World Health Organization, Pan Am. Health Organ. CDC. MMWR 46:1-21.

Centers for Disease Control and Prevention (1997b). Progress toward global measles control and elimination. MMWR 46:893-897.

Centers for Disease Control and Prevention (1998). Advances in global measles control and elimination: summary of the 1997 international meeting. MMWR 47(11):1-23.

Centers for Disease Control (2000). Measles Outbreak-Netherlands, April 1999-January. MMWR 49:299-303.

Centers for Disease Control and Prevention (2007). Measles (Rubeola): Case definition. In: Gustavo HD, Rota J, Bellini W, Red SB Eds. Manual for the surveillance of vaccine-preventable diseases 4th Ed. pp. 1-16. Available at: http://www.cdc.gov/ncphi/disss/nndss/casedef/measles_ current.htm.

Centers for Disease Control and Prevention (2008a). Progress towards interruption of wild poliovirus transmission worldwide. January 2007-April 2008. MMWR Wkly. 57:489-94.

Centers for Disease Control and Prevention (2008b). Progress towards poliomyelitis eradication-Nigeria. MMWR Wkly. 57(34):942-946.

Cieres M, Reyes D, Tactuk M, Mendoza MR (1986). La problematica de la infeccionsarampinosa en el Hospital de Nifios Roberto Reid Cabral (HRRC) de Santo Domingo. Boletin Unidad de Estudios Especiale 1:1-4.

Dabis F, Waldman RJ, Mann GF, Commenges D, Madzou G, Jones TS (1989). Loss of maternal measles antibody during infancy in an African city. Int. J. Epidemiol. 18(1):264-268.

Dagan R, Slater PE, Duvdevani P, Golubev N, Mendelson E (1995). Decay of maternally derived measles antibody in a highly vaccinated population in southern Israel. Pediatr. Infect. Dis. J. 14(11):965-969.

Esolen LM, Ward BJ, Moench TR, Griffin DE (1993). Infection of monocytes during measles. J. Inf. Dis. 168(1):47-52

Fagbami AH (2008). Measles Virus: In Medical Virology, Lecture Suppliments. Nihinco Prints Mokola, Ibadan pp 78-82.

Gagneur A, Pinquier D, Aubert M, Balu L, Brissaud O, De Pontual L, Gras Le Guen C, Hau-Rainsard I, Mory O, Picherot G, Stephan JL, Cohen B, Caulin E, Soubeyrand B, Reinert P (2008). Kinetics of decline of maternal measles virus-neutralizing antibodies in sera of infants in France in 2006. Clin.vaccine Immunol. 15(12):1845-1850.

Gibbs FA, Gibbs EL, Carpenter PR, Spies HW (1959). Electroencephalo-graphic abnormality in uncomplicated childhood diseases. JAMA 171:1050-1055.

Gindler J, Tinker S, Markowitz L, Atkinson W, Dales L, Papania MJ (2004). Acute Measles Mortality in the United States, 1987-2002. J. Infect. Dis. 189:69-77.

Goitem GW, Gasasira A, Harvey P, Masresha B, Goodson JL, Pate MA, Abanida E, Chevez A (2011). Measles resurgence following a nationwide measles vaccination campaign in Nigeria 2005-2008. J. Infect. Dis. 204:226-231.

Grais RF, Dubray C, Gerstl S, Guthmann JP, Djibo A, Nargaye KD, Coker J, Alberti KP, Cochet A, Ihekweazu C, Nathan N, Payne L, Porten K, Sauvageot D, Schimmer B, Fermon F, Burny ME, Hersh BS, Guerin PJ (2007). Unacceptably high mortality related to measles epidemics in Niger, Nigeria and Chad. PLoS Med. 4(1):e16.

Hanninen P, Arstila P, Lang H, Salmi A, Panelius M (1980). Involvement of the central nervous system in acute, uncomplicated measles virus infection. J. Clin. Microbiol. 11(6):610-613.

Hussey GD, Clements CJ (1996). Clinical problems in measles case management. Ann. Trop. Pediatr. 16(4):307-17.

IRIN (2005). Nigeria: Measles kills more than 500 children so far in 2005 (http://www.irinnews.org/Report/53506/Nigeria-measles-kills-more-than-500-children-so-far-in-2005).

Johnson CE, Darbari ADS, Darbari DN, Whitwell J, Chui LW, Cleves MA, Kumar ML (2000). Measles vaccine imunogenicity and antibody persistence in 12 vs 15month old infants. Vaccine 18:2411-2415.

Lee B, Ying M, Papania MJ, Stevenson J, Seward JF, Hutchins SS (2004). Measles hospitalizations, United States, 1985-2002. J. Infect. Dis. 189:210-215.

Litvak AM, Irving JS, Gibel H (1943). Encephalitis complication. Am. J. Dis. Child 65(2):265-295.

Millennium Development Goals Report (2008). Available at http//www.un.org/millenniumgpals/2008highlevel/pdf/newsroom/mdg%20reports/MDGReport2000ENGLISH.pdf.

Miller E, Hill A, Morgan-Capner P, Forsey T, Rush M (1995). Antibodies to measles, mumps and rubella in UK children 4 years after vaccination with different MMR vaccines. Vaccine 13(9):799-802.

Muller CP, Hanses F, Troung A, Ammerhan WO, Ikusika W, Adu F (1999). Molecular epidemiology of Nigerian and Ghanaian measles virus isolates reveals a genotype circulating widely in western and central Africa. J. Gen. Virol. 80(4):871-877.

Nigeria/Africa Masterweb Special Feature (NMSF) Nigeria (2006) Census Figures. South Census Figures North Census Figures FCT and Total Census Figures. Available at: www.nigeriamasterweb.com/Nigeria2006CensusFigs.html.

Nicoara C, Zach K, Trachsel D, Germann D, Matter L (1999). Decay of passively acquired maternal antibodies against measles, mumps and rubella viruses. Clin. Diagn. Lab. Immunol. 6(6):868-871.

Orude P (2011). Bauchi records 2,000 cases of measles outbreak Available at: http://www.nigerianbestforum.com/index.php?topic=106854.0.

Pampiglione G (1964). Prodromal phase of measles: Some neuro-

neurophysiological studies. Br. Med. J. 2:1296-1300.
Sani Y (2012). 37 new measles cases recorded in Kebbi. http://dailytimes.com.ng/article/37-new-measles-cases-recorded-kebbi.
Sato H, Albrecht P, Reynolds DW, Stagno S, Ennis FA (1979). Transfer of measles, mumps and rubella antibodies from mother to infant. Its effect on measles, mumps and rubella immunization. Am. J. Dis. Child. 133(12):1240-1243.
Weldegebriel GG, Gasasira A, Harvey P, Masresha B, Goodson JL, Pate MA, Abanida E, Chevez A (2011). Measles resurgence following a nationwide measles vaccination campaign in Nigeria, 2005-2008. J. Infect. Dis. 204:226-231.
Wharton M, Chorba TL, Vogt RL, Morse DL, Buehler J.W. (1990). Case definitions for public health surveillance. MMWR Recomm. Rep. 39(13):1-43.
White DO, Fenner FJ (1994). Medical Virology, 4th eds by Academic Press, a division of Harcourt Brace and Company, San Diego California pp 461-465.
Expanded programme on immunization (1982). The optimal age for measles immunization. Wkly Epidemiol Rec 57:89-91.
World Health Organization (1999). WHO guidelines for epidemic preparedness and response to measles outbreaks. WHO/CDS/CSR/ISR/99. Available: www.who.int/csr/resources/publications/measles/WHO_CDS_CSR_99_1/en.
World Health Organization (2006). Mortality country fact sheet on Nigeria.
World Health Organization (2007). Manual for the laboratory diagnosis of measles and rubella virus infection. 2nd Edition. WHO/IVB/07.01 pp 10-13.
World Health Organization (2009). Measles reported cases 2009. Available at http://www.who.int/immunization_monitoring/en/globalsummary/timeseries/tsincidencemea.htm.
World Health Organization (2011). Reported measles cases and incidence rates by WHO member states 2010 and 2011. WHO factsheet 2011. Available at: http://www.who.int/immunization_monitoring/diseases/measlesreportedcasesbycountry.pdf.