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EPIDEMIOLOGY OF MEASLES IN THE CENTRAL REGION OF GHANA: A FIVE-YEAR CASE REVIEW IN THREE DISTRICT HOSPITALS
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EPIDEMIOLOGY OF MEASLES IN THE CENTRAL REGION OF GHANA: A FIVE-YEAR CASE REVIEW IN THREE DISTRICT HOSPITALS

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ABSTRACT

Objective: **As part of a national accelerated campaign to eliminate measles, we conducted a study, to define the epidemiology of measles in the Central Region.**
Design: **A descriptive survey was carried out on retrospective cases of measles.**
Setting: **Patients were drawn from the three district hospitals (Assin, Asikuma and Winneba Hospitals) with the highest number of reported cases in the region.**
Subjects: **Records of outpatient and inpatient measles patients attending the selected health facilities between 1996 and 2000. Data on reported measles cases in all health facilities in the three study, districts were also analysed.**
Main outcome measures: **The distribution of measles cases in person (age and sex), time (weekly, or monthly, trends) and place (residence), the relative frequency, of cases, and the outcome of treatment.**
Results: **There was an overall decline in reported cases of measles between 1996 and 2000 both in absolute terms and relative to other diseases. Females constituted 48%-52% of the reported 1508 cases in the hospitals. The median age of patients was 36 months. Eleven percent of cases were aged under nine months; 66% under five years and 96% under 15 years. With some minor variations between districts, the highest and lowest transmission occurred in March and September respectively. Within hospitals, there were sporadic outbreaks with up to 34 weekly cases.**
Conclusion: **In Ghana, children aged nine months to 14 years could be appropriately targeted for supplementary, measles immunization campaigns. The best period for the campaigns is during the low transmission months of August to October. Retrospective surveillance can expediently inform decisions about the timing and target age groups for such campaigns.**

INTRODUCTION

While tremendous progress has been made in increasing immunisation coverage in Ghana, the national targets have not been met since the launch of the Expanded Programme on Immunisation (EPI) in 1978. The national measles immunisation coverage increased markedly from 24% to 84% from 1980 to 2000. Corresponding with this increase, the number of reported cases fell by 72% from 82,684 to 23,068 over the same period(1). However, the measles coverage still falls short of the national target of 90% (2). A target was set to reduce reported measles from 40,000 in 1998 to 10,000 per year by the year 2000. Meanwhile, sporadic measles outbreaks occurred; one large outbreak in 1995 involved 43,177 cases and 85 deaths.

In line with a recent global initiative by the World Health Organization (WHO) and the United Nations Children's Fund (UNICEF) to halve measles mortality(3), Ghana developed a national strategic plan to control measles with the objective of reducing measles morbidity by, 90% and measles mortality by 95% from pre-vaccination levels by the end of 2003; preventing measles outbreaks in all ten regions by the end of 2002; and eventually eliminating measles with near zero deaths by 2005 (1).

Based on a high EPI performance, the Central Region was selected as the initial region for accelerated campaign towards the elimination of measles. In the year 2000, the region recorded 2,378 measles cases and two deaths. Measles immunisation coverage in 2000 was 84%. In preparation for planned measles supplemental activities (SIAs), we conducted a study to obtain information on the local epidemiology of the disease to guide the selection of target age groups and the timing of the campaign.

MATERIALS AND METHODS

For reasons of cost and expediency, we conducted a retrospective review of measles in the three districts in the Central Region with the highest reported cases - the Asikuma-Odoben-Brakwa (AOB), Assin and Awutu-Effutu-Senya (AES)

districts. The study had two components. First, we examined EPI surveillance forms and communicable diseases forms at the district disease control office and the regional surveillance unit for trends on reported monthly measles cases (and measles immunisation coverage) from each sub district of the three study districts for the period 1996-2000. We also collected data on the monthly trends of reported measles in the region as a whole.

In the other component, we collected retrospective data on the age, sex, address, date of visit, date of onset or symptoms, admission status, vaccination status and outcome of treatment on all patients attending the district hospitals of the three study districts during the five-year period, 1996-2000. In each hospital, we obtained a list of outpatients with measles from consulting room registers, measles registers or disease surveillance forms. The unique identity numbers of patients so obtained were then used to retrieve the patient notes. Where a line list of patients was not available, we searched all available patient notes to locate those containing a diagnosis of measles. Inpatient lists or measles cases were prepared from an admission and discharge register and a non-maternity nominal roll.

We collected data on all new outpatient attendants by age and sex in each hospital and calculated the proportion by age-sex groups diagnosed with measles for each year from 1996 to 2000. Patient data were captured using Epi Info 6.04d and analysed with Epi Info 2000.

Study area: The three districts of Assin, AOB and AES had respective populations of 193,888, 87,796 and 165,193 in the year 2000 according to a national census. The capitals of the study districts are Assin Foso, Asikuma and Winneba respectively. The proportion of infants (representing about 4% of the total population) immunised with measles in the districts ranged between 78% and 100%. Assin district is divided into eight sub-districts based on the location of key health facilities in the district. The AOB and AES districts are made up of three and four sub-districts respectively. The district hospitals in Assin and AOB are mission-owned while that in AES is government-owned. There are also community-clinics, health centres and private clinics which operate in the catchment area of the hospitals.

RESULTS

Measles cases in the three study districts: Only the district aggregate of measles trend is presented here. All three districts registered a decline in reported cases from 1995 to 2000 (Figure 1). The most rapid decline occurred in the AOB district where the number of cases dropped by 85% from 940 in 1996 to 145 in 2000. This translates to a decline from 95 per 10,000 population in 1995 to 17 per 10,000 population in 2000. The district share of the central regional population versus share of the total reported measles over the period 1996-2000 was respectively 12% versus 15% or Assin, 6% versus 16% for AOB and 10% versus 5% for the AES districts.

The highest transmission of measles in the Central Region as a whole occurred in March with a second smaller peak in December while the lowest transmission occurred in September (Figure 2). The monthly trends in the study districts were slightly more erratic but they were broadly similar to the regional trend. In all three districts the peak frequency occurred in March (with smaller peaks in November or December) while the lowest transmission occurred in September.

Figure 1

Annual trends in reported measles cases in three districts of the Central Region 1996-2000

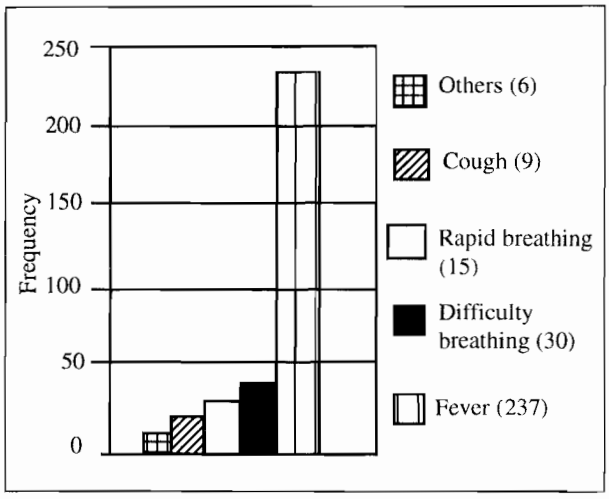
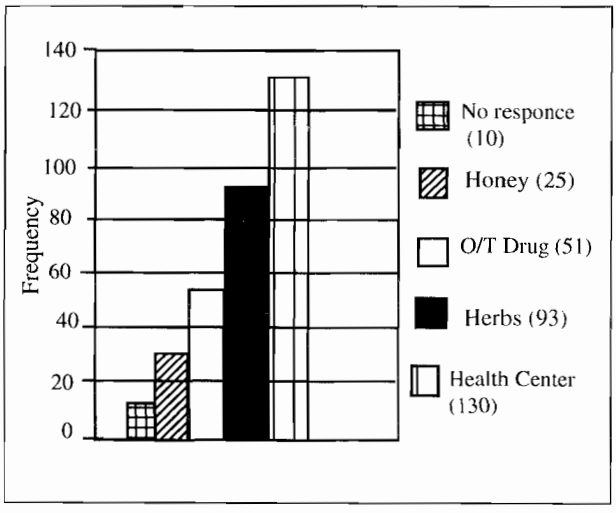


Figure 2

Monthly trends of measles in the Central Region, 1996-2000



Measles in the three district hospitals

Age and sex of measles cases: Overall, 1,508 recorded cases of measles were identified over the period from 1996-2000. Three hundred and forty eight were at the Assin hospital, 1042 at the Asikuma hospital and 118 at the Winneba hospital (Table 1). Females constituted 48% of cases at Asikuma and

Winneba hospitals and 52% of cases at the Assin hospital. In total, patients came from more than 200 communities. The proportion of patients from outside these districts attending these hospitals was about 5% for Winneba, 16% for Assin and 36% for the Asikuma hospitals.

The age of patients ranged from one month to 60 years with a median and mean of 36 months and 56 months respectively (Table 2). The age distribution among children aged <9 months, 9 months-4 years, 5 years-14 years and >5 years was 11%, 55%, 30% and 4%, respectively (Figure 3). One hundred and sixty-one patients (11%) were aged between six and nine months. By health facility, 8%-19% were below age nine months. The mean age of patients differed significantly between facilities. Patients at Assin hospital were youngest while those at the Winneba hospital were the oldest (Kruskal-Wallis $H = 11.3$, $p < 0.005$).

On the whole, the median age of patients fell from 31 to 24 months from 1996 to 2000 (Table 2). Between hospitals, the change in the median age over time was inconsistent-increasing at Asikuma hospital while decreasing at the Winneba hospital. In each hospital, female patients were older than the male patients although, overall the difference did not reach statistical significance (Table 3).

Table 1

Sex distribution of reported measles cases by health facility, 1996-2000

Facility	1996	1997	1998	1999	2000	Total
Asikuma						
Female	111	194	150	27	22	504
Male	131	191	163	34	19	538
Sub-total	242	385	313	61	41	1042
Assin						
Female	31	14	51	55	29	180
Male	25	15	39	57	32	168
Sub-total	56	29	90	112	61	348
Winneba						
Female	7	21	14	8	7	57
Male	6	29	14	7	5	61
Sub-total	13	50	28	15	12	118
Total by sex						
Female	149	229	215	90	58	741
Male	162	235	216	98	56	767
Total	311	464	431	188	114	1508

Table 2

Summary of age distribution of reported measles cases in months by health facility, 1996-2000

	1996		1997		1998		1999		2000		Total	
Facility	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median
Asikuma	58	30	54	36	53	36	58	48	81	48	56	36
Assin	54	31	33	15	60	30	61	28	40	22	54	24
Winneba	51	44	94	51	63	24	40	24	23	13	68	36
Total	57	31	57	36	55	36	58	36	53	24	56	36

Table 3

Summary of age-sex distribution of reported measles cases in months by health facility, 1996-2000

Facility	Female					Male				
	Obs	Min	Mean	Median	Max	Obs	Min	Mean	Median	Max
Asikuma	504	1	62	36	720	538	1	50	36	672
Assin	180	3	24	24	552	168	2	48	24	684
Winneba	57	6	76	44	516	61	6	60	30	624
Total	741	1	62	36	720	767	1	51	32	684

Figure 3

Age distribution of measles cases in three district hospitals, Central Region, Ghana, 1996-2000

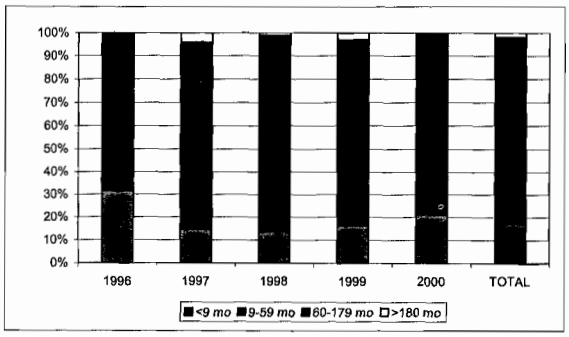
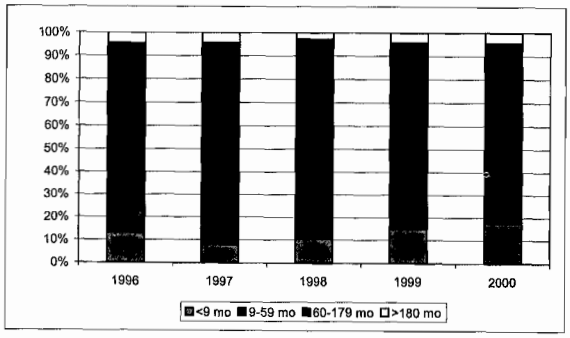


Figure 4

Admitted measles cases from three district hospitals by age group, Central Region, Ghana, 1996-2000



The proportion of cases in children under five years of age in the three hospitals increased from 66% in 1996 to 71% in 2000 (Figure 3). That for children under 15 years of age increased slightly from 95% to 96% over the same period. The proportion of outpatient morbidity due to measles in children aged under five years in the three hospitals declined from 0.7% (range 0.6%-1.1%), in 1999 to 0.4% (0.3%-0.8%) in 2000. The trend for the relative morbidity for children under 15 years of age was similar.

Trends in reported measles: Only about 8% of the reported measles increases cases specified the date of onset of the illness on the clinical notes. These cases reported to the health facility on either the day of onset of the illness or up to two weeks later. The median interval between onset of symptoms and attendance was 3.5 days for Asikuma and 3 days each for Assin and Winneba hospitals.

Consistent with district level trends, there were three clear outbreaks of measles at the Asikuma hospital from March to May 1997, March 1998 and January 1999. In the worst outbreak, 34 cases were recorded in a single week in May 1997. Assin hospital recorded outbreaks from December 1998 to April 1999 with a peak of three weekly reported cases. In the Winneba hospital, there was an outbreak during the first and third quarters of 1997.

Vaccination status: The vaccination status was only available for 66 (6%) patients at the Asikuma hospital and for three (0.9%) patients at the Assin hospital. Of these, 45 patients in Asikuma and none at Assin Foso had been vaccinated against measles.

Severity and outcome of illness: Overall, 275 (18%) measles cases were admitted; 11 % in Asikuma, 28% in Assin and 53% in Winneba. Cases admitted were significantly younger (median 24 months, mean

43 months) than those who were not admitted (median 36 months, mean 59 months) (Kruskal Wallis H=20.5 p<0.005). Forty-seven (17%) of the admitted cases were younger than nine months and five (2%) were older than five years (Figure 4).

Fourteen measles patients (0.9%) died. In total the case fatality in females (1.1%) was not significantly higher than in males (0.8%). The case fatality rates (CFR) over the five year period were 0.5% in Asikuma, 1.4% in Assin and 3.4% in Winneba hospitals. Among the deaths, four were younger than nine months of age, eight were five years nine months and two were older than five years. Thus, the case fatality, for cases below age five years was 1.2% and that for those over five years was 0.4%.

DISCUSSION

As with other retrospective studies, there were some general deficiencies in data availability and completeness. These were due to the use of multiple reporting forms, loose storage or patient cards without jackets, torn sheets, incomplete or illegible entries, annual changes in the patient identifier numbers and the lack of computerised data storage. We maximised completeness by retrieving any available data from registers. Establishing, a prospective case-based surveillance would eliminate some of these deficiencies and permit laboratory, confirmation of the cases.

Despite these limitations, our study revealed a number of important findings relating to the epidemiology of the measles in the Central Region of Ghana. On the whole, measles cases declined in absolute and relative terms in all the health facilities from 1996 to 2000. This decline has been reported by other workers(5,6) and has been attributed to successful EPI and vitamin A supplementation(7). Even so, sporadic outbreaks occurred in the Central Region during this period.

The affected age of patients has implications for the current measles immunisation schedule; a single dose using the Schwarz vaccine at nine months of age. Eleven percent of our cases were younger than nine months. The vulnerability of younger infants in Ghana has been reported since the early 1970s. At the Korle-Bu Teaching Hospital, the peak age of admissions of children with measles was 7-12 months in 1973-1982 (5). However, the currently, available measles vaccine does not produce adequate sero-conversion rates when administered to younger infants(8). In view of this, Ghana has been interested in other vaccines, such as the AIK-C vaccine, which may be more effective in younger infants(9).

Most of the cases (96%) were in children under 15 years; 30% of them in children between the ages of five and 14 years. Thus, the age group nine months to 14 years could be targeted for mass campaign in the Central Region of Ghana as in Malawi where measles morbidity and mortality have been reduced to near zero(10).

WHO recommends that where a large proportion of cases occur in children aged between six and nine months, children as young as six months may be vaccinated(11). This strategy would however impose higher financial and logistical costs, as was the case in Uganda. Moreover, expanding the target group to cover these younger infants may not be necessary if routine coverage of over 60% in infants could be achieved and a good quality SIA could reach over 90% of children aged nine months to 14 years. As has been observed in many countries of East and West Africa, such coverage would rapidly and drastically remove the source of infection for the younger infants and so prevent cases and deaths in the latter group(12). Hence, we propose that the target age group, nine months to 14 years be maintained in the Central Region despite having, 11% of cases in younger infants.

The challenge therefore, is for the Central Region to achieve a high SIA coverage. This can be daunting if communities no longer perceive measles to be a threat and there are financial, logistical and human resource constraints. However, Ghana and other African countries have the experiences gained in recent poliomyelitis supplemental immunisation campaigns on their side. These experiences could be deployed to the new wave of measles vaccination campaigns particularly in the area of social mobilisation.

Significant measles morbidity and mortality in children older than five years has also been observed in other African countries in which an average of 50% of cases occurs in children aged 5-14 years(13). This morbidity pattern holds in countries such as Kenya and Tanzania with high routine measles coverage (70%-80%) and in those such as Mali and Cameroon with lower routine measles coverage (50%-60%).

The peak transmission of measles differed slightly between districts probably, as a result of the differences in the populations attending the district hospitals. The lowest transmission for measles occurs from August to October suggesting that this could be the best time for mass vaccinations in the Central Region.

In conclusion, we have demonstrated that retrospective surveillance data quickly provides information on the local epidemiology of measles relevant for the planning of mass vaccination campaigns in Africa.

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