Incidence of pneumonia and gastroenteritis among infants admitted to Orotta Referral Paediatric Hospital in Asmara, Eritrea in 2006.

Eyob Frezghi1, Yordanos Mengesha1, Yirgalem Tekle 2, Dawit Tesfay3, Jacob Mufunda1, Andemariam Gebremichael1.

Institutional Affiliation

1 Orotta School of Medicine PO Box 10549, Asmara, Eritrea

2 Department of Research and Human Resource Development Ministry of Health, State of Eritrea

3 Orotta Paediatric Teaching Hospital, Asmara, Eritrea

Corresponding author Professor Jacob Mufunda Orotta School of Medicine

PO Box 10549 Asmara, Eritrea.

Email: mufunda@yahoo.com

Abstract

A retrospective study based on medical records of infants admitted to the Orotta Paediatric Teaching Hospital for the whole of 2006 in order to study the morbidity and mortality rates from pneumonia and gastroenteritis among infants in Eritrea using the integrated management of childhood illnesses guidelines. The main causes of the 2537 admissions of whom nearly two thirds were males and which showed no seasonal variation were pneumonia (39.7%), gastroenteritis with no dehydration (27.1%) and severe pneumonia (19.7%). The case fatality rates were 1.6% for severe pneumonia, 2.7% for pneumonia, 3.5% for gastroenteritis, and 3.2% for those affected by pneumonia and gastroenteritis.

Relatively high infant morbidity rates in this study from pneumonia and gastroenteritis is mitigated by low case fatality rates. There is urgent need to identify the factors underpinning high morbidity among infants and scale up interventions such as community IMCI.

Key words: Pneumonia, gastroenteritis, IMCI, Orotta, Eritrea.

Introduction

Pneumonia and gastroenteritis are the leading causes of preventable childhood morbidity and mortality representing more than one third of mortality among children less than 5 years of age globally 1. Mortality from pneumonia among American children decreased by more than 90% from 1939 to 1996 largely due to a combination of interventions such as penicillin, vaccinations and introduction of Medicare among the poor 2. Vaccination against hemophilus influenza and pneumococcus has further decreased incidence rates and severity pneumonia in developed countries 3. Globally, pneumonia continues to be a major cause of childhood morbidity and mortality especially among infants with an estimated 4 million children dying from the disease annually 4.

Another major cause of disease morbidity among infants is gastroenteritis with annual episodes estimated to be more than 100 million globally 5. Gastroenteritis and pneumonia share one common transmission route through interpersonal contact spreading infectious agents. In addition gastroenteritis can also be transmitted from environmental factors such as water and animals, a situation which may explain higher morbidity from gastroenteritis 6.

The development and implementation of integrated management of childhood illness (IMCI) jointly by the WHO and UNICEF more than ten years ago is a landmark strategy designed to reduce childhood morbidity and mortality 7. The main tenets of IMCI are to focus on the five common causes of childhood mortality namely; acute respiratory infections, diarrhoea, measles, malaria and malnutrition. The strategy received reverence from some studies but others have failed to scale up the interventions nationwide and thus had limited scope and desired national impact 8,9.

Annual incidence rates of acute respiratory tract infections (ARI) were reported to be increasing among infants in Eritrea in spite of high immunization coverage rates and the introduction of IMCI 10. In addition, the disease burden from diarrhoea continued to be high. The explanations for these observations were not proffered because of the limitations inherent in the retrospective and aggregated nature of the HMIS databases.

The objective of this study was to document the incidence of infant morbidity and mortality from pneumonia and gastroenteritis among infants in a referral hospital setting in order to determine modifiable risk factors that could guide policy and management guidelines.

Methods

This was a retrospective study based on medical records of patients admitted to Orotta Paediatric Teaching Hospital Ward B between 1st January 2006 and 31st December 2006. The inclusion criteria for the study sample were all children with ages ranging from one month to one year, with a clinical diagnosis according to the clinical evolution of IMCI guidelines namely; severe pneumonia, pneumonia, gastroenteritis with no dehydration, some dehydration, and severe dehydration. The case definitions did not include radiological and laboratory diagnosis. The diagnoses were based on criteria proposed by the WHO, IMCI guidelines. The medical records of eighteen children which had insufficient data or unclear diagnoses were excluded from the study as set in the selection criteria. During the study period, 2537 children up to one year old were hospitalized, with a diagnosis of pneumonia and/or gastroenteritis in their hospital records.

Statistical analysis

The data is presented as percentages of admissions with the denominator being the total admissions including all other children with different diseases. Case fatality rate is calculated from the number of deaths divided by the number of cases with the same diagnosis.

Results

Pneumonia and gastroenteritis contributed to more than half (50.9%) and one third (33.8%) respectively of patients admitted to the Orotta Paediatric Teaching Hospital Ward B during the period of the study. Male infants were affected twice as much as females. (Table 1).

| Table 1 Distribution of hospitalized infants by gender and diagnosis				
Diagnosis	Male	Fe male	Total	% of total inpatients in the ward
Severe Pneumonia	295	206	501	15.5
Pneumonia	608	386	994	30.7
Gastroenteritis with no dehydration	410	276	686	21.2
Gastroenteritis with some dehydration	173	90	263	8.1
Gastroenteritis with severe dehydration	18	12	30	0.9
Pneumonia with gastroenteritis	41	22	63	1.9
Total	1545	992	2537	78.3

The proportion of admissions due to pneumonia was high in the months between April and June, while the proportional distribution due to gastroenteritis was fluctuating with peak admission in June (12.5%) (Figure1). In the first six months of the year, (January-June) admissions from pneumonia (53.5%) were slightly higher than from gastroenteritis (51.1%) and the reverse was true in the succeeding six months (July –December) with the proportion of gastroenteritis 48.9% and 46.5% pneumonia. All these differences were not statistically significant.

Figure 1: Percentage of infants admitted by month with pneumonia/gastroenteritis
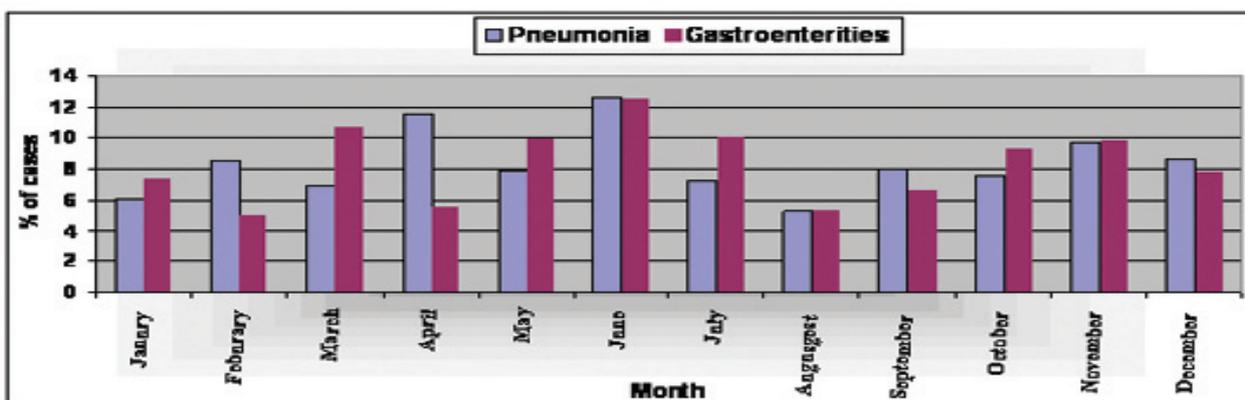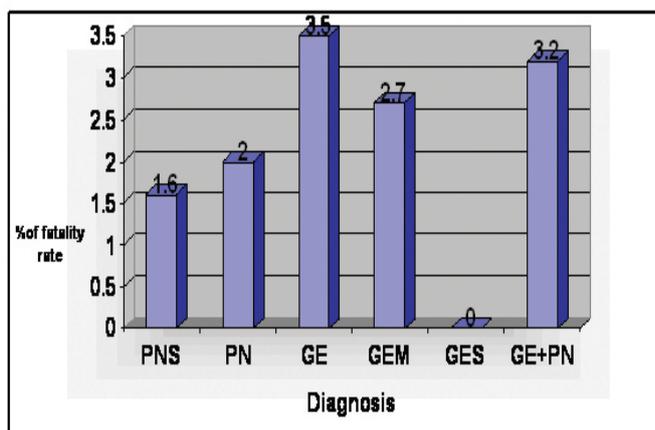
Even though both pneumonia and gastroenteritis affected all infants the rate was lower in the first month of age but gradually increased to peak at six months and the rate started declining to reach lowest levels by the time the infants attained one year (Figure 2).

Figure 2: Distribution of infants admitted with pneumonia/gastroenteritis by age
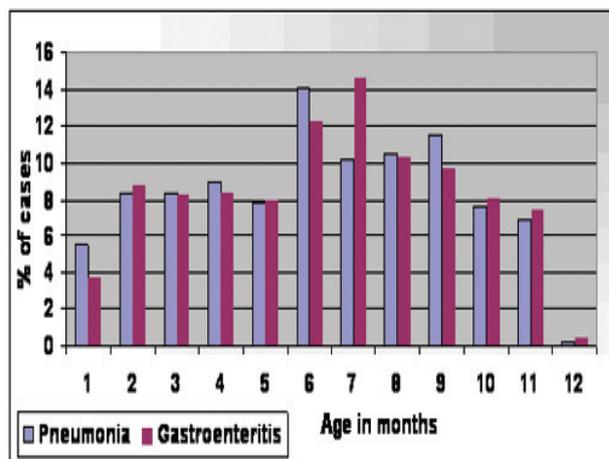
Although the case fatality rates were generally low, the rate for gastroenteritis with pneumonia was double that of severe pneumonia alone. No deaths were recorded from gastroenteritis with severe dehydration (Figure 3).

Figure 3: Case fatality rates for pneumonia and gastroenteritis

Discussion

The study was designed to determine the morbidity and mortality rates of pneumonia and gastroenteritis among infants admitted to a referral paediatric hospital in Eritrea. The disease burden from these two leading causes of admission was very high but the mortality rates were very low possibly a reflection of effective case management. There was no significant seasonal or gender difference in the cases. The observations of very low morbidity rates from both diseases at 1 month and negligible rates at 12 months of age compared to the remaining age were unique findings.

The high disease morbidity from pneumonia and gastroenteritis was higher than has been documented in other studies 11-12. The reliance of case definitions of both pneumonia and gastroenteritis on clinical rather than radiological or laboratory findings may exaggerate the incidence rates of these two diseases but this speculation has not been formally explored in our setting13. Definitions of pneumonia according to the WHO as well as from the IMCI guidelines rely largely on signs and symptoms without radiological or laboratory confirmation in resource poor countries 7,13, a practice which makes it difficult to distinguish pneumonia from other acute respiratory infections.

The diagnosis of pneumonia in the set up of our study was based on the respiratory rate rather than radiological diagnostic confirmation. While the reasons for the high morbidity of pneumonia were not investigated in our study, overdiagnosis of the disease cannot be excluded. This speculation is plausible because, unlike other reports from developing countries, the case fatality rates in this study is relatively low for clinical pneumonia cases compared to reports in similar resource poor countries 13.

The morbidity rates in our setting are much higher than global estimates from other studies 1. One can speculate with hindsight that the IMCI interventions in Eritrea were initially hospital based leading to improved outcomes in hospitals. Community IMCI was only recently introduced in limited geographical areas in Eritrea. There was limited impact of community based preventive and management interventions for childhood illnesses 7. Instead of witnessing a decline in the incidence of pneumonia following the introduction of IMCI but rather an increase, it is probable that there might have been over diagnosis of pneumonia coupled with aggressive and effective management.

The finding of more than three quarters of admissions being from pneumonia and gastroenteritis is beyond the projections based on HMIS trends in this country 10. While it has been reported previously that globally and within the region, the two diseases consume the lion's share of resources earmarked for health care in terms of health workers' time and hospital bed occupancy, the global estimates have been in the range of less than 60% 1. The mitigating factor for the high morbidity rates in our setting were the low case fatality rates which are a reflection of good clinical case management and a positive attribute of the quality of hospital service.

Gastroenteritis and malnutrition are known to be interlinked in a cause and effect relationship 11. It is possible that the frequent droughts in the East African geographical region could have exposed the infants to unhealthy water and sanitation practices leading to diarrhoea predisposing them malnutrition and the malnutrition-diarrhoea vicious cycle. Immunity has also been shown to be compromised in malnourished children 12.

Case fatality rates are a proxy of competences in clinical case management. The fact that the case fatality rates were generally low could partly be attributed to health worker competences and/or strict adherence to IMCI guidelines which have been shown to work in different settings. The success of IMCI in hospital settings have been demonstrated, it is the transfer of the same competences and expanding it nationally which has hit some snags in other settings 7,9. Rightly it is premature to evaluate the situation in this country where the community and neonatal components have just been introduced.

The fluctuation of morbidity rates with the lowest at 1 year of age followed by 1 month and highest at 6 months is an interesting observation for which no explanation has been investigated. It is plausible to speculate that the maternal immunological protection is at its peak during the first few months with unfettered breastfeeding practice in Eritrea. The peak around 6 months coincides with declining of contribution of maternal immunity through breast milk compounded by the introduction of weaning and supplementary feeding and these infections through possibly contaminated supplementary feeds 14. The precipitous decline in the morbidity by the 12 month age group can be explained by the completion of most of the routine immunizations against diseases some of which also contribute to pneumonia and gastroenteritis 15.

Conclusion

Pneumonia and gastroenteritis together contribute more than two thirds of admissions in the referral hospital in Eritrea with low case fatality rates. It is important to determine the factors that contribute to the high morbidity rates among infants in order to institute appropriate preventive interventions.

Acknowledgements

References

1.   Wardlaw T, Salama P, Johansson EM, Mason E. Pneumonia: the leading killer of children. Lancet. 2006; 368: 1048-50.

2.   Dowell SF, Kupronis BA, Zell ER, Shay DK. Mortality from pneumonia in children in the United States, 1939 through 1996. N Engl J Med. 2000; 342: 1399-407.

3.   Giebink GS. Prevention of pneumococcal disease in children. N Eng J Med. 2001; 345: 1177-83.

4.   Wardlaw T, Salama P, Johansson EM, Mason E. Pneumonia: the leading killer of children. The Lancet. 2006; 368: 1048-50.

5.   Mead PS, Slutsker L, Dietz V et al. Food related illness and death in the United States. Emerg Infect Dis. 1999; 5: 607-25.

6.   Musher DM. How contagious are common respiratory infections? N Eng J Med. 2003; 348: 1256-66.

7.   Benguigui Y, Stein F. Integrated management of childhood illness: an emphasis on the management of infectious diseases. Semin Pediatr Infect Dis. 2006; 17: 80-98.

8.   Patwari AK, Raina N. Integrated management of childhood illness (IMCI): a robust strategy. Indian J Pediatr. 2002; 69: 41-8.

9.   Geslin C, Ketsela T. Integrated management of childhood illness implementation and scaling up in four selected countries in the African Region. Communicable disease bulletin for the African Region. 2005; 3:5-6.

10. Mufunda J, Nyarango P, Kosia A, Ogbamariam A, Mebrahtu G, Usman A, Gebresillosie S, Goitom S, Araya E, Andemichael G, Gebremichael A. Continuing communicable disease burden in Eritrea. S Afr Med J. 2006; 96: 221-4.

11. Thapar N, Sanderson IR. Diarrhoea in children: an interface between developing and developed countries. Lancet. 2004; 363: 641-53.

12. Pelly TF, Santillan CF, Gilman RH, Cabrera LZ, Garcia E, Vidal C, Zimic MJ, Moore DA, Evans CA. Tuberculosis skin testing, anergy and protein malnutrition in Peru. Int J Tuberc Lung Dis. 2005;9(9):977-84.

13. Nathoo KJ, Nkrumah FK, Ndlovu D, Nhembe M, Pirie DJ, Kowo H. Acute lower respiratory tract infection in hospitalized children in Zimbabwe. Ann Trop Paediatr. 1993; 13: 253-61.

14. Woldemichael G. Diarrhoeal morbidity among young children in Eritrea: environmental and socioeconomic determinants. J Health Popul Nutr. 2001; 83-90.

15. Lu C, Michaud CM, Gakidou E, Khan K, Murray CJ. Effect of the Global Alliance for Vaccines and Immunization on diphtheria, tetanus and pertussis vaccine coverage: an independent assessment immunization and decline of disease. Lancet. 2006; 368: 1088-95.