

THE PEDIATRIC ADMISSION PATTERN ANALYSIS AND OUTCOME IN THE EMERGENCY UNIT AT AL-SALAM HOSPITAL, SADAH, YEMEN

تحليل أنماط القبولات والنتائج الملاحظة عند الأطفال الذين أدخلوا وحدة الطوارئ

في مستشفى السلام بصعدة في اليمن

Al Kubati AK Sallam, MD; Al Keksi Ahmed, MD; Bin Mohana Mabrook

د. عبد الخالق سلام، د. أحمد الكبسي، د. مبروك بن مهنا

ملخص البحث

هدف البحث: تعتبر هذه الدراسة الأولى من نوعها في مستشفى السلام بصعدة في اليمن، تهدف هذه الدراسة إلى تحليل النمط والنتائج عند الأطفال الذين أدخلوا قسم الطوارئ في مستشفى السلام بصعدة في اليمن.

طرق البحث: أجريت دراسة وصفية في قسم الطوارئ في مستشفى السلام في صعدة باليمن خلال الفترة بين 30 آب 2014 وحتى 31 آب من عام 2015، حيث شملت 24502 مريضاً تتراوح أعمارهم بين شهر واحد و15 سنة. تم جمع بيانات مفصلة عن الحالات تتضمن: العمر، الجنس، مدة المكوث في المشفى وأسباب القبول في المشفى.

النتائج: لوحظ من مجموع 24502 مريضاً في المستشفى، فقد تم إدخال 10535 (بنسبة 43%) لجناح الطوارئ. تراوحت أعمارهم من شهر واحد إلى 15 سنة بمتوسط عمري 36.3 شهراً، نسبة الذكور إلى الإناث كانت 1.4: 1. كان غالبية المرضى (8313 مريضاً بنسبة 78.9%) دون سن 5 سنوات، كما بلغ متوسط مدة بقائهم في المشفى 2.2 يوماً. كانت الأسباب الرئيسية للقبول في المشفى هي إبتانات الطرق التنفسية (3371 حالة بنسبة 32.0%)، أمراض الإسهال (2339 حالة بنسبة 22.2%)، سوء التغذية البروتينية (969 حالة بنسبة 9.2%)، والإبتانات (إنتان الدم، التهاب السحايا، الحصبة والكزاز) (885 حالة بنسبة 8.4%). كانت ذروة عدد حالات القبول والوفيات في المشفى في أشهر كانون الثاني، أيار وكانون الأول. تم بعد التقييم في وحدة الطوارئ نقل 4793 طفلاً إلى وحدة طب الأطفال، وتم خروج 4256 من المشفى، في حين تم تخريج 568 من قبل الأهل بخلاف التوصية الطبية، كما تم إحالة 116 طفلاً إلى مكان آخر. خلال هذه الفترة، توفي 801 طفلاً من مرضى الدراسة وهو ما أعطى معدل وفيات بنسبة 7.6%.

الاستنتاجات: لوحظ أن غالبية المرضى هم من الذكور ومن الأطفال بأعمار دون 5 سنوات. شكلت الأمراض الإبتانية (الإبتانات التنفسية الحادة، الإسهال، إنتان الدم، التهاب السحايا والكزاز) الأسباب الرئيسية للقبول في المشفى، وعليه يجب تكثيف الجهود وتوجيه الاهتمام نحو التثقيف الصحي وذلك لمنع ومكافحة العدوى في المنطقة الشمالية من اليمن بهدف السيطرة والوقاية من الأمراض الإبتانية والحد من معدلات المراضة والوفيات عند الأطفال.

ABSTRACT

Objective: This is the first study at Al Salam Hospital, Sadah (ASHS) Yemen. The aim of the study is to know the pediatric admission analysis pattern and outcome in the emergency care unit at this hospital.

Methods: A descriptive observational study was conducted in emergency care unit of Al Salam Hospital, Sadah (ASHS) from 30 August 2014 till 31 August 2015, involving 24502 patients, aged from one month to 15 years. Detailed data regarding age, sex, duration in the hospital and causes of admission were collected.

*Al Kubati AK Sallam, MD, Department of Pediatrics, Faculty of Medicine and Health Sciences, Sana'a University, P. O. Box 4228, Sana'a, Yemen.

E-mail: draksallam@gmail.com.

*Al Keksi Ahmed, MD, Department of Pediatrics, Faculty of Medicine and Health Sciences, Sana'a University, Sana'a, Yemen.

*Bin Mohana Mabrook, MD, Department of Pediatrics, Faculty of Medicine and Health Sciences, Sana'a University, Sana'a, Yemen.

Results: Of 24502 patients seen in the hospital, 10535 (43%) were admitted to the emergency ward. Their ages ranged from 1 month to 15 years, with a mean age of 36.3 months. More boys were admitted, with a male to female ratio of 1.4:1. The majority of patients (8313, 78.9%) were aged <5 years. The mean duration of stay was 2.2 days. The major causes of admission were respiratory tract infections (3371, 32.0%), diarrheal disease (2339, 22.2%), protein-energy malnutrition (969, 9.2%), and infections (septicemia, meningitis, measles and tetanus) (885, 8.4%). The peak admissions period and mortality were in the months of January, May and December. Following assessment in the emergency unit, 4793 children were transferred to the pediatric unit, 4256 were discharged, 568 were discharged against medical advice and 116 were referred elsewhere. Over this period, 801 children died, giving a mortality rate of 7.6%.

Conclusions: The majority of the patients were boys and with age ranging <5 years. The infectious diseases (acute respiratory infections, diarrhea, septicemia, meningitis and tetanus) were the major causes of childhood admissions in our study. Therefore; more intensified efforts and health education to prevent and control infections in the northern region of Yemen, in order to reduce our child morbidity and mortality were needed.

INTRODUCTION

Emergency care of the Pediatric Department, Al-Salam Saudi Hospital (PDASH) in Sadah, Yemen is under great pressure. The number of patients attending Accident and Emergency (A&E) departments is at an all-time high, and demand for beds is also at record levels because it is the only tertiary free-charge hospital in this region. Children and young people (under the age of 15 years) make up almost the majority from the total patients attending Hospital Emergency Department. Their healthcare needs can be very different from adults as in USA (Kossarova and others, 2016). Their condition can deteriorate and improve rapidly, and often requires specialist advice and support.

The fundamental aim of the World Health Assembly

by the Millennium development goals is to improve the quality of life of individuals, and their survival through improved health care amongst others.¹ Emergency care especially for children is one of such services, which would improve their chances of survival.¹ Children Emergency unit/Room is a key area of service in every tertiary health institution where pediatric emergencies are handled with a high patient turnover.¹ Performance evaluation of pediatric emergency of a hospital, whether retrospectively or prospectively, should be periodically carried out as information obtained from such studies could give an insight into the existing services with aims of improving them. Monthly mortality meeting are held in this hospital, with hospital-mortality council reviewed all hospital mortalities.

Children and young people are more frequent users of Accident & Emergency than adults (A total patients 24502) of these 10535 children (43%) were admitted into the emergency ward over a one year period (30th of August 2014 till 31st August 2015).

Disease distribution is influenced by several factors.² The necessary elements for disease transmission are the existence of a susceptible population, a disease-causing organism and a means of transmission. Any change in the availability of these factors affects the prevalence or incidence of diseases in a community.² Analysis of hospital admissions will be helpful to fill the neonatal sepsis is an important cause of neonatal morbidity and mortality, particularly in developing countries.³⁻⁷ Most of the estimated 4 million neonatal deaths per year occur in low- and middle-income countries.⁸ The majority deaths of children <5 years occur in low-income countries, and almost 1 million are attributable to infectious causes, including neonatal sepsis, meningitis and pneumonia.^{4,5,9}

Hypothermia is an important determinant of the survival of newborns, especially among low-birth weight (LBW) babies.^{10,11} Prolonged cold injury leads to edema, scleroderma, general hemorrhage (especially pulmonary hemorrhage), jaundice and death.^{12,13} For instance, a study of 50 Iraqi children with hypothermia, showed that the majority of infants had evidence of infection, particularly septicemia. Various studies in

that country have shown that mortality and morbidity in hypothermic infants are mainly related to the presence or absence of an associated septicemia.¹⁴

Measles is a major childhood problem that is a serious medical concern in Africa, Latin America, Europe, South-East Asia and the eastern Mediterranean.¹⁵ In Africa, about 13 million cases and 650000 deaths occur annually, with sub-Saharan Africa having the highest morbidity and mortality (Muller et al., 1999).^{16,17}

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). The death toll of measles epidemics has been either under-reported or overblown by different media accounts.

Although the practice of pediatric emergency medicine is still in its infancy in developing countries, but it is a mature discipline in developed regions.¹⁸⁻²⁰ In Yemen, emergency medicine has undergone tremendous changes since the 1980s; however, a precise definition of the specialty and formal training, particularly in pediatric emergency medicine, are still to be developed.

Because of the large population and its distribution, access to and the quality of emergency care remain a significant challenge to the health care system in Yemen. No studies in this field carried out in children from Yemen have been published. Therefore, this study was carried out to determine the pattern and outcome of childhood illnesses seen in a pediatric emergency ward of a tertiary care center in the Sadah region, Yemen.

METHODS

A record-based retrospective study was carried out in Al-Salam Hospital between 30 August 2014 and 31 August 2015. It is sponsored by the Saudi medical health care services provider in Sadah, Yemen. It covers all specialties from maternity to geriatrics. About 50 beds of the total of 200 beds in the hospital are in the

pediatric unit and newborn nursery. The emergency unit contains about 23 beds (general intensive care unit, trauma room, hydration room and general observation room). The pediatric emergency room in Al-Salam Hospital is a working referral unit that provides 24-hour services, receiving all medical pediatric emergencies as well as patients requiring medical supervision and intervention (e.g. injections, intravenous fluids, etc.).

The areas covered by the services are the whole Sadah Governorate, Emran government and many nearby districts (e.g. Al Jawf, Marib and Hajjah).

Children presenting to the hospital as emergencies are first managed at the children's emergency ward (Ped ER), and either discharged when they are well or transferred to the children's ward when they are stable for continued management.

A diagnosis of septicemia was based on the presence of a positive blood culture and/or clinical findings. Pneumonia and other infectious diseases were diagnosed by the presence of positive clinical and/or laboratory findings. Any child with septicemia and a rectal temperature $<36^{\circ}\text{C}$ was considered to have septicemia with hypothermia. A diagnosis of diarrheal disease was based on a history of diarrhea with or without vomiting and abdominal pain. The diagnosis of measles and protein-energy malnutrition relied on the presence of positive clinical and/or laboratory findings. Other disease conditions were identified by their characteristic clinical-features. Measles-cases were ascertained using the standard WHO clinical case definition: any person presenting with a history of fever ($39-41^{\circ}\text{C}$), generalized maculopapular rash and one of the following, coryza, croup or conjunctivitis.^{16,17}

A confirmed case is one that is either laboratory confirmed or meets the clinical case definition and is epidemiologically linked to a confirmed case, Centers for Disease Control and Prevention (CDC) 2007, complications such as bronchopneumonia, gastroenteritis/diarrhoea, encephalitis, dehydration, heart failure and protein-energy malnutrition were attributed to measles if they occurred within 30 days of rash onset.

Statistical methods: The results were then formulated in tables and frequencies and percentages calculated.

RESULTS

The total number of patients seen for different reasons throughout the period of the study was 24502 patients. Of those, 10535 (43%) were admitted to the emergency pediatric ward. Their age ranged from 1 month to 15 years, with a mean age of 36.3 months. The records of children admitted to the pediatric ER were retrieved, reviewed and analyzed. The data extracted from the children's records included the age, sex, diagnoses, duration of stay and outcome. The outcome was classified as discharged, died, transferred to the pediatric wards, referred to another center or discharged against medical advice. The duration of stay of all patients was also obtained from the records, irrespective of outcome.

A total of 10535 children were admitted into the emergency ward over a 1-year period (30 August 2014 to 31 August 2015). Of these, 6163 (58.5%) were boys and 4372 (41.5%) were girls, with a male-to-female ratio of 1.4:1. The children ranged in age from 1 month to 15 years, with a mean age of 36.6 months, and 8313 (78.9%) were aged <5 years with 5963 (56.6% of the total) aged between 12 and 60 months, Tables 1 and 2.

The duration of admission ranged from 1 to 10 days, with a mean of 2.2 days. The most common causes of admission in this study were measles with complications (67.7%), respiratory tract infection (32%) and diarrheal diseases (22.2%). The highest discharge rate was among children with febrile seizures (55.7%), while the most common reason for referral was anemia with heart failure/dilated cardiomyopathy.

Age (months)	No. of patients	Males	Females	% of total
1-12	3603	2016	1587	34.2
12-60	4708	2825	1883	44.7
>60	2224	1322	902	21.1
Total	10535	6163	4372	100

Table 1. Relation of patient admission at Pediatric Emergency Unit to their gender and age group.

Disease/condition	Age				Total
	<1 year	1-2 years	3-4 years	>5 years	
Respiratory tract infection	811	980	507	1073	3371
Diarrheal disease/ acute renal failure	800	1131	83	324	2338
Protein-energy malnutrition	1321	476	207	165	2169
Febrile seizure	319	353	191	148	1011
Septicemia/ hypothermia	310	330	132	197	969
Measles (complications)	41	183	133	317	674
Others (sickle cell anemia, cerebral palsy, bronchial asthma, trauma and poisoning)	1	1	0	1	3
Total (%)	3603 (34.2)	3454 (32.8)	1253 (11.9)	2225 (21.1)	10535 (100)

Table 2. Relation of patient's disease to their age-group.

Out of the 568 (5.4% of the total) children discharged against medical advice (DAMA), 237 were girls and 331 were boys, giving a male-to-female ratio of 1.4:1.

Respiratory tract infections, diarrheal disease and protein-energy malnutrition were the most common presentations among those discharged against medical advice. Mostly were aged <5 years, and the proportion discharged against medical advice (5.4%) was the same for boys and girls, Table 4.

The mortality pattern, a total of 801 children died over the study period, giving an overall mortality rate of 7.6%; 415 were boys and 386 were girls, giving a male-to-female ratio of 1.1:1. The proportional mortality rate for boys was 415 (6.7%) and for girls was 386 (8.8%), but the differences between the sexes was not significant ($X^2=2.63$; $p=0.10$). Of the patients who died, 681 (85%) were aged <5 years; 403 (50.3%) were aged <1 year. In seasonal pattern of admissions, as shown in Figure 1, the month with the greatest number of admissions was December, followed by May and January, and mortality also peaked in these

Disease/condition	No. of discharges (%)	No. of deaths (%)	No. of admitted unit (%)	No. of DAMA (%)	Patient referred (%)	Total (%)
Respiratory tract infections	1615 (47.9)	155 (4.6)	1421 (42.2)	174 (5.2)	6 (0.2)	3371 (32)
Diarrheal disease/acute renal failure	1052 (45)	91 (3.9)	1046 (44.7)	150 (6.4)	0 (0.0)	2339 (22.2)
Others (sickle cell anemia, cerebellar palsy, bronchial asthma, trauma and poisoning)	390 (34.6)	37 (3.2)	587 (52.1)	84 (7.4)	29 (2.7)	1127 (10.7)
Protein-energy malnutrition	322 (33.3)	60 (6.2)	520 (53.7)	56 (5.6)	11 (1.2)	969 (9.2)
Infections (septicemia, meningitis and tetanus)	184 (20.9)	156 (17.6)	485 (54.7)	37 (4.1)	23 (2.7)	885 (8.4)
Septicemia/hypothermia	222 (33)	193 (28.6)	247 (36.7)	12 (1.8)	0 (0.0)	674 (6.4)
Anemia with heart failure/DCM*	196 (38.8)	36 (7.1)	202 (40)	25 (4.7)	47 (9.4)	506 (4.8)
Febrile seizure	264 (55%)	30 (6.3)	156 (32.9)	24 (5.1)	0 (0.0)	474 (4.5)
Measles (complications)	12 (6.5)	43 (22.6)	129 (67.7)	6 (3.2)	0 (0.0)	190 (1.8)
Total	4257 (40.4)	801 (7.59)	4793 (45.5)	568 (5.4)	116 (1.1)	10535 (100)

*DAMA: Discharged Against Medical Advised, DCM: Dilated Cardiomyopathy.

Table 3. Admission etiology and children mortality at pediatric emergency unit.

months. Children presenting with diarrheal diseases/ acute renal failure, infections (septicemia, meningitis and tetanus), septicemia with hypothermia and anemia with heart failure/DCM typically presented between the months of May and July, which is the peak of the rainy season, whereas respiratory tract infections and measles (and its complications) occurred predominantly in the cool season in December and January. Other disease conditions showed no significant monthly variation in occurrence or mortality.

DISCUSSION

This study has shown the common causes of morbidity and mortality among the children in a pediatric emergency ward of a tertiary care center in the Sadah region, Yemen. Infections of various types is the leading cause of morbidity and mortality, which is similar to previous reports on the leading cause of childhood illnesses and mortalities in Nigeria, Abakaliki.²¹⁻²³ WHO²⁴ recognize severe anemia, diarrheal diseases, and acute lower respiratory infections as the leading cause of childhood morbidities and mortalities, especially in the under 5 age group, and similar finding was made in current study. These infections, however, are preventable and/

or are curable with minimal cost if they are recognized early or if presentations to hospital are made early. The persistence of similar pattern of morbidities in this study to previous documentations maybe due to persistence of those factors, which increased risk for infections in childhood.

In other African countries such as Zambia,²⁵ Sierra Leone,²⁶ Ethiopia²⁷ and Mozambique.²⁸ Their reports²⁵⁻²⁸ also confirm that, bacterial infections like pneumonia, gastroenteritis and meningitis as major causes of childhood morbidity and mortality. This is similar to findings from a study conducted at the paediatric emergency department of a tertiary care teaching and referral hospital in Kabul, Afghanistan to assess the morbidity and mortality pattern of illness in paediatric population where the most common illnesses were diarrhoea and respiratory infections.²⁹

The male predominance of childhood admissions in this study is similar to findings by Abhulimhen-Iyoha and Okolo²² in Benin and Ibeziako, who reported a male-to-female ratio of 1.3: 1. Although the reason for this has not been established, it may be related to the increased biological vulnerability of males to infection.^{25,27,29}

Our finding that the majority of admissions were of children below the age of 5 years is similar to findings reported by Abhulimhen and Okolo in Benin (70.2%),²²

Okechukwu and Nwalozie in Abuja (80.1%)³⁰ and Bamgboye and Familusi³¹ in Ibadan, Nigeria (86.4%).

Disease/condition	No. of cases	No. of deaths	Case fatality rate (%)	% of those who died (n=801)	% of total admissions
Respiratory tract infections	3371	155	4.6	19.35	1.47
Diarrheal diseases/acute renal failure	2339	92	3.9	11.48	0.87
Others (sickle cell anemia, cerebral palsy, bronchial asthma, trauma and poisoning)	1127	36	3.2	4.49	0.34
Protein-energy malnutrition	969	60	6.2	7.48	0.56
Infections (septicemia, meningitis and tetanus)	885	156	17.6	19.4	1.48
Septicemia/hypothermia	674	193	28.6	24.0	1.83
Anemia with heart failure/DCM*	506	36	7.1	4.49	0.34
Febrile seizure	474	30	6.3	3.74	0.28
Measles (complications)	190	43	22.6	5.36	0.40

Table 4. Relation of gender and age with patient's DAMA, (n=568).

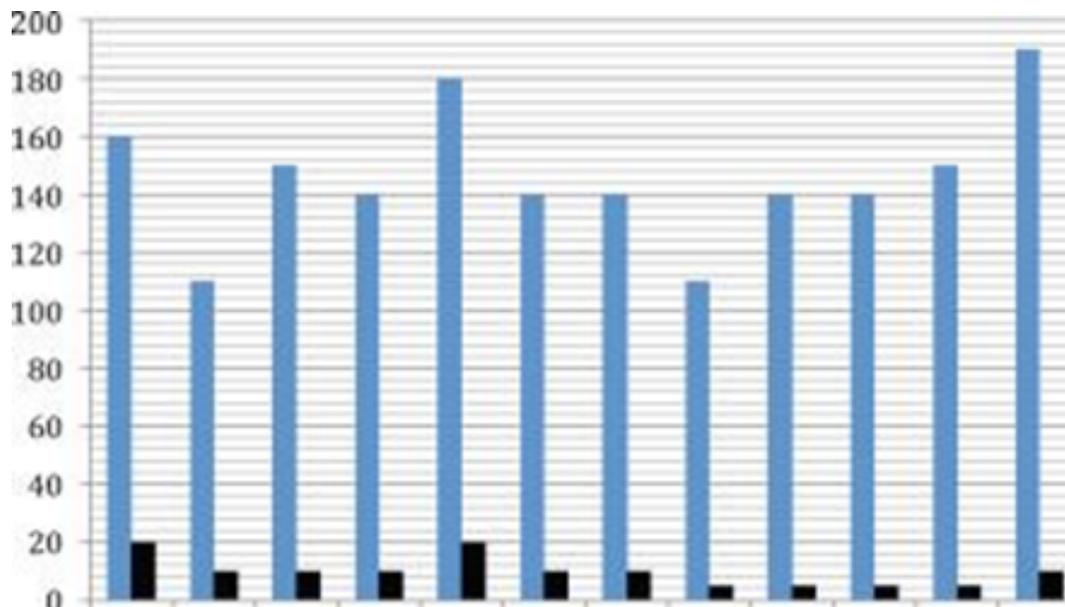


Figure 1. Monthly variation in number of admission.

Age (months)	No. of patients	No. of boys (%)	No. of girls (%)	% of total
1-12	193	108 (56.2)	85 (43.8)	34.0
12-60	260	151 (58.1)	109 (41.9)	45.8
>60	115	72 (63.15)	43 (36.85)	20.2
Total	568	331	237	100

Table 5. Patients outcome in 10535 admissions at Pediatric Emergency Unit.

This highlights the vulnerability of this age group and emphasizes the need to step up preventative and curative treatment. It has been shown that unsafe drinking water and poor environmental sanitation in this region of our country contribute significantly to childhood diarrhea during the summer.

Several traditional and modern methods have been previously suggested for the diagnosis of neonatal hypothermia. For instance, Singh et al,³² suggest using human touch as an assessment of a newborn baby’s temperature. Mothers, traditional birth attendants, nurses and physicians can be trained to assess a newborn’s temperature using this method, by touching the abdomen and feet. However, proper diagnosis usually requires a low-reading thermometer, lacking which the diagnosis can be suspected but is often missed. In the Himalayan part of north India, as well as in many Yemeni regions, a warm room for delivery and lying-in, early rooming-in, oil massage and layers of warm clothing are traditional means for thermoregulation.³³ However, recent studies from different parts of the world have shown a significant association between neonatal hypothermia and LBW, prematurity, a low Apgar score, delivery outside the hospital,³⁴ inadequate clothing after delivery, low maternal socioeconomic status and air temperature.³⁵⁻³⁸ And a link between hypothermia and neonatal mortality and morbidity is undeniable.

We found that the incidence of respiratory tract infections peaked in December and January, which agrees with the findings of Singh et al. Respiratory tract infections have also shown to be one of the major causes of mortality in children aged <5 years.³⁹⁻⁴¹

We found a good transfer rate out of the emergency

ward as well as a good discharge rate, similar to the findings of other studies in Nigeria.⁴²⁻⁴⁴

This study revealed an overall mortality rate of 7.6%, which is lower than the 8.4% reported by Razzak and Kellman, although they included neonatal mortality.⁴⁵ The reason for the higher mortality rate in our study is not immediately clear, but may be a result of environmental factors, as Adeboye et al. reported mortality in Nigerian hospitals located in urban centers; in contrast, our study hospital is located in a rural area of the northern region of Yemen. According to Mesike and Mojekwu⁴¹ the environmental risk factors account for one-fifth of the total disease burden in low-income countries.

Singh et al³² compared the outcome of pediatric emergency patients in an urban hospital and a rural hospital in India. They found that mortality was higher in the Rural area. Peak mortality occurred at the ages of 12-59 months, whereas in our study mortality was highest among infants aged 7-12 months (where we are unable to determine the causes of this high mortality); however, late presentation to the hospital and accessibility from most of the neighboring area is another challenge as the only source of transport from most of these communities is by car/foot owing to a lack of roads (and the roads that exist are difficult to use), poverty and neglect.

In this study the respiratory infections was 155/3371 gives mortality rate as 19.3%, which was less compare to same study done at Ethiopia⁴⁶ on 2002/3 which was 41.9%, but more once compare with Nigerian study on 2008 which was 10%, while diarrheal mortality diseases in our study was 92/2339 gives 11.4%, which is higher to that Ethiopian study 5.9%, but higher compare to Nigerian study 2008⁵¹ which was 5%. The malnutrition mortality rate in our study was 7.5%, which is more as to compare with Ethiopia 4.4% and Nigeria 2%.

To compare with similar study done in Nigeria Aba on 2008,⁴⁷ based on patients distribution by age-group, it showed our patients <1 year was 34.2%, between 1-5 years was 56.6%, those aged <5 years (total) was 56.6% and >5 years 21% were in Nigeria was 43.9%, 42.9% , 86.8% and 13.2% respectively.

On the bases of children admission and outcome; in our study, our total admission was 10535, our patient's discharge rate was 40.39%, our mortality rate 7.6 % out; 6.7% were males and 8.8% females, our DAMA was 5.4%, and patient's transferred was 45.49% compare to same study in Nigeria, Ebonyl State, 2012 it showed 1022, 66.6%, 10% out; 11.8% males and 7.4% females, DAMA was 3.8% and patient transferred was 19.6% respectively.⁴⁸ So late patient presentation to hospital, unavailable transportation, lack/difficult roads, poverty and neglect all could be a sharing similar factors between these two studies.

Finally, with other comparative similar study done in India,⁴⁹ in which total pediatric admission in Ped ER was 43800 (<our total number) out of that 42.1% was admitted (nearby our figures), and the main presentation to Ped ER was diarrhea and respiratory illnesses (23% each), which is similar to our diarrheal cases, but less in respiratory groups and their neonatal diseases only was 15.6% compare to our small infants <1 year was 34%. Moreover, in that Indian study they stat that 8 illnesses (Ac. diarrhea, respiratory infections, meningitis, seizures and neonatal sepsis) all comprise about half of all emergency visits which may similar to our observation.

Conflict of interest: There are no conflicts of interest.

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CONCLUSIONS

Infectious diseases are the major causes of childhood admissions in our study, so need more intensified efforts and health education to prevent and control infections (septicemia, meningitis and tetanus), acute respiratory infections and diarrhea in the northern region of Yemen that may reduce our child morbidity and mortality.

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