Original articles

Pattern of Neurological Disorders at Pediatric Outpatient Neurologic Services at Tikur Anbessa Specialized Hospital ................................................................. 1
Ayalew Moges, Sisay Gizaw, Getu Zenebe, Suresh Kotagal

Factors affecting physical growth amongst children with congenital heart disease: A case-control study in a tertiary cardiac care center In Ethiopia ................................................................. 10
Tamirat Moges, Etsegenet Gedlu, Tilahun Teka

Clinical Profile of children treated for Tuberculous meningitis at St. Paul’s and Yekatit 12 Memorial Hospitals in Addis Ababa: A Three Year Retrospective Cross-Sectional Analysis................................. 22
Debele Tolla, Solome Jebessa, Ephrem Lema

Patterns of chest X-ray findings in children with severe Pneumonia admitted to the department of Pediatrics and Child Health, Tikur Anbessa Specialized Hospital............................................. 34
Yalemwork Anteneh, Muluwork Tefera, Yocabel Gorfu

Case Report
Congenital Nasal Pyriform Aperture Stenosis................................................................. 43
Michael Tilahun

Instruction to Authors........................................................................................................ 47
The Ethiopian Journal of Pediatrics and Child Health aims to contribute towards the improvement of child health in developing countries, particularly in Ethiopia. The journal publishes original articles, reviews, case reports pertaining to health problems of children.

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### Table of contents

Pattern of Neurological Disorders at Pediatric Outpatient Neurologic Services at Tikur Anbessa Specialized Hospital ................................................................. 1  
*Ayalew Moges, Sisay Gizaw, Getu Zenebe, Suresh Kotagal*

Factors affecting physical growth amongst children with congenital heart disease: A case-control study in a tertiary cardiac care center In Ethiopia ......................................................... 10  
*Tamirat Moges, Etsegenet Gedlu, Tilahun Teka*

Clinical Profile of children treated for Tuberculous meningitis at St. Paul’s and Yekatit 12 Memorial Hospitals in Addis Ababa: A Three Year Retrospective Cross-Sectional Analysis…… 22  
*Debele Tola, Solome Jebessa, Ephrem Lema*

Patterns of chest X-ray findings in children with severe Pneumonia admitted to the department of Pediatrics and Child Health, Tikur Anbessa Specialized Hospital................................. 34  
*Yalemwork Anteneh, Muluwork Tefera, Yocabel Gorfu*

Case Report  
Congenital Nasal Pyriform Aperture Stenosis................................................................. 43  
*Michael Tilahun*

Instruction to Authors................................................................................................... 47
BACKGROUND: Description of the patterns of morbidity in a given population is an essential undertaking not only for healthcare finance planning & appropriation but also serves as a platform for additional analytical study. In this regard, studies about the patterns of pediatric neurologic morbidity are scarcely available in Africa.

AIMS OF STUDY: To describe the patterns of neurologic morbidities among patients attending the pediatric neurology clinic of TASH.

METHODS: 228 patients were selected using consecutive/ convenient sampling method over a period of eight weeks using the patient registration log book while they were attending their follow-up visits at the pediatric neurology clinic of TASH. Data abstraction forms were used to collect the data. Diagnoses were categorized based on the International Statistical Classification of Diseases and Related Health Problems version 10 (ICD-10). Descriptive statistics were used to analyze the results using SPSS version 16 software. Frequency (percentage) and mean ±2SD, with appropriate graphic display, were used for nominal/dichotomous and continuous interval variables respectively

RESULTS: The mean age for the sample was 63.7 (SD=48.4) months with a range of 2-192 months. Male sex contributed for 60.2% of the participants. Cerebral palsy (24.6%), Global developmental delay/mental retardation (21.5%), idiopathic epilepsy (13.2%), and CNS infections (12.7%) accounted for most of the morbidities seen in the pediatric neurology clinic of Tikur Anbessa Specialized Hospital.

CONCLUSION: This study showed the wide spectrum of pediatric neurologic disorders seen in a pediatric neurology clinic. Cerebral palsy was found to be the most common pediatric neurologic problem seen in the clinic followed by global developmental delay/mental retardation, idiopathic epilepsy, and CNS infections respectively. The neuro-rehabilitation services have to be strengthened to address the needs of these patients. Further institution and community based large-scale studies about childhood neurological disorders are required to be done in Ethiopia. So, this study can serve as a baseline.

KEYWORDS: neurological disorders.
given society is invaluable for rational utilization of medical resources, and facilitate individual patient management and public health intervention processes (2). The implications of epidemiologic morbidity data also extend to planning of resource allocation for medical education and research goals (3). The importance and utility of epidemiologic medical morbidity data is huge, and given unduly little emphasis in resource limited countries (4, 5). In particular, neurologic morbidity data are scarce and or outdated in most developing countries.

In a data compiled from 106 countries (covering 90\% of world population) the reported frequencies of neurologic disorders seen by specialists were almost similar across regions and economic groups of nations (3). Globally, epilepsy (92.5\%) and cerebrovascular diseases (84\%) followed by headache (including migraine) (61.3\%) are the top in the list of the diseases most frequently seen by a neurologist (3). Parkinson’s disease (46.2\%) and neuropathies (35.8\%) were the other major diseases encountered in specialist settings (3). However, this global neurologic morbidity data were not collected and calculated using stringent epidemiological research methods and slightly differ in reported prevalence from other local studies (5-7, 8).

In developing countries, the available studies on distribution and pattern of neurologic disorders, and factors that affect their characteristics are very few, and largely from hospital-based surveys. In this regard, an important neurologic morbidity data for developing nations was found in global surveys conducted under conjoint effort of the World Health Organization (WHO) and National Institutes of Health (NIH) (5). In this landmark survey reports there were indications to the overwhelming and increasing burden of neurologic disorders in the developing world (5). It had been pointed out taken together neurologic disorders in developing countries contributed to the largest proportion of the overall global burden of nervous system disorders (5). In one hospital-based study in Nigeria neurologic morbidities accounted for 15.6\% (604 out of 3,868) of hospital admissions (6). In another hospital-based study from Africa neurologic disorders contributed to 20-30\% of hospital bed occupancy (7). These few studies emphasized the need for an expansion and improvement of neurologic services in developing countries (3,5). The available resources including services for neurologic disorders are markedly insufficient with large inequities across regions and income groups of countries (3).
It is reasonably assumed that the profile and effects of neurologic disorders characteristically differ among adults and children, and requires an independent research enquiry for each population age-groups (9). As a matter of fact pediatric neurology is a separate and developing medical discipline with a distinctive demand for neuro-pediatricians and subspecializations (3, 10). Nonetheless, published epidemiologic morbidity data for pediatric neurologic disorders are even scarcer than for adult neurologic morbidities (6). In one study preventable infectious diseases were found to be the major causes of emergency neurologic morbidities and mortality among children five years of age and under (6). In this study febrile convulsion (35.1%), cerebral malaria (28.0%) and meningitis (27.0%) were the most common pediatric neurologic morbidities (6).

There are no available reports on the morbidity characteristics of patients seen at the outpatient pediatric neurologic services in Ethiopia. Similar scarcity of data is observed in most other African countries (11). The majority of studies of neurological disorders in Africa are done in adults (7, 9,11). Therefore, there is a need for additional descriptive data on morbidity patterns of pediatric neurologic disorders in developing countries like Ethiopia. It will not only help in rationale allocation of the meager health resources available but also in the design of future analytic studies.

There are only four Pediatric neurologists in Ethiopia with a population of more than 90 million among which under 15 children account for about 44% of all population. This also has a significant impact in the care of children with neurological disorders. Assessing the pattern and magnitude of neurological morbidities in a population is an important step for appropriate medical resource utilization and rational practice of clinical neurologic care. There is no study describing the patterns of pediatric neurologic diseases and disorders in outpatient neurology services in Addis Ababa. Having the basic neurologic morbidity data in these setups will have multifaceted constructive utilities. Particularly, it gives an understanding of the extents of use of standard neurologic diagnostic procedures, and paves the way for evidence based service improvement. This study described the patterns of pediatric neurologic disorders in a pediatric neurology clinic at Tikur Anbessa Specialized Hospital (TASH), Addis Ababa, Ethiopia.

**METHODS**

**STUDY SETTING:** This survey was performed at pediatric neurology clinic of TASH, Addis Ababa, Ethiopia in January and February 2013. TASH is located in the capital city, Addis Ababa, and serving as a teaching center for College of Health Sciences, Addis Ababa University. The pediatrics neurology clinic is under the Department of Pediatrics and Child Health (DPCH), College of
Tuesday afternoons and provides follow-up care to an average of 30 patients per clinic session. It receives all pediatric neurologic patients evaluated at DPCH who requires follow-up neurologic care (except pediatric patients with only seizure/epilepsy who are evaluated at the pediatric seizure clinic every Thursday afternoons.) The DPCH has medical record keeping and card room separate from other departments and units of TASH. TASH routinely provides common hematologic, serum chemistry, parasitological, microbiologic, immunologic laboratory tests and imaging studies. Neuroimaging studies and electrodiagnostic services (such as Electroencephalography, electromyography, nerve conduction studies) are available at TASH but the electrodiagnostic services give service mainly for adult patients only as they are under adult neurology clinic. Pediatric patients with neurological disorders get these services from private in institutions and other governmental institutions in Addis Ababa.

**STUDY POPULATION:** The survey study population incorporates all patients attending the pediatric neurology clinic of TASH.

**STUDY DESIGN and SAMPLING STRATEGY:** This is a descriptive cross-sectional institution based study done by chart review. Patients were consecutively sampled over a period of eight weeks using the patient registration log book while attending their follow-up visits at the pediatric neurology clinic of TASH.

**DATA COLLECTION TOOLS AND PROCEDURE:** Data were collected using data abstraction form with review of the information available on their treatment charts by Pediatric residents and verified by attending pediatric neurologist.

In the pediatric neurologic clinic a data abstraction form was used for data collection. The data included basic patient (and family characteristics), description of neurologic diagnosis or diagnoses, modes of diagnosis ascertainment process and other related information. Every sampled patient will have a filled data abstraction form by the attending physician (pediatric resident) at the end of each clinical encounter. The data collection process was also monitored by collaborating pediatric residents and investigators.

**STATISTICAL ANALYSIS:** Data were organized and prepared on a spreadsheet. Diagnoses were categorized based on the International Statistical Classification of Diseases and Related Health Problems version 10 (ICD-10) (13). All statistical tests were run on SPSS for Windows version 16.0 software. Frequency (percentage) and mean ±2SD, with appropriate graphic display, were used for nominal/dichotomous and continuous interval variables respectively.

**RESULTS:** The 230 patients in this survey were consecutively sampled during a continuous 8 week period in 2014 from registration log book. Two (0.9%) patients were excluded as their data were incomplete. Two-.
hundred twenty-eight (99.1%) patients were included in the study.

Participants ranged 2-192 months of age with a mean of 63.7 (SD=48.4) months. 60.2% (136 of 228) of the patients were male. 59.2% (135 of 228) of the patients were residents of the capital city Addis Ababa. Overall global developmental delay (mental retardation), cerebral palsy, idiopathic epilepsy, and infectious diseases contributed to the majority of morbidities observed in the clinic, accounting for 72.0% of the cases.

Table 1 depicts the distribution of the neurologic morbidity among the sampled patients. Among cerebral palsy patients, the proportion of subtypes were Spastic hemiplegic 30.4% (17 of 56), spastic quadriparetic 8.9% (5 of 56), Spastic diplegic 5.4% (3 of 56), extrapyramidal (dyskinetic) 7.1% (4 of 56) and cerebral palsy of unspecified type accounted for 48.2% (27 of 56). Symptomatic and/or idiopathic seizure occurred in 45.6% (104 of 228) patients.

Table 1: Frequencies of neurological disorders at pediatric neurology clinic at Tikur Anbessa Specialized Hospital.

<table>
<thead>
<tr>
<th>Diseases' Category</th>
<th>Number</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cerebral palsy</td>
<td>56</td>
<td>24.6</td>
</tr>
<tr>
<td>Global developmental delay (MR)</td>
<td>49</td>
<td>21.5</td>
</tr>
<tr>
<td>Idiopathic epilepsy</td>
<td>30</td>
<td>13.2</td>
</tr>
<tr>
<td>Central nervous system (CNS) infection</td>
<td>29</td>
<td>12.7</td>
</tr>
<tr>
<td>Disorders of the peripheral nervous system</td>
<td>15</td>
<td>6.6</td>
</tr>
<tr>
<td>Injury to the nervous system</td>
<td>13</td>
<td>5.7</td>
</tr>
<tr>
<td>Congenital malformation of CNS</td>
<td>11</td>
<td>4.8</td>
</tr>
<tr>
<td>Extrapyramidal disorders</td>
<td>6</td>
<td>2.6</td>
</tr>
<tr>
<td>Other paralytic disorder</td>
<td>6</td>
<td>2.6</td>
</tr>
<tr>
<td>Intracranial tumors</td>
<td>3</td>
<td>1.3</td>
</tr>
<tr>
<td>Generalized tetanus</td>
<td>2</td>
<td>0.9</td>
</tr>
<tr>
<td>Other disorders</td>
<td>8</td>
<td>3.5</td>
</tr>
</tbody>
</table>

Table-2 shows etiologies of the commonest neurologic morbidities seen at the pediatric neurology clinic of TASH. Etiology was not identified in 66.1% of cerebral palsy cases and in 59.2% of cases of global developmental delay/Mental retardation. Idiopathic epilepsy accounts for 28.8% of children with seizure disorder seen in the clinic. Neonatal etiologies and congenital etiologies accounted for 14.3% & 19.6% cases of
cerebral palsy respectively (total of 33.9%). Some of these etiologies like perinatal asphyxia are preventable causes.

Table 2: Etiologies of the commonest neurological disorders at pediatric neurology clinic at Tikur Anbessa Specialized Hospital.

<table>
<thead>
<tr>
<th>Diseases' Category</th>
<th>Number</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cerebral palsy</td>
<td>56</td>
<td></td>
</tr>
<tr>
<td>Unknown etiology</td>
<td>37</td>
<td>66.1</td>
</tr>
<tr>
<td>Neonatal etiology</td>
<td>8</td>
<td>14.3</td>
</tr>
<tr>
<td>Congenital etiology</td>
<td>11</td>
<td>19.6</td>
</tr>
<tr>
<td>Global developmental delay (MR)</td>
<td>49</td>
<td></td>
</tr>
<tr>
<td>Unknown etiology</td>
<td>29</td>
<td>59.2</td>
</tr>
<tr>
<td>Neonatal etiology</td>
<td>6</td>
<td>12.2</td>
</tr>
<tr>
<td>Congenital etiology</td>
<td>9</td>
<td>18.4</td>
</tr>
<tr>
<td>Down syndrome</td>
<td>5</td>
<td>10.2</td>
</tr>
<tr>
<td>Seizure disorders</td>
<td>104</td>
<td></td>
</tr>
<tr>
<td>Idiopathic epilepsy</td>
<td>30</td>
<td>28.8</td>
</tr>
<tr>
<td>Cerebral palsy</td>
<td>28</td>
<td>26.9</td>
</tr>
<tr>
<td>Global developmental delay</td>
<td>24</td>
<td>23.1</td>
</tr>
<tr>
<td>Post-CNS infection</td>
<td>13</td>
<td>12.5</td>
</tr>
<tr>
<td>Intracranial tumors</td>
<td>2</td>
<td>1.9</td>
</tr>
<tr>
<td>Post-traumatic</td>
<td>3</td>
<td>2.9</td>
</tr>
<tr>
<td>Others*</td>
<td>4</td>
<td>3.9</td>
</tr>
<tr>
<td>Central nervous system (CNS)</td>
<td>29</td>
<td></td>
</tr>
<tr>
<td>Pyogenic meningitis</td>
<td>13</td>
<td>44.8</td>
</tr>
<tr>
<td>Tuberculous meningitis</td>
<td>2</td>
<td>6.9</td>
</tr>
<tr>
<td>Intracranial tuberculoma</td>
<td>9</td>
<td>31.1</td>
</tr>
<tr>
<td>Encephalomenigitis</td>
<td>5</td>
<td>17.2</td>
</tr>
</tbody>
</table>

**DISCUSSION:** Our study demonstrated that cerebral palsy (24.6 %), global developmental delay/mental retardation (21.5%), idiopathic epilepsy (13.2%), and CNS infections (12.7 %) contributed to the majority of morbidities observed in pediatric neurology clinic of TASH, accounting for 72.0 % of all cases (144 of 228). These childhood neurological disorders like cerebral palsy and global developmental delay/mental retardation need a long-term management and follow up not only with a
pediatrician/pediatric neurologist but also with a team of health professional comprising of speech/language pathologists, occupational therapists, physiotherapists, clinical psychologists, child psychiatrists, ophthalmologists and ENT specialists. To this effect, one needs to have a neuro-rehabilitation unit/center, which is not the case here in Ethiopia, for proper management and follow up of these children.

In our study, seizure disorders (both idiopathic and secondary) alone or as comorbidity, were found in 45.6% of all cases (104 of 228 cases) among which 28.8% (30 of 104) were idiopathic and 71.2% (74 of 104) were secondary to other disorders. This shows that nearly half of the children at follow up in our pediatric neurology clinic have seizure disorders. Some of the causes of seizure disorders in these children were preventable causes such as CNS infections, trauma, and perinatal asphyxia.

This was somehow similar to the study done in Eritrea by Z.ogbe et al (11) where the commonest neurologic disorders were epilepsy 25.9%, cerebral palsy 19.3%, post febrile illness neuro problems 12.5%, speech and language problems 10.9% and mental retardation including Down syndrome 10.7%.

Our finding was also similar to a study done in Port Harcourt, Nigeria by A. I. Frank-Briggs et al (1) where the most frequent pediatric neurological disorders were epilepsy (24.6%), cerebral palsy (15.4%), and central nervous system infections (9.5%), microcephaly (7.6%) and mental retardation (7.2%).

The major difference of our study from the above two studies (1, 11) was that the proportion of patients with seizure disorders and global developmental delay/mental retardation was very high and that of cerebral palsy was relatively higher.

Our study also showed that 66.1% (37 of 56) of cases of cerebral palsy, 59.2% (29 of 49) of cases of global developmental delay/mental retardation and 28.8% (30 of 104) of cases who had seizure disorders were of unknown etiology. In a study done in an outpatient pediatric physiotherapy unit of a Nigerian Tertiary hospital by Omole J.O. et al (12) cerebral palsy accounted for the highest rate (50.3%) of cases referred for physiotherapy among which only 9.5% (14 of 148) of cerebral palsy cases had unknown cause.

Similarly, the higher proportion of children with global developmental delay/mental retardation and seizure disorders in this study were of unknown etiology as stated above. This shows the lack of diagnostic investigations or detailed history/physical examination or search for causes of common childhood neurological disorders in our setting. In most cases the patients may not afford even for the locally available investigations (PI’s observation).
CONCLUSION

Our survey demonstrated the wide spectrum of pediatric neurologic disorders seen in our setting. It has illustrated the challenges in diagnostic investigation of pediatric neurologic patients in resource limited settings like ours. It also generated a research question for further studies to identify possible preventable causes of cerebral palsy, global developmental delay/mental retardation and symptomatic seizures in our setting so as to prevent these long term neurologic disorders which have huge impact on the patient, family and our country in general.

The unique feature of this study is the high prevalence of seizure disorders, global developmental delay/mental retardation and cerebral palsy which calls for further community based large scale studies of these.

ACKNOWLEDGEMENT

We thank the patients and their parents/care takers for cooperating and providing information in our preparation of this report.

We also thank the pediatric residents who participated in data collection process and the pediatric nurses who helped us in facilitating the questionnaire administration and collection.

COMPETING INTEREST AND FUNDING

The survey protocol was approved by the Addis Ababa University School of Medicine, College of Health Sciences, Institutional Review Board. None of the authors have any relevant disclosures.

REFERENCES


ORIGINAL ARTICLE

FACTORS AFFECTING PHYSICAL GROWTH AMONGST CHILDREN WITH CONGENITAL HEART DISEASE: A CASE-CONTROL STUDY IN A TERTIARY CARDIAC CARE CENTER IN ETHIOPIA

Tamirat Moges 1, Etsegenet Gedlu 2, Tilahun Teka 3

ABSTRACT

Introduction: Children of sub-Saharan African (SSA) born with congenital heart disease (CHD) in whom corrective surgery is not done may suffer poor physical growth either due to the prevalent undernutrition in the region or the effect of their cardiac disease. The current study aimed to see factors of poor physical growth among these group.

Objective: to determine factors of poor growth among children with un-corrected congenital heart disease.

Materials and methods: this is a case-control study conducted in a tertiary pediatric cardiac care center in Addis Ababa. The study subjects were CHD cases with affected growth parameters while the controls were: CHD cases with normal growth parameter. Data were analyzed using SPSS and WHO ANTHRO software.

Results: The median age was 42 months. Stunting, underweight and wasting occurred in 52%, 79% and 62% respectively. Odds of exposure to low socioeconomic class, congestive heart failure, pulmonary hypertension, recurrent chest infection, cyanosis, were significantly higher in cases than in controls with p-value < .004, <.001, <.000, < .006, and <.025 respectively. When regression analysis were made on binary logistic model, only congestive heart failure (<.04), recurrent chest infection (<.04) and low socioeconomic class (< 0.01) remain significantly associated.

Conclusion and recommendation: hemodynamic factors of un-corrected cardiac disease and being low socioeconomic class remain factors of poor physical growth in children with congenital heart disease. Circumventing severe growth failure in children with CHD is a call for urgent action. Key words: congenital heart disease, Growth Failure, Congestive heart Failure, pulmonary hypertension, physical growth

INTRODUCTION

Congenial heart disease is a structural abnormality of the heart a child may be born with. Infants and children with Congenital Heart Disease (CHD), appear to have increased prevalence of malnutrition and growth failure. The cause of growth retardation in CHD is multifactorial; however, inadequate caloric intake is reported to be the most important cause of growth failure (1,2).
Patients with congenital heart disease may have increased mortality postoperatively in relation to infection and malnutrition when hypo-albuminemia and impaired cell-mediated immunity increases rates of clinical infection (3,4,5). In patients with congenital heart disease, malnutrition affects also emotional and behavioral responses, leading to apathy, which impairs functional recovery and further leads to anorexia. The cost to health care is also increased because of prolonged intensive care unit and hospital stays (6).

The pattern of malnutrition in CHD varies as reported by different authors. Bashir reported that stunting was proportionately higher in acyanotic CHD cases than in cyanotic once, while wasting was predominantly reported in the latter. Diametrically, Meherizi and Drash from Turkey reported that wasting is more common in acyanotic CHD (7,8,2,9).

Approach to patients with CHD-related malnutrition, were suggested by many. Balu et al recommended that irrespective of severity of CHD-related malnutrition, direct corrective intervention of cases as early as possible (10). On the other hand reports from the developed countries recommend prior intensive preoperative nutritional supplementation in order to optimize good operative outcome (11). By the same token, B.Varan indicated that delay in surgical repair of congenital heart lesions may produce worsening of malnutrition proportionately to the delay in intervention (12).

Incidence of CHD-related malnutrition varies in different countries and ranges from 27% to 90.4% (7). In Ethiopia the prevalence of poor physical growth and factors that determine poor physical growth in children with congenital heart disease has not yet been reported.

The objective of our study is to determine factors of poor physical growth among infants and children with un operated congenital heart disease.

MATERIALS AND METHODS

STUDY DESIGN: This was a case-control study, comparing Paediatric patients with and without poor physical growth with in a population of children having symptomatic congenital heart disease in the year November 2014 to March 2015.

Setting: The study was conducted within the department of paediatrics congenital paediatric cardiac clinic of TikurAnbessa Hospital in Addis Ababa. The clinic gives service five days per week, and provides care to 1500-2500 cases of CHD annually.

Study subjects: Cases and controls were selected from the population of CHD patients aged from 1 month to 14 years, who were under follow up in the clinic. Sample size was calculated based on the standard formula for case-control study. In order to calculate the proportion of cases exposed we used prevalence of stunting in hospital visiting children as proportion of controls exposed. After getting the proportion of controls and cases exposed, we calculated sample size to be 293, (146 cases and 147 controls).
Cases were selected from consecutive follow-up list only if they fulfill the inclusion criteria. For each case, age and sex matched controls were selected from consecutive follow-up cases of CHD based on the inclusion criteria for controls.

Sample size calculation is done by the sample size calculation method for case-control study based on the standard recommendation (13).

According to a national nutritional survey in underfive children in Ethiopia, the prevalence of stunting is stated to be 44 % (10). Another hospital data among hospitalized malnourished children done at Zewditu Memorial Hospital showed that stunting occurred in 69% of hospitalized malnourished children ((14). Both data may not be representative of stunting in hospital visiting children, the first represents data in the general population, the second represents data of severely malnourished cases. So we opted to use the average of the national and the hospital data.

Inclusion criteria for cases: congenital heart disease cases with growth affection where a weight-for-age or a height-for-age parameter falls < 5th percentile on the WHO/CDC growth curves.

Inclusion criteria for Controls: CHD cases with un-affected growth parameter, age and sex matched congenital heart disease) where weight-for-age and height-for-age falls >15th percentile on the WHO/CDC growth curves.

Exclusion criteria: Infants with a history of prematurity, known genetic malformations, dysmorphic features and neurologic disability, catheter or surgically palliated cases, HIV infection, active tuberculosis, syndromic anomalies, chronic illnesses other than CHD associated with visible/demonstrable oedema, and any serious on going acute illness requiring hospitalization were excluded.

Data were collected using questionnaires forms which were developed using survey monkey tool for congenital heart disease (15). They were modified to fit the desired purpose. Each questionnaire was appropriately pretested to determine appropriate information. Nurses with advanced diploma and BSc degree were trained on how to fill questionnaire forms and how to appropriately measure anthropometric data. Detail history of cardiac illnesses, information on socio-demographic profile, nutritional history, family history of cardiac and other illness were inquired. Questionnaires on sosocio-economic class were constructed on the basis of Kappuwamys recommendation for urban population after modification to suite our own condition (16). The socioeconomic status was classified in to upper (16-25), Middle (upper middle (11-15), and lower middle (5-10) Lower class (<5). Socioeconomic status Scales are based on three major Social variables (parental education, parental occupation and Family income) each of these variables again were re- categorized in to 7 grades.
Each of these 7 grades was given a score. The total scores from each major social variable were added up to give the final grade which determines the socio-economic status (16, 17). Adequacy of breast feeding was assessed based on the integrated management of newborn and child illness (IMNCI) feeding guideline (18). Data collectors feel the nutritional assessment checklist. Finally the pediatrician decides weather nutritional history is adequate or not. Data were entered into SPSS Version 20 New york USA soft ware, (19) and were validated by manual proof reading. The data were described using simple summary statistics. Standardized Z score values of anthropometric measurements were generated using the WHO ANTHRO version 1.01 software package. Binary logistic regression analysis model was used to test associations of independent variables (patient characteristics) with the presence or absence of growth failure, as outcome variable. Odds ratios with their corresponding 95% confidence intervals (CI) were calculated. Results were considered statistically significant when p value < 0.05.

Operational definition: Stunting, wasting and underweight is defined as WHO z-score for Height for age (HAZ) weight for age (WAZ), weight for height (WHZ). Moderate malnutrition is defined when Z-score value falls < -2SD from the mean re-

Inadequate nutritional history is defined as any one or more inappropriate feeding practice present for that particular age as listed on the assessment form. Ethics approval: The study was approved by the Institutional Review Board (IRB) of College of Health Sciences of Addis Ababa University. Before data collection, parents of patients were given consent form to give their willingness of participation in the study. Patients above the age of 7 year were also asked for assent.

Results
Two hundred ninety three cases were enrolled. Cases were congenital heart disease patients with growth affection where a weight-for-age or a height-for-age parameter falls < 5th percentile on the WHO/CDC growth curves. Controls are CHD cases with un-affected growth parameter, age and sex matched congenital heart disease where weight-for-age and height-for-age falls >15th percentile on the WHO/CDC growth curves.

Age ranged from 1month to 170 months with median age of 42 months (IQR 17-84 months). Female sex accounted for 53%. Sixty-Seven percent of the cases were under five years of age. Fifty one percent of cases were from Addis Ababa. Sixty-seven percent of study subjects came from lower socioeconomic class. Figure 1 showed the age distribution of study subjects, displaying a
skewed curve towards younger age groups. The pattern of the prevalence of wasting, underweight and stunting in the cases is displayed in Figure 2 thus severe form of wasting, underweight and stunting accounted for 21, 41 and 29 cases respectively while moderate wasting, underweight and stunting accounted for 70, 75 and 48 of the cases respectively. Figure 3 showed the relative frequency of congenital heart diseases in all study subjects thus the commonest acyanotic CHD were VSD followed by PDA and ASD respectively.

Figure 1 - the age distribution of study subjects, displaying a skewed curve towards younger age groups. Poor physical growth in children with congenital heart disease at Tikur Anbessa Specialized Hospital 2017.
Figure 2 - The pattern of the prevalence of wasting, underweight and stunting in the cases, poor physical growth in children with Congenital heart disease at Tikur Anbessa Specialized Hospital 2017.

Figure 3 - Pattern of congenital heart disease in all study subjects, Tikur Anbessa specialized hospital 2017.
Table 1: Showed the relation-ship between exposure and outcome factors. Accordingly congestive heart failure, pulmonary hypertension, recurrent chest infections, cyanosis, poor feeding practice and low socioeconomic class appeared to be significant risk factors for development of poor physical growth ($P < .0018$, $P < .000$, $P < .006$, $P < .025$, $P < .004$, $P < .004$ respectively. The commonest cyanotic CHD were Tetralogy of Fallot followed by D-transposition of the great arteries (D-TGA).

Table 1—Association between exposure and an outcome factor, poor physical growth in children with congenital heart disease at TikurAnbessa specialized hospital 2017.

<table>
<thead>
<tr>
<th>Exposure factor</th>
<th>Cases</th>
<th>Controls</th>
<th>Odds ratio with 95% CI</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Congestive heart failure</td>
<td>yes</td>
<td>25</td>
<td>3.765 (95% CI-1.639-8.648)</td>
<td>&lt;.0018</td>
</tr>
<tr>
<td></td>
<td>no</td>
<td>122</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pulmonary hypertension</td>
<td>yes</td>
<td>46</td>
<td>3.143 (95% CI-1.872-5.275)</td>
<td>&lt;.000</td>
</tr>
<tr>
<td></td>
<td>no</td>
<td>101</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recurrent chest infections</td>
<td>yes</td>
<td>90</td>
<td>1.913 (95% CI-1.202-3.047)</td>
<td>&lt;.006</td>
</tr>
<tr>
<td></td>
<td>no</td>
<td>57</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cyanosis</td>
<td>yes</td>
<td>45</td>
<td>1.859 (95% CI-1.082-3.194)</td>
<td>&lt;.025</td>
</tr>
<tr>
<td></td>
<td>no</td>
<td>102</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Feeding practice</td>
<td>adequate</td>
<td>96</td>
<td>1.973 (95% CI-1.232-3.161)</td>
<td>&lt;.004</td>
</tr>
<tr>
<td></td>
<td>Inadequate</td>
<td>50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low socioeconomic class</td>
<td>yes</td>
<td>111</td>
<td>2.091 (95% CI-1.267-3.449)</td>
<td>&lt;.004</td>
</tr>
<tr>
<td></td>
<td>no</td>
<td>36</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Congestive heart Failure is defined in the presence of tachypnea, tachycardia, tender hepatomegaly and cardiomegaly. (SI. 1996) Pulmonary hypertension is defined when trans tricuspid pressure gradient (VTR ) is $> 3.4m/s$ plus Mean RAP and/or PASP $>50mmHg$ on Doppler echocardiography (Susanna Sciomer 2005, Echocardiography 2014). Recurrent chest infection was defined when more than two episodes of pneumonia diagnosis was made in one year or three episode in any time frame.
DISCUSSION
The present study showed that low socioeconomic class, congestive heart failure, pulmonary hypertension, recurrent chest infection, and cyanosis affect growth status significantly. Unlike previous studies on the topic, this study showed socioeconomic status to be a strong predictor of poor physical growth in addition to the well known hemodynamic factors.
Most other studies compared children with CHD to healthy controls to compare prevalence of malnutrition (12). Still others compared pre- versus post-surgical intervention prevalence of malnutrition. The current study may represent the situation in the general population in view of the fact that study subjects came from all corners of the country. Although we have not used paired matching, study subjects were controlled for underlying cardiac disease, by age and sex matching.
The current study shared many similar findings in common with the previous reports. For example B. varan reported that Pulmonary hypertension appears to be most important factor, and cyanotic patients with pulmonary hypertension are the once most severely affected. We demonstrated the significance of cyanosis and pulmonary hypertension in the current report too. Shrivastava similarly reported that cyanosis is important determinant factor of growth failure in children with CHD (12, 21).

The current study differs in some of the findings with others, for example Christy AN Okromah from Nigeria reported Wasting to be more common in acyanotic CHD, while stunting in cyanotic CHD cases. Mohamed D also reported that wasting is affected more in acyanotic CHD (17,22) On the other hand IM Mitchell reported that children with congenital heart disease are frequently undernourished, irrespective of the nature of cardiac defect or presence or absence of cyanosis (23).
Cameron et al reported that left sided heart obstruction makes infants with CHD at high risk of malnutrition. We have not seen significant difference in growth due to left side heart obstruction. Mohamed Dallil from Iran reported lower weight in female sex and in those with cyanosis. We have not seen this effect in the current study may be because we have matched study participants for gender effect (17). It was reported that patients with acyanotic congenital heart disease, especially large left to-right shunts and pulmonary hypertension cases, had a greater growth deficit in weight, and those with cyanotic heart disease had a greater growth deficit in stature as demonstrated by both decreased height and weight (24).
In the current study the mean age of study subjects at diagnosis is 42 months. This is in contrast to most reports where mean age was less than 24 months. This implies that case are diagnosed so late in our setting (7, 12, 25,26,27).
Congestive heart failure (CHF) has been described as predictor of malnutrition by various investigators. The prevalence of CHF in the current review is significant. The whole mark of CHF is low cardiac output which is necessary for various body functions. In children with heart failure there is increased energy expenditure because of increased respiratory work and increased cardiac activity. In the face of low cardiac output such increased energy expenditure results in compensatory catabolic state. In addition patients with CHF have generally reduced appetite, poor oral intake, and poor intestinal absorption. In poor communities like ours where intake of fat and energy food is not optimal, the problem of poor oral intake made things worse.

Nearly a quarter of cases had pulmonary hypertension in the current study. The mechanism how pulmonary hypertension cause malnutrition is not yet established. However the reduced pulmonary blood flow especially in severe pulmonary hypertension significantly reduce the diastolic filling in the left side of the heart resulting in low cardiac output. The concomitant presence of hypoxia in severe pulmonary hypertension and subsequent release of hypoxia induced cytokines may reducing appetite and decrease in oral intake (28).

Low socio-economic status, significantly affected growth status in the current study. It was reported in one study, that the nutritional status of children from lower socio economic class was poor as compared to their counter parts in upper socio economic class (4). Infants born to low social class are less privileged to get food rich in fat and high protein. Minerals and vitamins are essential for maintaining the immune status of a child together with positive nitrogen balance. In low income families getting high protein diet as well as vegetables and mineral is not considered a priority. Poor parents give their children diluted, energy poor diet, often with out protein. Such infants are not only suffering from inadequate calories but also are prone to recurrent infections owing to hypoalbuminmnia and other immunoglobulin’s.

Living in crowded and unhygienic environment, which is common in low socioeconomic families, contributes to frequent and severe infection. Thus in low socioeconomic families management of a child’s feeding with congenital heart disease is difficult. In the present study, recurrent chest infection occurred in fifty-three percent of subjects and was significantly associated with poor physical growth. It was suggested that in large left to right shunting of blood, via a septal defect or the arterial duct, there is pulmonary over circulation and pulmonary edema. The pulmonary edema often becomes a nidus of infection for the lower respiratory tract (29).

CHD-cases with frequent chest infections are often anorexic, in increased metabolic rate. They are in catabolic state in order to generate energy for an increased energy requirement in state of cardiac failure. In the absence of supplementary feeding with high caloric diet or fat, they run in to severe
growth failure fast. Reports showed that different serum proteins level, have been low in cases of CHD with growth failure (30). However we have not looked for such data in the current study.

As limitation of this review we noticed that study subjects were not selected on random bases. Instead, we took consecutive subjects during their routine follow up visit. Confounding factors like un-matching of cases by severity and by specific type of lesions might affect the quality of the study. As a case control study, it is also prone to recall bias.

**Conclusion:** factors affecting physical growth among children with congenital heart diseases in our setting were not limited to hemodynamic factors such as CHF, PHT, Recurrent chest infection or cyanosis but also includes the level of low socio-economic class where adequate food consumption is not secured and infection rate is high.

Conflict of interest: The authors have no conflict of interest

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**REFERENCE**


5. LEE KB. Pediatric Cardiac Surgery in Developing Countries of Africa: Current State and Future Direction. The University of Texas Southwestern Medical Center International Medical Exchange Program 2012-2013.


INTRODUCTION

Globally about one-third of the world’s population is infected with mycobacterium tuberculosis (MTB). These individuals carry a lifetime risk of 10% for the development of active TB disease [1]. The risk of TB disease development is very high, especially in young children. The risk of progression to TB disease is about 50% in infants, 20-30% in Children 1-2 years, 5% in those 3-5 years, 2% in those 5-10 years and about 5% in older children in their life time [2]. In children with HIV the risk is even higher (about 10% annually) [2]. Young children are also more likely to develop the most severe forms of TB such as TB meningitis and Miliary TB.

Conclusion: Tuberculous meningitis continued to be a cause of significant sequel and mortality in children. Stage of TBM at presentation, increased intracranial pressure (ICP) and altered mentation on presentation has statically significant association with sequel on discharge while altered mentation on presentation has statically significant association with mortality.

REFERENCES

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In 2015, there were an estimated 10.4 million new TB cases worldwide, of which 1.0 million (10%) were among children. People living with HIV accounted for 1.2 million (11%) of all new TB cases [3]. There are currently no estimates of the number of children that develop TB meningitis worldwide or that die from the disease, largely due to difficulties with diagnosis [20]. Roughly about 1% of all TB diseases develop tuberculous meningitis [6].

Methodology
The objective of this study is to assess the clinical outcome and presenting characteristics in children admitted with TBM to SPHMMC and Yekatit 12 Memorial Hospital Medical College from July 1, 2014 – June 30, 2017GC. A retrospective cross-sectional study was designed and analyzed the charts of pediatric patients admitted during the above period. Tuberculous meningitis case definition is classified as Definite TBM if AFB seen on cerebrospinal fluid (CSF) microscopy or MTB detected by Gene Xpert or culture from CSF; Probable TBM if total score of ≥ 12 when neuroimaging available or total score of ≥ 10 when neuroimaging unavailable; and Possible TBM if total score of 6-11 when neuroimaging available and total score of 6–9 when neuroimaging unavailable (Table 1). Data entry was done using epi-info-7 and it was exported to SSPS version 20 for analysis.
<table>
<thead>
<tr>
<th>Criteria</th>
<th>Diagnostic score</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Clinical criteria (maximum category score = 6)</strong></td>
<td></td>
</tr>
<tr>
<td>Symptoms duration &gt; 5 days</td>
<td>4</td>
</tr>
<tr>
<td>Systemic symptoms suggestive of tuberculosis &gt; 2 weeks</td>
<td>2</td>
</tr>
<tr>
<td>History of recent close contact with confirmed pulmonary TB case</td>
<td>2</td>
</tr>
<tr>
<td>Focal neurologic deficit excluding cranial nerve palsy</td>
<td>1</td>
</tr>
<tr>
<td>Cranial nerve palsy</td>
<td>1</td>
</tr>
<tr>
<td><strong>CSF criteria (maximum category score = 4)</strong></td>
<td></td>
</tr>
<tr>
<td>Clear appearance</td>
<td>1</td>
</tr>
<tr>
<td>Cells: 5 - 500/µl</td>
<td>1</td>
</tr>
<tr>
<td>Lymphocyte predominance (&gt;50%)</td>
<td>1</td>
</tr>
<tr>
<td>Protein concentration (1gm/dl)</td>
<td>1</td>
</tr>
<tr>
<td>CSF glucose 40mg/dl (2.2mmol/l)</td>
<td>1</td>
</tr>
<tr>
<td><strong>Cerebral imaging criteria (maximum category score = 6)</strong></td>
<td></td>
</tr>
<tr>
<td>Basal meningeal enhancement</td>
<td>2</td>
</tr>
<tr>
<td>Hydrocephalus</td>
<td>1</td>
</tr>
<tr>
<td>Tuberculoma</td>
<td>2</td>
</tr>
<tr>
<td>Infarct</td>
<td>1</td>
</tr>
<tr>
<td>Precontrast basal hyperdensity</td>
<td>2</td>
</tr>
<tr>
<td><strong>Evidence of tuberculosis elsewhere (maximum category score = 4)</strong></td>
<td></td>
</tr>
<tr>
<td>Chest x-ray suggestive of active tuberculosis (excludes miliary tuberculosis)</td>
<td>2</td>
</tr>
<tr>
<td>Chest x-ray suggestive of miliary tuberculosis</td>
<td>4</td>
</tr>
<tr>
<td>CT/MRI/Ultrasound evidence for tuberculosis outside the CNS</td>
<td></td>
</tr>
<tr>
<td>AFB identified or MTB detected/cultured from another source, ie. sputum, blood, lymph node, gastric washing, urine</td>
<td>2</td>
</tr>
</tbody>
</table>
Results

Demographic characteristics

In this study seventy (70) children’s charts was collected from record room. All of them were admitted and treated for TBM in SPHMMC and Yekatit 12 Hospital Medical College with the diagnosis of TBM from July 1, 2014 to June 30, 2017GC. Sixty three (63) of them fulfilled the diagnostic criteria used in this study and were included for analysis (Table 2). The median age of the children was 6 years, ranging from 3 months to 14 years. The male: female ratio was 0.85: 1. All patients were from three Regions of the country; majority (57.1%) was from Oromia region 31.8% and 11.1% from Addis Ababa and South Nations Nationality Peoples Region (SNNPR) respectively. Twenty seven (42.9%) of children were severely malnourished. Based on case definition used in this study (40) 63.5% were possible cases, (22) 34.9% were probable cases and only (1) 1.6% was definitive case.

Table 3: Common presenting signs and symptoms of patients admitted with tuberculous meningitis to SPHMMC and Yekatit 12 Hospitals, from July 1, 2014 to June 30, 2017GC, (n = 63)

<table>
<thead>
<tr>
<th>Signs and Symptoms</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fever</td>
<td>56</td>
<td>88.9</td>
</tr>
<tr>
<td>Vomiting</td>
<td>41</td>
<td>65.1</td>
</tr>
<tr>
<td>Altered mental Status</td>
<td>37</td>
<td>58.7</td>
</tr>
<tr>
<td>Weight loss</td>
<td>34</td>
<td>54</td>
</tr>
<tr>
<td>Headache</td>
<td>31</td>
<td>49.2</td>
</tr>
<tr>
<td>Cough</td>
<td>29</td>
<td>46</td>
</tr>
<tr>
<td>Seizures</td>
<td>27</td>
<td>42.9</td>
</tr>
<tr>
<td>Neck stiffness</td>
<td>25</td>
<td>39.7</td>
</tr>
<tr>
<td>Cranial nerve palsy</td>
<td>5</td>
<td>7.9</td>
</tr>
</tbody>
</table>

The median length of time from the time symptoms started (according to patients recall) to the time treatment initiated was 21 days (ranging from 5 days to 331 days).
Tuberculous meningitis was staged using the modified criteria of the British Medical Research Council for all cases from documentation about Glasgow coma scale and neurologic deficit on patients file to determine the severity of TBM. Twelve (19%) were stage I; twenty one (33.3%) were stage II and thirty (47.7%) were stage III (Figure 3). Thirty six (57.1%) of children had motor examination abnormality on presentation. The commonest motor abnormalities were quadripar- esis 27(42.9%) and hemiparesis 8(12.6%). Thirty one (49.2%) had evidence of elevated ICP. Twenty nine (46%) had cranial nerve palsies.

Clinical documentations
Fifty three (84.1%) of patients file had documentation about their HIV status, of these 8 (12.7%) were HIV positive. Forty one (65.1%) had documentation in there chart that they are fully vaccinated according to Expanded Program on Immunization (EPI). There was no any documentation on the presence or absence of BCG scars. Nineteen (30.2%) of patients had recent close contact with confirmed pulmonary TB case. (Table 4)

Nineteen (30.2%) patients admitted with tuberculous meningitis had documentation in their charts about ophthalmologic evaluation. Fifteen (78.9%) patients had ophthalmologic evaluation abnormalities documented in their charts (exotropia, optic atrophy, papilledema, esotropia and retinal detachment) (Table 5). Five (7.9%) patients had hearing evaluation documentation in their charts and three (60%) of them had sensory neural hearing loss (SNHL)

Recorded Investigations for TBM

Brain imaging
Forty eight (76.2%) of patients had brain imaging, forty five (93.8%) of patients having brain imaging had abnormal findings. The findings were hydrocephalus 26(51%), basal meningeal enhancement 24 (47.1%), Tuberculoma 17(33.3%) and infarction 12(23.5%).

Chest radiography
Forty six (73%) of patients had chest X-ray imaging records in their files; for twenty nine (63%) the imaging had abnormal findings. Hilar lymphadenopathy 9(19.6%) was the commonest abnormality, followed by collapse consolidation 8(17.4 %) and miliary pattern 8(17.4%).

Laboratory investigation

CSF analysis
Gene Xpert from CSF was done and documented for only three (4.8%) patients. Only one patient had MTB detected on CSF Gene Xpert test and had no rifampicin resistance detected.

Out of the twenty six patients who had CSF analysis documentation, Acid fast bacilli (AFB) were not seen on CSF AFB stain. In eleven (42.3%) of cases the cells count was abnormal (> 5cells). Ten (91%) of patients
with documented abnormal cells count had lymphocyte predominance (>50%). The cells count ranged between 6 - 750 cells/mm³ (mean of 70 cells). CSF protein was reported in only five cases and ranged between 30 - 320 mg/dl (mean of 179.2 mg/dl). CSF glucose was reported in 14 patients and only 4 of them had glucose record less than 40 mg/dl.

**Gastric aspirate**

Thirteen (20.6%) patients had gastric aspirate AFB stain report in their chart and only 2 (15.4%) had AFB positive results. Gene Xpert from gastric aspirate was done for 13 (20.6%) patients, three (23.1%) had MTB detected with no rifampicin resistance detected.

**Outcome of tuberculous meningitis**

The average hospital stay was about 28 days (range 2 to 101 days). Nine (14.3%) of patients died; within 4 days of admission; forty eight (76.2%) of patients were discharged, twenty nine (46%) with some form of sequel (Table 6) while 19 (30.2%) of patients discharged improved with no sequel. Five (7.9%) of patients were left the hospital against medical advice and one patient was referred to another Hospital for pediatric intensive care unit care.

**Associated factors with outcomes of TBM**

Different factors were tested for statistical association with mortality and with sequel on discharge. Altered mentation on presentation has statically significant association with mortality (Table 7), while stage of TBM, altered mentation on presentation and presence of increased ICP had stastically significant association with sequel on discharge (Table 8).
Table 7: Mortality of tuberculous meningitis in patients admitted with tuberculous meningitis to St. Paul and Yekatit Hospital in relation with various factors, from July 1, 2014 to June 30, 2017GC, (n = 63)

<table>
<thead>
<tr>
<th>Factor</th>
<th>Number Of children</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Surviving</td>
<td>Dying</td>
</tr>
<tr>
<td>Stage of TBM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stage I and stage II</td>
<td>31</td>
<td>2</td>
</tr>
<tr>
<td>stage III</td>
<td>23</td>
<td>7</td>
</tr>
<tr>
<td>Mentation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Altered mentation</td>
<td>28</td>
<td>9</td>
</tr>
<tr>
<td>Not altered mentation</td>
<td>26</td>
<td>0</td>
</tr>
<tr>
<td>Elevated ICP</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Present</td>
<td>24</td>
<td>7</td>
</tr>
<tr>
<td>Not present</td>
<td>30</td>
<td>2</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 5years</td>
<td>27</td>
<td>4</td>
</tr>
<tr>
<td>≥ 5years</td>
<td>27</td>
<td>5</td>
</tr>
<tr>
<td>Duration of symptoms before treatment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>initiated &lt; 20days</td>
<td>24</td>
<td>5</td>
</tr>
<tr>
<td>≥ 20days</td>
<td>30</td>
<td>4</td>
</tr>
<tr>
<td>&gt; 3days</td>
<td>31</td>
<td>2</td>
</tr>
</tbody>
</table>
Table 8: Sequel of tuberculous meningitis in patients admitted to St. Paul and Yekatit 12 Hospital in relation with various factors from July 1, 2014 to June 30, 2017GC at the time of discharge

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Number of children</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>surviving with no sequel</td>
<td>Surviving with sequel</td>
</tr>
<tr>
<td>Stage of TBM</td>
<td>Stage I and stage II</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>stage III</td>
<td>1</td>
</tr>
<tr>
<td>Mentation</td>
<td>Altered mentation</td>
<td>19</td>
</tr>
<tr>
<td></td>
<td>Not altered mentation</td>
<td>3</td>
</tr>
<tr>
<td>Elevated ICP</td>
<td>Present</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td>Not present</td>
<td>5</td>
</tr>
<tr>
<td>Age</td>
<td>&lt; 5years</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>≥ 5years</td>
<td>12</td>
</tr>
<tr>
<td>Duration of symptoms before treatment initiated</td>
<td>&lt; 20days</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>≥ 20days</td>
<td>13</td>
</tr>
</tbody>
</table>
Discussion

Tuberculous meningitis is still the cause of high mortality and morbidity. In this study 9 (14.3%) patients died, 29(46%) patients survived with sequel on discharge and 19 (30.2%) survived with no sequel. This outcome is comparable with study done in Vietnam (mortality of 15%, sequel of 33%) and slightly higher than study done in South Africa (mortality of 8%, sequel 50%). In this study outcome was assessed on discharge which was too short duration to conclude on the outcome of tuberculous meningitis. In the Vietnam study the duration of follow up was from admission to the time of treatment completion. Outcome would also be different at the end of treatment completion compared to the time of hospital discharge when the neurological outcome is still evolving. In the south African study the duration of follow up was similar to this study( from admission to discharge), but only 28.1% patients were stage III TBM on admission and the rest were stage I and stage II TBM. This may explain the apparent low mortality of less than 10%.

The clinical outcome of this study is much lower than a previous study done in Ethiopia which showed mortality of about 46% and neurological sequel of 64%. This difference is probably due to; the mean duration of symptoms before presentation is longer (3.2months) and all cases were in stage II (29%) and stage III (71%) on presentation in previous study. In addition in this study the mean duration of symptoms before presentation was only 38 days, about 19% of patients were also presented in stage I TBM and the use of Cerebral imaging had role in early diagnosis and management of TBM which decreased the mortality and sequel significantly compared to the previous one.

The median age was 58months (range 3months to 14years). This is comparable with other study like South African (mean of 48months), indicate that TBM more affects young children.

On imaging of the brain about 93.8% have abnormalities. The commonest abnormality was hydrocephalus and basal meningeal enhancement. This finding is also comparable with the finding in other study, in Vietnam 86% brain imaging had abnormalities. In which basal enhancement and hydrocephalus were the commonest abnormalities.

On chest radiography about 63% had abnormality, which includes hilar lymphadenopathy, miliary pattern and collapse consolidations. This is higher than the study done in Vietnam in which 42% of chest x-rays had abnormal findings. Hilar lymphadenopathy and consolidation were the commonest abnormalities. The CSF leukocytosis is detected in only 42.3% and of the abnormal CSF cell count about 91% had lymphocyte predominance.
This finding is much lower than the finding in other studies where leukocytosis is present in 99% of CSF analysis (Silvia S Chiang and et al). The reason may be in that most of cases the CSF cells count where not reported. CSF MTB detection rate by Gene Xpert is about 33.3% whereas AFB stain MTB detection rate is null. In Silvia S Chiang and et al. study the CSF AFB positivity 8.9% which is higher than this study and the CSF culture positivity rate is 35.1% which is comparable with the CSF Gene Xpert MTB detection rate in this study.

Gastric aspirate/ sputum AFB detection rate is 2/13(15.4%) which is higher than the study done in South Africa and no AFB seen at all. Gastric aspirate Gene Xpert MTB detection rate is 3/13(23.4%) which is slightly higher than the gastric aspirate culture MTB detection rate in South Africa (14%). Eight (12.7%) patients were HIV positive. This is comparable with study done in South Africa which showed 9.7% of children with TBM were HIV positive. It is significantly lower than the study done in Ethiopia, which shows HIV infection rate of about 28.6% among pulmonary TB cases [21]. This low in HIV prevalence among children with TBM is probably because in TB high burden region children affected regardless of their HIV status.

Like in other studies, stage III TBM was strongly associated with sequel on discharge [2, 10, and 12]. In this study altered mentation on presentation is strongly associated with mortality and altered mentation and elevated ICP was associated with sequel on discharge.

Conclusion

Tuberculous meningitis continued to be a cause of significant sequel and mortality in children in Ethiopia. Stage of TBM, increased ICP and altered mentation on presentation has statically significant association with sequel on discharge while altered mentation on presentation has statically significant association with mortality. In this study the use of Molecular test like Gene Xpert from CSF is Very low. Majority of patients who had ophthalmologic and hearing evaluation had abnormal findings.

Acknowledgement

I thank Dr. Solome Jebessa and Dr. Ephrem Lema for their continuous support and critical review of this paper. I would also thank my family for great support during this work.

Ethical consideration

Ethical clearance was obtained from the respective IRBs of the two hospitals before starting data collection.
Reference


ABSTRACT

Background: Respiratory diseases are a major cause of mortality and morbidity worldwide especially in most developing countries. Amongst these respiratory diseases, pneumonia is the leading cause of death in children worldwide. In developing countries childhood pneumonias were diagnosed using clinical parameters, usually based on presence of cough and fast breathing. The simple chest radiograph has been an important investigative tool in the diagnoses of pneumonia.

Objective: To see the pattern of chest x-ray (CXR) findings in patients with severe pneumonia.

Methods: A prospective cross sectional study of 162 patients with severe pneumonia who were admitted to paediatric emergency unit of Tikur Anbessa Specialized Hospital (TASH) with chest x-ray.

Result: The prevalence of positive chest x-ray finding in patients with severe pneumonia was (48%). The commonest site of CXR finding was on the right upper lobe which accounts to 78.7%. Related type of chest x-ray finding was consolidation (27%). Chest x-ray has strong association with late presentation and underlying medical illness.

Conclusion: Chest X-ray can give useful information about the presence of pneumonia more commonly if chest x-ray taken after 4 days of illness, so physicians should select patients who need x-rays immediately, to avoid unnecessary exposure to radiation and wastage of time and money.

Key words: Pneumonia, chest x-ray, TASH, causality, Emergency Unit.

Introduction

Pneumonia is the leading killer of children worldwide especially in developing countries. It kills more children than any other illness i.e. AIDS, malaria and measles–accounting for 29 per cent of all under-five deaths. In Ethiopia under-five mortality is 68 deaths per 1,000 live births in 2012 (1), and the plan is to decrease to 66 deaths per 1000 live births by 2015 according to Millennium Development Goals. In developing countries childhood pneumonias are diagnosed using clinical parameters, usually based on presence of cough and fast raised respiratory rate. Although this is cheap, sensitive and maximizes the number of children identified and treated empirically but also nonspecific and highly dependent in the context in which it is
being applied.
In order to make a definitive diagnosis of clinical pneumonia you might need invasive procedure, which make more difficulties in identifying the causative organisms (2).
Blood culture is not an acceptable way to identify bacterial pneumonia (3-5) and a specimen from interstitial tissue is technically difficult and need experienced personnel and it is a risky procedure (4, 6). Therefore, chest X-ray can give useful information about the presence of pneumonia. Simple chest radiograph has been an important investigative tool in the diagnoses of diseases, since the discovery of X-rays in late nineteenth century (6). Chest radiograph is frequently used in the management of acute lower respiratory infection in children and still considered to be the gold standard for diagnosing respiratory infection and pneumonia (7).
The standard test for diagnosis of patients is a two view plain chest radiograph. To provide an objective end point WHO established standard categorization for radiological case definition of pneumonia, classified as: 1) Alveolar pneumonia: i.e. end point consolidation, which may be fluffy of part or whole lobe often containing air bronchogram and or with plural effusion 2) Non alveolar (i.e. other consolidation or infiltrate) (8). The presence of other infiltrates as defined above in the absence of pleural effusion as well as other non-end point (i.e. linear, interstitial, pre-bronchial thickening, multiple areas of atelectasis).
Several studies have found the pattern of radiologic features could not accurately distinguish a bacterial etiology from a viral etiology, although unilateral and or lobar infiltrates are often seen in bacterial pneumonia and some chest x-ray findings show disease severity. Studies regarding incidence of chest x-ray finding of patients with severe pneumonia in Africa are scarce. There are no literatures in Ethiopia which supports the incidence of chest x-ray finding for severe pneumonia. In Tikur Anbesa Specialized Hospital (TASH) at emergency unit severe pneumonia is the commonest cause of emergency admissions. (9)
Hence, this study will evaluate prevalence of chest x-ray findings of patients with severe community acquired pneumonia in our hospital.
The study was done at Addis Ababa University, Department of Paediatrics and Child Health, emergency unit which is located in the capital city of Ethiopia. All paediatric patients aged between 2 months and to 14 years who were admitted to paediatric emergency unit of TASH with the diagnosis of severe community acquired pneumonia were recruited in the study. The study design was prospective cross sectional study conducted from December 2013 to May 2014.
unit was approximately 1-2 cases daily (review of the registration book of emergency ward of TASH over six months- unpublished data) and by calculating the prevalence of severe community acquired pneumonia admission at emergency unit of TASH over 6 months which is 15%. The estimated sample size was 196 with 95% CI and margin of error or desired precision of 0.05. **The inclusion criteria** were age between 2 months and 14 years and who were admitted at the emergency unit of TASH with the diagnosis of severe community acquired pneumonia. **The exclusion criteria** were patients with no chest x ray, hospital acquired pneumonia, foreign body aspiration and if parents or guardians don’t agree to participate.

After the data was collected and compiled the analysis was done using SPSS. The results were expressed in description, rate and tables and association was made. Finally conclusion and recommendation was forwarded.

**Ethical Clearance:** After obtaining approval by the Department Research and Publication Committee the study was conducted.

Table 1: Age distribution of patients admitted with the diagnosis of severe community acquired pneumonia to the emergency unit of Tikur Anbessa Teaching Hospital, Addis Ababa, Ethiopia

<table>
<thead>
<tr>
<th>Classification</th>
<th>Number</th>
<th>Percent %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-2 yrs</td>
<td>38</td>
<td>19.4</td>
</tr>
<tr>
<td>2-5 yrs</td>
<td>21</td>
<td>10.7</td>
</tr>
<tr>
<td>5-10 yrs</td>
<td>16</td>
<td>8.2</td>
</tr>
<tr>
<td>≥ 10 yrs</td>
<td>8</td>
<td>4.1</td>
</tr>
<tr>
<td>Total</td>
<td>196</td>
<td>100%</td>
</tr>
</tbody>
</table>

Mon-months, yrs-years

Hundred forty three (73%) of patients were from Addis Ababa city, and the rest 53 (27%) were out of the city. From one hundred ninety six patients 111 (56.6 %) presented with fast breathing, cough 47 (24%), fever 34 (17.3%) and 4 (2%) were having grunting and other complaints. 111(56.6%) presented with three days of compliant, 72 (36.7%) presented after three days but within seven days and 13 (6.6%) presented after one week of their illness.

Fifty five (28.1%) of patients admitted with severe pneumonia were having previous admission with same compliant. Out of this 34 (61.8%) having only once, 11(20%) had twice and eight children (14.5%) had three admissions (table 2)
Table 2: duration of illness and previous history of pneumonia in patients admitted with the diagnosis of severe community acquired pneumonia to the emergency unit of Tikur Anbessa Teaching Hospital, Addis Ababa, Ethiopia

<table>
<thead>
<tr>
<th>Duration of illness</th>
<th>Number of patients</th>
<th>Percent (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Within 3 days</td>
<td>111</td>
<td>56.6</td>
</tr>
<tr>
<td>4-7 days</td>
<td>72</td>
<td>36.7</td>
</tr>
<tr>
<td>&gt;7 days</td>
<td>13</td>
<td>6.6</td>
</tr>
<tr>
<td>Previous history of pneumonia</td>
<td>55</td>
<td>28.1</td>
</tr>
<tr>
<td>Only one time</td>
<td>34</td>
<td>61.8</td>
</tr>
<tr>
<td>Two times</td>
<td>11</td>
<td>20.0</td>
</tr>
<tr>
<td>Three times</td>
<td>8</td>
<td>14.5</td>
</tr>
<tr>
<td>Four times</td>
<td>1</td>
<td>1.8</td>
</tr>
<tr>
<td>Six times</td>
<td>1</td>
<td>1.8</td>
</tr>
</tbody>
</table>

Out of one hundred ninety six children 139 (69.9%) were having underlying illness and 59 children (42.14%) were having cardiac disease. Hundred thirty seven children (69.9%) were the calculation same % as in 139 ) having auscultatory chest finding. The commonest type of chest finding was crepitations in 105 children (53.5%), bronchial breath sound (BBS) in 13 (6.6%) and wheeze in 10 (5%) children. In 73 children (53.2%) the findings were on the right side of the chest, in 22 (16. %) on the left side of the chest and in 42 (30.6%) bilaterally.

All patients who were admitted were having chest x-ray for the confirmation of the diagnosis. From hundred ninety six patients 102 (52%) were having normal chest x-ray whereas 94 (48%) patients were having abnormal chest x-ray; of this 53 (27%) had consolidation, 28 (14, 4%) had bronchopneumonia (Figure 1).
Figure 1: Prevalence of chest x-ray findings of patients admitted with the diagnosis of severe community acquired pneumonia to the emergency unit of Tikur Anbessa Teaching Hospital, Addis Ababa, Ethiopia.
From 94 patients who had abnormal finding 74 (78.7%) were seen on the right side of the chest, 7 (7.4%) seen on the left side and 13 (13.8%) were seen bilaterally (Table 3).

Fifty-three children (27%) stayed in the hospital less than 4 days, 92 (46.9%) patients stayed 4 up to 7 days and 51 (26%) patients stayed more than 7 days. From one hundred ninety six admitted patients 184 (93.9%) were discharged improved and 12 (6.1%) passed away.

Table 3: Site of chest x-ray finding of patients admitted with the diagnosis of severe community acquired pneumonia to the emergency unit of Tikur Anbessa Teaching Hospital, Addis Ababa, Ethiopia

<table>
<thead>
<tr>
<th></th>
<th>Bilateral</th>
<th>RUL</th>
<th>RML</th>
<th>RLL</th>
<th>LUL</th>
<th>LLL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consolidation</td>
<td>53</td>
<td>27</td>
<td>38</td>
<td>5</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Bronchopneumonia</td>
<td>28</td>
<td>14.4</td>
<td>15</td>
<td>3</td>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td>Interstitial pneumonia</td>
<td>7</td>
<td>3.6</td>
<td>5</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Pleural effusion</td>
<td>3</td>
<td>1.5</td>
<td>1</td>
<td>2</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Other finding</td>
<td>3</td>
<td>1.5</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Total</td>
<td>94</td>
<td>48</td>
<td>59</td>
<td>10</td>
<td>7</td>
<td>11</td>
</tr>
</tbody>
</table>

Right upper lobe (RUL), right middle lobe (RML), right lower lobe (RLL), left upper lobe (LUL), left lower lobe (LLL)

Discussion
In the current study the comonnest age at presentation was less than 12 months while in the Brazilian study median age was 17 months (10). Most of these patients presented with fast breathing followed by cough, fever and grunting. Our finding has some difference with study done in Iraq (11). The main presenting complaints in Iraq were fever (87.4%), shortness of breath (99.5 %), and cough (98%). The commonest auscultatory finding is crepitations (76.6%) which is comparable to Iraq study (82%) followed by bronchial breath sound. The auscultatory findings which are 53.2% on the right side of the chest and, 16 % on the left side of side chest and 30.6% bilateral is comparable with the study done in Iraq and Brazil (11, 10). In our study 48% of the participant were having abnormal chest x-ray while, 52% were having normal chest x –ray and this finding is comparable with Sudan’s study but it is greater than the study done in Iraq and lower than the Nigerian reports.
The explanation for the difference between our findings and the above mentioned studies was our study was conducted in patients who had severe pneumonia. (12, 11, 13) In our study 78.7% of the chest x-ray findings were on the right side followed by 13.8% bilateral and 7.4% were on the left side. The commonest chest-x ray findings were consolidation 27% followed by bronchopneumonia 14.4% and interstitial pneumonia 3.6%. There were 3 patients who had pleural effusion as complication of pneumonia. These findings are consistent with Brazil and Iraq studies (11, 10, 14) Commonly affected lobes in this study were right upper lobe, right middle lobe and right lower lobe respectively and the left lower lobe is more affected than that of left upper lobe. This is consistent with Greece study (15, 16, 17, 18). We have seen that there is a statistically significant association between chest x-ray findings with patients who presented after 7 days of complaint (p=0.015), patients who had previous admission with similar illness (p=000). Patients who had crepitations and decreased air entry on auscultation have also an association with chest x-ray finding (p=0.000, p<0.012 respectively). Patients having a cyanotic congenital heart disease, sever acute malnutrition and patients who stayed in the hospital more than 7 days have association with chest x ray finding.(p <0.004, p <0.006, p <0.004 respectively. This is similar with Sudan study (12, 19, 20, 21, 22). The mortality rate of pneumonia in this study is 6.1%. This has discrepancy with the Australian study 2.8% (3). This discrepancy may be due to other comorbid factors.

**Conclusion**

Chest X-ray can give useful information about the presence of pneumonia, if chest x-ray taken after 4 days of illness, so physicians should have to select patients who need x-rays immediately, to avoid unnecessary exposure to radiation and wastage of time and money.

**Acknowledgement:** Our thanks go to the Department of Paediatrics and Child Health for giving us this opportunity to conduct the study. Our thanks also extend to the nurses and residents who were working in the paediatric emergency unit during the study period.
Reference
CONGENITAL NASAL PYRIFORM APERTURE STENOSIS
MICHAEL TELAHUN

INTRODUCTION
Neonatal nasal obstruction due to congenital nasal pyriform aperture stenosis is very rare and uncommon. The usual clinical presentation is respiratory distress, cyclic cyanosis, apneas, and feeding difficulties. A bony overgrowth of the maxillary nasal processes is thought to be responsible for this deformity. The diagnosis is suggested by history and physical examination; however, it should be confirmed through radiological evaluation i.e., a CT scan of the nasal cavity. It has been suggested that a pyriform aperture width less than 8 mm in a term infant is diagnostic of CNPAS (Congenital Nasal Pyriform Aperture Stenosis). This anomaly has been reported as an isolated feature or can be associated with craniofacial or central nervous system anomalies. Surgery is indicated in cases of severe respiratory distress, feeding difficulties, and when there is no benefit with conservative methods. We are reporting a case of a male baby diagnosed with CNPAS and was managed in our Hallelujah General Hospital.

CASE REPORT
A pre-term male baby, second child of non-consanguineous parents was born by emergency caesarian section (C/S) because of pre-term labor and previous C/S scar. The birth weight was 2.1 kg and the neonate had an appearance, pulse, grimace, activity, respiration (APGAR) score of 8 and 9 at one 5th minutes respectively. The neonate is referred to our NICU (Neonatal Intensive Care Unit) because he developed fast breathing, grunting and retractions following delivery.

During his stay in the NICU baby had persistent fast breathing with desaturation when he is put off CPAP (Continuous positive airway pressure). After 72 hours of admission his condition started to improve except for the fast breathing (RR ranging between 62-66/minute) and intermittent desaturation. For initiation of trophic feeding naso-gastric (NG) tube was inserted because he had difficulty of suckling with his mouth. There was resistance during the insertion of the NG tube on both nostrils more on the right side.

After this the possibility of choanal atresia was considered. On examination the infant had no dysmorphic features. The external nasal pyramid and nasal vestibular opening were normal and test for nasal breathing with cotton was done and there was no movement of the cotton seen more on the right side suggesting obstruction.
All the cranial nerves were normal. There was no coloboma of eye and the cardiovascular examination was normal. Other investigations like chest X-ray, Echocardiogram and Brain CT were also normal. The CT scan of the Nose and paranasal sinuses showed bilateral nasal aperture stenosis with no evidence of bony or membranous choanal atresia. Preoperative CT scan showed narrowing of pyriform aperture.

On 20/05/17 the patient was taken to operation room after written consent of the family and put in supine position after wrapping with cotton, draped and anesthetized. Local anaesthesia lidocaine with strength of 1:200000 injected sublabially after cleaning oral cavity well. Incision was made sublabially about 5 mm away from the gingival sulcus up to subperiostem and flap is raised up to nasal orifice. Flap also raised in nasal cavity and prominent bone on both sides is curedtted and removed. Nasal cavity became patent and number 3 endotracheal tube stented and surgical wound closed in layer. After extubation the infant was able to maintain saturation at room air and there was no cyclical cyanosis and apneic spells. Then the patient was transferred to intensive care unit after being fully awake.
After 2 weeks both stents were removed and repeat nasal endoscopy was done which showed bilateral adequate nasal cavity. The infant remained comfortable at room air and was able to bottle feed and started to gain weight. The patient is on regular follow up for last two weeks and is doing well.

**DISCUSSION**

The nasal pyriform aperture is a pear-shaped bony inlet of the nose formed by the nasal and maxillary bones. The origin and embryological development of CNPAS remains undetermined; but it arises in the fourth month of fetal development because of an overgrowth of the nasal process of the maxilla and may present as an isolated condition or in association with other congenital disorders. The narrowing of the nasal aperture results probably from a bony overgrowth of the maxillary nasal processes during maxillary ossification (1).

Infants with CNPAS present at birth or shortly thereafter with severe nasal obstruction leading to noisy breathing and respiratory distress that worsens with feeding and improve with crying. It can occur in isolation or in association with other congenital disorders. The inability to pass a 5F catheter and a radiographically measured pyriform opening < –10 mm in a full-term infant are considered diagnostic (13-15).

**CONCLUSION**

CNPAS is a rare case of neonatal nasal obstruction. Early prompt recognition of neonatal nasal obstruction and timely management is necessary to relieve respiratory distress. It’s better to consider this unusual presentation of neonatal nasal obstruction in those newborns for whom there is no strong explanation for respiratory distress. Simple NG tube insertion can make the diagnosis of this rare cause likely.

In all cases of CNPAS, a multidisciplinary approach involving ENT specialists is required to rule out other craniofacial or midbrain abnormalities.
REFERENCE


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