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Clinical Profile of Hospitalized Community Acquired Childhood Pneumonia in Dhaka, Bangladesh

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INTRODUCTION

Community acquired pneumonia (CAP) has remained the world's leading cause of death among children under the age of 5 [1,2]. Although mortality has been greatly reduced in this age group over the last decade, only minimal reductions have been achieved in neonates [3]. The incidence rate of CAP for children less than 5 years remains very high in Bangladesh [4] and CAP accounted for twenty-six percent of neonatal deaths leading to high infant mortality rate (IMR) in Bangladesh (52.5 vs. 6.8/1,000 infant births in US). Thus, CAP during the neonatal period remains a major concern in low and middle income countries (LMIC).

In resource-limited settings, risk factors accounting for high childhood CAP-related deaths may include malnutrition, lower socioeconomic status, indoor air pollution (smoking, overcrowding), poor quality drinking water, lack of exclusive breast feeding, immunodeficiency conditions including HIV infection and other viral infections such as measles [4-10]. Potential barriers to optimal prevention and treatment of CAP in LMIC may include a lack of or access to preventive health care services, including routine childhood vaccinations; a lack of health education and awareness; complexities associated with diagnostic and treatment modalities; high cost of treatment and most importantly lack of a follow-up care. The lack of a follow-up care reportedly results in post-hospital discharge mortality exceeding in-hospital mortality and most occur at home [11-13]. This finding may suggest that the mortality incidence as reported in literature may be under-represented. Severe anemia in particular, has specifically been predicted to account for higher post-hospital discharge mortality in children [14]. Malnourished children have been reported to have an impaired immunologic response and consequently more severe infections. Protein-energy malnutrition may particularly affect the cell-mediated immunologic response [15,16]. The two major bacterial causes of childhood CAP in children were *Hemophilus influenzae* type b (*Hib*) and *Streptococcus pneumoniae (SPN)* [17,18]. While effective vaccines are available for these infectious diseases, the earliest age for a routine vaccination, per the WHO schedule, is six weeks in LMIC [19] unfortunately a disproportionate number of infants die before they are immunized.

This is the only study in literature that is evidence-based, collecting and analyzing data of hospitalized childhood CAP cases in a LMIC-the aim was to compare and contrast with standard of care practices in high income countries (HIC). The intent was to identify disparities in management and follow-up care of these cases compared to the standard of care (SOC) practices in high income countries. The goal was to inform clinicians and policy makers in LMIC, to acknowledge and address the identified disparities. Thus, data was collected and examined on eighty-three CAP cases in children, over a period of five months at Shaheed Suhrawardy Medical College Hospital (SSMCH) in Dhaka, Bangladesh.

This is a mini review of the manuscript previously published [20]. Data was retrospectively collected from medical records of the patients admitted to SSMCH.

Results were mostly remarkable for infants under 6 months of age, who suffered significant morbidities (tachypnea: p=0.04, hypoxia: p=0.05) and infants under 2 months, who were at a 14x greater risk (p=0.002) for tachypnea (p=0.001) when compared to their older counterparts. It was further noted that fifty percent of the patients were underweight/failing to thrive (less than third percentile for their age and gender). Of these underweight children, sixty-seven percent were under 2 months of age. Underweight children were also significantly (p=0.01) more likely to be in respiratory distress compared to children with normal weight for their age.

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The study had determined that the diagnostic criteria for clinical pneumonia in Dhaka, as a surrogate for a LMIC, was comparable to those in HIC empirical antibiotic selection for presumed organisms at specific age groups were appropriate [21-23] and comparable to those in HIC. Vancomycin however, was missed to be considered as an empiric therapy for late-onset CAP, which is usually caused by *Staphylococcus epidermidis* or methicillin resistant *Staphylococcus aureus* (MRSA). Lack of this consideration could result in a treatment failure. Treatment failure could not however, be determined in this study because of a lack of post-hospital discharge follow-ups. Since viruses account for most cases of childhood CAP in both LMIC and HIC, clinicians nevertheless, need to remain vigilant regarding unnecessary use of antibiotics in these children.

A complete blood count with differential as a laboratory diagnostic testing was utilized in only ten percent of the CAP cases in this study. The most likely reason for this insufficiency predicted was cost and difficulties with blood drawing in little children. This is in contrast to standard of care practice in a HIC- a CBC with differential is a minimal laboratory evaluation performed in all childhood CAP cases, which require hospitalization. A simple CBC with a differential does not only detect anemia as a marker for malnutrition; it also predicts etiology of the infection (bacterial vs. viral). Anemia was documented in all seven of our study children who tested with a CBC. Although impact of anemia on disease outcome may be enormous, treatment is simple and cheap. A missed opportunity to evaluate for anemia in a childhood CAP case may lead to serious consequences, including mortality. Although, no mortality from CAP cases in our study has been reported, no definite statement regarding mortality can be made because no post-hospital discharge follow-up was made. An estimated nine percent mortality has been reported in post-hospital discharge of CAP cases which were complicated by severe malnutrition in Dhaka, Bangladesh [24,25]. An estimated fifty percent of our study population may have remained at risk for post-hospital discharge mortality because fifty percent of these children were under 6 months of age and suffered malnutrition. Similarly, a chest radiograph was performed in only two percent of neonates and thirty percent of the CAP cases complicated by hypoxia. This deficiency was most likely attributed to cost and this remains a challenge in LMIC. It is however, not clear what prompted radiological evaluations in some patients and not in others with similar condition or complication. Only two of the ten neonates and nine of thirty-four children with hypoxia had a chest radiograph. Thus, there was a missed opportunity to examine eight neonates and twenty-five CAP cases complicated by hypoxia, with a chest radiograph. This is in contrast to the standard of care practice in a HIC [21]. A chest radiograph is usually performed in all childhood CAP cases, which require hospitalization. It has been recommended that a chest radiograph is a useful adjunct in the management of CAP-may suggest a bacterial versus a viral etiology and also predict disease severity. Pulse oximetry <92% can also suggest disease severity, according to British Thoracic Society (BTS) [21,26]. It may be reasonable to recommend pulse oximetry over a chest radiograph for assessment of these high risk CAP cases in LMIC for cost-effectiveness yet be productive. Thus, it is strongly recommended that clinicians, hospital administrators and policy makers work together to make resources available in LMIC to advance these aspects of management, in addition to treatment of infection alone with antibiotics.

While multiple interventions (vaccine and non-vaccine) [27] are needed to decrease childhood mortality from CAP, strategies to augment passive immunities from mothers to their infants may remain a cost-effective and most productive intervention to consider in LMIC. The Expanded Program for Immunization schedule for children administers *Hib* and *SPN* as routine standard of care starting at 6 weeks of age. Maternal immunization with a wider spectrum (23-valent) polysaccharide *SPN* and *Hib* vaccines during pregnancy may be one of the most cost-effective strategies to protect infants against these bacteria during this vulnerable period of their lives. Our study findings also strongly support maternal immunization during pregnancy to protect the vulnerable neonates with boosted passive immunities from mothers.

Our study highlights the deficiencies and disparities in the management of hospitalized childhood CAP cases in a LMIC compared to a HIC from a clinical perspective. Our findings thus, add to and reinforce results from other epidemiological studies in the literature. Thus, development, implementation and monitoring of structured quality improvement programs for assessment, management and post-hospital discharge follow-up of childhood CAP in LMIC is strongly recommended. This program also integrated with social workers, who facilitate overcome barriers to adequate health care of patients.

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