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REVIEW ARTICLE

A REVIEW OF PNEUMONIA IN THE PHILIPPINES

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The authors declare that the data presented are original material and has not been previously published, accepted or considered for publication elsewhere; that the manuscript has been approved by all authors, and all authors have met the requirements for authorship.

ABSTRACT

This review article gives an overview of pneumonia in the Philippines, with focus on childhood pneumonia. Its primary objective is to provide information on epidemiology, etiology, economic burden, risk factors and prevention of pneumonia. A review of literature was done to gather information about the disease, with emphasis on local data. In the Philippines, pneumonia is the third leading cause of death across all ages and is the most common cause of death among children<5 years of age. A prospective study on Invasive Pneumococcal Disease conducted in the Philippines looked at the incidence of chest x-ray–confirmed pneumonia (N=5,940) in three hospitals over a 2-year period. The highest incidence was seen in those 28 days to <6 months of age at two sites and those 6–12 months of age in another site. Risk factors include not exclusively breastfeeding infants <6 months, undernutrition, zinc deficiency, crowding and exposure to indoor air pollution, low birth weight, poverty and socio-economic factors, presence of underlying comorbidities and immunodeficiency states. CAP ranks number one in processed Philippine Health Insurance (PhilHealth) claims, showing the huge economic burden. Therefore, rationalizing its management with simple standardized guidelines, exclusive breastfeeding for 6 months and continued breastfeeding with appropriate complementary feeding, improving indoor air pollution, and promoting vaccination are effective interventions.

KEYWORDS: *Pneumonia, Pneumococcal disease, Pneumococcal Conjugate Vaccine*

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INTRODUCTION

Pneumonia, here defined as inflammation of the lungs, usually secondary to infection, is a major cause of morbidity and mortality worldwide. It is associated with tachypnea, fever, and lung parenchymal involvement evident on either physical examination or chest x-ray as infiltrates. It affects all ages with the greatest burden in children below 5 years of age.[1]

Based on evidence from the 1970s and 1980s, the World Health Organization (WHO) recently revised the classification of childhood pneumonia, in the context of managing patients, into two simple categories: (a) pneumonia with fast breathing and/or chest indrawing and (b) severe pneumonia with any general danger sign. The first requires only home therapy with amoxicillin but the second requires referral and healthcare facility admission for injectable therapy.[2] In the Philippines, among pediatricians, the risk classification system first introduced in the 2004 Joint Pediatric Infectious Disease Society of the Philippines (PIDSP) and Philippine Academy of Pediatric Pulmonology (PAPP) Clinical Practice Guidelines for pediatric community-acquired pneumonia (PCAP) and carried over up to the second 2016 PAPP update is widely used. This risk classification has four categories: (a) PCAP A and (b) PCAP B are non-severe, with PCAP B patients having comorbidities, inability to drink, or malnutrition; (c) PCAP C is severe or moderate risk requiring hospitalization; and (d) PCAP D is very severe or high risk requiring critical care.[3]

MATERIALS AND METHODS

A review of literature was done to gather information about the disease in terms of its epidemiology, etiology, economic burden, risk factors and prevention.

RESULTS AND DISCUSSION

Epidemiology

According to WHO, pneumonia is the single most common cause of death in children, estimated at 1.2 million every year.[4] This represents 18% of all deaths below 5 years of age worldwide.[5] The large majority of deaths occur in low to middle income countries.

Pneumonia and diarrhea together lead to 2 million child deaths annually and these two diseases have been the major focus of attention to reduce childhood morbidity and deaths.[4]

Among countries in Southeast Asia, the Philippines has a relatively high age-standardized death rate of 126.05 per 100,000 population as of 2017.[6] Pneumonia is the third leading cause of death in the country across all ages, next only to cardiac diseases and cancer.[7] In Filipino children below 5 years of age, it is the most common cause of death accounting for about 14% of all causes of mortality.[8]

There is a dearth of studies on the incidence of childhood pneumonia in the Southeast Asian region and in the Philippines. The only prospective study on Invasive Pneumococcal Disease conducted in the Philippines also looked at the incidence of chest x-ray–confirmed pneumonia (using WHO criteria) from 5,940 subjects in three hospitals (Philippine Children's Medical Center [PCMC], Philippine General Hospital [PGH] and Research Institute for Tropical Medicine [RITM]) over a 2-year period.[9] The incidence of chest x-ray–confirmed pneumonia ranged from 633.74 (PCMC) to 1,683.59 (PGH) per 100,000. The highest incidence was seen in those 28 days to <6 months of age at two sites (2,166.16 and 3,891.94 per 100,000) and in those 6-12months of age at the RITM (3,847.52 per 100,000). As the study noted, the results cannot be generalized to the whole country as this was a hospital-based study.[10]

Etiology

Determining the etiology of childhood pneumonia has remarkably been difficult because of certain challenges. These include the use of varying case definitions for pneumonia, lack of pulmonary specimens because very young children do not expectorate, and lung taps are invasive; suboptimal accuracy of assays using non-pulmonary specimens; and difficulty in interpreting results including multiple pathogens identified and equivocal chest x-rays when done.[11] There are several ongoing pneumonia etiology studies. The most extensive is the initially 7-country Pneumonia Etiology Research for Child Health (PERCH) study initiated in 2008 and funded by the Bill & Melinda Gates Foundation.

It aims to update our knowledge of pneumonia etiology using standardized case definitions and methodologies, employing an extensive array of specimens from varying socio-economic settings, and utilizing modern laboratory tests including multiplex real-time polymerase chain reaction for over 30 pathogens.[12,13]

Historical and recent data on etiology of pneumonia, however, indicate that the percentage of bacterial compared with viral etiology tends to be higher in low to middle income countries and that among the bacterial causes, *Streptococcus pneumoniae* tends to predominate together with *Haemophilus influenzae* type b and *Moraxella catarrhalis*. Atypical bacteria causing pneumonia include *Mycoplasma pneumoniae*, *Chlamydophila pneumoniae* and *Legionella pneumophila* in older patients. Depending on the geographic area, the role of *Staphylococcus aureus*, including community-acquired methicillin-resistant strains, can also be considerable.[14]

In the Philippines, detection of etiology is site-limited and data on viruses are even more limited. The advent of molecular methods has increased the recognition of a variety of viral agents causing pneumonia, but the most important are respiratory syncytial virus (RSV) and influenza virus.[15] In a study on viral etiology of pediatric pneumonia patients in the Cordillera Administrative region from 2009 to 2010, RSV was the most prevalent (of 377 nasopharyngeal/oropharyngeal swabs tested, 106 or 28.1% were positive for a viral isolate, of which 93 were RSV).[16] Viral detection in upper respiratory tract (URT) specimens, however, has low specificity because finding a virus in the URT does not necessarily mean it is the cause of the lower respiratory tract infection.[17] With the outbreak of measles cases in the country and other areas of the world, measles virus has once again become important as a cause. Currently, Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) has become a significant pathogen causing pneumonia in view of the Coronavirus disease 2019 (COVID-19) pandemic that has also affected the Philippines.[18] It is expected that this will account for a large number of cases when data are assessed in the near future. This is because the burden of COVID-19 pneumonia, based on worldwide experience, continues to increase, and because tools enabling SARS-CoV-2 diagnosis specifically, reverse-transcription polymerase chain reaction (RT-PCR), are now more widely available.[19]

Pathogens similar to those seen in children are encountered in adults in varying proportions and this recognition serves as the basis for guidelines for empiric therapy of adult community-acquired pneumonia (CAP).[20] A recent hospital-based study looked at the etiology of adult CAP (535 subjects) in a rural setting in Leyte, Philippines over a 2-year period. Bacterial detection rate was higher (40%) compared with viral detection (13%). *H. influenzae* (12%) was the most commonly detected bacterium followed by *Klebsiella pneumoniae* (11.6%) and *S. pneumoniae* (10.5%). Influenza virus (5%) was the most commonly detected virus. An underlying disease was found in more than half of patients with pulmonary tuberculosis accounting for 22%.[21] Even in children presenting with severe pneumonia, tuberculosis can play a role as it might be a direct cause of severe pneumonia or might be an underlying comorbidity increasing the risk of secondary bacterial infection.[22] This is true even for pediatric patients. SARS-CoV-2 causes pneumonia in children, though confirmed pediatric COVID-19 cases are smaller in numbers compared to adult COVID-19.[23,24]

Economic Burden

The economic burden of pneumonia in the Philippines is huge. Looking at the Philippine Health Insurance Corporation (PhilHealth) claims that were processed, CAP ranks number one and for severe CAP (CAP III) alone, a total of PHP 10,938,863,732 was paid in 2018.[25]

A local study on the economic burden of PCAP in children 3 months to <19 years of age using the societal perspective looked at both healthcare and non-healthcare costs at two tertiary private hospitals in the Philippines with 2012 as the reference year. Although the exact economic burden was not determined due to lack of specific number of PhilHealth claims in the age group, the figures obtained were considerable.

The estimated healthcare-related cost for PCAP-C was PHP 24,332 to PHP 75,409, and for PCAP-D, PHP 77,460 to PHP 121,301 in those without mechanical ventilation and PHP 97,993 to PHP 141,834 in those with mechanical ventilation. The authors concluded that there is a huge disparity between the PhilHealth case rates and the results of the study, so that the economic burden is much higher than PhilHealth claims data would suggest.[26]

A similar study by the same authors on CAP in adults, concluded that based on the number of PhilHealth claims for 2012 and the estimated healthcare cost, the economic burden of pneumonia in 2012 was PHP 8.48 billion for CAP, moderate risk (MR) and PHP 643.76 million for CAP, high risk (HR). This is again, much higher than figures based on PhilHealth estimates alone would suggest.[27]

Risk Factors

There are known risk factors for developing pneumonia. These include not exclusively breastfeeding infants younger than 6 months, undernutrition, zinc deficiency, crowding and exposure to indoor air pollution, low birth weight, poverty and socio-economic factors, presence of underlying comorbidities, e.g., cardiac or lung disease, immunodeficiency states including human immunodeficiency virus (HIV) infection, neuromuscular and gastrointestinal disorders like reflux.[4,28]

In a questionnaire-based study in Biliran Island, Philippines, a history of asthma, low socio-economic status and long travel time to the healthcare facility estimated by cost-distance analysis were significantly associated with higher occurrence of pneumonia-like episodes.[29] In a secondary analysis of a pneumococcal conjugate vaccine (PCV) trial among children <2 years of age in Bohol, a distance of 12 km from Bohol Regional Hospital, was associated with a decreased hazard ratio for radiographic pneumonia in PCV-vaccinated, compared with the placebo group. For children living 1 km from the hospital, there was little difference.[30]

Underlying viral infections like influenza, RSV and measles can predispose to secondary bacterial pneumonia as previously noted. A recent prospective cohort study done among 3,851 Filipino children below 5 years of age likewise showed that risk for subsequent acute respiratory infections was significantly enhanced after infections with adenovirus, influenza A virus, parainfluenza virus type 4 and rhinovirus species C.[31]

RECOMMENDATIONS

The WHO/UNICEF integrated Global Action Plan for Pneumonia and Diarrhea has specific targets for 2025 for children less than 5 years of age with respect to pneumonia, which are to: (a) reduce mortality from pneumonia to less than three per 1,000 live births, and (b) reduce the incidence of severe pneumonia by 75% compared to 2010 levels. The framework adapted is the Protect, Prevent and Treat framework: (a) protecting children through good health practices, (b) preventing children from becoming ill through universal immunization, HIV prevention and a healthy environment, and (c) treating ill children appropriately.[32]

To these ends, rationalizing the management of pneumonia with simple standardized guidelines, exclusive breastfeeding for 6 months and continued breastfeeding with appropriate complementary feeding, improving indoor air pollution, and promoting vaccination are interventions that have been shown to work. The pandemicity and novelty of COVID-19, however, has required more stringent measures, for example, quarantine, physical distancing and careful use of personal protective equipment. The current vaccine-preventable causes of pneumonia are measles, influenza, *Bordetella pertussis*, *H. influenzae* type b (Hib) and *S. pneumoniae*. The major causes of death from influenza and measles is pneumonia, and the case fatality rate of severe pneumonia in the presence of measles is more than double than that of severe pneumonia without measles.[33]

While measles, pertussis, influenza and Hib vaccines have been used for a longer period of time, their coverage needs to be enhanced. As for the PCV, the recent WHO position continues to recommend its inclusion in national immunization programs because of extensive impact data on pneumonia reduction. Its use should be complementary to control measures, such as appropriate case management, exclusive breastfeeding for the first 6 months of life and reducing known risk factors, such as indoor air pollution and tobacco smoke.[34] All of these recommendations, together with tuberculosis control, HIV prevention strategies and more accurate surveillance and monitoring, are of urgent importance in the Philippine setting.

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