**FINANCIAL IMPACT ON MALAYSIAN FAMILIES WITH CHILDREN ADMITTED WITH COMMUNITY ACQUIRED PNEUMONIA**

Rashdan Zaki Mohamed¹, Azriyanti Anuar Zaini²

**Abstract**

**Introduction:** Hospitalisation following community-acquired pneumonia (CAP) among children may cause considerable burden to a family. This study was conducted to determine the financial impact on the parents and risk factors for prolonged hospitalisation. **Methods:** A prospective, cross-sectional hospital-based study was conducted at the University Malaya Medical Centre (UMMC) among patients aged between 3 months and 12 years old with CAP. Parents were interviewed and medical records were reviewed. **Results:** A total of 95 patients were enrolled in this study with a median age of 13 months, of whom 52 were boys (54.7%) and 43 were girls (45.3%). The median (IQR) total expenses incurred by the parents was RM546.90 (USD 128.23), which constituted 12.6% of total household income. The median workday loss was 9 (4 – 29) days. Pre-existing chronic illness and underweight were found to be strong predictors of prolonged hospitalisation with odds ratio of 3.97 and 4.5, respectively. **Conclusion:** CAP resulted in a significant financial burden in terms of loss of productivity and costs incurred by parents.

**Keywords:** Community Acquired Pneumonia (CAP), financial impact, Malaysian, hospitalisation

**DOI:** 10.51407/mjpch.v30i1.264

**Received:** 22 May 2023; **Accepted revised manuscript:** 07 December 2023; **Published online:** 26 March 2024

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**Introduction**

"Pneumonia kills more children than any other illnesses – more than AIDS, malaria and measles combined. Over 2 million children die from pneumonia each year, accounting for almost 1 in 5 under-five deaths worldwide"⁶ - Pneumonia: The Forgotten Killer of Children [1].

Pneumonia is rather a loose term describing a chest infection. Pneumonia is defined as inflammation of lung tissue caused by an infectious pathogen causing acute respiratory signs and symptoms.

Pneumonia has resulted in two million deaths each year among children worldwide (95% CI = 1.6 - 2.2 millions), 70% of them in Africa and Southeast Asia [2] and accounting for almost one in five under-five mortality worldwide [1]. Most countries in Africa and Asia record 2 – 10 times more children with pneumonia (7 – 40 / 100 annually) than in the United States. Estimates from surrounding Asian countries, such as Bangladesh, reported that Acute Respiratory Infection (ARI) accounted for 15.5% of child deaths alone [2]. Australia reported a significant incidence of pneumonia of 5 – 8 per 1000 people per year [3].

Community-acquired pneumonia (CAP) causes significant burdens related to parents' time off work, child-care for other children in the family, school days lost and other costs. Swiss studies reported that the costs per episode of pneumococcal disease were 1170 Swiss francs (£517) for an uncomplicated illness and 4350 Swiss francs (£1924) for a complicated illness [4]. Another study conducted in Israel reported the total cost incurred by parents during hospitalisation for CAP as high as USD 234.2 which constituted 11% of total income [5].

Multiple studies have been conducted to ascertain the possible risk factors for CAP. In one multivariate logistic regression study, lack of immunization (adjusted odds ratio (AOR) = 1.54, 95% CI 1.0, 2.3), previous history of pneumonia (AOR = 1.77, 95% CI 1.16, 2.7), younger age (AOR up to age 59 months = 1.01, 95% CI 0.99, 1.03) and malnutrition (AOR = 2.2, 95% CI 1.0, 5.23) were revealed as important risk factors for pneumonia [6].

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Regarding specific risk factors associated with prolonged hospital stays in children with pneumonia—few studies reported that underlying cardiac and neuromuscular disease, lack of breastfeeding, overcrowding and mothers’ education level were independent predictors of prolonged hospital stays [7].

Currently, there is scarce evidence and a limited study that describes the cost incurred to the family following hospitalisation of CAP in Malaysian children and its associated risk factors. Hence, the current study seeks to determine the burden of disease in terms of the cost incurred by the family following a child’s CAP hospitalisation, and to identify the independent predictors of prolonged hospitalisation.

**Methods**

**Study Design**

This hospital-based, cross-sectional study was prospectively conducted in the paediatrics ward of the University Malaya Medical Centre (UMMC), Kuala Lumpur, Malaysia between June and November 2012.

**Study Population**

Children between 3 months and 12 years old who were admitted to UMMC during the study period were selected upon diagnosis of CAP. Inclusion and exclusion criteria were used to select eligible patients for the study. The sample size was calculated using Open-Epi, based on the prevalence of CAP taken from previous studies.

**Inclusion Criteria**

Children with documented pyrexia with a temperature of 38 and more degrees Celsius, cough with or without other respiratory symptoms, and tachypnoea for age (based on the WHO definition of tachypnoea for age): 2 – 12 months: more than 50 breaths per minute; 1 – 5 years old: more than 40 breaths per minute; more than 5 years: more than 20 breaths per minute, presence of two or more of the following physical findings: grunting, nasal flaring, chest retractions, crackles, reduced breath sound, dullness to percussion, and radiographic findings consistent with pneumonia: presence of consolidation or infiltration, lobar, perihilar, interstitial or segmental changes, presence of pleural effusion or empyema [14].

**Exclusion Criteria**

Children with primary or secondary immunodeficiency, chronic lung disease (except for bronchial asthma), haematological or any malignancies on chemotherapy, ingestion of oral or parenteral steroid for more than 4 weeks duration (except low dose topical and inhalational steroid), suspected or confirmed Tuberculosis, hospitalisation within 2 weeks prior to the study, children with nosocomial (hospital-acquired) pneumonia or had recurrent pneumonia, and those recruited earlier in the study.

**Data Collection**

Upon identification, parents were approached and introduced to the study. Consent was obtained upon agreement. Data was collected via interview with the parents or caretaker using a standardised questionnaire. Secondary data, such as past medical records, biochemical and radiological data, were obtained via medical records.

**Data Analysis**

The data was analysed using IBM SPSS software version 21.0. The findings were presented as numbers and percentages for categorical data. For continuous data, the normal distribution of the data was determined using the Kolmogorov-Smirnov test. Accordingly, the findings were presented as mean and standard deviation for normally distributed data or median and interquartile range values for non-normally distributed data. The relationship between the variables was determined using descriptive statistics. A chi-square test was used to determine the relationship between two categorical data sets. The chi-square result with a p-value less than 0.05 was considered statistically significant.

**Results**

**Sociodemographic characteristics**

From a total of 2571 patients admitted to the paediatrics ward a UMMC during the study period, 112 patients were diagnosed with CAP. Seventeen were excluded, leaving only 95 patients eligible for the study. They were 52 (54.7%) boys and 43 (45.3%) girls. Majority; 74 (78%) were of Malay ethnicity, while 10 (10.5%) of them were Indian, 7 (7.4%) were Chinese, 2 (2.1%) were non-Malay Bumiputera, and 2 (2.1%) were foreigners, as shown in Table 1.

| Table 1. Demographic Profile of the Participants (N=95) |
|---|---|---|
| **Age (months)** | Median (IQR) | N (%) |
| 13 (17) | | |
| **Gender** | | |
| Male | 52 (54.7) | |
| Female | 43 (45.3) | |
| **Race / Ethnicity** | | |
| Malay | 74 (78) | |
| Indian | 10 (10.5) | |
| Chinese | 7 (7.4) | |
| Non-Malay Bumiputera | 2 (2.1) | |
| Non-Malaysian Citizens | 2 (2.1) | |

( Note IQR: interquartile range, N: Frequency)
The mean age of the study population was 19.9 months, with a median age (IQR) of 13 (3 – 91) months. The age distribution was mainly seen in the younger age group between 3 and 11 months, with 42 (44.2%) children, 29 (30.5%) aged between 12 and 23 months, 17 (17.8%) aged between 24 and 59 months, and 7 (7.3%) aged more than 60 months, as shown in Graph 1.

Graph 1. Gender and Age Group Distribution

According to weight, a majority of 19 (20%) children were classified as underweight. Only 1 child was categorized as obese, while the remaining 75 (78.9%) children were overweight. The overall mean weight was 9.3 kg with a median of 8.5 (4.4 – 28.5) kg.

Financial burden of disease

Workday loss

Workday loss is a common term used to describe workday-related loss during the period of illness and may sometimes be inclusive of loss of income. From the total of 90 parents who responded to the interview questionnaire, 73 (81.1%) reported workday loss, while 17 (18.9%) reported being unaffected by CAP hospitalisation. The median workday loss was 9 (4 – 29) days.

Total expenses incurred to the family

The median total household income of the family was RM4,333.33 (800 – 10,000). The median loss of direct income reported by parents following the CAP hospitalisation of a child was RM269.90 (100 – 6,900). The median cost of the calculated hospital bill paid by the parents was RM277 (120 – 1,800). Hence, cumulatively, the median total expenses incurred by the parents following CAP hospitalisation of their children was RM546.90 (220 – 8,700), which was tabulated to 12.6% of their total household income as shown in Table 2.

Table 2. Financial impact and total expenses incurred by parents during hospitalisation for CAP.

<table>
<thead>
<tr>
<th>Financial Impact</th>
<th>No. of Respondent</th>
<th>Median</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Workdays missed (Days)</td>
<td>90</td>
<td>9</td>
<td>8.9</td>
</tr>
<tr>
<td>Income Loss (RM)</td>
<td>39</td>
<td>RM269.90</td>
<td>RM342.60</td>
</tr>
<tr>
<td>Medical Cost (RM)</td>
<td>95</td>
<td>RM277.00</td>
<td>RM370.40</td>
</tr>
<tr>
<td><strong>Total Expenses</strong></td>
<td></td>
<td><strong>RM546.90</strong></td>
<td></td>
</tr>
</tbody>
</table>
**Risk factors for prolonged hospitalisation**

The mean (SD) length of hospital stay following admission was 5.5 (±3.2) days, with a median value of 5 (2 – 23) days.

The risk factors analysed include exposure to smoking, household size, children's daycare attendance, breastfeeding, immunisation status, underlying chronic disease and weight. There were 45 (51.7%) children that were not exposed to cigarette smoke and 42 (48.3%) that were exposed to cigarette smoke in this study. In terms of overcrowding, a household size of less than 4 people was identified in 44 (48.8%) children, 5 to 7 people in 38 (42.2%) and more than 8 people in 8 (9%) children.

The majority of the 34 (37.8%) children in the study were taken care of at home by family members. For those who attend daycare centres including nursery, babysitter and kindergarten, the distribution according to the daycare centre was 20 (22.2%) attending centres with less than 5 children, 14 (15.6%) in centre with 5 to 10 children, and 22 (24.4%) in centres with more than 10 children. On further analysis of the duration of stay in daycare centre, it was noted that the mean hours spent in daycare were 5.85 hours per day (median 8.1 hours/day) and some children stayed up to 15 hours in daycare.

Twenty-nine (33%) children were exclusively breastfed for the first 6 month of life, 50 (56.8%) received mixed feeding while 9 (10.2%) children were not breastfed at all. The mean duration among those who were breastfed was around 6.8 months. Eighty-six children (90.5%) in this study had a full routine immunisation schedule for age.

Pre-existing underlying chronic illness was reported in 24 (25.3%) children. Distribution of the pre-existing chronic illness: 5 children with genetic syndrome (Down syndrome, VACTERL association, Golden Har syndrome, chromosome 7 deletion), 4 children with asthma, 4 children with underlying neurological disorder (epilepsy, cerebral palsy and structural agenesis of corpus colossum), 3 children who were born premature, 3 children with underlying congenital heart disease (septal defect, patent ductus arteriosus and operated double aortic arch, all not in failure) and 1 child with each condition namely eczema, rhinitis, uncomplicated operated left congenital diaphragmatic hernia, HbE thalassemia trait and familial intrahepatic cholangitis.

**Independent predictors of prolonged length of hospital stay among children with CAP**

Both pre-existing chronic illness and underweight were found to be strong predictors of prolonged hospitalisation in children with CAP (p < 0.05). Children with pre-existing chronic illnesses were found to have an odds ratio of 3.97 (95% confidence interval, 1.5 - 10.5, p value =0.04). For underweight children, the odds ratio was 4.5 with a 95% confidence interval and a p =0.04.

There were no statistically significant association (p > 0.05) between age, gender, race, exposure to smoking, household size, children's daycare attendance, breastfeeding status, and immunisation status with the length of hospital stay as shown in Table 3.

<table>
<thead>
<tr>
<th>Risk Factors</th>
<th>Mean rank</th>
<th>Odds ratio</th>
<th>95% CI</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attending daycare</td>
<td>43.54</td>
<td>0.72</td>
<td>0.3 – 1.77</td>
<td>0.48</td>
</tr>
<tr>
<td>Duration in daycare &gt; 6 hours</td>
<td>28.02</td>
<td>1.17</td>
<td>0.2 – 6.75</td>
<td>0.86</td>
</tr>
<tr>
<td>Not breastfeeding in first 6 months of life</td>
<td>41.00</td>
<td>0.59</td>
<td>1.45 – 2.39</td>
<td>0.46</td>
</tr>
<tr>
<td>Obese / Overweight</td>
<td>16.25</td>
<td>0.64</td>
<td>0.55 – 0.75</td>
<td>0.3</td>
</tr>
<tr>
<td>Underlying Chronic Illness</td>
<td>63.1</td>
<td>3.97</td>
<td>1.5 – 10.5</td>
<td>0.04</td>
</tr>
<tr>
<td>Not completed immunization</td>
<td>35.33</td>
<td>1.55</td>
<td>1.32 – 1.81</td>
<td>0.21</td>
</tr>
<tr>
<td>Exposure to tobacco smokes</td>
<td>47.94</td>
<td>2.25</td>
<td>0.9 – 5.62</td>
<td>0.08</td>
</tr>
<tr>
<td>More than 5 person per household</td>
<td>43.03</td>
<td>1.01</td>
<td>0.41 – 2.4</td>
<td>0.99</td>
</tr>
<tr>
<td>Race - Chinese</td>
<td>61.07</td>
<td>2.5</td>
<td>0.1 – 62.6</td>
<td>0.58</td>
</tr>
<tr>
<td>Race – Indians</td>
<td>60.05</td>
<td>2.3</td>
<td>0.11 – 50.98</td>
<td>0.59</td>
</tr>
<tr>
<td>Under-weight (Weight Less than 3rd Centile)</td>
<td>67.71</td>
<td>4.5</td>
<td>1.57 – 13.17</td>
<td>0.04</td>
</tr>
</tbody>
</table>
**Discussion**

CAP is a common disease that causes significant mortality and morbidity in children. It also causes a significant burden on the family in terms of loss of productivity, loss of income and financial impacts to account for the substantial cost of healthcare [8].

Literature has described the financial implications for parents with a child hospitalised due to illnesses including CAP in terms of the cost incurred. A study by Yaron Shoham et al. (2005) reported that the cost was up to USD234.20 (RM726), which made up 11% of combined family income in Israel [5]. In different aetiologies, Lee et al. reported that the cost incurred by parents for rotavirus gastroenteritis was USD194 in 2009 and rocketed up to USD252.86 in 2012 [9]. In our study, we found that: (1) median parental workday loss was 9 (4 – 29) days, and (2) median total expenses incurred by the parents when their children were admitted for CAP was significantly high up to RM546.90, which constitutes 12.6% of their household income.

CAP is associated with risk factors such as tobacco smoke exposure, being underweight or malnourished, attending daycare centres, a lack of immunisation, a lack of breastfeeding and younger age groups [10,11,12,13]. Studies have shown that neuromuscular and underlying cardiac disease, overcrowding, lack of breastfeeding and parental education level are independent predictors of prolonged hospitalisation due to pneumonia [2].

Risk factors such as underweight, younger age and pre-existing medical illness are the most significant factors in predicting the length of hospitalisation [10, 15]. In our study, underweight and chronic illness were the independent predictors of CAP prolonged hospitalisation with odds ratios of 4.5 and 3.97, respectively.

To summarise, this study indicated that children hospitalised with CAP cause a considerable financial burden to parents, in terms of workday loss and total expenses incurred. Underlying chronic medical illness and underweight were found to be independent predictors of prolonged hospitalisation, which leads to greater loss of productivity, loss of income and more cost incurred by the parents.

**Conclusion**

In conclusion, CAP causes a significant financial burden in terms of the cost incurred of RM546.90 (USD128.23) which is 12.6% of the total combined monthly household income. CAP leads to absent workdays (the median workday loss was 9 (4 – 29) days) during the hospitalisation period. Furthermore, underlying chronic illness and underweight were the independent predictors of prolonged hospitalisation with odds ratios of 3.97 and 4.5, respectively.

**Limitation**

This study was an observational, cross-sectional hospital-based study in a single institution (UMMC) over a relatively short period of time (5-6 months). Furthermore, simple logistic regression analysis cannot be used to generalize the findings.

**Recommendations**

A multi-centre, longer and more detailed study must be conducted to ascertain the total cost, loss of income/workdays missed, total direct CAP hospitalisation cost including treatment cost, investigation cost, emolument cost and admission consultation cost to indicate the health-economic burden.

**References**


