RISK FACTORS IN PREDICTING MORTALITY AMONG CHILDREN ADMITTED FOR PCAP C AND D AT PHILIPPINE CHILDREN'S MEDICAL CENTER

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ABSTRACT

OBJECTIVE: The study aimed to identify risk factors associated with mortality among patients admitted for PCAP C and D.

METHODOLOGY: The study was a cross-sectional study involving children admitted for PCAP C and D at PCMC from January 2017 to December 2019. Univariate and multivariate analyses through binomial logistic regression were used to determine significant predictors of mortality.

RESULTS: A total of 472 patients were included in the study, of whom 77% had PCAP C and 23% had PCAP D. More than half in each patient group were infants; male; and of normal nutritional status. Most common comorbidities in both groups were neurologic and cardiovascular in nature. Leukocytosis, thrombocytosis, and anemia were the most common hematologic findings. Overall mortality rate among patients was 5.08%. On univariate analysis, being severely underweight (cOR 8.28 [95% CI 2.52–27.23]), with history of antibiotic use (cOR 3.01 [95% CI 1.18–7.62], neurologic comorbidities (cOR 4.04 [95% CI 1.42–11.43]), cardiac comorbidities (cOR 5.33 [95% CI 1.31–21.75]), Down syndrome (cOR 22.11 [95% CI 2.44-200.30]), and thrombocytopenia (cOR 22.11 [95% CI 2.44-200.30]) were associated with greater odds of mortality among PCAP-D patients. On multivariate analysis, the odds of mortality were 5.02 (95% CI 1.05-23.96) for severely underweight patients, 4.51 (95% CI 1.13-17.95) in patients with neurologic disease, and 73.62 (95% CI 3.63–1491.10) in patients with Down syndrome.

CONCLUSION: Patients with PCAP D who have severe malnutrition, Down syndrome, cardiac and neurologic abnormalities, and thrombocytopenia should be managed more aggressively to decrease mortality in these patients.

KEYWORDS: PCAP, pediatric, community-acquired pneumonia, mortality

INTRODUCTION

Community-acquired pneumonia (CAP) is a prevalent cause of respiratory morbidity and mortality in a significant part of the global population and is the leading cause of death in children under five years of age. Several clinical practice guidelines have been formulated worldwide, including a local one published by the Philippine Academy of Pediatric Pulmonologists, Inc. in partnership with the Pediatric Infectious Disease Society of the Philippines.

Huang et al found that age < 2 years, pleural effusion as admission diagnosis, Hb < 10 g/dL, WBC count > 17,500/mL, tachypnea, and duration to defervescence >3 days were risk factors for progressive and complicated pneumonia. Streptococcus pneumoniae was the main etiology1. Another study by Koh et al. revealed that presence of co-morbidities and bacteremia were early prognostic variables identified as independent risk factors for poor outcome2. Risk factors identified by Negash et al associated with bacteremic pneumonia were non-vaccination with PCV10, female sex, malnutrition, and chest indrawing, whereas malnutrition was associated with mortality due to CAP3. In a local study by Dembele et al., risk factors significantly associated with death included age of 2–5 months, sensorial changes, severe malnutrition, grunting, central cyanosis, decreased breath sounds, tachypnea, fever (≥38.5°C), saturation of peripheral oxygen <90%, infiltration, consolidation, and pleural effusion on chest radiograph4. Predictors of death were similar in the local study of Lupisan et al which included age 2–5 months, weight for age z-score less than 2 SD, dense infiltrates on chest radiography and definite pathogens isolated in the blood5.

The aim of this study was to create a comprehensive profile of patients with PCAP C and D admitted at PCMC and identify risk factors associated with mortality which may help in guiding optimal utilization of resources for the most effective preventive and early management strategies.

OBJECTIVES OF THE STUDY

General Objective

- To identify risk factors associated with mortality among patients admitted for PCAP C and D at PCMC.

Specific Objectives

1. To determine the demographic characteristics of patients based on the following variables:
    a. Age
    b. Sex

2. To determine the following clinical characteristics:
    a. Nutritional status
    b. Presence of co-morbid conditions
    c. Signs and symptoms
    d.Antibiotics taken prior to admission
    e. Immunization history
    f. Physical exam findings
    g. Laboratory findings (CBC, blood culture, tracheal aspirate culture)
    h. Radiologic findings
    i. Type of admission (ICU or regular ward)
    j. Management (Oxygen support, antibiotics given)
    k. Presence of complications during confinement (development of pleural effusion/ empyema, pneumothorax, lung abscess, chest tube insertion, mechanical ventilation).
    l. Total days confined in the hospital.

3. To determine which of the demographic and clinical characteristics are highly associated with mortality.

METHODOLOGY

This was a cross-sectional analytic study carried out at Philippine Children's Medical Center Quezon City among patients admitted for PCAPC and PCAP D for the years 2017 to 2019.

The participants were cases of PCAP C and D admitted at Philippine Children's Medical Center in Quezon City from January 2017 – December 2019, ages 3 months to 18 years. Exclusion criteria included patients who were (1) immunocompromised, (2) transferees from other hospitals, (3) diagnosed with nosocomial pneumonia. Patients who were immunocompromised were excluded since these patients were more predisposed to developing more invasive infections and can carry poorer outcomes. Those with nosocomial pneumonia were also excluded since hospital acquired infections are largely affected and influenced by hospital infection control measures which is outside the scope of this paper and is not one of the risk factors of interest. Diagnosis and classification of PCAP C and PCAP D was based on the PAPP PCAP 2016 guidelines6.

The study used a simple random sampling method which included patient records for PCAP who were admitted at PCMC for 2017-2019. The number of total PCAP cases which met the inclusion and exclusion criteria were as follows: (1) 218 cases for 2017 (2) 249 cases for 2018; (3) 224 cases for 2019. Based on a national prevalence of 828 per 100,000 population7, the minimum sample size was computed at 158 cases/year.

The information which was included in the data abstraction form were the patients': A. Demographic data (1) age and (2) biological sex. B. Clinical characteristics: (1)history – cough, fever, dyspnea(2) nutritional status9– underweight, normal, overweight, obese (3) co-morbid conditions– cardiac disease, neurologic, chronic lung disease, chronic liver disease (4) antibiotics taken prior to admission (5) immunization history – influenza, pneumococcal, vaccines against Hib and measles (6) physical exam findings– febrile, altered sensorium, signs of dehydration, cyanosis, alar flaring, retractions, crackles, wheeze (7) complete blood count – anemia, thrombocytopenia, thrombocytosis, leukocytosis, leukopenia(8) culture results (blood, tracheal aspirate) (9) chest x-ray findings - interstitial infiltrate, single lobar consolidation, multilobar consolidation, mixed pattern, atelectasis(10) type of admission (ICU or ward) (11) oxygen support – 1-4lpm, 5-15lpm, non-invasive ventilation, intubated (12) antibiotic given; (13) presence of complications (pleural effusion, empyema, pneumothorax, lung abscess, chest tube insertion, mechanical ventilation) (14) total number of hospital days. C. Clinical outcome will be whether (1) discharged or (2) mortality.

Descriptive statistics were used to summarize the general and clinical characteristics of the participants. Frequency and proportion were used for nominal

variables, median and range for ordinal variables, and mean and standard deviation for interval/ratio variables. Odds ratios and the corresponding 95% confidence intervals from binary logistic regression were computed to determine the association between clinico-demographic factors and mortality.

All valid data were included in the analysis. Missing data were neither replaced nor estimated. Null hypothesis was rejected at 0.05α-level of significance. STATA 15.0 was used for data analysis.

RESULTS

A total of 472 patients were included in the study, of whom 363 (77%) had PCAP C and 109 (23%) had PCAP D (Table 1). Leukocytosis (39% and 42%), thrombocytosis (27% and 36%), and anemia (23%and 23%) were the most noted hematologic findings among PCAP C and D patients (Table 2). More than half in both groups (60% and 72%) had radiographic readings of infiltrates in both inner and mid lung zones, while more than a third had interstitial infiltrates (36%and 34%). Single lobar consolidation (24% vs 9%) and atelectasis (15% vs 3%) were more common among children with very severe disease. Pleural effusion was the most common lung complication, observed in 1% and 4% of pCAP C and D patients, respectively. One severely ill child developed lung abscess.

The primary sites for care for PCAP-C and PCAP-D patients were the ward and ICU, respectively (Table 3). O2 support of 1-4 lpm was applied to 70.6% of PCAP-C patients, while intubation was applied to 95.4% of patients in the PCAP-D group. For PCAP-D, there were 16 patients with H. influenzae, 6 patients with S. aureus, and 5 patients with S. pneumoniae (Table 4). Blood cultures were likewise positive in below 5% of the patients (Table 5). For PCAP-C, S. pneumoniae and CONS were reported in four patients each, while S. aureus, K. pneumoniae, and Salmonella group D were reported in one patient each. For PCAP-D patients, four patients had CONS, while S. pneumoniae and S. aureus was reported in three patients each. There was one patient with K. pneumoniae in the bloodstream, and one patient positive for Burkholderia. The top five commonly administered antibiotics to PCAP-C patients were: ampicillin (48.21%), ceftriaxone (23.42%), cefuroxime (23.14%), penicillin G (10.47%), and azithromycin (9.37%). The top five commonly administered antibiotics to PCAP-D patients were: ampicillin (75.23%), ceftriaxone (73.39%), gentamycin (32.11%), vancomycin (25.69%), and piperacillin-tazobactam (18.35%) (Table 6). Among PCAP-C patients, less than half (40.2%) had steroids and 78.2% had bronchodilators. Among PCAP-D patients, 66.06% received steroids and 75.23% received bronchodilators (Table 7). Mechanical ventilation and lung abscess as a complication were recorded only in the pCAP D group, in 83% and 1% of its members, respectively (Table 8). Pleural effusion as a complication were observed in both PCAP-C and PCAP-D with 0.83% and 6.42% respectively. Mortality was observed among PCAP-D patients only. Overall mortality rate among patients was 5.08% at

a rate of 0.44 (95% CI 0.29-0.65) per 100 patient-days. Among pCAP D patients, mortality incidence was 22% at a rate of 1.49 (95% CI 1-2.22) per 100 patient-days (Table 10).

On univariate analysis, being severely underweight (cOR 8.28 [95% CI 2.52–27.23]), with history of antibiotic use (cOR 3.01 [95% CI 1.18–7.62], neurologic comorbidities (cOR 4.04 [95% CI 1.42–11.43]), cardiac comorbidities (cOR 5.33 [95% CI 1.31–21.75]), Down syndrome (DS) (cOR 22.11 [95% CI 2.44-200.30]), and thrombocytopenia (cOR 22.11 [95% CI 2.44-200.30]) were associated with greater odds of mortality among PCAP-D patients (Table 11). On the other hand, presence of interstitial infiltrates had decreased the same odds by 79% (95% CI 23%–94%). Signs and symptoms were not included in the univariate and multivariate analysis since some of these are included in the basis of how we classify PCAP-C and PCAP-D. On multivariate analysis, the odds of mortality was 5.02 (95% CI 1.05-23.96) as much in severely underweight patients as in those with normal nutritional status, 4.51 (95% CI 1.13-17.95) with neurologic disease compared to those without, and 73.62 (95% CI 3.63–1491.10) with Down syndrome versus those without (Table 12). This final model explained 37.92% of the variation in mortality ($p < 0.0001$).

DISCUSSION

This study was conducted to identify clinical variables associated with mortality in children with a diagnosis of PCAP C and D. Case fatality rate of childhood pneumonia ranges between 3.4% to 12% in developing countries10. The mortality rate in this study was 5.08%, which is in line with previous published literature. As shown by other publications, young age has been associated with a greater incidence of respiratory infections and tend to be more vulnerable to developing severe pneumonia11. In our study, more than half of each patient group were infants (67% and 72%).

Risk factors for mortality vary between countries and regions due to socioeconomic factors and development in primary health care. In previous studies, younger age, malnutrition, and co-morbid conditions (such as prematurity and congenital heart disease) were found to be significant risk factors11. On univariate analysis, having cardiac comorbidities was one of the risk factors associated with greater odds of mortality among PCAP-D patients. Thrombocytopenia was another risk factor (cOR 22.11 [95% CI 2.44-200.30]). However, this was only seen on univariate analysis although prior studies also had the same findings. Plausible explanation for this is the association of low platelet counts with disseminated intravascular coagulation and severe sepsis13,14. On multivariate analysis, the odds of mortality was 4.51 (95% CI 1.13-17.95) in patients with neurologic disease compared to those without. This is in line with the study of Millman et al where they found that children with neurologic disorders hospitalized with community acquired pneumonia were more likely to be admitted to the ICU than children without neurologic disorders15. Patients with

neurologic co-morbidities —including epilepsy, neurodevelopmental disorders, and neuromuscular disorders—are particularly vulnerable to severe complications and death from respiratory failure since this set of patients may have pulmonary scarring from recurrent aspiration, ineffective cough, and chest wall or spinal abnormalities prohibiting maximal chest expansion15.

Down Syndrome is also one of the risk factors found to be significantly associated with mortality, OR 73.62 (95% CI 3.63–1491.10). The main cause of hospitalization and admission to the pediatric intensive care unit in children with DS is lower respiratory tract infection. Among this set of population, a higher incidence of acute lung injury and acute respiratory distress syndrome is reported. This increased risk of respiratory tract infections and morbidities may be associated with congenital heart disease, abnormal airway anatomy and physiology, hypotonia, and aspiration16. Our result yielded a very wide confidence interval. A possible reason is that we only had a small sample size having only 6 Down Syndrome patients under the PCAP D classification. Deficient nutritional status has clearly been established as a risk factor both for morbidity and mortality among patients with lower respiratory tract infection5,6,17. Similarly, we found that being severely underweight was also strongly associated with a higher likelihood of death based on multivirate analysis (OR 5.02 (95% CI 1.05-23.96)) and was prevalent among PCAP D patients accounting for about 16.5%. The Department of Health has made important efforts to introduce programs for the prevention and management of childhood diseases, examples are promotion of exclusive breastfeeding, supplementation of iron and vitamin A, introduction of EPI, all of which may have an impact on the incidence of new malnutrition cases. However, malnutrition prevalence rates remain high in the Philippines, especially the patients our hospital caters to and unless adequately addressed, will continue to negatively affect the survival of patients with pneumonia.

The results of this study should be viewed considering its limitations. Firstly, because this was a chart review, weight for height which is a better indicator of malnutrition, was not used since most of the data recoverable in the records only included weight. Another limitation was the lack of other potentially relevant risk factors like smoking exposure, lack of breastfeeding, and other socioeconomic factors since this information was also missing. Lastly, microbiological testing was not performed in all patients and viral studies were not done which underestimated the documented etiological agent.

CONCLUSION

In conclusion, the results demonstrated that among children admitted for PCAP D, being severely underweight, having Down syndrome, and having neurologic comorbidities were significantly associated with mortality, and should therefore be managed more aggressively.

TABLES

Table 1. Demographic and clinical profile of children with CAP (n=472)

	pCAP C (n=363)	pCAP D (n=109)
	Frequency (%)	
Age on diagnosis		
Infants (3 months – 2 years)	242 (66.67)	78 (71.56)
Children (2 – 12 years)	117 (32.23)	29 (26.61)
Adolescents (12 – 16 years)	4 (1.10)	2 (1.83)
Sex		
Male	209 (57.58)	63 (57.80)
Female	154 (42.42)	46 (42.20)
Clinical history		
Cough	356 (98.07)	107 (98.17)
Fever	285 (78.51)	81 (74.31)
Cyanosis	6 (1.65)	5 (4.59)
Nutritional status		
Severely underweight	37 (10.19)	18 (16.51)
Underweight	96 (26.45)	28 (25.69)
Normal	217 (59.78)	61 (55.96)
Overweight	12 (3.31)	2 (1.83)
Obese	1 (0.28)	0
Antibiotic use prior to admission	130 (35.81)	37 (33.94)
Physical exam findings		
Dyspnea	250 (68.87)	99 (90.83)
Desaturation	259 (71.35)	100 (91.74)
Hypotension	10 (2.75)	13 (11.93)
Grunting	0	20 (18.35)
Head bobbing	1 (0.28)	19 (17.43)
Altered sensorium	144 (39.67)	98 (89.91)
Irritable	143 (99.31)	71 (72.45)
Lethargic	1 (0.69)	27 (27.55)
Convulsion	5 (1.38)	3 (2.75)
Poor perfusion	1 (0.28)	14 (12.84)
Retractions	309 (85.12)	106 (97.25)
Crackles	329 (90.63)	96 (88.07)
Wheezing	63 (17.36)	23 (21.10)
Rhonchi	29 (7.99)	20 (18.35)
Immunization		
DTwP-IPV-Hib		
None	65 (17.91)	30 (27.52)
Incomplete	166 (45.73)	52 (47.71)
Complete	132 (36.36)	27 (24.77)
PCV		
None	337 (92.84)	103 (94.50)
Incomplete	18 (4.96)	5 (4.59)
Complete	8 (2.20)	1 (0.92)
Influenza vaccine		
None	348 (95.87)	106 (97.25)
Incomplete	8 (2.20)	2 (1.83)
Complete	7 (1.93)	1 (0.92)
Measles/MMR		
None	166 (45.73)	58 (53.21)
Incomplete	129 (35.54)	39 (35.78)
Complete	68 (18.73)	12 (11.01)
Comorbidities		
Cardiac disease	38 (10.47)	6 (5.50)
Neurologic only	38 (10.47)	18 (16.51)
Chronic liver disease (CLD)	12 (3.3)	0
Down Syndrome (DS)	8 (2.20)	2 (1.83)
Asthma	6 (1.65)	1 (0.92)
Bronchiectasis only	1 (0.28)	1 (0.92)
ILD only	1 (0.28)	0
Others	12 (31.58)	10 (9.17)
DS with Cardiac	1 (0.28)	3 (2.75)
Cardiac with other comorbid	3 (0.83)	0
DS with other comorbid	1 (0.28)	0
ILD and bronchiectasis	1 (0.28)	0
Cardiac and Neurologic	1 (0.28)	0
CLD w/ other comorbid	1 (0.28)	0
Neurologic with other comorbid	1 (0.28)	1 (0.92)
DS with cardiac and other	1 (0.28)	0
DS with neurologic and other comorbid	0	1 (0.92)

Table 2. Laboratory and radiologic findings of patients (n=472)

	PCAP C (n=363)	PCAP D (n=109)
	Frequency (%)	
Complete blood count		
Anemia	84 (23.14)	25 (22.94)
Leukocytosis	141 (38.84)	46 (42.20)
Thrombocytosis	98 (27.00)	39 (35.78)
Thrombocytopenia	20 (5.51)	6 (5.50)
Leukopenia	6 (1.65)	2 (1.83)
Chest radiograph		
Interstitial infiltrates	129 (35.54)	37 (33.94)
Infiltrates both inner to mid lung zones	218 (60.06)	78 (71.56)
Single lobar consolidation	33 (9.09)	26 (23.85)
Multi-lobar consolidation	6 (1.65)	3 (2.75)
Mixed pattern	0	0
Hyperinflation	41 (11.29)	15 (13.76)
Perihilar lymphadenopathy	18 (4.96)	2 (1.83)
Atelectasis	11 (3.03)	16 (14.68)
Others	6 (1.65)	1 (0.92)
Radiologic lung complications		
Pleural effusion	5 (1.38)	4 (3.67)
Lung abscess	0	1 (0.92)

Table 3. Type of admission and oxygen support (n=472)

	PCAP C (n=363)	PCAP D (n=109)
	Frequency (%)	
Type of admission		
Ward	363 (100)	4 (3.67)
ICU	0	105 (96.33)
O_2 support		
None	57 (15.70)	0
1-4 lpm	256 (70.52)	0
5-15 lpm	50 (13.77)	4 (3.67)
Non-invasive ventilation	0	1 (0.92)
Intubated	0	104 (95.41)

Table 4. Isolates from tracheal aspirate culture (n=472)

	PCAP D (n=109)
	Frequency (%)
S. pneumoniae	4 (3.67)
S. aureus	3 (2.75)
H. influenzae	12 (11.01)
K. pneumonia	7 (6.42)
P. aeruginosa	5 (4.59)
S. paucimobilis	2 (1.83)
E. aerogenes	2 (1.83)
E. coli	1 (0.92)
M. nonliquefaciens	1 (0.92)
Acinetobacter	3 (2.75)
MRSA	1 (0.92)
H. influenzae, E. coli	2 (1.83)
H. influenzae, C. albicans	1 (0.92)
H. influenzae, K. pneumonia	1 (0.92)
H. influenzae, K. pneumonia, E. coli	1 (0.92)
S. aureus, E. coli	1 (0.92)
S. aureus, MRSA	1 (0.92)
S. aureus, P. aeruginosa	1 (0.92)
S. pneumoniae, S. aureus	1 (0.92)

Table 5. Blood culture profiles in PCAP (n=472)

	PCAP C (n=363)	PCAP D (n=109)
	Frequency (%)	
S. pneumoniae	4 (1.10)	3 (2.75)
S. aureus	1 (0.28)	3 (2.75)
K. pneumoniae	1 (0.28)	1 (0.92)
Coagulase negative *Staphylococcus*	4 (1.10)	4 (3.67)
Burkholderia sp. sp.	0	1 (0.92)
Salmonella group D	1 (0.28)	0

Table 6. Antibiotics given to PCAP C and PCAP D (n=472)

	PCAP C (n=363)	PCAP D (n=109)
	Frequency (%)	
Ampicillin	175 (48.21)	82 (75.23)
Ceftriaxone	85 (23.42)	80 (73.39)
Cefuroxime	84 (23.14)	13 (11.93)
Penicillin G	38 (10.47)	9 (8.26)
Azithromycin	34 (9.37)	18 (16.51)
Gentamicin	19 (5.23)	35 (32.11)
S. Ampicillin	13 (3.58)	7 (6.42)
Piperacillin-tazobactam	11 (3.03)	20 (18.35)
Cefotaxime	6 (1.65)	2 (1.83)
Clindamycin	6 (1.65)	12 (11.01)
Clarithromycin	5 (1.38)	0
Amikacin	4 (1.10)	4 (3.67)
Ciprofloxacin	4 (1.10)	4 (3.67)
Meropenem	4 (1.10)	18 (16.51)
Ceftazidime	3 (0.83)	1 (0.92)
Vancomycin	3 (0.83)	28 (25.69)
Cefepime	1 (0.28)	1 (0.92)
Cefexime	1 (0.28)	0
Cotrimoxazole	0	1 (0.92)
Metronidazole	0	1 (0.92)

Table 7. Other medications for PCAP patients (n=472)

	PCAP C (n=363)	PCAP D (n=109)
	Frequency (%)	
Steroids	146 (40.22)	72 (66.06)
Bronchodilators	284 (78.24)	82 (75.23)

Table 8. Procedures and complications, by CAP severity (n=472)

	PCAP C (n=363)	PCAP D (n=109)
	Frequency (%)	
Interventions		
Mechanical ventilation	0	90 (82.57)
Complications		
Pleural effusion	3 (0.83)	7 (6.42)
Lung abscess	0	1 (0.92)

Table 9. Duration of hospitalization, by CAP severity (n=472)

	PCAP C (n=363)	PCAP D (n=109)
	Frequency (range)	
Duration from onset of symptoms to admission, days	4 (1 – 21)	4 (1 – 24)
Duration of hospitalization, days		
Among survivors	4 (1 – 12)	8 (2 – 15)
Among mortality	-	6 (1 – 21)

Table 10. Mortality incidence and incidence rate, by CAP severity (n=472)

	PCAP C (n=363)	PCAP D (n=109)
	% (95% CI)	
Mortality		
Overall	5.08 (3.28 – 7.47)	
Per group	0 (0 – 1.01)	22.02 (14.65 – 30.97)
Incidence density, per 100 days		
Overall	0.44 (0.29 – 0.65)	
Per group	0	1.49 (1.00 – 2.22)

Table 11. Univariate analysis for mortality among PCAP D patients (n=109)

Variable	Crude Odds Ratio (95% CI)	p-value
Age	1.07 (0.94 to 1.22)	.295
Sex		
Female	Reference	-
Male	1.03 (0.41 to 2.58)	.952
Nutritional status		
Normal	Reference	-
Severely underweight	8.28 (2.52 to 27.23)	.001
Underweight	1.81 (0.56 to 5.82)	.321
Overweight	-	-
Obese	-	-
With history of antibiotic use	3.01 (1.18 to 7.62)	.021
Comorbidities		
Neurologic	4.04 (1.42 to 11.43)	.009
Cardiac	5.33 (1.31 to 21.75)	.020
Down syndrome	22.11 (2.44 to 200.30)	.006
Steroids	0.52 (0.21 to 1.31)	.167
Bronchodilators	0.58 (0.21 to 1.55)	.275
Mechanical ventilation	2.75 (0.59 to 12.85)	.199
Complete blood count		
Anemia	1.53 (0.55 to 4.26)	.413
Leukocytosis	0.78 (0.31 to 1.97)	.598
Thrombocytosis	0.53 (0.19 to 1.46)	0.217
Thrombocytopenia	22.11 (2.44 to 200.30)	.006
Leukopenia	3.65 (0.22 to 60.66)	.366
Chest X-ray		
Interstitial infiltrates	0.21 (0.06 to 0.77)	.019
Infiltrates both inner to mid lung zones	0.96 (0.35 to 2.59)	.929
Single lobar consolidation	2.40 (0.90 to 6.41)	.081
Multi-lobar consolidation	1.80 (0.16 to 20.79)	.636
Hyperinflation	1.35 (0.39 to 4.68)	.641
Atelectasis	2.50 (0.80 to 7.78)	.114
Immunization		
DTwP-IPV-Hib	0.55 (0.21 to 1.43)	.219
PCV	3.90 (0.73 to 20.75)	.110
Influenza vaccine	7.64 (0.66 to 88.13)	.103
Measles/MMR	0.77 (0.31 to 1.92)	.570

Table 12. Multivariate analysis for mortality among PCAP D patients (n=109)

Variable	Adjusted Odds Ratio (95% CI)	p-value
Nutritional status		
Normal	Reference	-
Severely underweight	5.02 (1.05 to 23.96)	.043
Underweight	0.82 (0.16 to 4.32)	.816
Overweight	0	-
Obese	0	-
History of antibiotic use	2.77 (0.76 to 10.14)	.124
Comorbidities		
Neurologic	4.51 (1.13 to 17.95)	.032
Cardiac	0.92 (0.06 to 14.12)	.953
Down syndrome	73.62 (3.63 to 1491.10)	.005
Thrombocytopenia	22.82 (0.93 to 557.77)	.055
Interstitial infiltrates	0.23 (0.04 to 1.38)	107

Adjusted model R^2=37.92%; p <.0001

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