Original Research

WEIGHT LOSS IN PNEUMONIA PATIENTS AGED 6-60 MONTHS TREATED AT CHILDREN'S HOSPITAL 2 AND ITS RELATIONSHIP TO LENGTH OF HOSPITAL STAY AND TREATMENT RESPONSE

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ABSTRACT

Aims: To determine the rate of weight loss and the relationship of weight loss with length of hospital stay and treatment response in pneumonia inpatients aged 6-60 months.

Methods: A hospital cross-based prospective study was conducted on 208 patients aged 6-60 months diagnosed with pneumonia and treated as inpatients at the Respiratory Department 1 and 2 of Children's Hospital 2 from March to April 2024.

Results: The rates of weight loss after 3 days, after 7 days of hospitalization, and at discharge were 27.6%, 38.1%, and 38.0% respectively. The length of hospital stay for children with ≥ 5% weight loss after 3 days of hospitalization and at discharge was longer than for those with weight loss < 5% ($p < 0.05$). Children with ≥ 5% weight loss after 3 days of hospitalization and at discharge had a poorer treatment response compared to children with < 5% weight loss [(RR (95%CI)= 5.88 (1.71-20.1) and RR (95%CI)= 4.86 (1.95-12.1), respectively (p=0.025 and p=0.001).

Conclusions: Regulary monitoring children's weight during treatment and providing nutritional support to prevent excessive weight loss is essential to improve the treatment process and the hospital stay.

Keywords*: pneumonia, weight loss, length of hospital stay, treatment response.*

I. INTRODUCTION

Weight loss in children is a serious issue that affects their overall development and health. Sick children may experience weight loss due to reduced appetite or decreased ability to eat, combined with increased metabolic demands. Rapid weight loss negatively impacts treatment and requires timely assessment and intervention. This can lead to nutritional complications and reduced treatment efficacy, resulting in increased morbidity rates, longer hospital stays, higher treatment costs, and diminished quality of life [1, 2, 3]. Currently, there is limited research on weight loss in hospitalized children and its relationship to treatment response. Therefore, the study aimed to investigatethe the relationship between weight loss after 3 days, after 7 days of hospitalization, and at discharge with the length of hospital stay and treatment response.

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II. METHODS

Study design

A hospital-based prospective was carried out between March and April, 2024 on patients aged 6 – 60 months diagnosed with pneumonia and treated as inpatients at the Respiratory Departments 1 and 2, Children's Hospital 2. The pneumonia patients were diagnosed according to the protocol and admitted based on the hospital's admission criteria.

Inclusion criteria

Patients aged 6 – 60 months hospitalized due to pneumonia were recruited for the study when their primary caregivers' consent to participate in the study. Each patient was only enrolled in the study during their first hospitalization for this illness episode, excluding those who were readmitted or transferred back to the department.

Exclusion criteria

Patients were excluded from the study with one of the following criteria: research forms lacking ≥ 50% of the information or missing data on the child's weight; patients who were previously admitted to the Intensive Care Unit before being transferred to the Respiratory Department or those who were initially treated at lower-level hospitals before being transferred to Children's Hospital 2; patients were readmitted or transferred back to the department, patients transferred to other departments or Intensive Care Unit.

Sample size

The sample size was calculated using the formula: $n = \frac{Z^2_{1-\alpha/2}p(1-p)}{d^2}$

Where:

- n: minimum sample size for the study
- α=0.05: Type I error; $Z_{(1-\alpha/2)}$= 1.96
- d=0.07: margin of error.
- p = 0.701: estimated rate of children experiencing weight loss upon admission (based on the study by Hwang et al. at Korean).

The minimum sample size calculated was 182 subjects with a 10% expected drop-out rate.

Data collection

Children's weights were measured daily from admission to discharge. Medical records were reviewed to assess the treatment response of the children.

Weight change after 3 days, 7 days, and at discharge was determined by the difference between the weight at admission and the weight on the 3rd day, 7th day, and at discharge, respectively.

Weight Loss was calculated based on the formula:

$$\text{Weight Loss (\%)} = \frac{\text{Weight at admission} - \text{Current Weight}}{\text{Weight at admission}} x100$$

Treatment response was categorized into two values:

- Poor: increased oxygen requirement or escalated/added antibiotics
- Good: maintained or reduced oxygen/antibiotics.

Statistical analysis

Data was entered using EpiData software. Data processing and analysis were conducted using Stata 17.0 software. Qualitative variables were described using frequency and percentage. Quantitative variables were be described as mean and standard deviation; if the distribution is not normal, they were shown as median and interquartile range. Risks ratio (RR) was calculated with 95 confidence interval (CI).

III. RESULTS

The study was conducted on 208 children with 127 males (61.1%) and 81 females (38.9%). Among them, 59 children were 6-12 months old (28.4%), 92 children were 13-24 months old (44.2%), and 57 children were 25-60 months old (27.4%). During this treatment period, the majority of the children did not require intensive care or emergency services (88.0%), and the treatment prognosis was good (84.6%). The median length of hospital stay for the children was 7 days, with an interquartile range of 5-10 days.

Table 1. *Characteristics of the weight change of the children.*

Characteristics	Frequency	%	Characteristics	Frequency	%
Weight change after the first 3 days of hospitalization (*n* = 192)			Weight loss after the first 3 days of hospitalization (*n* = 53)		
Weight gain	60	31.3	< 5%	47	88.7
No change	79	41.2	5 – 10%	6	11.3
Weight loss	53	27.6	> 10%	0	0.0
Weight change after the first 7 days of hospitalization (*n* = 113)			Weight loss after the first 7 days of hospitalization (*n* = 43)		
Weight gain	44	38.9	< 5%	33	76.7
No change	26	23.0	5 – 10%	10	23.3
Weight loss	43	38.1	> 10%	0	0.0
Weight change at discharge (*n* = 208)			Weight loss at discharge (*n* = 79)		
Weight gain	71	34.1	< 5%	62	78.5
No change	58	27.9	5 – 10%	16	20.3
Weight loss	79	38.0	> 10%	1	1.3

Table 1 shows that after 3 days of hospitalization, 27.6% of the children experienced weight loss. After 7 days, 38.1% of the children had weight loss, and after hospitalization- at discharge, the percentage of children with weight loss was 38.0%. As shown in the Table 2, the children who experienced ≥ 5% weight loss after 7 days of hospitalization had a tend of longer length of hospital stay compared to those with < 5% weight loss ($p = 0.058$).

Table 2. *Relationship of the length of hospital stay with 5% or greater weight loss after 3 days, 7 days, and at discharge.*

Times measuring weight of the children	The length of hospital stay		*p*-value
	< 5% weight loss	≥ 5% weight loss	
After 3 days, *n* (%)	7 (5 – 9)	14.5 (6 – 22)	0.043
After 7 days, *n* (%)	9 (8 – 12)	11.5 (10 – 19)	0.058
At discharge, *n* (%)	6.5 (4 – 9)	11 (8 – 19)	<0.001

The length of hospital stay are shown in median (interquartile range).
p-values by Mann-Whitney U test.

Table 3. *Relationship between 5% or greater weight loss and treatment response.*

Variables	Treatment response		*p-value*	RR (95%CI)
	Good (*n* ,%)	Poor (*n* ,%)		
Weight loss after 3 days (*n* = 53)				
< 5%	43 (91.5)	4 (8.5)	0.025	1.0
≥ 5%	3 (50.0)	3 (50.0)		5.88 (1.71 - 20.1)
Weight loss after 7 days (*n* = 43)				
< 5%	26 (78.8)	7 (21.2)	0.110	1.0
≥ 5%	5 (50.0)	5 (50.0)		2.36 (0.95 - 5.81)
Weight lost at discharge (*n* = 79)				
< 5%	56 (90.3)	6 (9.7)	0.001	1.0
≥ 5%	9 (52.9)	8 (47.1)		4.86 (1.95 - 12.1)

RR, relative ratio. p-value by Fisher's exact test.

Table 3 shows that treatment response in children with < 5% weight loss after 3 days and during hospitalization was better compared to children with ≥ 5% weight loss ($p < 0.05$). Children with < 5% weight loss after 7 days had a tend of better treatment response compared to those with ≥ 5% weight loss.

IV. DISCUSSION

Relationship between 5% or greater weight loss after 3 days of hospitalization and length of hospital stay

Weight loss during hospitalization indicates that the child is not receiving adequate nutrition or is experiencing significant fluid loss due to vomiting, diarrhea, etc. Prolonged weight loss can lead to malnutrition in hospitalized children. A study by K. Huysentruyt et al. conducted on 379 children in Belgium found that malnourished children had longer hospital stays [4]. The study identified a statistically significant relationship between weight loss after 3

days of hospitalization and the length of hospital stay (p = 0.043). Specifically, children who experienced ≥ 5% weight loss after 3 days of hospitalization had longer hospital stays compared to those with < 5% weight loss. It is possible that if weight loss is not addressed within the first 3 days of hospitalization, it could continue and negatively impact the treatment, thereby prolonging the hospital stay.

Relationship between 5% or greater weight loss after hospitalization and length of hospital stay

Excessive weight loss can hinder the treatment process and prolong the length of hospital stay. The study found a statistically significant relationship between weight loss during hospitalization and the length of hospital stay (p < 0.001). Specifically, children who experienced ≥ 5% weight loss had longer hospital stays compared to those with < 5% weight loss. This finding is consistent with the study by G. A. Rocha on 203 children under 5 years old hospitalized in Fortaleza, Brazil, which also found that prolonged hospitalization was associated with weight loss during the hospital stay (p < 0.001) [5]. Prolonged hospitalization increases treatment costs, the risk of complications, hospital-acquired infections, and exacerbates malnutrition. Mild to moderate malnutrition in hospitalized children can often be overlooked as the focus is on treating the primary illness, leading to persistent malnutrition until discharge. Parents of children with low weight tend to pay more attention to their child's weight. Therefore, it is essential to monitor and give a nutritional care plan to these children to ensure that nutritional status does not adversely affect the treatment process and to reduce the length of hospital stay.

Relationship between 5% or greater weight loss after 3 days of hospitalization and treatment response

The study found a statistically significant relationship between weight loss after 3 days of hospitalization and the treatment response in children (p = 0.025). Weight loss after 3 days of hospitalization could be due to symptoms of the illness, dehydration (loss through sweat, vomiting, diarrhea, etc.), and loss of appetite. This is a warning sign that early intervention is needed to prevent malnutrition and complications, ensuring that the treatment process is not adversely affected. Improving the nutritional status of these children ensures they receive adequate nutrients, which enhances their immune response, speeds up recovery, and results in a better treatment response. Parental knowledge on caring for children under 5 years old with pneumonia in Vietnam still has many areas for improvement, especially regarding nutritional care [6, 7].

Relationship between 5% or greater weight loss during hospitalization and treatment response

There is a statistically significant relationship between ≥ 5% weight loss after hospitalization and treatment response in children (p = 0.001). Weight loss can lead to a deficiency in essential nutrients, weakening the immune system and resulting in poorer treatment response compared to children who do not experience weight loss. This increases the risk of complications, making the illness more severe and difficult to treat, requiring a longer recovery period. However, parents may not fully understand how to provide proper nutritional care for their hospitalized children to prevent weight loss. According to a study by Tran Do Hung and Nguyen Thi Dai Trang (2013) on 100 mothers of children aged 2-5 years with pneumonia at the General Internal Medicine Department, Children's Hospital of Can Tho City, most children were fed, drank, or nursed as usual (46%), while some mothers believed their children should eat and drink less (24%)[6]. Another study by Tran Thi Ngoc Bich and Pham Ngoc Toan (2022) on 300 caregivers of children with pneumonia aged 1 month to 5 years treated at Department C, National Children's Hospital (Hanoi) found that only 18% of caregivers practiced incorrect nutritional care for the children. Over time, nutritional care for children has become more of a focus, and caregivers have gained more knowledge on how to care for children during illness [7].

Limitations

The study only accounted for the weight loss during hospitalization of pneumonia patients based on the change in their current weight compared to the time of admission. It did not account for the change in weight compared to the actual weight of the pediatric patients before illness. Furthermore, patients who were previously admitted to the Intensive Care Unit before being transferred to the Respiratory Department or those who were initially treated at lower-level hospitals before being transferred to Children's Hospital 2 had to be excluded, which means the study did not represent all pediatric pneumonia patients.

V. CONCLUSION

There is a relationship between 5% or greater weight loss after 3 days and during hospitalization with the length of hospital stay and treatment response. Children who experienced weight 5% or greater loss had longer hospital stays and poorer treatment responses compared to those with < 5% weight loss after 3 days and after hospitalization. Regularly monitoring the child's weight during treatment to prevent excessive weight loss, which can negatively impact the treatment process and prolong hospital stay.

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