Original Article

Pneumonia is Severe and Complicated in Children with Vitamin D Deficiency

Pneumonia with Vitamin D Deficiency

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ABSTRACT

Objective: To determine the frequency of complications of pneumonia in children with vitamin D deficiency.
Study Design: Descriptive cross-sectional study.
Place and Duration of Study: This study was conducted in Pediatric department, Fauji Foundation Hospital, Rawalpindi from November 2017 to April 2018.
Materials and Methods: One hundred patients admitted with clinical diagnosis of pneumonia and confirmed by chest x-ray, were included in the study. All the selected patients were under five years of age and of both sexes. Blood samples were collected from these patients and sent to the hospital's laboratory for serum vitamin D levels.
The patients were divided into two groups, vitamin D deficient and vitamin D sufficient. Vitamin D deficiency was defined as serum vitamin D levels of <30ng/ml and vitamin D sufficient as >30ng/ml. Both groups were observed for the development of complications of pneumonia and were discharged once clinically stable.
Results: Out of 100 patients included in the study, 46 patients had deficient serum Vitamin D and 54 patients had normal Vitamin D levels. When pneumonia complications were compared in the two groups, all the complications were found to be statistically significant, like pleural effusion (p-value 0.036), empyema (p-value 0.045), need for chest intubation (p-value 0.042), need for mechanical ventilation (p-value 0.024) and death (p-value 0.015).
Conclusion: The incidence and severity of the complications was more in patients with vitamin D deficiency as compared to those with normal levels of vitamin D.
Key Words: Vitamin D deficiency, pneumonia, complications.

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INTRODUCTION

Pneumonia is one of the leading causes of morbidity and mortality in children under five years of age, all over the world. In the developing countries the incidence of pneumonia in this age group is ten times higher. Moreover three fourth of the world's pneumonia deaths in children occur in developing countries. Every year it causes 1.2 million deaths world wide[1].
According to, the Expanded program on immunization, Ministry of National Health Services Government of Pakistan, children under five years of age constitute one fifth of Pakistan's population. The incidence of respiratory infections including pneumonia and its possible complications is 4% in this major segment of our population. This totals to a staggering figure of 15 million episodes of acute respiratory infections every year in this age group[2]. It is therefore of utmost importance that preventable and possibly treatable predisposing factors of pneumonia in Pakistani children be identified.
International researchers have always made efforts to identify predisposing factors of pneumonia and determinants of its severity. One of the most commonly identified factors is vitamin D deficiency[3-8]. Vitamin D has an immune modulator role in innate immunity[9-12]. The occurrence of pneumonia, its severity and possibility of complications has a strong association with Vitamin D deficiency[13-16]. It also affects the response to treatment and outcomes in terms of complications and death[3-18].
We carried out a study to compare the frequency of complications of pneumonia between children who were vitamin D deficient and those with normal Vitamin D levels.

MATERIALS AND METHODS

This study was carried out at the department of Pediatrics, Fauji Foundation Hospital Rawalpindi from

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November 2017 to April 2018. Informed written consent for the collection of data and its use in research publication was taken from the parents. The confidentiality of the patient's data was ensured. Blood samples were collected from one hundred patients of both sexes, less than five years of age, and admitted with radiologically proven pneumonia. The blood samples were sent to the hospital's laboratory for serum vitamin D levels. Vitamin D deficiency was defined as serum vitamin D levels of <30ng/ml and Vitamin D sufficient as level >30ng/ml. The results were recorded individually for each patient. The patients were kept under observation for development of complications of pneumonia like pleural effusion, empyema, need for chest intubation, need for mechanical ventilation and death. The number of patients who fully recovered was also noted.

The data was analyzed on SPSS version 21.0. Data including age, gender, duration of hospital stay, complications, outcome and vitamin D levels was documented. Descriptive variables i.e gender, complications and outcome were described as frequencies and percentages while continuous variables i.e. age, vitamin D levels were described as mean and standard deviation. Comparison between the groups was done using chi-square test and Student T Test. A p-value of < 0.05 was considered significant.

RESULTS

Out of 100 patients included in the study Vitamin D level was found to be below normal in 46 patients, and normal in 54 patients (Table I). 81 (81%) patients recovered fully and 19(19%) developed complications of pneumonia, like pleural effusion, empyema, need for chest intubation, need for mechanical ventilation and death. 15 out of 19 patients who developed complications, had vitamin D levels below normal (78.94%) and 4 had normal vitamin D levels(21.05%). Two patients died and both were vitamin D deficient. Pneumonia complications were compared in the two groups. All complications were encountered more in vitamin D deficient group and the difference was statistically significant, pleural effusion (p-value 0.036), empyema (p-value 0.045), need for chest intubation (p-value 0.042), need for mechanical ventilation (p-value 0.024) and death (p-value 0.015) (Table 2).

Table No.I: Frequency and Percentages of Vitamin-D deficiency

	Frequency	Percent	Valid Percent	Cumulative Percent
Vit-D deficient	46	46.0	46.0	46.0
Normal Vit-D levels	54	54.0	54.0	54.0
Total	100	100.0	100.0	100.0

Table No.2: Complications of pneumonia in patients with below normal and normal Vit-D levels

Complications of Pneumonia	Vit-D deficiency N=	Normal Vit-D levels N=	p-value *
Plural effusion	8%	2%	0.036
Empyema	5%	4%	0.045
Need for a chest intubation	13%	2%	0.042
Need for a ventilating support	3%	0	0.024
Death	2%	0	0.015

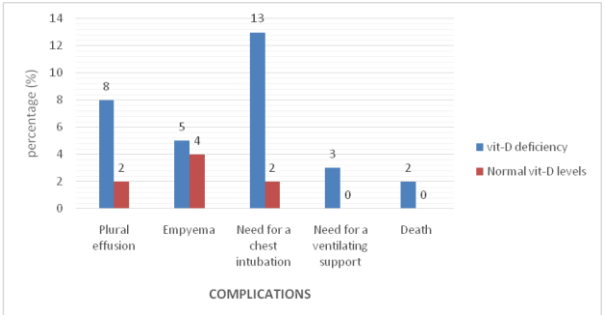

Figure No.1: Complications

DISCUSSION

In the last few decades researchers have developed an increasing interest in non-skeletal role of Vitamin D. It enhances production of human cathelicidin antimicrobial peptide (hCAP-18), and defensin which provide natural resistance against respiratory tract infections[14]. Decreased vitamin D leads to decreased resistance and increased incidence and severity of lower respiratory tract infections[16].

Among 100 patients included in our study, 46% patients had Vitamin D deficiency whereas 54% had normal serum Vitamin D levels. These results are similar to the results of many international studies. In the study published by Oduwole et al 54% of children admitted to hospital with pneumonia had vitamin D defficiency[16]. In Dogan M and colleagues study 47.1% patients with clinical rickets were admitted in hospitals with pneumonia[11] and in Sakka et al study 55.2% patients with pneumonia had vitamin-D deficiency [7].

In our study we observed that vitamin-D deficient children more frequently developed complications of pneumonia like pleural effusion, empyema, need for chest intubation, need for mechanical ventilation and death. This was in keeping with other international studies. In our study, frequency and percentages of empyema thoraces and death were 05 (5%), and 02 (2%) respectively. Whereas in Oduwole et al[16] study the frequency and percentage of empyema thoraces and death was 08(8%).The difference observed between the two studies may be due to comparatively larger sample size of our study which was divided into empyema thoraces and death separately, and secondly the vitamin

D deficiency was more severe in Nigerian children as compared to our patients[16].

In our study 3 (6.5%) patients needed mechanical ventilation. A study carried out by Inamo Y et al and mentions that 57.1% of infants admitted with pneumonia and vitamin D deficiency required oxygen and ventilator support[15]. The difference between the two studies is due to the fact that did not include oxygen supplementation in complications and considered the need for artificial ventilation only.

Some of the international researchers have tried to find out the results of universal supplementation of Vitamin D on decreasing the incidence of pneumonia in malnourished children. A commendable success was not achieved in this regard and no concrete recommendations were made[23,24]. Our patients could also have been studied in this respect but it was beyond the scope of our study.

CONCLUSION

The frequency of the complications was more in vitamin D deficient group in comparison to the vitamin D sufficient group.

Author's Contribution:

Concept & Design of Study:	Sayed Ibrar Hussain
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Data Analysis:	Mulazim Husaain, Rabia Aziz, Saira Arshad
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Final Approval of version:	Sayed Ibrar Hussain

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