International Journal of Medical and Health Research
ISSN: 2454-9142
Received: 09-06-2019; Accepted: 08-07-2019
www.medicalsciencejournal.com
Volume 5; Issue 8; August 2019; Page No. 70-73

Study of the association of pneumonia with the malnutrition in the children from PMCH

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Abstract
Important underline role of Malnutrition in child deaths is that most nutritional deficiencies impair immune function and other hosts defences leading to a cycle of long lasting and most severe infections and ever worsening nutritional status. Other facts such as socio- economic status, lack of breast-feeding, nutritional deficiencies, and Non-Vaccination and co existing illness also play a role in the causation of infection in malnourished host. The factors that depress the nutritional status of the susceptible child seem to be the very factors that magnify the severity of infectious diseases like Pneumonia. Hence the present study was planned to assess the correlation of pneumonia with malnutrition in children.
Total 110 cases of the malnutrition referred to the Upgraded Department of Paediatrics, Patna Medical College and Hospital Patna from April 2018 to Dec 2018 were enrolled in the present study. In this study, the sample children are selected randomly in urban & rural area, and desirable data were collected from both mother and children through oral questionnaires, physical and clinical examination, dietary habit, anthropometric measurements etc, and the various disease associated with malnutrition were evaluated by detailed history & clinical examination.
The data generated from the present study concludes that the prevalence of malnutrition was higher among children from low socioeconomic urban area. Healthcare institutions should strive to provide food education campaigns to parents of children under 5 years old. The primary health care staff shall be provided with training about the signs and symptoms of pneumonia with malnutrition since the risk factors detection contribute to a better treatment by minimizing complications and mortality.

Keywords: child malnutrition, pneumonia, nutritional status, etc

Introduction
Malnutrition is a condition that results from eating a diet in which one or more nutrients are either not enough or are too much such that the diet causes health problems. It may involve calories, protein, carbohydrates, vitamins or minerals. Not enough nutrients is called undernutrition or undernourishment while too much is called overnutrition. Malnutrition is often used to specifically refer to undernutrition where an individual is not getting enough calories, protein, or micronutrients. If undernutrition occurs during pregnancy, or before two years of age, it may result in permanent problems with physical and mental development. Extreme undernourishment, known as starvation, may have symptoms that include: a short height, thin body, very poor energy levels, and swollen legs and abdomen. People also often get infections and are frequently cold. The symptoms of micronutrient deficiencies depend on the micronutrient that is lacking [1-2].
Undernourishment is most often due to not enough high-quality food being available to eat. This is often related to high food prices and poverty. A lack of breastfeeding may contribute, as may a number of infectious diseases such as: gastroenteritis, pneumonia, malaria, and measles, which increase nutrient requirements. There are two main types of undernutrition: protein-energy malnutrition and dietary deficiencies. Protein-energy malnutrition has two severe forms: marasmus (a lack of protein and calories) and kwashiorkor (a lack of just protein). Common micronutrient deficiencies include: a lack of iron, iodine, and vitamin A. During pregnancy, due to the body's increased need, deficiencies may become more common. In some developing countries, overnutrition in the form of obesity is beginning to present within the same communities as undernutrition. Other causes of malnutrition include anorexia nervosa and bariatric surgery [3].
The relationship between nutrition and infectious diseases can be divided into five groups as follows [4]. (1) the effect of nutrition on the development of human immune system; (2) the effect of nutrition on emerge of infectious diseases (e.g., gastrointestinal infections), food poisoning (e.g., botulism), intestinal diseases (e.g., microbial diarrhea), and systemic infectious diseases (e.g., Brucellosis and typhoid); (3) relationship between malnutrition and infectious diseases; (4) nutrition in patients with severe combined immunodeficiency; and (5) relationship between overeating and infection.
The World Health Organization (WHO) defines malnutrition as the imbalance between the intake of nutrients and energy and the body's requirement to ensure homeostasis, specific functions, and, in the case of children, growth. A number of terms have been used to classify childhood malnutrition. Protein-energy malnutrition (PEM) in children is a term broadly used to describe malnutrition resulting from dietary deficiencies (inadequate intake) in protein and energy (calories). It is often accompanied by various deficiencies in micronutrients, especially iron and zinc. It may be acute, chronic, or acute superimposed on chronic. Acute malnutrition is defined as insufficient weight

relative to height, while stunting, or chronic malnutrition, is defined by poor linear growth (length or height) for age. WHO reference growth standards for age and sex enable the grading of malnutrition into severe, moderate, or mild categories [5].

The increased predisposition of the nutrient-deficient host to infection is presumed to be largely due to impaired immune function. Most of what is reported relating to the impact of malnutrition on host defense involves children or animal models that are broadly described as suffering from protein-energy malnutrition, but this is often poorly defined. Studies of children are limited mostly to the descriptive quantitation of specific cells or factors, often without an assessment of function or consequence. Little is known about the impact of malnutrition on mucosal and skin defense, leukocyte trafficking, leukocyte effector function, and inflammatory mediator activity in an in vivo context. Animal studies have shed some mechanistic light on the effect of malnutrition on host defense, but these models are not always representative of human conditions and have frequently utilized adult animals rather than animals of ages representative of young children with a developing immune system. Furthermore, the multifactorial nature of childhood malnutrition is difficult to represent in an animal model. Despite these caveats, a large body of information is available regarding the effects of malnutrition on multiple components of the host defense.

Malnutrition is a primary contributor to death in 60.7% of children with diarrheal diseases, 52.3% of children with pneumonia, 44.8% of children with measles, and 57.3% of children with malaria [6]. The relationship between malnutrition and infection is bidirectional [7]. Infection as a contributor to childhood growth faltering is most well documented for diarrhea and lower respiratory tract infection (LRTI), but other infections likely contribute on a more limited scale. Besides the direct organ-specific effect of infection (e.g., intestinal loss of nutrients during diarrhea), there is a metabolic cost to immune activation that contributes to the increased energy deficit in infected children [8]. The majority of patient studies, particularly those that are cross-sectional and observational, identify the association between malnutrition and infection but are unable to clearly address risk and causality, especially in the case of chronic infections. Clinical studies that investigate an association between malnutrition and risk of infection must control for the many socio demographic, environmental, and genetic confounders, such as seasonality, age, gender, household crowding, maternal education, and vaccination status, which influence the risk of infection. The risk of infection by specific pathogens is often undefined because the limited availability of sensitive, field-applicable diagnostic tests precludes the identification of etiologic agents in many resource-limited regions.

Important underline role of Malnutrition in child deaths is that most nutritional deficiencies impair immune function and other hosts defences leading to a cycle of long lasting and most severe infections and ever worsening nutritional status. Other facts such as socio- economic status, lack of breast-feeding, nutritional deficiencies, and Non-Vaccination and co existing illness also play a role in the causation of infection in malnourished host. The factors that depress the nutritional status of the susceptible child seem to be the very factors that magnify the severity of infectious diseases like Pneumonia [7]. Hence the present study was planned to assess the correlation of pneumonia with malnutrition in children.

Methodology

Total 110 cases of the malnutrition referred to the Upgraded Department of Paediatrics, Patna Medical College and Hospital Patna from April 2018 to Dec 2018 were enrolled in the present study. In this study, the sample children are selected randomly in urban & rural area, and desirable data were collected from both mother and children through oral questionnaires, physical and clinical examination, dietary habit, anthropometric measurements etc, and the various disease associated with malnutrition were evaluated by detailed history & clinical examination.

All the patients were informed consents. The aim and the objective of the present study were conveyed to them. Approval of the institutional ethical committee was taken prior to conduct of this study.

Following was the inclusion and exclusion criteria for the present study.

Inclusion Criteria: Malnourished children were diagnosed to be suffering from Pneumonia based on WHO guidelines and by radiological confirmation.

Exclusion Criteria: Children suffering from underlying chronic systemic diseases were not included in the study.

Results & Discussion

The increased incidence and severity of infections in malnourished children is largely due to the deterioration of immune function; limited production and/or diminished functional capacity of all cellular components of the immune system [9]. Pneumonia is one of the most important causes of death in children under the age of five years in developing countries.

The immune system, in response to infection, first consumes the innate and then subsequently acquired host defense functions. Both processes involve activation and propagation of immune cells and synthesis of an array of molecules requiring DNA replication, RNA expression, protein synthesis and secretion and therefore consume additional anabolic energy. Mediators of inflammation further increase the catabolic response. Consequently, the nutritive status of the host critically determines the outcome of infection [10].

A direct association has been found among malnutrition, increase risk of pneumonia episodes and fatality. For example, results of a study on 16,475 Malawian children demonstrated that severe malnutrition has a predictive value for hypoxemia and coma in children with pneumonia [11]. In Kenya, 25% of 4187 hospitalized children with severe pneumonia were reported to be severely malnourished. Thirty-seven percent of children were died after discharge from hospital. Effective factors on post discharge mortality included malnutrition, HIV status, young age, and prolonged length of stay. Malnourishment was found as a strong risk factor for inpatients mortality and severity signs of the disease [12].

Table 1: Age and distribution of disease

Type of Diseases	Malnutrition	Malnutrition with Pneumonia	Pneumonia
0 -1 years	4	0	6
1-2 years	11	3	14
2-3 years	13	2	16
3-4 years	14	4	9
4 -5 years	2	1	11
Total	44	10	56

Table 2: Type of Diseases

Type of Diseases	Malnutrition	Malnutrition with Pneumonia	Pneumonia
Socioeconomic Status			
Lower Class	42	9	46
Middle Class	2	1	8
Higher Class	0	0	2
Age of Mothers			
18 – 23	18	3	15
24 -28	11	5	32
28 and above	15	2	9
Breast Feeding			
Yes	37	8	49
No	7	2	7
Total	44	10	56

Table 3: Symptoms

	Malnutrition	Malnutrition with Pneumonia	Pneumonia
Fever	12	3	22
Weight Changes	6	2	10
General discomfort	10	1	5
Watery rhinorrhea	4	1	4
Dyspnea	3	0	1
Cough	4	1	5
Expectoration	2	1	3
Vomiting	3	1	6
Total	44	10	56

It is clear that nutritional deficiency is associated with common diseases in children such as pneumonia, which becomes an underlying cause for the death of children under 5 years old. Malnutrition weakens the organism, which does not respond equally to the treatments when these children have pneumonia, this phenomenon is evidenced in the lower strata people as it is confirmed in the present study and others related to the subject [15]. A high percentage of our population of study were under children under one year old, which suggests that a pneumonia infection associated with malnutrition leads to a poor prognosis of the infection presented as mentioned in studies conducted in Africa, Pakistan, Jordan and Bangladesh, among others [16].

It was found that the highest prevalence are male children with low levels of nutrition, leading to a poor development of the innate immune system which leads to an inappropriate defense response, making the child susceptible to presenting infectious diseases such as pneumonia, since malnutrition thins the lungs membrane which facilitates the entry of bacteria and viruses [17].

There is variable relationship between malnutrition and bacteremia risk and malnourished children are more likely to have Gram-negative bacteremia [18]. However, in underdeveloped countries, there is a similarity in the range of bacterial species in blood of both malnourished and no malnourished children.

Conclusion

The data generated from the present study concludes that the prevalence of malnutrition was higher among children from low socioeconomic urban area. Healthcare institutions should strive to provide food education campaigns to parents of children under 5 years old. The primary health care staff shall be provided with training about the signs and symptoms of pneumonia with malnutrition since the risk factors detection contribute to a better treatment by minimizing complications and mortality.

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