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Protein profile study among malnourished children in Umuahia

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Abstract

Some children are challenged with malnourishment and become underdeveloped with greater exposure to health challenges. Protein profile study was done among the malnourished children in Umahia, Abia state. Nigeria. The malnourished children were recruited from Federal Medical Center, Umuahia. A total of fifty (50) subjects were recruited for the study. Twenty (20) subjects were malnourished children (10 males, 10 females) aged 1 – 12 months and thirty (30) subjects were apparently healthy children (15 males, 15 female) as the control, serum samples were used for the laboratory tests using spectrophotometric method. The results were analyzed using t-test and significance level set at $p < 0.05$. The results showed significance decrease ($p < 0.05$) in serum total protein and serum albumin of the malnourished children compared to the control and showed significant increase $p < 0.05$ in globulin in malnourished children compared to the control. The malnourished children are more prone to infection because of deficient immunity.

Keywords: Total proteins, Albumin, globulins, malnourished children, Umuahia.

Introduction

Malnutrition is a condition that results from eating a diet in which nutrients are not enough or are too much such that it causes health problems. It refers to under nutrition where there are not enough calories, protein or micronutrients; or however, it also includes over nutrition (Young, 2012). According to Rasmussen (2001), if under nutrition occurs during either pregnancy or before the age of two years, it may result in permanent problems with physical and mental development. Extreme under nourishment known as starvation may have symptoms that include; a short height, thin body, very poor energy levels, swollen legs and abdomen. The symptoms of micro-nutrient deficiencies depend on the micro-nutrient that is lacking (Young, 2012).

Undernourishment is most often due to not enough high quality food available to eat. This is often related to high food prices and poverty. A lack of breast feeding may contribute, as may a number of infectious diseases such as gastroenteritis, pneumonia, malaria and measles which increase nutrient requirement (WHO, 2014).

Protein-energy malnutrition (PEM) in young children is currently the most important nutritional problem in most countries in Asia, Latin America, and Africa. Protein-energy malnutrition has two severe forms: marasmus and kwashiorkor (Young, 2012). Common micronutrient deficiencies include; a lack of iron, iodine and vitamin A during pregnancy, due to increased demand, deficiency become more common (Konje, 2007).

Malnutrition has become an urgent global health issue with under nutrition killing or disabling millions of children each year. Malnutrition also prevents millions more from reaching their fully intellectual and productive potential. The world health organization estimates that malnutrition accounts for 54% of the child mortality worldwide (Manary *et al*., 2013).

It has been estimated that PEM affects every fourth child in the developing world (UNICEF, 2005), with the regional prevalence for severe forms ranging from 1-7% (Reddy, 2001). It is associated with 49% of the 10 million deaths occurring in children in the developing world and 52% of all under five deaths in Nigeria (Oyedeji, 2000), with 24% and 16% of the total under 5 Nigerian population estimated to have suffered from mild-moderate and severe malnutrition respectively (Bamgboye and Familusi, 1990).

Efforts to improve nutrition are some of the most effective forms of development aid. Breastfeeding can reduce rates of malnutrition and death in children, and efforts to promote the practice increase rates. In young children, providing food in addition to breast milk between six months and two years improves outcomes (Bhutta *et al.*, 2013).

Materials and Methods

Study Area: The study was carried out in Federal Medical Centre, Umuahia.

Study population: A total of fifty subjects were recruited for this study. Twenty subjects were malnourished infants comprising 10 males and 10 females between the ages of 1-12 months while thirty (30) apparently healthy age matched infants were recruited as the control for the study.

Collection of blood: The subjects and their attendants were given a detailed briefing about the purpose of the study. With all aseptic precautions, 2.5ml of venous blood was drawn on day of admission before the treatment was started by the physician and was dispensed into a plain tube and after clotting and retracting was centrifuged at 3,000rpm for 5minutes on the same day. The sera obtained from the samples were used for serum total protein, serum albumin and serum globulin estimation by spectrophotometric technique.

Laboratory methods and procedures: All reagents were commercially purchased from a reliable supplier and the manufacturer's standard operating procedures were strictly followed.

Determination of total serum protein by Biuret method.

a) Total protein was determined by Randox kit with cat no.: TP245
Principle: cupric ion in alkaline solution reacts with the peptide bonds, producing a violet color, the intensity which is proportional to the amount of protein present.

Procedure:

4 tubes were labeled as test, blank, control and standard respectively. Into the tubes 0.1ml of serum was pipetted into the tube labeled standard, 0.1ml of distilled water was pipetted into the tube labeled blanks, 0.1ml of control serum into the tube labeled control. The 4 tubes were mixed thoroughly and incubated at 37^0C for 10 minutes and the absorbance read at 540nm wavelength.

Calculation:

$$\text{Total protein (g/dl)} = \frac{\text{Ab of test}}{\text{Ab of std}} \times \frac{\text{conc of std}}{1}$$

b) **Determination of serum albumin by modified Bromocresol green method**

This was done with Randox kit with catalog number AB 362.

Principle: Albumin reacts with the dye-Bromocresol green which has a specific affinity in

acidic solution (PH 4.1) to produce a blue green complex which is measured spectrophotometrically at 632nm wavelength. The intensity of the color produced is proportional to the concentration of albumin present in the sample.

Procedure:

4 tubes were labeled as test, blank, control and standard respectively. 4mls of (BCG reagent) albumin were pipetted into each tube respectively. 0.02mls of distilled water was added into the tube labeled blank, 0.02mls of standard was pipetted into the tube labeled standard, 0.02mls of control serum into the tube labeled control. The tubes were mixed thoroughly and incubated at 37^{O} C for 10 minutes. The intensity of the color is proportional to the albumin concentration in the sample. The absorbance read at 540nm wavelength.

Calculation:

$$\text{Total protein (g/dl)} = \frac{\text{Ab of test}}{\text{Ab of std}} \times \frac{\text{conc of std}}{1}$$

c) Determination of serum globulins

Serum globulin (g/dl) = Total proteins – albumin

Statistical Analysis: The results were analyzed using t- test and significance level set at $p < 0.05$.

Results

Table: Comparism of mean profile levels between the control subjects and the malnourished subjects.

Parameters	Control	Malnourished	P – level
Total protein (g/dl)	5.9 ± 0.6	4.4 ± 0.3	p < 0.05
Albumin (g/dl)	3.4 ± 0.3	1.6 ± 0.2	p < 0.05
Globulin (g/dl)	2.5 ± 0.5	2.8 ± 0.7	p < 0.05

Discussion

Serum total proteins and albumin levels were lower in the malnourished subjects (5.9 ± 0.6g/dl, 3.4 ± 0.3 g/dl) compared to the control (4.4 ± 0.3 g/dl, 1.6 ± 0.2 g/dl) respectively which showed significant difference $p < 0.05$. This is an agreement with previous study by Reeds and Laditan (1976). The globulin level showed significant increase in the malnourished subjects (2.8 ± 0.7 g/dl) compared to the control subjects (2.5 ± 0.5 g/dl) which agreed with the work of Reeds and Laditan (1976). The significant decrease in total protein and albumin in the cases is a threat to the development of those children and will expose them to numerous infections because their immune system will equally be challenged and compromised.

Conclusion

The study showed significant decrease in total protein and serum albumin level of the malnourished children. The children are prone to more oedema and immune suppression. The developments of those children are jeopardized. The mothers should be advised to breast feed their babies very well and children who are gift from God should be well fed. The government should help the less privileged parents to take care of their children; parents should give birth to the number of children they can care for adequately.

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