Original Article

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To Study Serum Total Protein and Serum Albumin in Children with Grade III and Grade IV Protein Energy Malnutrition (Cases) and in Children with Grade I and Grade II Protein Energy Malnutrition (Controls)

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Abstract

Background: This was a hospital based case control study, conducted in the Nutrition Rehabilitation centre in Index Medical College Hospital & Research Centre, Indore, Department of Pediatrics. **Subjects and Methods:** Children with PEM grade I and II without any other pathological problem.The children admitted in the department. **Results:** In study group, majority of children had PEM grade III malnutrition while in control group, equal number of children had PEM grade I and grade II malnutrition. This table shows that majority of children in study group had lower level of serum protein levels as compared with control group, and there is progressive fall in its level as the severity of malnutrition increases. This table shows that majority of children in study group had lower level of serum albumin levels as compared with control group, and there is progressive fall in its level as the severity of malnutrition increases. **Conclusion:** The study concludes that estimation of serum T3, T4 and TSH levels in severely malnourished children admitted and co-relation with serum protein and serum albumin levels. To conclude, altered thyroid profile in PEM is perhaps a defense mechanism against excessive metabolic stimulation and energy consumption. The resultant hypometabolism protect the malnourished child with low calories reserve from an early death.

Keywords: Serum Albumin, Protein, Malnutrition & Children.

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Introduction

Child malnutrition is a widespread public health problem having international Consequences.[1] It is estimated that PEM is the primary or associated cause of nearly half of the deaths in children under the age of 5 years. Three-quarters of the world's stunted children live in South Asia and Sub-Saharan Africa; India is home to nearly one-third of world's malnourished children.

Protein energy malnutrition is a nutritional deficiency resulting from either inadequate energy (calorie) or protein intake. The spectrum of protein energy malnutrition includes underweight children, kwashiorkor, marasmus, marasmic kwashiorkor. Marasmus is characterised by wasting of muscles and subcutaneous fat and is usually a result of severe restrictions in energy intake. Kwashiorkor is characterised by oedema, mental apathy, growth retardation and is usually the result of severe restrictions in protein intake.[2] The term marasmus is derived from the Greek word marasmos which means withering or wasting.[3-5] The term kwashiorkor is taken from the language of Ghana and means "the sickness of the weaning" or the disease that occurs when the child is displaced from the breast by another child. Dr. Cicely D Williams introduced the name into the international medical community.[4]

Subjects and Methods

This was a hospital based case control study, conducted in the Nutrition Rehabilitation centre in Index Medical College Hospital & Research Centre, Indore, Department of Pediatrics from June 2017 to Dec 2017 for 07 months.

Selection of Cases

Inclusion criteria

1. Cases were children between 6 months to 5 years of age with grade III and IV malnutrition admitted in NRC of CNBC.

Exclusion criteria

1. Children suffering from endocrine disorders.
2. Children suffering from mal absorption syndrome, protein losing nephropathy.
3. Children with congenital anomalies.
4. Children with severe systemic illness.

Selection Of Control

Children with PEM grade I and II without any other pathological problem.

The children admitted in the department of Paediatrics, of Index Medical College Hospital & Research Centre, Indore. They were divided into two groups. The first group was study group with 40 children admitted in NRC. Second was the control group with 20 children with grade I and II PEM. Consent was taken appropriately from parents.

Results

Table 1: Distribution Of Cases And Control According To Grade Of Malnutrition

Nurtitional status	Cases	Control	Total
PEM grade I	0	10(50%)	10(17%)
PEM grade II	0	10(50%)	10(17%)
PEM grade III	30(75%)	0	30(50%)
PEM grade IV	10(25%)	0	10(17%)
Total	40	20	60

In study group, majority of children had PEM grade III malnutrition while in control group, equal number of children had PEM grade I and grade II malnutrition.

Table 2: Mean Serum Protein Level

	Range	Mean	S.D.
Control	6.09-8.29	6.95	0.47
PEM grade III	3.09-7.99	6.10	1.22
PEM grade IV	4.50-7.49	5.52	0.81

This table shows that majority of children in study group had lower level of serum protein levels as compared with control group, and there is progressive fall in its level as the severity of malnutrition increases.

Table 3: Mean Serum Albumin Level

	Range	Mean	S.D.
Control	3.09-4.09	3.72	0.29
PEM grade III	1.29-3.69	3.00	0.63
PEM grade IV	2.00-3.89	2.69	0.58

This table shows that majority of children in study group had lower level of serum albumin levels as compared with control group, and there is progressive fall in its level as the severity of malnutrition increases.

Discussion

Among cases, 30 i.e. 75% were having grade III malnutrition, 10 i.e. 25% were having grade IV malnutrition. Among control, 10 i.e.50% were having grade I malnutrition, and remaining 10 i.e.50% were having grade II malnutrition.

Serum protein and albumin levels were also measured in all cases and control, the serum levels of protein and albumin were found to be decreased in PEM children. Mean value of serum protein in control group was 6.95, while it was 6.10 in children with grade III malnutrition, and 5.52 in children with grade IV malnutrition. Mean value of serum albumin in control group was 3.72, while it was 3.00 in children with grade III malnutrition, and 2.69 in children with grade IV malnutrition. So there was progressive decrease in serum protein and serum albumin levels as the severity of malnutrition increased.[6]

Similar results were obtained in another study done by B K Das et al in 1999.[7]In energy and protein restriction, several aspects of thyroid hormone and iodine metabolism are affected. Serum proteins including thyroxine-binding globulin (TBG), thyroxine-binding pre-albumin (TBPA) and albumin are all reduced due to decreased protein intake and reduced hepatic biosynthesis.[8] In acute PEM there is reduction in total T3, T4 secondary to reduced iodine absorption as well as reduced plasma proteins with maintained euthyroid state, in prolonged PEM there is overriding of adaptive mechanism leading to hypothyroidism. These changes play an important role in adaptive process of energy and protein metabolism in PEM, help in energy conservation when energy producing substrate is scarce, protects the child from early death due to low calorie reserve. [9,10]

In children with PEM serum proteins and serum albumin become low. Fall in serum albumin is seen only after about 3 weeks of malnutrition, various adaptations during this period are shift from extravascular pool to intravascular pool, decreased catabolism, decreased urine excretion of nitrogen. Total serum globulin remains in normal limits. Amino acid pool gets decreased to 50% of normal.[11]

Protein energy malnutrition is a nutritional deficiency resulting from either inadequate energy (calorie) or protein intake. The spectrum of protein energy malnutrition includes underweight children, kwashiorkor, marasmus, marasmic kwashiorkor. Marasmus is characterised by wasting of muscles and subcutaneous fat and is usually a result of severe restrictions in energy intake. Kwashiorkor is characterised by oedema, mental apathy, growth retardation and is usually the result of severe restrictions in protein intake[12]. The term marasmus is derived from the Greek word *marasmos* which means withering or wasting[5,13]. The term kwashiorkor is taken from the Ga language of Ghana and means “the sickness of the weaning” or the disease that occurs when the child is displaced from the breast by another child. Dr. Cicely D Williams introduced the name into the international medical community.

Conclusion

The study concludes that estimation of serum T3, T4 and TSH levels in severely malnourished children admitted and co-relation with serum protein and serum albumin levels.

To conclude, altered thyroid profile in PEM is perhaps a defense mechanism against excessive metabolic stimulation and energy consumption. The resultant hypometabolism protect the malnourished child with low calories reserve

from an early death.

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