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Original Article

Study of serum electrolytes and proteins level in severe malnourshed within 24 hours of admission (age group 6 month to 5 year).

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ARTICLE INFO

ABSTRACT

Introduction: The azygos venous system consists of the azygos vein on the right side and the hemiazygos and accessory hemiazygos on the left side. The latter two are said to be the tributaries rather than the equivalent of the azygos vein. This unpaired venous system is said to be full of anatomical variations and hence of much clinical significance. Aims: to study and report the prevalence of normal and anomalous variations of the azygos venous system in the region of East –Godavari district, Andhra-Pradesh (India)Methods: the present study was carried out in the Department of Anatomy, KIMS & RF, Amalapuram spanning over a period of 2 years. A total of 40 cadavers irrespective of age and sex were chosen. The entire course of the azygos venous system in these 40 cadavers was carefully noted and documented. Results: 29 cadavers showed the normal venous patterned as described in literature. The other 11 cases irrespective of age and sex showed anatomical variations which would be subsequently described in the article. Conclusion: knowledge of such variations exhibiting different drainage pattern is significant during mediastinal surgeries as it may become a potential source of hemorrhage. Also presence of such variations may lead to misinterpretation of thoracic CT and MRI findings of the posterior mediastinum.

INTRODUCTION

The world health organization defines malnutrition as "The cellular imbalance between supply of nutrients and energy and the body demand for them to ensure growth, maintenance and specific function ". It is the most widespread nutritional problem in developing countries. Predominantly affecting children. Severe malnutrition is globally the most important risk factor for illness and death contributing to more than half of death in children world -wide. [1]It occurs most frequently in infants and children and often associated with infection. [2]

Severe protein Energy Malnutrition is caused by protein and energy deficiency and has been identified as a major health and nutrition problem in India. The prevalence rate varies from 20-50% in different areas depending on socioeconomic status and levels of education and awareness.

Children with severe malnutrition are at risk of several life threatening problem like Hypoglycaemia, Hypothermia, serious infection and severe electrolyte disturbances. Malnutrition has been a permanent priority of the WHO for decades.

The severest clinical forms of PEM are Marasmus, kwashiorkor, Marasmic - kwashiorkor. The following symptoms and signs clinically Characterize them:

MARASMUS:

Marasmus is a serious worldwide problem that involves more than 50 million children younger than 5 year. According to the WORLD HEALTH ORGANIZATION (WHO) 49% of the 10.4 million death occurring in children younger than 5 year in developing countries are associated with severe PEM. The milder forms of it like stunting (chronic form) and wasting (acute) forms of malnutrition are highly rampant in developing countries.

Marasmic children have growth retardation and specific clinical manifestations including:-

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Wasting of subcutaneous fat and muscles.

Wizened monkey (old man face), poor appetite, sunken eye balls.

Mood change always irritable and mild skin and hair changes. [7]

A child with marasmus manifesting with old man`s face and skin appearance.

KWASHIORKOR:

Kwashiorkor (weaning disease) refers to condition caused by severe protein deficiency in individuals with an adequate or a marginally inadequate energy intake. When children are weaned from protein rich breast milk, to normal diet through starchy protein free weaning food.

Children with the kwashiorkor syndrome may have the following Clinical manifestations:

Growth failure, wasting of muscles and preservation of subcutaneous fat, edema (pitting type). Fatty liver (hepatomegaly), skins changes (ulceration, and hyper -pigmentation).

Moon face due to hanging cheeks as a result of edema and preserved subcutaneous fat.

Loss of appetite, lack of interest in the surrounding (apathy) and irritability.

Marasmic kwashiorkor can have the clinical features of both Marasmus and kwashiorkor.In children with PEM, there are usually deficiencies of micronutrients like: riboflavin, vitamin A, Iron and Vitamin D. Therefore, it is advisable to have high index of suspicion and look for the signs and symptoms of deficiencies of these nutrients [8] .

Child with kwashiorkor manifesting with edematous swollen legs and apathy.

Causes:

Causes of protein energy malnutrition are multi-factorial having a number of interwoven factors operating simultaneously. The causes could be categorized as Immediate, underlying and basic.

At the level of the individual child one or more of the following factors may operate:

 Lack of knowledge -People do not understand the nutritional nature of their

   Child's and related health problem.

 Poverty - lack of means to obtain and provide food to their child (as in the case of war or people living below poverty line).

 Famine and vulnerability- destitution, being orphan (Example HIV taking away parents Lives)

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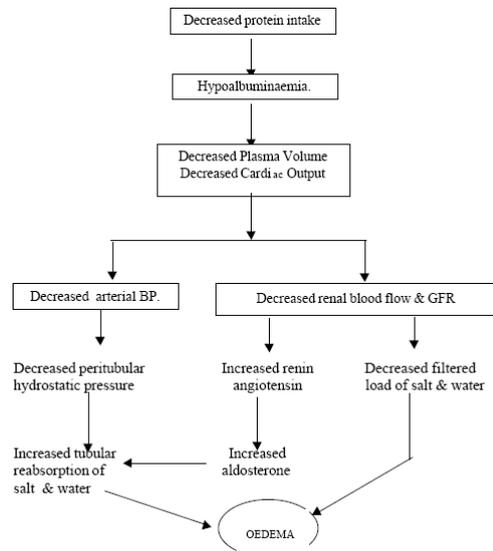
AIM:

To study serum electrolytes (Sodium & Potassium) and serum proteins (Total Protein, Albumin and Globulin) levels in severe malnourished within 24 hours of admission.(Age group 6 month to 5 year).

OBJECTIVES:

PRIMARY:

To determine the serum electrolyte (Na + & K+) level in severe malnourished children.

To determine serum proteins (Total protein, albumin & globulin) level in malnourished children.

SECONDARY:

To compare the value with normal healthy children.

MATERIAL AND METHODS:

Present work was done in the Department of Medical Biochemistry, Gandhi Medical College in Association with Department of Paediatrics of Gandhi Medical College at, Kamla Nehru Hospital Bhopal. The work included 50 malnourished patients and 50 healthy children of control group. All subjects were of 6 month to 5 years age group.

 INCLUSION CRITERIA:

All patients were suffering from grade III and grade IV Nutrition PEM.

All patients between the age group 6 month to 5 years.

.EXCLUSION CRITERIA:

Patients suffering from PEM due to non nutritional causes were excluded from the study.

A detailed history was taken and patients enrolled were carefully examined to distinguish PEM (Nutritional) from non nutritional causes. The severity of malnutrition was classified as per Indian Academy of Pediatrics (IAP) classification norms.

COLLECTION OF SAMPLE:

5 ml of blood sample were collected by venipuncture and all the details viz, name, age and sex of the patient were labeled on the vial.

SEPARATION OF SAMPLE:

The blood was allowed to clot and serum was separated by centrifuging sample for 10 minutes at 3000 rpm.

PARAMETERS ESTIMATED:

Serum electrolytes (Na+ & K+) levels by Flame Photometry.

Serum proteins (albumin & globulin) levels by BromoCresol Green (BCG) Method.

Estimation of serum electrolytes by Flame Photometer.

PRINCIPLE:

Estimation of serum sodium and potassium in a flame photometer is based on the principle that volatilization of molecules in a flame produce free atoms and then excites them to higher energy levels. The electrons being unstable in this excited state release the excess energy as photons of particular wavelength as they charge from the excited to ground state. The emission spectrum of element is produced under constant and controlled condition. The light intensity of the characteristic wavelength produced by each atom is directly proportional to the number of atoms emitting energy, which in turn is directly proportional to the concentration of the substance in the sample.

CALCULATION:

1 Concentration of highest standard – Concentration of lowest standard.

2 Reading of highest standard – Reading of Sample.

3 Reading of Test – Reading of lowest standard.

4 Factor = ½ X 3.

5 Concentration of lowest standard + Factor.

RESULT:

Results were expressed on mmol/L. The data were statistically analyzed using t test.

TOTAL PROTEIN ASSAY: BIURET METHOD

PRINCIPLE:

The peptide bond of protein reacts with cupric ions in alkaline solution to form a coloured complex. The intensity of colour produced is directly proportional to protein present in sample and can be measured on colorimeter at 530nm or green filter (blue colour appears).

Protein + Cu^{2}+ alkaline pH $\rightarrow$ Cu-protein complex.

REAGENT:

Biuret Reagent:

· Copper Sulphate

· Sodium hydroxide

· Sodium Potassium Tartarate (Rochelle salt)

· Surfactant

Protein standard: 6.5 gm/dl.

PROCEDURE:

REAGENT	TEST	STANDARD	BLANK
Protein Reagent	1000µl	1000µl	-
Standard Reagent	-	10µl	-
Serum/Plasma	10µl	-	-

Mix well. Incubate at 37^0C for 5 minute.

Total Protein Concentration (gm/dl) =

$$\frac{\text{Absorbance of Test} \times 6.5}{\text{Absorbance of Standard}}$$

Estimation of serum albumin by Bromo Cresol Green (BCG) method.

PRINCIPLE:

At pH 3.68, Albumin acts as a cation and binds to the anionic dye Bromo Cresol Green (BCG), forming a green coloured complex. The absorbance of final colour is measured at 630 nm. The colour intensity of the complex is proportional to albumin concentration in the sample.

Albumin + BCG = Green coloured complex.

PROCEDURE:

REAGENT	BLANK	STANDARD	TEST
Serum	–	–	10 µl
Reagent 2	–	10 µl	–
Reagent 1	1000 µl	1000 µl	1000 µl

Mix well. Incubate at Room temperature (15 – 30*C) for 1 minute.

CALCULATION:

Albumin (g/dl)   =   Absorbance of Test X 4

Globulin = Total Protein – Albumin.

OBSERVATION TABLE:

The present study was done in the Department of Medical Biochemistry, Gandhi Medical College, Bhopal in collaboration with Department of Paediatrics of Gandhi Medical College at, Kamla Nehru Hospital Bhopal. The work included 50 malnourished patients and 50 healthy children of control group. All subjects were of 6 month to 5 years age group.

GENERAL TABLE:
DEMOGRAPHIC PROFILE OF THE STUDIED COHORT.
TABLE NO 01. AGE WISE DISTRIBUTION:

AGE GROUP	KWASHIORKOR n= (%)	MARASMUS n= (%)	NORMAL
<1 YEAR	n = 13 (52%)	n= 12 (48%)	25 (50%)
>1 YEAR	n = 12 (48%)	n= 13 (52%)	25 (50%)
TOTAL	25 (50%)	25 (50%)	50 (100%)

TABLE NO 02. SEX WISE DISTRIBUTION:

SEX	KWASHIORKOR n (%)	MARASMUS n (%)
MALE	n=13 (52%)	n= 16 (64%)
FEMALE	n=12 (48%)	n=09 (36%)
TOTAL	25 (50%)	25 (50%)

TABLE NO 03.SOCIO ECONOMIC STATUS WISE DISTRIBUTION:
As per Prasad modified kuppuswami.

STATUS	KWASHIORKOR n (%)	MARASMUS n (%)	NORMAL
LOW	n=14 (56%)	n=13 (52%)	25 (50%)
MIDDLE	n=11 (44%)	n=12 (48%)	25 (50%)
TOTAL	25 (50%)	25 (50%)	50 (100%)

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Table No-04. Serum Electrolytes Level In Kwashiorkor:

PARAMETER	KWASHIORKOR	CONTROL	t – VALUE	p-VALUE	SIGNIFICANCE
SODIUM	132.97±4.11	137.15±2.04	4.546	<0.001	HS
POTASSIUM	3.01±0.07	5.00±0.22	41.68	<0.001	HS

It is evident from the above table the mean values of electrolytes i.e. S-Sodium is 137.15 ±2.04 mEq/L. in controls and 132.97±4.11 mEq/L. in kwashiorkor and the mean value of S-Potassium is 5.00±0.22 mEq/L. in controls and 3.01±0.07 mEq/L. in kwashiorkor.

TABLE NO 05. SERUM PROTEIN LEVEL IN KWASHIORKOR:

PARAMETER	KWASHIORKOR	CONTROL	t – VALUE	p-VALUE	SIGNIFICANCE
TOTAL PROTEIN	6.62±0.49	5.93±0.46	5.040	<0.001	HS
ALBUMIN	3.84±0.21	3.01±0.42	8.631	<0.001	HS
GLOBULIN	2.78±0.54	2.89±0.56	0.706	>0.05	NS

The mean value of protein i.e. S- Total Protein is 6.62±0.49 g/dl. in controls and 5.93±0.46 in kwashiorkor and mean value of S-Albumin 3.84±0.21g/dl in controls and 3.01±0.42 g/dl in kwashiorkor and the mean value of globulin is 2.78±0.5421g/dl in controls and 2.89±0.56 g/dl in kwashiorkor .
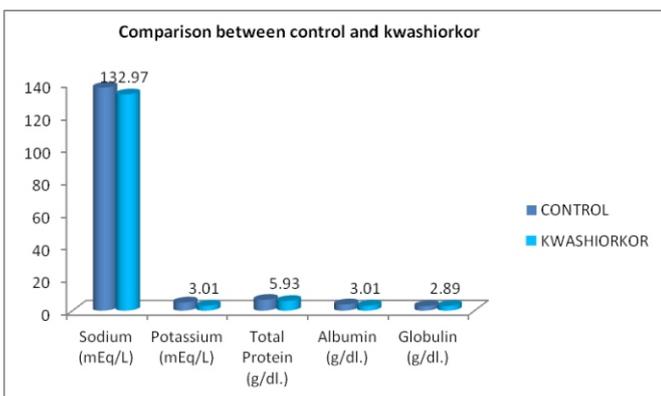
SERUM ELECTROLYTES LEVEL IN MARASMUS:

PARAMETER	MARASMUS	CONTROL	t-VALUE	p -VALUE	SIGNIFICANCE
SODIUM	129.18±2.73	133.36±1.25	15.71	<0.001	HS
POTASSIUM	3.21±0.10	4.25±0.46	10.95	<0.001	HS

It is evident from the above table the mean values of electrolytes i.e. S-Sodium is133.36±1.25 mEq/L. in controls and 129.18±2.73 mEq/L. in marasmus and the mean value of S-Potassium is 4.25±0.46 mEq/L. in controls and 3.21±0.10 mEq/L. in marasmus .

TABLE NO-07 PROTEIN LEVEL IN MARASMUS:

PARAMETER	MARASMUS	CONTROL	t-VALUE	p -VALUE	SIGNIFICANCE
TOTAL PROTEIN	6.76±0.50	6.75±0.75	0.03	>0.05	NS
ALBUMIN	3.95±0.18	3.40±0.63	4.20	<0.001	HS
GLOBULIN	2.76±0.53	3.35±0.79	3.07	<0.001	HS

The mean value of protein i.e. S- Total Protein is 6.76±0.50g/dl. in controls and 6.75±0.75g/dl. in case and mean value of S-Albumin 3.95±0.18 g/dl in controls and 3.40±0.63g/dl in cases and the mean value of globulin is 2.76±0.53 g/dl in controls and 3.35±0.79 g/dl in marasmus.
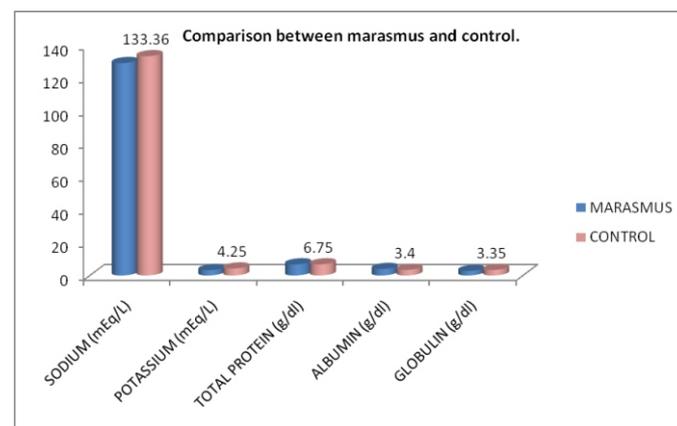

TABLE NO-08 SERUM ELECTROLYTE LEVEL IN KWASHIORKOR AND MARASMUS.

PARAMETER	KWASHIORK0R	MARASMUS	t – VALUE	p -VALUE	SIGNIFICANCE
SODIUM	132.97±4.11	129.18±2.73	3.83	<0.001	HS
POTASSIUM	3.01±0.07	3.21±0.10	7.67	<0.001	HS

It is evident from the above table the mean values of electrolytes i.e. S-Sodium is 132.97±4.11 mEq/L. in kwashiorkor and 129.18±2.73 mEq/L. in case and the mean value of S-Potassium is 3.01±0.07 mEq/L. in kwashiorkor and 3.21±0.10 mEq/L. in marasmus. The difference being highly significant.

TABLE NO-09 SERUM PROTEIN LEVEL IN KWASHIORKOR AND MARASMUS.

PARAMETER	KWASHIORK0R	MARASMUS	t – VALUE	p -VALUE	SIGNIFICANCE
TOTAL PROTEIN	5.93±0.46	6.75±0.75	4.60	<0.001	HS
ALBUMIN	3.01±0.42	3.40±0.63	2.53	<0.01	S
GLOBULIN	2.89±0.56	3.35±0.79	2.37	<0.01	S

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The mean value of protein i.e. S-Total Protein is 5.93±0.46g/dl. in kwashiorkor and 6.75±0.75g/dl.in marasmus and mean value of S-Albumin 3.01±0.42g/dl in kwashiorkor and 3.40±0.63g/dl in marasmus and the mean value of globulin is 2.89±0.56 g/dl in kwashiorkor and 3.35±0.79 g/dl in marasmus.
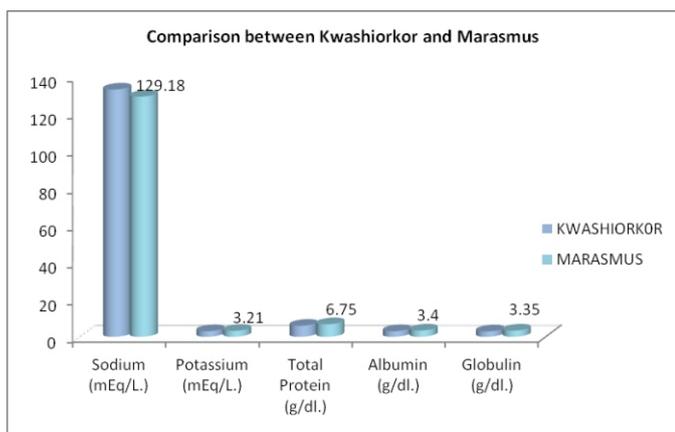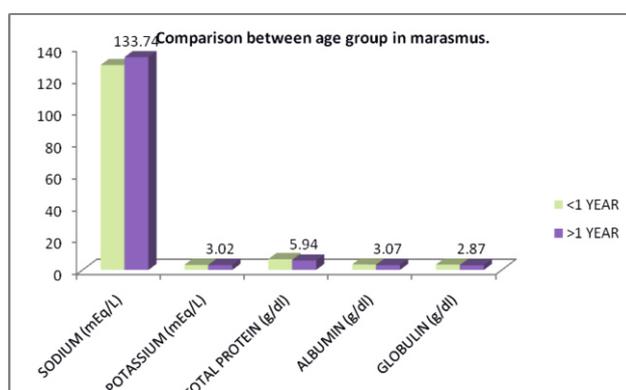

SERUM ELECTROLYTE VALUES IN DIFFERENT AGE-GROUPS IN MARASMUS.

PARAMETER	<1 YEAR	>1 YEAR	t - VALUE	p - VALUE	SIGNIFICANCE
SODIUM	128.76 ± 2.87	133.74 ± 4.11	3.479	<0.01	S
POTASSIUM	3.21 ± 0.09	3.02 ± 0.07	5.298	<0.001	HS

It is evident from the above table the mean values of electrolytes i.e. S-Sodium is128.76 ± 2.87 mEq/L. in the age-group <1 year and in age group >1 year 133.74 ± 4.11 mEq/L. in and S- Potassium is 3.21 ± 0.09mEq/L and 3.02 ± 0.07 mEq/L.

TABLE NO :17 SERUM PROTEIN VALUE IN DIFFERENT AGE-GROUPS IN MARASMUS.

PARAMETER	<1 YEAR	>1 YEAR	t - VALUE	p-VALUE	SIGNIFICANCE
TOTAL PROTEIN	6.81 ± 0.77	5.94 ± 0.45	3.451	<0.01	S
ALBUMIN	3.46 ± 0.70	3.07 ± 0.44	1.654	>0.05	NS
GLOBULIN	3.35 ± 0.73	2.87 ± 0.64	1.768	>0.05	NS

The mean value of protein i.e. S-Total Protein is6.81 ± 0.77g /dl.in <1year and 5.94 ± 0.45g/dl in >1 year and   S-Albumin is 3.46 ± 0.70g/dl in <1 year and 3.07±0.44g/dl in >1year and globulin is 3.35 ± 0.73g/dl in age group <1year and2.87 ± 0.64 g/dl   in marasmus.

TABLE NO-07 PROTEIN LEVEL IN MARASMUS:

PARAMETER	MARASMUS	CONTROL	t-VALUE	p -VALUE	SIGNIFICANCE
TOTAL PROTEIN	6.76±0.50	6.75±0.75	0.03	>0.05	NS
ALBUMIN	3.95±0.18	3.40±0.63	4.20	<0.001	HS
GLOBULIN	2.76±0.53	3.35±0.79	3.07	<0.001	HS

SUMMARY AND CONCLUSION

·   The present study was to "Assess serum electrolytes (sodium, potassium) and serum protein (Total protein,albumin, globulin) levels in severe malnourished children within 24 hours of admission ".

·   The values observed were compared simultaneously with matched control. Both cases and control were grouped as per Age,sex and socio-economic status.

·   Control group comparised of 50 healthy individuals who were not suffering from any disease.Same parameter Serum sodium.S-potassium,S-total protein,S-albumin,S-globulin,were estimated in them.

·   Malnourished group was comparised of 50 individuals (Of them 25 were kwashiorkor and 25 were marasmus).

·   As per sex – In kwashiorkor n=13(52%)were male,and n=12(48%)were female, and in marasmus n=16(64%)were male and n=09(36%)were female in marasmus.

·   As per age –In kwashiorkor were divided into age groups <1 year n=13(52%) and >1 year n=12(48%),and in marasmus were divide <1year n=12 (48%) and >1 year n=13(52%).

·   As per socio economic status –In kwashiorkor the patients were divided into low status n=14 (56%) and middle status n=11(44%).·

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As per socio economic status –In marasmus the patients were divided into low status n=13 (52) and middle n=12(48%).

On comparing mean values of various parameter i.e sodium,potassium,total protein and   albumin were highly significant except globulin.

·   Comparison of values in marasmus and control group showed a highly significant variation except total protein the value of S-sodium,S-potassium,and

S-albumin S-globulin showed showed highly significant variation when compared with the control group.

·   When the electrolyte (S-Na+ & S-K+) and protein levels (S-total protein,albumin and globulin) were compared in kwashiorkor and marasmus patients a highly significant variation ($p<0.001$) in S-Na+,K+ and total protein was found and a significant variation ($p<0.01$) in S-albumin and globulin was found.

·   Insignificant variation was found in S-sodium,total protein,albumin and potassium,globulin was significant in kwashiorkor male cases when compared with the female kwashiorkor cases.

·   The values of S-Na+,globulin were insignificant and K+ was highly significant and total protein,albumin were significant .When parameter in both the age group were compared with the both age group in kwashiorkor.

·   The values of S-Na ,total protein were significant and albumin and globulin level were insignificant ($p>0.05$) and K+ were highly significant ($p<0.001$)found i when compared with the both age group in marasmus.

·   Insignificant ($p>0.05$) variation was found in S-Na+,K+,total protein,albumin and globulin level in marasmus male cases when compared with the female marasmus cases.