Haematological Changes in Protein Energy Malnutrition (PEM)

Abstract

Malnutrition is a complex syndrome where several nutrient deficiencies exist simultaneously. Iron deficiency anaemia is the most common nutrient deficiency and is particularly common among preschool children. In many developing countries,the economic implications and public health consequences of anaemia have long been recognized. The well known consequences of anaemia are alteration of the immune status, adverse effects on morbidit ,delayed behavioural and mental development, below average school achievements and growth retardation . The reduced work capacity often associated with anaemia can result in educational and economic losses that eventually affect the well being of an entire population.

Keywords: Protein Energy Malnutrition (PEM), Haemoglobin (Hb) ,Total Leucocyte Count (TLC) and Erythrocyte Sedimentation Rate (ESR)

Introduction

Malnutrition due to various combination of protein and calorie deficiency is by far the most important nutritional problem in the developing countries of the world. It is the outcome of many factors that include physical, social and cultural factors. The severe forms kwashiorkor and marasmus are the leading killers of our paediatric population. Malnutrition among children is known to cause permanent stunting besides affecting their mental performance. Considerable morbidity (at times mortality) accompanies others such as nutritional anaemia and vitamin deficiencies. Different blood parameters (Hb, TLC and ESR) have been reported to be affected by protein energy malnutrition.

Aim of The Study

Present study has been undertaken to study biochemical parameters Serum Haemoglobin (Hb) ,Total Leucocyte Count (TLC) and Erythrocyte Sedimentation Rate (ESR) which would help in the early diagnosis and management of PEM and associated disorders.

Material and Method

350 PEM cases and 70 healthy subjects (controls) belonging to 6 months to 12 years of age group were taken in the study. On the basis of Wellcome trust classification 60 cases were diagnosed as Undernutrition, 23 as Kwashiorkor, 43 as Marasmic kwashiorkor and 224 as Marasmus. Approximately 5-6 ml blood was taken by venipunture. The blood was allowed to clot at 37 degree Celsius for half an hour and then centrifuged to get the serum. The separated serum was used for analysing Serum Haemoglobin (Hb), Total Leucocyte Count (TLC) and Erythrocyte Sedimentation Rate (ESR) in control and PEM cases. Serum Haemoglobin (Hb) was estimated by using Cyanmethaemoglobin method, serum Total Leucocyte count (TLC) by Haemocytometer method and serum Total Leucocyte count (TLC) was estimated by Wintrobe Tube method. Mean levels of serum total protein on the day of admission were compared with respective levels of controls. The patients were graded into uncomplicated recovered, complicated recovered and expired cases according to the final outcome of the disease. Serum Haemoglobin (Hb) ,Total Leucocyte Count (TLC) and Erythrocyte Sedimentation Rate (ESR) were estimated in these cases to assess their role in pathogenesis and their diagnostic importance. Student's t- test was used to analyse the data for statistical significance.

Anita Sharma
Assistant Professor,
Dept. of Chemistry,
N.A.S. College, Meerut,
Uttar Pradesh, India

Innovation The Research Concept

Results
Haematological Findings in Control and Study Groups of PEM

Groups (no. of cases)	Haemoglobin(gm/dl) Mean±S.D. Range	TLC(Thousands/mm3) Mean±S.D. Range	ESR (mm/hr) Mean±S.D. Range
Control group (70)	12.5 ± 0.98 10.5 – 14.00	8.24 ± 2.12 7.21 – 9.93	13.2 ± 2.69 1.2 – 16.0
Study groups Undernutrition (60)	10.2 ± 1.08*** 7.5 1 – 3.3	9.17 ± 2.18* 8.15 – 11.34	14.3 ± 2.47* 2.2 – 24.0
Kwashiorkor (23)	9.9 ± 1.06*** 7.2 – 13.1	11.88 ± 3.56*** 9.63 – 15.23	30.8 ± 4.16*** 12.0 – 40.0
Marasmic kwashiorkor (43)	8.5 ± 0.81*** 6.9 – 12.3	14.76 ± 2.98*** 11.58 – 17.64	21.1 ± 3.87*** 11.0 – 33.0
Marasmus (224)	8.3 ± 0.86*** 6.7 –11.9	15.27 ± 3.66*** 13.24 – 18.31	14.9 ± 4.38** 6.0 – 20.0
Total (350)	8.8 ± 1.04*** 6.7 –13.3	13.94 ± 3.23*** 8.15 – 18.31	16.6 ± 3.98*** 2.20 – 40.0

*p < 0.05 **p < 0.01 *** p < 0.001

Table 1 shows mean values of serum Haemoglobin (Hb) ,Total Leucocyte Count (TLC) and Erythrocyte Sedimentation Rate (ESR) in control and PEM cases. The table reveals that Hb level was observed to be significantly (p < 0.001) reduced in PEM casesas compared to controls. Maximum reduction in Hb level was observed in Marasmus group followed by Marasmic kwashiorkor group, Kwashiorkor group and Undernutrition group.

Total Leucocyte Counts (TLC) were observed to be significantly (p < 0.001) elevated in PEM cases as compared to controls. Elevation in Total Leucocyte Counts(TLC) was slight (p < 0.05) in Undernutrition group but was very high (p < 0.001) in Kwashiorkor, Marasmic kwashiorkor and Marasmus group.

Erythrocyte Sedimentation Rate (ESR) was also observed to be significantly elevated in PEM cases as compared to controls. ESR was slightly(p < 0.05) elevated in Undernutrition group but was significantly elevated (p < 0.001) in Kwashiorkor, Marasmic kwashiorkor and Marasmus group.

Discussion

In present study low haemoglobin levels are observed and the values decrease with increasing severity of malnutrition. Haemoglobin level is affected by infection, inflammation, liver diseases and protein energy malnutrition problems which are very common in developing countries. In PEM reduced Hb levels have been reported by various researchers. Saka et al.(2012), Arya et al. (2017), Gohain et al.(2016) also reported reduced Hb levels in PEM.

The elevation in Total Leucocyte Counts (TLC) level was slight (p < 0.05) for undernutrition but was very high for kwashiorkor , marasmic kwashiorkor and marasmus groups. Higher total leucocyte counts are observed with increasing severity of malnutrition which may be a response to infections. Similar to our study Saka et al.(2012), Arya et al. (2017), Gohain et al.(2016) also reported elevated TLC level in PEM.

In present study Erythrocyte Sedimentation Rate (ESR) was elevated significantly in all the study groups of PEM. The elevation in Erythrocyte Sedimentation Rate (ESR) was very high for

kwashiorkor group followed by marasmic kwashiorkor , marasmus and undernutrition groups.

In malnutrition low haemoglobin levels are observed and the values decrease with increasing severity of malnutrition and hence iron deficiency anaemia is more prevalent. Higher total leucocyte counts are observed with increasing severity of malnutrition, which may be a response to infections. Higher ESR values are observed in oedematous malnourished groups, which can be related to lower serum albumin concentrations in these groups.

Conclusion

Protein Energy Malnutrition (PEM) is associated with various changes in the body systems including changes in the haematologic system. Present study shows that PEM cases were having mild to moderate anaemia with reduced haemoglobin level and elevated TLC and ESR levels. Serum Hb, TLC and ESR may be applicable as parameters having diagnostic significance for PEM.

References

1. Arya A. K., Kumar P., Midha T., Singh M., Hematological profile of children with severe acute malnutrition: a tertiary care centre experience, International Journal of Contemporary Pediatrics Arya AK et al. Int J Contemp Pediatr. 2017 Sep;4(5):1577-1580
2. ASPEN Board of Directors and the Clinical Guidelines Task Force. Guidelines for the use of parenteral and enteral nutrition in adult and pediatric patients. JPEN J Parenter Enteral Nutr 2002;26(1Suppl):1SA–138SA.
3. Correia MI, Waitzberg DL. The impact of malnutrition on morbidity, mortality, length of hospital stay and costs evaluated through a multivariate model analysis. Clin Nutr 2003; 22:235–9.
4. Detsky AS, McLaughlin JR, Baker JP, et al. What is subjective global assessment of nutritional status? JPEN J Parenter Enteral Nutr 1987;11:8–13.
5. Gibson RS. Assessment of protein status In: Gibson RS. (ed). Principles of Nutritional Assessment. New York: Oxford University Press, 1990, 307.

Innovation The Research Concept

6. *Gohain E.K., Pathak K., Choudhury B. A Case Control Study of Hematological Changes in Children with Protein Energy Malnutrition Attending Gauhati Medical College and Hospital. IOSR Journal of Dental and Medical Sciences (IOSR-JDMS) e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 15, Issue 10 Ver. I (October. 2016), PP 25-29 .*

7. *Hematol R. B. Hemoter. Haematological alterations in protein malnutrition vol.26 no.1 São José do Rio Preto Jan./Mar. 2004*

8. *Saka A.O , Saka M J , Ojuawo A , Abdulkarim Aa, Bilamin S., Latubosun L & Adeboye Man(May 2012) Haematological Profile in Children with Protein Energy Malnutrition in North Central Nigeria, Global Journal of Medical research Volume 12 Issue 4 Version 1.0*

9. *Warner R.P., Dole M.G., Warder J., and Suskind R. M. The Anemia of Malnutrition Department of Pediatrics, Louisiana State University Medical Center; and *Charity Hospital of New Orleans, New Orleans, Louisiana 70112, USA*

10. *Young VR, Marchini JS, Cortiella J. Assessment of protein nutritional status. J Nutr 1990;120:1496–502*