Evaluation of changes in some haematological indices of malnourished infants in Umuahia

*Obeagu, Emmanuel Ifeanyi¹, Ochei, Kingsley Chinedum², Oshim, Ifeanyi Onyema³ and Obeagu, Getrude Uzoma⁴
1. Diagnostic Laboratory Unit, Department of Health Services, Michael Okpara University of Agriculture, Umudike, Abia State, Nigeria.
2. Family Health International (FHI360) Country Office, Garki - Abuja, Nigeria
3. Department of Medical Laboratory Science, Faculty of Health Science and Technology, Nnamdi Azikiwe University, Awka
4. Department of Nursing Science, Ebonyi State University, Abakaliki, Nigeria.
*Corresponding author: emmanuelobeagu@yahoo.com

Abstract

The study was done to determine the changes in some haematological indices of the malnourished infants in Umuahia. The study was done in children Emergency Ward of Federal Medical Centre, Umuahia. A total of fifty subjects (50) were recruited for the study. Twenty (20) subjects were malnourished infants aged 1-12 months (10 males, 10 females) and thirty (30) apparently healthy infants (15 males, 15 females). 2ml of venous blood was withdrawn into dipotassium EDTA anticoagulant tubes. This was used for the determination of all the haematological parameters studied, using manual method. The results were analysed using t-test and level of significance set at p<0.05. Significant lower mean values were observed in the red blood cell count, packed cell volume and haemoglobin values in infants with malnutrition as compared to controls. This shows anaemia in malnourished infants and reduced immunity which will affect them to withstand infection. The study showed significant increase in WBC and neutrophil. This could be as a result of metabolic stress and infection. The infants should receive adequate attention and feed well to avert the dangers associated with malnutrition.

Keywords: Red cell count, White cell count, Platelets, Malnourished Infants, Umuahia

Introduction

Malnutrition is a public health challenge especially to the developing countries like Nigeria (Obeagu et al.,2016). The cases of malnutrition may be increased due to economic recession the country is facing and other human factors such as war, terrorism and militancy. It can equally increase by natural disaster such as earthquake, volcanic eruption, flooding and food scarcity (Obeagu et al.,2016).

Malnutrition according to World Food Programme (WFP) is a state in which the physical function of an individual is impaired to the point where he or she can no longer maintain adequate bodily performance process such as growth, pregnancy, lactation, physical work and resisting and recovering from disease. It can equally be insufficient nutrient intake or excess nutrients intake(Olu,2012; Obeagu et al.,2016; Young,2012). If under nutrition occurs early in life of
a baby, it may result to permanent physical and mental damage (Rasmusseu, 2001).

Undernourishment is most often due to not enough high quality of food available to eat. This is associated with 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).

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 2 years improves outcomes (Bhutta et al., 2013).

Malnutrition affects every system in the body and always results in increased vulnerability to illness, increased complications and in very extreme cases even death (Schaible and Kaufmann, 2007; Stillwaggon and Eileen, 2008).

In those with malnutrition some of the signs of dehydration differ. Children, may still be interested in drinking, have decreased interactions with the world around them, have decreased urine output, and may be cool to touch (WHO, 2005).

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 full intellectual and productive potential. The world Health Organisation estimates that malnutrition accounts for 54% of child mortality worldwide (Manary et al., 2013). Even mild degrees of malnutrition double the risk of mortality for respiratory and diarrheal disease mortality and malaria (Walker et al., 2008).

Malnutrition could predispose children to some variations of haematological indices when compared to healthy children. This is possible because their total protein levels are reduced compared to healthy children and haematological parameters are products of micronutrients and nutrients.

**Aim**

To determine the changes in some haematological indices of malnourished infants in Umuahia.
The PCV value is read from the scale of a microhaematocrit reader.

**Procedure**

The capillary tubes were filled two-third full with well mixed EDTA anticoagulated venous blood of each subject, sealed the unfilled end, using a sealant material. The filled tubes were then placed in the microhaematocrit centrifuge and spun at 15,000 xg for 3 minutes. The PCV was read immediately after centrifuging.

**Total White Cell Count**

**Principle:** Whole blood is diluted 1 in 20 in an acid reagent which haemolyses the red cells leaving the white cells to be counted. White cells are counted microscopically using improved Neubauer ruled counting chamber and the number of WBCs per litre of blood calculated.

**Procedure**

Three hundred and eighty microlitre of Turk's solution was dispensed into a test rube and 20 microlitre of well mixed EDTA anticoagulated blood was added and mixed well. The counting chamber was mounted with cover slip and allow to charge with test solution after re:: g th test solution. The charged chamber was left undisturbed for 2-3 minutes for the cells to settle. The chamber was mounted on a light microscope, the ruling were focused and the cell counted using 10 objectives. The total number of cells counted was subjected to the first principle formular.

WBC=N x 20x 10^9/0.4
Where N = number of cells counted 
20= dilution factor 
0.4 = dept of the well 

**Results**

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Healthy Infants</th>
<th>Malnourished Infants</th>
<th>P-level</th>
</tr>
</thead>
<tbody>
<tr>
<td>RBC(x10^12/L)</td>
<td>4.3±1.3</td>
<td>2.4±1.8</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>Hb(g/dl)</td>
<td>12.8±1.6</td>
<td>7.1±1.5</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>PCV (%)</td>
<td>38.4±3.2</td>
<td>21.3±4.3</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>Platelets(X10^9/L)</td>
<td>354.0±63.6</td>
<td>270.0±68.4</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>WBC(X10^9/L)</td>
<td>5.7±1.4</td>
<td>13.2±3.2</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>Neutrophil (%)</td>
<td>42.0±2.9</td>
<td>55.2±8.0</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>Lymphocyte(%)</td>
<td>58.3±4.2</td>
<td>44.9±8.0</td>
<td>&lt;0.05</td>
</tr>
</tbody>
</table>

**Platelet Count**

**Principle:** Blood is diluted 1 in 20 in a filtered solution of ammonium oxalate reagent which lyses the red cells. Platelets are counted microscopically using an improved Neubauer ruled counting chamber and the number of platelets per litre of blood calculated.

**Procedure**

With the test tubes labeled accordingly. 038ml of filtered ammonium oxalate diluting fluid was dispensed into the tubes and 0.02ml of well mixed venous blood of the subjects added and allowed for 20 minutes undisturbed on blotting paper and covered with a lid. The chamber was placed on the microscope and the platelets counted.

**Blood film/differential white cell count**

**Making, Fixing And Staining Blood Films**

**Procedure**

Thin blood films were made from well mixed EDTA anticoagulated blood, air dried and covered with Leishman stain for 2 minutes, double diluted with buffered water of PH 6.8 and allowed to stain for 10 minutes. The stain was washed with tap water. The back of the slide was wiped clean and stood in a draining rack for the smear to dry. A drop of immersion oil was placed on the lower third of the blood film and covered with a clean cover glass. The film was examined microscopically using 10 times objective with condenser iris closed sufficiently to see the cells clearly and changed to 100X for differential count.
Fig 1: Showing the mean values of RBC (X10^{12}/L) of Subjects
RBC=Red blood cell

Fig 2: Showing the mean values of Hb (g/dl) of Subjects
Hb=Haemoglobin

Fig 3: Showing the mean values of PCV (%) of Subjects
PCV=Packed Cell Volume
Fig4: Showing the mean values of Platelets ($10^9$/L) of Subjects

Fig5: Showing the mean values of WBC ($10^9$/L) of Subjects
WBC=White blood cell

Fig6: Showing the mean values of Neutrophil (%) of Subjects
Discussion

Lower mean values were observed in the red blood cell count, packed cell volume and haemoglobin values in infants with malnutrition as compared to controls as finding similar to previous studies (El – Nawawy et al., 2002; laditan and Tindimebw a 1983). These changes can be attributed to adaptation to lower metabolic oxygen requirements and decrease in lean body mass seen in malnutrition (Abidoye and Sikabofiri, 2000). These changes have also been attributed to changes in the plasma volume as well as the intracellular body water in the body (Uner et al., 2001; Nathan, 1990).

An increase in the plasma volume is seen and is said to be responsible for changes in haematocrit and haemoglobin levels (Kornberg and Sebrell, 1946). This study also found a significant leucocytosis and neutrophilia among infants with malnutrition as compared to control. This is similar to a previous study which showed a significant rise in leucocyte count in the patients with malnutrition compared to the controls (Nathan, 1990). Leucocytosis in these infants can be a result of infection which is seen commonly in malnutrition. A lower lymphocyte count was observed in the malnourished children compared to controls. The lower lymphocyte count can be attributed to change in the thymus which is greatly reduced in infants during severe malnutrition. The degree of rhythmic atrophy correlates closely with depletion of lymphocytes and a decrease in the thymic dependent lymphocyte is also associated with impaired immunity (Smith, 1987). Infants with malnutrition had a significantly lower platelet count. This decrease in bone marrow activities which indirectly affect megakaryocyte functions. This decrease in platelets seen in malnutrition can be attributed to a purported decrease in bone marrow activities which indirectly affect megakaryocyte function. A similar finding has been reported by a previous study (Uner et al., 2001).

Conclusion

The study showed significant decrease in packed cell volume, haemoglobin, platelets and lymphocytes compared to the healthy infants. This shows anaemia in malnourished infants and reduced immunity which will affect them to withstand infection. The study showed significant increase in WBC and neutrophil. This could be as a result of metabolic stress and infection. The infants should receive adequate attention and feed well to avert the dangers associated with malnutrition.

References


