**International Journal of Multidisciplinary Research and Development**
**Online ISSN: 2349-4182, Print ISSN: 2349-5979, Impact Factor: RJIF 5.72**
**www.allsubjectjournal.com**
**Volume 4; Issue 7; July 2017; Page No. 148-150**

# Measurement of the main hematological parameters for some anemic infants in Khartoum state

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**Abstract**
The aim of this study was to measure the main hematological parameters and to investigate the effect of some socioeconomic factors that may lead to microcytic hypochromic anemia among infants at Dr. Gafaar Ibn Our Hospital in Khartoum state. Blood samples were collected from 150 infants after the Agreement of their mothers and the hospital authorities. Every mother answered a questionnaire about the health history and the social situation of the family as main factors, that may lead to Micocytic Hypochromic Anemia In children. The collected samples were analyzed for CBC using full analyzer Sysmex. The obtained results were statistically analyzed using SPSS program. The mean values of CBC were found to be as follows Hb 9 g/dl, PCV 28 %, MCV 63 fl, MCH 21 pg, MCHC 31.8g/dl, RBC 4.1($10^6$/µl), WBC 9.8 ($10^3$/µl), platelet counts 356($10^3$/µl), RWD 18.3%, reticulocyte counts 2.1%.The micocytic hypochromic blood pictures showed mild, moderate and severe anemia among the infants under study. The analysis showed a clear relation between the disease history in mothers, the family income, mother level of education, feeding system, and some other diseases such as fever and diarrhea in sick infants.

**Keywords:** infants, anemia, packed cell volume, breast milk

## 1. Introduction
Nutritional anemia is a major public health problem in many developing countries. It was estimated that more than two billion people in the world are anemic (Mason, 2001). 90% of this number live in developing countries (WHO, 1992).In developing countries, where 40–45% of children with ages ranging from two months to four years old suffer from anemia (ACC/SCN.2000). In Africa, anemia affects about 45% of adolescent girls (USAID 2007). In the developing countries Anemia is most commonly results from iron deficiency in dietary system. In patients suffering iron deficiency anemia, red blood cells are affected. The effect may lead to both microcytic and hypochromic anemia (Ramakrishnan, U., ed. 2001). In infants if hemoglobin (Hb) levels are below 11 g/dL we may consider this as anemia indication. In severe anemia levels hemoglobin will be less than 5 g/dL, and this is associated with an increased risk of child mortality (K. S. Phiri, J.C.J. Calis, *et al.* 2008) [2]. Cows milk have a greater incidence of iron deficiency because bovine milk has a higher concentration of calcium, which competes with iron for absorption (Maria A. A. *et al.* 2005) [4]. Iron deficiency can result from inadequate breast milk intake, or it can occur if milk remains as the only source of a child's nutrition after four months of age. A research carried in Chile showed that 40 % of children who depend mainly on breast milk as a source of nutrition, ndeveloped iron-deficiency anemia (Yip, R., and Ramakrishnan, U. 2002). Iron is an essential micronutrient, because it is required for adequate erythropoietic function (Muñoz M, Breymann C, *et al.* 2008).Therefore iron deficiency is considered to be the main cause of anemia. Severe anemia increases mortality among young children. Iron deficiency impairs behavioral and cognitive development and reduces fitness and work capacity (Stoltzfus, R. J. 2001). South East Asia has the largest number of anemic persons, both as an absolute number and also in proportion to its population, including children. 60% of women, 36% of men and 66% of children in this region are anemic (Stoltzfus RJ, Mullany. 2005) [9]. This contributes to 324,000 deaths and 12,500,000 disabilities in this region, as the highest number in the world (Stoltzfus RJ, Mullany. 2005) [9]. Mahgoub. H.M, *et al.*, (2010), carried a study among schoolchildren with ages ranging from 8 to 18 years old at new halfa in eastern Sudan. The study considered Schistosoma mansoni and Hymenolepis nana infections as risk factors leading to anemia disease among school childrens. They found that 16% out of five hundred and eighty of the school childrens were severely anemic (Hb < 8 g/dl). The remaining numberof children under study were found to be suffering anemia depending on the low hemoglobin value (Hb < 12 g/dl). Dr.Gafaar Ibn Ouf Hospital is specialized hospital for children in Khartoum state the present study is aiming to measure the main hematological parameters that indicate the occurrence of anemia disease samples were collected from 150 patients who are residence in the hospital because of malnutrition. At the same time the socioeconomic background of the families were analyzed as risk factors that may lead to anemia disease among infants. These factors include family anemic history, level of mother's education, feeding system, adequate lactation period, low family income and other diseases infections.

## 2. Materials and Methods
2.5 mls of venous blood samples were taken from 150 resident infants at Dr. Gafaar Ibn Ouf Hospital in Khartoum state, after the Agreement of their mothers. Every mother also answered a questionnaire about the health history and the socioeconomic situation of the family as main factors that may lead to

Micocytic Hypochromic Anemia in Infants. Each samlpe was transferred to $K_2$-EDTA anti coagulant container and analyzed for complete blood count using full analyzer sysmex. The results of the analysis were statistically analyzed using SPSS program. The group under study consist of 62 males (41.3%) and 88 females (58.7 %), with ages ranging from 2 months to 2 years. The patients were classified in three groups of ages 2-8 months, 9-16months and 17-24months.

## 3. Results and Discussion

Table (1) showed the mean values of complete blood count ( CBC ),which were found to be as follows Hb 9 g/dl, PCV 28 %, MCV 63 fl, MCH 21 pg, MCHC 31.8g/dl, RBC 4.1(106/µl), WBC 9.8 (103/µl), platelet counts 356 (103/µl), RDW 18.3 %, reticulocyte counts 2.1%.The micocytic hypochromic blood pictures of the different amounts of target cells and other cells showed mild, moderate and severe anemia among the infants.

**Table 1:** Mean values of the measured hematological parameters

| Parameter | Mean | SD |
|---|---|---|
| Hb | 9g/dl | 2.4 |
| PCV | 28% | 6.3 |
| MCV | 63fl | 11.2 |
| MCH | 21pg | 4.9 |
| MCHC | 31.8g/dl | 1.8 |
| RBCs | 4.1($10^6$/µl) | 1.1 |
| WBCs | 9.8($10^3$/µl) | 4.5 |
| Platelet | 356($10^3$/µl) | 172 |
| RDW | 18.3 % | 4 |
| Reticulocyte count | 2.1% | 2.3 |

Table (2) showed that anemia disease is less among the infants with ages ranging from 2-8 months (13%). This may be attributed to the factor that the infants in this age mainly depend on breast milk rather than the other types of food. Those of age group ranging from 9-16 months represents the highest anemic percentage among the study population (53. %), and the age group 17-24 was intermediate (33%). Mason J, Bails A, *et al.* (2005) reported that infants in the age range of 6 to 24 month are particularly at high risk for anemia. The obtained results in this study (table1) showed mean values of hemoglobin concentration 9g /dl, packed cell volume PCV 28%,, mean cell volume MCV 63 fl, mean cell hemoglobin MCH 21pg, mean cell hemoglobin concentration MCHC 31.8g/dl, RBCs 4.1 ($10^6$/µl), WBCs 9.8 ($10^3$/µl),platelet 356 ($10^3$/µl), RDW 18.3 %, reticulocyte count 1.95.This may agree with Ana Beatriz Barbosa Torino,. *et al.* ( 2014) who reported that in chronic iron deficiency anemia, the cellular indices show a microcytic and hypochromic erythropoiesis. According to Ramakrishnan, U., *et al.* (2001) [7] The microcytosis is apparent in the smear long before the MCV is decreased, after an event causing iron deficiency and Platelets are usually increased in this disorder.They also reported that, the red cells in a patient with iron-deficiency anemia are both microcytic and hypochromic. The analysis of the results showed that 25.7 % of the study infants have low birth weight and belong to anemic mother during pregnancy. 30% belong to anemic mothers but have normal birth weight. This may agree with Stoltzfus RJ. (2008) [10] who reported that, infants at risk of developing iron deficiency anemia before 6 month of age include preterm, lower-birth-weight, infants born to mothers with poor prenatal iron status.

**Table 2:** Showed the percentage of infants age ranges

| Age range | Patients number | percentage |
|---|---|---|
| 2 -8 months | 20 | 13% |
| 9-16 months | 50 | 33% |
| 17-24 months | 80 | 53% |

The results analysis also showed that 19% of the infants population have been depending on cow's milk as complimentary diet. according to (Yip, R., and Ramakrishnan, U. 2002) [14]. Iron deficiency can result from inadequate milk intake, or when milk remains as the only source of a child's nutrition after four months of age (Yip, R., and Ramakrishnan, U. 2002) [14]. 10% of the studied anemic infants' population was found to be suffering fever or diarrhea. This may agree with the findings reported by, Tulio Konstantyner, Thais Cláudia Roma Oliveira, *et al.* (2011).

## 4. Conclusion

As a conclusion, the results of this study showed significant abnormality in the measured hematological parameters for all groups of ages in children under study, compared with the normal mean values of CBC. The measured parameters mean values were found to be as follows Hb 9 g/dl, PCV 28 %, MCV 63 fl, MCH 21 pg, MCHC 31.8g/dl, RBC 4.1($10^6$/µl), WBC 9.8 ($10^3$/µl), platelet counts 356($10^3$/µl), RWD 18.3 %, reticulocyte counts 2.1%. Infants who belong to mothers of low education, low income low feeding practices, or anemic during pregnancy time were found to be facing higher risk of anemia.

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