Identification and Evaluation of Anemia Using Various Hematological Tests

[1] Shwetma Mishra, [2] O.P. Verma, [3] Jayanand, [4] G. S. Shukla
[1][3] Department of Biotechnology, Shobhit University, Meerut
[2][4] SHUATS, Allahabad, Department of Biotechnology, SHUATS, Allahabad

Abstract: Anemia is the commonest disorder of the blood and affected all age groups now days. It is diagnosed as low Hb count in Blood or decrease no of RBCs normally. Many biotechnological tools are formulated for accurate diagnosis of anemia e.g. Analyzers' for CBC counting, Neubauer chamber for cell counting, Microscopic findings of Bone marrow examination etc. The study has dynamic impact on the overall development of detecting the disease in the very early stage. It is less time consuming and easy way to find out presence of anemia in a person. They are either suffered by chronic illness or infected by blood parasite. It is also found out that traumatic disorder is also responsible for the cause of anemia. Some samples shows that it is hereditary or acquired. The study of anemia deals with the treatment of blood related disorders & tumors that are present in the human body. This study is fairly new one in India but is gaining rapid importance that is shaping the future of various patients that are actually carrying this disease.

*Keywords***: Anemia, hematological analysis, blood parasite, hereditary, acquired, tumors**

I. INTRODUCTION

Anemia is the most common disorder of the blood. There are several kinds of anemia, produced by a variety of underlying causes. Anemia can be classified in a variety of ways, based on the morphology of RBCs, underlying etiologic mechanisms, and discernible clinical spectra, to mention a few. The three main classes of anemia include excessive blood loss, acutely such as a hemorrhage or chronically through low-volume loss, excessive blood cell destruction, hemolytic or deficient red blood cell production, ineffective hematopoietic. Less common symptoms may include swelling of the legs or arms, chronic heartburn, vague bruises, vomiting, increased sweating, and blood in stool. Most of the anemic samples, especially women, suffer from mild to severe deficiency of iron. The hemoglobin count in most of the adolescent girls in India is less than the standard 12 g/deciliter, the standard accepted worldwide. Anemia is a decrease in normal number of red blood cells (RBCs) or less than the normal quantity of hemoglobin in the blood. [1][2] However, it can include decreased oxygen-binding ability of each hemoglobin molecule due to deformity or lack in numerical development as in some other types of hemoglobin deficiency. There are two major approaches: the "kinetic" approach which involves evaluating production, destruction and loss[3], and the "morphologic" approach which groups anemia by red blood cell size. The morphologic approach uses a quickly available and cheap lab test as its starting point (the MCV). On the other hand, focusing early on the question of production may allow the clinician more rapidly to expose cases where multiple causes of anemia coexist. Anemia goes undetected in many people, and symptoms can be minor or vague. The signs and symptoms can be related to the anemia itself, or the underlying cause.

II. METHODOLOGY

(Routine Hematology)
Anticoagulant of choice: EDTA
- Complete Blood Counts (CBCs)
- Erythrocyte Sedimentation Rates (ESRs)

2.1. Collection of blood:
The blood can be collected by veripuncture. The collected blood samples of 1000 sick persons according to their age groups are taken for the study of anemia. About 2-3ml of blood is collected in the EDTA tube (dipotassium salt) for the test performing are Complete Blood Count including Hemoglobin, Erythrocyte count, Leukocyte count, Platelet count, Erythrocyte Sedimentation Rate (ESR, method: wintrobe) by using automatic analyzer. The test which is carried out by collecting the sample in the solution of 3.8gm/dl trisodium citrate is prothombin time.The amount of blood is exactly 1.8 – 2.0 ml. If the ratio is not proper then the test becomes an error. It is necessary that the blood collected is without clots.The test which is performed by using whole blood without anticoagulant is smear for Differential Leukocyte Count, for correlating with Complete Blood Count. The collected blood sample have given number such as 1,2,3,4,5,6,7,8,9…..1000, for easy to perform tests procedure. After giving no.s the samples was putted in automated analyzer for the study. Few samples was also

examined by microscope for further evaluations or analysis. Results were categorized by different age groups.

Coulter Principle

Electrical impedance: resistance or change in current when cell passes between two electrodes in NaCl solution.

KNOW NORMAL RANGES

WBC	3000-7000*109
RBC	5.0+/- 0.5 109/l
HGB	11.0-18.0gm/l
PLT	150-400*109/l
Neutrophils	40-80%
Lymphocytes	20-40%
Monocytes	2-10%
Eosinophils	1-6%
Basophils	<1-2%
ESR	0-10mm/1st hour(male) ; 0-20mm/1st hour(female)

III. RESULTS AND DISCUSSION

3.1. Analysis of anemic samples:

From the hematological analysis done by using automated analyzer of one thousand samples, 15% samples are found as anemic. In the result it is found that children's of the age group 0-15 are found to be anemic i.e. 45.5% then any other age groups. From one thousand samples, random selection was done of samples which shows typically anemia. Ten samples of anemia are taken from each age group with their control value for identification.

3.2. Data showing Anemic and Non anemic samples in different age group:

Age Grouping	No. of Sample	Sample showing non Anemia	Sample showing Anemia
0 – 15	120	65	55
15 – 30	230	210	20
30 – 45	260	230	30
45 – 60	210	190	20
60 and Above	180	155	25
Total Samples	1000	850	150

Total No. of Samples = 1000

No. of sample indicating no anemia = 65+210+230+190+155 = 850
No. of sample indicating anemia = 55+20+30+20+25 = 150
% of sample indicating no anemia = 850x100/1000 = 85%
% of sample indicating anemia = 150x100/1000 = 15%

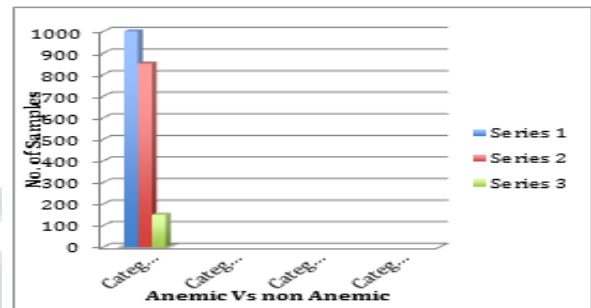### *3.3. Calculations of samples showing anemia with percentage according to their age group:*

0 – 15 years = 55x100/120 = 45.8%
15 – 30 years = 20x100/230 = 8.7%
30 – 45 years = 30x100/260= 11.5%
45 – 60 years = 20x100/210 = 9.5%
Above 60 years = 25x100/180 = 13.9%

Graff I showing Anemia in different age groups

(In the graff it is shown that the total no. of samples was 1000 in which 850 samples shows no anemia where as 150 samples of different age groups shows anemia: Series 1 of Blue line indicates total no of samples, Series 2 of red line indicates non Anemic samples & Series 3 of green lines shows anemic samples.)

3.4. Identification of hematological disorders from analyzed sample:

Total one thousand samples are taken in which one fifty samples was found anemic. Each age group of hundred samples were taken (graph II) and from one hundred samples, random selection was done of ten samples which shows typically anemia. ten samples of anemia are taken from each age group with their control value for identification. That was described in detailed results of the study.
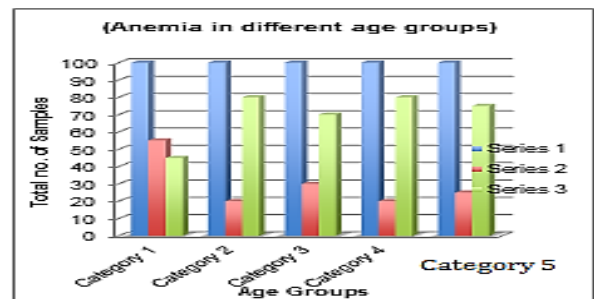
Graff II showing Anemia in different age groups

(In the graph it is shown that each age group of 100 samples was included in the study. Category 1 represents 0 – 15 years of age group in which 45 samples shows no anemia where as 55 samples shows anemia, Category 2 represents 15-30 years of age group in which 80 samples shows no anemia where as 20 samples shows anemia, Category 3 represents 30-45 years of age group in which 70 samples shows no anemia where as 30 samples shows anemia, Category 4 represents 45-60 years of age group in which 80 samples shows no anemia where as 20 samples shows anemia & Category 5 represent 60 years and above age group in which 75 samples shows no anemia where as 25 samples shows anemia: Series 1 of Blue line indicates total no of samples, Series 2 of red line indicates Anemic samples & Series 3 of green lines shows Non Anemic samples.)

IV. SUMMARY AND CONCLUSION

After performing the hematological analysis it is found that 15% of sample indicating anemia, in which age group of children's affected more i.e. 45.5% with low hemoglobin count which signifies that the oxygen carrying capacity of blood is reduced, which can be due to defective erythropoisis or high erythrocyte destruction rate (hemolysis or jaundice like disease). They are either suffered by chronic illness or infected by blood parasite. It is also found out that traumatic disorder is also responsible for the cause of anemia. Some samples shows that it is hereditary or acquired. The study of anemia deals with the treatment of blood related disorders & tumors that are present in the human body. This study is fairly new one in India but is gaining rapid importance that is shaping the future of various patients that are actually carrying this disease. The study is partly treated as a part of the medical course but it will soon create its own importance as the study has vital plans that will in the future shape the society's overall health. Therefore the study of anemia has various impacts that are vitally considered as positive for the society. There are various researches going in the field of tumor treatment that will help the doctors to treat this disease with more cautions and with more knowledge as well as understanding and therefore can tackle the disease with more effectiveness and come up with better results. The study of anemia influences does not end here. The study has vital impact on the overall development of detecting the disease in the very early stage. This will help to understand the eject cause of the tumor or any other disorders and help to eliminate at the very small instances. Thus the study of anemia has ample influence on the society and with proper understanding; the people around the world can be freed from the clutches of this disease that has been accounted as one of the largest life taking disease conceived by mankind. The field of anemia indeed plays a significant role in the development of the society.

V. ACKNOWLEDGMENTS

REFERENCES

1. (n.d.). Definition of Anemia Last Editorial Review: 12/9/2000 8:31:00 AM. from MedicineNet.com.

2. (n.d.). Anemia. merriam- webster dictionary. Retrieved on May 25, 2016

3. Fredrick M Abrahamian, Anemia, Chronic. eMedicine. Article DO, FACEP

4. The Franklin Institute Inc.. "Blood – The Human Heart".http://www.fi.edu /learn /heart /blood /blood. html. Retrieved 19 March 2009.

5. Hébert PC, Wells G, Blajchman MA, et al. (1999). "A multicenter, randomized, controlled clinical trial of transfusion requirements in critical care. Transfusion Requirements in Critical Care Investigators, Canadian Critical Care Trials Group". N. Engl. J. Med. 340 (6): 409–17. PMID 9971864.

6. Bush RL, Pevec WC, Holcroft JW (1997). "A prospective, randomized trial limiting perioperative red blood cell

transfusions in vascular patients". Am. J. Surg. 174 (2): 143–8. Doi: 10.1016/S0002-9610(97)00073-1. PMID 9293831.

7. Bracey AW, Radovancevic R, Riggs SA, et al. (1999). "Lowering the hemoglobin threshold for transfusion in coronary artery bypass procedures: effect on patient outcome". Transfusion 39 (10): 1070–7. doi:10.1046/j.1537-2995.1999.39101070.x. PMID 10532600.

8. McIntyre LA, Fergusson DA, Hutchison JS, et al. (2006). "Effect of a liberal versus restrictive transfusion strategy on mortality in patients with moderate to severe head injury". Neurocritical care 5 (1): 4–9. Doi: 10.1385/NCC: 5:1:4. PMID 16960287.

9. Corwin HL, Gettinger A, Pearl RG, et al. (2004). "The CRIT Study: Anemia and blood transfusion in the critically ill—current clinical practice in the United States". Crit. Care Med. 32 (1): 39–52. Doi: 10.1097 /01.CCM.0000104112.34142.79.PMID 14707558.

10. Vincent JL, Baron JF, Reinhart K, et al. (2002). "Anemia and blood transfusion in critically ill patients". JAMA 288 (12): 1499–507. Doi: 10.1001/jama.288.12.1499. PMID 12243637.

11. a b c Undersea and Hyperbaric Medical Society. "Exceptional Blood Loss — Anemia". http://www.uhms.org /ResourceLibrary/Indications/Exceptional BloodLossAnemia /tabid /277 /Default.aspx. Retrieved 2008-05-19.

12. Hart GB, Lennon PA, Strauss MB. (1987). "Hyperbaric oxygen in exceptional acute blood-loss anemia". J. Hyperbaric Med 2 (4): 205–210. http://archive.rubicon-foundation.org/4352. Retrieved 2008-05-19.

13. Van Meter KW (2005). "A systematic review of the application of hyperbaric oxygen in the treatment of severe anemia: an evidence-based approach". Undersea Hyperb Med 32 (1): 61–83. PMID 15796315. http://archive.rubicon-foundation.org/4038. Retrieved 2008-05-19.

14. http://www.nhlbi.nih.gov /health /dci /Diseases /anemia /anemia_ diagnosis.html

15. Ambaglio I, Travaglino E, Della Porta MG, Pascutto C, Ubezio M, Invernizzi R, Malcovati L, Cazzola M. The impact of the degree of anemia on survival of patients with myelodysplastic syndrome. A basis for prognostic assessment and clinical decision making. Haematologica 2010; 95(2):124.