A Review: Analysis of iron deficiency anemia in Pregnant women using Artificial Neural Network

Ms. [1]Priyanka M. Mule
Student of HVPM'S College of Engineering and Technology Amravati (India)

Dr. Ujwala A. Kshirsagar [2]
Head of the Dept. (Electronics and Telecommunication) of HVPM'S
College of Engineering and Technology (India)

Abstract: This Proposed work presents a novel method to detect five types of abnormal Red Blood Cells (RBCs) called Poikilocytes in Iron deficient blood smears. Classification and counting the number of Poikilocyte cells is considered as an important step for the automatic detection of Iron Deficiency Anemia disease. Round cells(Discocyte), Dacrocytes, Schistocytes and Elliptocytes, Degmacyte cells are five essential Poikilocyte cells that are prevalent in of Iron Deficiency Anemia. The suggested cell recognition approach includes preprocessing, feature extraction and classification steps. There are five main phases involved in the system.They are image pre-processing, extraction of five type Poilkilocyte Cell from segmented images, feature extraction, classification of five type Poilkilocyte Cell Images. For classification neural classifiers in DCT and WHT are used. The main aim of the method is to develop a Computer Aided system for classification of blood disease of five type Poilkilocyte Cell or abnormal red blood cell.

IndexTerms **- NeuroSolution neural network software, Transformed domain techniques DCT WHT, MATLAB, Microsoft Office Excel**

I. INTRODUCTION

Iron deficiency is a highly prevalent form of under nutrition, affecting around one-fourth of the world's women and children, and is one of the most common causes of anemia. Iron deficiency is one of the most prevalent nutrient deficiencies in the world, affecting an estimated two billion people. Children and Young children and women are the most commonly and severely affected because of the high iron demands. However, where diets are based mostly on staple foods with little meat intake, or people are exposed to infections that cause blood, iron deficiency may occur throughout the life span. Although much is known about iron metabolism, the health consequences of iron deficiency continue to be a subject of research and debate. This is partly because in many regions of the world iron supplements are the standard of care for individuals with anemia. Most trials of iron supplementation have measured hemoglobin Concentra- 164 Comparative Quantification of Health Risks as the primary outcome. There is surprisingly little evidence to either support or refute a causal link between iron deficiency and these important adverse health outcomes. As processes like this comparative risk assessment (CRA) bring to light the overall weakness of evidence either supporting or refuting the relationship, new research priorities may emerge[1,2].

So Anemia is considered as the most prevalent Hematological disorder and is mainly caused by the lack of Iron in the body. Iron Deficiency Anemia or simply Iron Deficiency Anemia is traditionally determined by Complete Blood Count test (CBC). It would be a sensible and reasonable idea to use image processing techniques for the diagnosis of Iron Deficiency Anemia. In an iron deficient blood smear, the shape and the size of red blood cells change significantly. Shape variation of cells is called **Poikilocytosis** and size variation is known as **Anisocytosis**. Based on the shape of the outer boundary of a cell, six different types of blood cells can be categorized in an iron deficient blood smear including round cells(Discocyte), Dacrocytes, Schistocytes and Elliptocytes, Degmacyte,.[6.8] Samples of these six blood types are illustrated in Fig.1.2,3,4,5, Dacrocytes are tear drop like cells and Elliptocytes are similar to ellipses. Round cells have circular outer boundary and include normal blood cells.

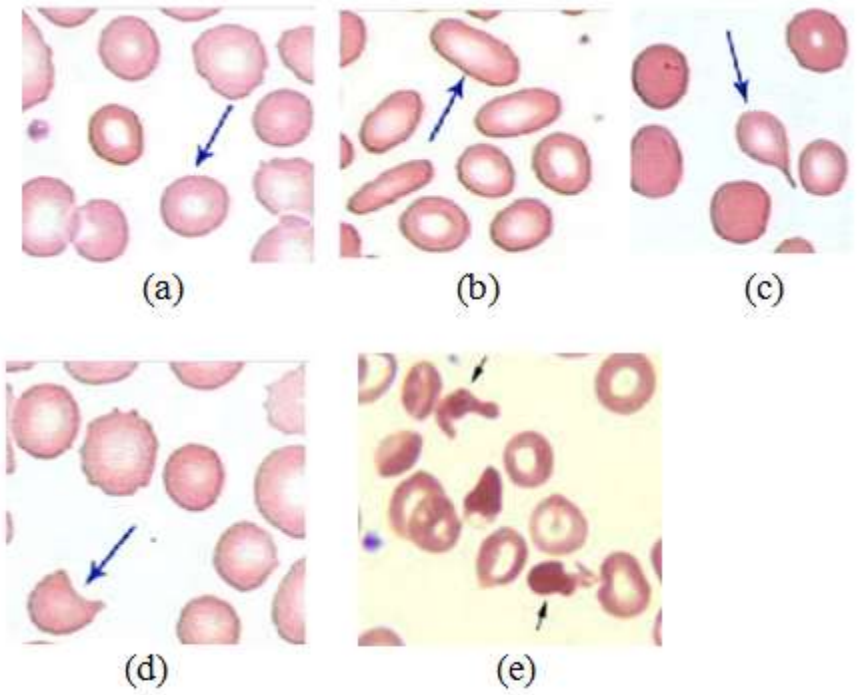

Figure.1(a) Round cell(Discocyte) (b)Elliptocyte (c)Dacrocyte (d) Schistocyte (e)Degmacyte,

These Poikilocyte cells (Dacrocytes, Elliptocytes and Schistocytes, Degmacyte, Discocyte) have different shapes which can be used as features for their classification. In this Purposed work, collecting data and preparing cell images for feature extraction, Dacrocyte cells, Elliptocyte cells, Schistocyte cells Degmacyte cells, Discocyte cells and round cells are classified.

Iron Deficiency Anaemia is considered as the most common type of haematological disorder and nutritional deficiency worldwide, it is caused by the deficiency of iron in body leading to reduction in the number of erythrocytes. Iron IS necessary to synthesize erythrocytes, which help to store and carry oxygen via blood. Iron is received in the liver as ferritin and discharges as demand to form new erythrocyte in the bone marrow. When erythrocyte completes its lifetime in the blood circulation (after 100-120 days), they are reabsorbed by the spleen. Iron is maintained by the balance between absorption and body losses and Img daily to maintain equilibrium. Grievous and protracted iron deficiency anemia may increase the risk of evaluative complicacy that affects heart and lungs as a consequence of which tachycardia (abnormally fast heart beat) or heart failure and dysfunction of iron inclusive cellular enzymes may occur. It can cause reduced impact motor and work capacity in adults and mental development in adolescents and children. There are few evidences that prove iron deficiency anemia causes fatigue in adult women and affects realization in adolescent girls. Deficiency generates in stages. In the first stage, iron necessity increase intake, causing onward depletion of bone marrow iron stores. As depository decrease, absorption of dietary iron increase in quid pro quo.[4]

During later stages, deficiency makes worse erythrocyte agglutination, finally causing anemia. Iron Deficiency Anaemia is traditionally determined by complete blood cell count test. It would be a sane and proper opinion to use digital image processing techniques for the diagnosis of iron deficiency anemia. In an iron deficient blood smear microscopic images, the shape and size variation of erythrocyte is observed. Shape of cells is called Poikilocyte and size variation is called Anisocytosis.

II. LITERATURE REVIEW

This recommendation has obvious benefits for the target population, programme implementers and governments in resource-poor settings are held-back by the increased cost of malaria control, iron deficiency, and anaemia control programmes. Usually, the end result is a poorly implemented programme with low coverage. This exacerbates the problem of malaria and iron deficiency anaemia control in malaria-endemic countries. Considering the upper limit of the 95% CI of the main effect of iron supplementation (─9.3% to 9.3%), we cannot exclude the possibility that iron supplementation may have led to a 9% increase in *Plasmodium* infection, which may have reduced birth weight. (Desaiet al. 2007) Overall, however, iron supplementation led to large increase in birth weight (143g). Particularly in women who were initially iron deficient, iron supplementation increased birth weight by 249 g. Although it is theoretically possible to screen and treat only those who are iron deficient, this is difficult to achieve in developing countries because of practical and financial constraints. For these reasons, we recommend universal iron supplementation in pregnant women, even in areas with poor coverage of IPTp The results reported in this thesis have tremendous implications for neonatal health. We showed that iron supplementation reduced the risk of low birth weight, which is the primary determinant of neonatal and post-neonatal mortality. Low birth weight is also an important cause of neonatal morbidity, inhibited infant growth, and cognitive

development. Our calculations indicate that if our results are applied to all women in developing countries in order to eliminate iron deficiency, we could avoid 3 million births with low birth weight annually and save the lives of more than half a million neonates. These figures should be treated with caution, however, because they are based on many assumptions. The effect of iron on birth weight was achieved at least in part through increased fetal growth (effect: 0.27 SD, 95%CI: 0.04 to 0.50). In this analysis, we assessed fetal growth by z-scores. Compared to dichotomised indicators of fetal growth such as small-for-gestational age, z-scores have the advantage that dichotomising of continuous outcomes leads to loss of information and reduced statistical precision when comparing groups. (MacCallum, Zhang, Preacher, & Rucker, 2002)

Our study also showed improved neonatal iron stores one month post-partum as indicated by an increase in plasma ferritin concentration by 17.1% (95% CI: 2.0% to 34.3%) in neonates of mothers who received high-dose iron compared to those who received low-dose iron. It is a common belief that the fetus obtains and stores normal amounts of iron even when its mother is mildly to moderately iron deficient. (Allen, 1997).

Most studies that failed to show an association between maternal and infant iron status examined the relationships between iron status in late pregnancy and iron markers in cord blood in women who were not iron deficient. (Allen, 1997) (Ajayi, 1988; Doyle, Crawford, Wynn, & Wynn, 2009; Okuyama, Tawada, Furuya, & Villee, 1985; Rios, Lipschitz, Cook, & Smith, 1975). In areas where anaemia is prevalent, however, cord blood iron markers were closely associated with maternal concentrations. (Agrawal, Tripathi, & Agarwal, 1983; Gaspar, Ortega, & Moreiras, 1993) The findings of this thesis provide more impetus to the need to offer iron supplements to pregnant women with an aim of boosting infant iron stores. Although infants born at term are not usually iron deficient, neonatal stores are important because they probably delay the time until infants develop iron deficiency.We also assessed whether zinc protoporphyrin is accurate when used to assess iron deficiency in malaria endemic regions .

After comparisons with other iron indicators such as plasma ferritin concentrations it was found that zinc protoporphyrin is of unreliable diagnostic utility when discriminating between pregnant women with and without iron deficiency. Whole blood ZPP content overestimated the proportion of iron deficient population. Erythrocyte ZPP content performed slightly better but still overestimated the proportion of iron deficient population. Further research is required to explain the factors that influence ZPP synthesis in patients with chronic diseases. In addition, there is need for a review of the guidelines on the diagnosis and management of iron deficiency as assessed by ZPP in pregnancy in regions where chronic diseases are prevalent. Our results indicate that whole blood ZPP should have no role as a screening marker to manage iron deficiency in pregnant women. Erythrocyte ZPP may have limited value to rule out iron deficiency in populations with low prevalence of iron deficiency, but a positive test result should be followed by other, more specific diagnostic tests such as plasma ferritin concentration. Haemoglobin concentration is not suitable for this purpose.

Non-transferrin bound iron has been the subject of many scientific discussions especially after the publication of the Pemba trial results. (Sazawal et al., 2006) The appearance of NTBI in circulation after oral ingestion of iron supplements has been thought to aid the growth and multiplication of *Plasmodium* parasites thereby increasing malaria induced morbidity and mortality. We conclude that oral ingestion of 60mg of ferrous fumarate will not lead to a detectable increase in NTBI concentrations provided that it is taken with food. The absence of an effect is consistent with the lack of an effect of iron on *Plasmodium* infection .

III.RESEARCH METHODOLOGY

Flow chart:

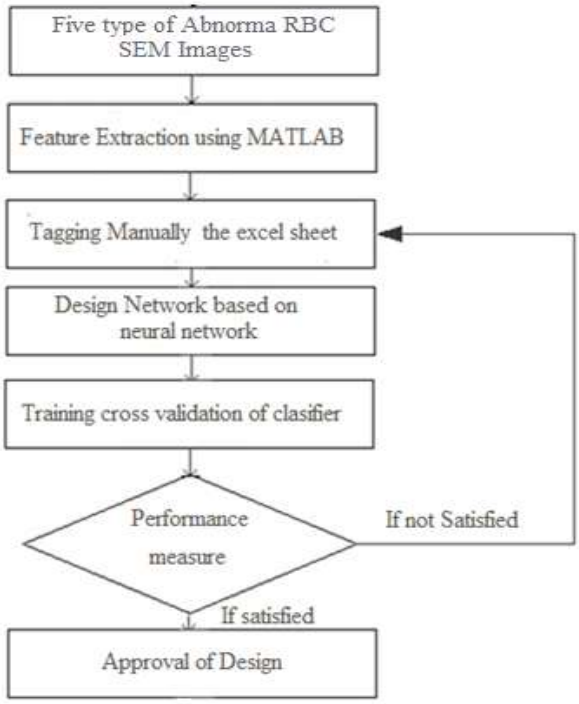

Figure 3.1 Methodology of work

It is proposed to study the classification of five type of blood abnormal RBC SEM images Using Neural Network Approaches.. Data acquisition for the proposed classifier designed for the Recognition of five type of blood RBC abnormal images. Image data will be Collected from the different- different Pathology labs .The most important un correlated features as well as coefficient from the images will be extracted .In order to extract features, statistical techniques, image processing techniques, transformed domain will be used.

Computational Intelligence techniques include the following will established techniques.

i) Statistics
ii) Image processing
iii) Learning Machines such as neural network.
iv) Transformed domain techniques such as Histogram, FFT, and WHT etc.

For choice of suitable classifier following configuration will be investigated.

i) Multilayer perceptron Neural network.
ii) Support vector Mchine.
iii) Generalized Feed Forward Neural Network

For each of the architecture, following parameters are verified until the best performance is obtained.

i) Train-CV-Test data
ii) Variable split ratios
iii) Retraining at least five times with different random initialization of the connection weights in every training run.
iv) Possibility different learning algorithms such as Standard Back-Propagation, Conjugate gradient algorithm , Quick propagation algorithm, Delta Bar Delta algorithm,Momentum

v) Number of hidden layers
vi) Number of processing elements of neurons in each hidden layer.

After regions training & retraining of the classifier, it is cross validated & tested on the basis of the following performance matrix.

i) Mean Square Error
ii) Normalized Mean Square Error
iii) Classification accuracy
iv) Sensitivity
v) Specificity

In order to carry out the proposed research work, Platforms/Software's such as Matlab, Neuro solutions, Microsoft Excel will be used.

IV.Research Objectives:

i)To maintain the correctness & accuracy in the diagnosis of Blood sample even though the input images are contaminated by known or unknown noise.
ii)To increase the classification accuracy for the detection of all five type of abnormal blood RBC Cells.
iii)To develop an efficient classification algorithm based on computational intelligence approaches, with accuracy similar to that achieved by experienced Pathologist.
iv)To increase the classification accuracy use maximum number of abnormal RBC images for classification.

V.CONCLUSION

This paper demonstrated how to using artificial neural networks(ANN)could be used to build accurate five type of abnormal blood RBC cell image classifier and i am also try to achieved result more accurate and reliable.

VI. Acknowledgment

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