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"NON-INVASIVE MEDICAL TOOL TO ESTIMATE ANEMIA"

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ABSTRACT:

This examination means to execute a picture preparing calculation for location of both red and blue recolored platelets to help in analysis of iron lack weakness in an increasingly viable and effective way. Our methodology enables us to acquire the accurate number of each recolored platelets. The calculation likewise ascertains the level of blue and red recolored cells in the given example picture test. This data is crucial in identifying the malady and deciding its seriousness. Despite the fact that the calculation is structured in such a way to give adaptability in regards to the choice of either a specific district or an entire given picture test, the figurings are accomplished for the ideal area as it were. Pictures of villi cells taken from the small digestive system of people were utilized.

KEYWORDS: *picture preparing calculation , structured , small digestive system.*

INTRODUCTION

A New Method and a Non-Invasive Device to Estimate Anemia Based on Digital Images of the Conjunctiva Anemia is a global public health problem with major consequences for human health. The World Health Organization (WHO) estimates that some two billion people are anemic, which is denied as Hb concentrations that are below the recommended thresholds [**WHO, Geneva, Switzerland 2004**], [**WHO, Geneva, Switzerland 2008**]. decrease in the red blood cells circulating in the blood or as a decrease in the concentration of Hb: hence, it is a reduced ability of the blood to transport oxygen. It originates mainly from nutritional factors (iron deficiency, vitamins and minerals), infectious diseases (malaria, intestinal parasites) or genetic factors (haemoglobin opathies) [**McLean. E et.al. PHN 2009**] [**WHO, 2001**]. These factors can occur in isolation but are frequently associated. Iron deficiency Anemia is the most common nutritional deficiency, and it causes thousands of deaths (allianceanemia.org); it is also morbidity and mortality in pre-school children and pregnant women. In 2002, iron deficiency Anemia was considered to be among the most important contributing factors to the global burden of disease [**WHO, Geneva, Switzerland, 2002**]. Anemia has a slow evolution: normally, no obvious symptoms appear for Hb>9-10 g/dl, since the human body implements compensatory mechanisms, such as increasing the amount of blood pumped, in such a way that the amount of oxygen released to the tissues remains almost unchanged. When the compensation can no longer

Anemia is defined as a | responsible for increased | guarantee an adequate dose of oxygen, symptoms such as fatigue, paleness, irritability, increased heart rate, insomnia, headache and many others appear. The clinical report, in most cases, is ambiguous and difficult to delineate. In addition, Anemia is often not diagnosed or adequately treated in chronic patients for whom it is an important risk factor (including mortality) and has a significant impact on the quality of life. Regardless of its aetiology, since a severe degree of Anemia compromises the cell oxygen availability and causes damage that ranges from damage to vital organs to a potentially life-threatening condition, in many cases, anemic patients must be transfused based on their Hb level, which can fluctuate day by day. Anemia is assessed by measuring the level of Hb, a protein in the red blood cell that is the most reliable indicator of Anemia, because Hb supplies oxygen to all of the cells of the body. Standard clinical methods to diagnose Anemia primarily rely on the invasive determination of blood Hb, which requires venepuncture performed by a nurse or a physician. Frequent blood sampling leads to the patient's discomfort, and the requirement of going to a laboratory or calling a nurse involves considerable expense. In fact, it is of great interest to study methods and to design instruments to monitor the concentration of Hb in a non-invasive way, with reduced costs, both in the laboratory and at the patient's home, sometimes even daily. Many studies show great interest in the pallor of body parts to estimate Anemia. As an example,

Kalter. H et al., 1997 show the usefulness of clinical signs in the detection of Anemia, which suggests the feasibility of adding conjunctival pallor to the Integrated Management of Childhood Illness (IMCI), a strategy designed to reduce child mortality and morbidity in developing countries.

Tsumura. N et al., 2003 studied skin color and texture analysis/synthesis by extracting Hb and melanin information in the skin. Additionally, reports studies on the relationship between skin and Hb.

Spinelli. M.G.N et al., 2003 compared the analysis of palmar and conjunctival pallor to detect Anemia: they found that there was a greater level of sensitivity to conjunctival pallor than to palmar pallor.

Spinelli. M.G.N et al., 2003 conclude that it was still early to recommend the routine use of this technique (2003); however, it could promote substantial savings if perfected.

Aggarwal. A. K et al., 2004 studied the validity of palmar pallor for the diagnosis of Anemia among children aged 6 to 9 months.

A similar approach is described **Silva. R.M.D et al.,2010** but the authors stated that conjunctival pallor evaluation is strongly influenced by the observer. Indeed, the physician's experience is crucial in this type of examination.

Hasan. M.K. et al 2017 and Wang. E.J. 2016, present image processing of a ngertip video to investigate the relationship between the image pixel information and different Hb (Hb) levels. Additionally, in this case, the estimate of Hb is strongly influenced by the color of the skin or by simple tanning.

For many years, physicians in common practice have estimated Anemia in people by observing the eyelid conjunctiva. This practice is still widespread in many disadvantaged areas of the earth. Observing the eyelid conjunctiva can provide information for suspecting Anemia, as several studies suggested.

In, the presence of conjunctival pallor was utilised for Hb determination, and the authors reached 95% discrimination accuracy between anemic and non-anemic patients based on an evaluation of conjunctival pallor, considering a cut-off of 90 g/L for the Hb concentration.

The common factor in all of the cited works is that the evaluation of conjunctival pallor is not objective, and it requires direct judgments of expert physicians. In recent years, there has been an increasing interest in the use of digital images of the palpebral conjunctiva to make a non-invasive estimate of Anemia. In the next section, we will detail related work that addresses Anemia evaluation based on digital image processing. According to a study conducted by the world health organization (WHO), 24.8 percentage of the entire world population was considered to be anemic between the year 1995 and 2005. The Haemoglobin concentration in the human blood is considered as the gold standard for the detection of anemia. This is an intravenous process which requires specialized surgical

equipment. Recently, figure prick blood sample is taken for lab testing but blood testing requires much time and may expose healthcare workers to risks of blood borne infections. Examination of the conjunctival pallor of the eye is usually used to rapidly screen for anemia in many clinics, Physicians generally pulls down the eyelid and subjectively examine the color of the anterior conjunctival pallor membrane. The clinical sign for anemia detection can prove to be quite useful in many cases, but still the lack of inter-observer agreements in many situations and low sensitivity of anterior conjunctival color can undermine the authenticity of the visual detection process. Color scale cards, which consists of the color spectrum and the corresponding haemoglobin concentration is used in many occasions to alleviate the problem of inter-observer disagreement and human error to make the visual detection process more reliable. Haemoglobin is the primary constituent which contributes to the pigmentation found in human blood. It possesses a bias in reflecting the red component of the light falling on its surface compared to the green component which it predominantly absorbs. This is the chief reason for the deep reddish appearance of haemoglobin. Hence, by comparing the red and green components of the RGB color spectrum of the conjunctival pallor, it is possible to obliquely estimate the haemoglobin concentration in the human blood stream. Due to lack of proper healthcare and medical facilities in underdeveloped countries, many people are vulnerable to anemia. This situation can be alleviated if an indication of anemia can be estimated without involving expensive blood tests, which are unavailable in many of these areas. Even the availability of doctors or medical workers is spotty. It would be a great help if the presence of anemia in a patient can be detected using non-invasive methods which does not include expensive tests or even the presence of a doctor or medical worker. The presence of anemia in a person can be an indication of other diseases like jaundice and lack of nutrition. The detection of anemia can serve to indicate the presence of other diseases as well.

REVIEW OF LITERATURE

Non-invasive approaches are extremely important for patients who need frequent blood tests, and recent improvements in image analysis have enabled promising methodologies to be developed. In recent years, new and interesting approaches to objectively correlate the eyelid color with the Hb concentration based on digital images of the palpebral conjunctiva have been proposed. As an example,

In 1989 ,Carrillo Sanchez et al. used a colorimetric tool to compare different color shades with the conjunctiva. Hence, they achieved interesting sensitivity and specificity levels in screening Hb concentrations.

In 2000 Rubeto. C.Di et al., This paper discusses about the malarial image processing system. This system detects and classifies malaria parasites in Giemsa stained blood slides images. Then after parasitaemia evaluation is done. Morphological approach to cell image segmentation is more precise than the classical watershed-based algorithm is shown in this paper. Grey scale granulometries are connected in view of opening with circle molded components, level and non-level. Non level circle molded structuring component improves the roundness and the red cells minimization.

In 2002 Ruberto.C.D.et al., This paper discuss a system classifies and identify malaria parasite by using microscopic images of blood cells. Morphological approach and the significantnecessities in developing this framework are the best systems for blood cell images segmentation.

In 2002 Liao. Q et al., This research work on an Automated Cell Count method is described. A precise method of segmentation for counting white blood cells automatically is presented here. Initial a straightforward thresholding approach is connected and the calculation is determined about blood spread images from priori information. The marks are balanced at that point with a specific end goal to deliver meaningful outcomes. This method is more influential as compared to traditional methods which use information of local context. It can perform accurate segmentation of white blood cells though they have un-sharp limits.

In 2002 Starck. J.L et al., In this work author using a filter bank of a‟ trous wavelet filters, curvelet transform implements curvelet sub-bands and uses a ridgelet transform as a component step, and idea throughout is that transforms ought to be over entire, more willingly than basically examined. In this computerized transforms are connected for de-noising of some standard images established in

repetitive noise. A combination of geometric distance and an enhanced distance transform combining intensity gradients is used for the watershed step

In 2003 Lin.G. et al., According to this paper an explicit mathematical model for characteristics of cell nuclei like size and shape measures is included. For each detected nucleus, a confidence score is computed by measuring suitability of nucleus in the model.

In 2005 Fabio. , Here author demonstrates the helpfulness of an automatic morphological strategy to perceive the Acute Lymphocytic Leukemia (ALL)with the help of images of peripheral blood microscope. The demonstrated system individuates the leucocytes from the others platelets, after that it picks the lymphocyte cells (the cells causes exceptional leukemia), morphological indexes from those cells are evaluated then after and at last classification is performed whether the presence of the leukemia is there or not.

In 2007, Suner. S et al., analysed color features of digital images of the conjunctiva. They utilised a standard grey card with a known RGB value to compare pictures acquired under different lighting conditions. In their experiment, they utilised an evaluation software that ran on a Personal Digital Assistant (PDA), which considered the RGB color model and found a moderate correlation between the Hb concentration calculated in situ and the Hb concentration measured in vitro. Another very interesting study is reported **In 2016 Chen. Y.M. et al.**, where the authors use 18 possible features, including a newly added entropy feature.

In 2014 Kim. O.et al., Studied the combination of a stochastic photon propagation model in a multi-layered human eyelid tissue and reactance spectroscopy was used to study the spectral reactance of palpebral conjunctiva for Hb determination. The extracted Hb levels were compared with in vitro measurements of Hb; the method showed 86% sensitivity estimates for clinically diagnosed Anemia cases. Unfortunately, the results were obtained using sophisticated and expensive clinical equipment that is not suitable for utilization in home settings.

In 2016 Trupti. S. et al., In this work author guides in such scenario to take decision in disease diagnosis. The input to the proposed system is person nail image. The system will process an image of nail and extract features of nail which is used for disease diagnosis. Human nail consist of various features, out of which proposed system uses nail color changes for disease diagnosis. Here, first training set data is prepared using Weka tool from nail images of patients of specific diseases. A feature extracted from input nail image is compared with the training data set to get result. In this experiment we found that using color feature of nail image average 65% results are correctly matched with training set data during three tests conducted.

In 2016 Bevilacqua. V et al., Here it was estimated that Hb levels using a digital image of the eyelid conjunctiva: different from Sanchez. C.I. and Suner.S. et.al our approach did not require a comparative card to determine the color of the conjunctiva, due to the design of a specific device that was made of two components: the hardware and software modules. The device consists of a head-mounted plastic passive viewer (similar to a Google cardboard) that solves some problems, including the influence of ambient light. As evidenced, we found a moderate correlation (0.49) between a (CIELAB component) value of the image of the palpebral conjunctiva taken through the above device and the Hb values. Furthermore, to predict the need for blood transfusion, we used a binary classier based on a Support Vector Machine (SVM), and the resulting indexes were 84.4% (accuracy), 82.4% (specicity) and 100% (sensitivity). The results were obtained with 77 patients (9 of them anemic, 68 healthy).

In 2016 Chen Y.M. et al., the authors, citing Bevilacqua. V. say that hopefully, such a device can become popular and affordable in the future'; however, we believe that the device is still quite cumbersome and expensive for home use. The result was very encouraging, but the experiment should be extended to a larger number of patients to ascertain if that methodology can truly be used to avoid unnecessary blood transfusion or blood sampling to detect the current degree of Anemia. Also in this paper, we evaluated the possibility of estimating the Hb level through a digital image of the eyelid conjunctiva. Due to the design of a new device and new software running on a common smartphone, we obtained a satisfactory result that will be detailed in the next sections.

In 2016 Wu. H.S.et al., According to this paper an iterative thresholding algorithm is utilized for segmentation purpose particularly from noisy images. This algorithm conquers the issue of cell extraction and segmentation from heavy noisy images. This algorithm works over the adjusted threshold of images iteratively providing robustness to image.

In 2017, Chen. Y.M. and Miaou. S.G. et al., Propose a combined approach that consists of a modied Kalman filter and penalty regression for non-invasive Anemia detection basing on the analysis of digital images of the palpebral conjunctiva, and they effectively reduce the number of suspect samples.

In 2018 Muthalagu. R. et al., According to this paper author present non-invasive method, correlation of haemoglobin with conjunctiva pallor colour scores and classification using neural networks. About 200 sample eye images were collected from Sankara Nethralaya with different lighting conditions (LED, CFL, Tungsten, tube light, sunlight, Daylight) and different mobile and digital cameras. Using the proposed HSI model, the different colour score of the selected region was estimated and correlated with laboratory haemoglobin value. Elman neural network was used for correlating and classifying anemic and non-anemic cases, out of which 91.3 percentages of the predictions were correct and 8.7 percentages were wrong classifications.

In 2018 Giovanni. et al., The author propose a non-invasive approach to Hb estimation based on the image analysis of a specic conjunctival region. Our goal is to develop a device that is not expensive and simple to use for assessing the anemic condition; this device could be used by the physician to decide whether to take a blood sample or even by a patient at home to decide whether to inform a physician; in this way, we can avoid having the patient go frequently to the laboratory to take a blood sample. This device also allows us to rapidly screen for Anemia in a large number of persons, for example, groups of girls who are at the beginning of the menses.

In 2018 Bhavya. et al., In this work author the focal point of our investigation is on medical images However, locating, identifying and counting of red blood cells physically are repetitive and tedious that could be simplified by means of automatic analysis, in which segmentation is a crucial step. In this paper, we show a way to deal with automatic segmentation and counting of red blood cells in microscopic blood cell images using Hough Transform and SURF.

In 2018 Komal et al., In this work author gives guides about the haemoglobin is the most important blood parameter. Haemoglobin is the protein in red blood cells that carry oxygen to the body. Low level of haemoglobin can be due to disease like anemia and high haemoglobin level may be due to polycythemia Vera. Conventional methods are mostly used to calculate haemoglobin level.

RATIONAL OF THE STUDY

As we know we are living in the era of 3D medical science where we have lots of Tools which are able to identify the disease. In present era we have lots of technology but there is lack of medical tools which are able to find anemia with any non invasive process. Currently we have to take the blood samples and through that we are able to find the anemia. Currently there is lots of research who are working on Non invasive process where they are using the concept of image processing. Here they are using the approaches like eye side or nails. So as per the current search there is lots of research gaps are there which is really need to be solved and those are followings:

- Lack of Real Time: All current approach are require pre define images of eye side or nails, so for that approach we have to capture good quality image through eye side scanner or high end camera.
- Accuracy: All current approaches are not able to make proper result as they are focus on one single approach like SPO2 based, EYE side based on nails based so there is no any cross check method is available which give surety of anemia.
- Long Process: As per scanner approach all previous existing tools are require longs time
- Time Issue: All current algorithms are not so quick to give proper result in time.
- Quality Issue: This is a big hazard which is really needed to be solved there is no any approach which is able to get quality level report from the input parameters.

OBJECTIVES

As per the previous existing in research gap there are followings objectives which we will cover in this work and they are followings:

- **Real Time Analysis**
- **High Accuracy:**
- **No more Long Process**
- **Reduction in Time Complexity**
- **Improvement in Quality Issue**

EXPECTED OUTCOME

In this work we are focus on the development of Non-Invasive Medical Tool to Estimate Anemia based on the Concept of Digital Data through real time Analysis, so as per our expectation we will able to improve the followings parameters through our novel algorithm:

1. Able to make justice with time parameter.
2. Here we will try to reduce the time complexity with 10-20%.
3. Here we will try to improve the quality complexity with 10-20%.
4. Here we will try to make more accurate system we will improve the accuracy by the 30-40% as compared to previous approaches.
5. We will make a real time system which is able to find fault on live camera

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