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A Retrospective Study of Hematological Parameters in Male and Female Hostel Residents of (Ripans) Regional Institute of Paramedical and Nursing Sciences, Aizawl, Mizoram

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ABSTRACT

Haematological parameters are assessed through laboratory tests and are essential for diagnosing and monitoring diseases such as anaemia, infections, clotting disorders, and haematological malignancies. A pilot observational study was performed on 140 hostel students of both boys and girls in at Regional Institute of Paramedical and Nursing Sciences, Aizawl, Mizoram, India where 64.3% (n = 90) of students among the total expressed haematological abnormalities and Hyper-segmented neutrophils during the study. The results recorded the significant level of abnormal in all haematological parameters compared with healthy controls and the significance was given as student's test (p<0.001)

Keywords: *Haematological parameter, Anaemia, Hyper-segmented Neutrophil, Blood, CBC, ESR, etc*

1. INTRODUCTION

Haematological parameters are those that have to do with the blood and the organs that produce it. The analysis of blood offers the chance to look into the existence of many metabolites and other components in an animal's body, and it is extremely important to the physiological, nutritional, and pathological status of an organism [1]. An individual may usually possess 4-7 litres of blood, about 55% of blood volume is the liquid portion Plasma contains variety of elements including enzymes for coagulation that keep blood vessels remains safe from any destruction and support circulation [2].

To evaluate the health of a patient Full blood count(FBC) or Complete blood count(CBC) a haematological test is used which contributes a key role in identifying a wide range of disorders including anaemia, thrombocytopenia, infection and leukaemia. The exact features of blood and its several components present in it were analysed by complete blood count (CBC)test which plays a significant role in tissue perfusion, involvement of leucocytes in host immunity and monitoring of haemostasis and coagulation by thrombocytes.

CBC provides useful information about the all blood cell production and also detects the capacity of a patient carrying oxygen through red blood cell (RBC) indices, haemoglobin, and haematocrit. By evaluating white blood cell and differential counts through complete blood count the test may provide additional information about the host immune system. This tests also helps in diagnosing anaemia, certain cancers, microbial and parasitic infections, acute haemorrhagic stages, allergies and other immune deficient disorders as well as monitoring side effects of certain drugs. (3).

The clinical care for patients usually depends on characterisation of red blood cell (RBC), complete blood counts (CBC), White blood differentials (WBC) and also utilising peripheral blood smear (PBS) [4]. Furthermore, because automated counters do not offer differential counts for abnormal WBCs, the majority of laboratories still rely largely on manual differentials, especially for abnormal samples [5].

For normal check-up of patient an appropriate blood test recommended frequently is the complete blood count. This CBC count can be very helpful in demonstrating number of conditions like microbial and parasitic infections, anaemia, immune system diseases and malignancy of blood. [6].

Around 2.5 billion people globally are suffering due to Iron deficiency anaemia which is a common nutritional issue in the current scenario. Despite its widespread incidence, nutritional anaemia is more of a problem in underdeveloped nations due to its high frequency there. In the underdeveloped world, women and children are most impacted [7]. Anaemia is defined as a condition when there is a reduction in blood's ability to carry oxygen. It may happen if there is not enough haemoglobin present or if the haemoglobin is not functioning properly [8].

Vitamin A, B2 (riboflavin), B6 (pyridoxine), B12 (cobalamin), C, D, and E deficiencies, folate deficiency, and copper can also result in Anaemia, owing to their specific roles in production of haemoglobin or erythrocytes [9].

The present study is aimed for screening of Haematological parameters in Male and Female hostel residents of RIPANS and the associated risk factors in the participants of the study area.

2. MATERIALS AND METHOD

Participants and study design

The present investigation study was a prospective study in its design screened haematological parameters of 140 samples of both male and female students for a period of 3 months duration (from February 2023 to April 2023) which includes a total healthy individual participates from Regional Institute of Paramedical and Nursing Sciences (RIPANS), Aizawl, Mizoram, India.

The students were given a questionnaire consisting of family and nutritional history and were recruited into the study. Venous blood (2mL) was collected by venipuncture method in EDTA vial for the estimation of Haematological parameter.

Statistical analysis

Data was recorded on a predesigned performa and managed on an Excel spreadsheet. Data and percentage of each parameter was calculated and analysed. Statistical analysis was performed using the students t-test to compare haematological parameters between male and female students, with results expressed as mean ± SD; a *P-value* of <0.05 was considered statistically significant and *P <0.001* was Highly Significant

3. ETHICAL APPROVAL

Ethical approval was obtained from the Ethics Committee of Regional Institute of Paramedical and Nursing Sciences, Aizawl, Mizoram, India. Written consent was obtained from the students before sample collection.

4. RESULTS AND DISCUSSION

Iron deficiency represents a large contribution to anaemia as such needs immediate attention are required and action to be taken to increase the intake of iron through supplementation, food fortification and diversification of the diet. Estimation of haemoglobin concentration often used as proxy indicator for assessing iron status of population or control iron deficiency assuming that anaemia is always associated with iron deficiency though many other possible reasons and factors are present. The examination of haematological parameters has the ability when the results are interpreted in correct manner in relation to the clinical history which further guide for accurate diagnosis, drug monitoring and disease management. These kinds of assessments measure iron deficiency rarely and most of the time the contributing factors remain unidentified or unknown (10,11)

The present investigation was designed to evaluate the haematological parameters to assess the health as well as the physiological status of healthy individuals of both male and female hostellers and the study was conducted with a sample size of 140 including case (n=35) and control (n=35) of both male and female students of RIPANS. Despite the self-reported normal health status, a detailed haematological analysis revealed significant deviations in multiple parameters. Data on demographic profile of the study population were presented in Table.1& Table 2, Fig.1 & Fig.2.

A wide range of haematological variation was observed among participants out of 140 samples (64.3%) were found to have subnormal or abnormal haematological parameter(s), while only (35.71%) were within the normal range. (Table.1& Table 2, Fig.1 & Fig.2.)

Low haemoglobin level (P <0.001) represented a large contribution in this study accounting of about 47.1% in male (12.20±1.18:14.87±0.79)(Table.1 & Fig.1) and 81.43% in Female (10.31±1.44 : 13.09±0.90) (Table.2 & Fig.2) which suggests a high prevalence of latent anaemia or underlying haematological conditions among apparently healthy students mainly due to the nutritional deficient that may further lead to Iron Deficiency Anaemia, which is one of the leading cause of Anaemia in developing countries[10].Anaemia is one of the leading disorder can affect people of all ages, races and ethnicities which may further leads to several complications or sometimes life threatening. Anaemia in particular produce

adverse effect on women of are all in reproductive age and also in child health in addition it leads to increased morbidity, maternal death and also influence in social economic growth (11).

Peripheral blood smear examination revealed diverse morphological abnormalities in red blood cells; Anisopoikilocytosis (P > 0.05) (Fig.3) was commonly noticed such as microcytic hypochromic and microcytic RBSs appearing frequently accounting for 3.2% (4.85±1.47: 4.78±0.38) found in the female population which is usually characterized by a low level in MCV and Iron deficiency is one of the most common factors of microcytic anaemia [12]. The deficiency of Iron contribute adversative consequences on maternal, child health outcomes and results in low birth weight, neonatal and maternal mortality and also produce other complications such as restricted diets, growth spurt and heavy blood loss (13). Other findings include rouleaux formation (P > 0.05) (Fig.4) accounting of only 1.42% (4.85±1.47 : 4.78±0.38) in a female individual, suggesting elevated plasma proteins or early signs of dysproteinaemia and also conditions such as infections, multiple myeloma, Waldenstrom's macroglobulinemia, inflammatory and connective tissue disorders and cancers. It also occurs in diabetes mellitus and is one of the causative factors for microvascular occlusion in diabetic retinopathy [14].

Table 1. COMPARISON OF CLINICAL MARKERS FOR CASES AND CONTROLS IN MALE

Markers	Case (n=35)	Control (n=35)	P values
Age	21.41±2.01	21.42±1.69	0.05
Hemoglobin (gm/dL	12.20±1.18	14.87±0.79	0.001*
Red Blood Cell Count (million cells /cu mm)	4.89±1.27	5.54±0.38	0.05*
Total Leukocyte Count	14.40±5.62	7.99±1.75	0.001*
ESR (mm/hr)	27.08±4.44	6.33±5.64	0.001*
Neutrophil	57.17±22.73	56.45±7.41	0.05
Eosinophil	1.50±2.98	3.29±1.38	0.05*
Basophil	2.00±0.00	0.15±0.36	0.001*
Monocyte	0.18±0.39	2.00±0.00	0.001*
Lymphocyte	**46.71±8.24**	**34.19±5.03**	**0.001**

Table shows the Mean±SD and P values

P- Value: Level of significance

P > 0.05: Non- significant (NS) P< 0.05: Significant (S)

P <0.001: Highly Significant

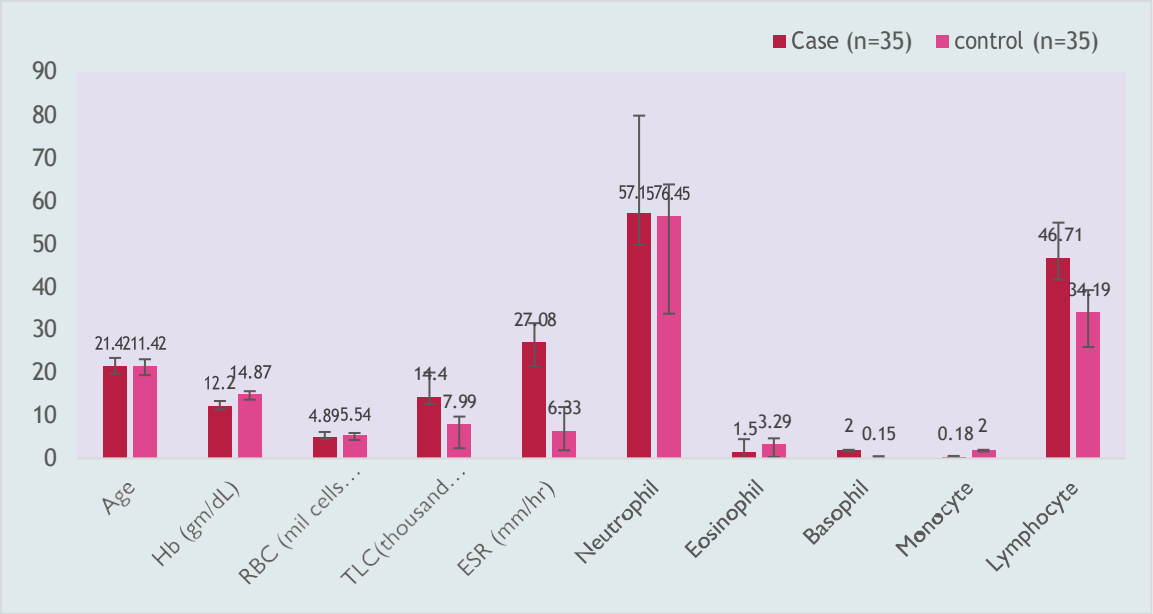

Fig. 1: Hematological markers of cases and controls in Male

Table 2 COMPARISON OF CLINICAL MARKERS FOR CASES AND CONTROLS IN FEMALE

Markers	Case (n=35)	Control (n=35)	P values
Age	22.55±2.46	20.50±1.65	0.05
Hemoglobin (gm/dL	10.31±1.44	13.09±0.90	0.001*
Red Blood Cell Count (million cells /cu mm)	4.85±1.47	4.78±0.38	0.05*
Total Leukocyte Count	7.55±7.36	5.77±1.19	0.05
ESR (mm/hr)	24.69±6.63	9.79±3.20	0.001*
Neutrophil	39.35±13.26	53.98±8.53	0.001*
Eosinophil	4.33±5.31	3.08±1.30	0.05*
Basophil	2.00±0.00	0.38±0.49	0.001*
Monocyte	0.29±0.46	2.27±0.47	0.001*
Lymphocyte	**50.39±8.50**	**33.58±4.26**	**0.001**

Table shows the Mean±SD and P values

P- Value: Level of significance

P > 0.05: Non- significant (NS) P< 0.05: Significant (S)

P <0.001: Highly Significant

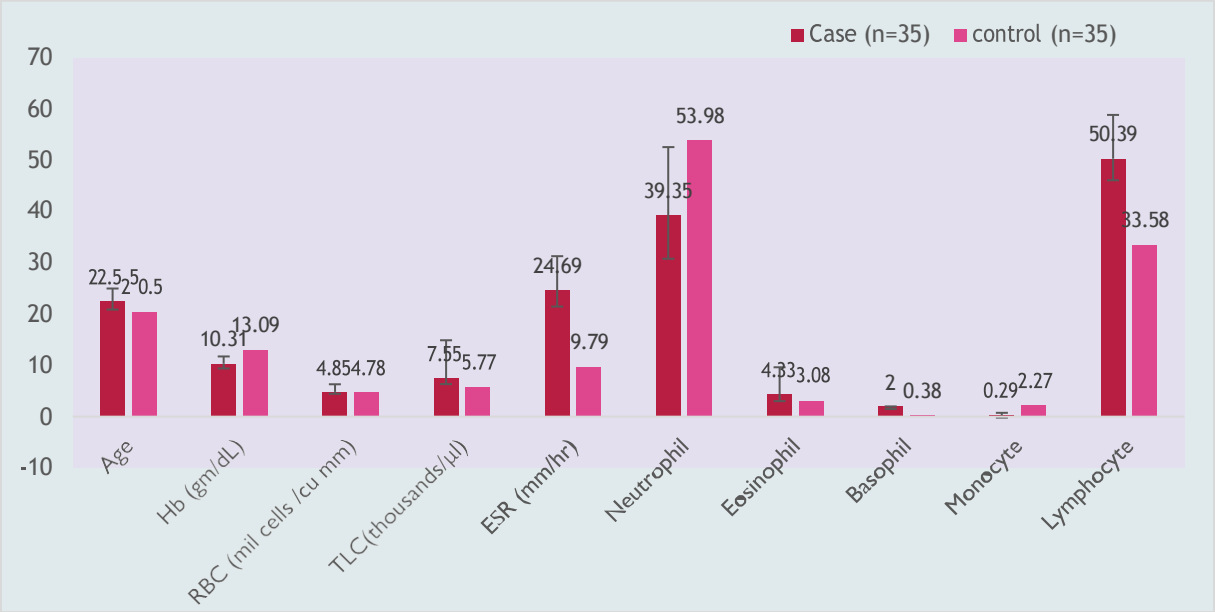

Fig. 2: Haematological markers of cases and controls in Female

In the present investigation the results also expressed statistically variations in Total leukocyte with some participants confirming leucocytosis. Morphologically, Hyper-segmented neutrophils were observed (Fig.5) in higher levels in Female 73.5% (P <0.001) (7.55±7.36: 5.77±1.19) than the Male about 26.53% (P <0.001) (14.40±5.62: 7.99±1.75).

Factors like nutritional deficiencies and the participants consumed in hostel-provided meals during the study period, dietary insufficiencies in these essential nutrients could plausibly account for the observed neutrophil abnormalities. It can also be indicative of potential megaloblastic anaemia or nutritional deficiencies such as vitamin B12 or folate, while in other studies 66.66% were detected in a patient of COVID-19 infection [15], in another study 515 individuals with established B12 levels, the sensitivities and specificities of the mean cell volume (MCV), the red cell distribution width (RDW), and blood smear hyper-segmentation for B12 insufficiency were examined with hyper-segmentation was more sensitive [16].

Neutrophilia was accounted for about 10% in male (P <0.001) (14.40±5.62: 7.99±1.75). and 25% (P <0.001) (7.55±7.36: 5.77±1.19) in female, a greater absolute count in the blood than the typical reference range is referred to as neutrophilia. Infections, inflammation, and/or neoplastic processes can all produce neutrophilia. In many cases, additional analysis is required. [17]

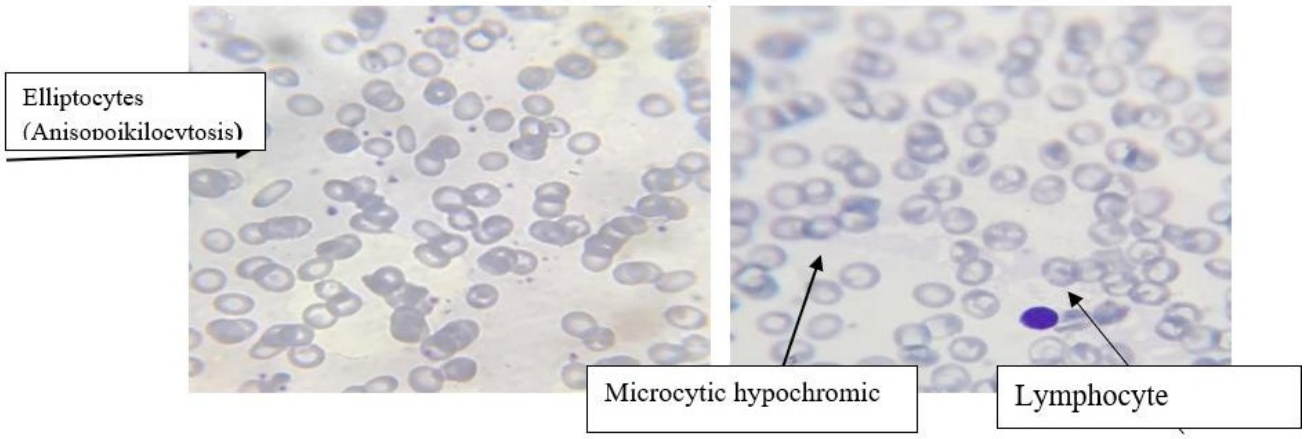

Fig 3: Picture a) Microscopic picture shows mild Anisopoikilocytosis b) Microscopic picture shows mild Hypochromia was found

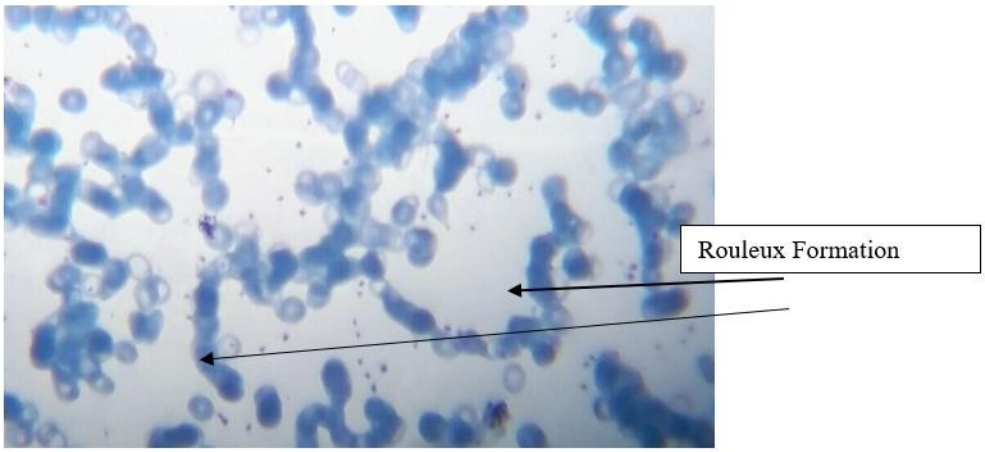

Fig. 4: Microscopic picture showing Rouleaux formation of RBC was found

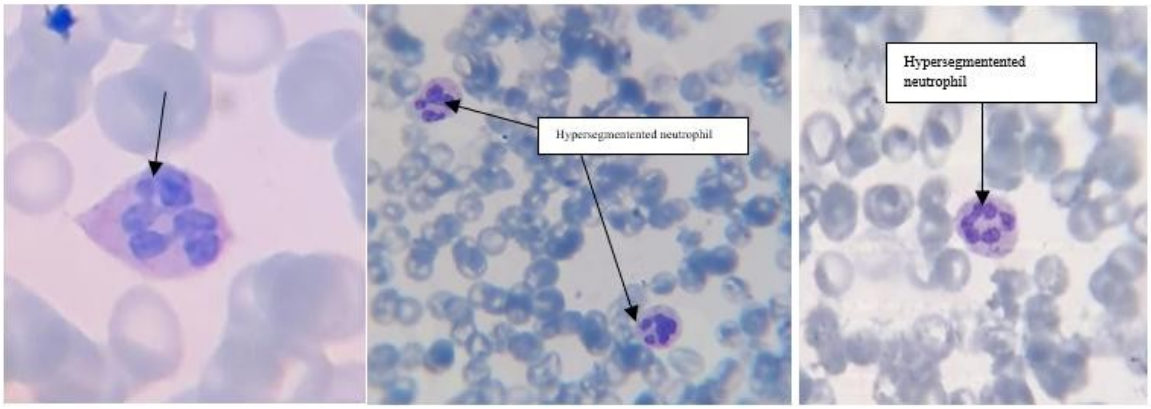

Fig 5: Shows Microscopic picture of Hypersegmented Neutrophil

A significant increase in Eosinophil count (P< 0.05) was observed in the study population with, 52% in male (1.50±2.98: 3.29±1.38) and 48.6% in female (P <0.001) (4.33±5.31: 3.08±1.30) participants. This rise may be attributed to the construction activities that were underway on campus at the time, which likely lead to the exposure to dusts-an environment factor known to trigger eosinophilia. It could also be related to parasitic infections or allergic conditions in some participants, The typical range for eosinophils is between 2 to 6% of peripheral blood smear. Helminthic infections are the most frequent cause of eosinophilia globally, while atopic illness is the most frequent cause in industrialized countries [18]. While Lymphocytosis accounted of about highly significant increased (P <0.001) 51% in Male (46.71±8.24: 34.19±5.03) and 64.3% in female (50.39±8.50: 33.58±4.26) which could be due to post-infection or infection due to Bacterial, viral, fungal, etc. [19]

The erythrocyte sedimentation rate (ESR) is a test to evaluate the red blood sedimentation in autologous plasma. It is a non-specific test used in the assessment of the acute phase response to inflammatory disorders (11). In this study, median ESR values were much higher in both genders (P <0.001) about 18.6 % (27.08±4.44: 6.33±5.64) in male and but it Female it was progressively very high 53% (24.69±6.63: 9.79±3.20). The ESR also maintains its important role in the diagnosis and follow-up of rheumatoid arthritis and temporal arthritis. Recent, ESR has been reported to be of clinical significance in sickle cell disease, osteomyelitis, and, surprisingly, in non-inflammatory conditions such as stroke, coronary artery disease, and prostate cancer. [20]

These haematological irregularities were documented not only in individuals with subnormal haemoglobin levels but also in a few students with haemoglobin levels in the lower-normal range, indicating early or subclinical stages of haematological disorders.

The findings from this study highlights a significant public health concern, especially within a population that was assumed to be healthy. The high percentage of students (64.3%) within the subnormal and abnormal haemoglobin levels underscore the burden of anaemia and related haematological disorders especially in the female population.

Leukocytic abnormalities such as Eosinophilia, Hyper-segmented Neutrophils, Leucocytosis, Rouleaux formation may

suggest and imply the need for further screening such as immunological, parasitological and nutritional comprehension. Furthermore, the study suggests that haemoglobin levels alone may not be sufficient to evaluate the detection of anaemia. The data also suggests for immediate attention and action, particularly; implementing Iron and folate supplementation programs, Dietary diversification and fortification in community levels, schools and institutions and regular haematological screening especially among female population.

Furthermore, educating students and the administration about nutritional health and encouraging routine check-ups can play a vital role in preventing long term-complications associated with undiagnosed anaemia or other blood disorders.

Haematological values could serve as baseline information for comparison in conditions of nutrient deficiency, physiology and health status. Haematological parameter is a reliable and reflection of indicating of public health along with being a simple, fast and cost-effective test.

5. CONCLUSION

Assessing the haematological parameters has the potential, when interpreted carefully, correctly and in relation to the clinical history, to provide very useful information to assist in diagnosis, drug monitoring and management of diseases. The parameters included in the present investigation can potentially pinpoint the presence of diseases such as anaemia, infection and immune system disorder.

Furthermore the present retrospective study screened and compared the haematological markers of male and female students in RIPANS with healthy controls in the study area. The results affirmed that all the haematological markers clearly indicated the abnormal level of various clinical markers in the study group.

Iron deficiency represents a large contribution to anaemia as such needs immediate attention are required and action to be taken to increase the intake of iron through supplementation, food fortification and diversification of the diet. Estimation of haemoglobin concentration often used as proxy indicator for assessing iron status of population or control iron deficiency assuming that anaemia is always associated with iron deficiency though many other possible reasons and factors are present. Haematology consultation is encouraged in patients with Leukocytic abnormalities such as Eosinophilia, Hyper-segmented Neutrophils, Leucocytosis, Rouleaux formation may suggest and imply the need for further screening such as immunological, parasitological and nutritional comprehension. Regular nutrition education and counselling are also essential based on their education, Involvement of policymakers and other stake holders is required in treatment of anaemia as well as to decrease the rate of other blood related disorders. It is believed that using a pragmatic approach combined with recent scientific knowledge along with service oriented medical fraternity may handle this problem all over the country so that the country can reach the goal of reduction by 2030.

6. CONFLICT OF INTEREST

The author(s) declare that there have no conflict of interest

7. FUNDING SOURCES

There are no funding sources

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