Effect of thyroid dysfunction on hematological profiles at Menelik II Referral Hospital, Addis Ababa, Ethiopia

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Abstract

Background

Thyroid hormones have a crucial role in the metabolism, production, and proliferation of blood cells. So the current study aimed to assess the hematological profile of patients with thyroid dysfunction.

Methods

A comparative prospective study was conducted from June to September 2021; on a total of 360 participants (120 health groups and 240 patients with thyroid dysfunction. 10 ml of venous blood samples were collected and separated into two test tubes (in the SST tube used for measurement of TSH, T3, and T4, and sample in the EDTA tubes was used for CBC analysis). The analysis was done by using SPPS software. Finally, the result was interpreted by using chi-square, Pearson's correlation, and multivariate logistic regression. The level of statistical significance was set at a 95% confidence and P-value is less than 0.05 was considered clinically significant.

Results

Out of 360 study participants (120 (33.33%) hypothyroidism, 120 (33.33%) hyperthyroidism, and 120 (33.33%) healthy controls); 195 (54.2%) were female, 150 (41.7%) were in the age range of 25-44 years. The finding indicated a statistically significant decrease in RBC, Hgb, HCT, MCV, PLT, MCH, MCHC, MPV, and a significantly increased valve in RDW, WBC, and NEU% in both types of thyroid dysfunction compared to control groups (p-value <0.05). Finding of MON%, EOS% and BAS% did not show significant differences between the groups (p-value >0.05).

Conclusion

The finding showed that thyroid dysfunction has a significant effect on RBCs, Hgb, HCT, MCV MCHC, MCH, WBC, neutrophils, PLT count, and MPV findings (p<0.05). But no show significant effect on monocyte, eosinophil and basophils (p-value > 0.05).

Introduction

Background

The thyroid gland is a small organ that's located in the front of the neck, wrapped around the windpipe (trachea). The thyroid gland is a vital hormone gland: It plays a major role in the metabolism, growth, and development of the human body. It helps to regulate many body functions by constantly releasing a steady amount of thyroid hormones into the bloodstream (1, 2). The thyroid gland releases the two basic

triiodothyronine (T3) and thyroxine (T4) which play an important role in the regulation of your weight, energy levels, internal temperature, skin, hair, nail growth, and more. Hormonal output from the thyroid is controlled by thyroid-stimulating hormone (TSH) or thyrotropin secreted by the anterior pituitary which is mediated by thyrotropin-releasing hormone (TRH), secreted by the hypothalamus (3, 4). Thyroid hormones have a crucial role in the metabolism and proliferation of blood cells. Thyroid dysfunction induces different effects on blood cells such as anemia, erythrocytosis leukopenia, thrombocytopenia, and in rare cases causes' pancytopenia. It also alters RBC indices include MCV, MCH, MCHC, and RDW (5, 6).

Thyroid dysfunction happens when the thyroid gland makes either too much or too little of these important hormones and this condition is also known as thyroid disease. The cause of this problem can be primary or secondary and the types of thyroid disease can be hyperthyroidism, hypothyroidism, thyroiditis, and Hashimoto's thyroiditis (7, 8). Hypothyroidism (underactive thyroid) is a condition in which your thyroid gland doesn't produce enough of certain crucial hormones. Primary hypothyroidism is defined by elevated TSH levels and reduced thyroid hormones (T3 andT4) and secondary hypothyroidism is defined by reduced levels of TSH, T3, and T4 (9, 10). Causes of primary hypothyroidism could be functional problems within the thyroid gland, infiltrate disease of the thyroid, and secondary hypothyroidism caused due to anterior pituitary gland failures (9-11). Hyperthyroidism (overactive thyroid) occurs when the thyroid gland produces too much of the hormone thyroxine and this problem can accelerate our body's metabolism, causing unintentional weight loss and a rapid or irregular heartbeat. The cause of hyperthyroidism can also be primary, secondary, or tertiary with the most known cause of autoimmune (12-14).

Some previous study findings indicated thyroid dysfunction induces different effects on blood cells such as anemia, erythrocytosis leukopenia, thrombocytopenia, and in rare cases causes' pancytopenia (5). Thyroid hormones involve in involvement in hemoglobin production, enhance erythropoiesis through a hyper proliferation of immature erythroid progenitors, increase secretion of erythropoietin (EPO) by inducing erythropoietin gene expression, motivate the growth of erythroid colonies (BFU-E, CFU-E), intensify erythrocyte 2, 3 DPG compactness, effect on megakaryocytes through modulation of bone marrow matrix proteins, such as fibronectin, increase the expression of fibronectin gene, an alter platelet function and affects hematopoiesis in many ways (15, 16). So the current study aimed to assess the effect of thyroid dysfunction on the hematological profile of patients.

Materials And Methods

Study area

The study was conducted at Menelik II Referral Hospital which is found in Addis Ababa under Addis Ababa health bureau, Addis Ababa, Ethiopia.

Study design and period:

A hospital-based comparative cross-sectional study was conducted from June to August 2021, at Menelik II Referral Hospital in Addis Ababa, Ethiopia.

Study Population

Patients who have confirmed thyroid dysfunction at Menelik II referral hospital was considered as case group and healthy individuals were randomly selected from Menelik II referral hospital were recruited as control groups.

Inclusion and exclusion criteria:

All age patients with thyroid dysfunction and visiting Menelik II referral hospital during the study period were taken as case groups and also all age group healthy individuals were taken as control groups for this study. On the other hand, patients taking any hormonal drugs which affect complete blood counts (CBC) such as non-steroidal anti-inflammatory drugs, Penicillin and its derivatives, Phenazopyridine, Quinidine, and patients with comorbid disease (such us: TB, HIV, Heart disease, and chronic kidney disease)were excluded from case groups. Also, control groups of individuals with signs of illness and those who are taking medications were excluded.

Sampling method and Data Collection Procedure

The sample was collected by using convenient sampling to enroll patients with thyroid dysfunction and healthy controls in Menelik II referral hospital (MRH). After consent and assent were obtained from each study participant, socio-demographic and clinical information was obtained using a pretested semi-structured questionnaire. Then 1o ml of venous blood sample was aseptically collected from each study participant by an experienced laboratory technologist and transferred into two test tubes (5 ml in each tube). 5 ml blood to EDTA test tube for CBC analysis and 5 ml blood into SST test tube for thyroid function test analysis. Then the blood sample in EDTA test tubes was transported to the hematology department of Menelik II referral hospital and CBC is analyzed by using a fully automated Mindray BS-500 analyzer. The blood specimen in the SST tube was transported to the clinical chemistry department of the MRH laboratory department and centrifuged at 3000 RPM for 5 minutes to separate the serum. Then the thyroid function test was determined from the serum sample by using Mindray CL-960i Chemiluminescence Immunoassay fully automated analyzer.

Laboratory analysis

Thyroid function tests were performed using Mindray CL-960i Chemiluminescence Immunoassay system which is a fully automated, random access, software-controlled system for immunoassay analysis. It works based on the electrochemiluminescence (ECL) assay principle. The competitive immunoassay principle was for the measurement of T3, T4, and the two-site sandwich immunoassay method was used for the measurement of TSH. For hematological profile or complete blood count analysis mindray BS-500

five differential fully automated hematological analyzer with test principle of impedance principle (electric resistance) was used.

Data Quality Assurance

To assure the quality of the data, training was given to the data collectors, and the data was collected by using a pretested questionnaire. Standard operating procedures (SOPs) were strictly followed during specimen collection and laboratory procedures. Before sample analysis commercially prepared low, normal, and high-quality control reagents were used to check the reliability (accuracy and precision) of the data generated by the hematology analyzer, and two-level control was used for the hormonal analyzer. The accuracy and completeness of the collected data were checked every day by the principal investigator. Data were cleaned, coded, and entered correctly.

Data analysis and interpretation

All the data collected from the laboratory investigation and questionnaire were analyzed using SPSS software (SPSS Inc., Chicago, IL, USA, version 21.0). Descriptive statistics were used to express the socio-demographic and clinical characteristics. Binary and multiple logistic regressions were computed to assess the association between variables. Differences in mean values were determined by an independent t-test for patients with thyroid dysfunction and healthy participants. P-values < 0.05 were taken as statistically significant.

Ethical considerations

The study was conducted after ethical approval is obtained from the Research and Ethics Institutional Review Board. An official permission letter was submitted to the Addis Ababa Health Bureau and Menelik II referral hospital. Informed written consent and assent were also obtained from each participant in Menelik II referral hospital before the actual data collection.

Result

A total of 360 participants of the 240 (110 males, 130 females) patients with thyroid dysfunction and the rest 120 (55 males, 65 females) healthy controls were recruited for this study. Out of 240 patients with thyroid dysfunction, 120 (50%) were with hypothyroidism and the rest 120 (50%) were with hyperthyroidism. Most of the study participants who participated in the current study were in the age range of 25-44 years (41.7) with an average age of 28.7 years(a minimum of 1 year and a maximum of 82 years). The majority of study participants in the current study were females 195 (54.2%). The age of the case group and the control group in the current study was relatively matched (Table 1).

Table 1
Socio-demographic finding of the participants who participated in the current study at MSH, Addis Ababa, Ethiopia from June to August 2021.

Variable	Category	Thyroid functional status		
		Normal	Hypothyroidism	Hyperthyroidism
		120 (33.3%)	(120 (33.3%)	120 (33.3%)
Sex	Male	54 (45%)	56 (46.7%)	55 (45.8%)
	Female	66 (55%)	64 (53.3%)	65 (54.2%)
Age/years	≤14	7 (5..8%)	5 (4.2%)	6 (15)
	15-24	15 (12.5%)	15 (12.5%)	10 (8.3%)
	25 -44	45 (37.5%)	50 (41.7%)	55 (45.8%)
	45-64	34 (28.3%)	25 (20.8%)	23 (19.2%)
	≥65	19 (15.8%)	25 (20.8%)	26 (21.7%)
Educational status	Illiterate	3 (2.5%)	4 (3.4%)	5 (4.2%)
	Primary school	5 (4.2%)	6 (5%)	20 (16.7%)
	Certificate and diploma	18 (15%)	23(19.2%)	20 (16.7%)
	First degree and above	97 (80.8%)	90 (75%)	75 (62.5%)
Residence	Rural	2 (1.7%)	2 (1.7%)	12 (10%)
	Urban	118 (98.3%)	118 (98.3%)	108 (90%)

From a total of 360 study participants, almost all of the respondents 118 (98.33%) healthy controls and 226 (94.2%) patients were from urban residents. The educational status finding also indicated that the majority of study participants 115(95.83%) normal controls and 190(79.2%) participants with thyroid dysfunction were had primary and above education level and was significantly associated with hematological findings (p=0.004) (Table 1 and Table 2).

Table 2
Hematological profile findings of the participants who participated in the current study at MSH, Addis Ababa, Ethiopia from June to August 2021.

Variable	Category	Thyroid functional status		
		Normal	**Hypothyroidism**	**Hyperthyroidism**
		120 (33.3%)	**(120 (33.3%)**	**120 (33.3%)**
Hgb (g/dl)	<12	21 (17.5%)	69 (57.5%0	64 (53.3%)
	12.1- 17.2	86 (71.7%)	36 (30.0%)	26 (21.7%)
	>17.2	13 (10.8%)	15 (12.5%)	30 (25.0%)
RBC ($\times10^{12}$/L)	<4	21 (17.5%)	69 (57.5%)	64 (53.3%)
	4-6	85 (70.8%)	41(34.2%)	30 (25.0%)
	>6	14 (11.7%)	10 (8.3%)	26 (21.7%)
MCHC (g/dl)	< 32	22 (18.3%)	70 (58.3%)	64 (53.3%)
	32 -36	86 (71.7%)	40 (33.3%)	30 (25.0%)
	>36	12 (10.0)	10 (8.3%)	26 (21.7%)
MCH (pg/cell)	>27	21 (17.5%)	69 (57.5%)	64 (53.3%)
	27-32	86 (71.7%)	36 (30.0%)	26 (21.7%)
	>32	13 (10.8%)	15 (12.5%)	30 (25.0%)
MCV (fl)	<70 fl	21 (17.5%)	69 (57.5%)	64 (53.3%)
	70-100 fl	86 (71.7%)	36 (30.0%)	26 (21.7%)
	>100 fl	13 (10.8%)	15 (12.5%)	30 (25.0%)
WBCs count(($\times10^{9}$/L)	<4	12 (10.0%)	5 (4.2%)	4 (3.3%)
	4-10	101 (84.2%)	30 (25.0%)	31 (25.8%)
	≥10.1	7 (5.8%)	85 (70.8%)	85 (70.8%)
Neutrophil (%)	<40%	10 (8.3%)	5 (4.2%)	5 (4.2%)
	40- 60%	105 (87.5%)	25 (20.8%)	25 (20.8%)
	> 60%	5 (4.2%)	90 (75.0%)	90 (75.0%)
Monocyte (%)	< 2%	12 (10.0%)	12 (10.0%)	20 (16.7%)
	2 - 8%	88 (73.3%)	86 (71.7%)	70 (58.3%)
	> 8%	20 (16.7%)	22 (18.3%)	30 (25.0%)

Lymphocyte	<20%	4 (3.3%)	8 (6.7%)	8 (6.7%)
	20-40%	110 (91.7%)	90 (75.0%)	100 (91.7%)
	> 40%	6 (5.0%)	22 (18.3%)	12 (10.0%)
Basophiles	< 0.5%	2 (1.7%)	3 (2.5%)	15 (12.5%)
	0.5 -1%	112 (93.3%)	112 (93.3%)	85 (70.8%)
	> 1%	6 (5.0%)	5 (4.2%)	20 (16.7%)
PLT count (K/mm3)	<150	10 (8.3%)	60 (50.0%)	45 (37.5%)
	150-450	110 (91.7%)	58 (48.3%)	45(37.5%)
	>450	0	2 (1.7%)	30 (25.0%)
MPV (femtoliter)	< 7	5 (4.2%)	60 (50.0%)	50 (41.7%)
	7-12	105 (87.5%)	54 (45.0)	40 (33.3%)
	>12	10 (8.3%)	6 (5.0%)	30 (25.0%)

As indicated in Table 2 hematological profile findings indicated that the majority of the healthy study participants were had normal valve of hemoglobin (71.7%), WBC (84.2%), RBC (70.8%), MCV (71.7%), Neutrophil (87.5%) and PLT (91.7%). On the other hand, most of the study participants who have thyroid problems both hypothyroidism and hyperthyroidism were had relatively low levels of hemoglobin (57.5% and 53.3%), WBC (70.8% and 70.8%), RBC (57.5% and 53.3%), MCV (57.5% and 53.3%), Neutrophil (75.0% and 75.0%) and PLT (50.0% and 50.0%) respectively (Table 1).

Our multivariate logistic regression analysis indicated that study participants with the educational level of the first degree and above had 2.8 more chances to develop thyroid dysfunction when compared with study participants with the educational level of below degree level (AOR 2.8, 95% CI: 1.23, 6.69, p value=0.001) and those whose age is greater than 65 years were have 5.2 times more chance to develop any types of thyroid dysfunction relative with healthy individuals AOR 5.2,95% CI: 1.34-7.90, p value=0.003) (Table 3).

This study finding also indicated that study participants with Hb value of less than 12 g/dl were more likely to be affected by thyroid dysfunction (AOR 2.3, 95% CI (1.03-6.52)), p value=0.001), MCV value less than 70 fl were 3.13 times more likely to develop thyroid dysfunction (AOR 3.13, 95% CI:1.21- 9.46, p value=0.003), RBC value less than $4X10^{12}$ cells /L were 3.4 times more likely to develop thyroid dysfunction (AOR 3.4, 95% CI:1.51-3.69, p value=0.002), WBC value greater than $10X10^{9}$ cells /L were have 5.6 times more chance to develop thyroid dysfunction (AOR 5.6, 95% CI:1.09-10.82, p value=0.001), and those whose PLT value less than $150x10^{9}$ cells /L were 2.7 times more likely to develop thyroid dysfunction (AOR 2.7, 95% CI:1.26-11.36, p value=0.004) compared with control groups (Table 3).

Table 3
Multivariate analysis outcome of thyroid dysfunction and independent variables for study participants who participated in the current study at MSH, Addis Ababa, Ethiopia from June to August 2021.

Variables		Thyroid dysfunction	
		AOR: 95%,CI	**p- value**
Age /year	≤14	1.13: 0.20-2.45	0.09
	15-24	1: 1.0-12.2	0.07
	25 -44	0.9: 1.20-4.5	0.07
	45-64	1: 0.12-3.34	0.06
	≥65	5.2: 1.34-7.90	0.003
Educational level	Illiterate	1	
	Primary school	1	
	Certificate and diploma	1.2: 1.99-14.65	0.06
	First degree and above	2.8: 1.23-6.69	0.001
Hb g/dl	<12	2.3: 1.03-6.52	0.001
	12.1- 17.2	1	
	>17.2	1	
RBC ×1012/ L	<4	4.4: 1.51-3.69	0.002
	4-6	1	
	>6	1.09: 2.1-22.23	1.2
MCV (fl)	<70	3.13: 1.21-9.46	0.003
	70-100	2.1: 0.98-18.71	1.0
	>100	1	
WBC ($x10^9$cells/L)	<4	1	
	4-10	5.6: 1.09-10.82	0.001
	≥10.1	1	
Neutrophil (%)	<40	1	
	41- 60	1.8: 1.11-13.36	0.005
	> 60	3.7: 1.67-11.23	0.003
PLT ($x10^9$cells/L)	<150	2.7: 1.26-11.36	0.004

	150-450	1
	>450	1

* P < 0.05: statistically significant, 1 =Reference group, AOR= Adjusted odd ration, C.I=95% confidence interval

Comparison of hematological parameters between control and participants with thyroid dysfunction

The result of this study showed that there was a statistically significant decrease in RBC count, Hgb, HCT, MCV, MCH, MCHC, MPV, and PLT counts in thyroid dysfunction patients when compared with apparently healthy controls (p-value <0.05). WBC, RDW, and Neutrophils were statistically significantly higher in thyroid dysfunction patients when compared with apparently healthy controls (p-value <0.05). The valve of monocyte, basophils, and eosinophils were not shown a significant difference between the groups (p-value >0.05) (Table 2, and 4).

Table 4
Comparison of RBCs count and RBC indices between patients with hypothyroidism, hyperthyroidism, and healthy controls participated in the current study at MSH, Addis Ababa, Ethiopia from June to August 2021.

Index	Thyroid status	No	Mean±SD	AOR, 95%,CI	P-Value
Hgb valve less than 12(g/dl	Hypothyroidism	69	13.6 ± 4.7	2.4, 1.11-3.56	<0.001
	Control	21	14.8 ± 2.2	1	
	Hyperthyroidism	64	13.6 ± 4.2	2.6, 1.31-6.56	<0.001
MCV less than 70fl	Hypothyroidism	69	74.3 ± 10.3	3.5, 1.64-6.78	<0.001
	Control	21	86.4 ± 11.2	1	
	Hyperthyroidism	64	75.2 ± 12.9	2.8, 1.82-7.56	<0.001
RBC less than 4×10^{12}/L	Hypothyroidism	69	4.3± 2.3	4.4, 1.67-7.56	0.001
	Control	21	4.9± 2.5	1	<0.001
	Hyperthyroidism	64	5.0 ± 2.6	4.8, 1.67-8.76	0.001
MCH less than 27 pg/cell	Hypothyroidism	69	28 ± 4.8	2.2, 1.13-3.56	<0.001
	Control	21	31.7 ± 3.9	1	
	Hyperthyroidism	64	27.8 ± 3.8	2.6, 1.41-9.99	<0.002
MCHC less than 32 g/dl	Hypothyroidism	70	32 ± 3.3	1.8, 1.11-6.66	<0.001
	Control	22	35.4 ± 2.8	1	<0.001
	Hyperthyroidism	64	33.3 ± 2.1	3.1, 1.51-4.56	
WBC greater than 4×10^{9}/L	Hypothyroidism	85	5.3 ± 3.5	3.8, 2.11-12.56	0.004
	Control	7	7.3 ± 2.9	1	
	Hyperthyroidism	85	5.6 ± 5.0	5.6, 1.31-10.56	0.009
PLT less than 150×10^{9}/L	Hypothyroidism	60	160± 46.3	2.9, 1.89-7.56	<0.001
	Control	10	320 ± 32.4	1	<0.001
	Hyperthyroidism	50	165 ± 33.7	2.8, 1.33-5.56	<0.001
Neutrophils greater than 60%	Hypothyroidism	85	74 ± 8	5.4, 2.32-8.56	<0.001
	Control	7	55 ± 6	1	<0.001
	Hyperthyroidism	85	68 ± 9	2.6, 1.41-7.56	<0.001

Discussion

The thyroid gland is a small organ that's located in the front of the neck and is vital for the secretion of two hormones (T3 & T4) gland which plays a major role in the metabolism, growth, and development of the human body. It helps to regulate many body functions by constantly releasing a steady amount of thyroid hormones into the bloodstream (1, 2). The most common thyroid dysfunctions, hypothyroidism, and hyperthyroidism affect blood cells and cause anemia with different ranges of severity [25].

The finding of the current study indicated a statistically significant decrease in RBC, Hgb, HCT, MCV, PLT, MCH, MCHC, and MPV in both thyroid dysfunction patients when compared with apparently healthy controls (p-value <0.05). RDW, WBC, and NEU% were statistically significantly increased (p-value <0.05) in those patients, and the rest MON%, EOS%, and BAS%, did not show significant differences between the groups (p-value >0.05). And also our multivariate logistic regression analysis showed that RBC count, Hgb, MCV, WBC and PLT had significant difference with thyroid dysfunction compared with control groups (AOR; 95%:CI, p-value: 4.4: 1.51-3.69, 0.002, 2.3: 1.03-6.52, 0.001, 3.13: 1.21-9.46, 0.003, 5.6: 1.09-10.82, 0.001 and 3.7: 1.67-11.23, 0.003 respectively) (Table 3). Contemporary other hematological valves had not shown a significant difference (p-valve>0.05). Also as our study finding indicated participants with an age of greater than have 5.2 times more chance to develop thyroid dysfunction (5.2: 1.34-7.9, 0.003) and participants who have a degree and above were have 2.8 times more chance to develop thyroid dysfunction (2.8: 1.03- 6.52, 0.001) (Table 3).

Findings of total RBC and RBC Indices between case and control groups

Thyroid hormones stimulate the proliferation of erythrocyte precursors, directly and indirectly, influencing erythropoietin (EPO) production enhancement. EPO regulates the survival, proliferation, and differentiation of elytroid progenitor cells and the number of red blood cells in the peripheral blood. So the problem in this gland directly or indirectly affects the production of blood cells. In our study, the mean RBC, Hgb, HCT, MCV, MCH, and MCHC valve of participants with thyroid dysfunction were have shown statistically significant decrement and the RDW valve were showed increased valve compared with control groups(p-value <0.001) (Table 2). Our result is in agreement with different study findings conducted in Saudi Arabia (17), Iraq (18), Iran (19), Saudi Arabia (20)and was in opposite with the study finding conducted in Kenya (21). This difference may be due to geographical, physiological, and dietary variations.

On the opposite, the current study finding showed a significant increment in the value of red cell distribution width in participants with thyroid dysfunction compared with the control groups (p-value <0.001) (Table 2). And this finding was supported different previous study findings (22-24).

Findings of total WBC and WBC differential between case and control groups

As the multivariate analysis indicated total WBC count and neutrophil percentage were significantly increased in participants with thyroid dysfunction compared with apparently healthy controls (p-value = 0.021) (Table 2). A similar result was also reported by different previous studies(20, 23). On the other hand, the findings of lymphocyte, monocyte, eosinophil, and basophils were not showing a significant difference between the two groups (p-value >0.05).

Platelet count finding and thyroid dysfunction

The current study finding also showed a significantly decreased valve of PLT among individuals with thyroid problems compared with the healthy control groups (p-value = 0.021) (Table 2). This finding was in line with the previous studies conducted in Italy (25), Austria (26), and in opposite with previous studies conducted in Turkey (27)

Conclusion And Recommendation

Conclusion

Depending on the current study finding thyroid hormones (T3 and T4) have a significant influence on blood cell count and blood cell indices. The current study finding showed that thyroid dysfunction has a significant effect on RBCs, Hgb, HCT, MCV MCHC, MCH, WBC, neutrophils, PLT count, and MPV findings ($p<0.05$). But no show significant effect on monocyte, eosinophil and basophils (p-value > 0.05).

Recommendation

Routine hematological tests particularly RBCs, Hb, RDW, MCHC, PLT, WBCs, and differential count should be done for patients with thyroid dysfunction. So that complications could be detected and managed.

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Declarations

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Abbreviations

BAS%- the percentage of basophils, **CBC**- complete blood count, **EOS**%- a percentage of eosinophils, **EPO**- erythropoietin, **HBV** -Hepatitis B Virus, **HCV** - Hepatitis C Virus, **Hgb** - Haemoglobin, **HIV** - Human Immune Virus, **MCH**- mean corpuscular hemoglobin, **MCHC**- mean corpuscular hemoglobin concentration, **MCV**- mean cell volume, **MPV**- mean platelet volume, **MRH** - Menelik II Referral Hospital, **NEU**% -a percentage of neutrophils, **PLT**- platelet, **RBC**- red blood cell, **RDW**- red cell distribution width, **T3**- Triiodothyronine, **T4**- Thyroxine, **TFT**- thyroid function test, **TSH**- a thyroid-stimulating hormone, **WBC**- white blood cell