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EFFECT OF *ALOE VERA* JUICE ON TOTAL BLOOD COUNT AGAINST TOXICITY INDUCED BY ETHIONAMIDE AND PARA AMINO SALICYLIC ACID IN SPRAGUE-DAWLEY RATS

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ABSTRACT: Fresh *Aloe vera* plant leaves were brought from botanical garden and sample was identified and brought to the laboratory in the Department of Zoology, Patkar-Varde College, Goregaon (W), Mumbai. 50 grams of leaves were then grounded with 50ml of distilled water in sterilized pestle and mortar. The yield will be calculated based on weight of the extract compared to the weight of the pulp of the leaves. Forty-eight (48) *Sprague- dawley* rats (average weight 150 - 250 g) of either sex were used for the experiment. The ETH and PAS drug and *Aloe vera* juice were given to respective groups daily for 28 days. At the end of the study animals were anesthetized and were sacrificed by cervical decapitation. Blood was collected via cardiac puncture and studied for WBC: White blood cell count, LYM: Lymphocytes, MID: Indicates the combined value of the other types of white blood cells not classified as lymphocytes or granulocytes, NEUT: Neutrophils, RBC: Red blood cell count, HGB: Hemoglobin, HCT: Hematocrit and PLT: The platelet counts by using Operon hematology analyzer. Graph Pad Prism 7 was used for statistical analysis by one way variance (ANOVA). The value ($p< 0.05$) considered as significant and ($P< .00001$) is no significant. The present study demonstrated that the anti-tuberculosis drugs ETH and PAS changes the hematological parameters due to the presence of toxic metabolites. The toxic metabolites of the drugs bind to cellular macromolecules and released to form toxic free radicals which in turn it caused tissue damage. Whereas, we observed that after administration of *Aloe vera* juice independently or in combination with the anti-TB drugs ETH and PAS the hematological parameters found improved towards normalization. Based on the above results it is concluded that the *Aloe vera* juice have a good bio-enhancer property against toxicity induced by ETH and PAS drugs in *Sprague-dawley* rats.

INTRODUCTION: *Mycobacterium tuberculosis* is the infectious agent that causes tuberculosis (TB). Despite medical advances, tuberculosis remains fatal and is the leading cause of human death in many countries.

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Every second person in the world is infected with tuberculosis. The estimated number of new cases of tuberculosis every year around the world is around 9.6 million.

Approximately one -third of the world's population is currently infected with tuberculosis and up to 10% of these will develop active TB, causing 1.6 million deaths per year [1]. It has been studied that the development of MDR-TB is due to misuse of proper antibiotic treatment by patients and lack of attention focused on these patients. The very high incidence of MDR-TB has led to the use of second-

line tuberculosis drugs. Ethionamide (eth eye on a mid) is the most commonly used drug which shares similarities with Isoniazid in terms of structure and anti-mycobacterial function. The daily oral dose of Ethionamide is 250 mg/kg and can be increased to 1 gram if well tolerated by the patient. Some cases of ethionamide-induced hepatotoxicity have been severe and harmful cases have also been reported [2]. Para-aminosalicylic acid (PAS) was the first antibiotic found to be effective in the treatment of tuberculosis in the 1940s [3]. PAS treatment is uncommon and highly drug-resistant strains have limited resistance to this drug. Thus, PAS became the principal second-line agent for the treatment of MDR-TB [4]. Hematology is one of the most frequent and serious adverse effects of anti-TB drugs and can reduce treatment effectiveness by compromising treatment regimens [5].

Several medicinal plants used traditionally for thousands of years are present in the herbal preparations of the Indian traditional health care system. Today, about 80% of the world population depends on botanical agents as medicines to meet their health issues [6]. In developing countries, traditional plant remedies are widely used to treat various diseases. Many varieties of plants have been used to treat a variety of diseases including hepatoprotective potential [7]. Nowadays, dietary supplements and herbal remedies have increased the interest of researchers in treating a variety of diseases. In India, more than 40 polyherbal commercial formulations reputed to have hepatoprotective action are being used [8].

More than 500 species of aloe are known, but *Aloe vera* is recognized as the "true *aloe vera*" for its widespread use and purported healing powers [9]. *Aloe vera* has been used for many centuries for its medicinal and therapeutic properties. Aloe juice has been used for centuries as a laxative and medicinal cleanser [10]. Many of the health benefits associated with *Aloe vera* are attributed to promoting wound healing, antifungal activity, hypoglycemic or anti-diabetic effects, and anti-inflammatory, anticarcinogenic, immuno-modulatory, and gastroprotective properties [11]. Hematological changes associated with tuberculosis treatment have been studied by many researchers throughout the globe. However, to the best of our knowledge, there is very scanty comprehensive data is available on the hematological abnormalities among TB patients in India in general and Maharashtra in particular. Hence, this study was designed to determine the effect of anti-TB drugs on hematological profile.

MATERIALS AND METHODS

Collection and Identification: *Aloe vera*: Fresh *Aloe vera* plant leaves were brought from botanical garden and sample was identified and brought to the laboratory in the Department of Zoology, S.S. & L.S. Patkar-Varde College, Goregaon (W), Mumbai. *Aloe vera* plant identified by reviewing the literature and the final identification and authentication was done at Department of Botany, St Xavier,,s College (autonomous) Mumbai, India.

Preparation of Crude Extract: Fresh *Aloe vera* leaves were rinsed 2-3 times in the tap-water. 50 grams of leaves were then grounded with 50ml of distilled water in sterilized pestle and mortar. The yield will be calculated based on weight of the extract compared to the weight of the pulp of the leaves as proposed by Davis (1993) in a sterile container and keep at-20 0C till further use.

Purchas of Drugs: The drugs ETH (Macleods Pharmaceuticals Ltd) and PAS (Lupin Ltd) were purchased following the Prescription of Physician by the medical practitioner, from New Krishna Medicos, Shop No. 3, Salim Estate Near Times Square, opposite Kanakia Seven, Marol, Andheri, (E), Mumbai, India.

Experimental Design: Forty-eight (48) *Sprague-dawley* rats (average weight 150 - 250 g) of either sex were used for the experiment. They were purchased and procured from the National Toxicological Centre, APT Testing & Research Pvt. Ltd. (ATR) Pune. The experimental study was approved by Ethical committee at APT Research Foundation Pune, prior to the experimentation (CPCSEA NO. RP 01/2223 dated 11/June/2022). The rats were acclimatized, maintained and housed in APT laboratory for a week. The controlled humidity and temperature at $22+3^0$C, humidity 50-60 %, and illumination cycle set to 12-hlight/12 hrs dark cycle was also maintained. Six rats per cage were housed in polypropylene cages with stainless steel grill top, facilities for commercial Pallet food and water bottle with ad-libitum and bedding of clean paddy husk.

TABLE 1: SHOWING DOSE LEVEL OF *ALOE VERA*, ETH AND PAS IN DIFFERENT GROUPS OF SPRAGUE-DAWLEY RATS

Groups (n=6)	Treatment
Group1	Animals fed with rat pellets and ordinary water
Group 2	ETH (132 mg/kg, p.o) for 28 days
Group 3	PAS (400 mg/kg, p.o) for 28 days
Group 4	ETH (132 mg/kg, p.o) + PAS (400 mg/kg, p.o) for 28 days
Group 5	ETH (132 mg/kg, p.o) + *Aloe vera* juice (50 ml/kg, p.o) for 28 days
Group 6	PAS (400 mg/kg, p.o) + *Aloe vera* juice (50 ml/kg, p.o) for 28 days
Group 7	ETH (132 mg/kg, p.o)+ PAS(400 mg/kg, p.o)+ *Aloe vera* juice (50 ml/kg, p.o) for 28 days
Group 8	Only *Aloe vera* juice (50 ml/kg, p.o) for 28 days

Administration of Test Article: The test article at the above concentration was administered to each rat by a single oral gavage. The animals were dosed using a stainless-steel intubation needle fitted onto a suitably graduated syringe. The dosage volume administered to individual rat was adjusted according to its most recently recorded body weight. Animal weights were determined weekly along with food consumption. Animals were randomly divided into following groups containing 6 animals (3 males and 3 females) in each group. Test drug and inducers were given to respective groups as indicated in the table daily for 28 days. At the end of study various hematological parameters were analyzed from blood such as, WBC: White blood cell count, LYM: Lymphocytes, MID: Indicates the combined value of the other types of white blood cells not classified as lymphocytes or granulocytes, NEUT: Neutrophils, RBC: Red blood cell count, HGB: Hemoglobin, HCT: Hematocrit and PLT: The platelet count etc. by using Operon Hematology Analyzer (Model No: BC 5380), at APT Testing & Research Pvt. Ltd. (ATR) Pune.

Statistical Analysis: The data was statistically analyzed by one way analysis of variance (ANOVA). The value $p< 0.05$ considered as significant. Statistical analysis: ANOVA followed. The p-value is $P< .00001$. The result is no significant at $p < .05$.

RESULTS AND DISCUSSIONS:

TABLE 2: SHOWING THE EFFECT OF *ALOE VERA* JUICE AND DRUGS ETHIONAMIDE AND PARA AMINO SALICYLIC ACID, ON COMPLETE BLOOD COUNT OF SPRAGUE- DAWLEY RATS

S. no.	Group		WBC	LYM	MID	NEUT	RBC	HGB	HCT	PLT
			$*10^9$/L	$*10^9$/L	$*10^9$/L	$*10^9$/L	$*10^{12}$/L	g/dL	%	$*10^9$/L
1	NC	Mean	8.00	4.58	0.63	2.78	7.76	13.70	58.98	455.33
		SD	2.18	1.75	0.19	0.32	0.49	0.75	3.74	54.33
2	ETH 132 mg/kg	Mean	7.88	4.30	0.68	2.90	7.17	13.37	56.52	490.50
		SD	3.34	2.09	0.31	1.12	0.72	1.25	5.65	107.73
3	PAS 400mg/kg	Mean	8.25	4.63	0.85	2.77	6.93	12.90	54.45	505.33
		SD	3.51	1.89	0.51	1.68	0.70	1.62	4.94	145.37
4	ETH+PAS	Mean	9.83	5.12	0.82	3.90	7.63	14.20	58.92	536.67
		SD	3.93	1.49	0.44	2.44	0.56	0.79	3.37	117.04
5	ETH+ *Aloe vera* 90mg/kg	Mean	7.38	4.47	0.65	2.27	7.27	13.92	58.33	491.67
		SD	2.73	2.04	0.21	0.50	0.31	0.90	3.22	130.99
6	PAS+ *Aloe vera* 90 mg/kg	Mean	7.68	4.47	0.73	2.48	7.56	13.73	57.80	546.17
		SD	3.07	1.87	0.34	0.92	0.70	0.93	4.81	65.49
7	ETH+PAS+ *Aloe vera*	Mean	8.77	5.23	0.77	2.77	7.06	13.57	57.48	536.33
	90mg/kg	SD	3.36	2.35	0.29	1.08	0.30	0.43	1.74	93.06
8	Only *Aloe vera* 90mg/kg	Mean	6.22	4.07	0.52	1.63	7.05	12.83	54.48	465.00
		SD	3.06	2.15	0.29	0.89	0.84	1.38	4.78	58.40

*Each value is the mean of 8 determinations. WBC: White blood cell count, LYM: Lymphocytes, MID: Indicates the combined value of the other types of white blood cells not classified as lymphocytes or granulocytes, NEUT: Neutrophils, RBC: Red blood cell count, HGB: Hemoglobin, HCT: Hematocrit, PLT: The platelet count.

The experiment was conducted for up to 28 days. There was no mortality was noted in control and experimental groups. After 28 days the animals were sacrificed and blood, is withdrawn by heart

puncture for estimation of liver functional test, as per the guidelines. The body weights and relative liver weights were estimated by dissecting the liver to calculate the difference in weights of liver in control and experimental groups. The rate of food consumption was also calculated at the interval of every 7 days up to the end of the study.

The mean rate of food consumption (R=Remained, C=Consumed, C/A= Consumed / Animal Quantity of Food Given: 100) was calculated every week in control and experimental group. In normal control group the rate of food consumption was found to be (R= 38.50 gm ± 4.95; C=61.50 gm ± 4.95 and C/A = 20.50 gm ± 1.65). In experimental groups, the minimum food consumption was noted in group treated with PAS+ *Aloe vera* juice (R=60.25gm ± 6.72; C= 39.75 gm ± 6.72 and C/A = 13.25gm ± 2.24), whereas the maximum food consumption was observed in group treated with ETH+PAS+ *Aloe vera* juice (R= 40.75gm ± 5.30 C= 59.25gm ± 5.30 and C/A = 19.75 gm ± 1.77) respectively.

The mean body weights were measured weekly (every 7 days) during the study. The mean body weight in normal control group is (292.5 gm ± 59.7). In experimental groups the minimum body weigh was found in animals treated with ETH+PAS+ *Aloe vera* juice (270.7 gm ± 51.0), Where as maximum body weight was recorded in animals treated with ETH+ *Aloe vera* juice (314.0 gm ±49.1). The mean body weights present in animals treated with *Aloe vera* juice only was (276.8 gm ± 59.5).

White Blood Cell Count (WBC): The mean concentration of WBC estimated in normal control group was (8.00 10^9 /L ± 2.18). The minimum mean concentration of WBC was found in animals treated with ETH + *Aloe vera* juice (7.38 10^9 /L ± 2.73). This decrease in WBC count in ETH + *Aloe Vera* juice treated group suggested that the drug ETH may be immunosuppressive. The reduction in the WBC may be because of their diminished production, redistribution from peripheral blood into the tissue spaces or rapid destruction of WBC. The maximum concentration was noted in animals treated with ETH +PAS (9.83 10^9/L ± 3.93). The high WBC count found in ETH +PAS treated group which could result in the production of injurious cytokinins which may cause tissue damage. In animals treated only with *Aloe vera* juice, the mean concentration of WBC was estimated as (6.22 10^9/L ± 3.06).

Lymphocytes (LYM): The mean total LYM was estimated in normal control group was (4.58 10^9/L ± 1.75). The minimum mean total LYM was found in group treated with ETH (4.30 10^9/L ± 2.09). The maximum mean total LYM was found in group treated with ETH + PAS + *Aloe vera* juice (5.2310^9/L ± 2.35). Increased levels of LYM is possible that the membranes of these lymphocytes were oxidized when the rats treated with *Aloe vera* juice which lowered the LYM to nearly normal or absolute low level of lymphocytes concentration is associated with increased level of infection after trauma. The group of rats treated only with *Aloe vera* juice, the mean total LYM was estimated as (4.07 10^9/L ± 2.15). This diminished level of LYM recovers the rats from infection.

MID: Indicates the combined value of the other types of white blood cells not classified as lymphocytes or granulocytes: The mean total MID was recorded in normal control group (0.63 10^9/L ± 0.19). In the case of treated groups, the minimum mean total MID was found in animals treated with ETH + *Aloe vera* juice (0.65 10^9/L ± 0.21), whereas the maximum mean total MID was found in animals treated with ETH + PAS (0.8210^9/L ± 0.44). In the case of animals treated only with *Aloe vera* Juice, the level of mean total MID was estimated as (0.5210^9/L ±0.29).

Neutrophils (NEUT): The mean total neutrophils estimated in normal control group was (2.78 10^9/L ± 0.32). The minimum mean total neutrophils were found in group treated with ETH+ *Aloe vera* juice (2.27 10^9/L ±0.50). The maximum mean total neutrophils were found in group treated with ETH + PAS (3. 90 10^9/L ± 2.44). This was suggested the high degree of infection. This may occur due to ingestion of ETH + PAS as a matter of fact, these drugs may induce the metabolic rates, with the resultant increased in the production of free radicals with the resultant cellular damage. In stressful conditions the immune system responds to the damage by producing oxidants. During this response, neutrophils produce free radicals which firstly respond to the inflammatory cells for the removal of damage cells. The group of animals

treated only with *Aloe vera* juice; the mean total neutrophils was estimated as (1.6310^9/L ±0.89).

Red Blood Cell Count (RBC): The mean Total RBC was estimated in normal control group was (7.76 10^{12}/L ± 0.49). The minimum mean Total RBC was found in group treated with PAS (6.93 10^{12}/L ± 0.70). The animals with obvious clinical signs of hemorrhage or with regressive anemia deplete the total count of RBC.

The maximum mean Total RBC was found in a group treated with PAS + *Aloe vera* juice (7.56 10^{12}/L ± 0.70). This may be occur because of PAS drug it might caused acute respiratory failure or hypertension, liver and peripheral nervous and hematologic system is the main target organs of PAS chronic toxicity significantly. The group of animals treated only with *Aloe vera* juice; the mean Total RBC was estimated as (7.05 10^{12}/L ± 0.84).

Hemoglobin (HGB): The mean total Hemoglobin was recorded in normal control group was (13.70 g/dL ± 0.75). In the case of treated groups, the minimum mean total Hemoglobin was found in animals treated with PAS (12.90 g/dL ± 1.62). This low concentration of HGB may result in the presence of anemia.

This may be because of PAS drug. The maximum mean total Hemoglobin was found in animals treated with ETH + PAS (14.20 g/dL ± 0.79). In the case of animals treated only with *Aloe vera* Juice, the level of mean total Hemoglobin was estimated as (12.83 g/dL ± 1.38).

Hematocrit (HCT): The mean Total HCT was estimated in normal control group was (58.98 % ±3.73). The minimum mean total HCT was found in group treated with PAS (54.45 % ±4.94). These low levels of HCT attributed to the destruction of sickle red blood cells by the phagocytes are the constituents of immune system are present in the circulating fluids of the body. The maximum mean total HCT was found in group treated with ETH + PAS (58.92 % ±3.73). The highest levels of hemoglobin usually indicate the presence of dehydration and occasionally polycythaemia. The group of animals treated only with *Aloe vera* juice, the mean Total HCT was estimated as (54.48 % ±4.78).

The Platelet Count (PLT): The mean total Serum PLT was recorded in normal control group was (455.33 10^9/L ± 54.33). In the case of treated groups, the minimum mean total PLT was found in animals treated with ETH (490.50 10^9/L ± 107.73). The reduce number of platelets (thrombocytopenia) occurs due to the decreased production and increased destruction of platelets in the bone marrow disease, uraemia, toxaemia, infection, hypoadrenocortidsm, DIC, immune-mediated disorders, myeloprolifera disorders, haemorrhage and splenomegaly. The maximum mean total PLT was found in animals treated with PAS + *Aloe vera* Juice (546.17 10^9/L ± 65.49). The high number of platelets (thrombocytosis) occurs because of excessive production of PLT or decreased rate of removal from the circulating fluid. This may be due to acute or chronic infection, inflammatory disease, or drug induced toxicity. Some myeloproliferative disorders also play an important role for an increased number of PLT. This may also occur in malignant neoplasia. In the case of animals treated only with *Aloe vera* Juice, the level of mean total PLT was estimated as (465.00 10^9/L ± 58.40).

Blood parameters are the important indicators to decide the potential health hazards and also have productive value to determine toxicity [12]. The experiments conducted by many researchers on different animal models to find the hematological effect. The WBC count increases when the animal is under stress or caused infection because they have to face the adverse conditions in animal's habitat like scarcity of food and water [13]. The study carried out by[14] on carp found that methaidathion treated carps showed an increased level of haematocrit. The malathion caused a significant increase in the WBC count in rates [15]. Ample contrast data is available in respect to different animals. It was found that the catfish treated with malathion showed an increased levels of erythrocytes count and haemoglobin content[16]. The study carried out by[17] observed a significant decrease in the total WBC count in fish (*Labeo rohita*, *Channa punctatus*, *Oreochromis niloticus* and *Clarias gariepinus*) treated with malathion their work is disagree with the work of [18]. There is not any change in the total WBC and differential counts of WBCs when male chickens treated with malathion [19].

The study carried out by [20] found that the administration of *Aloe vera* extract brought the value of W.B.C.'s count to near normal in diabetic rats. This reduction in the W.B.C'. s count to near normal may be due to their diminished production, redistribution from the peripheral blood into the tissues or rapid destruction of W.B.C.'s [21]. The destruction of W.B.C.'s may lead to fever, gastrointestinal disturbances, rashes and immunological reactions and other proteins [22]. The reduction in W.B.C.'s production could arise from the drug during treatment regimes. Drugs bind to some proteins to regulate the proliferation, differentiation and maturation of committed cells for the production of W.B.C.'s [23]. It was also found that the *Aloe vera* extract supplementations in Rainbow trout were enhancing the number of WBCs and the Hct while studying the haematological parameters [24].

The RBC indicates the diagnosis of anemia [25]. A hematological index such as hemoglobin (HB) is associated with the total population of red blood cells (RBCs) [26]. The hematocrits represent the percentage of RBCs of whole blood volume, which is clinically used to determine anemia [27]. The administration of ATDs for 30 days to rats resulted in alteration of blood parameters by decreasing the amount of RBC and hemoglobin [28]. The rats treated with ATDs showed decreased in RBCs, hemoglobin, mean corpuscular volume, mean corpuscular hemoglobin, mean corpuscular hemoglobin concentration, platelets, and eosinophils along with increase in the number of lymphocytes. Whereas the rat treated with the crude extract of naringenin encountered ATDs showed alteration in the hematological parameters [29].

Several researchers observed himitological changes in different animals (chikens, pigeons, fish and rats) treated with organophosphorus insecticides [30]. In the study against the toxicity of malathion on rabbits, the *Aloe vera* juice shows protections and it was revealed that the haematological parameters (RBCs count, Hb counts and Hct value) returned towards normal in the therapeutic group. This was evident to the short-term exposure rather than the long-term treatment. The rabbits treated with *Aloe vera* group showed marked increase in the RBCs, HB and Hct values in short- and long-term treatment when compared with control group during the experiment [31]. The study conducted out by [32] and [33] found that the chronic administration of *Aloe vera* gel extracthad significant effect on the haematological parameters of rat. In another study, it was demonstrated that the rabbits treated with *Aleo vera* juice concurrent with malathion lowered the percentage of increased in WBCs count illustrated in rabbits treated with malathion. This indicates that *Aloe vera* juice showed ameliorative action on haematological parameters of the rabbits treated groups. Study carried out by [34] found that the *Aloe vera* leaf gel applied to diabetic rats showed significantly increased in the total hemoglobin content. This may be because of an improvement in the glucose metabolism. In diabetic rats, the administration of *Aloe vera* extract brought the values of Hb, WBCs and RBCs to near normal [35].

The study carried out by [36] concluded that *Aloe vera* improved the hematological parameters in broiler chicks, laying hens, mice, and turkeys. In contrast to the above study [37] demostrated that the *Aloe vera* treated rats showed a significant decree in RBC count, Hb concentration and Hct values when compared with control rats. WBCs are the safeguard of the body's and are in mobile defense mechanism against pathogenic infection. They were also aid in the detoxification of toxic proteins and develop immunity against foreign pathogens. Any differences in their number are of great significance for the diagnostic and prognostic purposes [38]. The study carried out by [39, 40, 41] found that the changes resulted from the isoniazid and rifampicin caused toxic, reactive metabolite which leads to tissue damage.

Whereas *Aloe vera* extract supplementation resulted in significant improvement in the hematological parameters might be due to its antioxidant, antistress, cytotoxic, antioxidant, hypoglycemic and anti-inflammatory properties. In another study carried out by [42] found that the hematological parameters were disturbs on the treatment of anti -TB drugs ETH and PAS. However, after treatment of *Piper nigrum* seed extract in treat and control groups independently or in combination with the anti -TB drugs, the hematological parameters were improved towards normalization. The rat exposed to *C. murale* extract

significantly decreases the level of hemoglobin and platelets compared to the control rats [43.] The evaluation of platelet can be used to determine the hypersensitive reaction against drugs [44]. The increasing or decreasing ratio of platelet count will evaluate the bleeding or clotting abnormalities43. The amount of platelet volume (MPV), platelet distribution width (PDW) and a platelet large ratio (P-LCR) are useful to determine the toxicity ratio in human being [45, 46, 47].

In our present study, In the case of mean food consumption rate, and mean body weights, was calculated in normal control and the rats' treated groups. From the above results it was found that, statically no significant difference ($p<0.001$) was noted in mean rate of food consumption and mean body weights, when compared with the normal control groups. The maximum mean total WBC was found in animals treated with ETH +PAS as compared to the normal control group and the rats treated with *Aloe vera* juice. The level of total WBC was found increased but the statistically no significant difference ($p<0.001$) was noted as compared with normal control group. The maximum mean total LYM was found in a group treated with ETH + PAS + *Aloe vera* juice. The minimum mean total LYM was found in the group treated with ETH, when compared with the normal control group. The level of total LYM was found increased in ETH + PAS + *Aloe vera* juice but the statistically no significant difference ($p<0.001$) was noted as compared with normal control group and the rats treated with *Aloe vera* juice.

The maximum mean total MID was found in animals treated with ETH + PAS, and the minimum mean total MID was found in animals treated with ETH + *Aloe vera* juice when compared with normal control group and the rats treated with *Aloe vera* juice. Statistically no significant difference ($p<0.001$) was noted in MID. The maximum mean total Neutrophils was found in group treated with ETH + PAS and minimum mean total Neutrophils was found in group treated with ETH+ *Aloe vera* juice, when compared with normal control group and the rats treated with *Aloe vera* juice. Statistically no significant difference ($p<0.001$) was noted. The maximum mean total RBC was found in group treated with PAS + *Aloe vera* juice and minimum mean total RBC was found in group treated with PAS when compared with normal control and the rats treated with *Aloe vera* juice. Statistically no significant increased in difference ($p<0.001$) was noted when compared with the treated rats and normal control group and rats treated with *Aloe vera* juice. The maximum mean total Hemoglobin was found in the group treated with ETH + PAS and minimum mean total Hemoglobin was found in group treated with PAS when compared with normal control group and the rats treated with *Aloe vera* juice. Statistically no significant increased in difference ($p<0.001$) was noted when compared with the treated rats and normal control group and rats treated with *Aloe vera* juice. The maximum mean total HCT was found in the group treated with ETH + PAS and minimum mean total HCT was found in group treated with PAS when compared with normal control group and the rats treated with *Aloe vera* juice. Statistically no significant increased in difference ($p<0.001$) was noted when compared with the treated rats and normal control group and rats treated with *Aloe vera* juice. The maximum mean total PLT was found in group treated with PAS + *Aloe vera* Juice and minimum mean total PLT was found in group treated with ETH when compared with normal control group and the rats treated with *Aloe vera* juice. Statistically no significant increased in difference ($p<0.001$) was noted when compared with the treated rats and normal control group and rats treated with *Aloe vera* juice.

CONCLUSION: The finding of the present study demonstrated that the anti- tuberculosis drugs ETH and PAS changes the hematological parameters due to the presence of toxic metabolites. The toxic metabolites of the drugs bind to cellular macromolecules and released to form toxic free radicals which in turn it caused tissue damage. Whereas, we observed that after administration of *Aloe vera* juice independently or in combination with the anti –TB drugs ETH and PAS the hematological parameters found improved towards normalization. This might be due to its antioxidant, antistress, cytotoxic, antioxidant, hypoglycemic and antiinflammatory properties. Thus, the information obtained from this study can serve as a baseline data for further pharmaceutical studies of *Aloe vera* as a medicinal plant. Further, chronic

toxicity studies and phytochemical characterization of *Aloe vera* extract would be beneficial.

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