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Studies on physiological and haematological alterations of skin and subcutaneous neoplasms in bovines

Deepak Kumar Kashyap, SK Tiwari, MO Kalim and Rukmani Dewangan

Abstract
The present study conducted to assess the physiological and haematological changes of skin and subcutaneous neoplasm in bovines with different treatments. The temperature, heart rate and respiration rate were examined whereas blood collected from jugular vein for estimation of haemoglobin, packed cell volume, total leucocyte count and differential leucocyte count just before, during and after treatments. The result showed non-significant changes in temperature with significant changes in heart rate and respiration value. Blood parameters showed non-significant variation in hemoglobin, packed cell volume and neutrophil values whereas significant differences observed in total leucocyte count, lymphocyte, monocyte and eosinophil values.

Keywords: Physiological, haematological, skin, neoplasm, bovine

Introduction
Neoplasm is an unwanted, non-differential, abnormal structure on or inside the body without any specific function, which can be produces systemic effect either by alteration of normal physiological activities or variation in haematological values. But location and types of neoplasm play important role for these type of changes. Sometimes there was no significant difference found in physiological parameters and the values under normal limit. Blood parameter also provide some clue for identification or diagnosis of neoplasms in bovines. Anaemia is the most common abnormality encountered during haematological estimation in animals with neoplasm. High peripheral leucocyte count (Shastry and degloorkar, 1981) [36], lymphopaenia, eosinopaenia, anemia and higher ESR values (Chauhan *et al.* 1981) [12], microcytic-hypochromic anemia (Nimje, 1983) [26], moderate neutrophilia and eosinophilia with normal vital signs (Baniadam *et al.* 2010) [1] changes occurs in different types of neoplasms in bovines. In some cases normal values of complete blood count also found by Sharma *et al.* (2012) [40], Bhaskar (2010) [3], Bhimappa *et al*. (2016) [4].

Material and Methods
Experimental design
The present study was conducted on clinically suspected cases of various bovine neoplasm; which were presented at Government Veterinary Hospitals of various districts of Chhattisgarh, India for a period of one year. Thirty clinical cases of skin and subcutaneous tumours in bovines of different age groups, species (cattle and buffaloes) and breeds were selected for this study. The animals were divided into 5 groups are as follows:

S. No.	Group	Number of Animals (n)	Type of tumour	Treatment
1.	I	6	Benign	*Thuja Occidentalis*
2.	II	6	Benign	Auto-hemotherapy
3.	III	6	Benign	Surgery
4.	IV	6	Malignant	Surgery
5.	V	6	Malignant	Surgery + Chemotherapy

Physiological parameters
This comprised of recording the following parameters pre-operatively, during and immediately post-operation.

a) Rectal temperature (per minute): The rectal temperature was recorded with clinical thermometer and it was expressed in ^{0}F.

b) Heart rate (per minute): The heart rate was recorded by auscultation with the help of stethoscope.

c) Respiration rate (per minute): It was recorded by counting the thoracic respiratory movements per minute.

Haematological parameters

Blood samples were collected from the animals before, during and post-surgery. The venous blood (approximately 3ml) was collected from external jugular vein from all the animals in vaccumised ethylene diamine tetra acetic acid (EDTA) vials. Before mixing the EDTA, slides were immediately prepared for DLC. The estimation of hematological parameters was done by automated haematology blood cell counter (HDC 5-Part MS4S2). The parameters which were estimated are as follows

i) **Haemoglobin (Hb):** The values was expressed in gm/dl.
ii) **Packed cell volume (PCV):** the values was expressed in percentage.
iii) **Total leucocyte count (TLC):** The results was expressed in thousand /µl of blood.
iv) **Differential leucocyte count (DLC):** The blood smears were prepared immediately after the blood collection. The smear was fixed in Methanol for 1 minute and was stained with Geimsa stain for 30 minutes. The counts were expressed in percentage.

Statistical analysis

The Mean and Standard Error of recorded values were calculated. The data shall be analyzed by using analysis of variance (ANOVA) for knowing any difference existing among the groups using standard procedures as outlined by Snedecor and Cochran (1994) [37]. For qualitative and quantitative comparison "t" test / Chi square test was applied for each parameter under study.

Results and Discussion

Physiological Parameters

Rectal Temperature (^{0}F)

The value of rectal temperature (^{0}F) in different groups of animals at various time interval before, during and after treatment in animals affected with skin and subcutaneous tumours are given in Table 1 and shown in Fig. 1.

Table 1: Effect on body temperature (ºF) in different groups at various time intervals.

Groups	Time intervals		
	Before	During	After
Group 1	101.0 ± 0.30	100.7 ± 0.29	100.6 ± 0.16
Group 2	101.2 ± 0.22	101.0 ± 0.20	100.9 ± 0.23
Group 3	101.2 ± 0.36	100.9 ± 0.33	100.7 ± 0.31
Group 4	101.5 ± 0.40	101.2 ± 0.39	101.1 ± 0.38
Group 5	101.0 ± 0.34	100.7 ± 0.35	100.6 ± 0.38

Note: Mean value (± standard error of mean) with different superscript in a column varied significantly ($p \leq 0.05$).

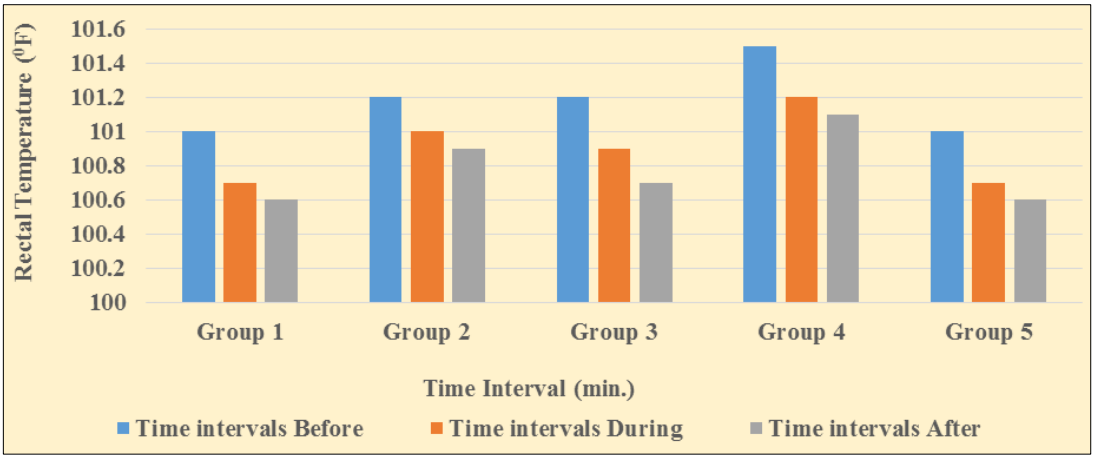

Fig 1: Rectal Temperature (^{0}F) before, during and after treatment in skin and subcutaneous tumours affected animals.

Rectal temperature in all the groups of animals showed a non-significant increase before, during and after treatment. The mean increased values of rectal temperature ranged from 100.6 ± 0.16 ^{0}F to 101.5 ± 0.40 ^{0}F in different groups of animals at various intervals.

Similar observations had been observed by Swamy (2016) [38] on the day of surgical excision of neoplasms in all the animals. The mean physiological parameters recorded at different intervals were within the normal range as supported by Naik (2010) [25] with minor fluctuations which were statistically non-significant. Singh *et al.* (2020) [35] who found the lesions at the anterior portions especially in the facial and neck region where body temperature of infected cattle was normal (101^{0}F). Nehru *et al.* (2017) [27] estimated the physiological parameters were within the normal range in case of bovine papillomatosis.

Bhimappa *et al.* (2016) [4] observed that the rectal temperature was within the normal range on his research. He postulated that there was no significant difference between the groups and between the different intervals of the study. Likewise, Rao *et al.* (2014) [31] also diagnosed nonsignificant increase in body temperature in different treatment groups after 72 hrs of treatment. A nonsignificant increase in body temperature might be due to surgical trauma causes surgical stress might have stimulated sympathetic nervous stimulation resulting in increased metabolic activity as suggested by Boddie (1969) [5].

Guyton (1981) [15] emphasized that neurotransmitter activated following surgical trauma stimulated glycogenolysis. Which increases cellular activity, culminating in increased body temperature. Similar finding was recorded in cattle by Campbell *et al.* (1979) [10], in buffaloes by Peshin and Kumar (1983) [28] and in neonate calves by Sharma *et al.* (2006) [40]. Decreased rectal temperature might be due to depression of thermoregulatory centre by xylazine (Sharma *et al.*, 2006) [40]. Chandrashekar *et al.* (2003) [11] also suggested fall in rectal temperature in calves after administration of xylazine or combination with ketamine cause depression of thermoregulatory centre by xylazine. Maskray *et al.* (1970) [24] investigated that Alpha-2 agonists activated the

hypothalamic- alpha- receptors inhibiting the heat conserving mechanism whereas reduced basal metabolic rate and muscle activities causes less heat production in the body and depression of thermoregulation might have resulted in decreased body temperature (Ponder and Clark, 1980) [29].

Heart rate (beats/min.)

The value of heart rate (beats/min.) in different groups of animals at various time intervals before, during and after treatment in animals affected with skin and subcutaneous tumours are given Table 2 and shown in Fig. 2.

Table 2: Effect on Heart rate (beats/min) in different groups at various time intervals.

Groups	Time intervals		
	Before	During	After
Group 1	72.5 ± 0.42^{a}	70.6 ± 0.21^{b}	70.8 ± 0.30^{b}
Group 2	72.0 ± 0.44^{a}	70.6 ± 0.33^{b}	70.8 ± 0.30^{b}
Group 3	71.8 ± 0.30^{a}	70.5 ± 0.34^{b}	70.3 ± 0.21^{b}
Group 4	72.5 ± 0.42^{a}	70.6 ± 0.33^{b}	70.5 ± 0.22^{b}
Group 5	71.8 ± 0.47^{a}	70.8 ± 0.30^{ab}	70.6 ± 0.21^{b}

Note: Mean value (± standard error of mean) with different superscript in a column varied significantly ($p \leq 0.05$).

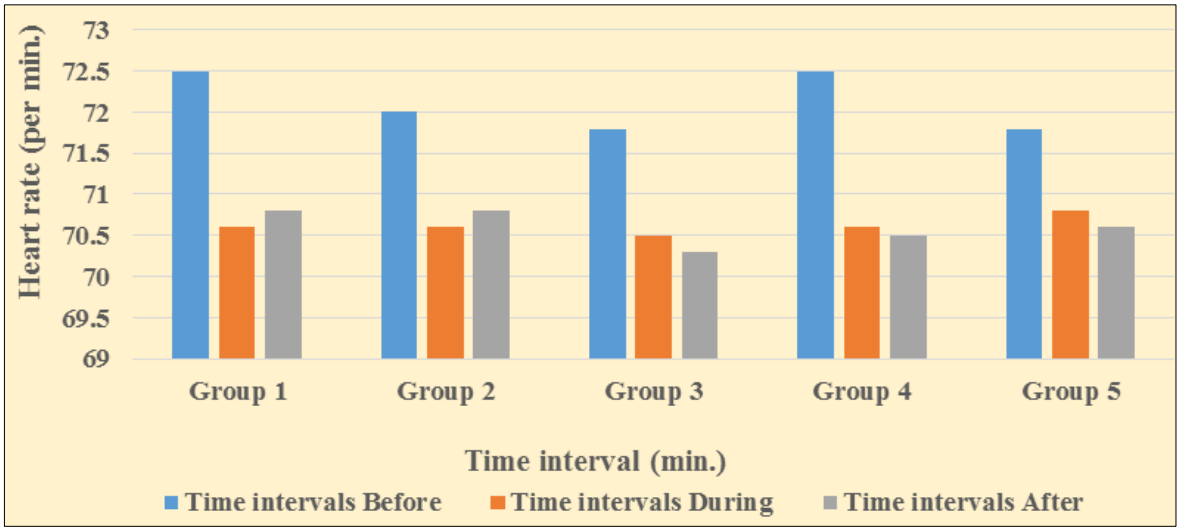

Fig 2: Heart Rate (per min.) before, during and after treatment in skin and subcutaneous tumours affected animals.

Heart rate in the groups (I, II, III and IV) of animals showed a significant ($P< 0.05$) increase value whereas in all four groups. There was significant difference between before and during as well as before and after treatment. In group V non-significant variation was found at different time interval. The mean increased values of heart rate ranged from 70.3 ± 0.21 beats/min to 72.5 ±0.42 beats/min. in different groups of animals at various intervals of treatment.

Boddie (1969) [5] recorded slight increase of heart rate following horn amputation might be due to pain which reflex accelerated pulse causes tissue damage and release of substances like histamine, bradykinin, prostaglandin, excess of potassium ions and proteolytic enzymes (Guyton, 1981) [15]. Similar to present study, Bulgouda (2014) [9] also suggested non-significant effect of horn cancer and its treatment on heart rate because most of the animals with normal physiological parameters during presentation. The elevated heart rate in the present study might be due to release of histamine and bradykinin which stimulates pain receptors at nerve endings (Rao *et al.*, 2014) [31]. Bhimappa *et al.* (2016) [4] also not found any significant difference between the groups or between different intervals on their study.

Respiration rate (per min.)

The value of respiration rate (per min.) in different groups of animals at various time intervals before, during and after treatment in animals affected with skin and subcutaneous tumours are given in Table 3 and shown in Fig. 3.

Table 3: Effect on Respiration (per min) rate in different groups at various time intervals.

Groups	Time intervals		
	Before	During	After
Group 1	28.6 ± 0.33^{a}	27.1 ± 0.40^{b}	26.5 ± 0.42^{b}
Group 2	29.5 ± 0.42^{a}	28.3 ± 0.55^{a}	26.6 ± 0.42^{b}
Group 3	29.3 ±0.21^{a}	27.6 ± 0.33^{b}	27.0 ± 0.36^{b}
Group 4	30.1 ± 0.60^{a}	28.6 ± 0.55^{ab}	28.3 ± 0.42^{b}
Group 5	29.6 ± 0.42^{a}	28.0 ± 0.36^{b}	27.6 ± 0.49^{b}

Note: Mean value (± standard error of mean) with different superscript in a column varied significantly ($p \leq 0.05$).

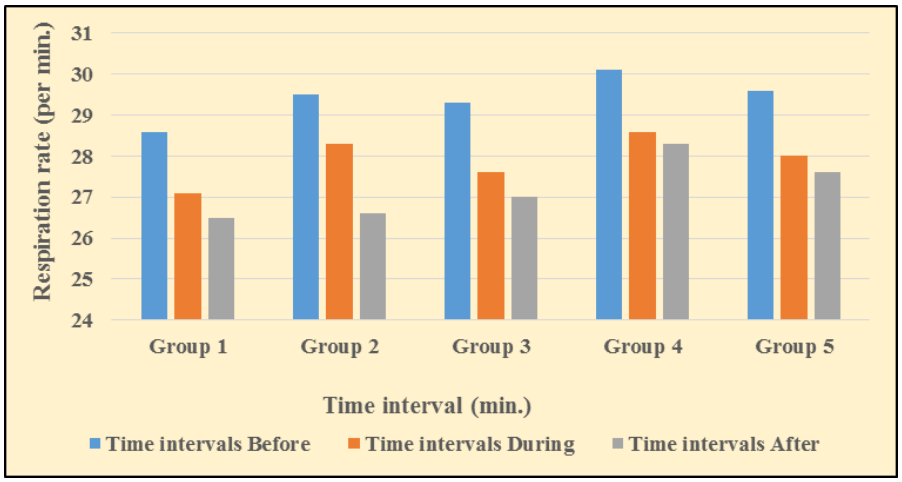

Fig 3: Respiration Rate (per min.) before, during and after treatment in skin and subcutaneous tumours affected animals.

A significant ($P< 0.05$) decrease was noticed between time interval (before and during; before and after) in groups (I, III and V). In group II showed significant deviation between time interval (before and after; during and after) whereas in group IV, non-significant variation in respiration rate was observed. The mean decreased values of respiration rate ranged from 26.5 ± 0.42 per min. to 30.1 ± 0.60 per min. in different groups of animals at various intervals.

Decreased respiration rate might be due to depressed respiratory centre through stimulation of supraspinal adrnoreceptors following systemic absorption of the drugs. Lin *et al.*, (1998) [23] and Prado *et al.*, (1999) [30] whereas transient rise in respiration rate was recorded in each of the treatment groups at 6 hrs post treatment that might be due to reflax stimulation of respiratory center (Boddie, 1969) [5]. The initial decrease in respiration rate might be due to direct depressive effect of Alpha-2 agonist on CNS in general and specific to respiratory center (Tiwari *et al.*, 1997) [41] or could be due to hypoventilation, direct depression of the respiratory regulatory centre (Kumar and Thurmon, 1979) [20] and decreased cardiac output (Campbell *et al.*, 1979) [10].

Kumar *et al.* (2000) [21] reported non-significant rise in the mean respiration rate for varying period and attributed this rise in respiration rate due to stress of surgery or stress of antineoplastic drug. Bhimappa *et al.* (2016) [4] evaluated that the respiration rate was within the normal limits on all the days of observation and in all bullocks of different groups. There was no significant difference between the groups and between the days of observation.

The reduction in immediate post-operative period might due to stress induced by surgery stimulating the adreno-cortical phase and in addition, due to blood loss during surgery in cases like horn cancer. The other values showed minor variations at different intervals which were within normal physiological limits and statistically non-significant (Swamy, 2016) [38]. No specific reasons were attributed to these changes. It was in accordance with the findings of Bharadwaj *et al.* (1986) [6] in fibroma of bovine reticulum. Contrary to this Rao *et al.* (2014) [31] estimated elevation in respiration rate in different treatment groups after 72 hrs of treatment.

Haematological parameters

Haemoglobin (gm/dl)

The mean values of haemoglobin (gm/dl) before, during and after treatment in different groups of animals at various intervals in animals affected with skin and subcutaneous tumours are given in Table 4 and shown in Fig. 4**.**

Table 4: Effect on Haemoglobin (gm%) in different groups at various time intervals.

Groups	Time intervals		
	Before	During	After
Group 1	14.20 ± 0.23^{a}	12.86 ± 0.45^{ab}	12.51 ± 1.73^{b}
Group 2	14.15 ± 0.25	13.68 ± 0.24	13.50 ± 0.23
Group 3	13.68 ± 0.45	13.05 ± 0.62	12.91 ± 0.57
Group 4	13.36 ± 0.37	13.10 ± 0.37	12.90 ± 0.38
Group 5	13.41 ± 0.44	13.11 ± 0.44	12.83 ± 0.44

Note: Mean value (± standard error of mean) with different superscript in a column varied significantly ($p \leq 0.05$).

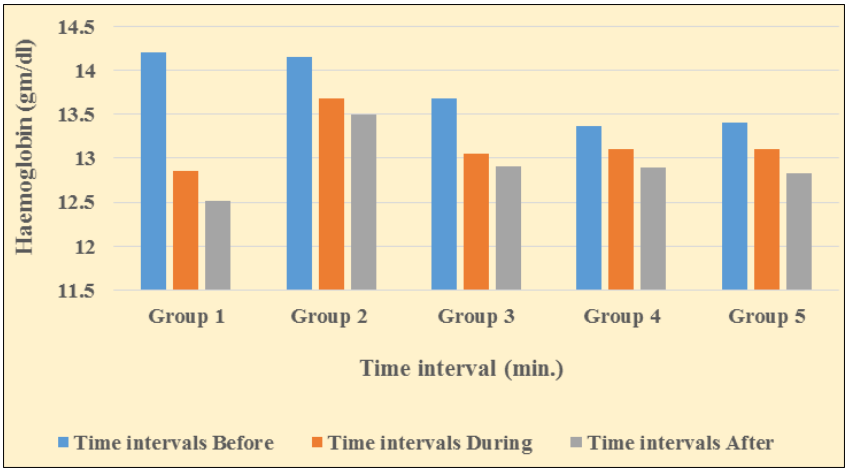

Fig 4: Haemoglobin (gm/dl) before, during and after treatment in skin and subcutaneous tumours affected animals.

Haemoglobin showed a non-significant decrease value at various intervals in between and within a groups. These values ranged between 12.51 ± 1.73 gm/dl to 14.20 ± 0.23 gm/dl.

Haematological studies of CWT affected cattle and buffaloes showed significant decrease in Heamoglobin value (Jana, 2015) [16]. Mean values of haemoglobin were found within normal range in all the groups of bullocks at all the intervals in research (Bhimappa *et al.*, 2016) [4].

Similar findings had also been supported by Rao *et al.* (2014) [31] between different treatment groups during post-operative periods but on the contrary, they recorded values within the normal levels as that of healthy control group. In line with the present study, constant and linear inclining trend of haemoglobin level was reported by Udharwar *et al.* (2008) [42]. Effect of vincristine sulphate on reticulo endothelial system and myelo-suppression could be the contributing factor in lowering of haemoglobin in group B and D (Dinesh *et al*, 1993) [14].

Kuldeep *et al.* (2018) [19] found increased haemoglobin level after 12 days of treatment. Initial drop of haemoglobin in treatment groups could be attributed to sedation with xylazine and as a result of carcinoma (Somvanshi *et al.* 1985) [39]. Lower level of haemoglobin in horn cancer is suggestive of anaemia and is in accordance with the findings of Nimje (1984) [26].

Packed Cell Volume (%)

The mean values of packed cell volume (%) before, during and after treatment in different groups of animals at various intervals are given in Table 5 and shown in Fig. 5.

Table 5: Effect on PCV (%) in different groups at various time intervals.

Groups	Time intervals		
	Before	During	After
Group 1	43.83 ± 0.47	41.83 ±0.47	42.83 ± 0.47
Group 2	42.66 ± 0.42	40.50 ± 0.42	41.66 ± 0.42
Group 3	42.66 ± 0.88	40.33 ± 0.98	41.50 ± 0.92
Group 4	41.50 ± 1.17	39.33 ± 1.11	40.16 ± 1.01
Group 5	41.16 ± 0.94	39.16 ± 0.87	39.16 ± 0.90

Note- Mean value (± standard error of mean) with different superscript in a column varied significantly ($p \leq 0.05$).

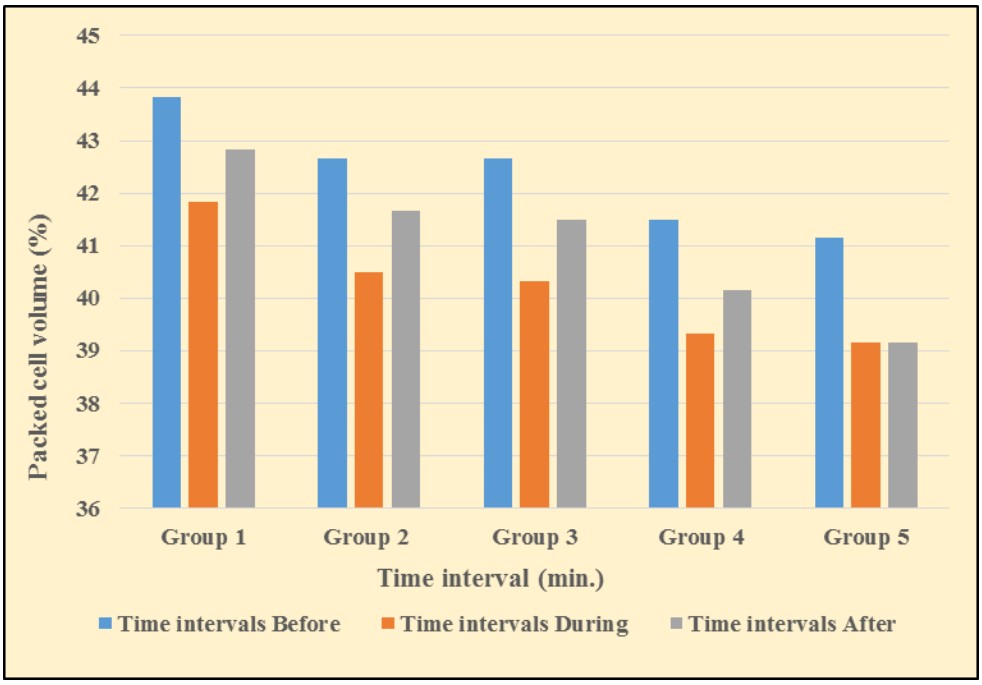

Fig 5: Packed cell volume (%) before, during and after treatment in skin and subcutaneous tumours affected animals.

The packed cell volume showed a non-significant decrease in all the treatment groups at various intervals. The PCV values ranged from 39.16 ± 0.90 % to 43.83 ± 0.47 % in different groups of animals at various intervals.

Similar to present study, Kuldeep *et al.* (2018) [19] also recorded lower PCV value in animals with horn cancer as compared to healthy animals. Haematological studies of CWT affected cattle and buffaloes showed significant decrease in packed cell volume (Jana, 2015) [16]. Lowering of PCV level in different treatment groups could be due to sedation with xylazine leads to pooling of the circulating blood cells in the spleen or secondary to decreased sympathetic activity of body (Jean *et al.*, 1990) [17] whereas increased level of PCV after initial fall was reported by Kuldeep *et al.* (2018) [19]. However Rao *et al.* (2014) [31] isolated non-significant changes in PCV upto 5th post-operative day.

Total Leucocyte Count (Thousands/mm^3)

The mean values of total leucocyte count (Thousands/mm^3) before, during and after treatment in different group of animals at various intervals are given in Table 6 and shown in Fig. 6.

Table 6: Effect on TLC (x 10^3 cumm-1) in different groups at various time intervals.

Groups	Time intervals		
	Before	During	After
Group 1	11.08 ± 0.26^a	10.33 ± 0.29^{ab}	9.86 ± 0.41^a
Group 2	11.21 ± 0.28	10.98 ± 0.28	10.85 ± 0.27
Group 3	11.40 ± 0.48	10.95 ± 0.71	10.58 ± 0.81
Group 4	11.80 ± 0.39	11.60 ± 0.38	11.43 ± 0.38
Group 5	11.61 ± 0.41	11.30 ± 0.41	11.13 ± 0.39

Note: Mean value (± standard error of mean) with different superscript in a column varied significantly ($p \leq 0.05$).

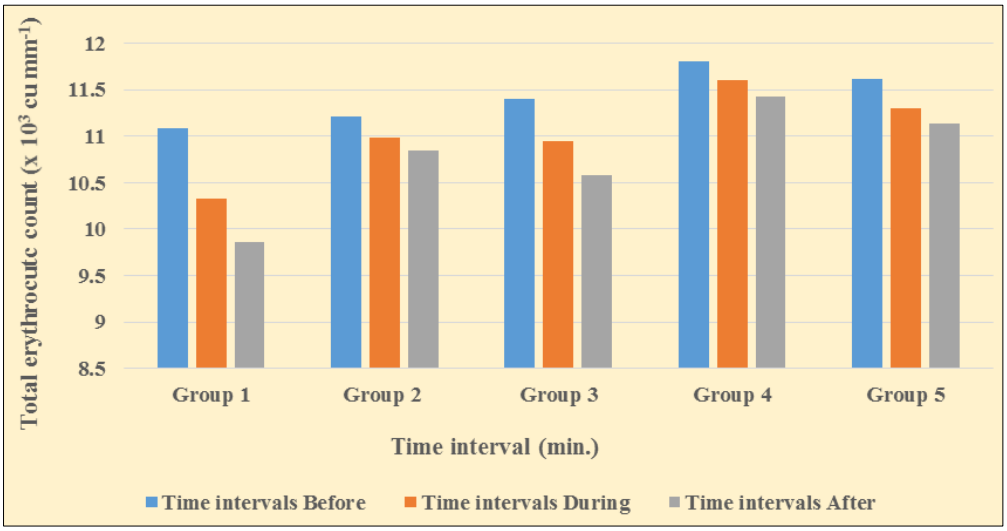

Fig 6: Total erythrocyte count (x 10^3 cu mm^{-1}) before, during and after treatment in skin and subcutaneous tumours affected animals.

There was significantly increased value of TLC count was observed before and after treatment in group I whereas in other groups non-significant changes was noticed. The values ranged between 9.86 ± 0.41 to 11.80 ± 0.39 before and after surgery.

Jana (2015) [16] found on his haematological studies of CWT affected cattle and buffaloes showed significant rise in the total leucocyte count. Also, Shastry and Degloorkar (1981) [36] recorded high peripheral leukocyte count in malignant lymphoma in a cow. Haematobiochemical parameters estimated at different intervals were also within normal range in all animals which was in agreement with Kaneko (1997) [18] and Bhimappa *et al.* (2016) [4].

Benjamin (2007) [2] found except haemoglobin values, significantly reduced immediately after surgery later returned to normal on the 7th post-operative day with statistical significance level. Other researchers like, Kuldeep *et al.* (2018) [19] also found leukocytosis in animals affected with horn cancer. On contrary, Udharwar *et al.* (2008) [42] suggested decrease in total leukocyte count in animal suffering from horn cancer. Uharwar *et al.* (2008) [42] and Kuldeep *et al.* (2018) [19] also observed declined trend of TLC upto 7th day and 12th day, respectively after treatment of horn cancer with vincristine whereas post-operatively non-significant changes in TLC was suggested by Rao *et al.* (2014) [31].

Jean *et al.* (1990) [17] and Wagner *et al*. (1991) [44] noticed that decreased TLC count might be due to migration of fluid from extravascular to intravascular compartment as a result of anaesthesia or sedation. Almost similar differential leucocyte count was recorded in squamous cell carcinoma by Rao and Rao (1986) [32]. On contrary, Rajan *et al.* (1979) [33] found lymphocytosis on his study.

Differential Leucocyte Count (DLC) (%)

Neutrophils (%)

The mean values of neutrophils (%) before, during and after treatment in different groups of animals at various intervals are given in Table 7 and shown in Fig. 7.

Table 7: Effect on Neutrophil count (%) in different groups at various time intervals.

Groups	Time intervals		
	Before	During	After
Group 1	37.63 ± 3.15	36.41 ± 2.67	35.31 ± 1.44
Group 2	43.10 ± 2.84	40.55 ± 2.43	38.38 ± 1.71
Group 3	38.26 ± 2.08	36.70 ± 1.76	36.20 ± 1.56
Group 4	37.65 ± 3.20	35.65 ± 2.86	33.78 ± 1.96
Group 5	41.30 ± 2.52	38.88 ± 2.31	37.31 ± 2.01

Note: Mean value (± standard error of mean) with different superscript in a column varied significantly ($p \leq 0.05$).

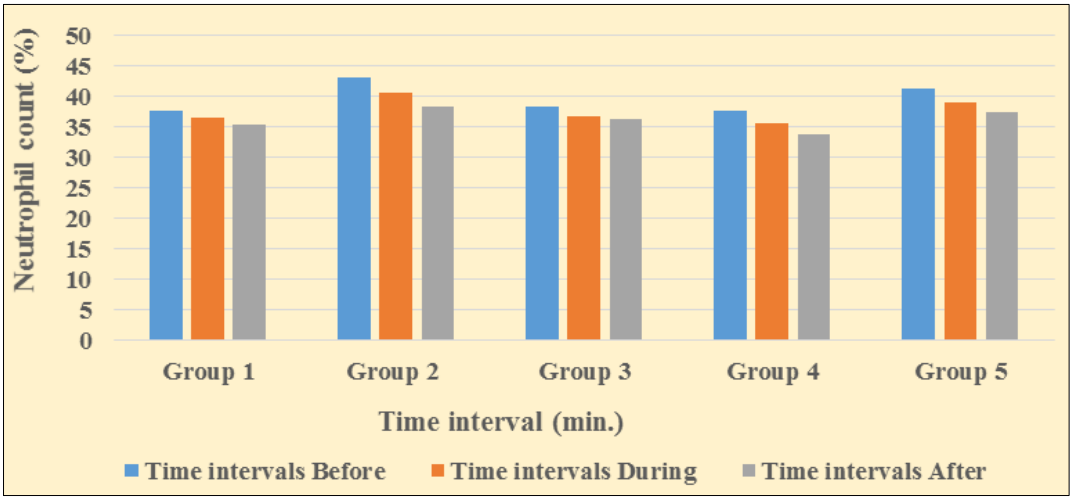

Fig 7: Neutrophil count (%) before, during and after treatment in skin and subcutaneous tumours affected animals.

A non-significant elevation in neutrophils value were observed in all the five groups at different time interval of treatment. The increased values ranged from 33.78 ± 1.96 percent to 43.10 ± 2.84 percent. In addition, Baniadam *et al.* (2010)[1] evaluated moderate neutrophilia and eosinophilia in a cow affected with nasal squamous cell carcinoma with normal vital signs.

Lymphocytes (%)

The mean values of lymphocytes (%) before, during and after treatment in different groups of animals at various intervals are presented in Table 8 and shown in Fig. 8.

Table 8: Effect on Lymphocyte count (%) in different groups at various time intervals.

Groups	Time intervals		
	Before	During	After
Group 1	53.66 ± 1.70^{b}	55.25 ± 1.40^{ab}	58.11 ± 0.57^{a}
Group 2	53.76 ± 2.21	55.56 ± 1.80	59.00 ± 0.66
Group 3	55.23 ± 1.58^{b}	56.80 ± 1.28^{ab}	59.60 ± 0.54^{a}
Group 4	56.71 ± 1.67	58.23 ± 1.35	60.70 ± 0.63
Group 5	58.76 ± 0.32^{b}	60.08 ± 0.42^{b}	61.75 ± 0.72^{a}

Note: Mean value (± standard error of mean) with different superscript in a column varied significantly ($p \leq 0.05$).

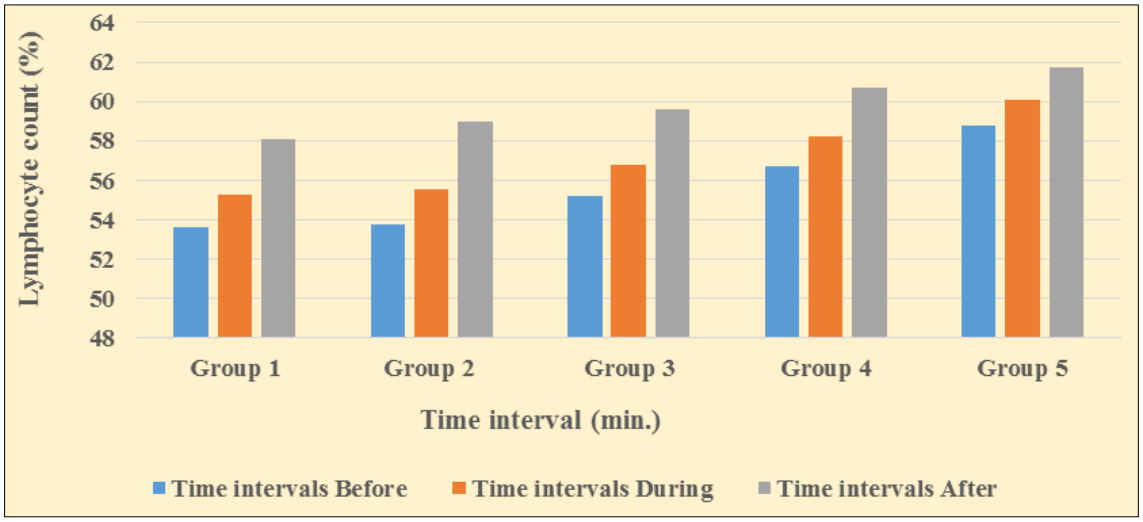

Fig 8: Lymphocyte count (%) before, during and after treatment in skin and subcutaneous tumours affected animals.

A significant lower value expressed by group V between the time interval of before and after treatment. The decreased values ranged between 53.66 ± 1.70 percent to 61.75 ± 0.72 percent.

Cattle and buffaloes affected with CWT showed significant decrease in the lymphocytes (Jana, 2015) [16].

Monocytes (%)

The mean values of monocytes (%) before, during and after treatment in different groups of animals at various intervals are presented in Table 9 shown in Fig. 9.

Table 9: Effect on Monocyte count (%) in different groups at various time intervals.

Groups	Time intervals		
	Before	During	After
Group 1	4.51 ± 0.31^{b}	4.91 ± 0.33^{ab}	5.56 ± 0.24^{a}
Group 2	5.60 ± 0.32^{b}	6.00 ± 0.31^{ab}	6.60 ± 0.19^{a}
Group 3	5.20 ± 0.46	5.76 ± 0.42	6.25 ± 0.34
Group 4	5.38 ± 0.28^{b}	5.80 ± 0.22^{b}	6.31 ± 0.25^{a}
Group 5	5.63 ± 0.26^{b}	6.11 ± 0.30^{ab}	6.70 ± 0.21^{a}

Note: Mean value (± standard error of mean) with different superscript in a column varied significantly ($p \leq 0.05$).

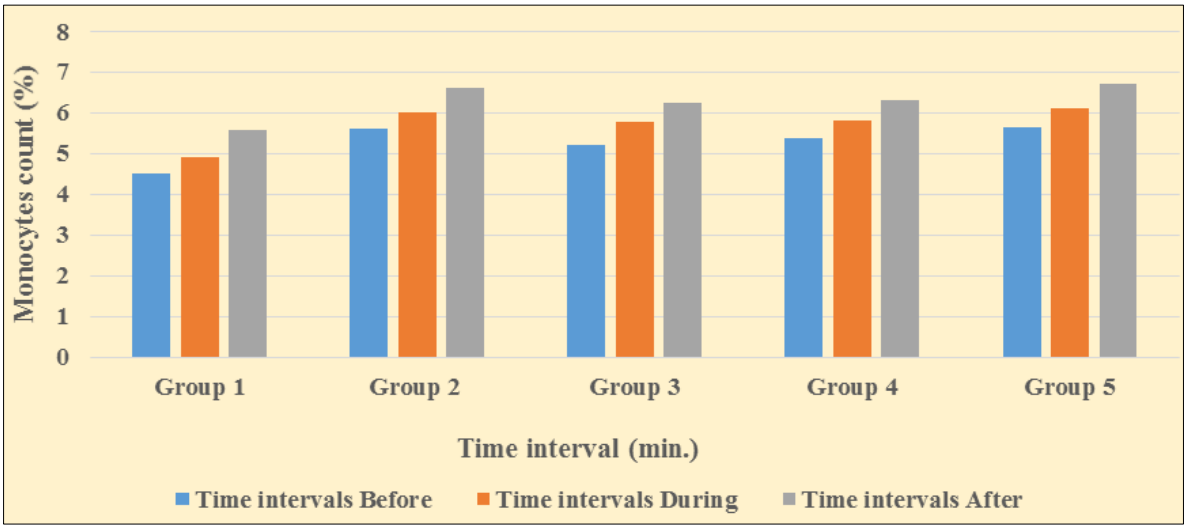

Fig 9: Monocytes count (%) before, during and after treatment in skin and subcutaneous tumours affected animals.

The Monocyte count fluctuated significantly at different time intervals after various treatment. These values ranged from 4.51 ± 0.31 percent to 6.70 ± 0.21 percent in all the groups of animals at various intervals. Similar finding was also observed by the Jena (2015). Udharwar *et al.* (2008) [42] also tested increasing trend of lymphocytes and monocytes whereas declining trend of neutrophils and eosinophils over progress of time post treatment.

Eosinophils (%)

The mean values of eosinophils (%) before, during and after treatment in various groups of animals at different time intervals are given in Table 10 and shown in Fig. 10.

Table 10: Effect on Eosinophil count (%) in different groups at various time intervals.

Groups	Time intervals		
	Before	During	After
Group 1	6.11 ± 0.46^{a}	4.60 ± 0.30^{b}	6.46 ± 0.29^{a}
Group 2	5.20 ± 0.35^{a}	3.83 ± 0.19^{b}	5.55 ± 0.18^{a}
Group 3	4.58 ± 0.53^{ab}	3.53 ± 0.40^{b}	5.38 ± 0.30^{a}
Group 4	5.20 ± 0.26^{a}	3.45 ± 0.33^{b}	4.93 ± 0.20^{a}
Group 5	5.68 ± 0.04^{a}	4.17 ± 0.31^{b}	5.21 ± 0.31^{a}

Note: Mean value (± standard error of mean) with different superscript in a column varied significantly ($p \leq 0.05$).

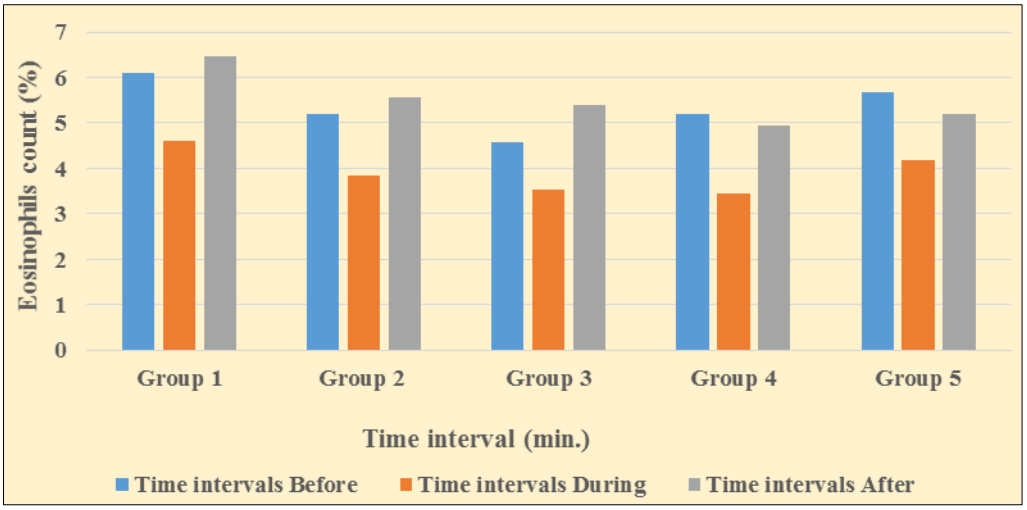

Fig 10: Eosinophils count (%) before, during and after treatment in skin and subcutaneous tumours affected animals.

A highly significant variation in eosinophil count was observed in all groups in different time interval whereas in group III the value was lowest during the treatment. In groups (I, II, IV and V) significant variation found at various intervals in different treatment and the values ranged from 3.45 ± 0.33 percent to 6.11 ± 0.46 percent in all the groups of animals at various intervals.

Rao and Rao (1986) [32] recorded differential leukocyte count in a buffalo bull affected with squamous cell carcinoma of frontal sinus. As per his record the lymphocytes were 59.7%, neutrophils 38.2% and eosinophils 1.7% in this animal suffering from horn cancer. Baniadam *et al.* (2010) [1] identified moderate eosinophilia in a cow affected with nasal squamous cell carcinoma with normal physiological signs on his research. On the contrary Chauhan *et al.* (1981) [12] observed lymphopaenia, eosinopaenia, anemia and higher erythrocyte sedimentation rate values whereas Nimje (1983) [26] noticed microcytic hypochromic anaemia in bovines. The values of haemoglobin, total leukocyte count and total thrombocyte count in case of ocular squamous cell carcinoma were not significantly different from normal animals. However, packed cell volume was significantly higher than the normal animals suggested by Bhume *et al.* (1990) [7].

Bhaskar *et al.* (2010) [3] reported that no significant changes in haematological parameters such as haemoglobin and total erythrocyte count in bullocks suffering from eye cancer. Similar to the present study Chaudhary *et al.* (2010) [13] postulated neutrophilia and lymphopaenia in cases of squamous cell carcinoma.

Over all, the DLC could not provide a key in the diagnosis and prognosis of horn cancer in animals, though there were lymphopenia and neutrophilia. On the other hand haematological findings definitely showed a secondary anaemia with reduced cell counts and haematocrit values. There are several other conditions where/in such changes may occur, Changes in climate, breed, nutrition, management and stress might also alter these values besides the disease conditions.

Conclusion

It was concluded that neoplastic growth affect the normal physiological and haematological values and also depends upon the time of presentation i.e. early or delayed, location of the mass, type of treatment and effect on vital part.

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