International Journal of Science, Environment and Technology, Vol. 8, No 4, 2019, 882 – 895

ISSN 2278-3687 (O)
2277-663X (P)

CLINICO-PHYSIOLOGICAL AND HAEMATO-BIOCHEMICAL ALTERATIONS IN NON- PENETRATING FOREIGN BODY SYNDROME WITH REFERENCE TO THE PERCENTAGE OF PLASTIC IN CATTLE

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Abstract: The present study was conducted on 36 clinical cases of cattle affected with non-penetrating foreign body syndrome which were subjected for lapro-rumenotomy and grouped according to the percentage of plastic recovered in relation to the body weight of animal as group I (1-5%), group II (5-10%) and group III (10-20%). The present paper emphasizes on the various clinico-physiological and haemato-biochemical alterations which occur inside the animal body in relation to the percentage of plastic inside rumen on 0^{th} day preoperatively and 7^{th} and 15^{th} day postoperatively. It was concluded that plastic foreign body has a profound impact on the health status of cattle and it significantly alters the clinico-physiological and haemato-biochemical parameters in relation to the percentage of plastic.

Keywords: Non-penetrating foreign body, cattle, percent of plastic, haematological parameters, Biochemical parameters.

Introduction

Due to the advent of modern civilization, the era of industrialization and urbanization the country's greenery has started gradually diminishing. Due to industrialization and changed lifestyle of the people, use of plastics has become a common practice. The kitchen waste is being discarded in thin plastic bags. Cows and buffaloes swallow plastic bags in an attempt to eat food materials present in them. The indiscriminate ingestive behavior of cattle predisposes them to accidental swallowing of both penetrating and non- penetrating foreign bodies as they are not having sensitive prehensile organs and sense of taste (Udall 1964). One particular condition of relevance is 'Pica' wherein the affected animals develop the urge to ingest non-edible and indigestible material such as plastic, wood, stone etc. just to satisfy their allotrophagic cravings. Ruminal tympany due to metallic or non metallic (mostly polythene material) objects are among the most common cause of gastro intestinal disorders

*Received July 10, 2019 * Published Aug 2, 2019 * www.ijset.net*

in ruminants (Radostatis *et al*, 1994). These non-penetrating foreign bodies remain in the rumen without getting cleared. They cause multitude rumen dysfunction such as indigestion, ruminal impaction and failure of eructation. Non-penetrating foreign body syndrome is emerging as a silent killer disease and contributes a lot for reduced production, productivity and death of animal affecting mostly the bovines followed by sheep and goats. Further, the effects of these non penetrating foreign bodies such as plastic bags, nylon rope etc on the nutrition and health aspect of cattle has not been elucidated. Keeping in view the growing incidence of disease, economic losses in terms of low milk yield and death of animals, this study was undertaken which emphasizes on the various clinico-physiological and haemato-biochemical changes which occur inside the animal body due to the ingestion of non-penetrating foreign bodies.

Materials and Methods

The present study was conducted on 36 clinical cases of non- penetrating foreign body syndrome in cattle irrespective of age, sex, productive and reproductive status. All the cases were subjected for lapro-rumenotomy operation and they were divided into 3 groups consisting of 12 animals in each group. Group I comprised of (1-5 %) plastic, Group II (5-10%) and Group III (10-20 %) plastic in relation to the body weight of animal. The clinico-physiological parameters like general body condition, appetite, posture, rectal temperature, heart rate, respiration rate and ruminal motility were studied on 0^{th} day preoperatively and 7^{th} and 15^{th} day postoperatively. Similarly the haematological parameters like haemoglobin, packed cell volume, total leucocyte count, differential leucocyte count, total erythrocyte count and biochemical parameters like serum glucose, serum alkaline phosphatase, serum calcium, serum phosphorus, blood urea nitrogen, serum creatinine and serum total protein were estimated on 0^{th}, 7^{th} and 15^{th} postoperative day in all the three groups. The data collected during the present study was statistically analyzed as per WASP -2, ICAR GOA. A two-way factorial design was used to analyze the significance of difference between the three groups having varying amount of plastic. Significance level was set at P=0.01 and P= 0.05.

Results and Discussion

Clinical Parameters: In the present study the various clinical parameters like general body condition, appetite, posture recorded in group I, II and III are depicted in table no.1,2 and 3.

General body condition: General body condition was evaluated by observing the body condition and mucous membrane of individual animal. In group I body condition was found

to be good to average in all the animals having normal to moderately anaemic mucous membrane. In group II 50% of the animals exhibited average body condition whereas in remaining 50% animals poor to emaciated body condition was observed. Anaemia was observed in most of the animals of group II except 2 animals which had normal mucous membrane. Anaemia was observed in all the animals of group III with poor to emaciated body condition on 0^{th} day preoperatively. The general body condition improved significantly by 7^{th} day in group I animals except one animal (cow no.36) which had penetrating foreign body (nails) inside the reticulum, whereas in group II and III the body condition gradually improved towards average by 7^{th} day postoperatively and improved significantly by 15^{th} day postoperatively. In the present study anaemia was observed in most of the cases in group II and III. Igbokwe et al. (2003) also reported similar findings and opined that it might be due to interference of foreign body with the process of fermentation and absorption of volatile fatty acids leading to poor body condition. They further opined that ingestion of foreign body is mainly related with nutritional deficiencies and affected animals manifest nutritional anaemia. Vanitha et al.(2010) also reported that out of the 30 cases which were suspected for ruminal impaction due to plastic, 21 cases exhibited anaemia.

Appetite: In group I animals, the appetite was found to be partially reduced or reduced in most of the animals except two animals in which the appetite was totally absent. In group II the appetite was absent in about 50% of cases and was reduced or partially reduced in another 50% animals, whereas in group III 9 cows (75 %) exhibited complete anorexia whereas significantly reduced appetite was observed in 3 cows (25%) on 0^{th} day preoperatively. After rumenotomy, supportive post-operative therapy to normalize the ruminal ecosystem was administered to all the animals of the three groups. Group I animals showed remarkable improvement in appetite from the very next day after surgery and regained normal feed intake by 7^{th} postoperative day whereas in group II and III moderate improvement in feed intake was observed by 7^{th} day but all the animals regained normal appetite by 15^{th} day postoperatively. Inappetance to complete anorexia was observed in all the animals of group I,II and III. Reddy et al.(2004) observed inappetance in animals with indigestible foreign bodies in rumen and reticulum. Mohammed and Mohammed (2007) observed inappetance in clinical cases of fatal polythene bag rumen impaction in cattle at the National Animal Production Research Institute Shika –Zaria, Nigeria. Khose et al.(2010) observed anorexia in a 6 year old cow which was severely impacted with foreign materials. Similar findings have been observed by Raidurg (2010), Vanitha et al. (2010), Mersha Chanie et al. (2012) and

Anwar et al.(2013). Inappetance and anorexia in the present study may be due to physical presence of foreign body mass and stretching of the cranial sac of rumen which could stimulate ventro-medial hypothalamus and satiety centre leading to loss of appetite as reported by Ghurashi et al. (2009).

Posture: The posture of all the animals of group I was normal except one animal (cow 36) which showed abnormal posture with arched back. In group II two animals (Bull 29 and Bull18) were recumbent and arching of back with bilateral abdominal distension was found in one animal (cow 33) while rest of the cows had normal posture. In group III lateral recumbency was observed in three animals (cow 4, cow 8 and bull 15) and abnormal posture with arching of back was observed in one animal. (cow 16) and rest of the animals exhibited normal posture on 0^{th} day preoperatively. In group I arched back posture was exhibited by one animal (cow 36) which might be due to presence of a nail inside the reticulum which was recovered while rumenotomy operation, whereas in group II and III arched back posture with bilateral abdominal distension might be attributed to huge quantity of non-penetrating foreign bodies in rumen. Rohi (2003). Similar findings were reported by Misk et al. (1984) and Bulgin and Anderson (1986). After operation the animals had regained normal posture due to the removal of plastic.

Table 1: Clinical parameters like General body condition, Appetite and Posture in relation to the percentage of Plastic

Group I

Sr.No.	Animal no.	Body wt .of animal	Quantity of Plastic recovered	% of plastic recovered	General Body condition		Appetite	Posture
					Body condition	Mucous membrane		
1	Cow 1	262 kgs	4.5 kgs	1.7 %	Good	Moderately anaemic	Reduced	Normal
2	Cow 3	318 kgs	3.5 kgs	1.10 %	Good	Normal	Partially reduced	Normal
3	Cow 17	248 kgs	6 kgs	2.41 %	Average	Normal	Reduced	Normal
4	Cow 6	350 kgs	7 kgs	2 %	Average	Normal	Reduced	Normal
5	Cow 7	230 kgs	7 kgs	3.04 %	Average	Moderately anaemic	Reduced	Normal
6	Cow 9	230 kgs	2.5 kgs	1.08 %	Good	Normal	Partially reduced	Normal
7	Cow 10	70 kgs	2.5 kgs	3.57 %	Average	Moderately anaemic	Absent	Normal
8	Bull 11	260 kgs	3.5 kgs	1.34 %	Good	Normal	Partially reduced	Normal
9	Cow 13	280 kgs	8 kgs	2.85 %	Good	Normal	Absent	Normal
10	Cow 26	200 kgs	5 kgs	2.5 %	Good	Normal	Reduced	Normal
11	Cow 36	230 kgs	9 kgs	3.91 %	Average	Moderately anaemic	Absent	Abnormal posture with arched back,
12	Cow 25	300 kgs	5.5 kgs	1.8 %	Good	Normal	Reduced	Normal

Table 2: Clinical parameters like General body condition, Appetite and Posture in relation to the percentage of Plastic
Group II

Sr.No	Animal no.	Body wt .of animal	Quantity of Plastic recovered	% of plastic recovered	General Body condition		Appetite	Posture
					Body condition	Mucous membrane		
1	Cow 33	200 kgs	20 kgs	10 %	Emaciated	Anaemic	Absent	Abnormal posture arching of back, bilateral abdominal distension
2	Bull 29	170kgs	15 kgs	8.82 %	Poor	Anaemic	Absent	Recumbent
3	Cow 5	250kgs	17 kgs	6.8 %	Average	Normal	Reduced	Normal
4	Cow 35	260kgs	19 kgs	7.30 %	Average	Anaemic	Reduced	Normal
5	Cow 28	198kgs	12 kgs	6.06 %	Average	Moderately anaemic	Reduced	Normal
6	Cow 21	220kgs	15 kgs	6.81 %	Poor	Anaemic	Partially reduced	Normal
7	Cow 20	300kgs	20 kgs	6.66 %	Average	Moderately anaemic	Reduced	Normal
8	Cow 14	305kgs	18 kgs	5.90%	Good	Normal	Partially reduced	Normal
9	Bull 18	266kgs	21 kgs	7.89%	Emaciated	Anaemic	Absent	Recumbent
10	Cow 22	320kgs	23 kgs	7.18 %	Poor	Anaemic	Absent	Normal
11	Cow 34	150kgs	10 kgs	6.66 %	Emaciated	Anaemic	Absent	Normal
12	Bull 30	309kgs	22 kgs	7.11 %	Average	Normal	Absent	Normal

Table 3: Clinical parameters like General body condition, Appetite and Posture in relation to the percentage of Plastic
Group III

Sr.No	Animal no.	Body wt .of animal	Quantity of Plastic recovered	% of plastic recovered	General Body condition		Appetite	Posture
					Body condition	Mucous membrane		
1	Cow 2	168 kgs	20kgs	11.90 %	Average	Moderately anaemic	Reduced	Normal
2	Cow 4	268 kgs	40 kgs	14.92 %	Poor	Anaemic	Absent	Recumbent
3	Cow 23	200 kgs	39 kgs	19.5 %	Emaciated	Anaemic	Absent	Normal
4	Cow 27	309 kgs	45 kgs	14.56 %	Poor	Anaemic	Absent	Normal
5	Cow 8	270kgs	54 kgs	20 %	Emaciated	Anaemic	Absent	Recumbent
6	Cow 24	250kgs	30 kgs	12 %	Average	Moderately Anaemic	Partially reduced	Normal
7	Cow 19	160kgs	24kgs	15 %	Poor	Anaemic	Absent	Normal
8	Bull 15	290 kgs	50 kgs	17.24 %	Emaciated	Anaemic	Absent	Recumbent
9	Cow 12	240kgs	35 kgs	14.58%	Emaciated	Anaemic	Absent	Normal
10	Cow 16	242kgs	47kgs	19.42 %	Emaciated	Anaemic	Absent	Abnormal posture ,arching of back,bilateral abdominal distension
11	Cow 31	312kgs	51kgs	16.34%	Poor	Anaemic	Absent	Normal
12	Bull 32	350kgs	40 kgs	11.42%	Average	Moderately anaemic	Partially reduced	Normal

Table 4: Mean ± S.E. of Rectal temperature, Heart rate, Respiration rate and Ruminal motility of cattle with rumen impaction due to plastic

Sl.No.	Parameters		Interval			Pooled Mean for group
			0	7	15	
1	Rectal Temperature (°F)	Group I	101.51 ± 0.14	101.47 ± 0.18	101.48 ± 0.15	**101.48** ± 0.09
		Group II	101.29 ± 0.15	101.32 ± 0.14	101.26 ± 0.15	**101.29** ± 0.08
		Group III	101.60 ± 0.14	101.43 ± 0.13	101.41 ± 0.12	**101.48** ±0.07
	Pooled Mean for Interval		**96.40** ± 3.73	**96.34** ± 3.73	**96.32** ± 3.73	
2)	Heart Rate (Beats/min)	Group I	46.33 ± 1.25	46.92 ± 0.90	46.00 ± 0.99	**46.42** ± 0.59
		Group II	44.91 ± 3.54	44.41 ± 3.33	44.06 ± 3.20	**44.46** ± 1.89
		Group III	46.67 ± 1.37	46.33 ± 1.08	45.58 ± 0.86	**46.19** ± 0.64
	Pooled Mean for Interval		**43.77** ± 2.02	**43.69** ± 1.96	**43.05** ± 1.91	
3)	Respiration Rate Breaths /min	Group I	19.08 ± 0.57	17.92 ± 0.41	16.75 ± 0.27	**17.92** ± 0.29
		Group II	17.67 ±0.53	17.67 ±0.40	17.00 ± 0.25	**17.44** ± 0.23
		Group III	18.17 ± 0.47	17.58 ± 0.36	17.00 ± 0.43	**17.58** ± 0.25
	Pooled Mean for Interval		**17.42** ± 0.72	**16.86** ± 0.67	**16.08** ± 0.64	
4)	Ruminal motility/2mins	Group I	0.92 ± 0.22	1.92 ± 0.19	2.75 ± 0.18	**1.86^{B}** ± 0.17
		Group II	0.42 ±0.14	1.50 ± 0.19	2.67 ±0.14	**1.53^{A}** ± 0.18
		Group III	0.25 ± 0.13	1.33 ± 0.14	2.58 ± 0.15	**1.39^{A}** ± 0.18
	Pooled Mean for Interval		**0.52^{I}** ± 0.11	**1.52^{II}** ± 0.12	**2.54^{III}** ± 0.13	

Means bearing different superscript differ significantly.

Physiological Parameters: The variation in physiological parameters like rectal temperature, heart rate, respiration rate and ruminal motility are depicted in (Table.4). The overall mean values for rectal temperature, heart rate and respiration rates differed non-significantly between the three groups as well as at various periodic intervals whereas ruminal motility decreased significantly ($P < 0.01$) in all the three groups but it was more pronounced in group II and III when compared to I. It was observed that the ruminal movements per 2 minutes were considerably reduced in group I, II and III according to the percent of non-penetrating foreign body in forestomach of cattle. The rumen was found to be atonic in many of the cases on 0^{th} day before the removal of plastic in all the 3 groups which gradually increased towards normal by 7^{th} day and 15^{th} day after the removal of plastic in all the groups. The contraction of rumen and reticulum are basically initiated from the biphasic contraction (Blood and Hutchins 1955). Presence of huge amounts of foreign body in forestomach, probably hampers the initiation of biphasic contractions of rumen and reticulum through the vagus nerve to produce subsequent hypomotility and atony of rumen. The above observations go in accordance with Vanitha (2010), Mersha Chanie (2012) and Dodia (2014).

Haematological parameters: The haematological parameters (Table 5) revealed highly significant decrease ($P<0.01$) in the overall mean values of haemoglobin, PCV and total erythrocyte count between the three groups with the lowest value being observed in group III followed by group II and I whereas the TLC values increased significantly ($P<0.01$) between the three groups with the highest value recorded in group III followed by group II and I. Differential leucocyte count revealed neutrophilia with corresponding lymphocytopenia between the three groups but they were more pronounced in group II and III when compared to I. The mean values for monocytes and eosinophils altered significantly ($P<0.01$) between the three groups but within normal limits whereas the basophil count exhibited non-significant variation between the three groups. Highly significant alterations in the haematological parameters were observed at various periodic intervals. The variations observed on 0^{th} day preoperatively were normalized by 15^{th} day after surgical intervention in all the three groups. In the present study the haematological parameters ranged within normal reference range in group I having least quantity of plastic whereas they altered significantly in group II and III having high quantity of plastic.

Table 5: Mean ± S.E. values of Haematological Parameters of cattle with rumen impaction due to plastic

Sr. No.	Parameters	Group	Interval			Pooled mean for group
			0	7	15	
1	Haemoglobin (g/dl)	Group I	8.88 ±0.14	9.46 ± 0.16	10.18 ± 0.18	**9.50^{C} ± 0.38**
		Group II	7.39 ±0.07	7.88 ± 0.08	8.49 ± 0.07	**7.92^{B} ±0.32**
		Group III	6.52 ±0.08	7.31± 0.08	8.16± 0.10	**7.33^{A}±0.47**
		Pooled Mean for Interval	**7.59^{I} ±0.17**	**8.21^{II}± 0.17**	**8.94^{III} ± 0.17**	
2	PCV (%)	Group I	28.17^{b} ± 0.42	36.08^{d} ± 0.80	38.58^{e} ± 0.76	**34.28^{C}** ± 0.84
		Group II	27.67^{b} ± 0.92	32.25^{c} ± 1.18	36.00^{d} ± 0.74	**31.97^{B}** ± 0.79
		Group III	24.33^{a} ± 0.56	27.42^{b} ± 0.68	32.67^{c} ± 0.86	**28.14^{A}** ± 0.70
		Pooled Mean for Interval	**25.48^{I}** ± 1.06	**30.48^{II}**± 1.37	**34.08^{III}** ± 1.41	
3	TLC (x10^{3}/cu.mm)	Group I	9.79^{b} ± 0.16	8.77^{a} ± 0.12	8.12^{a} ± 0.02	**8.89^{A}** ± 0.13
		Group II	11.24^{c} ±0.39	9.45^{b} ± 0.18	8.84^{a} ± 0.12	**9.84^{B}** ± 0.22
		Group III	14.68^{e} ± 0.29	13.54^{d} ± 0.36	11.08^{c} ± 0.38	**13.10^{C}** ± 0.32
		Pooled Mean for Interval	**11.25^{III}** ± 0.56	**9.99^{II}** ± 0.53	**8.84^{I}** ± 0.42	
4	Neutrophils (%)	Group I	38.08^{c} ± 0.75	33.92^{b} ± 0.66	29.67^{a} ± 0.47	**33.89^{A}** ± 0.68
		Group II	44.42^{e} ± 1.05	36.67^{c} ± 0.68	29.50^{a} ± 0.52	**36.86^{B}** ± 1.12
		Group III	50.92^{f} ± 1.03	40.67^{d} ± 1.00	30.67^{a} ± 0.67	**40.75^{C}** ± 1.49
		Pooled Mean for Interval	**42.13^{III}** ± 1.88	**35.17^{II}** ± 1.47	**28.45^{I}** ± 1.13	
5	Lymphocyte (%)	Group I	55.58^{c} ± 0.67	59.17^{d} ± 0.44	62.75^{e} ± 0.48	**59.17^{C}** ± 0.58
		Group II	50.92^{b} ± 0.77	58.17^{d} ± 0.68	63.92^{e} ± 0.36	**57.67^{B}** ± 0.97
		Group III	45.42^{a} ± 1.13	54.33^{c} ± 1.08	62.83^{e} ± 0.64	**54.19^{A}** ± 1.32
		Pooled Mean for Interval	**48.27^{I}** ± 2.01	**54.46^{II}** ± 2.16	**60.04^{III}** ± 2.33	
6	Monocyte (%)	Group I	2.75 ± 0.31	3.33 ± 0.31	3.50 ± 0.26	**3.19^{B}** ± 0.17
		Group II	2.08 ± 0.31	2.33 ± 0.31	2.58 ± 0.29	**2.33^{A}** ± 0.17
		Group III	1.17 ± 0.21	1.83 ± 0.24	2.67 ± 0.39	**1.89^{A}** ± 0.19
		Pooled Mean for Interval	**1.94^{I}** ± 0.19	**2.41^{I}** ± 0.20	**2.79^{II}** ± 0.20	
7	Eosinophils (%)	Group I	3.17 ± 0.30	3.33 ± 0.26	3.75 ±0.25	**3.42^{B}** ± 0.16
		Group II	2.33 ± 0.14	2.58 ± 0.26	3.75 ± 0.25	**2.89^{A}** ± 0.16
		Group III	2.25 ± 0.33	2.83 ± 0.27	3.50 ± 0.31	**2.86^{A}** ± 0.19
		Pooled Mean for Interval	**2.47^{I}**± 0.18	**2.79^{I}** ± 0.18	**3.50^{II}** ± 0.19	
8	Basophils (%)	Group I	0.42 ± 0.14	0.25 ± 0.13	0.33 ± 0.14	**0.33** ± 0.08
		Group II	0.25 ± 0.13	0.25 ± 0.13	0.42 ± 0.15	**0.31** ± 0.07
		Group III	0.25 ± 0.13	0.33 ± 0.14	0.33 ± 0.14	**0.31** ± 0.08
		Pooled Mean for Interval	**0.30** ± 0.07	**0.27** ± 0.07	**0.35** ± 0.08	
9	TEC (x10^{6}/cu.mm)	Group I	5.44 ± 0.19	6.54 ±0.20	7.42 ± 0.22	**6.47^{C}** ± 0.18
		Group II	3.99 ± 0.17	5.18 ± 0.20	6.58 ± 0.23	**5.25^{B}** ± 0.21
		Group III	3.40 ± 0.12	4.26 ± 0.14	5.04 ± 0.20	**4.23^{A}** ± 0.14
		Pooled Mean for Interval	**4.09^{I}** ± 0.22	**5.10^{II}** ± 0.26	**6.07^{III}** ± 0.30	

Means bearing different superscript differ significantly.

Decrease in haemoglobin and total erythrocyte count in the present study could be due to partial or complete anorexia. Significantly lower values of haemoglobin obtained in foreign body rumen impaction cases can be ascribed to gastrointestinal disease and malnutrition as stated by Vanitha et al. (2010b) and Akinrinmade and Akinrinde (2012). Significant decrease in haemoglobin and total erythrocyte count was also observed by Abdelaal et al. (2014) and Dodia et al.(2014). Decreased PCV values in the present study may be due to inadequate dietary intake and dietary deficiency as a result of presence of foreign materials in the rumen as stated by Rouabah et al.(2017). Vijay Kumar et al.(2013) also observed decreased PCV in a 12 years old captive sambar having ruminal impaction with plastic foreign body. Leucocytosis observed in the present study is in concurrence with the findings of Rouabah et al. (2017) who stated that significant increase in WBC in cattle with rumen impaction compared to the control group might be in response to stress and infection. Neutrophilia observed in the present study might have resulted from chronic irritation of the forestomach wall by impacted foreign materials, leaving the wall exposed to secondary infection which resulted in infection (Hailat et al.1996). Meshram (2015) observed neutrophilia in a study conducted on 10 animals with non-penetrating foreign body syndrome. Lymphocytopenia in the present study might be due to release of corticosteroids as a result of stress as stated by Feldman et al.(2000). Dodia et al.(2014) reported lymphocytopenia in 50 clinical cases of stray cattle with plastic foreign body. The animals of all the three groups presented with rumen impaction due to plastic showed normal range of monocyte, eosinophil and basophil count both preoperatively and postoperatively at all the intervals. Similar findings were reported by Boodur (2010) and Vanitha et al. (2010 b).

Biochemical Parameters: The biochemical parameters (Table 6) revealed highly significant decrease ($P<0.01$) in the overall mean values of serum glucose in group II and III having high amount of plastic whereas it ranged within normal limits in group I. The overall mean values for serum alkaline phosphatase increased significantly ($P<0.01$) by 7^{th} and 15^{th} day post-operatively in all the three groups but the values were found to be within normal physiological limits indicating that plastic foreign body does not have any effect on serum alkaline phosphatase. The increase in serum alkaline phosphatase in the present study is suggestive of healing of surgical wound with cessation of cell proliferation, progression of granulation tissue, formation and remodelling. This has been used as a marker for wound healing. Similar findings were also observed by Hussain et al.(2004) and Al-Derawie (2012). The overall mean values for serum calcium and serum phosphorous was lower than normal in

group I but it significantly decreased (P<0.01) in group II and III which might be due to dietary deficiency and failure of calcium absorption due to reduced rumen motility. Dodia et al. (2014) stated that hypocalcemia may be due to low intake of food and water and also inflammatory condition in body due to presence of plastic foreign body. The decreased phosphorous levels in the present study correlates with the findings of Vanitha et al.(2010b) who reported that hypophosphatemia might be due to shortage of feed, perhaps especially of minerals and vitamins.

Table 6: Mean ± S.E. values of Biochemical Parameters of cattle with rumen impaction due to plastic

Sr. No.	Parameters	Group	Interval			Pooled mean for group
			0	7	15	
1	Serum glucose mg/dl	Group I	48.83 ± 2.52	56.67 ± 2.61	61.17 ± 2.02	55.56^{B} ± 3.60
		Group II	38.42 ± 0.80	42.83 ± 0.86	48.17 ± 0.79	43.14^{A} ± 2.82
		Group III	34.42 ± 0.77	42.83 ± 0.86	46.17 ± 0.72	41.14^{A} ± 3.50
		Pooled Mean for Interval	40.56^{I} ± 1.36	47.44^{II} ± 1.44	51.83^{III} ± 1.34	
2	Serum Alkaline phosphatise (IU/L)	Group I	92.33 ± 0.94	102.58 ±1.94	114.50 ± 2.40	**103.14^{A}** ± 1.85
		Group II	92.33 ± 0.94	107.17 ±2.63	117.50 ± 3.97	**105.67^{B}** ± 2.35
		Group III	94.42 ±1.23	103.42 ±1.78	119.92 ± 3.01	**105.92^{B}** ±2.15
		Pooled Mean for Interval	**88.39^{I}** ± 3.44	**99.31^{II}** ± 3.94	**111.53^{III}**±4.54	
3	Serum Calcium (mg/dl)	Group I	8.03^{b} ± 0.13	8.39^{c} ± 0.08	8.98^{d}± 0.04	**8.47^{B}** ± 0.08
		Group II	6.94^{a} ± 0.12	7.75^{b} ±0.10	8.64^{c} ± 0.09	**7.78^{A}** ± 0.13
		Group III	6.83^{a} ± 0.11	7.89^{b} ± 0.11	8.53^{c} ± 0.07	**7.75^{A}**± 0.13
		Pooled Mean for Interval	**6.92^{I}** ± 0.29	**7.62^{II}** ±0.30	**8.29^{III}** ± 0.32	
4	Serum Phosphorous (mg/dl)	Group I	4.33^{a} ± 0.10	5.73^{b} ± 0.08	6.13^{c}± 0.07	**5.40 ^{B}**± 0.14
		Group II	4.94^{a} ± 0.07	5.40^{b} ±0.06	5.95^{c} ± 0.08	**5.43 ^{B}** ± 0.08
		Group III	4.69^{a} ± 0.09	5.20^{b} ± 0.08	5.74^{c} ± 0.08	**5.21 ^{A}**± 0.09
		Pooled Mean for Interval	**4.43 I**± 0.18	**5.18II** ± 0.21	**5.65 III**± 0.22	
5	Blood Urea Nitrogen (mg/dl)	Group I	31.99^{b} ± 0.89	30.22^{a} ± 0.79	27.78^{a} ± 0.36	**30.00^{A}** ± 0.50
		Group II	38.38^{c} ± 0.92	33.38^{b} ± 0.74	29.08^{a} ± 0.66	**33.61^{B}** ± 0.78
		Group III	44.33^{d} ± 1.27	36.70^{c} ± 1.05	28.94^{a} ± 0.60	**36.66^{C}** ±1.20
		Pooled Mean for Interval	**36.21^{III}** ± 1.69	**31.72^{II}** ±1.36	**27.19^{I}** ± 1.08	
6	Serum Creatinine(mg/dl)	Group I	1.22 ± 0.09	1.33 ± 0.07	1.43 ± 0.05	**1.32^{B}** ± 0.04
		Group II	0.81 ± 0.05	0.95 ± 0.04	1.12 ± 0.10	**0.96 ^{A}** ± 0.05
		Group III	0.70 ± 0.05	0.88 ± 0.04	1.19 ± 0.05	**0.93^{A}** ± 0.04
		Pooled Mean for Interval	**0.87^{I}** ± 0.06	**1.01^{II}** ± 0.06	**1.19^{III}** ± 0.06	
7	Serum Total Protein (g/dl)	Group I	6.93^{d} ± 0.07	7.10^{e} ± 0.05	7.23^{e} ± 0.04	**7.09^{C}** ± 0.04
		Group II	6.10^{b} ± 0.07	6.46^{c} ± 0.07	6.87^{d} ± 0.06	**6.48^{B}** ± 0.07
		Group III	5.70^{a} ± 0.11	6.08^{b} ± 0.11	6.61^{c} ± 0.08	**6.13^{A}** ± 0.09
		Pooled Mean for Interval	**5.95^{I}** ± 0.25	**6.23^{II}** ± 0.25	**6.57^{III}** ± 0.26	

Means bearing different superscript differ significantly.

The overall mean values for serum glucose, serum creatinine and serum total protein was within normal limits in group I but it declined significantly ($P<0.01$) in group II and III having high amount of plastic. The decrease in the serum glucose and serum creatinine levels in group II and III in the present study can be attributed to low intake of food and water and also inflammatory condition in the body due to presence of plastic foreign body. Decreased serum creatinine levels is a sign of losing muscle mass as creatinine is the end product of normal muscle metabolism and when this muscle metabolism is hampered due to prolonged periods of illness, malnutrition or low protein diet, low levels of creatinine is produced which then enters the bloodstream and is excreted by the kidneys through urine. Dodia et al.(2014) . Hypoproteinemia was observed in the present study in group II and III. Mersha Chanie et al. (2012) stated that hypoproteinemia in cattle with indigestible foreign bodies might be due to dietary malnutrition and stress reaction to infection. In the present study the BUN values recorded in group I having least quantity of plastic was found to be within normal reference range but it significantly increased ($P<0.01$) in group II and III with high amount of plastic which can be attributed to anorexia, starvation, decreased rumeno-reticular activity and dehydration as these conditions lead to renal insufficiency as stated by Raubah et al. (2017). Rani et al. (1995) also reported significantly higher blood urea nitrogen which might be due to absorption of ammonia from rumen into circulation and conversion to urea by the liver. Similar findings have been reported by Shrirao (2009), Vanitha et al. (2010), Dodia et al. (2014) and Mohan et al. (2014). In the present study all the biochemical parameters exhibited highly significant variations in group II and III as compared to group I indicating that large amount of plastic has significant effect on biochemical parameters. All the biochemical parameters exhibited highly significant variations ($P<0.01$) at various periodic intervals but the values were normalized by 15^{th} day after surgical intervention.

Conclusion

From the present study it can be concluded that rumen impaction due to plastic foreign body poses great hazard to cattle health and results in economic loss to the farmer in the form of reduced production, productivity and death of animals. All the clinico-physiological and haemato-biochemical parameters are greatly altered due to the ingestion of plastic foreign body and these alterations have a direct relation with the amount of plastic and the time for which it has been present inside the rumen and hence polythene bags should be strictly

avoided, awareness should be created among the animal owners regarding hazardous effect of plastic and animals should not be allowed to freely graze around in towns and cities to overcome this menace.

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