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Epidemiological Aspects of Foreign Body in Fore Stomach and Associated Risk Factors in Cattle Slaughtered at Hawassa Municipal Abattoir

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Abstract: This cross-sectional study was conducted from Nov. 2011 to March 2012 at Hawassa municipal abattoir, to identify any foreign body in the fore stomach of cattle and to assess epidemiological role of risk factors. Accordingly, four hundred eleven cattle examined for the presence of foreign body. The fore stomach of systematically selected animals were thoroughly observed, meanwhile sex, age, origin and body condition of each animals were recorded. Indigestible materials identified based on physical appearance as plastic bags, cloth, rope, wire and nails. Data was analyzed using descriptive statistic and logistic regression thereby set a model. The study revealed that 27.7% animals with indigestible materials observed; which included plastic bags (46.6%), clothes (6.1%), ropes (2.7%), wire (4.9%) and Nail (1.2%). Metallic materials were observed in the reticulum and the remaining indigestible materials were found in the rumen. Among the risk factor body condition score, breed and origin were included in the model using level of significance and maximum log likelihood; where the odds of foreign body in cattle were about 10.2 and 17.07 times less likely to exist when body condition being medium and good body condition score than poor body condition score, respectively; whereas the odds of foreign body in cattle were 2.60 times more likely to occur when the breed being exotic than being local with the other variables in the model held constant. In the process of model building the coefficient of risk factors showed that an increase of body condition by one unit into medium and good body condition the occurrence of foreign body decreases by 2.33 and 2.84, respectively. The model fitness was moderate using receiver operating curve (ROC). It could be concluded that apart from the factor considered additional study needs to identify important risk factor that contributes for abnormal feeding.

Key words: Foreign Body · Cattle · Prevalence · Risk Factor · Model · Hawassa · Ethiopia

INTRODUCTION

Ethiopia has livestock population more than 59.5 million of cattle, 30.70 million sheep and 30.20 millions goats, 2.16 million horses, 8.44 million donkeys, 0.41 million mules and about 1.21 million camels in the sedentary areas of the country [1]. Livestock is a backbone of agriculture in the country. Apart from milk and meat production, serve as source of drought power, foreign currency through export of live animals, carcass as well as hide and skin. Livestock numbers also serve as live bank especially when crop agriculture affected. Despite all these importance animals productivity severely affected due to poor genetic pool, poor feed source, poor management practices and rampant diseases. Consequently, livestock that exist today has low meat and milk production; reduced drought power and limited international markets, in addition to the high risk of zoonotic diseases that remain a bottleneck [2].

Due to poor feed supplement to livestock especially cattle forced to scavenge unusually materials. The ingestion of materials other than normal feed referred to as pica or allotrophagia, which appears as the result of a variety of nutritional deficiencies that causes abnormal feeding of bulk, fiber or metallic materials [3]. Sometimes animals eat nervously without choosing mixed foreign body with normal feed. Shrinking of gazing land forced livestock to scavenge in smaller tracts of land, with significant over grazing leadings to malnourishment.

Foreign body ingestion in cattle was reported to be a condition of great economic importance and causes severe loss of production and high mortality rates [3].

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Cattle commonly ingest foreign objects because they do not discriminate against metal materials in feed and do not completely masticate feed before swallowing [3]. Reports from cattle and sheep reared within urban and peri-urban environments indicated that impaction of the rumen resulted from the accumulation of foreign bodies, such as plastic bags, nylon rope which causes interference with flow of ingesta leading to distention of the rumen and absence of defecation or passing of scanty [4].

Gingivitis, glossitis, lampas, stomatitis, pharyngitis, tonsillitis, choke esophagitis, ruminitis, impaction of the rumen, traumatic pericarditis and traumatic reticuloperitonitis are the most common health problems associated with foreign body ingestion by the ruminants [5]. In Jordan, the most common foreign bodies found in the grazing ruminants were plastic objectives such as bag and pipes etc [6]. Reports from different parts of the world have shown that due to ingestion of foreign bodies significantly causing high body weight loss and loss of production [3, 7-9].

In Ethiopia there are few studies conducted on the occurrence of foreign body. Among many few [10-13] have reported the prevalence of 23.9, 13.2, 23.2 and 85 percent of foreign body in different species of ruminants, respectively. However the occurrence and abnormal feeding associated risk factors in different agro ecological area have not been well addressed so far. Therefore the general objective of this study was to contribute pieces of information related to foreign body ingestion prevalence and risk factors associated with. It is therefore the objective of this study entails

- To assess the prevalence of rumeno-reticulum foreign bodies in large ruminants slaughtered at Hawassa Municipal Abattoir and
- To identify the type of foreign bodies recovered and associated risk factors

MATERIALS AND METHODS

Study Area: The study was conducted in Hawassa town at Hawassa municipal abattoir. Hawassa is a capital city of Southern Nation, Nationalities, People Regional state (SNNPRs), located at the Southern part of Addis Ababa far from 275kms. The area has an altitude ranging from 1650-1700 m.a.s.l. Hawassa is located at latitude 7.06° N and longitude 38.47°E, in the northern hemisphere. The annual mean rainfall ranges from 900-1100 mm and minimum and maximum annual temperature is 25°C and 30°C, respectively. The total area of the city is 42, 550 hectares and the agro ecological conditions are Woinadega (80%) and Kola (20%). Animals were coming to Hawassa municipal abattoir from surrounding town and peri-urban area. The livestock production is characterized mainly extensive farming system by rearing indigenous cattle and there is little intensive farming system. Farmers in the region had an estimated total 7, 938, 490 head of cattle (representing 20.5% of Ethiopia's total cattle), 3, 270, 200 sheep (18.8%), 2, 289, 970 goats (17.6%), 298, 720 horses (19.7%), 63, 460 mules (43.1%), 278, 440 asses (11.1%), 6, 586, 140 poultry of all species (21.3%) and 726, 960 beehives (16.7%) (Annual reports of Sidama zone Agriculture office, 2011).

Study Animals: The study population was cattle presented to abattoir for slaughtering. Both sexes and regardless of their management system, age and origin included in the sampling procedure. Study animals were selected using systematic random sampling and to detect foreign body in rumen and reticulum. During the study different risk factors like origin, age, sex, species, breed and body condition of the animals were considered.

Study Design and Data Collection: A cross-sectional type of study was conducted from November 2011 - March 2012 at Hawassa municipal abattoir. Study conducted in three working days per week and animals were sampled systematically in each day. The first sample for each day was randomly selected and followed by taking sample at an interval of five animals until it attain sample size during study period. Data for each sampled animals were recorded in the prepared format sheet.

Sample Size Determination: Sample size was determined using the formula given by Thrusfield [14]. To calculate the sample size 50% expected prevalence used for simple random sampling procedure, 95% confidence level and 5% desired absolute precision (d=0.05) were used. Therefore, using the formula $n= (1.96)^2 (P_{exp}) (1-P_{exp})/ d^2$.

where: n= required sample size, 1.96= the value of Z at 95% confidence level, P_{exp}= expected prevalence (50%) and d = desired absolute precision level at 95% confidence level; Hence $n= (1.96)^2 (0.5) (1-0.5)/ (0.05)^2 =$ 384. According to the above formula a minimum of 384 cattle was sampled, however a total of 411 cattle were used to estimate the occurrence of foreign body in rumen and reticulum.

Ante- Mortem Inspection: A total of 411 head of cattle were systematically selected in every 5 animal's interval and marked and numbered for postmoteum examination. Ante-mortem examination was conducted on individual animals. Data of age, sex, breed, origin and body condition score of selected animal was recorded. The body condition score was ranked using 1-9 system of body scoring or American system of body scoring (http: //www.cowbcs.info/). Where the body condition score was categorized as poor, medium and good for rank from 1-3, 4, 5, 6 and above; respectively. Age was determined based on dental eruption as described by De-Lahunta and Habel [15]. Age was also grouped into three categories; accordingly less than 4 (<4) years, 4-6 years and above 6(>6) years. Sampled animals were identified during ante-mortem inspection and marked by marker on their body surface for further post-mortem examination.

Post- Mortem Inspection: During post- mortem inspection rumen and reticulum of 411 cattle's were thoroughly examined on the inspection table. Immediately after evisceration of the slaughter animals, rumen and reticulum were opened and any types of foreign materials or indigestible materials were examined. The observed foreign bodies were washed with tap water to remove adhering ingesta and clearly identified the types of foreign bodies and recorded.

Data Management and Analysis: All large ruminants presented for slaughter were identified by a unique identification number. The data recorded was managed using Microsoft excel spread sheet. Descriptive statistics was used to determine means, frequencies and percentages of the findings analyzed. The simultaneous evaluation of different risk or protective factors for the occurrence of foreign body was performed using logistic regression models, as demonstrated by Dohoo *et al.* [16]. The choice of multiple variable models was performed on the basis of goodness of ?tness. This model was constructed using statistical software version Stata 12.0 [17] and considering the municipal abattoir as the statistical analysis unit. The preliminary selection of variables to be included in the model was performed using the uni-variable logistic regression, followed by removing the variables with highest p-value, where p>0.15 was a bench mark for exclusion, back ward step analysis was conducted until the fit model obtained. Variables with significant odds ratio value as well as variables, whose absence that could reduce the maximum likelihood were included in the model. Selection of logistic regression model adjustment was performed using Wald's test (P = 0.05) and Hosmer–Lemeshow's test (observational, analytical and sectional survey P > 0.05). The fitness of selected full model was evaluated using estat gof and ROC.

RESULTS

The occurrence of foreign body was 114 (27.7%) of the total sampled animals. The types of foreign bodies found were plastic bags, cotton clothes, ropes, wire and nail. A 53 plastic bags (46.6%) represent the highest foreign body observed followed by 25 cotton clothes (6.1%), 11 rope (2.7%), 20 wires (4.9%) and 5 Nails (1.2%). The types of foreign bodies encountered and their frequency of occurrence is presented in Table 1.

Prevalence of foreign body in the fore stomach of cattle showed that there was high prevalence foreign body in animals originated from urban area than peri-urban area but there was no significant difference (P>0.05), whereas, in exotic breed there was significantly (P<0.05) high prevalence in exotic breed than local breed similarly cattle with relatively poor body condition showed significantly (P<0.05) high prevalence of foreign body as shown in Table 2. There was no significant (P>0.05) difference between sex and age group.

As shown in Table 3 when multiple variable logistic regression analyzed using variables with less than P< 0.15, by removing variables above P> 0.15 showed that the odds of foreign body in cattle was about 10.23 times less likely to exist when body condition score being medium than being poor body condition with the other variables in the model held constant. Similarly the odds of foreign body in cattle was about 17.07 times less likely to occur when body condition being good than being poor body condition score with the other variables in the model held constant. In addition the odd of foreign body in cattle was about 2.60 times more likely to recover when the breed being exotic than being local with the other variables in the model held constant.

To build the model on risk factor that were significant with Odds ratio, coefficient of each factor and the log likelihood ratio was analyzed in different model using all explanatory variables, explanatory variables with p< 0.15 and explanatory variables with only significant variables as shown in Tables 4-6.

Table 1: Types of foreign body identified and organ location in the cattle slaughtered at Hawassa municipality abattoir

Types of foreign body	No identified	Rumen (%)	Reticulum (%)
Wire	20	0	20 (17.54)
Nail	5	0	5 (4.43)
Plastic	53	53 (46.54)	0
Cloth	25	25 (21.94)	0
Rope	11	11 (9.65)	0
Total	114	89(78.1%)	25(21.9)

Table 2: Multiple variable logistic regression analysis of foreign body against all assumed risk factors with respective odds ratio in cattle slaughtered at Hawassa municipal abattoir

Factor		n	N°+ve	Prevalence (%) [95% CI]	OR[CI]	P-value
Origin:	Urban	178	58	32.58[25.87, 40.06]	1	0.178
	Per-urban	233	56	24.03[18.80, 30.14]	0.33[0, 0.8]	
Age:	≤ 4 years	46	14	30.43[18.20, 45.92]	1	
	4 ≤ 7 years	267	74	33.80[27.57, 40.63]	1.06[0.49, 2.31]	0.877
	7 years	98	17	21.21[15.87, 27.70]	1.43[1.67, 3.73]	0.464
Sex:	Female	113	35	30.97[22.80, 40.47]	1	0.937
	Male	298	79	26.51[21.66, 31.97]	1.02[0.58, 1.81]	
Breed:	Local	354	93	26.27[21.83, 31.24]	1	0.005
	Exotic	57	21	36.84[24.76, 50.70]	2.84[1.38-5.82]	
BCS:	Poor	35	26	74.3[56.43, 86.89]	1	
	Medium	191	45	34.51[28.41, 41.15]	9.92[4.27, 22.72]	0.000
	Good	185	34	19.4[14.16, 26.05]	15.38[6.25, 38.46]	0.000

Table 3: Multiple variable logistic regression analysis with p-value less than 0.15 variables

Factor		n	No +ve	Prevalence (%) [95% CI]	OR[CI]	p-value
Origin	Urban	178	58	32.58[25.87, 40.06]	1	
	Per-urban	233	56	24.03[18.80, 30.14]	1.42[0.88, 2.30]	0.148
Breed	Local	354	93	26.27[21.83, 31.24]	1	
	Exotic	57	21	36.84[24.76, 50.70]	2.59[1.35-5.01]	0.004
BCS	Poor	35	26	74.3[56.43, 86.89]	1	
	Medium	191	45	34.51[28.41, 41.15]	10.2[4.4, 23.58]	0.000
	Good	185	34	19.4[14.16, 26.05]	17.1[7.1, 41.2]	0.000

Table 5 is selected as a full model for logistic regression analysis rather than Table 4 because in Table 4 there were none significant (p>0.15) explanatory variables like sex and age. In addition when Table 5 compared with Table 6, even if table 6 contains only significant explanatory variables, the log likelihood of Table 5 was -207.57 and the log likelihood of Table 6 was -208.61. Hence, the maximum likelihood value of Table 5 was greater than Table 6. Therefore, based on this finding Table 5 was considered as fit full model to compare with null model (model without explanatory variables). Therefore the log likelihood of the null model was -233.559 and the log likelihood of the full model was -207.571. According to this result the maximum log likelihood of the full model was greater than the null model and hence full model has included the explanatory variables of body condition, breed and origin. In the full model the variable origin_2 is insignificant however; the maximum likelihood was greater when origin included in the model.

Interpretation of the Coefficients and the P-value in the Process of Model Selection: For the above analysis the coefficient and p-value could be interpreted as follows.

The medium body condition coefficient -2.33 indicate that when poor body condition changes to the medium body condition score increases by one unit, the log odds of foreign body occurrence decreases by 2.33 with the other variables in the model held constant and the good body condition coefficient (-2.84) indicate that when poor body condition changes to the good body condition score increases with one unit, the log odds of foreign body occurrence decreases by 2.84 with the other variables in the model held constant.

The breed coefficient (0.95) indicate that when breed being exotic with one unit, the log odds of foreign body occurrence increases by 0.95 with the other variables in the model held constant.

Table 4: Coefficient and log likelihood of model which contains all variables

```
i.bcs             _Ibcs_1-3           (naturally coded; _Ibcs_1 omitted)
i.breed           _Ibreed_1-2         (naturally coded; _Ibreed_1 omitted)
i.sex             _Isex_1-2           (naturally coded; _Isex_1 omitted)
i.age             _Iage_1-3           (naturally coded; _Iage_1 omitted)
i.origin          _Iorigin_1-2        (naturally coded; _Iorigin_1 omitted)

Iteration 0:   log likelihood = -233.55093
Iteration 1:   log likelihood = -207.53083
Iteration 2:   log likelihood = -206.74247
Iteration 3:   log likelihood = -206.73096
Iteration 4:   log likelihood = -206.73096

Logistic regression                                     Number of obs   =        411
                                                        LR chi2(7)      =      53.66
                                                        Prob > chi2     =     0.0000
Log likelihood = -206.73096                             Pseudo R2       =     0.1149
```

foreinbody	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
_Ibcs_2	-2.287798	.4265357	-5.36	0.000	-3.123793	-1.451804
_Ibcs_3	-2.734759	.4609619	-5.93	0.000	-3.638228	-1.831291
_Ibreed_2	1.042314	.3669396	2.84	0.005	.3231257	1.761502
_Isex_2	-.0228409	.2908105	-0.08	0.937	-.592819	.5471373
_Iage_2	.0610314	.3951026	0.15	0.877	-.7133554	.8354182
_Iage_3	-.3575197	.4878226	-0.73	0.464	-1.313634	.598595
_Iorigin_2	.3310378	.245776	1.35	0.178	-.1506743	.8127498
cons	.8847598	.5110464	1.73	0.083	-.1168728	1.886392

Table 5: Full model after dropping non significant variables (sex and age)

```
L gistic regression                                     Number of obs   =        411
                                                        LR chi2(4)      =      51.98
                                                        Prob > chi2     =     0.0000
Log likelihood = -207.57127                             Pseudo R2       =     0.1113
```

foreinbody	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
bcs						
2	-2.325225	.4258614	-5.46	0.000	-3.159898	-1.490552
3	-2.837178	.4491881	-6.32	0.000	-3.717571	-1.956786
2.breed	.9541030	.3340891	2.85	0.004	.2977332	1.610474
2.origin	.3537231	.2446724	1.45	0.148	-.1258261	.8332723
_cons	.906738	.4008961	2.26	0.024	.1209961	1.69248

Table 6: Model with only significant variables

```
Logistic regression                                     Number of obs   =        411
                                                        LR chi2(3)      =      49.89
                                                        Prob > chi2     =     0.0000
Log likelihood =  -208.6163                             Pseudo R2       =     0.1068
```

foreinbody	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
bcs						
2	-2.316191	.424324	-5.46	0.000	-3.14785	-1.484531
3	-2.830783	.4474808	-6.33	0.000	-3.70783	-1.953737
2.breed	.9524130	.3337623	2.85	0.004	.2902516	1.606576
_cons	1.060872	.3867462	2.74	0.006	.3028631	1.81888

Table 7: Evaluation of full model using estat gof

```
i.bcs             _Ibcs_1-3           (naturally coded; _Ibcs_1 omitted)
i.breed           _Ibreed_1-2         (naturally coded; _Ibreed_1 omitted)
i.origin          _Iorigin_1-2        (naturally coded; _Iorigin_1 omitted)

Iteration 0:   log likelihood = -233.55893
Iteration 1:   log likelihood = -208.30857
Iteration 2:   log likelihood = -207.58238
Iteration 3:   log likelihood = -207.57127
Iteration 4:   log likelihood = -207.57127

Logistic regression                               Number of obs   =        411
                                                  LR chi2(4)      =      51.98
                                                  Prob > chi2     =     0.0000
Log likelihood = -207.57127                       Pseudo R2       =     0.1113

------------------------------------------------------------------------------
  foreinbody |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     _Ibcs_2 |  -2.325225   .4258614    -5.46   0.000    -3.159898   -1.490552
     _Ibcs_3 |  -2.837178   .4491881    -6.32   0.000    -3.717571   -1.956786
   _Ibreed_2 |   .9541038   .3348891     2.85   0.004     .2977332    1.610474
  _Iorigin_2 |   .3537231   .2446724     1.45   0.148    -.1258261    .8332723
       _cons |    .906738   .4008961     2.26   0.024     .1209961     1.69248
------------------------------------------------------------------------------

. estat gof

Logistic model for foreinbody, goodness-of-fit test

       number of observations =       411
 number of covariate patterns =        10
              Pearson chi2(5) =      4.37
                  Prob > chi2 =    0.4976
```

Origin_2(Urban): coefficient =0.35and p-value = 0.148 here the p-value is greater than 0.05 so we don't have sufficient evidence to reject our null hypothesis for origin-2 group.

So we reject our *Ho* at 0.0001 significance level. The type I error we could make mistake by rejecting our null hypothesis is only 1 in 1000 for body condition and 4 in 1000 for breed. The negative sign of the coefficient indicates that when body condition decreases it is more suitable for the presence of foreign body as shown in Table 5.

For the above analysis the logit (p) question can be developed as follows logit(p) = ln[p/1-p]= $ß_0$+ $ß_1$(medium body condition score)+ $ß_2$(good body condition score)+ $ß_3$(exotic breed)+ $ß_4$(peri-urban) logit(p) = ln[p/1-p]= 0.91-2.33 (medium bcs)-2.84 (good bcs) +0 .95(exotic breed) + 0.35(peri-urban).

In this model removing 'origin_2', which is insignificant of course, might bring a significant change on the model (p=0.148). So it should be included in the model rather than dropping out origin from the full model. Therefore the question for the model can be expressed mathematically as follows.

$$Y= ß_0+ ß_1 x_1) + ß_2(x_2) + ß_3(x_3) + ß_4(x_4)$$

where y = foreign body, x_1-x_4 =independent variables, $ß_0$= constant and $ß_{1-4}$ = coefficient of respective variables; therefore the equation for full model is set as follows:
Foreign body = 0.91 - 2.33 (medium bcs) - 2.84 (good bcs) +0 .95(exotic breed) + 0.35 (peri-urban).

Evaluation of Selected Logistic Regression Models: Different steps were used to assess the fitness of selected logistic regression model. The first step was by assessing the predictive ability of the model. Computing the sensitivity and specificity of the model at various probability thresholds and/or generating a receiver operating characteristic (ROC) curve using estat class and lroc commands were employed.

The other method used to assess goodness of fitness was Pearson χ^2 or Hosmer-Lemeshow goodness-of-fit test. Estat gof logistic model for foreign body, goodness-of-fit test indicated that Pearson χ^2 =4.37 with p=0.497. Therefore, based on p-value (P>0.05) the model which contain explanatory variable body condition score, breed and origin was accepted as shown in Table 7.

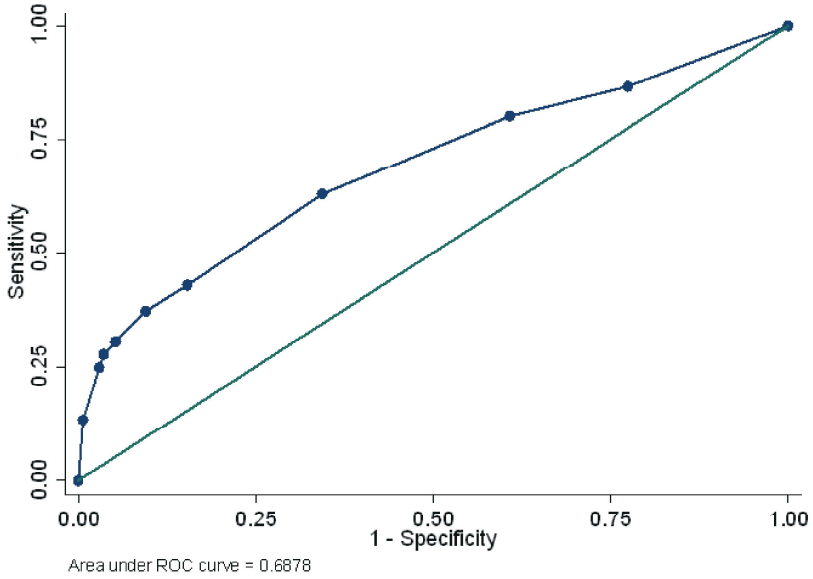

Fig. 1: Generating a Receiver Operating Characteristic (ROC) Curve
Logistic model for foreign body
Number of observations = 411
Area under ROC curve = 0.6878

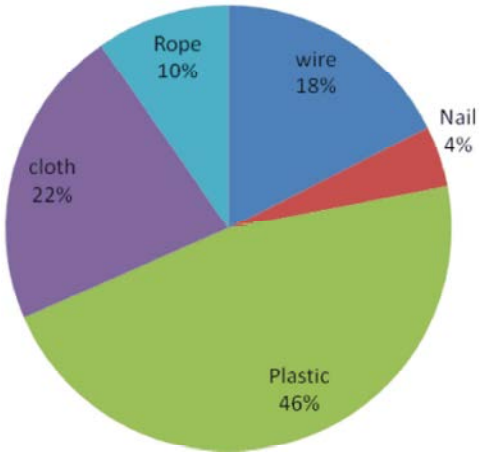

Fig. 2: Type of foreign body and their proportion in Forestomach of cattle slaughtered in Hawassa abattoir

Generating a Receiver Operating Characteristic (ROC) Curve: By using generating a Receiver Operating Characteristic (ROC) Curve the fitness of the model decided based on the width of the curve near to the top left corner, the better the fitness is the wider the curve or the greater the percentage near to 90%. Therefore, according to ROC curve shown below, in this lroc evaluation method the result below showed that the percentage of area under the curve is 68.78%.Since the percentage of lroc is near 75% the analysis indicates that the model moderately fit and we fail to reject the null hypothesis. That is the model is fit.

A Type of foreign body identified includes wire, nail, plastic bags, cotton clothes and ropes were the major findings. Among foreign body observed plastic bags showed high proportion followed by cloth and wire as shown in Fig. 2. Metallic materials were like wire and nails were found inside the reticulum, whereas plastic, cloth and rope were found in the rumen.

DISCUSSION

This study revealed an overall prevalence of 27.7% (114/411) of fore stomach foreign body in cattle slaughtered at Hawassa Municipality Abattoir. Shahin and Mohsen [18] reported a prevalence rate of 23.9% in cattle in Iran. In Hirna municipal abattoir it was observed that 92/384 (23.9%) and in Asella municipal Abattoir 21.8% were found positive for different types of foreign bodies in their rumen and/or reticulum observed, Dawit *et al*. [10] and Teshome *et al.* [19]; respectively, which is almost in agreement with current study. Study conducted by Desiye and Mersha [11] and Fromsa and Mohammed [20] at Jimma municipal and Mojo Luna export abattoir showed 13.22 % and 6.1% foreign body; respectively, which was lower than the current finding.

Observation at Bahirdar has indicated that of the 400 cattle, 320 sheep and 320 goats examined, 41.8, 20.6 and11.9 %, respectively, contained one or more types of foreign bodies reported by Desie *et al.* [21]; and out the total of 350 animals examined, 207 (59.14%) were found positive for the occurrence of indigestible foreign bodies in Pakistan Anwar *et al*. [22] where prevalence of foreign body in this report is by far higher than the current study. In 711 cases of ruminal impaction surgery at Gondor city 85% rumenotomy case had excess foreign body Velappagoundar and Hardeep [13]. On the contrary, a higher prevalence rate (56.8%) was reported in Pakistan in bovine brought from urban and peri-urban areas for slaughter Ramadan and Mahroose [23]. In cattle having foreign body in the rumen, plastic bags constituted major part followed by cloth, wire, rope and nail, accordingly. This agrees with the findings of Ramadan and Mahroose [23] who in majority of cattle and sheep found soft foreign bodies in the form of sag and plastic objects in the rumen. Due to relatively large size, plastic materials are preferentially retained in the rumen and at certain time may cause impaction of the rumen leading to death of the animals. This is substantiated by the findings of Egbe and Chaudhry [24] who in Nigeria, recovered polythene, cloth and ropes from the rumen of cattle, sheep and goats suffering from ruminal impaction. In the present study cloth and rope were also recovered from rumen and metallic objects were recovered inside reticulum. In Ethiopia the overall prevalence of rumen foreign bodies were found to be 23.2% (n= 162) in small ruminants. Of these 86 (53.1%) were sheep and 76 (46%) were goats. Plastic bags were recovered as the most common foreign bodies. Other foreign bodies retrieved were leather 30 (4.3%), rope 3 (0.4%), hair ball 2 (0.3%) and paper 2 (0.3) Roman and Hiwot [12]. Such materials occupy large volume of the rumen and would therefore, limit feed consumption by the animal.

The difference in the prevalence might be due to differences in the origin of animals presented for slaughter, living standard of the community in the area and type of waste management system difference among countries and study sites. The ingestion of foreign materials associated from a variety of nutritional deficiencies [3]. Livestock are left to scavenge smaller tracts of land; with consequential over grazing of the few available rangeland grass leads to malnourishment. Similarly, in Ethiopia, feed shortage is prevailing particularly during the long dry season and most owners do not supply supplementary feed to their animals, as the result animals are exposed for allotrophagia. Pollution of the environment particularly with plastic bags has been a common observation in both urban and peri-urban areas. Shahin and Mohsen [18] reported a higher prevalence in females. In this study, different findings were observed. This may be associated with sample size and the number of male animals higher than female animals in the slaughtering house. There was no significant difference among age categories, but Fromsa and Mohammed [20] reported old animals had more foreign body than young group whereas Anwar *et al*. [22] has reported young animals had more foreign body than older groups. Such kind of different observation may indicate that there is underlining factor that contribute for the prevalence of indigestible materials.

Plastics were found in almost all animals within rumen in this study. The wide spread use and improper disposal of plastic bags could be the reason. Similar findings were reported in Pakistan by Shahin and Mohsen [18] and Ramadan and Mahroose [23]. The current and other studies finding indicates that the risk of the wide-spread use and improper disposal of plastic (polythene) bags to the health problem of livestock and environmental pollution brings a great attention by ecologists as well as related stakeholders. Lack of awareness among livestock owners on the risk of ingestion of these materials on the health of their animals also contributed to the high prevalence of rumen impaction in cattle thereby leads to discomfort, low productivity and even death occurs. Metallic foreign bodies recovered in reticulum in this study as similarly reported by Radostits *et al*. [3], might be due to heavy nature of materials at a time of swallowing it can be pulled down to the reticulum by gravitational force and/or even after it has reached there it is difficult to be propelled by reticulum movement to the next digestive organ because of its heavy nature. In backward multiple logistic regression analysis, among the assumed factors body condition score and breed showed statistically significant difference ($p<0.05$). Where being medium and good body condition score, the probability of having foreign body in the fore stomach will reduce by 2.33 and 2.84 times, respectively. Whereas being exotic breed and if animals' origin is from urban area, the probability of having foreign body in the fore stomach will increase by 0.95 and 0.35 times, respectively. Following full model evaluation using estat gof and ROC, the fitted model formula for this study was foreign body = 0.91 - 2.33 (medium bcs) - 2.84 (good bcs) +0 .95(exotic breed) + 0.35(peri-urban). However, receiver operating curve (ROC) showed the percentage of area under the curve is 68.78%, which indicates that the model fits

moderately. Therefore the model built in this study is still acceptable; however, addition of risk factors like feed quality/quantity per day per cow, housing management (indoor or outdoor), if it is outdoor system how much grazing site is closer to waste disposal site or else are animals let to roam around village could have contributed much better to strengthen the model.

CONCLUSION

In this research finding indicated that animals can be exposed to various type foreign body, especially those managed poorly. Different types of indigestible foreign body observed in fore stomach of sampled animals namely: plastic bags, cloth, rope, wire and nails. Among these plastic bags was the most commonly recovered one followed by cloth and wire, respectively. Plastic bags, cloth and rope were recovered in rumen whereas wire and nails were found in reticulum. Significant variation was not observed between sex and among age groups. Risk factor body condition score breed and origin showed fit for the model. Where being medium and good body condition score reduces the occurrence of foreign body in the animals whereas being exotic breed and animals originated from urban area increases the occurrence of foreign body in the animals. Poor body condition score animals significantly had foreign body in their fore stomach; this is a good indicator that when the animals starved, animals will be forced to scavenge anything found in the surrounding. Exotic breed in Ethiopian feeding style might have lost to achieve the standard level, this might be the reason exotic breed more starved and forced to chew foreign materials. To understand the main cause of feeding indigestible foreign materials in livestock industry further study need to be conducted. Therefore, the following recommendations are forwarded.

- To understand the main cause of foreign body ingestion further study has be conducted so that it will be supportive in livestock industry to reduce morbidity and mortality.
- Create awareness among animals' owners about the side effect of feeding leftover, shortage of feed and nutritional deficiency
- Train the resident and farmers in order to dispose wastes in appropriate area.
- Owners should understand ratio formulation so that he can feed his animals to the level of standard according to the daily requirement.

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