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Anthelmintic treatment practices for control of gastrointestinal nematodes in sheep of Odisha

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Abstract
In order to maintain the efficacy of anthelmintics, its proper use is important and abuse should be avoided by promoting awareness among the farmers, veterinarians and paravets about different human, natural and managemental factors that can contribute to delay the development of resistance against anthelmintics. In view of this, in order to assess the level of awareness among the farmers, vets and paravets in the area, a questionnaire based survey was carried out involving a total of 109 respondents comprising 87 farmers and 22 vets and paravets from the native tracts of different sheep breeds were included in the survey in home tracts of different recognized sheep breeds of Odisha. The survey revealed that, overall, the majority of sheep farmers (88.1%) in the native tracts of Kendrapada, Ganjam and Balangir breeds were rearing the respective breeds of sheep under extensive management system and rest were adopting semi intensive system of management. Highest percentage of sheep farmers in native tract of Kendrapada breed were aware of worm infection followed by that of Ganjam and lowest in native tract of Balangir breed and the variation was statistically significant ($p<0.05$). In the study area more number of deworming was practiced during summer season as a routine practice. Deworming was practiced mostly as a routine practice without faecal sample examination and dose of drug in most cases was determined based on visual estimation of body weight of sheep. Benzimidazoles were the most frequently used anthelmintic and there was no periodic rotation of class of anthelmintics as revealed by the vets and paravets. In majority of cases there was no post treatment faecal sample examination.

Keywords: questionnaire, survey, anthelmintic practice, sheep

Introduction
Parasitism is an important global problem and still continues to seriously affect the livestock economy throughout the world. Sheep, due to their close grazing habit, are more prone to various pasture-borne endoparasites particularly gastrointestinal nematodes. The economic loss in sheep caused by parasitism is mostly due to nematodes which are one of the main causative worm parasites (Coop and Angus, 1981) [2]. Recent study carried out in southern India has revealed an estimated loss due to GI nematodes in sheep amounting between Rs.1194 to Rs.1774 per animal where *Haemonchus contortus* was found as the predominant species (Ilangopathy *et al*., 2019) [5].

Use of anthelmintic drugs has been the common and most dependable practice since decades for control of gastro-intestinal nematodes in grazing animals including sheep. This practice will continue as a major mode for control of worms till vaccines against these parasites are available for large scale use by farmers at affordable price. But this strategy for controlling haemonchosis and other GI nematode infections suffered a severe setback since the first report of anthelmintic resistance against phenothiazine in sheep in the U.S (Leland *et al*., 1957) [7]. Benzimidazoles (BZs) were the first drugs to lose their effectiveness against nematodes of small ruminants (Drudge *et al*., 1964) [4]. Later on, frequent and inappropriate use of all classes of anthelmintics in small ruminants has resulted in multiple anthelmintic resistance culminating in a global problem. (Swarnakar and Singh, 2017) [10].

Emergence of anthelmintic resistance in *Haemonchus contortus* and other GI nematodes has been attributed to repeated use of same group of drugs, incorrect dosing, mass deworming approach, untimely deworming and use of spurious drugs (Sanyal, 2017) [9]. Therefore, knowledge and awareness among farmers, veterinarians and para-veterinarians on use and abuse of drugs is essential for effective management of available anthelmintics to minimize the development and spread of resistant worm populations.

It is therefore necessary to assess the level of awareness among the farmers, vets and paravets on different aspects of ideal worm control practices prevailing in an area for effective use of available anthelmintic drugs. The objective of the present research was to assess the various practices associated with the control of gastrointestinal parasites in different sheep breeds of Odisha and its possible impact on emergence of anthelmintic resistance.

Materials and Methods

A questionnaire in Odia language was prepared and information in form of response were collected from farmers, Paravets and Veterinarians with regard to sheep flocks, their housing, management, awareness on worm infection and anthelmintic treatment practices (class, source, frequency, timing, dose of anthelmintics). A total of 109 respondents comprising 87 farmers and 22 Vets and Paravets from the native tracts of different sheep breeds of Odisha (Ganjam, Kendrapada and Balangir) were included in the survey. Information were sought from the Veterinarians and Paraveterinarians working in field. They were supplied with the questionnaire in person or through social media and the same were collected to record their response to preset questions. Farmers were interacted with at their doorsteps. Farmers having at least ten number of sheep were included in the study and were asked to collect information as per the proforma questionnaire. Questions with respect to management practices, housing, grazing and health care in general and antiparasitic treatment practices in particular were asked to the farmers and the answers were instantly recorded. The data generated were tabulated and subjected to statistical analysis to draw inference.

The means were examined by applying analysis of variance to find out the inter-group variability. The frequency distribution of data, obtained on different questionnaires with regard to differential groups were analyzed adopting Chi-square test. All statistical analysis were made with SPSS 21.0 Software.

Results and Discussion

A questionnaire based survey was carried out in home tracts of different recognized sheep breeds of Odisha and the data have been summarized in the given table. The respondent (farmers and vets/paravets) answered the questions related to anthelmintic practices followed by them. An overall 88.1% of sheep population was reared under extensive management system in the area under study. The percentage of extensively managed population of sheep was highest in the native tracts of Balangir breed (93.5%) followed by Ganjam (92.1%) and Kendrapada (80%). Bersissa and Ajebu (2008) [1] while conducting the questionnaire survey on naturally infected sheep in Hawassa, southern Ethiopia recorded the extensive production system adapted by all the sheep farmers for keeping the sheep.

Higher percentage of respondents in Balangir (64.5%) and Ganjam (63.2%) were unaware of worm infection where as in native tract of Kendrapada sheep majority of farmers were was aware of worm problem in sheep. The response indicated that frequency of anthelmintic drenching was more during summer in all three area under study which was 74.2%, 60% and 52.6% in Balangir, Kendrapada and Ganjam area. Deworming in sheep in all three areas was as a routine practice. Overall 89% respondents revealed that, the dose for administration of anthelmintic drugs was based on visual estimation of body weight. Benzimidazole group of anthelmintics were the most preferred and widely drug as admitted by 60.6% respondents. Mass deworming was admittedly a common practice in all three areas under survey. Maximum respondents (94.5%) revealed that there was no post-treatment screening of faecal samples of sheep treated with anthelmintics to know the effect of the drug. Mengist *et al.* (2014) [8] in Ethiopia had conducted the questionnaire survey and observed that almost all respondents didn't know about the endoparasite disease of small ruminant, primarly haemonchosis.

There was significant difference observed with regards to awareness on worm infection and frequency of anthelmintic treatment among the two categories of respondents in the native tracts of Ganjam, Balangir and Kendrapada breed of sheep. Percentage of respondents aware about worm infection in sheep was 26(65.6%), 14(36.8%) and 11(35.5%) in native tracts of Ganjam, Balangir and Kendrapada breeds respectively. The frequency of anthelmintic treatment was recorded as 21(52.5%), 20(52.6%) and 5(16.1%) in Kendrapada, Ganjam and Balangir area respectively. There was also found significant difference among respondents as regards to basis of treatment, calculation of dose, type of anthelmintic used, practice of mass deworming and periodic rotation of anthelmintic types.

Emergence of single or multiple anthelmintic resistance in GI nematodes of grazing animals is an ever increasing problem spreading to new geographical area. In this context, the biggest challenge before the Veterinarians in general and Parasitologists in particular is how to linger the effective lifespan of the available anthelmintics. In order to maintain the efficacy of anthelmintics, its proper use is important and abuse should be avoided by promoting awareness among the farmers, veterinarians and paravets about different human, natural and managemental factors that can contribute to delay the development of resistance against anthelmintics. It is therefore essential to assess the level of awareness prevailing among all stakeholders in a particular area on factors which have direct or indirect relation with development of anthelmintic resistance among the prevalent worm population. Factors such as repeated use of same class of anthelmintics over years, incorrect dosing of animals based on visually assessed body weight, administering anthelmintic medication during season when pasture contamination of infective larvae is less or nil, practice of mass deworming without sparing the refugia, and use of spurious drugs have direct influence on emergence of resistant worm population. In view of this it was felt necessary to assess the level of awareness among the farmers, vets and paravets in the area under the present study for which a questionnaire based survey was carried out in home tracts of different recognized sheep breeds of Odisha. The survey revealed that, overall, the majority of sheep farmers (88.1%) in the native tracts of Kendrapada, Ganjam and Balangir breeds were rearing the respective breeds of sheep under extensive management system and rest were adopting semi intensive system of management. In both the cases the sheep were frequently exposed to outside for grazing increasing the chance of infection with different gastrointestinal nematodes. This was the trend observed in respective native tracts of each breed of sheep under study. Highest percentage of sheep farmers in native tract of Kendrapada breed were aware of worm infection followed by that of Ganjam and lowest in native tract of Balangir breed and the variation was statistically significant ($p<0.05$). Awareness on worm infection positively influence the number

of treatments thereby exposure to anthelmintics. In the study area more number of deworming was practiced during summer season as a routine practice. As ascertained from field veterinarians, this was due to more supply of anthelmintic drugs from Government sources towards end of February and March and more number of mass deworming camps were organized during that part of the year. Deworming was practiced mostly as a routine practice without faecal sample examination and dose of drug in most cases was determined based on visual estimation of body weight of sheep. Benzimidazoles were the most frequently used anthelmintic and there was no periodic rotation of class of anthelmintics as revealed by the vets and paravets. In majority of cases there was no post treatment faecal sample examination. The present findings were in partial agreement with the observations made by some earlier authors (Bersissa and Ajebu, 2008 in Ethiopia; Swarnkar and Singh, 2010 in India; Domke, *et al*. 2011, in Norway and Terefe *et al*., 2013 in Ethiopia) [1, 10, 3, 12]. Repeated use of benzimidazoles, determination of dose of anthelmintics based on visual estimation of body weight, untimely deworming in summer when larval contamination in pasture usually remain low, and no rotation in anthelmintic class might have contributed to development of anthelmintic resistance in the *Haemonchus contortus* predominantly prevalent in sheep breeds of Odisha to Benzimidazoles (Kumar and Singh., 2017) [10].

Table 1: Anthelmintic treatment practices followed in the home tract of sheep

Factor	Sub-factor	Overall	Native Tracts of sheep breeds			χ^2
			Kendrapada	Ganjam	Balangir	
Management	Intensive	13(11.9)	8(20.0)	3(7.9)	2(6.5)	3.96
	Extensive	96(88.1)	32(80.0)	35(92.1)	29(93.5)	
Awareness about worm infection	YES-1	51(46.8)	26(65.6)	14(36.8)	11(35.5)	8.43*
	NO-2	58(53.2)	14(35)	24(63.2)	20(64.5)	
frequently anthelmintic drenching Season	Monsoon-1	11(10.1)	4(10)	3(7.9)	4(12.9)	6.03
	WINTER-2	31(28.4)	12(30)	15(39.5)	4(12.9)	
	SUMMER-3	67(61.5)	24(60)	20(52.6)	23(74.2)	
Treatment based on	Symptom-1	35(32.1)	10(25)	12(31.6)	13(41.9)	2.94
	Faecal Examination-2	22(20.2)	10(25)	8(21.1)	4(12.9)	
	Routine Practiced-3	52(47.7)	20(50)	18(47.4)	14(45.2)	
Dose based	Measured body weight-1	12(11)	3(7.5)	4(10.5)	5(16.1)	1.34
	Visual estimation of body weight-2	97(89)	37(92.5)	34(89.5)	26(83.9)	
Type of Anthelmethic used	Benzimidazole-1	66(60.6)	24(60)	25(65.8)	17(54.8)	11.62
	Ivermectin-2	20(18.3)	8(20)	9(23.7)	3(9.7)	
	Others-3	17(15.6)	8(20)	2(5.3)	7(22.6)	
	Don't know-4	6(5.5)	0	2(5.3)	4(12.9)	
Frequency of Anthelmethic treatment	Yearly-1	17(15.6)	7(17.5)	4(10.5)	6(19.4)	24.37**
	Half yearly-2	27(24.8)	11(27.5)	9(23.7)	7(22.6)	
	Triannually-3	46(42.2)	21(52.5)	20(52.6)	5(16.1)	
	No treatment-4	19(17.4)	1(2.5)	5(13.2)	13(41.9)	
Mass deworming	Yes-1	68(62.4)	24(60)	27(71.1)	17(54.8)	2.07
	No-2	41(37.6)	16(40)	11(28.9)	14(45.2)	
Periodic rotation of Anthelmetic	Yes-1,	10(92)	4(10)	4(10.5)	2(6.5)	3.15
	No-2	39(35.8)	13(32.5)	11(28.9)	15(48.4)	
	Don't know-3	60(55)	23(57.5)	23(60.5)	14(45.2)	
Post treatment feacal examination	Yes-1	6(5.5)	3(7.5)	1(2.6)	2(6.5)	0.96
	No-2	103(94.5)	37(92.5)	37(97.4)	29(93.5)	

Conclusion

Repeated use of benzimidazoles, determination of dose of anthelmintics based on visual estimation of body weight, untimely deworming in summer when larval contamination in pasture usually remain low, and no rotation in anthelmintic class were observed to be the common practice in the area under studies which might contribute to development of anthelmintic resistance in gastrointestinal nematodes of sheep in Odisha.

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