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Knowledge, attitude and practices of small-hold cattle and carabao owners towards fasciolosis in Northeastern Luzon, Philippines

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Abstract A cross-sectional study using a structured questionnaire was assessed the knowledge, attitudes, and practices among small-hold farmers in Northeast Luzon, Philippines about bovine fasciolosis. A total of 136 participants were interviewed from 20 Barangays in the Municipality of Jones and San Agustin, Isabela. The majority were male (93.38%), middle-aged adult (54.41%) farmer (72.79%) owners (97.79%) that are mostly high school graduates (33.82%). The participants had fair knowledge about fasciolosis (mean score of 3.55 out of 7) with the college-level participants having significantly higher mean knowledge scores more than the elementary level and elementary graduates ($p \leq 0.05$). They also demonstrated a high mean attitude score of 7.12 out of 8 questions, but low practice assessment scores (mean score 2.50 out of 6 questions). A high proportion (98.57%) expressed willingness to participate in future campaigns/mass deworming programs. The knowledge score of the participants was positively correlated with their attitude and practice scores ($p \leq 0.01$). Results suggested the need for massive education campaigns about the biology of the disease particularly its mode of transmission and zoonotic risk that should be augmented by local government support through regular mass deworming programs to help control the disease spread in these communities.

Keywords: Fasciolosis, KAP, Philippines

Introduction

Fasciolosis is a major trematode infection considered as neglected tropical diseases of humans by the World Health Organization (WHO). The disease has emerged as an important zoonosis with over 50 million people estimated to be infected and about 180 million at risk (Nyindo and Lukambagire, 2015). It is separately classified as food-borne trematodiases (Cwiklinski *et al.,* 2016) with a higher prevalence seen among farming communities in low-income countries. It is a primary disease of ruminant animals caused by *Fasciola hepatica*

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(temperate liver fluke) and *F. gigantica* (tropical liver fluke) which is found in Asia and Africa. Ruminants harbor the disease by eating metacercaiae-contaminated grass. Supporting data in many tropical developing countries and regions associates the disease with the presence of snail species responsible for transmission making the possibility of infection high where the proximity of humans with domestic animals is common.

Fasciolosis is also a food security risk causing annual losses of more than US$3000 million to livestock production worldwide due to mortality and morbidity through decreased productivity via reduction of meat, milk, and wool yields (Morphew *et al*., 2014). In Asia, the prevalence of fasciolosis is highest in cattle at 69.2% while lowest in goats at 47% (Khalid Mehmood *et al.,* 2017). In the Philippines, *F. gigantica* is the main causative agent of fasciolosis and is the leading cause of bovine morbidity and mortality (Gray *et al*., 2008) although there are reports which show the overlapping distribution of both species in the country (Mas-Coma and Bargues, 1997). Fasciolosis prevalence is reported to be high in Northern Samar (Gordon *et al.,* 2015), Leyte (Portugaliza *et al.,* 2019) and Cotabato (Molina *et al.*, 2011).

Control of fasciolosis in livestock is mostly based on anthelmintic drugs such as Albendazole and Triclabendazole. The latter is the drug of choice since it has shown high efficacy against the migratory and juvenile stages of infection (Mas-Coma *et al.,* 2014) but reports of resistance to Triclabendazole, Albendazole, and Bromofenofos have already been established in the country (Venturina *et al.,* 2015; Liu *et al.,* 2013). Also, the lack of awareness of the disease's economic impact and its zoonotic potential deters the effective management of the disease most especially in developing countries like the Philippines.

Published studies regarding the current status of fasciolosis in provinces and in the country remain limited. In the province of Isabela, *Fasciola spp*. is a constant finding in slaughtered carabaos in various abattoirs but it is not reported and often ignored. Examining the knowledge, attitude, and practices of a community about fasciolosis may reveal previously unrecognized gaps that contribute to the disease's endemicity in the community. Despite the disease's endemicity and potential as a public health threat, the knowledge, attitudes, and practices of owners about bovine fasciolosis in the area have not been studied. This baseline information will be needed to tailor the disease's control program to the needs of the community.

The current study aimed to assess the knowledge, attitude, and practices of cattle and carabao owners concerning bovine fasciolosis, and to recommend future control strategies to help prevent the spread of the disease in the area.

Materials and methods

Study area and participants

The study was conducted in 20 barangays with the highest number of bovine populations from the municipalities of Jones and San Agustin in the 4th district of Southern Isabela, Philippines. According to the Philippines Statistics 2015 census, Jones and San Agustin had a total population of 45,666 and 22,880, respectively. Both towns have mostly agricultural lands with some forested parts. Mixed farming is the main livelihood activity and rice is the major temporary crop in the area. The average annual temperature of Jones and San Agustin is 26.5° C and the average rainfall is 2248 mm.

This KAP study was a part of the Fasciola profiling project of the School of Veterinary Medicine-Isabela State University Echague, Philippines. The participants included in this study owned at least one animal that was included in the prevalence study. The estimated total sample size of 309 animals from the two municipalities for the prevalence study was calculated using Slovin's sampling technique, with a 92% confidence level. However, only 209 animals were sampled in the study because of the African Swine Fever scare during the collection period and the implementation of the Enhanced Community Quarantine due to Corona virus spread. The 209 sampled animals were owned by 136 owners who all agreed to be the respondents in this survey study.

Study design

A cross-sectional descriptive study was conducted from September 2019 to February 2020 using a pretested structured survey questionnaire. Questions covered the demographic information of the animal owners, their knowledge and attitude about fasciolosis, and their practices related to fasciolosis transmission. Survey questionnaires were originally written in English and translated in Ilokano and Tagalog dialects. In each barangay, representative animals were recruited for the prevalence survey and the owners were invited for the face-to-face interview. Questionnaires were administered verbally. A laminated picture of the adult *Fasciola spp.* was shown to the interviewees during the interview. Table 1 shows the structure of the KAP questionnaire and the scoring used in the study adapted from Phi (2018) and Quy *et al.* (2015).

Statistical analysis

Data on the demographic characteristics of participants were tabulated and analyzed descriptively using frequency distribution. The distribution of mean

knowledge scores, attitude scores, and practice scores by demographic characteristics were tabulated and compared using the Analysis of Variance at 5% significance level. Kendal tau b correlation was performed to determine the relationship between Knowledge score and the attitude and practice scores of the respondents.

Table 1. Structure of the KAP Questionnaire

Part	No of Questions	Maximum Total Score	Assessment
I. Demographic Characteristics	10	No scoring	None
II. KAP Questions			
Knowledge	7	7 points	4.64-7.00 (high knowledge) 2.31-4.63 (fair knowledge) 1.00-2.30 (poor knowledge)
Attitude	8	8 points	≥5 points (pass);<4 points(fail)
Practice	6	6 points	≥4 points (pass);<3 points (fail)

Results

Sociodemographic characteristics

A total of 136 respondents, 65 from Jones, Isabela and 71 from San Agustin were interviewed for the KAP survey. Males accounted for 93.38% and females 6.62% with ages ranging from 16 to 83 years old. Majority finished secondary school (33.82%) with farming (72.79%) as their main occupation. Most (98.53%) spoke in Ilokano, and were not Roman Catholic (55.88%). On the average the owners have been in livestock raising for 23 years (Table 2).

Knowledge regarding fasciolosis

The majority of participants (81.62%) had heard of fasciolosis but were unaware that it was caused by a parasite (70.59%). When shown a photograph of an adult liver fluke, some (4.41%) correctly identified the parasite. The majority (80.15%) recognized the liver as the target organ and emaciation as the principal clinical sign of infection in their animals. More than half were unaware that it is transmitted through consumption of water and grass contaminated with cercariae (65.14%). Most (77.94%) are unaware of the disease's zoonotic potential and have no concept how people can become infected (Table 3). Participants' average knowledge score was fair (3.55 out of 7 questions) with the college-level

participants having significantly higher scores than that of elementary level or elementary graduates (p= 0.05) (Table 4).

Table 2. Socio-Demographic information of the study participants from Jones and San Agustin, Isabela

Demographic information	Number(n)	Percentage (%)
Gender		
Male	127	93.38
Female	9	6.62
Age group		
15-30	8	5.88
31-50	54	39.71
> 51	74	54.41
Religion		
Roman Catholic	60	44.12
Others	76	55.88
Education		
Elementary level	24	17.65
Elementary graduate	14	10.29
High school level	13	9.56
High school graduate	46	33.82
College level	23	16.91
College graduate	9	6.62
Vocational	7	5.15
Municipality		
Jones	65	47.79
San Agustin	71	52.21
Occupation		
Farmer	99	72.79
Barangay official	20	14.71
Gov. employee & retired	4	2.94
Other	13	9.56

Table 3. Knowledge, Attitude, and Practice of Study Participants Related to Fasciolosis in Jones and San Agustin, Isabela

Knowledge Questions	Number(n=136)	Percentage (%)
Have you heard about liver fluke infection?		
Have heard	111	81.62
Did not heard	19	13.97
Seen	6	4.41
What causes fasciolosis?		
Parasite	20	14.71
Bacteria	10	7.35
Virus	10	7.35
I don't know	96	70.59
Do you know if it causes disease in animals?		
Yes	109	80.15
No	27	19.85
Do you know if it affects humans?		
Yes	30	22.06
No	106	77.94
Do you know what organ is affected?		
Yes	86	63.24
No	50	36.76
Do you know its sign/symptoms?		
Yes	67	49.26
No	69	50.74
Do you know if fasciolosis is treatable/preventable?		
Yes	55	40.44
No	79	58.09
Others	2	1.47

Table 4. Knowledge Average Score and Standard Deviation by Demographic Characteristics

Demographic Characteristic	Number (n)	Mean Score	Standard deviation	Min-Max
Gender				
Male	127	3.61	1.86	0 – 7
Female	9	2.67	2.39	0 – 7
Age group				
15-30	8	3.38	1.77	0 – 6
31-50	54	3.61	2.09	0 – 7
51-65	74	3.53	1.80	0 – 7
Education				
Elementary level	24	2.58*	2.06	0 – 7
Elementary graduate	14	3.00*	2.04	0 – 6
High school level	13	3.46	1.51	0 – 6
High school graduate	46	3.70	1.94	0 – 7
College level	23	4.26*	1.54	0 – 7
College graduate	9	4.22	1.39	2 – 6
Vocational	7	4.00	2.16	0 – 6
Municipality				
Jones	65	3.52	2.00	0 – 7
San Agustin	71	3.58	1.83	0 – 7
Occupation				
Farmer	99	3.42	1.95	0 – 7
Barangay official	20	4.00	1.78	0 – 7
Gov. employ. & retired gov. emp.	4	4.75	1.89	2 – 6
Others	13	3.46	1.71	0 – 7

Note : * is significantly different at 95% level of confidence.

Attitude towards fasciolosis

Majority (97.44%) passed the attitude assessment, with high mean attitude score of 7.12 out of 8 questions. However, the differences in the mean scores across sexes, young and old, college degree or elementary graduate, farmer or other jobs are not significant statistically (Table 5). The majority (85.47%) view fasciolosis to be a serious condition and are concerned about the well-being of their animals. Almost all (98.57%), including those who had never heard of the disease, expressed a readiness to engage in future education

campaigns and mass deworming initiatives (Table 6). If they suspect a liver fluke infection in their animal, the majority (76.07%) stated they would seek the advice of a veterinarian, although some (1.71%) claimed they would just sell their animals. Furthermore, respondents that were aware about fasciolosis have a positive attitude toward prevention practices, with the majority agreeing not to let their animals drink from irrigation water, rivers, and ponds (82.91%) or eat grass near these bodies of water (83.76%) and 75.21% agreeing that collecting and composting feces and killing or removing snail intermediate hosts (76.07%) will protect their animals from liver fluke infection (Table 7).

Table 5. Attitude Average Score (±SD) by Demographic Characteristics

Demographic Characteristic	Number (n)	Mean Score	Standard deviation	Min-Max
Gender				
Male	111	7.12	1.15	3 – 8
Female	6	7.17	0.98	6 – 8
Age group				
15-30	7	7.00	1.29	5 – 8
31-50	45	7.27	1.07	4 – 8
51-65	65	7.03	1.17	3 – 8
Education				
Elementary level	17	7.12	1.32	3 – 8
Elementary graduate	11	6.82	1.17	5 – 8
High school level	12	6.50	1.17	5 – 8
High school graduate	40	7.35	1.00	5 – 8
College level	22	7.05	1.25	4 – 8
College graduate	9	7.11	1.05	5 – 8
Vocational	6	7.67	0.82	6 – 8
Municipality				
Jones	54	6.98	1.19	4 – 8
San Agustin	63	7.24	1.09	3 – 8
Occupation				
Farmer	83	7.06	1.19	3 – 8
Barangay official	18	7.11	1.18	4 – 8
Gov. employ. & retired gov. emp.	4	7.75	0.50	7 – 8
Others	12	7.33	0.78	6 – 8

Table 6. Attitude of Study Participants Related to Fasciolosis in Jones and San Agustin, Isabela

Attitude Questions	Number(n=117)	Percentage (%)
Are you concerned that your animals will get liver fluke infection?		
Not concerned	3	2.56
Slightly concerned	14	14.53
Very concerned	100	85.47
What to do when your animal has fasciolosis?		
Treat/deworm	24	20.51
Call a Veterinarian	89	76.07
Do nothing	2	1.71
Others	2	1.71
Willingness to participate in information drives and mass deworming		
Yes	134	98.53
No	2	1.47

Table 7. Distribution of Participants' Attitude Toward Risk Behaviours Related to Fasciolosis

Statements	Attitude scale					
	Disagree		Agree		Neither Agree nor disagree	
	n	%	n	%	n	%
1. To prevent liver fluke, I will not let my animals drink irrigation water, river and ponds	8	6.84	97	82.91	12	10.26
2. To prevent liver fluke infection, I will not let my animals eat grass near rivers, ponds, or irrigation water	13	11.11	98	83.76	6	5.13
3. To prevent liver fluke, I will collect and dispose of animal feces properly.	23	19.66	88	75.21	6	5.13
4. To prevent liver fluke infection, I will apply molluscicide or collect snails in the area	19	16.24	89	76.07	9	7.69

Practice related to fasciolosis

Majority (75%) of the participants raised their carabao without a structured shelter and practice free grazing (64.71%) with the river being the most common source of water (Table 8). Only 30.15% of participants deworm their animals every six months, 52.21% deworm only once a year, and 11.77% have never dewormed their animals. Albendazole was the most common dewormer used, followed by Ivermectin. Makabuhay *(Tinospora rumphii Boerl)* plant was also used, and a few (16.91%) practices composting of their animal's feces.

The mean practice score of the participants was 2.50 out of 6, but differences between sexes, age groups, educational attainment, and occupation were not statistically significant (Table 9).

Table 8. Practice of Study Participants Related to Fasciolosis in Jones and San Agustin, Isabela

Practice Questions	Number(n=136)	Percentage (%)
Type of shelter of animals		
No shelter	102	75.00
Well structured	24	17.65
Sparsely structured	10	7.35
Cattle/Carabao grazing practice		
Free grazing	88	64.71
Cut and carry	2	1.47
Semi grazing	46	33.82
Water source		
River	67	49.26
River and faucet	25	18.38
Faucet	39	28.68
Irrigation	1	0.79
Ponds	4	2.94
Deworming frequency per year		
Once	71	21.00
Twice	41	30.15
Once in many years	3	2.21
Every 3 or 4 months	8	5.88
Never	13	9.56
Waste disposal		
Left in the environment	113	83.09
Composted	23	16.91

Table 9. Practice Average Score (±)SD by Demographic Characteristics

Demographic Characteristic	Number (n)	Mean Score	Standard deviation	Min-Max
Gender				
Male	127	2.5	1.34	0 – 6
Female	9	2.44	0.72	1 – 3
Age group				
15-30	8	2.5	1.07	1 – 4
31-50	54	2.43	1.22	0 – 5
51-65	74	2.55	1.41	0 – 6
Education				
Elementary level	24	2.33	1.24	1 – 5
Elementary graduate	14	2.21	1.48	0 – 6
High school level	13	1.69	0.95	1 – 4
High school graduate	46	2.61	1.27	0 – 6
College level	23	2.61	1.47	0 – 6
College graduate	9	3.11	0.93	2 – 5
Vocational	7	3.00	1.41	1 – 5
Municipality				
Jones	65	2.48	1.42	0 – 6
San Agustin	71	2.52	1.22	0 – 5
Occupation				
Farmer	99	2.45	1.32	0 – 6
Barangay official	20	2.9	1.25	1 – 5
Gov. employ. & retired gov. emp.	4	3.5	1.00	3 – 5
Others	13	1.92	1.19	0 – 4

Correlation of KAP scores

A highly significant ($p \leq 0.001$) positive correlation of the participants knowledge score to their attitude and practices was observed (Table 10).

Table 10. Correlation of the Knowledge score to the attitude and practice scores of participants

	Attitude score	Practice score
Knowledge score	0.339**	0.224**

Note: **p<.001

Discussion

The results of the study showed that cattle and carabao raisers in Jones and San Agustin, Isabela had limited knowledge about fasciolosis. Our data showed that although the respondents had heard about fasciolosis or know the appearance of a liver fluke, there is inadequate understanding about how the disease is transmitted in both animals and humans. The fact that mean knowledge scores differed between college-level and elementary-level participants further supports the idea that educational level has an impact on one's level of knowledge. This might be explained by the different ways college-level participants were able to receive information regarding the disease, such as lectures, reading materials or through social media. Thus, future awareness campaigns about the disease should ensure the attendance of people with varied educational attainment. Provision of disease flyers may also be given at the end of seminars to accommodate or reach a wider audience.

In comparison to northeast Thailand, the survey participants currently know less about how the disease is spread. According to Kaewpitoon *et al.* (2007), the majority (79.72%) of their respondents were educated about prevention and control, and more than half (55.11%) had an excellent understanding of parasite transmission. Although the attitude of the participants in the current study is more favorable than that of the Thai population, both the attitude and the practices in the prevention and control of liver fluke were considered to be good. On the contrary, a KAP study on human fasciolosis conducted in Vietnam by Quy *et al.* (2015) found that less than half of the participants in three communes (24.6% - 46.0%) knew the cause of fasciolosis and that a sizable percentage of them engaged in behaviors that encourage it. This includes eating improperly boiled vegetables (28.2-33.8%), drinking unboiled water (23.5-42.5%), and not owning a household toilet (14.2-20.5%). Similarly, a low percentage of the respondents in the study of Phi (2018) in Vietnam passed the knowledge, attitude, and practice assessment. On the other hand, knowledge about fasciolosis among farmers in Laos was lower compared to our present findings (Rast *et al.,* 2017).

Given the strong association between the knowledge score and practice scores of the study participants, it is possible that the low practice score in the study is a reflection of the participants' insufficient knowledge regarding the disease. For instance, although many believed that they should not let their animals drink near the river, the majority of them still practiced it. Grazing or drinking of water by animals near rivers and irrigation was shown to be highly associated with Fasciola infection because the snail intermediate hosts were abundant in these areas (Portugaliza *et al.,* 2019). Additionally, some participants do not deworm their animals at all, while others just deworm once a year.

Albendazole was the most commonly used dewormer by owners, and *Fasciola spp*. have reportedly grown resistant to it (Venturina *et al.,* 2015). The farmers should be advised to deworm their livestock using other anti-fasciola dewormers, such as Triclabendazole or Rafoxanide to avoid resistance. The knowledge gap in the transmission of Fasciola has led our farmers to adopt practices that are favorable to the disease transmission. This proves the need to educate the people in the area regarding fasciolosis through campaign programs to change their current practices. The positive attitude towards liver fluke infection and prevention of almost all participants in the study is considered a very good opportunity for future educational campaigns and mass deworming programs, as their perceived willingness to participate in these programs is a key factor in preventing the spread of the disease in their communities.

In conclusion, the main barriers identified in this study, including inadequate knowledge about fasciolosis transmission, irregular deworming practices, possible anthelmintic resistance, and unfavorable husbandry practices, should be addressed. The significant positive association found between the knowledge and practice scores of participants, along with their high concern about the disease and willingness to support future campaigns and deworming programs, presents an opportunity to develop an improved protocol for controlling fasciolosis in the area. Educating communities about fasciolosis, its transmission in both humans and animals, and the alternate use of dewormers will address the need for changes in current practices to stop the transmission of the parasite in the area.

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