How to cite: Teferdegn, E.,Y., Ün, C., Taşkın, T., A Preliminary Study for the Determination of Prion Disease for Farm Animals in Ethiopia, J. Anim. Prod., 2020, 61 (1): 17-21, DOI: 10.29185/hayuretim. 583573

Research Article
(Araştırma Makalesi)

J. Anim. Prod., 2020, 61 (1): 17-21
DOI: 10.29185/hayuretim. 583573

A Preliminary Study for the Determination of Prion Disease for Farm Animals in Ethiopia

Etiyopya'daki Çiftlik Hayvanlarında Prion Hastalığının Belirlemesine Yönelik Bir Ön Çalışma

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Keywords:

Ethipian, farm animals, prion-like disease, public health.

Alınış (Received): 28.06.2019 Kabul tarihi (Accepted): 11.09.2019

ABSTRACT

Objective: The aim of this study was to investigate prion and prion-like disease status of native Ethiopian farm animal.

Material and Methods: In this study, descriptive study design was employed. A Semi-Structured interview was conducted to collect primary data from farmers who owned all or either cattle, sheep or goat and animal health extension of the provinces. Simple random sampling and purposive sampling were used to identify farmers who encountered the loss of more than three farm animals from their flock because of the same disease phenotype. Thus, 55 farmers and 6 animal health workers/experts who hold animal science or DVM degree were interviewed.

Results: Of the total, 29 of the farmers experienced the loss of a significant number of animals at different times while 10 of them were not able to recall the incidence. All of the participated farmers claimed that there was no prion-like disease that killed dozens of their animals emerged in their areas. Despite the fact that the majority of farmers asked were not able to remember the exact sign and symptom of the disease that was the cause for the death of their animals, they were able to recall the most frequent phenotypes. According to animal health workers; foot and mouth disease (FMD), Lumpy skin disease (LSD) and sheep pox were the major outbreaks detected in the past few years.

Conclusion: There were treated and untreated cases of animal diseases having similar clinical signs with that of prion diseases. Though this data has some limitations to conclude that prion disease never happened in the areas where the current study was conducted, it is possible to speculate that there was no epidemic of prion or prion-like disease yet.

Anahtar Kelimeler:

Etiyopya, çiftlik hayvanı, prion benzeri hastalık, halk sağlığı.

ÖZ

Amaç: Bu çalışma, Etiyopyada çiftlik hayvanlarında prion ve prion benzeri hastalıkların durumunu belirlemek amacıyla yapılmıştır**.**

Materyal ve Yöntem: Bu bir duurm belirleme çalışmadır. Sığır, koyun ya da keçi yetiştiren üreticilerle yapılan görüşmelerden elde edilen bilgiler derlenmiştir. Yetiştiricilerin belirlenmesi, şansa bağlı olup sürüsünde en az 3 hayvanı aynı hastalık belirtileri göstererek ölen hayvan sahipleri şeklinde olmuştur. Bu amaçla 55 yetiştirici ve 6 adet de hayvan sağlığı uzmanıyla görüşme yapılmıştır.

Bulgular: Toplamda, yetiştiriiclerin 29'u farklı zamanlarda kayda değer sayıda hayvan kaybı yaşarken, 10'u hastalık görülme durumunu hatırlamadığını belirtmiştir. Ankete katılan yetiştiricilerin tümü, bölgelerinde çok sayıda hayvanda hastalık belirtilerinin ortaya çıkmasına neden olan prion benzeri bir hastalık olmadığını iddia etmiştir. Yetiştiricilerin çoğunun sorulara verdiği yanıt, hayvanlarının ölüm nedeni olan hastalığın kesin belirtisini ve semptomunu hatırlayamamış olmasına rağmen, en sık görülen belirtilerinin neler olduğunu hatırlayabilmişlerdir. Hayvan sağlığı çalışanlarına göre; şap/ayak ve ağız hastalığı (FMD), topaklı deri hastalığı (LSD) ve koyun çiçeği, son birkaç yılda görülen başlıca salgınlardır.

Sonuç: Prion hastalıklarına benzer klinik bulgulara sahip hayvanlar tedavi edilen ve edilmeyen hayvan hastalıkları vakaları vardır. Her ne kadar bu veriler, prion hastalığının mevcut çalışmanın yapıldığı bölgelerde asla yaşanmadığı sonucuna varmak için bazı sınırlamaları vardır. Henüz prion ya da prion benzeri hastalık salgını olmadığını tahmin etmek mümkün görünmemektedir.

INTRODUCTION

Livestock is the major source of economy in Ethiopia. A great deal of the population of the country depends on livestock for domestic consumption and export (Endalew and Ayalew, 2016). Together with the growth of the population, the size of livestock is continuously growing. To date, there are about 52.1 million cattle 24.2 million sheep and 22.6 million goats in the country (Endalew and Ayalew, 2016). Despite the fact that livestock is the determining factor for the growth and development of the country, animal husbandry is loosely monitored (Asmare, 2014). Although there are always efforts to improve the quality and quantity of livestock, the lack of modernized and technology-based approach challenges the progress. Especially research-based practices are greatly compromised in livestock production management (EIAR, 2019). Apart from that, the obscene of routine disease surveillance and diagnosis during outbreaks jeopardized livestock wellbeing and production.

One of the most debilitating animal diseases of our time having no cure is Transmissible Spongiform Encephalopathy (TSE). TSE affects both human and animal. A number of studies revealed that environmental dynamics and genetic makeup of individuals are determining factors for the contraction of TSE. So far, horizontal and vertical transmissions of TSE were established (Saunders, Bartelt-Hunt et al. 2008, Pritzkow, Morales et al. 2018). Such infection including cross-species transmission of the disease often labeled as acquired. However, the susceptibility of prion disease contraction was confirmed to be significantly dependent on the genetic makeup of individuals. For example, in sheep individuals with ARR haplotypes are resistant to small ruminant prion disease than the counterpart VRQ this is highly susceptible (Imran and Mahmood 2011). Besides, sheep prion disease infection could cross the species barrier and infect bovine but not human. The well-known acquired human TSE, CJD, is contracted by the human from Bovine (Lukic and Mead, 2011). The common grazing lands, housing, animal handling, and other environmental factors indeed contribute to the entrance of the infection into the food chain parallel to the genotype of individuals exposed to infection(Saunders, Bartelt-Hunt et al. 2008, Taskin et al. 2010, Pritzkow, Morales et al. 2018).

The commonly known TSE in animals is Bovine Spongiform Encephalopathy (BSE) in cattle, chronic wasting disease (CWD) in deer, Feline spongiform Encephalopathy (FSE) in cats (Imran and Mahmood, 2011). Scrapie is also the oldest TSE of small ruminants, which was known for more than 200 years (Chesebro, 2003; Liberski, 2012). However, the underlined mechanism was not clearly understood (Liberski, 2012) until Prusiner discovered the misfolded protein is the principal cause of TSE in 1982 (Prusiner, 1998). Later a number of studies came out to understand the disease epidemiology, etiology and molecular mechanism in many countries. Questionnaire-based surveillances are the first step in identifying the disease status. Many developed countries conducted questionnaire based and postal surveys (Morgan, et al. 1990; Schreuder, et al. 1993; Hoinville, et al. 2000). However, none of the above-mentioned type of studies addressed the issue of interest in Ethiopia. Considering the value of livestock to the country and the seriousness of the disease, it is worth conducting prion disease surveillance as a preventive means (Teferedegn et al. 2019). In this study, only non-clinical and herd management-related risk factors were examined in randomly selected livestock farmers and health workers. It was intended to provide a base line data for future large-scale study which includes genotyping native farm animals aiming to improve the welfare, quality and quantity of livestock in the country. Thus the aim of this study is to identify disease phenotypes that resemble prion and speculate prion disease status of farm animals in Ethiopia.

METHOD and MATERIAL

Study area

This study was conducted in North Shewa (10°15'00.0"N 39°30'00.0"E), AgewAwi (11°00'0.00" N 36°39'59.99" E) and Fogera (11°57'00.0"N 37°35'00.0"E) zones of Amhara, (9° 33' 0" N, 40° 24' 0" E) Amibara zone of Afar, (7°52′N 38°42′E ') Arsi Adamitulu zone of Oromia.

Study design

In this study, descriptive study design was employed. A Semi-Structured interview was conducted to collect primary data from farmers who owned all or either cattle, sheep or goat and animal health extension of the provinces.

Sampling

Simple random sampling and purposive sampling were used to identify farmers who encountered the loss of more than three farm animals from their flock because of the same disease phenotype. Thus, 55 farmers and 6 animal health workers/experts who hold animal science or DVM (Doctor of Veterinary Medicine) degree were interviewed.

Data management and analysis

The data collected was properly coded and entered into a spreadsheet. Descriptive statistics, namely, mean, frequencies and percentages were made to summarize the results using SPSS (1999).

RESULTS

Among the 55 interviewed farmers 16 of them did not encounter mass loss of animals (i.e. more than 3 animals) at a given time because of the same disease phenotype they described. Of the total, 29 of the farmers experienced the loss of a significant number of animals at different times while 10 of them were not able to recall the incidence. All of the participated farmers claimed that there was no prion-like disease that killed dozens of their animals emerged in their areas. Despite the fact that the majority of farmers asked were not able to remember the exact sign and symptom of the disease that was the cause for the death of their animals, they were able to recall the most frequent phenotypes. The clinical signs that were the most frequently singled out by the farmers were ; fever, bloating, swelling of the throat, extra salivation, lesion of different parts of animals' body, sneezing and cough were the frequently described symptoms by the farmers. Loss of appetite, running nose, walking difficulty and rash were disease phenotypes that most farms tried to recall as well. Interestingly, tick and other ectoparasites were mentioned by farmers as their unbearable challenges.

Table 1. Frequency of symptoms of a disease mentioned by farmers in their deceased animal
Çizelge 1. *Yetiştiricilerin ölen hayvanlarına ait hastalık belirtilerin görülme sıklığı*

Symptoms of a disease in a deceased animal	Frequency(%) n=29
Lesion	0.29
Bloating + Lesion	0.58
Bloating + Dizziness	0.58
Bloating + Lesion	0.58
Swelling of the throat + Salivation + Swelling of the throat	0.58
Walking difficulty + Swelling of the throat	0.29
Swelling of the throat + Cough Salivation + Lesion	0.29
Coughing + Sneezing + Loss of appetite	0.29
Coughing + Lesion	0.58
Something contagious	0.29
Loss of appetite + weight loss + vomit	0.29

Although none of the farmers had awareness about prion diseases i.e. Scrapie and BSE in this case, they tried to rule out prion diseases phenotypes when they were given to choose among the list of sign and symptoms. Accordingly, loss of hair, eating difficulty, ataxia, hyperexcitability and aggressiveness, unusual behavior than others, weight loss, teeth grinding and milk product reduction were chosen by the farmers. None of the farmers were able to identify all of the above typical prion sign and symptoms in a single animal.

Table 2. The frequency of ruled out Prion disease clinical sign and symptoms recalled by the farmers in their deceased animals
Çizelge 2. *Yetiştiricilerin ölen hayvanlarında görülen hastalık belirtileri ile Prion hastalığının klinik belirtilerine ait frekanslar*

Clinical sign and symptoms of a disease in a deceased animal	n=29 Negative (%)	Positive (%)
Loss of hair	10.7	2.3
Scratching against an object	12.5	0.6
Eating difficulty	6.4	6.7
Ataxia	7.5	8.4
Tremors, Gait Abnormalities	7.5	5.5
Hyperactivity, aggressiveness irritability, restlessness unusual alertness	9.9	3.2
Unusual behavior like - incoordination	8.9	4.1
Weight loss	6.7	6.4
Teeth grinding	8.9	4.4
Reduction in milk	6.4	6.7
All of the above symptoms in an animal at once	13.1	0

N- the total number of farmers experienced the loss of a significant number of animals at different times which is equal to the frequency of symptoms that were resembles at least one of the clinical presentation of prion disease

Positive-reflects the frequency of the clinical presentation which was recalled by the farmers in their deceased animals

Negative- reflects the frequency of the clinical presentation which were ruled out recalled by the farmers in their deceased animals

According to animal health workers; foot and mouth disease (FMD), Lumpy skin disease (LSD) and sheep pox were the major outbreaks detected in the past few years. One of the health workers from Menz mentioned that rabbis and ectoparasite as local epidemic diseases. All of the interviewed animal health extension workers were aware of prion disease and claimed that there was neither prion disease outbreak nor a single case reported yet.

DISCUSSION

Ethiopia is one of the largest sources of livestock to the African market. The large population size of livestock in the country for domestic consumption and export needs a great deal of attention to safeguard the smooth economic flow of the country. Satisfaction of market demand and high-quality product requires monitoring of animals wellbeing on a regular basis (Knight-Jones and Rushton 2013; Molla et al. 2017a). Thus, epidemiologic surveillance adds value in identifying common disease phenotypes of chronic and lethal diseases. Among the lethal neurodegenerative disease, Prion diseases are the most debilitating infectious diseases, which can be transmitted vertically and horizontally through different routes (DeJoia et al. 2006; Gough and Maddison, 2010). Many developed countries conducted questionnaire based prion disease surveillance (Morgan, et al. 1990; Schreuder, et al. 1993; Hoinville et al. 2000; McIntyre et al. 2006). An epidemiologic study reported the spread of scrapie in Kenya from Western Europe countries in 1970 (Detwiler and Baylis, 2003). For the last several decades, there has been illegal and legal livestock exchange between Kenya and Ethiopia across the southern border. Such incidence might cause cross border disease transmission. Moreover, transboundary diseases are greatly impaired the livestock export rate and have significant public health burdens in Ethiopia (Negesso et al. 2016). Thus, the need for scrapie based diagnostic and a non-diagnostic epidemiologic survey is the first step in the prevention, eradication, and control of the disease. In the current non-diagnostic observatory and interview-based survey, all extension works participated were well aware of prion diseases of animals. They confirmed the case was never reported in the regions they were assigned. They also mentioned that they have never come across with any sick animal presented with an absolute prion disease-like phenotype. Instead, extension workers shared the most frequent epidemic of small animals were FMD, sheep and goat pox and LSD. Apart from that, endo and ectoparasites were reported to be the main challenge of farmers. This finding is in line with the previous studies conducted in the same region of the current study where FMD was epidemic in different times (Ayelet, et al., 2012; Jemberu et al., 2016; Sulayeman et al., 2018). The frequent FMD outbreak was partly because; most of the farms were not interested in the heavy involvement of the disease control strategies (Jemberu et al., 2015). In the current study as well, some of the farmers admitted that they usually avoided vaccination of their animals because they think that vaccination may endanger their animals. Similar to the current study, previous studies as well reported LSD was the commonest outbreaks of livestock across the country (Abera et al. 2015; Molla et al. 2017b, Molla et al. 2017c). A sheep and goat pox was also claimed to be prevalent by the extension workers. A study in Amhara region revealed sheep and goat pox (SGP) were epidemics in the specified area (Fentie et al. 2017).

Despite all of the farmers who were participated in the study were not aware of prion disease and the disease phenotypes, they were able to recall the disease sign and symptoms because of which they lost their animals at some point. The most frequent described disease phenotypes were fever, depression, and lesions in many parts of the animals' body, movement difficulty, salivation, and weight loss and the decline in milk production. Though those clinical signs resemble prion disease phenotypes, they were most presumably FMD (Grubman and Baxt, 2004). That is because the extension works confirmed the outbreaks of FMD and those cases were all treatable. Besides to that, none of the participants confirmed that they encountered a disease with absolute prion disease like phenotypes as they were guided to rule out from the list of sign and symptoms of prion disease.

In this study, the main findings were; participated farmers claimed that they have never heard of prion disease before and they have never experienced mass killing contagious animal disease, which was untreatable, and having the exact prion disease sign and symptoms. Similarly, extension workers were certain that the previous outbreaks were other resembling diseases but not prion. However, due to the luck of nonexclusive representativeness of the sample; it is still unprecedented to disclose the absence of prion disease in the area of the current study and in the country at large.

CONCLUSION

There were treated and untreated cases of animal diseases having similar clinical signs with that of prion diseases. Though this data has some limitations to conclude that prion disease never happened in the areas where the current study was conducted, it is possible to speculate that there was no epidemic of prion or prion-like disease yet. Besides, it is strongly recommended to conduct a large-scale study to support the current finding.As the most important factor in prion disease distribution are uncontrolled

animal movements, direct and indirect passages between flocks and common pasture usage, it is highly recommended to practice good flock management i.e. timely veterinary consultation ,proper animal hosing and feeding.Thus, this study provides trustworthy information in increasing awarness about the disease in the country and suggest consideration of protective measures during cross breeding among local and foreign breeeds

ACKNOWLEDGMENT

The authors would like to thank Ethiopian Biodiversity Institute (Animal breeding section) for partially financing the study and Addis Ababa university college of Veterinary Medicine and Agriculture for facilitating the work.

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