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Review on epidemiology of PPR, current status and its future perspective in Ethiopia

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Abstract

Pest des petites ruminants are severe viral infectious disease of sheep and goats. This paper focused on reviewing PPR prevalence in Ethiopia and opportunities to eradicate the diseases. In Ethiopia National sero-prevalence of PPR studies were conducted and 6.4% sero-prevalence was reported in sheep and goat. Other studies were conducted at different time with in different region and district of Ethiopia by different researchers to know the PPR sero-prevalence in sheep and goats. The overall prevalence of PPR ranges from 27.3% to 48.43% as reported from different parts of country. There is only one serotype of PPR virus, no carrier state and once vaccinated produce life-long immunity, but there is a greater challenge for the vaccination strategy due to large number of goats and sheep. As a recommendation Sero-prevalence study should be conducted in unstudied area to identify the high risky zone in order to control and eradicate the diseases.

Keywords: Ethiopia, PPR, Sero-prevalence

Introduction

In Ethiopia goat and Sheep population is almost similar in number which is about 30.20 million and 30.70 million (CSA, 2016/17) ^[9] respectively. They are contributing to the income of the households in live of rural population in Ethiopia, (Legesse *et al.*, 2010) ^[17]. Sheep and goat especially goat are species of choice by pastoralist because they are able to survive unfavorable climatic condition (Tolera and Abebe, 2007) ^[39]. PPR is especially disease of sheep and goats which is viral, highly infectious disease caused by the PPR virus. (PPRV) belongs to Paramyxoviridae family and the genus of Morbillivirus. PPR diseases were described first from West Africa in 1942 in Cote d'ivoire. PPR diseases known by different names such as Pseudo Rinderpest of small ruminants, Pest of small ruminants, and Goat plague (Braide, 1981) ^[8]. Can cause as high as 90% mortality rate and all age group can be affect (Wondimagegn, 2016) ^[44]. Can be transmitted by close contact with infected animals (FAO, 2008) ^[13].

In Ethiopia in 1977 in the Afar region PPR was clinically suspected for the first time from a goat herd. As Abraham *et al.*, 2005, reported occurrence of PPR in camels and cattle have been demonstrated serologically in Ethiopia. Waret-Szkuta *et al.*, 2008 ^[42] reported 6.4% overall sero-prevalence has been reported at national level. As study conducted by different researchers show that there is a difference in prevalence of PPR at different parts of Ethiopia. PPR prevalence were 18.3%, reported from western Amhara by Tsegaw *et al.* (2018) ^[40], 48.43%, East Shoa and Arsi zone by Getachew *et al.* (2017) ^[18], 27.3%, at Gambella study from Megersa *et al.* (2011) ^[27] from study of Berihu *et al.* (2014) 46.3%, at South Tigray and 3.26%, from Maji district, South Westen Ethiopia, by Asamenech (2017) ^[3], respectively. This variation is created due to difference in condition of agro-climatic, and production systems variation as mentioned by researchers. As mentioned by Munir *et al.*, 2013 ^[29], age, sex, season, breed, newly received animals and agro-ecology are associated risk factors of PPR diseases. That means young animals are more affected than old animals to PPRV and male less affected than female (Luka *et al.*, 2011) ^[26].

Opportunities to eradicate and control PPR is similar with that of rinderpest using Vaccine which able to provide life-long immunity. PPR diseases control should be aimed at poverty alleviation programs. Quantify prevalence, distribution of the diseases, and associated factors with the disease occurrence are the prerequisite for control program. Therefore, the present review is, aimed:

- To review the prevalence, and current status of PPR diseases in Ethiopia and opportunities to eradicate and its future perspective.

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Peste Des Petits Ruminants Diseases

PPR is severe infectious viral disease of small ruminants which characterized by diarrhea conjunctivitis, fever, stomatitis and other signs. (Braide, 1981)^[8].

Etiology: The etiological agent of PPR diseases (PPRV), *Paramyxoviridae* family, *Mononegavirales* Order and Genus of *Morbillivirus*. Have Similarity with other *morbilliviruses* (Tober *et al.*, 1998)^[38]. PPR virus characterized by it cannot be surviving for outside the host for long time, it is fragile and alcohol and most disinfectants can kill it easily (Tober *et al.*, 1998, CIDRAP, 2003)^[38, 10].

Geographical distribution: The disease widely distributed and endemic to Africa and Asian countries, Europe free of the diseases. (OIE 2013 and FAO, 2015)^[32, 16].

Host range: Highly affect goat, and sheep. Sheep are less susceptible than goats; (Lefevre and Diallo, 2007). Subclinical infection observed on pigs, cattle and camels (Taylor, 1984)^[36]. From wild small ruminants in a zoo and those living in the wild the diseases also reported (Kinne *et al.*, 2010; Sharawi *et al.*, 2010)^[23, 34].

Transmission of the virus: Aerosol route, milk from infected dam, ingestion, conjunctival penetration and close contact between animals main route of transmission of PPR diseases. (Banyard *et al.*, 2010)^[5]. Affected animals is source of transmission (Braide, 1981)^[8].

Socio-Economic Impact of PPR: Different areas African and Asian countries their live based on sheep and goat production (Banyard *et al.*, 2010). PPR disease highly affects trade both locally and internationally (Elsawalhy *et al.*, 2010)^[12]. Globally Large number of small ruminants are at high risk to be infected by the diseases (FAO, 2009)^[14].

Risk factors for PPR disease: Different studies have been reported that different risk factors such age, sex, agro-ecology, animal species, season, breed, newly purchased animals and returned unsold from markets for PPR diseases (Munir *et al.*, 2013)^[29]. Adult animals less affected than

young or unweaned animals (Taylor *et al.*, 1990)^[37]. New animals Introduction to the herd or returned unsold animals from markets are the risk factors for PPR diseases (Singh *et al.*, 2004a)^[35].

Clinical symptoms: incubation period will be 3–5 days, fever, Stomatitis, conjunctivitis, diarrhea, and anorexia, mucoid nasal discharges were observed. (Mondal *et al.*, 2001)^[28].

Diagnosis Techniques: For the detection and confirmation of PPRV there are number of molecular diagnostic tests and currently available serological tests such as PCR or I-ELISA (Baron, *et al.*, 2011)^[6].

Differential Diagnosis: Diseases which are diagnostic challenge for PPR diseases those diseases which cause diarrhea, mucoid nasal discharge, pneumonia in goat and sheep. (Radostitis *et al.*, 2007)^[33]. Differential diagnosis for PPR disease were include: pasteurullosis bluetongue, mineral poisoning, CCPP, and contagious ecthyma (OIE, 2002)^[31].

Control and Prevention: minimize the chance of transmission of the diseases from healthy animals by separating infected animals. Moreover, a good option is to vaccinate the animal to minimize risk of the diseases occurrence to healthy animals. (Braide, 1981)^[8].

Treatment: No treatment for PPR diseases. Affected animals can be treated with broadspectrum antibaotics. Specifically to prevent secondary pulmonary infections. Using oxytetracycline and chlortetracycline are recommended (CIDRAP, 2003)^[10].

Sero-prevalence of PPR in different District of Ethiopia
From a research conducted at East Shoa and Arsi zone 48.43% an overall PPR sero-positivity was reported (Getachew *et al.*, 2017)^[18]. (Table. 2). Study report by Waret-Szkuta *et al.* (2008)^[42], report 6.4% National PPR sero-prevalence (Table 1).

Table 1: Sero-prevalence of PPR diseases conducted at national level

Study area (Ethiopia)	Species	No. of tested (*)	Prevalence (%)	Reference
Afar	Both	1653	15.3	Waret-Szkuta <i>et al.</i> , 2008 ^[42]
Amhara	Both	5992	4.6	Waret-Szkuta <i>et al.</i> , 2008 ^[42]
Benshangul Gumuz	Both	729	8	Waret-Szkuta <i>et al.</i> , 2008 ^[42]
Oromia	Both	2290	1.7	Waret-Szkuta <i>et al.</i> , 2008 ^[42]
SNNPR	Both	1622	1.8	Waret-Szkuta <i>et al.</i> , 2008 ^[42]
Somali	Both	465	21.3	Waret-Szkuta <i>et al.</i> , 2008 ^[42]
Tigray	Both	900	15.3	Waret-Szkuta <i>et al.</i> , 2008 ^[42]
Overall prevalence	Both	13561	6.4	Waret-Szkuta <i>et al.</i> , 2008 ^[42]

*Using C-ELISA laboratory technique with cross sectional study design

A study conducted at Gambella and Afar regions reported sero-prevalence of 30.9% (Megersa *et al.*, 2011)^[27]. 28.1% sero-prevalence reported by Alemu, (2014)^[2] from Eastern

Amhara. Fikru *et al.* (2018)^[15] reported the overall prevalence of PPR was 40.2% at selected district of Afar (Table 2).

Table 2: Sero-prevalence PPR in different parts of Ethiopia

Study area (Ethiopia)	Species	No. tested (*)	Prevalence (%)	Reference
Gambella (Itang)	Both	779	27.3	Megersa <i>et al.</i> , 2011 ^[27]
Afar (ada'ar)	Both	384	38.3	Megersa <i>et al.</i> , 2011 ^[27]
Afar (Awash Fentale)	Both	238	36.6	Delill <i>et al.</i> , 2012 ^[11]

South Tigray	Goat	240	46.3	Berihun <i>et al.</i> , 2014 ^[7]
Horro, Bonga and menz	Sheep	448	11.2	Azeb, 2016 ^[4]
around Somali region Ethiopia	Both	798	41	Wondimagegn, 2016 ^[44]
Maji district	Both	768	3.26	Asamenech, 2017 ^[3]
East shoa and Arsi zone	Both	700	48.43	Getachew <i>et al.</i> , 2017 ^[18]
Adama	Both	384	30.2	Hirut <i>et al.</i> , 2017 ^[21]
South omo	Both	894	30.9	Kibrom <i>et al.</i> , 2018 ^[22]
Bench Maji and Kafa Zones	Both	968	2.1	Tsegaye <i>et al.</i> , 2018 ^[41]
Silti and gurage	Both	390	29.2	Gizachew, 2018 ^[19]
Afar region	Both	229	40.2	Fikru <i>et al.</i> , 2018 ^[15]
West Amhara	Both	672	18.3	Tsegaw <i>et al.</i> , 2018 ^[40]

*Using C-ELISA laboratory technique with cross sectional study design

Hint: Both: (sheep and goat)

Opportunities and PPR Eradication Challenges

The PPRV and Rinder Pest virus very much similar. Therefore, it is possible to control and eradicate PPR like that of Rinder pest diseases. Factors these favors PPR eradication are, PPR virus has only one serotype, life-long immunity after vaccination, has no carrier state, unable to survive outside the host for a long period of time (Kumar *et al.*, 2013) ^[24]. Sheep and Goats reproduce rapidly than cattle are more numerous and, which creates greater challenge for the vaccination strategy.

After the successful Rinderpest eradication campaign, OIE has officially declared PPR as next candidate disease, to be eradicated. Peste des petits ruminants (PPR), has been targeted by the global community for eradication within the next 15 years. (Fournié *et al.*, 2018) ^[20]. Currently Ethiopia developed strategy and working for the progressive control and eradication of PPR.

Conclusion and Recommendations

A Peste des petits ruminant (PPR) is an acute, highly infectious, and economically important transboundary viral disease of sheep and goat. In Ethiopia the highest prevalence was reported from northern part (South Tigray and Eastern Amhara), Eastern Oromia, Somali and afar region, and lowest prevalence was reported from South Western region. The variation is due to difference in husbandry practice, different geographical regions and other factors. Based on the above conclusion the following recommendations are forwarded:

- The current ongoing government efforts to perform PPR vaccination of goats and sheep should be applied more strictly and strategically.
- Strict animal movement control within the country and cross-border.
- Sero-prevalence study should be conducted in unstudied area.

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