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Vaccination Coverage of Contagious Bovine Pleuropneumonia in Adamawa State, Northeastern Nigeria

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SUMMARY

Contagious bovine pleuropneumonia is an important, transboundary animal disease of high socio-economic impacts and vaccination has been recommended as one of the preferred option for its control. Twelve years (2006-2017) of data were retrieved from the Ministry of Livestock Production, Adamawa state. The relevant data collated included; estimated annual cattle population, number of cattle vaccinated against CBPP, number of CBPP outbreaks reported, number of mortality due to the disease, number of cattle slaughtered and examined for CBPP lesions and number of cattle with suspected CBPP lesions. The overall vaccination coverage of 4.80% was obtained with the highest vaccination coverage (20.57%) and the lowest vaccination coverage (1.03%) recorded in 2013 and 2015 respectively. A negative and insignificant correlation ($r= -0.2346$, $p> 0.05$) was obtained between vaccination coverage and prevalence, whereas correlation between prevalence and reported outbreak of CBPP was positive ($r= 0.7381$). A total of 76 outbreaks representing an average of 6.33 outbreaks per year and a mortality of 456 were recorded. The highest number of outbreaks (15) was recorded in 2017 whereas the least number of outbreaks (1) was recorded in 2007. The study has established low and irregular vaccination coverage which resulted in increased outbreaks of the disease in the study area. The need for Government to procure CBPP vaccines that is affordable as well as accessible to cattle owners at subsidized rates, increased and compulsory vaccination coverage of 80% for 5 consecutive years and enlightenment of cattle owners through public media on the dangers of the disease was recommended.

Key words: Contagious bovine pleuropneumonia, outbreak, vaccination coverage, Adamawa state.

INTRODUCTION

Contagious bovine pleuropneumonia (CBPP) is an economically important and highly infectious respiratory disease of cattle caused by *Mycoplasma mycoides* subspecies *mycoides* with serious threat and impediment to livestock production in sub-

Saharan Africa (Ankeli *et al*., 2017; Francis *et al*., 2017). It produces clinical manifestation like anorexia, fever and severe respiratory signs such as dyspnoea, polypnoea, cough and nasal discharges (OIE, 2014). The disease is prevalent in Africa and Nigeria in particular due to improper/lack of implementation of test and slaughter policies and compensation of cattle owners by concerned authorities (Aliyu *et al*., 2000; Jores *et al*., 2013; Francis *et al*., 2018).

The economic effects of CBPP can be enormous, resulting in heavy loss in cattle populations. Due to high financial and economic loss caused by the disease in endemic regions, OIE declared it as the most serious, notifiable and major transboundary animal disease (TAD) of high socio-economic impacts (Wade *et al*., 2015). CBPP has been reported causing significant economic loss on the agriculture sectors and the national economy (Admassu *et al*., 2015). Direct economic implication of CBPP have been ascribed to its impact on production, especially cattle mortality, morbidity, reduced weight gain, low milk yield and reduced working time of draught animals and indirect cost arises from expenditures related to prevention strategies such as vaccinations, treatments and surveillance, compensations for culled animals (Suleiman *et al*., 2015). The disease has a major impact on livestock-dependent populations and can result to reduced food supply and significant income losses because of trade restrictions (Gourgues *et al*., 2016). In Nigeria, Fadiga *et al.* (2013) reported CBPP morbidity and mortality rates of 50% and 25% respectively, with economic analyses estimating its annual financial burden to be N2.2 billion.

Mass and rigorous vaccination of cattle has been reported as the major preferred option for CBPP control in Africa (Olorunshola *et al*., 2017). Vaccination apart from having the potential to protect cattle herds against CBPP; has been reported as the most effective, efficient and economic control strategy for the disease (Onono *et al*., 2014). Several vaccine strains have been developed so far from the causative agent *Mycoplasma mycoides* subsp. *mycoides*, including strain T1/44, which is currently used in Africa. This attenuated strain was derived in the 1950s from a Tanzanian strain by 44 passages on embryonated eggs (Gourgues *et al*., 2016). CBPP vaccine T1/44 currently in used in Nigeria has been produced in National Veterinary Research Institute (NVRI) Vom which produced immunity for about 1 year (Tambuwal *et al*., 2011). However, short duration of action, partial protection to the vaccinated animals, cold chain requirement and adverse tissue reaction has been reported as the major setbacks of the vaccine (Tambuwal *et al*., 2011; Schieck *et al*., 2014; Musa *et al*., 2016). It was reported that, for a new vaccine to replace T1/44, it should preferably, be stable, given in a single dose, provide a longer duration of immunity and higher levels of protection and not cause adverse reactions (Olorunshola *et al*., 2017).

CBPP has been reported to be endemic and widespread in Adamawa state with high incidence of occurrence irrespective of the season (Aliyu *et al*., 2000; Musa *et al*., 2016; Francis *et al*., 2018). It is against this background that we investigated field outbreaks and vaccination coverage of the disease, so as to curtail further outbreaks as well as suggest possible ways of accessing vaccines and increasing vaccination coverage of the disease in the state.

MATERIAL AND METHODS

Study area

Adamawa state is located at the north-eastern part of Nigeria around the area where the river Benue enters Nigeria from Cameroon Republic. It falls between longitude 11.5°E and 13.75°E and latitude 8°N and11°N. It shares boundaries with Taraba state in the south and west, Bauchi state to its north-west, Yobe and Borno states to the north. Also, Adamawa state shares international boundary with

Cameroon Republic along its eastern border. The state covers land area of about 39,742.13km^2. The state is one of the lead producers of livestock in Nigeria with an estimated cattle population of 3.5 million (MLP, 2017).

Data retrieval and collation

Twelve year (2006-2017) of data were retrieved from Adamawa State Ministry of Livestock Production (MLP). The relevant data collated included; estimated annual cattle population, number of cattle vaccinated against CBPP, number of CBPP outbreaks reported, number of mortality due to the disease, number of cattle slaughtered and examined for CBPP lesions and number of cattle with suspected CBPP lesions.

The limitations of the study are: lack of steady procurement and supply of CBPP vaccines by the state Government during the period under study; inaccessibility of CBPP vaccines in the zonal and area veterinary offices across the LGAs where most cattle owners are located; and the practice of self-purchase and administration of vaccines by cattle owners leading to under reporting of outbreaks and vaccination figures in the state.

Data analysis

Vaccination coverage (total number of cattle vaccinated divided by estimated cattle population) and prevalence (number of cattle with suspected CBPP lesions divided by total number of cattle slaughtered) were calculated. Correlation coefficient (r) test (formula calculation) was used to compare average vaccination coverage and prevalence of the disease in the study area.

RESULTS

Twelve year (2006-2017) estimated cattle population, number of cattle vaccinated against CBPP, vaccination coverage, reported outbreak, mortality due to the disease and prevalence of CBPP in Adamawa state are shown in TABLE I. The overall vaccination coverage of 4.80% was calculated with the highest vaccination coverage (20.57%) and the lowest vaccination coverage (1.03%) recorded in 2013 and 2015 respectively. A negative and insignificant correlation coefficient ($r = -0.2346$, $p > 0.05$) was obtained between vaccination coverage and prevalence, whereas correlation coefficient between

TABLE I: Estimated cattle population, vaccination coverage and prevalence of CBPP-like lesions in cattle in Adamawa State (2006-2017)

Year	Estimated cattle population	No. vaccinated against CBPP	Vaccination coverage (%)	Reported outbreak	Mortality due to CBPP	Number of cattle slaughtered	Number with CBPP lesions	Prevalence (%)
2006	2,902,815	125,400	4.32	3	46	23,909	629	2.63
2007	2,938,251	79,042	2.69	1	7	20,748	505	2.43
2008	2,963,420	91,975	3.10	6	28	23,398	674	2.88
2009	2,998,300	168,214	5.61	2	15	22,451	768	3.42
2010	3,024,812	101,369	3.35	11	73	19,606	1,128	5.75
2011	3,052,301	34,524	1.13	8	12	20,713	1,118	5.40
2012	3,081,411	95,482	3.10	10	57	18,337	716	3.91
2013	3,110,800	639,780	20.57	4	23	22,884	625	2.73
2014	3,141,908	71,522	2.28	7	14	21,788	699	3.21
2015	3,173,327	32,980	1.04	9	34	22,510	728	3.23
2016	3,204,060	155,731	4.86	3	21	25,317	839	3.31
2017	3,524,466	184,539	5.24	15	126	27,350	1,548	5.66
Total	37,115,871	1,780,558	4.80	76	456	267,051	9,797	3.67

P=0.5372; Correlation coefficient (r): vaccination coverage and prevalence = -0.2346; vaccination coverage and reported outbreak = -0.2216; prevalence and reported outbreak = 0.7381

prevalence and reported outbreak of CBPP was positive (r= 0.7381).

The number of outbreaks reported and vaccination coverage vary across the years (Figure 1). A total of 76 outbreaks representing an average of 6.33 outbreaks per year and a mortality of 456 were recorded. The highest outbreak of 15 was recorded in 2017, whereas the least outbreak of 1 was recorded in 2007.

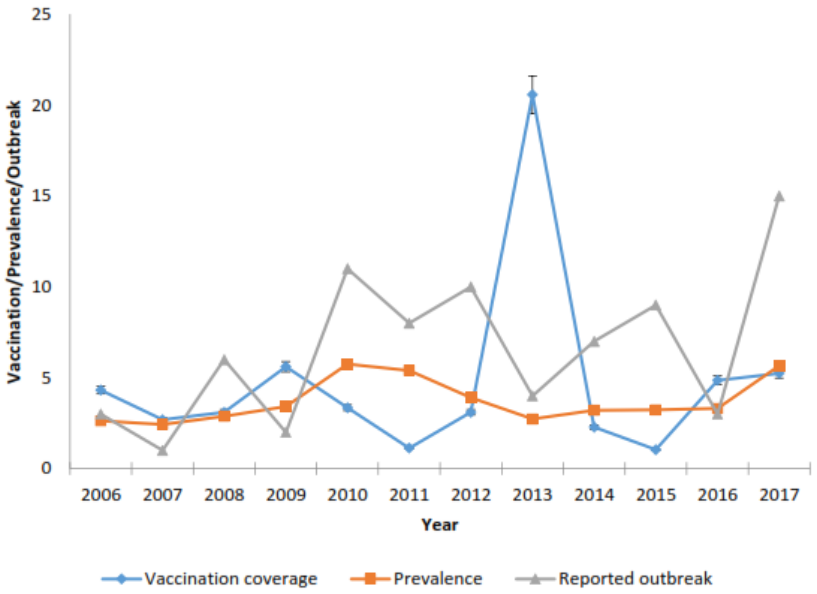

Figure 1: Vaccination coverage, prevalence and reported outbreak of CBPP in Adamawa State (2006-2017)

DISCUSSION

Average vaccination coverage of 4.80% was obtained. The vaccination coverage of this dreadful disease was relatively low compared to the estimated cattle population in the state and this indicates ineffective and inadequate vaccinations resulting to poor protectionagainst CBPP. The finding of this study was lower than the previous reports of Tambuwal *et al*. (2011) and Sada *et al*. (2015) who reported vaccination coverage of 34.5% and 48.8% respectively in Sokoto and Katsina States in Northwestern Nigeria. Aliyu *et al*. (2000) also reported high vaccination coverage of 9.5% for 1988-1997 for five cattle producing states in northern Nigeria. With the fluctuating and low coverage observed in this study, the control of this economically important disease of cattle will be very difficult more especially in a state that relies on vaccination as the major control option as earlier reported (Fadiga *et al*., 2013). High cost of mass vaccination campaigns, difficulties in cold chain maintenance, logistics, lack of cooperation on the side of cattle owners, lack of motivation of animal health workers by concerned authorities may all resulted in the low, up hazard and uncoordinated vaccination activities reported. Also during period that the animals were vaccinated, the vaccine viability could also be questionable due to break in cold-chain; the strain used in production of vaccine being not indigenous and so may not confer adequate protection as desired. All these factors put together pose a serious negative effect on the control of the disease and this corroborates with the findings of Aliyu *et al*. (2000). Egwu *et al*. (2012) pointed out that CBPP is a fast spreading infection in Nigeria, which is as a result of inadequate vaccination coverage or vaccine failure. The highest vaccination coverage observed in 2013 might be as a result of high outbreak reported in 2010 and 2012. This might have prompted the state Government to organise a massive vaccination campaign which drastically lowered the prevalence. This tempo was not adequately sustained in the subsequent years, hence, the increase in outbreak of the disease.

The number of outbreak reported in this study might have been higher even though underestimated. This is because, recent years due to intertribal and ethnic wars as well as insurgency, there was displacement of most people and their livestock in the

northern and some LGAs in the central zone of the state. There has been little or no documented report of any outbreak of disease in those areas even with the return of normalcy. Therefore, outbreaks might have occurred in such places without being detected and reported. Following authors also reported similar findings (Tambuwal *et al*., 2011; Ankeli, 2015; Ankeli *et al*., 2017). It is worth to note in this study that, vaccination coverage did not match with the total cattle population in the state. The reason behind this was that vaccination programmes, procurement, handling and other services became so expensive that yearly budgetary allocation for such purposes fell short of requirement, this buttress the report of Nawathe (1992).

CONCLUSION AND RECOMMENDATIONS

The present study has established low and irregular vaccination coverage and this resulted in increase outbreak of the disease in the study area. The increased outbreak of CBPP coupled with low vaccination coverage indicates that control measures put in place were inadequate. We recommend the state Government in collaboration with the Ministry of Livestock Production to procure CBPP vaccines for cattle owners at subsidized rates. The vaccines should be affordable and easily accessible by cattle owners in all the zonal and area veterinary offices across the state. Increased and compulsory vaccination coverage of at least 80% of cattle population for 5 consecutive years as recommended by OIE, and also public enlightenment of cattle owners on the dangers and economic importance of the disease.

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