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ARTICLE

Farmers' Awareness of Marek's Disease and Biosecurity Practices in Poultry Production in Selected States of Nigeria

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SUMMARY

The relationship between Marek's disease (MD) and factors responsible for the continuous enzootic outbreaks in Nigerian poultry farms were investigated. A structured questionnaire was served to test the level of awareness of the poultry farmers in different locations in 2009. The retrieval rate was 68.0% (150/200) from farmers in Oyo, Enugu, Plateau, Kaduna, Kano, Nasarawa and Jigawa States. Seventy nine per cent of farmers have heard about Marek's disease, while 87.9% vaccinated against MD. It was observed that the risk factors for Marek's disease using odds ratio analysis to test for association were statistically significant. A comparison between the risk of having Marek's disease infection in intensive and semi-intensive management systems with extensive was highly significant (OR 29.6 and 5.0 at 95% CI, $p < 0.0001$) respectively. Eighty five percent of farmers with the same source of chicks complained of having MD, while 94.7% raised chicks separately from adult birds which was highly significant (OR 8.2 and overall $p = 0.0009$). Statistical analysis showed no significant difference ($p = 0.5335$, 0.1783, 0.0680 and 0.0840) respectively for gender of poultry farmers, closure of poultry farm due to MD, poultry house proximity to other neighbouring farms and source of water used. Marek's disease was still not popular among some farmers; unvaccinated birds served as carriers resulting in difficulty to control. Strict biosecurity was recommended to limit early exposure of chicks to wild or field virus before the establishment of vaccinal immunity, proper handling of Marek's disease vaccines and good management practices.

KEYWORDS: Marek's Disease, Poultry Farmers, Awareness, Biosecurity, Practices, Nigeria

INTRODUCTION

Marek's disease (MD) is mostly a worldwide disease of chickens than other birds (Owoade and Oni, 2008; Dunn et al., 2010; Jwander et al., 2013a). The disease is economically important because it causes high morbidity, mortality and financial loss (Witter et al., 2005) leading to psychological trauma to farmers especially those with credit facilities to raise commercial birds thereby creating self-employment as the only means of livelihood in Plateau state of Nigeria as

observed Jwander (2005).

Losses due to Marek's disease in the poultry industry and the estimated cost of Marek's disease is said to be in the range of several billion US dollars (Calnek and Witter, 1997; David, 2000; Frank, 2001; Ionica and Comand, 2009; Katherine et al., 2011)

In developing countries like Nigeria, Marek's disease virus field pathotypes are yet to be determined for their virulence (Witter and Schat, 2003). Since the diagnosis of Marek's disease in Nigeria was made by early reports (Hill and Davis, 1962; Adene, 1975 and 1983), records from Veterinary Hospitals and Clinics indicated that there have been rapid and regular reported clinically suspected cases of Marek's disease across the country by many poultry farmers (Jwander et al., 2012a).

Virulence is a property associated with Marek's disease viruses (MDVs) designated as serotype 1 with related herpesviruses of serotype 2 and 3 which are considered non oncogenic (Kamaldeep et al., 2007). It is usually measured in terms of the ability to induce lymphoproliferative lesions in chickens, normally characterized by enlargements of peripheral nerves due to lymphoid infiltration and lymphomas in various visceral organs or tissues (Witter et al., 2005). Virulence is said to be important for many reasons especially because property varies among serotype 1. Marek's disease virus isolates are directly related to the ability of isolates to be protected by vaccines (Witter et al., 2005; Dunn, 2010; Gimeno et al., 2011).

Virulence of Marek's disease virus strains has increased over the years, a trend that continues to the present time and represents a formidable obstacle to the long term control of the disease (Witter, 1972; Witter et al., 2005; Kamaldeep et al., 2007). This survey was designed to determine the effect of Marek's disease on poultry production and poultry farmers' level of awareness, biosecurity practices contributing to the spread with a view to determine the best way to control it in Nigeria.

MATERIALS AND METHODS

Study area and data collection

Structured questionnaire was designed, pretested and adjustments made. It was then served by practicing Veterinarians to the farmers to provide information on farmers' identification, biosecurity practices and effects of Marek's disease on poultry production and farmers' level of awareness on Marek's disease (have you heard about Marek's disease, are chicks vaccinated against Marek's disease and types of poultry management etc?). Farmers were randomly

Figure 1: *Map of Nigeria showing the locations of Poultry farmers in selected states across the country, whose level of awareness on Marek's disease was tested (Map of study site was designed in ArcView GIS version 3.1).*

selected based on reference of the veterinarians consulting poultry farms within the study areas for questionnaire administration and were mostly those that visited the Veterinary Hospitals, Clinics, and Diagnostic centres of Jigawa, Kano, Kaduna, Plateau, Oyo and Enugu States of Nigeria.

Statistical analysis

Data from the filled questionnaire were transferred to excel spread sheet and the data from the excel sheet transferred to MedCal data base and analyzed into descriptive statistics and Odd ratios (OR) were calculated. The data were reduced into a table of positive response (yes) or negative (no), grouped into different variables of association using odd ratio at 95% confidence interval (CI) to determine the significance of the association between the variables with regards to Marek's disease.

RESULTS

The overall level of awareness of poultry farmers in selected parts of the country on Marek's disease (MD) was put at 79.0% positive respondents (with overall p = 0.1300). Oyo (P value = 0.0025), Enugu (p = 0.0076), Plateau (p = 0.0556), Kaduna (p = 0.1127), Kano (p= 0.574), Nasarawa (p = 1.0000) by locations had the chances of having MD in descending order when compared the odd ratio with that of Jigawa state (Table I). On gender of poultry farmers, there was no significant difference between the risk of having MD (Table I). The risk of experiencing MD by occupation of poultry farmers was high among farmers in business and civil servants than farmers whose job is purely poultry farming (Table I). On management practices, intensive and semi-intensive management systems showed high risk of experiencing MD with odd ratio of 29.6 and 5.0 times with overall p< 0.00001 respectively when compared with extensive or free-range system (Table II). Commercial and mixed sources of birds, well and pump water, commercial with self-feed milling were at high risk of MD infection (Table II). Poultry farmers that did not isolate birds, and had no access to veterinary services were at high risk of MD infection (Table II). Mode of carcass disposal and close range proximity between poultry farms had no significant differences in the spread of MD (Table II). Not vaccinating and revaccinating birds, keeping birds of different ages and chicks bought from MD contaminated source had high risks of experiencing MD (Table 1II). Commercial birds, hot and rainy seasons, farms that were closed due to MD experienced high risk of the disease (Table 1V). Farmers without the prior knowledge of MD experienced it most (Table V).

Table I: Farmers that experienced Marek's disease in selected seven states across Nigeria.

Associated factors	Positive/Total respondents (%)	Odd Ratio (95% C.I)	P value	Overall p value
Location				
Enugu	11/12 (91.7)	22.0(2.3-2.12)	0.0076	
Kaduna	14/24 (58.3)	2.8 (0.8-10.0)	0.1127	
Kano	4/9 (44.4)	1.6 (0.3-8.3)	0.5743	
Nasarawa	3/9 (33.3)	1.0(0.2-5.5)	1.0000	
Oyo	16/17 (94.1)	32.0(3.4-30.2	0.0025	
Plateau	13/20 (65.0)	3.7(1.0-14.2)	0.0556	0.1300
Jigawa	6/18(33.3)	1	RF	
Farmer's gender				
Female	23/35(65.7)	1.3(0.6-3.1)	0.5335	0.5335
Male	41/69.4)	1	RF	
Occupation				
Farmer	18/33(54.6)	1.1(0.3-3.5)	0.9141	
Business	12/16(75.0)	2.7(0.6-11.7)	0.1937	
Civil servant	20/33(60.6)	1.4(0.4-4.5)	0.6034	0.6770
Others	9/17(52.9)	1	RF	

OR = odd ratio, CI = confidence interval, RF = reference group

Table II: Association of management practices and spread of Marek's disease in poultry farms.

Management practice	Tested/Total (%)	Odd Ratio (95% C.I)	P value	Overall p value
Management system				
Intensive	55/68 (80.9)	29.6 (7.7-114.5)	<0.00001	
Semi-intensive	5/12(41.7)	5.0 (0.9-26.5)	0.0585	<0.0001
Extensive	3/24(12.5)	1	RF	
Source of birds				
Commercial	52/58(89.7)	39.0 (11.5-132.6)	<0.00001	
Mixed	2/3(66.7)	9.0 (0.7-116.2)	0.0923	<0.0001
Local	6/33 (18.2)	1	RF	
Source of water				
Borehole	13/14 (92.9)	9.3 (1.1-76.9)	0.0388	
Pump water	13/25 (52.0)	0.8 (0.3-2.1)	0.6057	
Well/pump	12/13 (92.3)	8.6 (1.0-71.4)	0.0469	
River	0/6 (0.0)	0.06(0.003-1.04)	0.053	0.0840
Well	28/40 (70.0)	1	RF	
Source of feed				
Scavenged for food	9/36 (25.0)	0.3 (0.07-1.6)	0.1724	
Commercial feed	41/50 (82.0)	4.5(0.9-21.7)	0.0572	
Commercial/self mill	8/8 (100.0)	17.0 (0.7-391.7)	0.0767	0.0440
Self mill feed	4/8 (50.0)	1	RF	
Isolation of sick birds				
No	51/76 (67.1)	2.3 (1.0-5.5)		0.0543
Yes	14/30 (46.7)	1	RF	
Dead birds disposal				
Burry	10/15 (33.3)	1.3 (0.4-4.0)		0.7046
Throw away	56/91 (61.5)	1	RF	
Access to vet services				
No	43/62 (69.4)	2.4(1.1-5-3)	0.0357	0.0357
Yes	21/43 (48.9)	1	RF	
Proximity (other farms)				
10-50 metres	21/42 (50.0)	0.4 (0.1-1.1)	0.3889	
51-100 metres	20/31 (64.5)	0.7 (0.2-2.2)	0.5518	0.0680
= 100metres	18/25 (72.0)	1	RF	
MD vaccination status				
No	51/58 (87.9)	21.9 (6.8-70.0)	<0.0001	<0.0001
Yes	7/28 (25.0)	1	RF	
Revaccinated birds				
No	13/14 (92.9)	10.5 (1.3-83.7)	0.0269	0.0269
Yes	46/83	1	RF	
Keep birds of different ages				
No	18/44 (40.9)	0.2 (0.1-0.5	0.0005	<0.0001
Yes	44/58 (76.6)	1	RF	

Table III: Different Farmers complained of Marek's disease in chicks bought from the same source (infected chicks source).

Farmers with same source of chicks	Positive/Total respondents (%)	Odd Ratio (95% C.I)	P value	Overall p value
Yes	33/39 (84.6)	5.5 (2.0-14.9)	0.0009	0.0001
No	31/62 (50.0)	1	RF	
Raised chicks separately				
Yes	18/19 (94.7)	8.2 (1.1-64.9)	0.0453	0.0009
No	59/86 968.6)	1	RF	

Table IV: The distribution effect of Marek's disease on poultry production and poultry farmers

Variable	**Positive/Total respondents (%)**	**Odd Ratio (95% C.I)**	**P value**	**Overall p value**
Types of Birds				
Commercial chickens	61/72 (84.7)	27.7(9.4-82.2)	<0.00001	<0.0001
Local chickens	6/36 (16.7)	1	RF	
Season with MD				
Rainy season (May-October)	11/14 (78.6)	6.4 (1.6-26.5)	0.0101	
Hot season (February-April)	24/29 (82.6)	8.4 (2.7-26.3	0.0003	0.0001
Harmattan (Nov- January)	16/44 (36.4)	1	RF	
Sold & closed farm due to MD				
Yes	6/79 (85.7)	4.4 (0.5-38.2)	0.1783	0.1783
No	49/85 (57.7)	1	RF	

MD= Marek's disease. RF= reference group

Table V: Poultry farmers' level of awareness of Marek's disease

Variable	Positive/Total respondents (%)	Odd Ratio (95% C.I)	P- Value	Overall p - value
Have you heard about Marek's disease?				
No	**49/62 (79.0)**	**6.5 (2.7-15.8)**	**<0.0001**	**<0.0001**
Yes	**15/41 (36.6)**	**1**	**RF**	

DISCUSSION

Strong association existed between locations and Marek's disease (p = 0.0025), risk estimate was also relevant (OR-32.0) for Oyo state and the distribution of MD outbreak is not the same in these study areas; they vary from one region to another as earlier reported by Frank (2001) and Stephen et al. (2008). The risk of MD outbreaks was highest with Farmers from Oyo followed by Enugu, Plateau, Kaduna, and Kano when compared with Jigawa state. The MD outbreaks in these locations are likely to be directly or indirectly associated with high number of hatcheries, human activities as the case with those farmers who are into business/poultry keeping and poultry farms concentrations which posed great risk of the disease transmission even in the face of vaccination as reported (Calnek and Witter, 1997; Frank, 2001).

The risk of having Marek's disease infection in commercially intensive and semi-intensive managed systems when compared with extensive system was highly significant (P < 0.00001, OR-29.6). This finding supported other reports that, Marek's disease is common in intensively managed commercial layer type chickens (Dong et al., 2006; Stephen et al., 2008). This could be due to Marek's disease spread horizontally in a flock, which was aided by close contact of the infected birds shedding the virus and other stress factors in the flock as reported (Baigent and Davison, 2004). Similar risk factors of MD were seen with commercial type of birds, source of birds, feed, isolation of sick birds and distance between a poultry farm to other neighbouring poultry farms as good practices of not getting the farm infected with Marek's disease but, it was not so in already contaminated environment as reported by (Olabode et al., 2009; Okwor and Eze, 2011; Jwander et al., 2013b).

Farmers who had the same complaints of Marek's disease from the same source of chicks could be due to chicks bought from hatcheries or chicks vendors that had been contaminated with Marek's disease virus or were not vaccinated prior to supply. In addition, Farms that raised chicks separately from adult birds but experienced Marek's disease could be that, MD was endemic with constant pollution of the environment hence separating them made no difference as reported (Dunn et al., 2010; Okwor and Eze, 2011).

Farmers with access to veterinary services had chances to enhance their level of awareness on Marek's disease, which could play a great role in both disease spread and control. Poor knowledge of the disease can affect the true incidence and prevalence data of the disease reported in an area.

Witter and Schat (2003) and kamaldeep et al. (2007) reported the continuation of evolutionary trend of Marek's disease virus (MDV) towards greater virulence as the

cause of increased losses from Marek's disease in vaccinated flocks. Early vaccinal immunity in newly hatched chicks against MD is very important to protect them from the field virus. In the case of vaccine failure or vaccine break, the birds will not be protected when exposed to highly virulent MDV strains despite vaccination status. This agreed with the results of this finding. Out of 58 farmers who vaccinated against the disease, 51 of them (87.9%) experienced Marek's disease outbreaks.

Professional handling of Marek's disease vaccines is also a key factor required, this was because dilution of MD vaccines by inexperienced worker or farmer can lead to reduce Marek's disease protection, reduce relative body weights and increase challenge of Marek's disease virus DNA load in chicks as reported (Gimeno et al., 2011). The pathogenic viruses when released with keratinized squamous epithelial cells even from vaccinated birds, these viruses threaten mostly commercially unvaccinated chickens at the same location (Witter, 1992; Jwander et al., 2012b; Jwander et al., 2013a).

Farmers experienced Marek's disease outbreaks more during the hot and wet raining season probably due to poor ventilation against wind and rain in the poultry houses, encouraging concurrent infections as reported (Witter et al., 1979; Abbassi et al., 1999). Farmers who kept birds of different ages together experienced Marek's disease more was due to repeated infection of the adult chickens, which served as carriers to the newly housed chicks in a contaminated environment.

The understanding of farmers' level of awareness on Marek's disease was an important factor in the disease control; from the results of this study, 36.6% of the farmers who had no prior knowledge of Marek's disease (have never heard about MD, but experienced the disease on explanation by veterinarians) were at high risk of experiencing MD outbreaks. Bad management and lack of good Marek's disease biosecurity have adverse effect on poultry farms.

Poor knowledge of Marek's disease by the poultry farmers stands the chances of having more outbreaks of the disease among others, due to contaminated environment. Since the virus is mostly spread through dust particles containing Marek's disease virus shed with dead epithelial cells from the feather follicles of infected birds as reported by Marrow and Fehler (2004) and Jwander et al. (2012a).

Since prevention of the disease required optimal hygiene and good management, farmers need to know that, apart from the use of vaccines, hygiene had been reported by Marrow and Fehler (2004) as the second important weapon in the fight against Marek's disease.

CONCLUSION and RECOMMENDATIONS

Marek's disease was still not popular or well known among some farmers, intensive commercial poultry farms were more at risk and not all commercial birds were vaccinated against MD due to obvious reasons serving as reservoirs or carriers across the country there by making it very difficult to control. Routine vaccination of day old chicks with potent Marek's disease vaccines either by the farmers or by hatcheries be encouraged. Potent smaller doses of Marek's disease vaccine vials be imported for small scale farmers. Stakeholders should implement good biosecurity practices. There should be proper control of veterinary biological such as Marek's disease vaccines been imported into the country. This survey presented the views of poultry farmers, which was relative. Further research is needed to compare their opinions for future references.

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