

Full Length Research Paper

Disease management and biosecurity measures of small-scale commercial poultry farms in and around Debre Markos, Amhara Region, Ethiopia

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This cross-sectional study was carried out to assess disease management and biosecurity measures of small scale commercial poultry farms by structured questionnaire through personal interview. The data was analysed by χ^2 and t-test, one way analysis of variance and general linear model by SPSS software. The result shown that, only 38.8% of the producers' suspects Coccidiosis was the frequently occurred disease in the farm. Some of the producers (30.6%) suspect the cause of the disease might be environmental problem, 24.5% management problem, and 12.2% both environment and management. The most leading symptoms of diseases that occurred in the study area were ruffled feather (15.5%), loss of appetite (15.1%), depression (12.6%), diarrhoea (9.7%), and others. About 79.6% of the farms had close relation with the veterinarian and consult about disease management. Only 12.2% of the farms vaccinate NCD, 49% NCD and Gumboro, 28.6% NCD, Gumboro and fowlbox and the rest 10.1% vaccinate their chicks for NCD, Gumboro, fowlbox, Fowl cholera/typhoid and Marix disease. Biosecurity measures were very crucial in the poultry farms. About 63.3% of the producers dressed on protective cloth (tuta), only 8.2% of the producers wear hand gloves. About 77.6% of the producers used the foot path in front of their farm entrance. Prevention and treatments were the major mechanisms for controlling measure of disease and the mortality percentage of chicks was only 4.7%. From this study, it could be concluded that better disease management and biosecurity measures are required to attain better poultry production

Key words: Biosecurity, disease, mortality rate, symptoms, vaccination.

INTRODUCTION

It is essential that the flock is in good health to achieve their performance potential; however, one of the

important reasons for failure in the poultry industry is disease. Various types of poultry diseases can caused

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serious loss in the poultry farming business. Diseases occur due to lack of proper care and management, inadequate nutritious feeding and some other factors. Generally, diseases can be defined as 'changes of general or usual physical condition'. Almost all types of animal can be affected by different types of disease in their lifetime. Poultry are not exception; they also get affected by numerous diseases. In small scale commercial farms, coccidiosis was identified as the most common disease (Singla and Gupta, 2012), followed by infectious bursal disease (IBD) and Newcastle disease (NCD) (Safari et al., 2004; Akidarju et al., 2010). However, infectious bronchitis, Marek's disease, fowl cholera, fowl pox, avian encephalomyelitis are also the major poultry diseases which affects the flock in the farm (Jacob et al., 1998; Ahmed et al., 2011; Hailu, 2012). Hailu (2012) reported that Newcastle disease, infectious bursal disease and Marek's disease are among major viral diseases of chickens in Ethiopia. Diseases can be caused by viruses, mycoplasma, bacteria, fungi, protozoa and parasites (Sandhu et al., 2009; Hamra, 2010).

The most common symptoms of disease in small scale poultry farms were enteritis (Diarrhea), ruffled feather, depression (dejection), respiratory rales/panting, coughing, drooling saliva, swelling of head and eyes, torticollis (twisting of the neck) and others (Akidarju et al., 2010). Developing and practicing daily biosecurity procedures as best management practices on poultry farms will reduce the possibility of introducing infectious diseases. Controlling diseases from the beginning is important for the success of the operation (Mobley and Kahan, 2007). The diseases can be reduced by proper sanitation on the farm, biosecurity measures and vaccination of the chickens (Hamra, 2010). However, the management of disease and biosecurity measures in small scale commercial poultry farms in and around Debre Markos had not been studied yet and there was no documented evidence. Therefore, to get a piece of information and to take remedial measures for successful poultry production, this study was done to assess the management of disease and biosecurity measures of small scale commercial poultry farms in and around Debre Markos.

METHODOLOGY

The study area

This study was conducted in and around Debre-Markos, Ethiopia from September, 2015 to May, 2016. Debre-Markos is located at 300 km from Addis Ababa in Northwest of the country and 265 km Southeast of Bahir Dar, capital of Amhara Region. The altitude ranges from 500 to 4154 m above sea level. The annual rainfall ranges from 900 to 1800 mm and a minimum and maximum temperature of the area is 7.5 and 25°C, respectively.

Study population

All small-scale poultry farm owners who started by their own

initiation and organized by small and micro enterprise offices in and around Debre Markos were considered as the study population.

Research design

Cross-sectional study was carried out to assess management of disease and biosecurity measures of small-scale commercial poultry farms.

Data collection and analysis

Data were collected by the use of pretested structured questionnaire through personal interview method from heads (owner of the farm) and leaders of the farm (organized in small and micro enterprise offices) to generate information on management of disease and biosecurity measures in small-scale commercial poultry farms.

Statistical analysis

Data generated was entered into SPSS version 20 and analyzed using descriptive statistics with emphasis on frequency, mean and percentages. Analysis of variance (ANOVA) and t-test was computed to know the significant difference of variables. Chi-square (χ^2) for association values was computed to determine the relationships between the categorical variables.

RESULTS

Socio demographic characteristics

The socio demographic characteristics of small scale poultry farmers are presented in Table 1. Sex had a significant effect ($P < 0.05$) on operation of small scale poultry farms. There was no significant ($P > 0.05$) difference between married and unmarried in small scale poultry operation. The educational level had highly significant effect ($P < 0.05$) on running poultry farming. About one third (36.7%) of small scale farming was run by first degree poultry producers. More than half (57.1%) of the producers had no experience and the rest 42.9% of the producers run their farms with experiences. Family size had a significant effect ($P < 0.05$) on small scale poultry production. Only 79.6% of the producers had 1 to 3 family sizes. Exactly 79.6% of the poultry producers were engaged fully in poultry production and the rest 20.4% had it as secondary occupation in and around Debre Markos small scale commercial poultry farms.

Flock size of chicks in small scale poultry farms in and around Debre Markos

The flock size and breeds of chicks in small scale poultry farms in and around Debre Markos is presented in Table 2. The mean flock size per farm was 844.3; however, the flock size was significantly ($P < 0.05$) influenced by sex of birds. Female chicks were higher ($P < 0.05$) than male

Table 1. Socio demographic characteristics of small scale poultry farms in and around Debre Markos.

Variables		N=49	%	χ^2	P-value
Sex	M	41	83.7	10.694	< 0.001*
	F	8	16.3		
Age	<15	1	2.0	97.204	< 0.001*
	15-30	42	85.7		
	31-45	5	10.2		
	46-60	1	2.0		
Marital Status	Married	22	44.9	0.510	0.475
	Unmarried	27	55.1		
Religion	Orthodox	48	98	45.082	< 0.001*
	Muslim	1	2		
	Others	0	0		
Ethnic Group	Amhara	49	100	1.000	< 0.001*
	Others	0	0		
Occupation	Poultry prod	39	79.6	17.163	<0.001*
	Others	10	20.4		
Family size	1-3	39	79.6	49.143	<0.001*
	4-6	9	18.4		
	7-9	1	2.0		
Presence of experiences	Yes	21	42.9	1.000	0.317
	No	28	57.1		
Experience years	new	28	57.1	23.551	<0.001*
	1-3	20	40.8		
	4-6	1	2.0		
Educational level	5-8 grade	4	8.2	10.694	0.030*
	9-10 grade	8	16.3		
	11-12 grade	9	18.4		
	Diploma	10	20.4		
	Degree	18	36.7		

*Significant effect at $P < 0.05$.

chicks. The flock was composed of four breeds of chicks like Bovans brown (egg type), Bovans white (egg type), Koekoek (dual) and Sasso T44 (dual). The flock size was not statistically ($P > 0.05$) affected by breed. However, 71.4% of the producers kept Bovans brown.

Poultry disease and prevention mechanism in small scale poultry farms

Poultry disease and prevention mechanism are in Table 3 Only 38.8% of the producers suspected the frequently occurring disease in the farm was coccidiosis and the

other 61.2% of the producer did not know which type of disease occur in their farm. However, there was no accustomed record of the disease that occurred. Some of the producers (30.6%) reported that the cause of the disease might be environmental problem, 24.5% of the producers replied that the cause of the disease might be management problem. About 12.2% reported both environment and management problem. The other 24.5% did not know the cause of the diseases in their farms. There was a significant ($P < 0.05$) difference in the experiences of disease outbreak. About 91.8% of the producers did not have any experience on disease outbreak and report of the disease outbreak.

Table 2. Flock size and breeds of chicks in small scale poultry farms in and around Debre Markos.

Variables	N (%)	Mean (SEM)
Flock size	49(100)	844.3(98.257)
Sex	Female chicks	49(100)
	Male chick	13(26.5)
Breed	Bovans brown (egg type)	35(71.4)
	Bovans white (egg type)	2(4.1)
	Koekoek (dual)	9(18.4)
	Sasso T44 (dual)	3(6.1)

N (%) describes percent of producers; SEM-standard error of mean, means with the different letter of superscript in the same column did differ significantly (P<0.05).

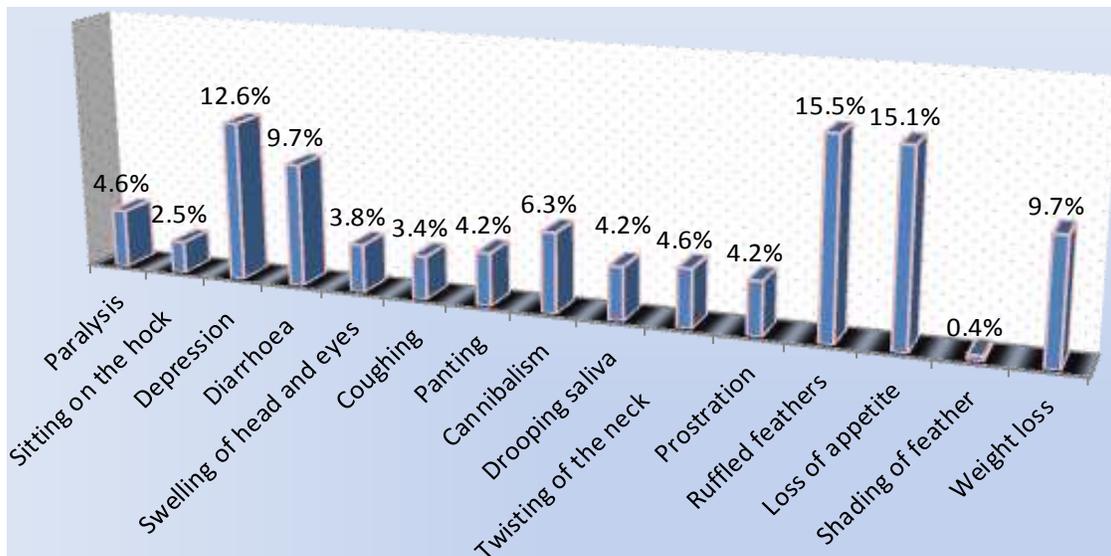


Figure 1. Symptoms seen in small-scale poultry farms in and around Debre Markos.

However, prevention and treatments were the major mechanisms for controlling measure of the disease. The immediate measures of sick birds were isolation and treating them until recovery. More than half of the producers treated their chicks by themselves by purchasing Amprolium and oxytetracycline from nearby veterinary pharmacy. If a disease was severe, all the producers called veterinarian for treatment when the birds are sick and among them, about 81.6% of the producers had close relationship with veterinarians. All the producers vaccinated their chicks either twice, thrice, fourth and more than fourth. Majority of the producers (46.9%) vaccinated their chicks more than four times. About half (49%) of the producers vaccinated for Newcastle disease and Gumboro. About 98% of the producers adhered to the vaccination schedule; however, there was no any significant difference (P>0.05) in

differentiation the name of the vaccine to be given for what type of disease. There were no significant (P>0.05) difference in the cost of the vaccine, thus, 40.8% of the respondents said that the purchasing price of the vaccine was optimum price.

The mortality percentage of chicks in small scale commercial poultry farms was only 4.7% at 1 to 3 weeks of age. According to the producers reply, the highest mortality was recorded during long rainy season and their mortality was sporadic. The cause for mortality was transportation stress (51%) and overcrowding (32.7%) due to the disturbance of the light.

The major symptoms of disease in small scale commercial poultry farms are presented in Figure 1. The most leading symptoms of diseases were ruffled feather (15.5%), loss of appetite (15.1%), depression (12.6%), diarrhoea (9.7%), weight loss (9.7%), cannibalism (6.3%),

Table 3. Poultry health and disease in small scale poultry farms in and around Debre Markos.

Variables		N	%	χ^2	P-value
Do you vaccinate your chicken Vaccination of the disease	Yes	49	100	19.000	<0.001*
	NCD	6	12.2		
	NCD ¹	24	49.0		
	NCD ²	14	28.6		
	NCD ³	5	10.2		
Frequency of vaccination	Once	0	0	12.959	0.005*
	Twice	10	20.4		
	Thrice	7	14.3		
	Four times	9	18.4		
	More than four times	23	46.9		
Adherence of vaccination schedule	Adhered	48	98	45.082	<0.001*
	Non adhered	1	2		
Immediate measure for sick birds observed	Isolation and treat them until recovery	49	100		
Experiences for disease outbreak	Yes	4	8.2	34.306	<0.001*
	No	45	91.8		
Reporting of disease out break	Yes	4	8.2	34.306	<0.001*
	No	45	91.8		
Type of disease frequently occurred	I know(Coccidiosis)	19	38.8	2.469	0.116
	I don't know	30	61.2		
Do you know the name of vaccine	Yes	26	53.1	0.184	0.668
	No	23	46.9		
Close relation with the veterinarian	Yes	39	79.6	17.163	<0.001*
	No	10	20.4		
Accustomed to inform for vaccine/treatment	Yes	40	81.6	19.612	<0.001*
	No	9	18.4		
Time of recovery after treatment	1-3 days	30	61.2	17.184	<0.001*
	4-6 days	9	18.4		
	No recovery	10	20.4		
In what case you call veterinarian	at sick	49	100		
Accustomed to treat your chick by your own	Yes	27	55.1	0.510	0.475
	No	22	44.9		
Cost of vaccine	Cheap	16	32.7	1.510	0.470
	Medium	20	40.8		
	Expensive	13	26.5		
Accustomed to record the disease	Yes	0	0		
	No	49	100		
Presence of isolation room	Yes	49	100		
	No	0	0		

Table 3. Cont'd.

What could be the causes of infection	Management	12	24.5	8.653	0.070
	Environment	15	30.6		
	Both	6	12.2		
	I do not know exactly	12	24.5		
	No disease occurrence	4	8.2		
Major control measure of disease	Prevention and treatment	49	100		
Highest mortality age	Starter (1-3 weeks)	49	100		
Season of mortality	Long dry season (October to January)	3	6.1	37.735	<0.001*
	Long rainy season (June to September)	46	93.9		
Reasons of mortality	Transportation stress	25	51.0	26.184	<0.001*
	Overcrowding due to light	16	32.7		
	Cannibalism	2	4.1		
	Unclear	6	12.2		
Type of mortality	Sudden	14	28.6	9.000	0.003*
	Sporadic	35	71.4		
Mortality (%)			4.7		
Survival (%)			95.3		

NCD- Newcastle disease, ¹Gumboro, ²Gumboro, fowlbox, ³Gumboro, fowlbox, Fowl Cholera/Typhoid/, Marix disease). *Significant difference (P<0.05) in the same column in Chi square test.

Table 4. Biosecurity of small-scale poultry farms in and around Debre Markos.

Variables		N	%	χ^2	P-value
Presence of foot path	Yes	38	77.6	14.878	<0.001*
	No	11	22.4		
Wearing of protective cloth	Yes	31	63.3	3.449	0.063
	No	18	36.7		
Using of hand gloves	Yes	4	8.2	34.306	<0.001*
	No	45	91.8		

*Significant difference (P<0.05) in the same column with Chi square test.

paralysis (4.6%), twisting of necks (4.6%) and others.

Biosecurity measures of small-scale commercial poultry farms

Biosecurity of small-scale poultry farms in and around Debre Markos is presented in Table 4. There was significantly higher (P<0.05) using of the foot bath to protect the entrance of microorganisms in the farm. About 77.6% of the producers have used the foot path in front of their farm entrance like formalin and berekina. Only 63.3% of the producers dressed on protective cloth (tuta);

however, 91.8% of the producers did not use hand gloves.

DISCUSSION

Disease and symptoms in small scale commercial poultry farms

Almost all the producers did not know the type of disease that occurred in their farms and were not accustomed to recording the disease that occur; however, few of the

producers (38.8%) reported Coccidiosis was the frequently occurring disease in the study area. Almost similar result was reported by Nusirat et al. (2012) who noted that about 33.3% of the producers reported that coccidiosis was the most common disease outbreak in farms, followed by IBD (24.2%) and NCD (21.2%) in Ilorin, Kwara State, Nigeria. Proportional mortality rates due to coccidiosis were 14.5 and 13.3% in small scale and large scale poultry farms, respectively (Safari et al., 2004).

With respect to the cause of the disease in the study area, 30.6% of the producers suspect environmental problem, 24.5% management problem, and 12.2% both environment and management. Jones et al. (2005) reported that poor management practices and environmental variation (temperature and relative humidity) were the cause of the disease and adversely affected the health of the flock. Reiter and Bessei (2000) emphasized the importance of local variation in temperature and humidity affects the birds' health. The management practices especially poor health care and keeping the birds beyond standard rearing period affects the flock (Rahman, 2015). Weather or poor management practices also cause the disease and affect the flock in the farm (Akidarju et al., 2010). Key factors that can increase the risk of disease include the number of birds on the farm, whether or not keeping other species of bird, not using all in and out management system, feed type and source, stress levels, breed type and so on (Anna, 2011).

The most leading symptoms of diseases in the study area were ruffled feather (15.5%), loss of appetite (15.1%), depression (12.6%), diarrhoea (9.7%), weight loss (9.7%), cannibalism (6.3%), paralysis (4.6%), twisting of necks (4.6%) and others. Almost similar result was reported by Akidarju et al. (2010) in Maiduguri arid zone, Nigeria.

About 91.8% of the producers did not have an exposure of disease outbreak and reported it to veterinarians in the study area. Almost similar result was shown by Akpabio et al. (2014) who reported that about 74% of the producers did not report any disease outbreak, while 26% of the farmers reported disease outbreaks in small scale commercial poultry farms in Kaduna State, Nigeria. Nusirat et al. (2012) also noted that the producers reported 33.3% coccidiosis, 24.2% IBD and 21.2% NCD as a disease outbreak in Ilorin, Kwara State, Nigeria. About 79.6% of the farms had close relationship with the veterinarian and consult about disease management in the study area. In contrast, Nusirat et al. (2012) reported that 42.1% of the respondents routinely consulted veterinarians in Ilorin, Kwara State, Nigeria. A good disease prevention program should be available for the newly introduced chicks to avoid any future losses (Hamra, 2010). Thus, prevention and treatment were the major mechanisms for controlling measure of disease in the study area. Mobley

and Kahan (2007) reported that controlling diseases from the beginning is important for the success of the operation. More than half of the producers can treat their chicks by their own by purchasing Amprolium and oxytetracycline from nearby vet pharmacy. If a disease was severe, all the producers were accustomed to calling veterinarian for treatment and among them about 81.6% had close relationship with veterinarians. Muhammad et al. (2010) reported that only 28.8% consulted a veterinarian for diagnosis and treatment, and the other 71% self-diagnosed the problems and instituted treatment which included vitamin supplementation or antimicrobial therapy, with enrofloxacin and gentamycin being the most popular drugs used in Jos, Central Nigeria. All producers had an isolation room for sick birds. However, Birhanu et al. (2015) reported that about 76% of the producers had isolation pen for diseased chicken in and around Mekelle. Almost, all in and out management system was done in the study area; however, Birhanu et al. (2015) reported that only 24% of the farms were practicing all in and out management system in and around Mekelle Ethiopia.

Vaccination in small scale commercial poultry farms

All small scale commercial farms in the study area were accustomed to vaccinating their chicks either twice, thrice, four times and more than that. Majority of the producers (46.9%) vaccinate their chicks more than four times. Only 12.2% of the farms vaccinate NCD, 49% NCD and Gumboro, 28.6% NCD, Gumboro and fowlbox and the rest 10.1% vaccinate their chicks for NCD, Gumboro, fowlbox, Fowl cholera/typhoid and Marix disease. Similar result was reported by Muhammad et al. (2010), all farmers (100%) vaccinated their flocks against infectious bursal disease (Gumboro) in the first week in Jos, Central Nigeria. However, Bereket et al. (2014) reported that among respondents, 24% vaccinated and 76% did not vaccinate for common diseases in the area in small scale intensive poultry farms in Bahir Dar Zuria District, Ethiopia. The result was similar to the report of Nusirat et al. (2012) who reported that about 48.5% of the respondents practiced all the recommended vaccination of their birds against the preventable diseases of Newcastle Disease (NCD), Infectious Bursal Disease (IBD), Fowl Cholera and Fowl pox in Ilorin, Kwara State, Nigeria. Birhanu et al. (2015) reported that about 84% of the farmers use vaccine for prevention of NCD, Fowl pox and Marek's diseases, whereas 80% of them use prophylactic antibiotics for prevention of bacterial diseases in and around Mekelle, Ethiopia. About 98% of the producers adhered to vaccination schedule. In contrast, Akidarju et al. (2010) reported that 27.8% of the poultry farmers had full adherence to vaccination schedules for their chickens, as against 56.7% non-adherence in Maiduguri arid zone, Nigeria.

Mortality of chicks in small scale commercial poultry farms

The mortality percentage of chicks in the study area was only 4.7% at 1 to 3 weeks of age. According to the producers reply, the highest mortality was recorded during long rainy season and their mortality was sporadic. Similar result was reported by Geidam et al. (2006) who noted that when chicks are bought at day old, mortality should not exceed 3% by the 3rd week; loss exceeding 5% requires an investigation. Mortality percentage can reach 10% or more in the first week of age in poultry farms (Anna, 2011). Mortality rate may rise due to disease, predation or high temperature. The mortality rate of small chicks (up to eight weeks of age) is about 4%; that of growers (between 8 and 20 weeks of age) is about 15%; that of layers (between 20 and 72 weeks of age) is about 12% and the average mortality rate of a flock is 20 to 25% percent per year (FAO, 2003). The cause of mortality in the study area was transportation stress (51%), overcrowding (32.7%) due to the disturbance of the light and the rest by disease. However, Akidarju et al. (2010) reported that about one third of the producers stated that sudden mortality occurred frequently due to different diseases in small scale commercial farms in Maiduguri arid zone, Nigeria. According to Muhammad et al. (2010), the level of chick mortality was 11.4% of flock size in the first two weeks of life and the major predisposing factors associated with these mortalities appear to be chick quality, disease, stress and nutrition and other management in small scale poultry farms in Jos, Central Nigeria. Early chick mortality is associated with disease, poor management, inadequate brooding temperatures and heat stress in hot climates (Chou et al., 2004). Poor quality hatches have also been reported to increase first week mortality from 0.8 to 13% (With, 2001). The first week after hatching is known to be the highest risk period for raising chicks (Chou et al., 2004). Most farmers in Jos, Central Nigeria recognized that conditions such as stress could affect their flocks in the initial first weeks, and other management factors and the source of chicks predisposed to early chick mortality (Muhammad et al., 2010). Presence of disease, feed shortage, predators and bad weather condition/extreme weather condition were identified as the major causes of chicken mortality. Among diseases, Newcastle disease, infectious bursal diseases and coccidiosis were cited in their order of importance in Bahir Dar Zuria District, Ethiopia (Bereket et al., 2014). Temperature and ventilation in the brood house are generally considered to be significant factors for early mortality in the chicks' life (Anna, 2011). The major diseases or conditions that farmers associated with mortality included stress (25.6%), Pullorum disease (13.3%), diarrhoea (13.3%), coccidiosis (4.4%), chronic respiratory disease (CRD) (1.1%) and management causes such as overcrowding and poor ventilation (8%) in Jos, Central Nigeria

(Muhammad et al., 2010).

Biosecurity measures in small scale commercial poultry farms

Developing and practicing daily biosecurity procedures as best management practices on poultry farms will reduce the possibility of introducing infectious diseases. The risk of disease transmission between farms can be reduced through appropriate farm sitting and management. Disease outbreaks (from pathogenic bacteria and viruses) in poultry can spread between farms and significantly affect poultry growing enterprises. The risk of disease developing on a farm is influenced by many factors, including the management of litter, feed and water; disinfection of sheds; vermin removal; disposal of used litter and dead birds; and the effectiveness of biosecurity measures adopted for people and equipment entering the farm (Stephen, 2012). Biosecurity measures are very crucial in the poultry farms like wearing of protective cloths and gloves. However, in the study area, about 63.3% of the producers dressed on protective cloth (tuta), only 8.2% of them wear hand gloves and very few wear boot on their foot. Similar result was reported by Nusirat et al. (2012) who noted more than one third (35.1%) of respondents did not use any form of protective clothing in their farms, while 29.7% used outer clothing like coverall in their farms. Also, 18.9% used hand gloves as a form of protective clothing. Birhanu et al. (2015) noted that 76% of the producers used separate clothes and shoes in and around Mekelle small scale commercial poultry farms. About 77.6% of the producers used the foot path in front of their farm entrance like formalin and berekina in the study area. The result is in line with the report of Birhanu et al. (2015) who noted that about 80% of the farms applied a foot bath at the door of entrance in and around Mekelle small scale poultry farm. The result is nearly similar to that of Akpabio et al. (2014) who confirmed that 66% of the farms used foot bath in Nigeria. Small scale farms are characterized by low levels of biosecurity and are more prone to the introduction of infectious agents (Akidarju et al., 2010). About 78.95% of the producers practiced biosecurity in Ilesha West Local Government Area of Osun State, Nigeria (Adedeji et al., 2014). The reason might be lack of knowledge on the use of biosecurity measures and its benefit.

Conclusion

Almost all the producers did not know the type of disease that occurred in their farms and were not accustomed to recording the disease that occurred; however, few of the producers reported Coccidiosis. The cause of the disease might be environmental, management and both

environment and management problems. The most leading and frequently observed symptoms of diseases were ruffled feather, loss of appetite, depression, diarrhoea, weight loss, cannibalism, paralysis, twisting of necks and others. All farms were accustomed to vaccinating their chicks either twice, thrice, four times and more for NCD, Gumboro, fowl cholera, Fowl Cholera/Typhoid and Marix disease. Biosecurity measures like wearing of protective cloths and gloves, and using of the foot path in front of their farm entrance like formalin were very crucial in the poultry farms. Prevention and treatment methods were the major mechanisms for controlling measure of disease and the mortality percentage of chicks was only 4.7%.

Conflict of Interests

The authors declare that they have no conflict of interests.

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