CO-ADMINISTRATION OF ALBENDAZOLE AND LEVAMISOLE TO CONTROL MULTIPLE ANTHELMINTIC RESISTANT NEMATODES IN A SHEEP FARM IN KABETE KENYA

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Abstract

Albendazole (ABZ) and levamisole (LEV) were co-administered to evaluate their ability to control natural helminth infections in a sheep farm where resistance to the individual anthelmintic had previously been reported. Thirty two sheep of mixed ages and sex were randomly allocated to four equal groups. Group 1 and 2 were treated with ABZ and LEV respectively. ABZ and LEV were co-administered to group 3 while group 4 was the untreated control. Rectal faecal samples were collected from all the animals on the day of treatment (0 DPT) and fourteen days post-treatment (14 DPT) and the eggs per gram of faeces (EPG) determined. On both sampling occasions, pooled feacal samples from the respective groups were separately cultured for strongyle larval stage three (L3) identifications. Anthelmintic efficacies were evaluated based on faecal egg count reduction percentage (FECR%). Resistance to both drugs was still evident at FECR% of 71% and 75% for LEV and ABZ respectively. Co-administration of the two drugs resulted in a higher efficacy at 95.4% FECR %. L3 recovered from faecal culture 14DPT indicated that Haemonchus spp. survived treatments with ABZ and LEV given separately and when co-administered. Trichostrongylus spp. survived the LEV treatment but was highly susceptible to ABZ given alone or when co-administered with LEV, while Oesophagostomum species survived ABZ given separately. Combining these two drugs may therefore offer a temporary solution in helminth control on the farm as other control measures are sort.

Key words: Efficacy, resistance, albendazole, levamisole, co-administration

ADMINISTRATION CONCOMITANTE DE L'ALBENDAZOLE ET DU LÉVAMISOLE POUR LE CONTRÔLE DE PLUSIEURS NÉMATODES RÉSISTANTS AUX ANTHELMINTHIQUES DANS UNE FERME OVINE À KABETE (KENYA)

Résumé

L'albendazole (ABZ) et le lévamisole (LEV) ont été administrés concomitamment pour évaluer leur capacité à contrôler les infections par les helminthes naturelles dans une ferme ovine où la résistance aux anthelminthiques individuels avait déjà été signalée. Trente-deux ovins d'âges mixtes et des deux sexes ont été affectés de manière aléatoire à quatre groupes de même taille. Les Groupes 1 et 2 ont été traités respectivement avec l'ABZ et le LEV. L'ABZ et le LEV ont été administrés simultanément au Groupe 3, tandis que le Groupe 4 a servi de témoin non traité. Des prélèvements rectaux de matières fécales ont été faits sur tous les animaux le jour du traitement (0 DPT) et quatorze jours après le traitement (14 DTC), et les numérations d'œufs par gramme de fèces (EPG) ont été déterminées. Aux deux occasions d'échantillonnage, des prélèvements composites des divers groupes ont été mis en culture séparément pour les identifications de strongles au troisième stade larvaire (L3). Les efficacités des anthelminthiques ont été évaluées sur la base du pourcentage de réduction du nombre d'œufs fécaux (% FECR). La résistance aux deux médicaments était toujours évidente au FECR de 71% et de 75%, respectivement pour le LEV et l'ABZ. L'administration concomitante des deux médicaments s'est révélée très efficace, avec un FER de 95,4%. La L3 récupérée à partir de la culture fécale à 14DPT a indiqué que la Haemonchus spp a survécu aux traitements à l'ABZ et LEV administrés séparément et même à l'administration concomitante des deux produits. L'espèce Trichostrongylus spp a survécu au traitement LEV mais était très sensible à l'ABZ

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administré seul ou en cas d'administration concomitante avec le LEV, tandis que l'espèce Oesophagostomum a survécu à l'ABZ administré séparément. L'association de ces deux médicaments peut donc être une solution temporaire de lutte contre les helminthes à la ferme en attendant que d'autres mesures de contrôle soient déterminées.

Mots-clés : efficacité, résistance, albendazole, levamisole, administration concomitante

Introduction

Gastrointestinal parasitism is one of the most important disease complexes of sheep. Over the past several decades, the parasites have been controlled through the use of anthelmintics, but the emergence of anthelmintic resistance (AR) has threatened this chemotherapeutic approach. In some countries anthelmintic resistance has reached alarming proportions in small ruminant industry, where numerous reports indicate widespread resistance to one or more anthelmintics1,2,3,4. In the farm under investigation, multiple anthelmintic resistances to LEV, ivermectin (IVM), levamisole – rafoxanide combination and albendazole had been earlier reported5. Treatment of animals with a combination of drugs from different classes where resistance to the individual drug exists has resulted in improved efficacy. In some countries, the combined drugs are available as commercial formulations4. Where this is not available, the different classes of drugs may be co-administered at dose rates recommended by the individual manufacturers. On farms with multiple resistance, the specific nature of resistance will determine whether the combination drenches are effective or not and only drench testing can determine this. The main goal of the current trial was therefore to compare the efficacy of ABZ and LEV given either separately or co-administered to sheep naturally infected with GI nematodes resistant to both drugs.

Materials and Methods

Study site and worm control history

The study was carried out on a farm in Kabete, 20 Km west of Nairobi. The sheep enterprise on the farm consisted of 120 dorpers kept permanently on the farm and grazed in the same paddocks for 2 years. The animals had been moved to these paddocks after the previous ones were found to be highly contaminated and the helminths resistant to a number of anthelmintics previously used for their control[5].

Experimental animals and sampling

Initially, rectal faecal samples were collected from the entire flock examined for the presence of helminth eggs, and a modified McMaster technique as described in the MAFF6 manual used to determine the eggs per gram (EPG) of faeces. Thirty two animals with at least 100 epgs were identified and randomly assigned to four groups with equal numbers. Group 1 animals were given a drench of albendazole (Valbazen® Ultravetis East Africa Ltd, Nairobi, Kenya), group 2 were injected subcutaneously with levamisole (Levacide® Norbrook Laboratories Ltd, Karuri, Kenya) and in group 3 the two drugs were co-administered at the manufactures recommended dose rates. The fourth group remained as untreated control. Rectal faecal samples were again collected from the selected animals on the day of treatment (0DPT) and 14 day post treatment (14DPT) then processed as earlier described. FECR% and the 95% confidence limit for the reduction were calculated according to the method described in the World Association for the Advancement of Veterinary Parasitology (WAAVP7. AR was declared when the FECR% was less than 95 % and the lower 95 % confidence limit was less than 90 %. Analysis of variance was used to compare the FECR% and the 95% CI for the different drug treatments. Pooled faecal samples from the respective groups were cultured on both sampling occasions for strongyle L3 identification.

Table 1: The Faecal Egg Count Reduction Percentage (FERC%) and its Confidence Interval (CI) calculated according to the method of the World Association for the Advancement of Veterinary Parasitology (WAAVP) developed by Coles *et al.*, (1992).

Treatment	**Arithmetic mean eggs per gram (EPG) of faeces (Range)**						
	Pre-treatment (day 0)		**Post-treatment (day 14)**				
	Control	Treated	Control	Treated	FECR%	95% CI	Remarks
ABZ	4086 (300-10000)	2750 (100-7900)	1350 (100- 3100)	338 (0 - 1300)	75	61.2 – 83.9	Resistant
LEV	4086 (300-10000)	5800 (1200-12000)	1350 (100 - 3100)	386 (0-2400)	71	40.9 – 86.2	Resistant
ABZ + LEV	4086 (300-10000)	2975 (100-9100)	1350 (100 - 3100)	63 (0-300)	95.4	92 – 97.3	Susceptible

Key: ABZ = Albendazole, LEV = Levamisole

Table 2: The percentage composition of third stage strongyle larvae recovered from pooled pre-treatment and post – treatment faecal cultures

Day Post-treatment (DPT)	**Strongyle genera**	**Percentage composition of third stage strongyle larvae**			
		Control	**ABZ**	**LEV**	**ABZ + LEV**
DPT = 0	*Haemonchus*	60	61	62	65
	Trichostrongylus	30	27	25	21
	Cooperia	7	3	5	4
	Oesophagostomum	3	7	8	7
	Nematodirus	-	2	-	3
DPT = 14	*Haemonchus*	63	90	56	97
	Trichostrongylus	25	5	40	3
	Cooperia	8	2	3	-
	Oesophagostomum	4	3	1	-

Key: ABZ = Albendazole, LEV = Levamisole

Results

The results of the FECR % and their corresponding 95 % CI are shown in Table 1. The FECR % indicated resistance to ABZ (75%) and LEV (71%) when administered separately and susceptibility when the two drugs were co-administered (95.4%). Co-administration of the two drugs resulted in a significant increase ($p < 0.05$) in the FECR% and the 95% CI (92 – 97.3%) compared to that of the individual drugs. The percentage composition of L3 recovered from faecal culture of pooled samples at 0DPT and 14DPT are shown in Table 2. Haemonchus spp. survived treatments with ABZ and LEV given separately and when co-administered. Trichostrongylus spp. survived the LEV treatment but was highly susceptible to ABZ given alone or when co-administered with LEV, while Oesophagostomum species survived ABZ given separately.

Discussion

Modern anthelmintics are used at an efficacy of about 99% against susceptible strains3. The World Association for the Advancement of Veterinary Parasitology

(WAAVP) recommends that, AR is declared when the FECR% is less than 95 % and the lower 95 % confidence limit is less than 90 % 7. In the current study, the results of the FECR% for ABZ and LEV when administered separately were less than 95 % and the lower 95 % confidence limit were less than 90% an indication that resistance to these drugs as earlier reported5 still persisted in the farm. Once AR has established, there is no evidence of reversing to susceptibility even after prolonged withdrawal of the drug8. This was evident in this farm where ABZ had been withdrawn for the previous two years. It is important therefore that management practices that prolong the effectiveness of all classes of anthelmintic be applied at all times.

Resistance to multiple classes of anthelmintic commonly used in control of sheep endoparasites is common in many parts of the world3,4,9. Resistance to benzimidazoles (BZ) is common to Haemonchus contortus, Trichostrongylus colubriformis and Telardosagia circumcincta. Resistance to LEV is relatively rare in Haemonchus contortus, but common in T. colubriformis and T. circumcincta9. The results of this study are in agreement with these observations as the faecal cultures showed Haemonchus as the main parasites resistant to ABZ and LEV given separately and when co-administered. Trichostrongylus spp. showed resistance to LEV treatment but showed susceptibility to ABZ given separately and when the two drugs where co-administered.

Treating simultaneously with 2 drugs from different anthelmintic classes is one of the methods of preventing the development of AR and can prolong their use for over 20 years10. However, once resistance alleles accumulate in worm populations, this strategy will probably not be successful. Nevertheless, treatment with 2 drugs of different anthelmintic classes where resistance to the individual drug exists can still be of great benefit. Compared with individual drug effects, anthelmintics of different chemical classes administered together induce a synergistic effect, resulting in clinically relevant increases in the efficacy of treatment. This synergistic effect is most pronounced when the level of resistance is low. Once high-level resistance to both drugs is present, the synergistic effect is unlikely to produce acceptable levels of efficacy. In the present study, the FECR% for ABZ (75%) and LEV (71%) when administered separately suggest a fairly low level of resistance. The synergistic effects when the two drugs were co-administered greatly raised the FECR% (95.4%) and 95% CI (92 – 97.3) and thus produce acceptable levels of efficacy. Co-administrations of the 2 drugs may therefore offer a temporary solution in helminth control on the farm as other control measures are sort.

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SURVEY OF DISEASE STATUS OF CHICKENS IN SOME POULTRY FARMS IN SOUTH-WEST NIGERIA

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Abstract

A survey of health status of chickens in poultry farms in some local government areas (LGA) of Ogun State was carried out to determine the common chicken disease. Structured interview guides were administered through stratified and random sampling in six LGAs of Ogun state, viz. Odeda, Ewekoro, Ifo, Obafemi-Owode, Abeokuta South and Abeokuta North LGA, respectively. A total of 80 respondents who were the owners of the Poultry Farms were successfully interviewed and data collected were subjected to descriptive statistics to establish prevalent chicken diseases, and Chi-square analysis to determine associations between socio-economic characteristics of respondents and disease status of their flock. Coccidiosis was the major cause of ill-health in flocks. Significant relationships were established as follows: access to extension services and flock size ($p=0.001$), extension services and feeding of birds ($p=0.001$), extension services and shelter ($p=0.003$), extension services and healthcare ($p=0.006$), extension services and total sick ($p=0.001$), extension services and action on sick ($p=0.044$), access to veterinary services and flock size ($p=0.003$), veterinary services and feeding ($p=<0.001$), veterinary services and sheltering ($p<0.001$), veterinary services and healthcare ($p<0.001$), veterinary services and action on sick birds ($p<0.001$). It was concluded that socio-economic characteristics of farmers in the study area could influence health status of chickens.

Key words: Disease surveillance, poultry management, socio-economic characteristics.

ENQUÊTE SUR LA SITUATION SANITAIRE DES POULETS DANS CERTAINES FERMES AVICOLES DU SUD-OUEST DU NIGERIA

Résumé

Une enquête sur la situation sanitaire des poulets de fermes avicoles de certaines collectivités locales de l'Etat d'Ogun a été effectuée dans le but de déterminer les maladies courantes du poulet. Des guides d'entrevue structurés ont été administrés par échantillonnage stratifié et aléatoire dans six collectivités locales de l'Etat d'Ogun, à savoir : Odeda, Ewekoro, Ifo, Obafemi-Owode, Abeokuta Sud et Abeokuta Nord. Au total, 80 répondants, propriétaires de fermes avicoles, ont été interviewés avec succès, et les données recueillies ont été soumises à des statistiques descriptives dans le but de déterminer les maladies de volailles répandues, et à l'analyse du chi-carré pour déterminer les relations entre les caractéristiques socio-économiques des répondants et la situation sanitaire de leurs troupeaux. La coccidiose est la principale cause du mauvais état de santé des troupeaux. Des relations significatives ont été établies de la manière suivante : l'accès aux services de vulgarisation et la taille des troupeaux ($p = 0,001$), les services de vulgarisation et l'alimentation des oiseaux ($p = 0,001$), les services de vulgarisation et le logement ($p = 0,003$), les services de vulgarisation et les soins de santé ($p = 0,006$), les services de vulgarisation et l'ensemble des oiseaux malades ($p = 0,001$), les services de vulgarisation et l'action sur les malades ($p = 0,044$), l'accès aux services vétérinaires et la taille des troupeaux ($p = 0,003$), les services vétérinaires et l'alimentation ($p = <0,001$), les services vétérinaire et le logement ($p <0,001$), les services vétérinaires et les soins de santé ($p <0,001$), les services vétérinaires et l'action sur les oiseaux malades ($p <0,001$). Il a été conclu que les caractéristiques socio-économiques des aviculteurs dans la zone d'étude étaient susceptibles d'influencer l'état de santé des poulets.

Mots-clés : surveillance des maladies, gestion avicole, caractéristiques socioéconomiques

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Introduction

Animal production in general and chickens in particular play important socio-economic roles in developing countries. Food securities, generation of income and religious/cultural considerations are amongst the major reasons for keeping chickens. Chickens are the most widely distributed of all livestock species in Nigeria with a population of 166 million birds (FAOSTAT, 2007). The poultry sub-sector is the most commercialized of all the sub-sectors of Nigerian agriculture with those that are commonly reared being chickens, ducks, guinea fowls, turkeys, pigeons and more recently ostriches (Adene and Oguntade, 2006). Those that are of commercial or economic importance given the trade in poultry, however, are chicken, guinea fowls and turkeys, amongst which the chickens predominate (Adene and Oguntade, 2006), so much so that the term poultry is often taken by most people to refer to chickens.

Nigeria is a country with heavy human population and this population is continuously on the rise. This increase has led to the high demand for the available animal and poultry products in all parts of the country. Among the cheapest and highly affordable protein sources for this teeming population are poultry products (meat and egg). There is a really good rationale why chicken is so popular just about everywhere. Poultry meat is regarded as the most diet-friendly of all of the other meats. It is an abundant source of easily digestible proteins, vitamins and minerals. Chicken white meat is the most useful meat type – with minimal amount of fats, it is second only to fish. The protein amount of chicken white meat is equal to that of beef or pork, but it cooks considerably faster. Chicken is filling but in addition the meat is easily digested (Devriendt, 2012).

As lucrative as the business of chicken farming is, it is not without its drawbacks. Like any venture, it is faced with a number of constraints, chief of which is the susceptibility of chickens to a wide array of diseases (Damerow, 1994). Disease cause severe economic losses in poultry production. The loss is not only due to the death of birds but also loss in production. A farmer should always therefore remain on the alert to notice any symptom evinced by the flock so that control or treatment measures can be initiated early and the loss minimized (Prabakaran, 2003). Infrastructural capacity to diagnose the main causes of disease losses accurately will therefore prove necessary for countries seeking to develop a sustainable poultry industry (Bagust, 2008).

A health survey is an important tool that can be used by the government and agricultural bodies to investigate into the disease status of livestock in a given area which would in turn enable them sensitize and make farmers aware of these diseases. Merriam Webster Online Dictionary (2011) defines a survey as an act of querying (someone) in order to collect data for the analysis of some aspect of a group or area. The minimization of outbreaks of chicken diseases is very important for further improvement and development of the chicken farming industry in Nigeria, which would invariably bring about increased availability of chicken products and enhance the diet of Nigerians. Conducting a survey of chickens on poultry farms in some local government areas of Ogun State, to determine the disease status of the domestic fowls in this geographical location, which was the aim of this study, will be the first step towards solving the problems facing poultry health in the state and in the nation as a whole.

Materials and Methods

The study area of the survey comprised six local government areas of Ogun State viz.: Abeokuta North, Abeokuta South, Ewekoro, Ifo, Obafemi-Owode and Odeda Local Government Areas, all in the old Egba division of Ogun State in southwest Nigeria. It lies below the Olumo Rock, home to several caves and shrines (Wikipedia, 2011).

Poultry farming is a well-embraced business venture in Ogun State, with a sizeable number of farms established and a high percentage of these farms specialized in production of chicken (Gallus gallus domesticus). Average number of birds for small farm size is 301, for medium farm size is 740, while that of large size is 2,288.

Data Collection: The data for the survey was collected with the use of well structured questionnaires from extension agents and chicken farmers of selected poultry farms in the study area. Due to unequal distribution of poultry farms in the six local government areas under study, 14 farms were surveyed in Odeda, 10 in Ewekoro, 17 in Ifo, 19 in Obafemi-Owode, 10 in Abeokuta North, and 10 in Abeokuta South, bringing the total number of respondents to eighty (80). The method of sampling was both stratified and random, that is, the study area was stratified into local governments and farms selected randomly within each local government. The structured interview guides was divided into three sections to acquire information from farm personnel on the following: Socio-economic status of respondents; Management information on the birds; Disease status of the birds.

Data Analysis: Data analysis was done with the use of analytical tools (the Chi-Square) Test Statistics of the SPSS 17 Package (2008). Descriptive Statistics Tools of the same package was used to determine the most common of the diseases identified in all of the farms visited, and to establish the relationship between the socio-economic status of respondents and disease status/management of the birds.

Results and Discussion

Common Clinical Signs in the Study Area

Figure 1: shows the frequency of observed clinical signs in the farms visited. Weight loss has the highest incidence – 34, followed by anorexia and bloody diarrhoea (29 and 26 respondents, respectively). Respiratory problems were identified by 21 respondents, discoloured faeces by 18, stunted growth by 17, immobility and inactivity by 10, and limb paralysis by 7 respondents. Limb paralysis is the least observed with just (7). Two listed other clinical signs and 16 said they saw no disease symptoms in their flock.

As shown in Figure 2, Coccidiosis was the disease most identified by the farmers and therefore has the highest probable prevalence in the study area (35%) followed by Chronic Respiratory Disease at 13.8%, Newcastle Disease at 6.3%, Gumboro and Salmonellosis at 3.8%, respectively. The least prevalence was shown by Fowl Pox at 1.3%; 35% of the respondents claimed to have identified no diseases in their flock. This result is almost similar to a retrospective study carried out in Sokoto State, Nigeria between 2004 and 2008 in which it was reported that out of a total of 1,034 cases recorded, 337 (32.9%) was Infectious Bursal disease (IBD), 147 (14.0%) was coccidiosis, while 128 (12.4%) and 102 (9.9%) were Newcastle disease (NCD) and Fowl typhoid (FT), respectively (Adamu *et al.,* 2009).

Disease Status of Chickens in the Study Area

Abeokuta-North Local Government Area: Total numbers of birds on farms visited in Abeokuta-North LGA were 40,689 and number of sick birds was 140 (Figure 3). Weight loss was the common clinical sign identified while the most common probable chicken disease was Coccidiosis.

Abeokuta-South Local Government Area: Total numbers of birds surveyed in Abeokuta South were 18,627 and number of sick birds, 182 with Ibara being the location with the highest number of sick birds (Figure 3). Anorexia, inactivity, diarrhoea and discoloured faeces showed the same degree of prevalence among the clinical signs. Coccidiosis was also the most common probable disease.

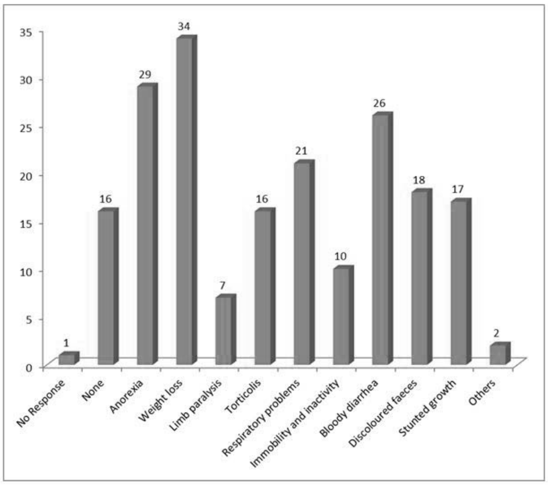

Figure 1: Frequency of clinical signs in the study area

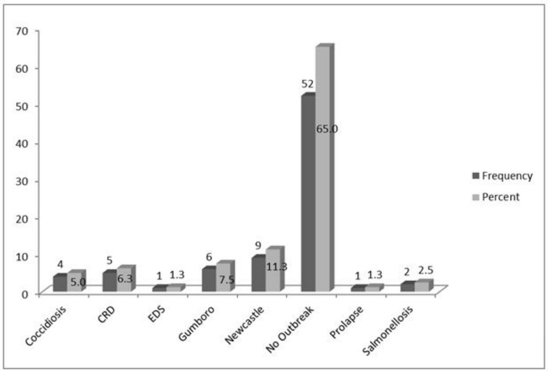

Figure 2: Probable disease outbreaks in the study area

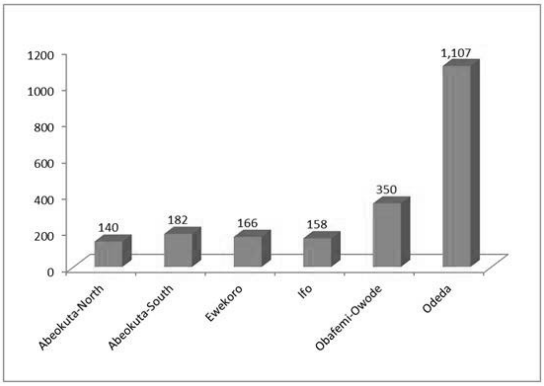

Figure 3: Number of Sick Birds in the Study Area

Ewekoro Local Government Area: Total number of birds on farms surveyed in Ewekoro Local Government Area was 10,086 and the total number of sick birds was 166 as seen in Figure 5. Diarrhoea was the most prevalent clinical sign and coccidiosis was the probable disease of highest prevalence.

Ifo Local Government Area: Total number of birds on farms surveyed in this local government area was 52,795 with the number of sick birds totalling 158. The two farms visited in Atan had the highest number of incidence of sick birds. Respiratory problem was the common disease symptom followed by stunted growth. Coccidiosis was the most common probable disease.

Obafemi-Owode Local Government Area: Total numbers of birds surveyed in the LGA were 90,640 and number of sick birds was 350. Weight loss was the common clinical sign while the most common probable disease was also coccidiosis.

Odeda Local Government Area: The total number of birds on all farms visited in Odeda local Government Area was 82,435 while the total number of sick birds was 1,107 (Figure 5). The high incidence of disease was Chronic Respiratory Disease. Weight loss was the most common clinical sign and the most common probable disease was coccidiosis.

Table 1: Chi-Square Analysis of Relationships between some Socio-economic Characteristics of Respondents and Disease Status/Management of their Flock

The chi-square analysis of the relationship between the socio-economic characteristics of the respondents and disease status/management of flock (Table 1) revealed that there was no significant relationship between the following: age of respondent and total birds, shelter, health services, total sick, action on sick, common diseases; sex of respondents and total birds, total sick, disease outbreak, common disease; marital status and total sick, action on sick, disease outbreak, common disease; level of education and total sick, disease outbreak; family size and all factors except disease outbreak; years in business and all factors; extension services and disease outbreak, common disease; veterinary services and total sick, disease outbreak, common disease; reason for business and total sick, common disease, respectively ($P > 0.05$).

However, there were significant relationships between age of respondent and feeding of birds ($P=0.044$), age of respondent and disease outbreak ($P=0.022$), sex of respondent and feeding of birds ($P=0.002$), sex of respondent and sheltering of birds ($P=0.003$), sex of respondent and healthcare provision ($P=0.023$), sex of respondent and action on sick birds ($P=0.047$), marital status of respondent and flock size ($P=0.008$), marital status of respondent and feeding of birds ($P<0.001$), marital status of respondents and sheltering of birds ($P<0.001$), marital status of respondents and healthcare provision ($P=0.001$), educational level of respondents and flock size ($P=0.003$), educational level of respondent and feeding, sheltering, healthcare provision ($P<0.001$), educational level of respondent and action on sick birds ($P=0.003$), family size and disease outbreak ($P=0.018$), access to extension services and flock size

Table 1: Chi-Square Analysis of Relationship between Socio-economic Characteristics of Respondents and Disease Status/Management

Socio-Economic Characteristics	Total Birds	Feeding	Shelter	Health Services	Total Sick
Age	9.464 (P=0.149)	9.812 (P=0.044)*	5.166 (P=0.271)	2.205 (P=0.698)	6.197 (P=0.401)
Sex	3.519 (P=0.318)	12.555 (P=0.002)*	11.510 (P=0.003)*	7.525 (P=0.023)*	0.983 (P=0.805)
Marital Status	17.527 (P=0.008)*	21.497 (P<0.001)*	20.245 (P<0.001)*	18.382 (P=0.001)*	9.976 (P=0.126)
Level of Education	30.169 (P=0.003)*	47.765 (P<0.001)*	52.357 (P<0.001)*	46.731 (P<0.001)*	10.585 (P=0.565)
Family Size	37.996 (P=0.150)	31.014 (P=0.055)	15.985 (P=0.718)	23.957 (P=0.244)	18.393 (P=0.952)
Years in Business	14.987 (P=0.242)	5.845 (P=0.483)	6.422 (P=0.600)	3.394 (P=0.907)	12.589 (P=0.400)
Ext. Services	27.487 (P=0.001)*	23.277 (P=0.001)*	19.884 (P=0.003)*	18.167 (P=0.006)*	29.394 (P=0.001)*
Vet. Services	28.844 (P=0.003)*	56.233 (P<0.001)*	43.093 (P<0.001)*	57.576 (P<0.001)*	13.962 (P=0.124)

**Significant (P<0.05)*

(P=0.001), extension services and feeding of birds (P=0.001), extension services and shelter (P=0.003), extension services and healthcare (P=0.006), extension services and total sick (P=0.001), extension services and action on sick (P=0.044), access to veterinary services and flock size (P=0.003), veterinary services and feeding (P=<0.001), veterinary services and sheltering (P<0.001), veterinary services and healthcare (P<0.001), veterinary services and action on sick birds (P<0.001).

Conclusion

From the study, it was concluded that Coccidiosis is the most prevalent of the probable disease, irrespective of scale of production, age, sex or level of education of farmers as shown by the lack of significant relationship between the socio-economic characteristics of farmers and common diseases. High prevalence of coccidiosis may be due to the lack of vaccination programmes against the disease. The weight loss, anorexia and bloody diarrhoea high frequency could be associated with Coccidiosis infection. The survey also revealed that the socio-economic status of farmers had an impact on flock management in areas of healthcare provision, sheltering and feeding.

Impact

The occurrence of poultry disease in this study area is highly correlated with the socio-economic status of the farmer. The access of the farmers to extension services and provision of veterinary care was a great advantage in the curbing of prevalent diseases and thus a better health status of the birds. This will mean a better performance of the birds, food security and thus a higher profitability, and poverty alleviation amongst farmers.

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