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Full Length Research Paper

Prevalence of gastro-intestinal helminthes and coccidia in indigenous chicken from different agro-climatic zones in Kenya

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A study on the prevalence of gastro-intestinal endoparasites in indigenous chicken was carried out in three regions in Kenya. The objective of the study was to determine the species and their prevalence rates. A total of 710 adult free-ranging local chickens were sampled from six districts, Kakamega (162), Bondo (81), Narok (81), Bomet (150), Turkana (70) and West Pokot (166). Qualitative and quantitative microscopic parasitological examinations were used for faecal examination. The survey showed that 192 (27.04%) was infected with Coccidial oocysts, 182 (25.63%) with *Ascaridia galli,* 10 (1.41%) with *Heterakis gallinarum*, 2 (0.3%) with *Syngamus trachea*, 37 (5.21%) with *Capillaria retunsa*, 8.45% with *Capillaria annulata,* 21 (2.96%) with *Raillietina tetragona,* 94 (13.24%), while 112 (15.8%) were negative, with no helminthes infestation. The findings suggested that endoparasites are a common health problem in free range indigenous chicken in Kenya and agro-climate significantly influenced the distribution of endoparasites.

Key words: Prevalence, endoparasites, indigenous chicken.

INTRODUCTION

In Kenya, rural poultry production represents a significant portion of the economy, as it acts as a source of income to smallholder farmers. In addition, both poultry meat and eggs are affordable sources of animal protein. Poultry keeping constitutes a large portion of farming where domestic chicken constitutes over 98% of the total poultry population (MALDM, 2000). Out of an estimated population of 27.7 million domestic chickens, about 70% are categorized as indigenous. Previous research has reported that over 90% of households in rural areas rear indigenous chicken (Ndegwa et al., 1998; Kaudia and Kitalyi, 2002). Endo-parasites infections in indigenous chicken are very common because of the risks posed by free-ranging (Ondwassy et al., 2000). These parasites contribute to the low productivity of the indigenous chicken (Siamba et al., 2000, Sani et al., 1987). Control of the parasites in rural poultry using commercial anthelmintics in Kenya is rare (Siamba et al., 2000) largely because of high relative costs. Diseases and poor management are the major constraints to the health and productivity of village poultry (Minga and Nkini, 1986; Bell et al., 1990). A review of village poultry diseases by Gueye (1998) showed that periodic outbreaks of Newcastle disease can devastate free-ranging chicken populations wherever they are found in the world. A high mortality rate caused by Newcastle disease is thought to take away the focus from other diseases, and thus mask other diseases in village chickens (Bell, 1992). Other devastating poultry diseases include infectious bursal disease (IBD) commonly referred to as gumboro, infectious coryza and fowl pox. The common bacterial diseases are the fowl typhoid, chronic respiratory disease (CRD) and salmonellosis. Coccidiosis in poultry causes enormous economic loses in poultry production (Nakamura et al., 1989). A survey in Tanzania reported the occurrence of 6 types of helminthes in indigenous chicken (Ondwassy et al., 2000). It was found that 90.2% of all chickens sampled were infested by at least one

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Table 1. The prevalence of gastro-intestinal parasites in adult chickens in six districts in Kenya.

S/N	District	Agro-climate	Number chickens examined	% of chickens with parasites
1	Kakamega	Highland	162	155 (95.68)
2	Bondo	Lowland	81	68 (83.95)
3	Narok	Lowland	81	49 (60.49)
4	Bomet	Highland	150	144 (96.0)
5	Turkana	Lowland	70	17 (24.29)
6	West pokot	Midland	166	165 (99.4)
	Total		710 (100%)	598 (84.2)

species. Chickens infested with *Heterakis gallinarum*, *Tetrameres americana* and *Prosthogonimus pellucidus* showed no symptoms of illness while those infested with *Syngamus trachea, Raillietina tetragona* and *Ascaridia galli* causes high mortalities in the young birds. This paper presents results of a study designed to establish prevalence rates and impact of agro-climatic zones on endo-parasites.

MATERIALS AND METHODS

Study area

The study was conducted from November 2007 to December 2008 (dry season) in three regions of Kenya. Six districts were selected from three different agro-climatic zones; lowlands, midlands and highlands. The regions used were western region (Kakamega and Bondo), south rift region (Narok and Bomet), and the North rift (Turkana and West pokot). Kakamega and Bomet are highlands of altitude greater than 2800 m.a.s.l with a temperate highland climatic description, annual rainfall > 80 evaporative potential with an average annual rainfall of 1800 mm. West Pokot (Kapenguria) lies in the midlands lying 2300 m.a.s.l, with temperatures 20 - 28°C and an annual rainfall average of 900 mm, it is a semi-humid climatic condition with rainfall evaporative potential of 50 - 64 (FAO, 2007). Bondo, Narok and Turkana with less than 1,500 m above sea level represented the lowlands with higher temperatures 30 - 43°C and an annual average rainfall of 700 mm. A multistage sampling was used for cross sectional study on gastro-intestinal helminthes.

Faecal sampling and examination

Seven hundred and ten live birds of both sexes were screened using faecal samples from random homes in respective villages in six districts. Samples were put in a cool box at +4°C before they were examined. Both qualitative and quantitative faecal examination was carried out to determine the presence of nematode, cestode eggs and oocysts. Classification of nematodes followed the method of Vicente et al. (1995) and that of trematodes was based on the method of Travassos et al. (1969). Microscopial examination of prepared samples for qualitative technique was done using a simple floatation method. The magnification for nematode and cestode was 10 × 10; coccidian, 10 × 40, while for trematode eggs it was 10 × 4 (Perry and Hansen, 1994). Quantitative techniques for separating and concentrating eggs was carried out by the use of modified McMaster counting technique which determined the number of eggs or oocysts per gram (epg) of faeces (Train and Hansen, 1968).

Statistical analysis

The analysis was done using statistical analysis system (SAS) (2000) package of proc general linear model (GLM) while mean separation was done using Duncan multiple range test. The test of significance between the districts and prevalence rates was performed using F-test, at 95% confidence interval, in one way ANOVA. Pearson's correlation coefficient was used to measure the linear association between prevalence rates of parasites and their respective egg per gram counts.

RESULTS

Prevalence of parasites

A total of 710 chickens were examined from the six districts (Table 1). Of this, 27.04% were infected with coccidia (protozoa), 25.63% with *A. galli,* 1.41% with *H. gallinarum*, 0.3% with *S. trachea*, 5.21% with *Capillaria retunsa,* 8.45% with *Capillaria annulata* and 2.96% with *Raillietina tetragonal,* 13.24% were found with *Raillietina echinobothrida* while 15.8% were found to be negative (Table 2). Mean separation indicated that coccidia and *A. galli* were significantly different in prevalence from the other helminthes species ($P < 0.05$). The difference in prevalence rates of coccidia and *A. galli* (25.63 and 27.75%) was not statistically significant ($P < 0.05$). The correlation coefficient between prevalence rates and the faecal eggs counts (FEC) per gram of faeces (Figure 1) was positive ($r = 0.707$) and highly significant at $p < 0.01$. Thus the higher the prevalence rate of a parasite in a district, the higher the parasite's egg per gram counts. In general there was a statistically significant difference ($P < 0.01$) in the prevalence rates of helminthes infection between the districts; F-value was 15.4.

DISCUSSION

Statistical analysis revealed that the distribution of helminthes was highly significant ($P < 0.01$) between the districts. The districts experience different agro-climatic zones. Thus, the prevalence of parasites was influenced by the biotic and abiotic factors. Extreme temperatures were not conducive for the completion of the

Table 2. Percentage distribution of species of helminthes recovered from chickens in six districts representing three agro-climatic zones in Kenya.

Parasite species	Highland			Lowland		Midland	Total infested	Percentage
	Kakamega	Bomet	Narok	Bondo	Turkana	West Pokot		
A. galli	26.54	29.33	20.99	40.74	8.57	23.49	182	25.63
Coccidia	35.8	20.7	35.8	28.4	7.10	27.7	192	27.04
H. gallinarum	3.70	0.00	0.00	0.00	0.00	2.41	10	1.41
S. trachea	1.20	0.00	0.00	0.00	0.00	0.00	2.0	0.28
C. retunsa	4.94	15.33	0.00	0.00	0.00	3.61	37	5.21
C. annulata	3.70	12.0	3.70	2.47	8.57	15.06	60	8.45
R. tetragonal	0.00	0.00	0.00	0.00	0.00	12.65	21	2.96
R. echinobothrida	19.75	18.67	0.00	12.35	0.00	14.45	94	13.24

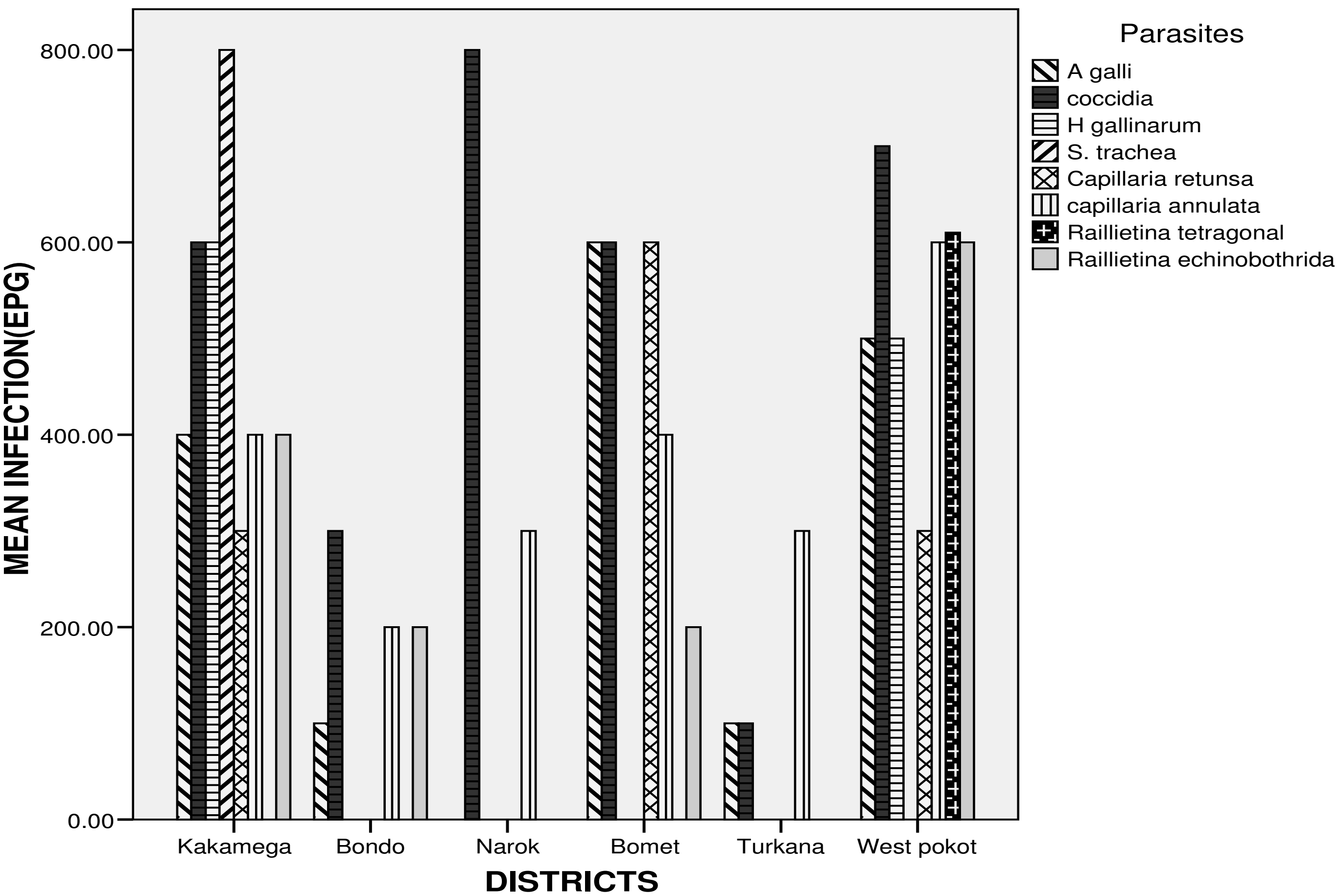

Figure 1. Mean faecal egg counts (epg) in six districts of Kenya.

developmental stages for vector-host transmission of parasites. Turkana district which has 40°C had coccidian (protozoa), *A. galli* and *C. annulata* as prevalent helminthes; these high temperatures hindered development of most parasite stages. Intestinal protozoa, *Eimeria* species were highly prevalent in the six districts with a prevalence rate of 27.04%.

This protozoon is a causative agent for coccidiosis in indigenous poultry. Coccidiosis is a poultry disease causing enormous economic loss in poultry production (Nakamura et al., 1989). The prevalence rates of coccidia were higher in Kakamega, Bondo and Narok. Low infestation was found in Bomet and Turkana. Indigenous chicken in all the districts were infested with coccidiosis because the protozoan coccidian can survive wide ranges of temperatures. The egg counts per gram for coccidia were high in Narok (800), West Pokot (700), Kakamega (600) and Bomet (600). Low of counts, < 300 egg per gram was found in Turkana and Bondo. This indicates that coccidiosis is prevalent in the four districts with high eggs per gram counts of faeces. *A. galli* had a prevalence rate of 25.63% in all the six districts. This nematode parasite is the most common gastro-intestinal helminthes found in indigenous free range poultry. *A. galli* prevalence rates between the districts were insignificantly different. The reason for this phenomenon is explained by the fact that the parasite survives a wide range of climates. The eggs can survive winter with moderate frost and will survive in most developmental stages up to 43°C (Permin et al., 1997). *A. galli* significantly affects the health of chickens by sharing the feed consumed by the host, thus causing stunted growth and reduced egg and meat production (Eshetu et al., 2001). *H. gallinarum* is a nematode (round worm) parasite identified in the study.

The prevalence rate for this parasite in the six districts was found to be lower than *A. galli* with 1.41%.The infestation of indigenous free range chickens varied in the six districts. This indicates the significant effect of the agro-climatic factors as a source of variation in the districts. *H. gallinarum* parasite was highest in Kakamega followed by West Pokot district. The average egg per gram counts in the districts varied: Kakamega (600), West Pokot (500) while Bondo, Narok and Turkana had less than 100 counts. The parasite *S. trachea* had a prevalence rate of 0.28% in all the six districts. The prevalence of the parasite was found to have fewer variations in the six districts. The parasite was not found in other districts, thus its occurrence may be subject to other factors than climatic and biotic factors in that region. The parasite was highly prevalent in Kakamega district. This occurrence is in relation to the relative density of chicken populations between the districts. *S. trachea* became a common parasite occurring in regions of high chicken population densities. The egg per gram count was very high with 800 counts. The other districts had a zero count in McMaster technique of sensitivity of 50 eggs per gram of faeces (Hansen and Perry, 1994).

The study also revealed two species, *C. annulata* and *C. retunsa*. The prevalence rate for *C. annulata* species in all districts was found to be 8.45% while for *C. retunsa* was lower with a prevalence rate of 5.21%. For the very hot temperature districts, Turkana had insignificant prevalence of parasites; thus the parasite thrives well in warm areas than extreme cold or hot environments. Kakamega, Bomet and West Pokot districts has nearly same agro-climatic factors with altitude 1,500 - 1,800 ASL and temperature of 16 - 25°C. Bomet and West Pokot had high egg per gram counts (600,400), (300,600), while Kakamega had a low count of (300,400) eggs per gram for *C. retunsa* and *C. annulata*, respectively. Thus, the parasite was devastative in Bomet. This is one of the most important cestode (tapeworm) found in the study. The two species found were *R. tetragonal* and *R. echinobothrida.* The prevalence rate for *R. tetragonal* was 2.96% while for *R. echinobothrida* species was 13.24% in the six districts. Multiple infections were common in the study with chicken harboring 1 - 4 helminthes. Narok district had only three parasites recorded with low helminthes prevalence and egg per gram counts. The indigenous people, the Maasai, utilize a range of herbal remedies in poultry farming. A survey conducted in the same period revealed that the Maasai use Osugorroi (*Aloe* spp.), pepper, ash, muraro (soot) and stinging nettle (*Urtica* species). Other external parasites found occurring in all the six districts were fleas, mites and ticks and were controlled by the use of paraffin and dusting. Chicken population density may be a source of variation for helminthes distribution in the six districts. The number of poultry farms in each district according to the food and agriculture organization (FAO) (2007) report showed that West Pokot had 30,233 farms; Kakamega, 26,506 farms and Bomet, 21,200 farms, while Narok had 18,533 farms, Bondo had 13,047 farms and the lowest was Turkana with 633 farms. These districts with high chicken populations had higher prevalence rates than the districts with low population densities. This implies that the higher the chicken population densities, the higher the rate of infection and transmission of parasites in flocks from one household to another. In other studies, Saad et al. (1989) found that of 123 Sudanese chicken, 77.3% harbored endo-parasites, out of these 41% only hosted one species while others had 1 - 5 helminthes species. In Mwanza region in Tanzania, Msanga and Tungaraza (1985) found that 95% of the chickens had endo-parasites. The study showed 84.2% harbored with endo-parasites. These findings suggest an intervention to control helminthes through low cost and easily available strategies.

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REFERENCES

Bell JG (1992). “The village chickens and disease control”, Tanzania Vet. J. 12: 44-47.

Bell JG, Kane M, Le Jan C (1990). “An investigation of the disease status of village poultry in Mauritania”, Prev. Vet. Med. 8: 291-294.

Eshetu Y, Mulualem E, Ibrahim H, Berhani A, Aberra K (2001). Study of gastro-intestinal helminthes of Scavenging chickens in four rural districts of Amhara region, Ethiopia .Rev. Sci. Tech. off. Epiz 20(3): 791-796.

FAO (2007). The structure and importance of the commercial and village based poultry systems in Kenya. Nairobi, Kenya.
Gueye EHF (1998). “Village egg and fowl meat production in Africa”, World. Poult. Sci. J. 54: 73-86.
Hansen J, Perry B (1994). The epidemiology, diagnosis and control of helminthes parasites of ruminants: A handbook. International Livestock Research Institute, Nairobi, 171 pp. ISBN 9290557031.
Minga UM, Nkini RP (1986). “Disease as a major constraint to chicken production in Tanzania”, in Proceedings of the Tanzania Society of Animal Production Scientific conference 10: 120-135.
Msanga JF, Tungaraza R (1985). The Incidence of external and internal parasites of Indigenous poultry in Mwanza municipality, Tanzania. Tanzania Vet. Bull. 7: 11-14.
Permin A, Magwisha H, Kassuku AA, Nansen P, Bisgaard M, Frandsen F, Gibbons L (1997). “A cross-sectional study of Helminthes in rural scavenging poultry in Tanzania in relation to season and climate.” J. Helminthol. 71: 233-240.
Saad MB, El Sadig AA, Shammat AM (1989). helminthes parasites of local breed of poultry in (Kordofan Region). Sud. Vet. Sci. Anim. Husbandry 28(2): 54-55.
Sani RA, Harisah M, Aini I, Shah-Majid M (1987). Malaysia: Fowl diseases. In Copland JW (editor). Newcastle Disease in poultry: A new food pellet Vaccine. ACIAR Monograph No 5, Canberra, Australia pp. 89-92.
Siamba DN, Ndegwa JM, Kimani CW, Nampaso J, Ole Sinkeet SN, Mukisira EA, de Jong R (2000). Rural poultry production: Efforts to improve production and contribution to household economy. In de Jong and Mukisira (Editors), testing of livestock technologies on smallholder mixed farms in Kenya. Research-extension-farmer experiences in the National Dairy Cattle and Poultry Research Programme 1995-1999 pp. 141-156.
Travassos L, Freitas JFT, Kohn A (1969). Trematódeos do Brasil. Mem. Inst. Oswaldo Cruz. 67: 1-886.
Vicente JJ, Rodrigues HO, Gomes DC, Pinto RM (1995). Nematóides do Brasil. Parte IV: nematóides de aves. Revta Bras. Zool. 12 (Supl.1): 1-273.