



**A STUDY ON THE INCIDENCE OF COLIC IN DONKEYS IN
LIMURU AND LARI SUB-COUNTIES.**

Submitted by:

CHARLES KIRUTHU MUNGAI

J30/2053/2010

**A PROJECT REPORT SUBMITTED IN PARTIAL FULFILLMENT
OF THE REQUIREMENTS FOR BACHELOR'S DEGREE IN
VETERINARY MEDICINE**

**DEPARTMENT OF CLINICAL STUDIES
FACULTY OF VETERINARY MEDICINE, UNIVERSITY OF
NAIROBI**

YEAR 2015

DECLARATION

This project report is my original work and has not been presented for a degree in any other university

SIGNATURE _____ DATE _____

Mungai Charles Kiruthu.

J30/2053/2010

This project report has been submitted for examination with the approval of university supervisor:

SIGNATURE _____ ..DATE _____ .

D r. J. K. Muthee. BVM., MSC., Ph.D

Department of clinical studies

DEDICATION

This project report is dedicated to my lovely mother Martha Wairimu for her support and guidance, my late father Stanley Mungai and my late aunty Peris Nyambura.

ACKNOWLEDGEMENTS

First, I thank the almighty God for his blessings, care and for keeping me upto this far. His love is immense.

My special thanks to my dear mother for devoting all her energy towards my education and also for giving moral support all through.

I express my heartfelt gratitude to my supervisor Dr. Muthee for his constant encouragement, guidance and stimulating discussion during the study.

I thank the head of team Kenya Network for dissemination of Agricultural Technologies (KENDAT) Mount Kenya West Region for allowing me to use the treatment records for Limuru and Lari sub counties.

I am deeply indebted to Mount Kenya West region staff for providing all necessary support in terms of facilities throughout the study and their cooperation.

Special thanks to Dr George Kibet.

My deepest gratitude goes to my siblings for their love and understanding. Also to my late dad and aunty though they didn't live long to see this, their support and guidance kept me going.

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ABSTRACT

Colic is a gastrointestinal disease in equines and it causes significant setbacks in animal welfare and economics. In Kenya it is much of a problem in working donkeys as it is in horses around the world. It causes mortality and loss of working hours. In Kenya, donkeys provide a cheap source of labor in most of the rural areas, but with changing attitude towards donkeys, their use is spreading to peri-urban areas. They serve as a source of income to a greater proportion of people in these areas especially in the study area either directly or indirectly.

There has been a systematic and well coordinated effort in documenting the prevalence of colic in equines in several countries of the world. However, not much has been done in recent years in Kenya, yet that information is important in planning and implementing a colic control programme. Also little effort has been put in determining the most affected age of donkey by colic. Lack of this information necessitated the studies reported in this report.

Using case records available in Kenya Network for Dissemination of Agricultural Technologies (KENDAT) Mt Kenya West region, a retrospective survey was carried out to determine the incidence and the age predilection of colic to donkeys in Limuru and Lari Sub Counties over a period of five years (2009-2013). The incidence rate was calculated for each sub county and then for each of the five years. Using pooled data, total incidence rate for the two was calculated. The age predilection of donkey to colic was determined by tallying and then getting the mode.

A total of 1,387 cases were treated in the two Sub Counties during the 2009-2013 period in a population of 4,910 donkeys. Out of these, 69 (1.41%) were treated for colic. Limuru recorded highest prevalence (1.46%) with 46 cases treated for colic out of 823 cases in a population of 3,150 donkeys. Lari recorded 1.30% with 23 colic cases out of 564 cases in a population of 1,760 donkeys.

Out of the 69 cases, 11-15 years age group had the highest number of cases (35), then followed by 6-10 years age group with 17 colic cases. Limuru, 11-15 years age group recorded the highest number of cases (21), followed by 6-10 years age group 14 colic cases. Also in Lari out of 23 cases, 11-15 years age group recorded the highest number of cases (14) followed by 0-5 years age group 4 cases.

The incidence rate was considered high depending on the source of data and thus this call for implementation of control measures and also educating donkey owners about colic and the risk factors involved in order to lessen the incidence of the disease and the economic losses incurred.

CHAPTER ONE

1.0 INTRODUCTION

In Kenya, livestock contribute greatly to the gross domestic product (GDP). Livestock products; milk, meat and eggs, and the offtake returns contribute a great proportion to the agricultural GDP. Rural Kenyans derive a range of financial benefits from livestock keeping, including the provision of credit, insurance, and as a means of sharing risk. In addition, livestock owners use animals as collaterals to acquire credit. Donkeys are among the livestock kept by most of the rural Kenyans. (Roy and David., 2011). Donkey population in the country is approximately 1.8 million; Kiambu County has 11304 donkeys, Limuru Sub County 3150 and Lari Sub County 1760 donkeys. (National livestock census report 2009).

Limuru and Lari sub counties are in Kiambu County. The area has fertile land with fertile soil where subsistence farming takes place. However the lower part of it is has hot and dry environmental conditions with little farming taking place and water being a great problem. In some areas the road network is very poor making transport of goods from farms difficult. Donkeys assist a lot in all these areas to transport farm inputs and products to farm and markets, transporting building materials to construction sites and of late they assist in carrying litter out of the town centre for disposal. Donkeys provide cheap source of transport. They also help alleviate the drudgery of women's household activities, such as water and firewood carrying. A great number of people in Limuru area are small scale dairy farmers and donkeys assist them to transport fodder and also milk to milk collection centres. Therefore, it's notable that donkeys serve as a main source of income to a greater portion of the population in the area while the other proportion depends on the donkey directly or indirectly for services.

Donkeys suffer problems like African horse sickness, mange, equine colic, helminthosis, ectoparasites infestations, wounds, sarcoids, dermatophilosis, habronemiasis, and pneumonia amongst others.

Due to less information about colic and poor management by donkey owners, colic is serving as a major source of loss of donkeys. Colic remains a significant problem in equines in terms of welfare and economics, in some regions it is much a common cause of death. It is one of the

most difficult diseases to study with epidemiologic methods due to the large number of diseases that include colic (abdominal pain) as a clinical sign. Therefore, epidemiologic data related to colic are meaningful only if an accurate diagnosis of the primary disease process can be determined. Nevertheless, recent epidemiological investigations have confirmed that colic is complex and multifactorial in nature.

Most colic, 80 to 85% of cases can be designated as simple colic or ileus because no specific diagnosis is identified, and most equines respond to medical treatment or resolve spontaneously. (Tinker et al.,1995). Apart from horses, donkeys also suffer the same condition albeit with lesser severity. However, case fatality and mortality rates are high.

The condition can be caused by many factors and determination of these risk factors for specific types of colic may help identify the cause and lessen disease incidence by decreasing exposure to an incriminated risk.

1.1 OBJECTIVES

1.1.1 GENERAL OBJECTIVE

To assess the incidence of equine colic by determining the most affected age of donkeys over a five year period (2009-2013) in Limuru and Lari Sub Counties.

1.1.2 SPECIFIC OBJECTIVES

- a) To determine the incidence of colic in donkeys in Limuru and Lari
- b) To determine the age predisposition to colic in donkeys.

1.2 HYPOTHESIS

- a) There is no regional prevalence of colic.
- b) Colic is more prevalent in middle aged donkeys.

1.3 PROBLEM STATEMENT

A notable increase in the use of donkeys is evident in Kenya as mechanization on small farms and businesses have proved difficult due to large capital investment needed. Also they provide the cheapest form of labor. This has resulted in changing perceptions of the value of donkey and increased interest in the donkey in many rural communities as has been noted in the study areas.

As a result of this change, many donkey owners have little understanding of donkeys' requirements, husbandry practices, diseases, behaviors and potential for improvement. While the government and other livestock agencies haven't understood the contribution of donkeys to rural livelihoods and therefore need for improvement.

The challenge facing farmers is to make the best use of the resources that they have available and to access information on donkey diseases and husbandry. The challenge to livestock researchers and extension officers is to provide information that will help farmers. This is attributed to little being done on donkey diseases in Kenya and particularly colic.

Culture and myths works against donkeys' interest and welfare. Some of the myths popular in the community are that donkeys should not be treated when sick and thus should be abandoned to die, donkeys should not be grazed with other animals, and donkeys contribute to transmission of tetanus to humans via their feces amongst others. As such most of the donkeys suffer and die from diseases that can be controlled especially colic. This can be attributed to neglect of sick animals, little information and understanding of donkey husbandry practices and behavior patterns.

In Kenya little have been done on incidence of colic in donkeys and with welfare groups offering extension services to donkey owners, change in attitude and better treatment for the animal has been noted. There is a need to assess the situation with regard to colic in donkeys in Limuru and Lari. By evaluating the number of colic cases treated, an assessment of the incidence rate of colic in the region was done.

1.4 JUSTIFICATION OF STUDY

Donkeys are tolerant to harsh environmental conditions, and, in general, are more likely found where agriculture is subsistence. Despite the increase in mechanization throughout the world, donkeys are still well deserving of the name 'beasts of burden'. They have an important role to play in the transport of people and goods in areas where roads are poor or non-existent.

Due to this and considering the situation and conditions in Limuru and Lari sub-county, donkeys are widely reared and used in the area with an approximate of every two donkeys per owner. They are the cheapest form of transport and farm power other than human labor and vehicles, and therefore within reach of the "poorest of the poor" in the society. As such they serve greatly as a sole source of income to a big population of the area either directly or indirectly. Also in different business enterprises they play a big role in making profits by providing labor in terms of transport.

In accordance to animal welfare guidelines, colic presents a great deal of issues that contravenes the animal's welfare; the great pain, discomfort, inability to eat and mental stress associated with colic. Considering all this, if animals are to suffer colic, that means they cannot work for the day and that means lost income to the owner for that day. And due to the high incidences of death associated with colic, if owners are to keep on losing donkeys to colic, this means lost income, additional cost for replacement and animal welfare issue for the suffering animals.

Loss of donkeys to colic would translate to reduction in production for small scale dairy farmers, loss of income for transporters, increased labor cost for businesses that depend on donkeys for transport, difficulties in fetching water in dry areas and spoilage of farm products in farms due to delayed transport to markets in areas with poor roads. Therefore, this was to assess the incidence rate of colic in the region and to identify the causes and lessen the disease incidence by mitigating the identified/ incriminated risks.

CHAPTER 2: LITERATURE REVIEW

2.1 EQUINE COLIC

2.1.1 AETIOLOGY

Gastrointestinal disease causing signs of abdominal pain in equines is commonly referred to as colic. Colic is a frequent and important cause of death in equines. Its commonly caused by distension of gut with fluid, gas or ingesta, pulling on the root of mesentery, feed impaction or constipation, meconium impaction (newborns), gastric ulcers (foals), thromboembolism, volvulus of small intestines, massive strongyle infection and toxins

Colic may be classified into: Obstructive, Obstructive and strangulating, Non-strangulating infarctive and Inflammatory (peritonitis, enteritis). Classification can also be done on basis of duration of the disease: acute (24-36 h), chronic (>24-36 h) and recurrent (multiple episodes separated by periods of > 2 days of normality). Another classification system is anatomically based: stomach, small intestines, cecum, ascending and descending colon.

2.1.2 OCCURENCE

Equine colic occurs worldwide, although there are regional differences in the types of colic, and is a common and important disease of equines. Incidence rate ranges between 3.5 and 10.6 cases per 100 horse years (*Tinker et al., 1997a; Kaneene et al., 1997*). Mortality due to colic ranges between 0.5 and 0.7 deaths per 100 horse years, representing 28% of overall horse deaths. The case fatality rate is 6-13% of field cases (*Tinker et al., 1997a*) and is greater than any other cause of death except old age and musculoskeletal injury (*White et al., 2009*)

2.1.3 RISK FACTORS

Colic risk may be categorized into internal and external risks. Some of the risk factors include:

Horse characteristics/Signalment:- where younger and older equine appear to be at less risk for simple colic (*Tinker et al., 1997b*), middle-aged horses are at higher risk of colic than older horses; Weanling and yearling horses are more likely to have ileocecal intussusceptions and older horses (>12 years) are at increased risk of strangulating lipoma (*Proudman, 1992*). Gender is an apparent risk for conditions such as inguinal hernia in stallions and large colon displacement/volvulus in periparturient mares. Behavior and response to external environment appeared associated with an increased risk (*White N.A.,*)

Diet and feeding practices: - Feeds or feeding activity have long been associated with the incidence of colic. Coarse roughage with low digestibility or particularly coarse fiber is observed to be associated with impaction colic (White and Dabareiner, 1997). Poor dentition has been proposed to predispose to colic due to poor mastication of food, though this has not been confirmed (Hillyer et al., 2002). Feeding hay from round bales is also associated with an increased risk of colic (Hudson et al., 2001). Grain overload increases the risk of colic and laminitis; grain diets decrease the water content of ingesta in the colon due to a decrease in fiber, which binds to water (Lopes et al., 2004). Grain in the diet also increases gas production and is more likely to create an intraluminal environment that favors gas production or altered motility leading to intestinal displacements.

Management: - Equines without constant access to water are at increased risk of developing colic, whereas horses with access to ponds or dams have a reduced risk of colic compared to horses provided with water from buckets or troughs. Changes in housing and feeding practices has also been associated to causing colic (M.H. Hillyer et al., 2002)

Medical history: equines with a history of previous colic are at higher risk for future colic episodes (Cohen and Honnas., 1996; Tinker et al., 1997a)

Parasite control: Parasites (ascarids, tapeworms, strongyles) are associated with an increased risk of colic as they cause gastrointestinal obstruction. Tapeworm infestation is related to an increased frequency of colic, and specifically to colic associated with diseases of the ileum and cecum (Proudman and Holdstock, 2000).

Others:-

-Mares and Jennies have an increased risk for colon displacement or volvulus during late pregnancy and lactation (Huskamp, 1982; Snyder et al., 1989). Serum calcium concentrations and alterations in diet, including increases in energy due to more concentrates in the diet to support lactation, may be related to this increased risk

-General anesthesia increases the risk of colic, specifically, colic after general anesthesia for non-abdominal surgery which mostly leads to impaction (Senior et al., 2006).

2.1.4 PATHOGENESIS

The pathogenesis of equine colic is variable depending on the cause and severity of the inciting disease. Equine colic often involves changes in many body systems and most presents with pain, gastrointestinal dysfunction, intestinal ischemia, endotoxemia, compromised cardiovascular function (shock) and metabolic abnormalities.

Pain is attributable to distension of the gastrointestinal tract and stimulation of stretch receptors in the bowel wall and mesentery, stretching of mesentery by displaced or entrapped bowel, and inflammation and irritation of the bowel, peritoneum or mesentery. The intensity of the pain is often related to the severity of the inciting disease. Pain has an inhibitory effect on normal gastrointestinal function, causing a feedback loop in which the pain inhibits normal gut motility and absorptive function, allowing accumulation of ingesta, gas and fluid, resulting in progressive distension, occasionally rupture and further pain.

Ischemia may set in due to impaired blood flow as a result of torsion/volvulus, strangulation either by intestinal entrapment, tumor and excessive gastrointestinal distention. In cases of rupture and ischemia, endotoxins leak into peritoneal cavity leading to endotoxemia and eventually death. Loss of fluid and electrolytes into gastrointestinal lumen and endotoxemia lead to cardiovascular collapse, this impairs venous return to heart and therefore cardiac output, arterial blood pressure and oxygen delivery to tissues.

2.1.5 CLINICAL FINDINGS

Signs of abdominal pain include agitation, flank watching, flank biting, pawing, and frequent lying down, kicking at the abdomen, frequent attempts to urinate or defecate, and rolling.

Tachycardia is common. Normal gut sounds are absent and replaced by tympanic sounds.

Abdominal distension may develop with vomiting through the nose being observed. Rectal examination may reveal abnormalities which will include; gas and fluid distension of the cecum and colon, fluid distension of the small intestine, impaction of the large and small colon, and displacement of the large colon.

2.1.6 CLINICAL PATHOLOGY

Hemoconcentration, azotemia and metabolic acidosis are frequent findings. Peritoneal fluid may have increased protein and leukocyte concentration (Latson. et al., 2005)

2.1.7 TREATMENT

Depending on severity of the disease treatment can either be medical or surgical; however, owners and veterinary surgeons have to make informed decisions about the most appropriate treatment for individual cases (Mair 2002; Proudman *et al.* 2002a).

Medical treatment aims to:

- Relieve pain by sedation or analgesia
- Normalize intestinal function by administration of fecal softeners or lubricants
- Restore or support cardiovascular function through correction of fluid, acid-base and electrolyte abnormalities by fluid therapy
- Prevent further ischemic injury as in cases of thrombo-embolic infarction colic by use of drugs with activity against migrating larvae.
- Treat infection and endotoxemia by use of broad spectrum antimicrobial drugs.

Surgery is indicated for conditions not amenable to medical treatment, however, Pre-operative treatment for control of infection, shock, pain and fluid imbalance should be done to stabilize the patient (David ., 2013). Nasogastric intubation should be used to maintain decompression of the stomach during surgery. Anti-tetanus toxoid should be administered post-operatively.

CHAPTER 3: MATERIALS AND METHODS

This was a retrospective study from data recorded by KENDAT over 5 year period for all cases treated in Limuru and Lari Sub Counties.

3.1 Data collection

Clinical records for donkeys treated in Limuru and Lari over a period of five years (2009-2013) that were available at KENDAT-HP Mt Kenya West region, were used in this study. The records from the two sub counties were entered in Microsoft excel and analyzed. The records were used to determine the number of donkeys treated for colic, the ages of the affected donkeys and the total number of donkeys treated. The records were used to calculate the incidence per year and the most affected age of donkeys by colic in Limuru and Lari over the five year period.

3.1.1 Calculation of incidence of colic

The incidence of colic was calculated as a percentage of the number of donkeys suffering from colic out of the population of donkeys at risk. Incidence was calculated for each sub county for every year. All the data was then pooled to determine the incidence of colic in the two sub counties for every year. The donkey population is as reported in National livestock census report 2009 and during calculations, donkey population was considered to be constant throughout the five year period.

3.1.2 Determination of age predisposition of colic

The most affected age of donkeys by colic was determined by tallying the ages of donkeys affected by colic that were reported to KENDAT.

3.2 Statistical data analysis

The data were analyzed statistically using repeated measures of analysis of variance (ANOVA), to test for the significant differences in the sub-county and each year incidences.

CHAPTER 4: RESULTS

4.1. Incidence of colic in donkeys in the period 2009-2013

Over the period of 5 years, a total of 1,387 cases were treated in the two Sub Counties in a donkey population of 4,910. Out of these, 69 (1.41%) were treated for colic. Limuru Sub County had the highest incidence (1.46%) of treated colic cases. Out of 823 cases, 46 were treated for colic in a population of 3,150 donkeys. Lari Sub County had incidence of 1.30% of treated colic cases. Out of 564 cases, 23 were colic cases in a population of 1,760 donkeys. The overall mean Sub County incidences were significantly different ($p= 0.05$)

This information is summarized in Table 1, which shows the number of cases treated in Limuru and Lari Sub Counties during the period 2009-2013, the number of colic cases treated, the calculated incidence of colic and the donkey population. For ease of overview, calculated overall percentage incidence of colic in the two sub counties is summarized in Figure 1.

The annual and overall mean sub-county incidence of colic in each sub-county and the mean incidence for the two sub-counties for each of the years 2009 to 2013 are shown in Table 2. In Appendix 1, data on the number of cases treated in each of the five years, number of cases treated for colic, donkey population and the calculated incidence of colic are shown. The trend in the incidence of colic over the 5 years period in the two subcounties mirrored the overall observations in Table 1 and Figure 1

Table 3 shows the total number of cases attended to during each of the 5 years (2009-2013), the number treated for colic, number of donkeys at risk and the calculated percentage incidence of colic. A graphical presentation is done on Figure 2. The calculated incidence of colic in the two Sub-counties was 0.41% in 2009 and decreased to 0.29% in 2010. 2011 and 2012 had incidence of 0.26%, this was followed by a gradual decrease in incidence from 0.26% in 2012 to 0.18% in 2013. As observed in table 2, there was a decrease in the incidence of colic in the two Sub-counties between 2009 and 2013.

Table1. Total number of cases treated in Limuru and Lari Sub counties during the period 2009-2013, the number treated for colic and the calculated overall percentage incidence of colic.

SUBCOUNTY	NUMBER OF COLIC CASES	TOTAL NUMBER OF CASES ATTENDED	NUMBER OF DONKEYS AT RISK	INCIDENCE OF COLIC (%)
Limuru	46	823	3150	1.46
Lari	23	564	1760	1.30
Grand total	69	1387	4910	1.41

Table 2. The annual incidence of colic in Limuru and Lari and the average mean incidence for the year, during the period 2009-2013, based on treatment records.

YEARS (Incidence %)						
sub county	2009	2010	2011	2012	2013	mean incidence
Limuru	0.41	0.32	0.03	0.25	0.19	1.46
Lari	0.40	0.23	0.23	0.28	0.17	1.30
Average	0.41	0.29	0.26	0.26	0.18	1.41

Table 3. The number of cases attended by KENDAT during the period 2009-2013, the number of cases treated for colic, number of donkeys at risk and the calculated percentage incidence

YEAR	NUMBER OF COLIC CASES	TOTAL NUMBER OF CASES ATTENDED	DONKEY POPULATION	INCIDENCE (%)
2009	20	647	4910	0.41
2010	14	218	4910	0.29
2011	13	281	4910	0.26
2012	13	172	4910	0.26
2013	9	69	4910	0.18
TOTAL	69	1387	4910	1.41

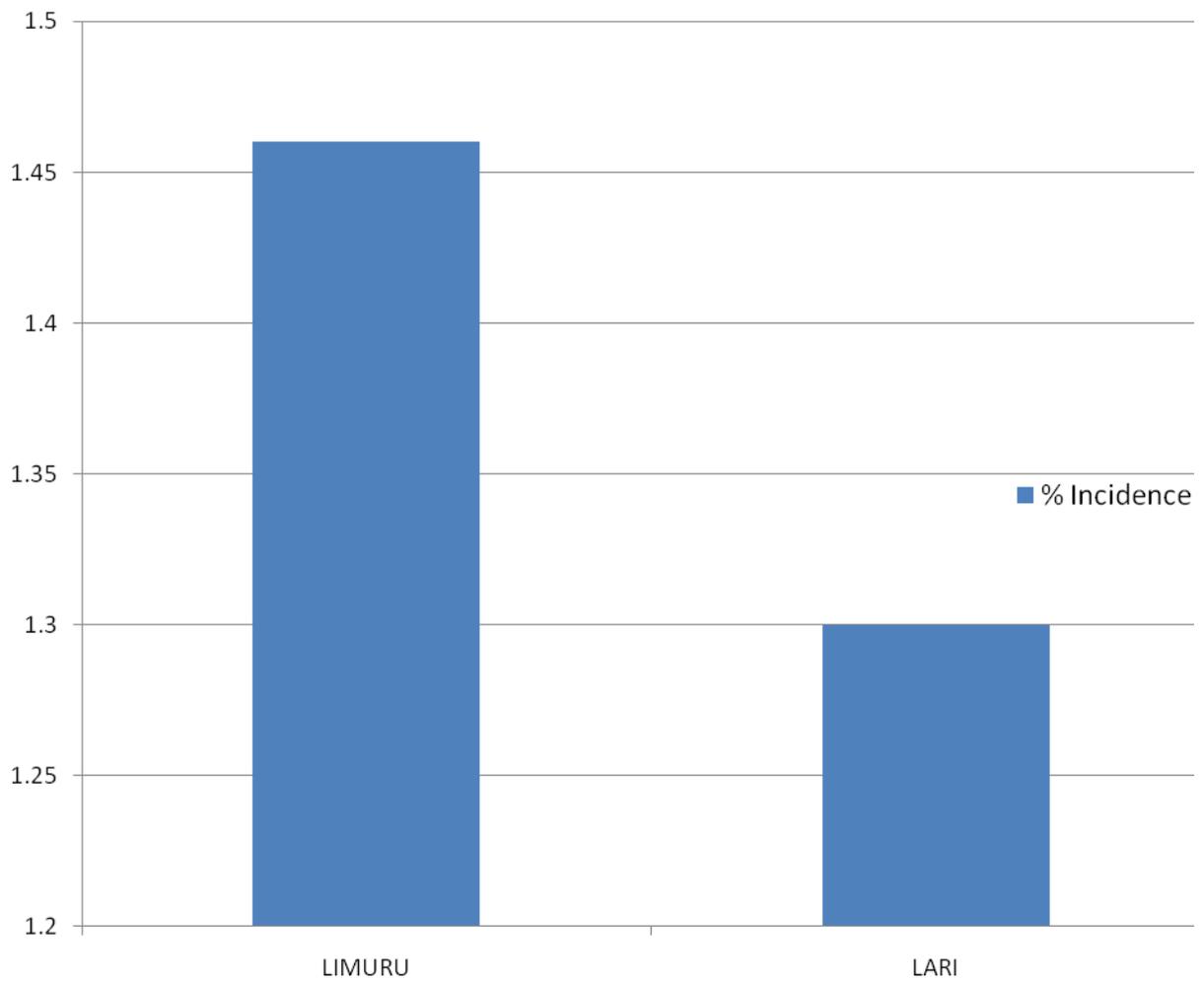


Figure1. Incidence of colic in Limuru and Lari sub counties during the period 2009-2013 based on treatment records.

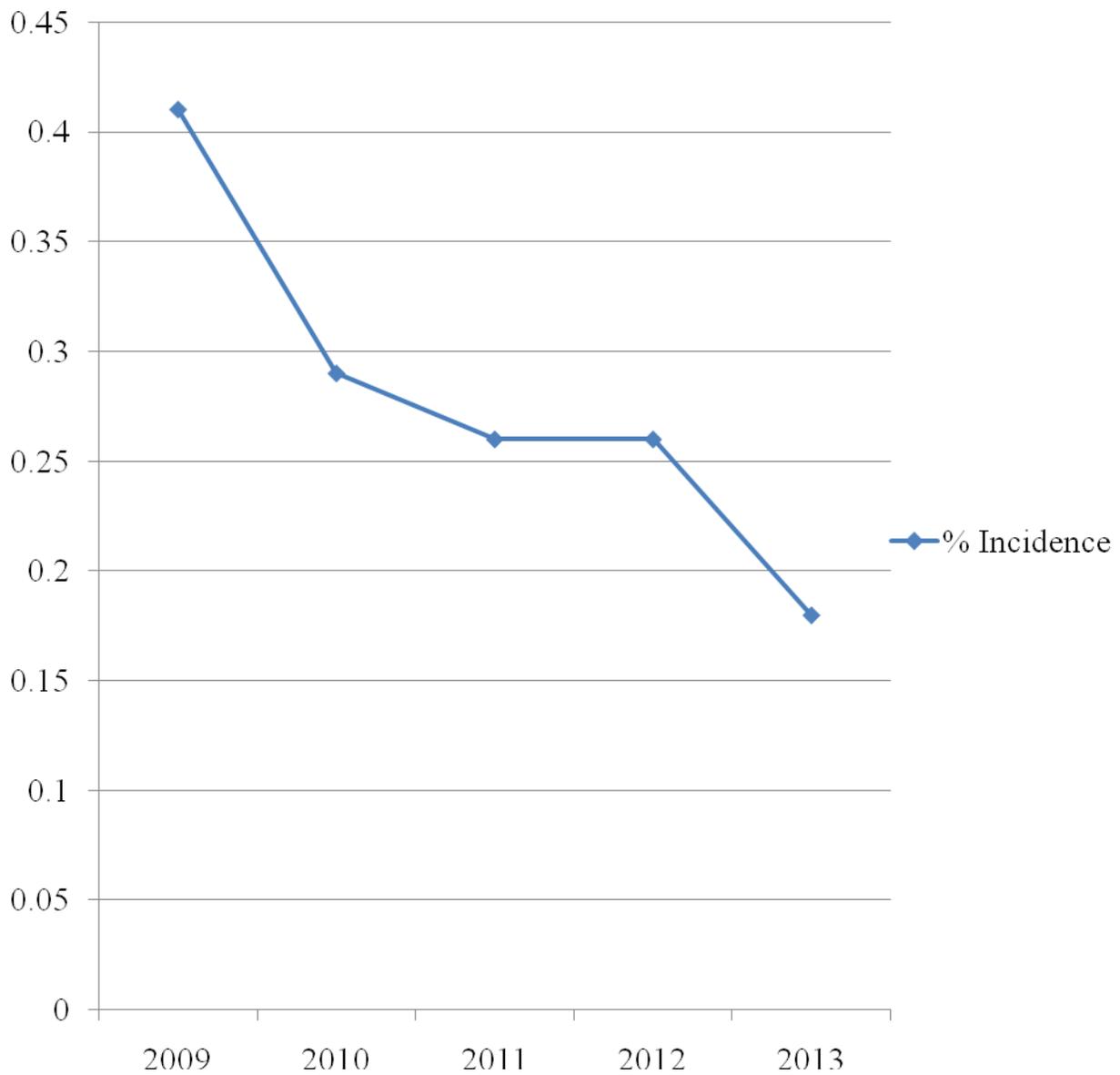


Figure 2. Trends in the incidence of colic in the two Sub-counties over the period 2009-2013 based on KENDAT treatment records.

4.2. Colic cases in donkeys by age.

Over the period of 5 years 69 cases were treated for colic, 46 cases in Limuru and 23 cases in Lari. Out of the 69 cases, 11-15 years age group had the highest number of cases (35), this was followed by 6-10 years age group with 17 colic cases, 16-20 years age group didn't have any colic cases. Out of the 46 cases in Limuru, 11-15 years age group had the highest number of cases (21), followed by 6-10 years age group with 14 colic cases, 16-20 years age group had no colic case. Also in Lari out of 23 cases, 11-15 years age group had the highest number of cases (14) followed by 0-5 years age group with 4 cases, 16-20 years age group didn't have any case.

This information is summarized in Table 4, which shows the number of colic cases treated in Limuru and Lari Sub Counties per age group during the period 2009-2013 and the total number of colic cases treated in the two sub-counties per age group. For ease of overview, a graphical presentation of the cases per age group per sub-county is summarized in Figure 3.

Total number of colic cases for the two sub-counties for each of the years 2009 to 2013 are shown in Table 5. For ease of overview, a presentation of total number of colic cases per age group for each year is summarized in Figure 4. In Appendix 2, data on the number of colic cases treated in each of the five years per sub-county and the age group with most cases treated for colic are shown.

Table 4. The number of colic cases treated in Limuru and Lari Sub Counties per age group during the period 2009-2013 and the total number of colic cases treated in the two sub-counties per age group.

AGE GROUP (YRS)	LIMURU	LARI	TOTAL
0-5	8	4	12
6-10	14	3	17
11-15	21	14	35
16-20	0	0	0
>20	3	2	5

Table 5. Total number of colic cases for the two sub-counties for each of the years 2009 to 2013.

AGE GROUP (YEARS)	2009	2010	2011	2012	2013
0-5	2	1	4	4	2
6-10	4	3	2	2	5
11-15	12	9	7	6	1
16-20	0	0	0	0	0
>20	2	0	0	1	2

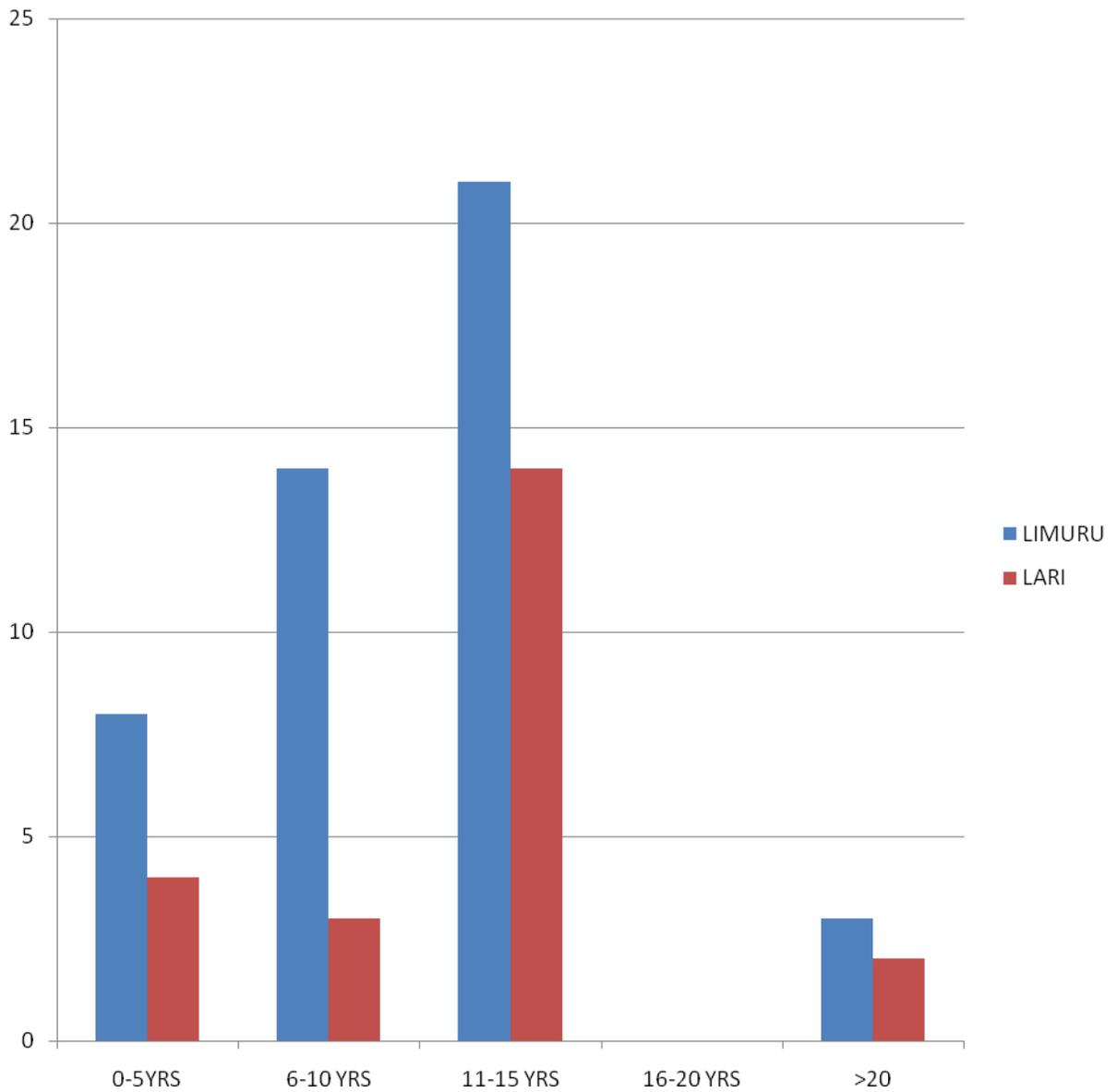


Figure 3. Number of cases treated for colic for Limuru and Lari sub-county per year based on KENDAT treatment records.

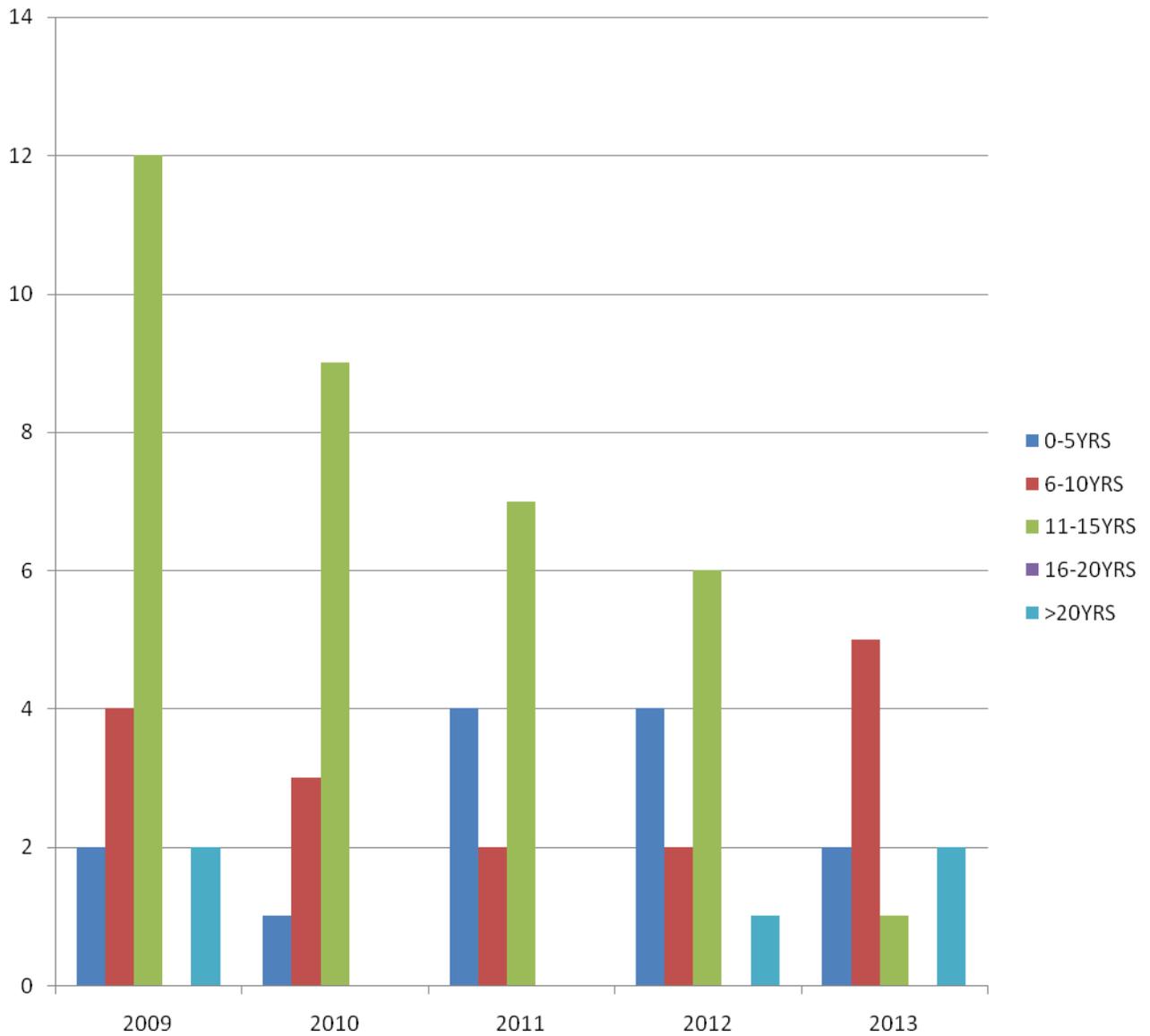


Figure 4. Total number of colic cases per age group for each year between 2009 and 2013 based on KENDAT treatment records.

CHAPTER 5 DISCUSSION, CONCLUSION AND RECOMMENDATION

5.1 DISCUSSION

Colic is one of the common gastrointestinal conditions in equines throughout the world and also one of the most difficult diseases to study with epidemiologic methods due to the large number of diseases, which create the signs of colic. The current study sought to investigate, using retrospective treated case records, the incidence and the most affected age of donkeys by colic. The results from the case records helped to determine the incidence in the two sub counties and the age predisposition of donkeys to colic.

The incidence of colic observed in this study in the two sub counties is consistent with other studies. (Tinker *et al.*, 1997a and Kaneene *et al.*, 1997). In this study, Limuru Sub County had the highest incidence of colic in donkeys. Limuru recorded high incidence possibly because the largest numbers of donkeys are within the township and due to poor management they scavenge from waste pits and are likely to have colic. Also donkey owners around the township had an easy access to KENDAT thus reported cases more often. In Lari, the incidence and the number of cases reported could have been lower due to poor access to veterinary services (KENDAT) and most probably, only emergency cases are reported with most of the cases being not reported. Poor husbandry is also an issue.

In both sub-counties, possibly donkeys work all day with little time for grazing and in most cases they are not provided with water and little veterinary care is offered. Due to the poor feeding and poor management including deworming, donkeys get a large worm burden which predispose to verminous colic (Proudman and Holdstock 2000) and feed on paper bags in waste pits which create enteroliths that cause impaction colic (Cohen *et al.*,2000; Hassel *et al.*,2001; Hassel *et al.*, 2004) . Also failure to give water predispose to colic (Hillyer *et al.*,2002; Cohen *et al.*,1999; Reeves *et al.*,1996)

The trend in the incidence of colic gradually decreases per year from 2009 to 2013 with 2009 having the highest incidence. This can be attributed to increased sensitization of donkey owners on animal welfare and need to seek veterinary services for sick donkeys by KENDAT through trainings and the media. Another explanation is that KENDAT empowered local animal health practitioners through trainings and with time they warmed up to treating donkeys and KENDAT

only handled emergency cases most of which were colic cases. The incidence rate recorded in this study could partly be due to the source of data used as most of cases were handled by local animal health practitioners with KENDAT handling few cases and possibly most of the cases are not reported.

Over the period 2009-2013, 11-15 years age group recorded highest number of cases. As stated in other similar studies, Middle aged equines are at higher risk of colic than older horses (White 2006). The observation in this study can be attributed to most donkey owners preferring to keep and also use donkeys >5years and <20years. Another explanation is that probably, there is poor dental care leading to overgrown teeth which is observed in a bit older donkeys and thus colic observed in such donkeys is due to poor feed mastication (Hillyer et al., 2002).

Over the period 2009-2012, 11-15years age group had the highest number of cases but in 2013, 6-10 years age group had the highest number of cases. This can be attributed to improvement in donkey husbandry and management practices due to continued training of donkey owners by KENDAT and farmers probably preferring middle aged donkeys.

5.2 CONCLUSION

1. Colic is present in donkeys in Limuru and Lari Sub Counties. During the 5 year period covered by the study, Limuru had the highest incidence probably due to large number of donkeys in the region and easy access to vet services.
2. Over the period of study, 2009 had the highest prevalence probably due to poor donkey husbandry and management practices.
3. During the 5 year period, 11-15 years age group had the highest number of colic cases probably due to poor management practices and most people keep donkeys between ages 5-20 years.
4. The incidence rate of colic of 1.41 % in most of working donkeys is high. There is need for attention of establishing a programme for instituting appropriate control measures to prevent loss of draught power, given that most donkey owners keeping donkeys under such management do not have any knowledge on colic and thus no control measures in place.

5.3 RECOMMENDATION

Considering the incidence observed in this study, there is urgent need to train donkey owners on management practices that will prevent colic from occurring which may include;

- Making sure donkeys have a constant source of fresh water,
- Ensuring that forage makes up at least 60% or more of the diet, and that concentrates (soluble carbohydrates) are fed at the minimal level required to maintain weight and performance.
- Regular parasite control
- Regular dental care.
- More donkey owners need to be sensitized on the need to seek veterinary care for sick donkeys and also sensitize them against traditional myths surrounding donkey health and the need to treat them.

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APPENDICES

Appendix 1. The total number of cases treated, number of cases treated for colic, donkey populations and the calculated incidence of colic for Limuru and Lari Sub Counties per year in the period 2009-2013.

	2009				2010				2011				2012				2013			
	C	TC	P	%	C	TC	P	%												
LIMURU	13	368	P1	0.41	10	142	P1	0.32	9	166	P1	0.03	8	99	P1	0.25	6	48	P1	0.19
LARI	7	279	P2	0.40	4	76	P2	0.23	4	115	P2	0.23	5	73	P2	0.28	3	21	P2	0.17
TOTAL	20	647	PT	0.41	14	218	PT	0.29	13	281	PT	0.26	13	172	PT	0.26	9	69	PT	0.18

KEY

C: Number of colic cases

TC: Total number of cases

P: Number of donkeys at risk

P1: 3150

P2: 1760

PT: 4910

?: Incidence of colic

Appendix 2. The number of colic cases treated per year per age group in each sub-county and the age group with most cases treated for colic as recorded in KENDAT case records.

	2009		2010		2011		2012		2013	
	LIMURU	LARI	LIMURU	LARI	LIMURU	LARI	LIMURU	LARI	LIMURU	LARI
0-5 YRS	2	0	0	1	3	1	2	2	1	1
6-10 YRS	3	1	3	0	2	0	2	0	3	2
11-15 YRS	7	5	6	3	4	3	3	3	1	0
16-20 YRS	0	0	0	0	0	0	0	0	0	0
>20 YRS	1	1	0	0	0	0	1	0	1	1
MODE	10-15 yrs	5-10 yrs	5-10 yrs							