STUDY OF GASTROINTESTINAL PARASITES OF DOMESTICATED DUCK (*Anas platyrhynchos* Linnaeus, 1758) IN CHANDRAGIRI MUNICIPALITY, KATHMANDU, NEPAL

Dipesh Shrestha
T.U. Registration No. : 5-2-37-759-2008
T.U. Examination Roll No. : 21685
Batch : 2068/069

A thesis submitted in partial fulfilment of the requirements for the award of the degree of Master of Science in Zoology with special paper Parasitology

Submitted to
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Tribhuvan University
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TRIBHUVAN UNIVERSITY ☎ 01-4331896
CENTRAL DEPARTMENT OF ZOOLOGY
Kirtipur, Kathmandu, Nepal.

Ref.No.:

DECLARATION

I hereby declare that the work presented in this thesis has been done by myself, and has not been submitted elsewhere for the award of any degree. All sources of information have been specifically acknowledged by reference to the author(s) or institution(s).

Date:……. **.....**

Dipesh Shrestha
T.U. Registration No. : 5-2-37-759-2008
T.U. Examination Roll No. : 21685
Batch : 2068/069

TRIBHUVAN UNIVERSITY ☎ 01-4331896
CENTRAL DEPARTMENT OF ZOOLOGY
Kirtipur, Kathmandu, Nepal.

Ref.No.:

RECOMMENDATION

This is to recommend that the thesis entitled **" Study of gastrointestinal parasites of domesticated duck (*Anas Platyrhynchos* Linnaeus, 1758*)* in Chandragiri municipality, Kathmandu, Nepal"** has been carried out by Dipesh shrestha for the partial fulfilment of Master's Degree of Science in Zoology with special paper parasitology. This is his original work and has been carried out under my supervision. To the best of my knowledge, this thesis work has not been submitted for any other degree in any institutions.

Date: …….. **……**

Supervisor
Janak Raj Subedi
Lecturer
Central Department of Zoology
Tribhuvan University
Kirtipur, Kathmandu, Nepal

TRIBHUVAN UNIVERSITY ☎ 01-4331896
CENTRAL DEPARTMENT OF ZOOLOGY
Kirtipur, Kathmandu, Nepal.

Ref.No.:

LETTER OF APPROVAL

On the recommendation of supervisor **"Mr. Janak Raj Subedi"** this thesis submitted by **Dipesh shrestha** entitled **" Study of gastrointestinal parasites of domesticated duck (*Anas Platyrhynchos* Linnaeus, 1758*)* in Chandragiri municipality, Kathmandu, Nepal"** is approved for the examination and submitted to the Tribhuvan University in partial fulfilment of the requirements for Master's Degree of Science in Zoology with special paper Parasitology.

Date: …….

…….
Prof. Dr. Ranjana Gupta
Head of Department
Central Department of Zoology
Tribhuvan University
Kirtipur, Kathmandu, Nepal

TRIBHUVAN UNIVERSITY ☎ 01-4331896
CENTRAL DEPARTMENT OF ZOOLOGY
Kirtipur, Kathmandu, Nepal.

Ref.No.:

CERTIFICATE OF ACCEPTANCE

This thesis work submitted by Dipesh shrestha entitled **" Study of gastrointestinal parasites of domesticated duck (*Anas Platyrhynchos* Linnaeus, 1758*)* in Chandragiri municipality, Kathmandu, Nepal"** has been approved as a partial fulfilment for the requirements of Master's Degree of Science in Zoology with special paper Parasitology.

EVALUATION COMMITTEE

…….

Supervisor
Janak Raj Subedi
Central Department of Zoology
Tribhuvan University
Kirtipur, Kathmandu, Nepal

……

Head of Department
Prof. Dr. Ranjana Gupta
Central Department of Zoology
Tribhuvan University
Kirtipur, Kathmandu, Nepal

……...

External Examiner

…….....

Internal Examiner

Date: …….

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Dipesh Shrestha
T.U. Registration No. : 5-2-37-759-2008
T.U. Examination Roll No. : 21685
Batch : 2068/069

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LIST OF ABBREVIATIONS

Abbreviated form	Details of abbreviations
am	ante meridiem
CPG	Cyst Per Gram
df	Degree Of Freedom
EPG	Egg Per Gram
et al.	And his associates
FAO	Food and Agriculture Organization
GI	Gastrointestinal
GIP	Gastrointestinal Parasite
GIT	Gastrointestinal Tract
gm	Gram
GNI	Gross national income
Km	Kilometre
Km^2	Kilometre Square
m	metre
m^2	meter square
mg	milligram
ml	millilitre
OPG	Oocyst Per Gram
OR	Odd Ratio
P value	Probability value
rpm	Rotation per minute
sp	Species
SPF	Specific Pathogen Free

TU	Tribhuvan University
USA	Unites State of America
US$	American dollar
viz.	Namely

ABSTRACT

Ducks (*Anas platyrhynchos* Linnaeus, 1758) are under order of Anseriformes (water fowl) of family Anatidae which contains 146 species and 43 genera. A cross-sectional study was conducted to determine prevalence and associated risk factors of gastrointestinal parasites of ducks reared in three different locations (Bishnu-Devi, Kanchan-Basti and Balambu) of Chandragiri Municipality from November to February, 2017 using opportunistic random method. A total of 120 ducks were sampled to assess and identify different genera of gastrointestinal parasites of ducks (40 samples from each three location). The collected faecal samples were examined by differentiation floatation technique and sedimentation techniques for isolation of parasitic eggs and/or oocysts. Among 120 samples collected from the field, 81.67% samples were found to be positive with one or more than one gastro-intestinal parasites. Among 120 samples the highest occurrence was 80% nematodes followed by 21.67% of protozoan and 10.83% cestodes. Among seven different genera of gastro-intestinal parasites one genera of protozoa, five genera of nematodes, one genera of cestodes were observed where *Ascaridia* sp. (21.67%) followed by *Capillaria* sp. 16.67%, *Hetarakis* sp. 15.00%, *Tetrameres* sp. 14.16% and *Strongyloides* sp. 12.50%. Only species of cestode was *Raillietina* sp. 10.83% and only genera of protozoa was *Eimeria* sp. 21.67%. The study also revealed that, out of 120 ducks examined, 20 (16.67%) and 78(65.00%) ducks were found to harbour mixed and single infections respectively. Statistical analysis indicated that location ($\chi 2 = 5.55$; $p<0.05$) were significantly and insignificantly associated with the infection of gastrointestinal tract parasites in the study area . This study revealed that duck's gastrointestinal tract parasites were the major biological constraints contributing to the low productivity of ducks and decreases the economic benefits obtained from the sector. Therefore, further detailed investigations are needed to formulate appropriate and cost effective strategies for the control of gastrointestinal parasites in duck farms in Chandragiri municipality.

1. INTRODUCTION

1.1 Background

Nepal is the independent, indivisible, sovereign, secular, inclusive, democratic, socialism oriented federal democratic republic state .Although economic activity rebounded strongly in Nepal with gross national income per capita of US$ 700. Where more than 36.1% is accounted by agriculture among which 3.5% is poultry of which 1.54% is from Duck husbandry (FAO, 2014). Nepal, where poultry trade is a mounting sector. Duck husbandry is lucrative business. Subtropical climate and geographical location made Nepal Eden for rearing of duck. Duck are easier and cheaper to keep than chicken and easily brooded. They are quite hardy, resistant to many avian diseases, can adjust with almost all type of environmental conditions, short brooding period, less mortality rate and helps to control harmful pests. Furthermore duck can be raised to produce more fish in pisciculture as duck manure provides nutrients supply to fish pond (FAO, 2014) and can be used in Integrated rice duck farming. Duck are commonly used for dual purpose i.e. meat and egg and mostly reared under traditional system . Other products of duck which can be sold includes feather, downs and flattened liver.

1.2 Introduction of Duck.

Ducks are under order of Anseriformes (water fowl) of family Anatidae which contains 146 species and 43 genera. They are adapted for living in water. The body is covered with oily feather which repel water. They have webbed feet with short digits act as paddle to locomote in water, digits end in nail. they have long broad beak which helps to filter and catch prey in water. Common breeds of ducks can be classified as Egg type(e.g. khaki Campbell, Indian runner) ,Meat type (e.g. White Peking, Muscovy, Aylesbury) ,Ornamental type (e.g. Crested white). Duck farming started in Nepal since 1970, duck meat is alternative of chicken. Improved strains of duck have been introduced into the country and their production commercially . Tracing back history of improved duck farming, Peking duck were introduced as a gift from the government of Hungary in Nepal in 1970 (FAO, 1979). NG Chow duck was given by New Zealand freedom from hunger campaign action for development committee through the FAO regional office of Bangkok in April 1975 (FAO, 2014).

1.3 Parasites in ducks

Parasites are living organisms which receive nourishment and shelter from other organism where they live. Intestinal parasites are endo-parasite that attach in the Intestinal wall desire nutrition from the food in the Lumen and the intestinal wall in the process of which they harm the host. Most of the parasites follow a specific route in different part of the body before they are established in the intestine by which they cause variety of disorders. The intestinal parasites are generally are protozoan and helminths. Helminths parasites are of Nematodes (round worm), Cestodes (Segmented worm) and Trematodes (flatworm).

In traditional system disease prophylaxis is rare so there is high rate of infection of parasites where ducks can't be left untouched. Although it is known that parasites constitute a health problem in poultry, there are only a few reports on the prevalence and significance of endoparasites , ectoparasites and haemoparasites in the different poultry production systems. Ducks are also affected by many endoparasites, ectoparsites and haemoparasites. The common ecto-parasites infecting ducks in skin are *Argas persicus, Dermanyssus gallinae, Ornithonyssus* spp. and *Echidnophaga gallinacea.* Haemo- parasites infecting ducks are *Leucocytozoon* spp., *Haemoproteus* spp. and *Aegyptinella* spp. In many tropical areas traditional poultry production is often described as a low input/low output system, where poultry flocks of 10-20 animals are left scavenging around the house during daytime. Here they obtain what feed they can get from the environment such as insects and seeds. In addition they may be given leftovers from the kitchen and other types of offal so they have high chance of infection of endo- parasites in different parts of body, more commonly proventriculus, gizzard, small intestine, cloaca and caeca. The common described endo-parasites of class coccidia, nematoda, cestoda and trematoda infecting ducks are *Tetramere* spp. in proventriculus, *Amidostomum anseris* in gizzard, *Ascaridia galli*, *Ascaridia* spp., *Hymenolepis* spp. and *Eimeria* spp. in small intestine, *Heterakis* spp. and *Allpdapa suctoria* in caeca and *Prosthogonimus* spp. and *Echinostoma revolutum* in cloaca (FAO, 1998).

1.4 Rationale of the study

Duck meat industry is quite small in comparison to chicken meat production in Nepal but it can be global demand. Duck are kept in traditional, rural scavenging system in Nepal. Almost all of duck suffer from parasitic diseases(Farjan *et al.,* 2008).Ducks acts as the final and intermediate host for protozoon and helminths parasites. The parasite have serious effects on the health of ducks as result in great economic loss due to loss in body weight and reduction in egg production . Ducks are continuous contact with cultivated lands, irrigation canals where they are frequent contact with suitable intermediate hosts of parasites like fry, earthworm, snail but no any record has been found in study of parasitic infection in duck in local level in Nepal. So, This research may help and provides guideline for further research and helps in control of parasitic infection of duck which will increase in profit in duck husbandry and also which will add up to increase GNI of Nepal as Duck husbandry is mounting sector at present context.

1.5 Objectives

1.5.1 General objective

- To find-out overall prevalence of gastro-intestinal parasites in ducks of three locations of Chandragiri Municipality.
-

1.5.2 Specific objectives

- To identify the gastro-intestinal parasites of duck by morphological characters. off eggs.
- To determine the rate of prevalence of gastro-intestinal parasites of ducks in three locations of Chandragiri Municipality

1.6. *Limitation of the study*

This study was carried out to determine the prevalence of helminths parasites of duck but the study didn't reveal why some parasites were more predominant and others were not. . Due to the lack of well-equipped laboratory, the identification of parasites was done up to general level only. This study is limited to certain parameters and some of the parts of the study were left untouched due to time and cost factors so that future researchers can elaborate this study by approaching the untouched portion.

2. LITERATURE REVIEW

Sub tropical climate present in Nepal which is suitable for duck husbandry also favours the growth, multiplication , development, survivable and spread of various parasite. System of management, nutritional status, ecology of the parasites and their host parasite relationship exert significant effects on the occurrence of helminths infection in duck. In fact, ducks are affected by different types of helminths (Anisuzzaman *et al*., 2005) but very little attention has been paid to study the epidemiologic and pathologic aspects of helminths infection of ducks in Nepal.

The most commonly mentioned parasites are *Emeria* sp., *Ascaridia galli* and *Heterakis gallinarum* which is mainly due to the fact that many studies are carried out in this parasite (Ahmed, 1969). Kinsella and Forrester (1972) examined 78 Florida ducks (*Anas platyrhynchos fulvigula*) where they found total 34 species of helminths among which 12 species of trematodes where *Apatemon gracilis* was highest 62.82%, seven species of cestodes where *Cloacotaenia megalops* was highest 48.72%, 14 species of nematodes where *Epomidiostomum uncinatum* and *Capillaria* sp. were highest 60.26% and one species of acanthocephalan that is *Corynosoma* sp. 0.256%. Seasonal peaks in the incidence of some trematodes and cestodes appeared to be correlated with rainfall and the food habits of the host. *Porrocaecum crassum* is recorded for the first time from North America and *Strongyloides* spp. is reported for the second time from wild ducks. Two species of blood flukes were found. *Trichobilharzia* sp. was found most often in *Psilochasmus oxyurus* and *Levinseniella* sp. are trematodes associated with brackish water marshes.

The nematodes can complete their life cycle without intermediate hosts (Soulsby, 1982) so it leads to a high infection rate of nematodes in Poultry (Sandhu *et al.*, 2009). Farias and Canaris (1986) examined gastrointestinal tracts of 129 Mexican ducks from Mexico and the United States where they found 25 species of helminths which are *Echinoparyphium recurvatum, Echinostoma revolution, Hypoderaeum conoideum, Hymenolepis* sp, *Notocotylus attenuatus, Prosthogonimus cuneatus, Zygocotyle lunata, Anomotaenia ciliata, Cloacotaenia megalops, Diorchis bulbodes, Drepanidotaenia lanceolata, Diorchis* sp., *Echinocotyle rosseteri, Fimbriaria fasciolaris, Corynosoma constrictum, Sobolevicanthus gracilis, Polymorphus minutus, Amidostomum acutum, Echinuria* sp., *Epomidiostomum crami, Hystrichis varispinosus, Tetrameres* sp., *Fimbriarioides* sp. and *Rusguniella arctica* occurred predominantly in ducks from south-central Chihuahua, Mexico.

Parasitism is one of the major problems that affect the productivity and performance of animals (Mohammed, 2009). Parasitic disease either lowers the working efficiency or even may result in death of animal or sometimes is potential danger for public health. Borgsteede *et al*.(2005) examined 25 eider duck (*Somateria mollissima*) which are found dead and are collected in time between 1976-1991on the cost of North sea and Wadden sea of Netherland. The specimen were brought and their gastrointestinal tract was examined under a stereomicroscope (× 10) Where they found *Amidostomum acutum* 100% , *Paractiaria formosensis* 28.6% and *Streptocara crassicauda* 14.3 % in gizzard, *Tetrameres fissispina* 20% in proventriculus, *Catatropis verrucosa* 61.5% in ceccum and *Capillaria nyrocinarum* 76.9%, *gymnophallid* and *microphallid digeneans* 100%, *Psilotrema simillimum* 100%, *Cryptocotyle concavum* 100%, cestodes (*Hymenolepididae*) 76.9 % and *Profilicollis botulus* 76.9 % in intestine.

The pathogenic effects of gastrointestinal parasites may be sub-clinical or clinical. Young animals are most susceptible. The effect of these parasites is mainly dependent on the number of parasites and nutritional status of the animal they are infecting. The clinical symptoms are weight loss, reduced food intake, diarrhoea and reduced yield. Severe blood and protein loss intro abomasums and intestine due to damage caused by the parasite often results in edema in the sub-mandible region. Some nematode species especially *Haemonchus* spp. is most pathogenic among blood sucking worms and infection with large number of this parasite often results in severe anaemia in the host. Muhairwa *et al.* (2007) examined gastrointestinal tracts of 192 free-ranging ducks (96 ducklings and 96 adult ducks) for the presence parasites in Morogoro Municipality, Tanzania. Where they found 52% infection of which five subfamilies represented one cestodes and four nematodes, whereas no trematodes were found in the study. The average number of helminths per duck was 11, ranging from one to 55 helminths per duck. A total of 14 different helminths species were identified. The identified species were: *Ascaridia columba* (0.5%), *Ascaridia dissimilis* (0.5%) *Ascaridia galli* (23.4%), *Capillaria anatis* (0.5%) , *Capillaria annulata* (3.1%), *Capillaria contorta* (7.3%), *Heterakis dispar* (0.5%), *Heterakis gallinarum* (14.1%), *Heterakis isolanche* (2.6%), *Raillietina echinobothridia* (0.5%), *Raillietina tetragona* (10.4%), *Subulura brumpti* (6.3%), *Subulura strongyilina* (0.5%) and *Subulura sucturia* (0.5%). Prevalence of gastrointestinal worms was statistically significant higher ($P<0.05$) in ducklings than in the adult ducks.

Since helminths parasites are the causative agent of a terrible and list of deliberating, deforming and killing disease of water fowl, the studies in these regards are very important from epidemiological point of view. Some helminths infection, particularly due to intestinal parasites, is one of the major causes of gross health problem in domesticated animals. Farjana *et al.* (2008) examined 300 domestic ducks *(Anas boschas domesticus)* from March 2002 to May 2003 from different villages of Netrokona and Mymensingh districts of Bangladesh investigate the population density of helminths parasites in relation to host's age, sex, breed and seasons. Off 300 ducks examined, 290 (96.66%) were infected with 17 species of helminths parasites in which 11 species were trematodes, four were cestodes and two nematodes. Among the parasites, density of cestodes was the highest (33.15±5.26), followed by trematodes (5.98±1.32); and nematodes (2.95±0.68). Mean density of parasites increased with the increase of age (young: 21.23±1.09, adult: 26.18±2.14 and old: 27.87±2.98) while the mean density of most of the helminths parasites was higher in female ducks (31.35±4.72) than in males (27.52±3.32). Indigenous ducks (33.72±3.61) were infected with the highest

load of helminths than Khaki Campbell breed (29.61±4.32) of ducks. Mean density of most trematodes (5.42±0.80) were highest in winter season whereas mean density of all cestodes (48.43±4.85) and nematodes (4.13±1.76) were highest in summer

Infection of domestic animals with intestinal parasites cause significant loss estimated at over US$ 2000 million per year to the agriculture sector worldwide with over 600 million animals affected . Yousuf *et al.* (2009) examined 206 ducks by routine post-mortem examinations from July 2007 to June 2008 in Bangladesh. Of the ducks examined, 167 (81.1 %) were infected by one/more species of gastro-intestinal helminths. Single double and mixed infections were found in 78 (46.7%), 46 (27.5%) and 43 (25.8%) ducks, respectively. Prevalence of gastrointestinal helminths was significantly ($P<0.05$) higher in female ducks (82.7 %) than male ducks (77.6%). Ducks above six month to one year of age were more affected (53.9%) than the ducks < 6 month (15.0%) and > 1 year of age (31.1%). Helminth infection was significantly ($P<0.05$) lower in rainy season (64.9%) in contrast to summer (75.7 %) and winter season (91.1 %).A total of ten species of helminth parasites were recovered from gastrointestinal tract, of which four species were trematodes namely: *Echinpstoma revolutum, Notocotylus attenuatus, Hypoderaeum conoideum* and *Echinoparyphim recurvatum;* two were nematodes, viz. *Amidostomum anseris, Capillaria contorta*; two were cestodes viz. *Hymenolepis coronula* and *Fimbriaria fasciolaris* and two species belonged to acanthocephala such as, *Arythmorhynchus anser* and *Filicollis anatis*

Daraji *et al.(*2009) tested three Mallard duck (*Anas platyrhynchos* L. 1758) by dissecting and found digenetic trematodes *Eucotyle* spp. and *Orchipedum jolliei* were encountered in the uterus and Trachea respectively for the first time in mallard duck of Iraq. The prevalence of *Eucotyle* spp. was 33.3% and of *Orchipedum jolliei was 66.6 %.*

Adejinmi and Oke (2011) collected 175 faecal samples between January and July 2008, from Domestic Ducks (*Anas platyrhynchos*) in Ibadan South western Nigeria in six different locations and examined using formol-ether concentration method and modified Ziehl Neelsen staining technique, sodium chloride floatation and zinc sulphate sedimentation methods out of which 167 (95.4%) were positive for Gastro-intestinal parasites. A total of five different helminths and three different protozoan parasites were identified. Among the helminths identified, *Ascaridia galli* 82 (46.8%) was the most frequently observed followed by *Heterakis gallinarum* 41 (23.4%), *Capillaria* sp. 38 (21.7%), *Echiurus unicinata* 20 (11.4%) and *Syngamus trachea* 13 (7.4%). For intestinal protozoa. *Eimeria* sp. 60 (34.3%) was the most frequently encountered followed by *Tyzzeria* spp. 29 (16.6%) and *Cryptosporidium* sp. 27 (15.4%). Mixed infections with two or more parasites were common. A total of 75 (42.9%) had single infection, 38 (21.7%) double infection and 54 (30.8%) triple infection.

AbouLaila *et al.* (2011) examined gastrointestinal tracts of 110 ducks of breed Native Sudanese, White Peckin, Campbell and Muscovy from Damanhur City of Egypt from 2001-2003. The prevalence of helminths was 4.54% from which the prevalence of nematodes,

cestodes, and trematodes infections was 2.72%, 3.63%, and 1.81%, respectively. They found nematodes *Heterakis gallinarum* (1.81%) and *Ascaridia galli* (0.9%), trematodes *Echinoparyphium recurvatum* (0.9%) and *Echinoparyphium paraulum* (1.81%), cestodes were *Cladogynia phoeniconaiadis* (3.63%), *Echinolepis carioca* (3.63%), and *Baerfainia anoplocephaloides* (3.63%). This study presented the first record of three new cestodes in ducks from Egypt.

Yoshino *et al.* (2011) examined gastrointestinal tract of 37 Aigamo ducks of four age group in Hokkaido where they found prevalence of 37.84% of five species of helminths viz. *Amidostomum acutum, Echinostoma revolutum, Aploparaksis* sp. and *Fimbriarua* sp. Among the above *A.acutum, Aploparaksis* spp. and *Hymenolepis* spp. are the first host record from Aigamo ducks in Japan

Musa *et al.* (2012) collected 20 domestic duck (*Anas platyrhynchas* Linnaeus, 1758*)* Dhaka city and were brought to Parasitology Laboratory, Zoology Department, University of Dhaka for examination of intensity of ectoparasite and endoparasite. Location wise more parasites were recorded in the small intestine (80% and intensity of 19± 16) than large intestine and caecum (10% and intensity of 16 ± 1). Sex wise all female ducks were found infected with helminths compared to 60% of drake. The intensity of infections was 24.4 ± 8 in female ducks and 15.33 ± 2 in male ducks. One species of trematodes i.e. *Echinostoma revolutum* (30%) and two species of cestodes i.e. *Cotugnia cuneata* (20%) and *Hymenolepis columbae* (40%).

Kavetska *et al.* (2012) examined 1,052 wild ducks of 17 species from 1999 -2010 in the coastal zone of North western Poland for nematodes of digestive tract. They found prevelence of 21 species from six families of nematodes in 813 (77.3%). Majority of nematodes were found in gizzard (n= 7,326) followed by oesophagus (n= 429), caeca (n= 336) and less in intestine where Jejunum (n= 46), ileum (n=18), colon (n=29) and cloaca (n= 3) of total number of 14,396 nematodes. The most frequent nematodes in examination was *Amidostomoides* (n=6,686) which was 49.4%.

Omolayo (2013), examined 20 ducks of which 10 blue winged teal and 10 ring neck duck for intestinal trematodes from lake Winninbigoshish, Minnesota in fall of 2012. A total of 1,605 trematodes worm were recovered (1,041 from blue winged and 564 from ring necked duck). Total eight species were found of which two species were not identified and six identified species were *Apatemon gracilis* (family strigeidae), *Cotylurus flabelliformis* (Family Strigeidae), *Diplostomum mergi* (Family Diplostomatidae), *Echinoparyphium aconiatum* (Family Echinostomatidae), *Psilotrema mediopora* (Family Psilostomatidae), and *Sphaeridiotrema pseudoglobulus* (Family Psilostomatidae).

Saijuntha *et al.* (2013) examined 90 free-grazing ducks from northern, central, and northeastern regions of Thailand for intestinal helminths parasites, with special emphasis on zoonotic *Echinostomes*. Of these, 51 (56.7%) were infected by one or more species of

zoonotic *Echinostomes*. *Echinostoma revolutum, Echinoparyphium recurvatum and Hypoderaeum conoideum. Echinostomes* found were identified using morphological criteria when possible. The prevalence of infection was relatively high in each region, namely, north, central, and northeast region was 63.2%, 54.5%, and 55.3%, respectively. The intensity of infection ranged up to 49 worms/infected duck.

Hoque *et al.* (2014) conducted survey of gastrointestinal parasitic infection in domestic and wild birds in Chittagong and Greater Sylhet, Bangladesh during April 2012 to February 2013. The overall prevalence of parasitic infection ranged among locations from 25 to 55% in indigenous domestic ducks (live bird samples=304), 20% in resident wild birds (environmental faecal samples=40) and 40% in migratory birds (live bird samples=35). The prevalence of parasitic infection was significantly higher in indigenous domestic ducks collected during summer (39%) than winter (22%) (p=0.04). In domestic indigenous ducks and Muscovy ducks, both single and multiple types of parasitic infections were found. However, other domestic birds and wild birds often had a single type of parasitic infection. *Ascaridia* spp. with an average egg load of 50-900, was commonly detected in faecal samples of domestic and wild birds in this study. Other identified parasites were *Capillaria* spp. and *Heterakis* spp. both in domestic and wild birds.

Tu *et al.* (2016) examined 620 fresh faecal sample of free-range poultry of Anhui province, faecal samples from chickens, ducks, gooses and pigeons for 228 days from June 2014 to October 2014 to evaluate the status of intestinal parasite infections by Saturated brine floating method of which 172 sample were of duck. Infection rate in free-range chickens, ducks, gooses and pigeons were 70.9%, 13.4%, 18.4%, and 80.0%, respectively. Among 172 sample of duck 23 samples (13.4%) were positive for parasites where Predominant parasites in duck was *Capillaria opisthorchis and Capillaria caudinflata.*The study found presence of coccidiain *Tetrameres perniciosa* 10.5 % in duck.

England *et al*. 2016) examined 130 female Lesser Scaup (*Aythya affinis),* North Americian diving duck for intestinal helminths from four different locations of Illinois and Wisconsin during the springs of 2014 and 2015. The found 100% positive infection rate and counted 647,174 helminths from 40 different taxa including 20 trematodes , 14 cestodes ,four nematodes and two Acanthocephalans. All Sample collected were infected with two to 23 helminth species.

Dao *et al.* (2016) examined liver and gall bladder of 178 ducks from 34 farms for *Opisthorchis viverrini* infection of four districts of Phu district of Binh Dinh Province, Central Vietnam. An infection rate of 34.3% (range 20.7 - 40.4% among districts) was found; the intensity of infection was 13.8 worms per infected duck (range 1-100).

Singh and Mohilal (2017) examined fresh faecal samples of total 515 domesticated bird 185 broiler (*Gallusgallus domesticus*), 130 layers (*Gallus* spp.), 75 free range local chicken (*Gallus domesticus*), 40 house pigeon (*Columba livia*), 70 ducks (*Anas platyrhynchos*) and 15 turkeys (*Melleagris gallopavo*) in valley districts of Manipur for intestinal protozoan and

helminths infections by direct microscopical wet smear method. A total of 10 species of intestinal parasites were encountered where the protozoan *Eimeria* and *Isospora* were the most common (68.3 %). The highest (90.8 %) prevalence of these parasitic infections was found in broiler followed by layer (78.5 %), duck (75.7 %), house pigeon (75 %), Turkey (66.7 %) and free range local chicken (65.3 %).

3. MATERIALS AND METHODS

3.1 Study Area

Chandragiri is a municipality in south-western corner of Kathmandu valley in the Central development region of Kathmandu District in the province number three of Nepal which is formed by merging eleven existing villages viz. Baad Bhanjyang, Balambu, Dahachok, Mahadevsthan, Machhegun, Matatirtha, Naikap Naya Bhanjyang, Naikap Purano Bhanjyang, Satungal , Thankot and Tinthana on 02 dec 2014. It is extended over 27^0 $41^{'}$ $25^{''}$ N latitude and 85^0 $13^{'}$ $13^{''}$ E longitude and time zone Nepal Time (UTC+5:45).

Present study is located in three different places including Bishnu-Devi, Kanchan-Basti and Balmbu of Chandragiri Muncipality. The capital city Kathmandu is approximately five to nine km away from study area. In the study area it was noticed that Duck were kept in traditional, rural scavenging system . Ducks were continuous contact with cultivated lands, irrigation canals where they are frequent contact with suitable intermediate hosts of parasites. This may results a various kinds of diseases to ducks by the parasites. So, this study is carried out for the prevalence rate of gastrointestinal parasites infection in ducks.

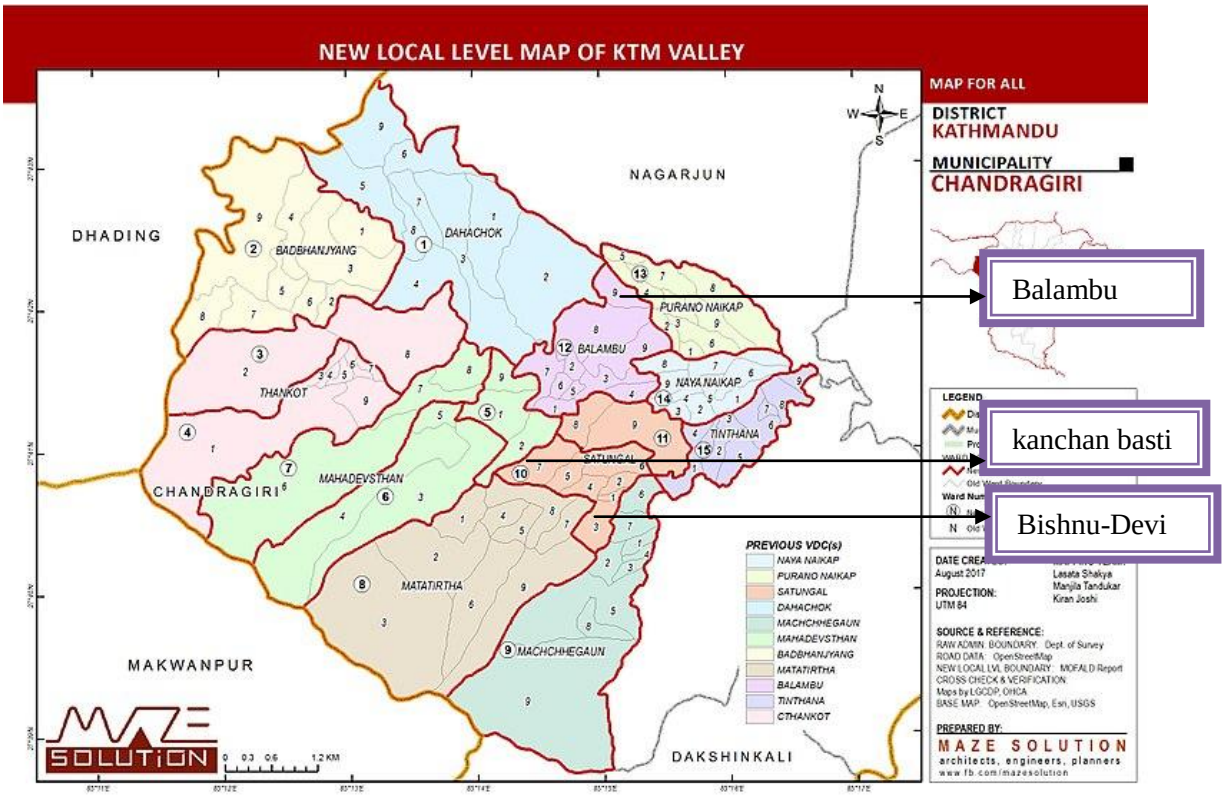


Figure 1: Map of Chandragiri Municipality showing study areas .

3.2 Materials used:

3.2.1 Materials for field:

- Plastic vials
- Medicate hand gloves
- Plastic spoon
- paper mask

3.2.2 Materials for laboratory:

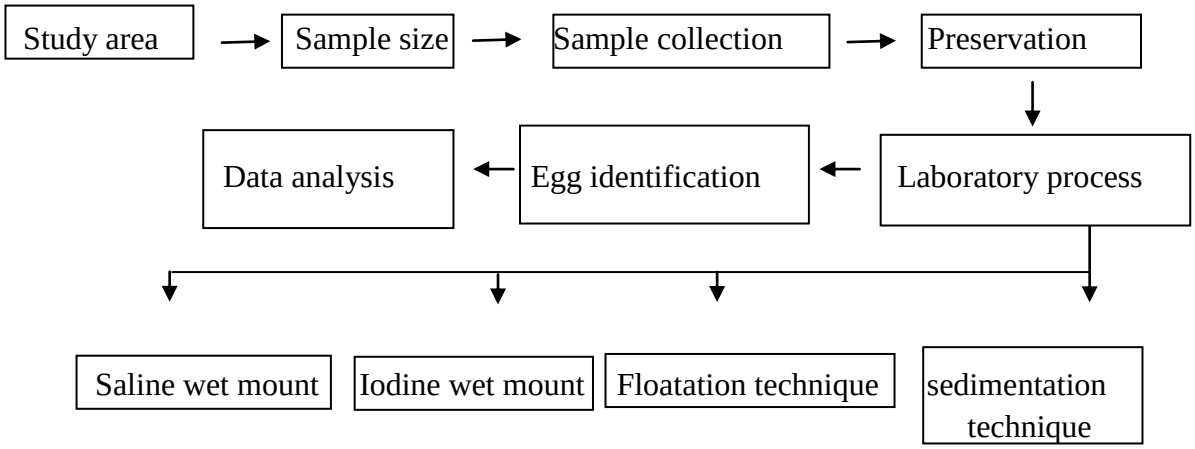
a) Electric microscope
b) Ocular micrometer
c) Stage micrometer
d) Volumetric flask
e) Centrifuge machine
f) Centrifuge tubes
g) Gloves
h) Beakers
i) Cover slips
j) Slides
k) Cotton
l) Tea strainer
m) Glass Cavity slide
n) Watch glass
o) Rack
p) Dropper
q) Tooth picks
r) Needle
s) Camera

3.2.3 Chemicals:

a) Ethyl alcohol(70%)
b) Iodine solution
c) Saturated NaCl solution
d) Methylene blue
e) Distilled water

3.3 Research design:

The present study was designed to assess the gastrointestinal parasitic infection in duck of Balambu, Bishnudevi and Kanchan basti of Chandragiri Municipality . The research comprises:



3.3.1 Study Period

The study was carried out from November to February 2017.

3.3.2 Precautions and Preservation

To ensure the better condition during the sample collection, the following mentioned precautions were taken.

- Only fresh samples were collected.
- The samples were collected in air-tight container to prevent desiccation.
- 70% ethyl alcohol was used to fix the samples.
- Sampling was done randomly

3.3.3 Sample and data collection methods:

The three different locations (Bishnu-devi , Kanchan-Basti , Balambu) which lies in the Chandragiri Muncipality is far from the urban areas of Kathmandu, Nepal. So, It is considered as the best place for agriculture and found raring different domestic animals including ducks, hen, pigs, cows etc for their betterment of economic conditions. During the collection of faecal samples in three locations, three days was given to each of them.. Fresh faecal samples were taken from individuals ducks at early mornings. About 10 gram faecal sample from each ducks was taken with help of disposable gloves n plastic spoon then transferred inside the clean vial. Necessary information were noted clearly , such as faecal samples collection data, location and number is allocated to sample. Data were collected by using direct field observation.

3.3.4 Preservation of faecal samples:

Collected faecal samples of ducks were preserved in 70% ethyl alcohol that help in maintaining morphology of protozoan parasites and preventing further development of helminths eggs and larva.

3.3.5 Sample size :

A total of 120 faecal samples of ducks were collected. Out of 120 samples 40 samples each were collected from Bishnu-Devi, Kanchan-Basti, Balambu

3.4 Laboratory examination:

The stool samples were collected and brought to laboratory of Central Department of Zoology, Kirtipur, Kathmandu in preservatives 70% ethyl alcohol. The stool samples are examined by differential floatation technique, sedimentation technique and direst smear microscopic observation method.

3.4.1 Concentration techniques:

Eggs/cysts were often low number in faeces that they were difficult to be detected in direct smear. Therefore faecal samples were examined using flotation and sedimentation techniques (Soulsby 1982, Zajac and Conboy, 2012).

3.4.1.1 Differential Flotation Technique:

In the floatation technique, the suspending fluid (Sodium Chloride or Zinc Sulphate) has higher specific gravity than parasitic forms which therefore rise to the surface. All the helminth's eggs float in such a solution except the following unfertilized eggs of *Ascaris*

lumbricoides, eggs of *Taenia solium* and *Taenia saginata* and also the eggs of intestinal fluke. The *Strongyloides* larvae do not float in salt solution.

About 3 gm. of faecal sample was taken. The sample was kept on porcelain basin and grinded about 42ml. of water was then added and again grinded and filtered. Filtrate of the faecal solution was mixed and about 15ml. of it was kept on plastic tube. The tube was centrifuged at 1000 rpm till 5 minutes. The tube was taken out the upper part of the water was removed with the help of pipette. The tube was filled with sodium chloride solution and centrifuged at 1000rpm for five minutes. More NaCl solution or Zinc sulphate solution was added up to the tip of the tube. One drop of Methylene Blue (to stained) was added. A cover slip was placed over the top of the tube. So that NaCl touches the cover slip for few minutes and then the cover slip was placed on a slide and examined at 10X and 40X. For this process eggs of Nematodes, Cestodes, and Coccidian can be detected for detection of long worm half saturated salt solution is used.

3.4.1.2 Sedimentation Technique:

The technique is used for the detection of trematodes eggs. It provided good results as the egg of trematodes is a bit heaver than the other eggs and deposited in the bottom. (Source: Veterinary lab techniques, 2003). 3 gm of stool sample was taken in a beaker,42 ml. of water was added and grinded highly with the help of motor and pestle. The sample was filtered with a tea strainer and filtered samples were poured in a plastic test tube. The tube was taken out and upper water was removed with the help of a pipette. NaCl solution was filled in the tube and again centrifuged at 1000 rpm for 5 minutes .A drop of deposited materials was taken out from the test tube with the pipette and placed on the slide, add drop of methylene blue into it and examined under the microscope at 10X and 40X.

3.5 Eggs, cysts and larva size measurement:

By using ocular and stage micrometer, the length (eggs, cysts and larvae) of parasites measured with calibration.

3.6 Eggs, cysts and larva size identification:

Cysts, eggs and larvae of parasites were identified on the basis of morphological characters (shape and size) by using books of (Soulsby 1982, Zajac and Conboy ,2012), other published and unpublished article and also from internet sources.

3.7 Data analysis:

For this study, prevalence was measured as the percentage of host individuals infected with a particular parasite (Margolis *et al.*, 1982, Bush *et al.*,1997). The collected data were coded and entered into Microsoft Excel spread sheet. Data were statistically analyzed using Pearson's Chi-square test with Yates' continuity correction, performed by "R", version 3.3.1 software packages. Percentage was used to calculate prevalence. Data were statistically analyzed using Chi-square. In all cases 95% confidence interval and $p<0.05$ was considered for statistically significant difference.

4.RESULTS

4.1. General prevalence rate

Among 120 samples collected from the field, 98 samples were found to be positive with one or more than one gastro-intestinal parasites. Hence Positive percentage was 81.67% .

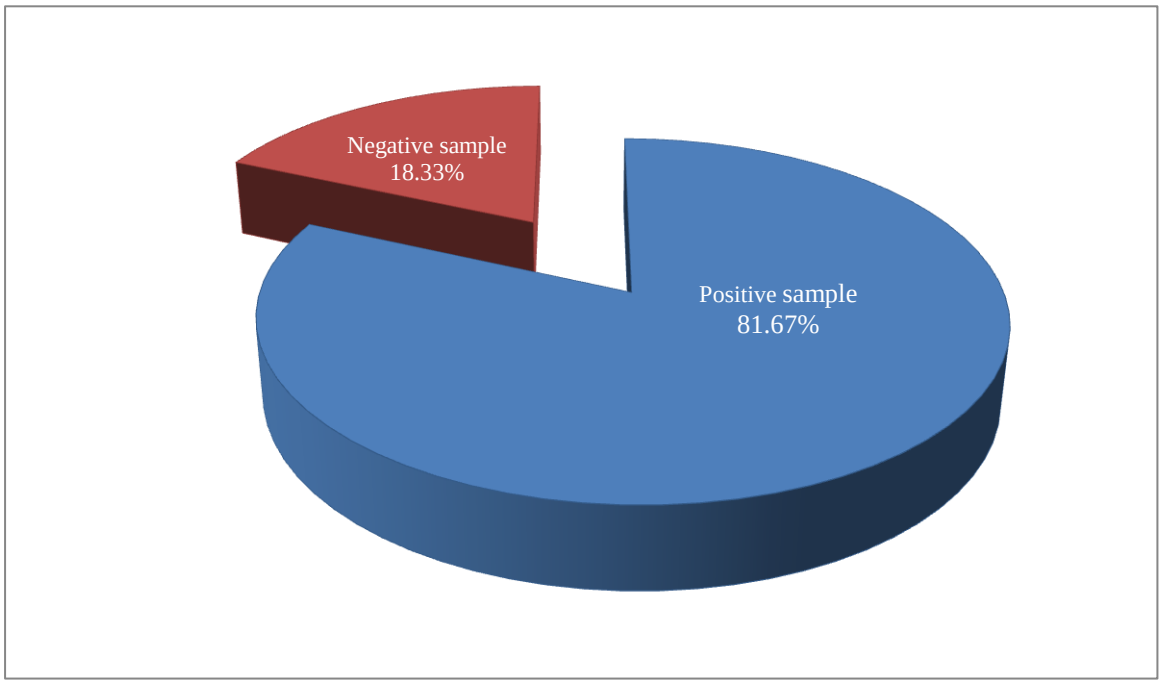


Figure 2. Overall prevalence of gastrointestinal parasites in duck

4.2 Class wise prevalence rate of parasite:

The gastrointestinal parasites infecting ducks are protozoan , nematodes, trematodes and cestodes. Among 120 samples, the highest occurrence were nematodes with 80.00% followed by 21.67% of Coccidia and 10.83% of cestodes**.**

Table 1. Class wise prevalence of gastrointestinal parasites in ducks

S.N	**Class**	Positive sample (n =120)	Prevalence (%)
1	Nematodes	96	80.00%
2	Coccidia	26	21.67%
3	Cestodes	13	10.83%

4.2.1 Protozoan parasites :

Protozoan are very common on ducks. Overall, ducks were found to be infected with only protozoan parasite belonging to the class coccidia . *Eimeria* sp. showed prevalence 21.67%. as given in Table 2.

Table 2: Overall protozoan parasites in ducks :

S.N	Class	Parasite Name	Positive sample (n =120)	Prevalence (%)
1.	Coccidia	*Eimeria* sp.	26	21.67%

4.2.2 Helminths parasites :

Ducks were found to be infected with helminths parasites belonging to two classes viz. cestodes and nematodes. Five genera of nematode and one genera of cestodes were found where *Ascaridia* sp. (21.67%) was the highest followed by *Capillaria* sp. 16.67%, *Hetarakis* sp. 15.00%, *Tetrameres* sp. 14.16% was found to have the lowest prevalence and *Strongyloides* sp. 12.50%. Only species of cestode was *Raillietina* sp. 10.83% (Table 3)

Table 3: Overall helminths parasites in ducks :

S.N	Class	Parasite Name	Positive sample (n =120)	Prevalence (%)
1.	Nematode	*Ascaridia* sp.	26	21.67%
		Capillaria sp.	20	16.67%
		Hetarakis sp.	18	15.00%
		Tetrameres sp.	17	14.16%
		Strongyloides sp.	15	12.50%
2.	Cestode	*Raillietina* sp.	13	10.83%

4.2.3 Location-wise prevalence of gastrointestinal parasites in ducks :

The study showed effects of different locations of Chandragiri Municipality on the prevalence of gastrointestinal parasites and there was statistical significant difference of the prevalence of intestinal parasite among selected location ($\chi 2 = 5.55$; $p<0.05$) (Table 3).The highest prevalence (95.00%) was revealed in Bishnu Devi location followed by Kanchan Basti (82.50%) and Balambu (67.50%) respectively (Table 4).

Table 4 : Location-wise prevalence of gastrointestinal parasites in ducks :

Location Name	Number examined	Number of positive samples	Prevalence (%)	$\chi 2$	P – value
Bishnu-Devi	40	38	95.00%	5.55	0.0098
Kanchan-Basti	40	33	82.50%		
Balambu	40	27	67.50%		

4.2.4. Location-wise prevalence single and mixed infection of gastrointestinal parasites in ducks

Out of 120 ducks examined, overall 120 (16.67%) and 78(65.00%) ducks were found to harbour mixed and single infections, respectively. Location wise mixed infection is highest in Bishnudevi 20.00%, followed by Kanchan Basti 17.50% and Balambu 15.00%. Single infection is found the highest Bishnudevi 75.00% followed by Kanchan Basti 65.00% and Balambu 52.50%. (Table 5).

Table. 5. Location-wise prevalence single and mixed infection of gastrointestinal parasites in ducks

Variables	No. of ducks examined	Infection type		$\chi 2$	p-value
		Mixed (polyparasitic)(%)	Single (monoparasitic) (%)		
Location				16.41	0.048
Bishnu-Devi	40	8 (20.00 %)	30 (75.00 %)		
Kanchan-Basti	40	7 (17.50 %)	26 (65.00 %)		
Balambu	40	6 (15.00 %)	21 (52.50%)		
Total	120	20 (16.67 %)	78 (65.00 %)		

4.2.5 Location-wise comparative prevalence of parasite classes :

Location-wise the highest prevalence of *Eimeria* sp. (30.00%) revealed in Bishnu devi followed by lowest in Balambu (12.50%). In cestodes only parasite *Raillietina* sp. (15%) is the highest in Kanchan basti followed by lowest in Bishnu- Devi (7.50%). Similarly, the highest prevalence of *Capillaria* sp. (27.50 %), *Hetarakis* sp. (30.00 %) and *Tetrameres* sp. (22.50 %) revealed in location of Kanchan basti. *Strongyloides* sp. (22.50 %)and Ascaridia sp. (32.50%) belonging to class nematodes had the highest prevalence in Bishnudevi. (Table 6).

Table 6 : Location-wise comparative prevalence of parasite classes

Class	**Parasite Name**	**Bishnu-Devi n= 40**	**Kanchan-Basti n= 40**	**Balambu n= 40**
Coccidia	*Eimeria* sp.	12 (30.00 %)	9 (22.50%)	5 (12.50%)
Cestode	*Raillietina* sp.	3 (7.50%)	6 (15.00 %)	4 (10.00 %)
Nematode	*Capillaria* sp.	5 (12.50 %)	10 (27.50 %)	5 (12.50 %)
	Hetarakis sp.	2 (5.00 %)	12 (30.00 %)	4 (10.00 %)
	Tetrameres sp.	7 (17.50%)	8 (22.50 %)	2 (5.00%)
	Strongyloides sp.	9 (22.50 %)	1 (2.5 %)	4 (10 %)
	Ascaridia sp.	13 (32.50%)	6 (15.00 %)	7 (17.5%)

Photographs of identified eggs / cysts of parasites found in duck

Oocyst of Coccidia

Photo 1 : Oocyst of *Eimera* sp. 15 X(28µm)

Eggs of Nematodes

Photo 2 : Unfertilized egg of *Ascaridia* sp. 15 X(80µm)

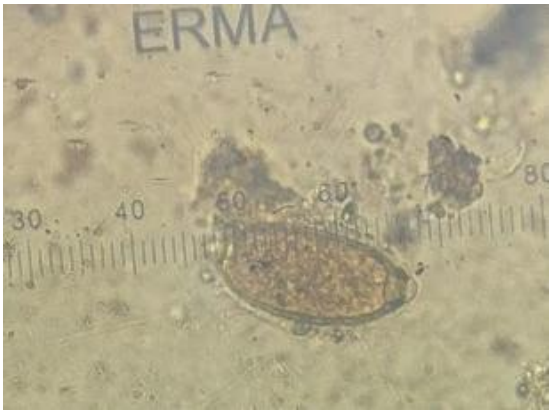


Photo3 : Egg of *Capillaria* sp.15 X(54µm)

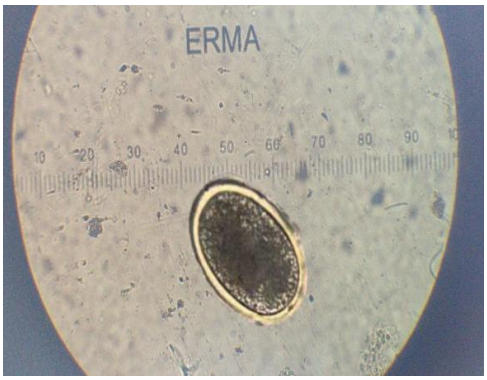


Photo 4 : Egg of *Hetarakis* sp. 40 X (64µm)

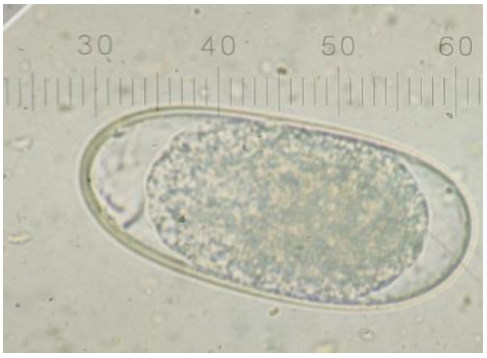


Photo 5 : Egg of *Strongyloides* sp.15X(39µm)

Photo 6 : Egg of *Tetrameres* sp.15 X (54µm)

Egg of Cestode

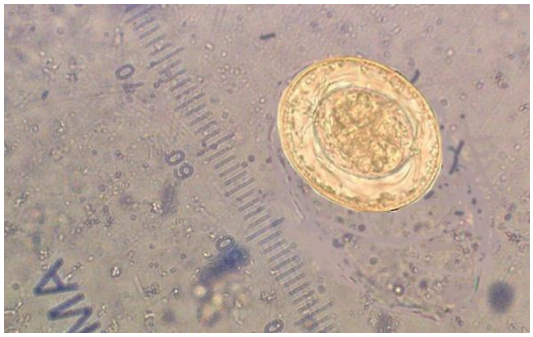


Photo 7 : Egg of *Raillietina* sp. 15 X(64µm)

Photographs of study area

Photo 8 : Collecting stool samples

Photo 9: Grazing duck

Photo 10 : pen of duck

Photo 11 :Samples of faeces of duck

Photographs of laboratory work

Photo 12 : Microscopic fecal observation

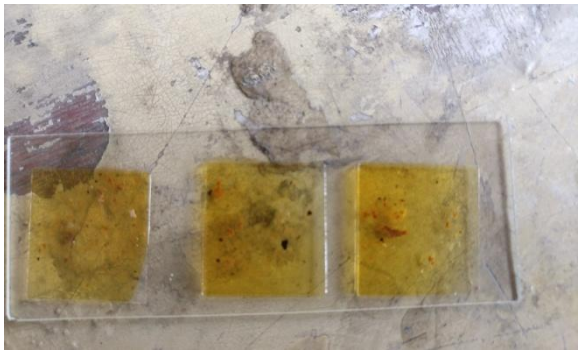


Photo 13 : Slide for observation

5. DISCUSSION

From the very beginning of origination of living organism from pre biotic soup in dynamic earth from pre Cambrian era, absorbing nutrients for the survivable , Parasitism is the best strategy as explained by Darwin's theory of struggle for existence and survivable of fittest. From the dating of fossil it has been noted that parasitism was there from the very beginning of evolution of organism. Actual helminths parasites were only evolved in Cambrian period of Palaeozoic era where protozoan were evolved in Precambrian era of geological time scale. After origination they has been changed continuously for existence in dynamic earth and changed themselves by modifying body organ and developing new body organ for adaptation as explained in Lamarckism, Use and disuse of organ. No living organism can be free from parasite.

In the present study, the prevalence of gastrointestinal parasites of ducks have been carried out from three different locations (Bishnu-Devi, Kanchan-Basti, Balambu) of Chandragiri Municipality. Overall prevalence rate was found to be 81.67% which is same as (Yousuf *et al*., 2009) where he found 81.1% positive test which includes 10 species of gastrointestinal parasites and highest prevalence was of trematodes species where he found four species of trematodes. The prevalence rate of gastrointestinal parasite is more than finding of (Muhairwa *et al.,* 2007) 52%, (AbouLaila *et al.,* 2011) 4.54%,(Yoshino *et al.,* 2011) 37.84%, (Saijuntha *et al*., 2013) 56.7%, (Hoque *et al.,* 2014) 55%, (Tu *et al.,* 2016) 13.4%, (Doo *et al.,* 2016) 34.3% and (Singh and Mohilal, 2017) 75.7% but less than (England *et al.,* 2016) 100%, (Adejinmi and Oke ,2011) 95.4% and (Farjana *et al*,. 2008) 96.66%.20 (16.67%) and 78(65.00%) .The test of ducks were found to harbour mixed and single infections, respectively

The total number of genera observed during faecal examination were seven. Among identified parasites *Ascaridia* sp. (21.67%) showed the highest prevalence and *Raillietina* sp. (10.83 %) showed the lowest prevalence . Similar result was found in study of (Adejinmi and Oke, 2011). In 95.4% positive sample highest rate was of *Ascaridia galli* 46.8%.This might be because of host specific relation between duck and *Ascradia* sp. The remaining parasites *Eimeria* sp., *Raillietina* sp., *Strongyloides* sp., *Capillaria* sp., *Tetrameres* sp. and *Hetarakis* sp. showed the prevalence of 15.00%, 10.83%, 12.50%, 20.00%,15.83% and 17.50% respectively.

Class wise prevalence of nematode is found to be highest that is 80.00% and five species followed by protozoa 21.67% and cestodes 10.83% but no any species of trematodes were found in the test. Similar result was found by (Muhairwa *et al.,* 2007) .They examined gastrointestinal tracts of 192 free-ranging ducks (96 ducklings and 96 adult ducks) for the presence parasites in Morogoro Municipality, Tanzania. Where they found 52% infection of which five subfamilies represented one cestode and four nematodes, whereas no trematodes were found in the study. The reasons for absence of trematodes might be that all species of trematodes are transmitted to the host as metacercaria which are a larval resting stage that resides in fish, amphibians and leech which are absent in testing period and duck from Balumbu were reared inside cage where there was totally out of contact

with such hosts. The nematodes can complete their life cycle without intermediate hosts (Soulsby 1982) so it leads to a high infection rate of nematodes in Poultry (Snadhu *et al.,* 2009). More parasite burden of nematodes in ducks might be explained by their scavenging feeding of vector host of nematodes. Lower burden of cestodes and absence of trematodes might be due to the molluscan intermediate host which are not available during the sample collection period i.e. winter season. Lower presence of coccidian might be because they have short life cycle than helminths.

The study showed effects of different locations of Chandragiri Municipality on the prevalence of gastrointestinal parasites and there was statistical significant difference of the prevalence of intestinal parasite among selected location ($\chi 2 = 5.55$; $p<0.05$) Location wise prevalence of gastrointestinal parasite is more in Bishnudevi with 95.00% followed by kanchan basti 82.50% and Balambu 37.50%. The prevalence of gastrointestinal parasite found to be highest in Bishnu devi because ducks were continuous contact Bishnu devi river where they are frequent contact with suitable intermediate hosts of parasites and they were reared with pig and fish in traditional, rural scavenging system and larger flock. As the size of faecal deposition increases the level of clustering of larvae increases leading to rise in the severity of outbreak of parasite burden (Fox *et al*., 2013). The reason for less positive sample for gastrointestinal parasites in Ducks of Balambu might be fact that they were de-wormed recently and they were reared separately where there was less chance of contamination and away from source of water and irrigation channels. Still there was prevalence of 67.5% gastrointestinal parasites, It might be because albendazole is only 33% efficacy against *Capillaria* spp. up to 21days and 67 % efficacy against *Heterakis* spp. up to 21 days and it is also affected by the methods of admistration as explained by (Tucker *et al*., 2007).

It is thought that that the prevalence of gastro intestinal parasites is considerably influenced by the climatic conditions and as far as possible the evidence for the distribution and prevalence of the diseases is presented by geographical area, roughly corresponding to climatic conditions. Generally the warm and humid conditions, which prevail in much of South-East Asia, provide good conditions for many gastro intestinal parasites to flourish. Continuous high rainfall throughout the year in parts of the region means that there is no season during which the parasites are not a problem. Similar result as in country where there is climate as Nepal like Bangladesh, India, Vietnam, Nigeria and Thailand shows same result. Yousuf *et al.* (2009) where he found 81.1% positive test in ducks of parasite which is same as present finding i.e. 81.67%. (Adejinmi and Oke, 2011) found five species of nematodes where *Ascaridia sp.* 46.8% was the most frequently observed followed by *Heterakis gallinarum* 23.4% and *Capillaria* sp. 21.7%. The present finding also have similar result where *Ascaridia sp.* 21.67% was the most frequently observed followed by *Capillaria* sp. 20.00% and *Heterakis gallinarum* 17.50%.

6. CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

The aim of the study was to investigate the gastrointestinal parasites of domesticated duck in Chandragiri municipality. Altogether 120 samples were collected three different locations (Bishnu-devi , Kanchan-Basti , Balambu) which lies in the Chandragiri municipality and observed . The present investigation was carried out from november to February 2017. Out of 120 samples, 81.67% sample were found to be positive.

Parasites are the part of ecosystem without which natural balance can't be imagined. The topic is so vast that not all of the known human and animal intestinal helminths parasite infection has been surveyed properly from throughout the world. In Nepal, there is no such studies have been done in duck..

Intestinal parasites are cosmopolitan in distribution. All animals whether humans, domestic animals or wild animal, bears the different kinds of parasite. No one is free from the parasitic of infection. Out of 120 positive samples, eight different genera of helminths were observed. Among them, five genera was found to be positive for nematodes, one genera were cestodes and one genera were found to be positive for protozoa but test for trematodes was negative . Among nematodes, *Ascaridia* sp., *Tetrameres* sp., *Capillaria* sp., *Strongyloides* sp. and *Hetarakis* sp. were found which were 96 in numbers. Similarly one species of Cestodes comprise *Raillietina* sp. and a species of Coccidia viz. *Eimeria* sp. were reported.

6.2 Recommendations

On the basis of outcome of the present study, following measures are recommended:

- Treatment of infected hosts with anthelmintics and diagnosis could be done by taking help of nearby veterinary personnel in a regular basis .
- Further research work should be carried out.

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