



**STUDY ON THE PREVALENCE OF INTESTINAL  
PARASITIC INFECTIONS IN GOAT FLOCKS FROM  
THREE DIFFERENT FARMS MANAGEMENT IN  
TERENGGANU**

**BY**

**DR. MOHD HISHAMMFARIZ BIN MOHD AMIN**

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## ABSTRACT

Protozoa and helminth parasites are intestinal parasitic infections that responsible for many gastrointestinal illnesses that affect not only human but also animals. The prevalence of protozoa and helminth parasites especially in ruminants can give effect such as weight loss and severe diarrhoea thereby decreasing the productivity of ruminants. Despite the betterment done by the government especially bodies regarding the infectious diseases in animals, the issue of gastrointestinal parasites still a major concern in Malaysia. Hence, the present study aimed to measure the prevalence of intestinal parasites among goat flocks in three farms located at Terengganu. Besides, this study aimed to identify the variance in goat management systems at the risk factors of protozoa and helminth infections raised in farms. Goat faecal samples were collected from farms listed under Department of Veterinary Services, Terengganu. The samples were processed by using wet mount procedure, formal-ether concentration technique and stained by modified Ziehl-Neelsen and trichrome stain. A total of 287 faecal specimens were collected from goats from three farms. 124 faecal samples were collected from Hulu Seladang farm (semi-intensive), 60 faecal samples were collected from Segading farm (extensive farm) and 103 faecal samples were collected from Mengabang Bakung farm (intensive farm). Present study revealed that, out of 287 samples examined from three different farms, 283 samples (98.6%) were positive with intestinal protozoa or helminthes. The highest prevalence of gastrointestinal parasites between three farms was Mengabang Bakung farm. All 103 samples (100%) from Mengabang Bakung farm were positively detected with gastrointestinal parasites. Meanwhile, the lowest prevalence of gastrointestinal parasites was Hulu Seladang farm. The prevalence of nematodes infection was highest in semi-intensive farm management (86.3%) and lowest in intensive farm management (14.6%). The protozoa infection was highest in intensive farm management (100%) and lowest in semi-intensive farm management (86.3%). This study had revealed that the different farm management system was an important risk factor that influences the prevalence of gastrointestinal parasitic infections in goats in Terengganu. The information from this study need to be taken into consideration when designing a better parasites control management systems for the better production of goats.

## خلاصة البحث

البروتوزوا والديدان الطفيلية الطفيلية المعوية الطفيلية التي مسؤولة عن كثير من الأمراض المعوية التي تؤثر ليس فقط الحيوانات البشرية ولكن أيضا. انتشار الطفيليات والديدان المعوية والطفيليات وخاصة في الحيوانات المجترة يمكن أن تعطي تأثير على مبلغ خطيرة من الأمراض مثل فقدان الوزن والاسهال الشديد مما يقلل من إنتاجية الحيوانات المجترة. وعلى الرغم من تحسن القيام به من قبل الحكومة وخاصة الهيئات بشأن الأمراض المعدية في الحيوانات، قضية الطفيليات المعوية لا يزال مصدر قلق كبير في ماليزيا. وبالتالي، فإن الدراسة الحالية تهدف إلى قياس مدى انتشار الطفيليات المعوية بين قطعان الماعز في ثلاث مزارع تقع في تيرينجانو. وعلاوة على ذلك، فإن هذه الدراسة تهدف إلى التعرف على التباين في نظم إدارة الماعز في عوامل خطر الإصابة البروتوزوا والديدان الطفيلية التي أثرت في المزارع. تم جمع عينات البراز الماعز من المزارع المدرجة تحت قسم الخدمات البيطرية، تيرينجانو. تم تجهيز العينات باستخدام الإجراء جبل الرطب، تقنية تركيز رسمية للأثير، والبقع بسبب تعديل تسيل-نلسن وثلاثي الألوان وصمة عار. تم جمع ما مجموعه 287 عينة البراز من الماعز من ثلاث مزارع. تم جمع 124 عينة براز من المزرعة هولو Seladang (شبه المكثف)، تم جمع 60 عينة براز من المزرعة Segading (مزرعة واسعة) و 103 عينة براز تم جمعها من Mengabang Bakung المزارع (مزرعة مكثفة). وكشفت الدراسة أنه من بين 287 عينة تم فحصها من ثلاثة مزارع مختلفة، كانت 283 عينة (98.6%) إيجابية مع الأوليات المعوية أو الديدان. وكان أعلى معدل انتشار الطفيليات المعوية بين ثلاث مزارع Mengabang Bakung المزرعة. تم الكشف عن عينات 103 (100%) من المزرعة Mengabang Bakung بإيجابية مع الطفيليات المعوية. وفي الوقت نفسه، كان أدنى معدل انتشار الطفيليات المعوية هولو Seladang المزرعة. وكان انتشار عدوى الديدان الخيطية أعلى في إدارة شبه المكثف الزراعية (86.3%) وأدناها في إدارة المزارع المكثفة (14.6%). كان عدوى البروتوزوا أعلى في إدارة المزارع المكثفة (100%) وأدناها في إدارة المزارع شبه المكثفة (86.3%). كشفت هذه الدراسة أن نظام إدارة المزارع مختلفة كان عامل خطر مهم أن يؤثر على انتشار الأمراض الطفيلية المعوية في الماعز في تيرينجانو. المعلومات من هذه الدراسة يجب أن تؤخذ بعين الاعتبار عند تصميم أفضل الطفيليات تتحكم أنظمة إدارة لإنتاج أفضل من الماعز.

## APPROVAL PAGE

I certify that I have supervised and read this study and that in my opinion, it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a thesis for the degree of Master of Health Science.

.....  
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Supervisor

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.....  
Asst. Prof. Dr Mohd Shukri Baba  
Internal Examiner

.....  
Assoc. Prof. Dr Lokman Hakim bin Idris  
External Examiner

This thesis was submitted to the Department of Biomedical Science and is accepted as a fulfilment of the requirement for the degree of Master of Health Science

.....  
Asst. Prof. Dr Mohd Shukri Baba  
Head, Department of Biomedical  
Science

This thesis was submitted to the Kulliyah of Allied Health Science and is accepted as a fulfilment of the requirement for the degree of Master of Health Science.

.....  
Asst. Prof. Dr Wan Azdie Bin Mohd. Abu Bakar  
Dean, Kulliyah of Allied Health Science

## DECLARATION

I hereby declare that this dissertation is the result of my own investigations, except where otherwise stated. I also declare that it has not been previously or concurrently submitted as a whole for any other degrees at IIUM or other institutions.

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# CHAPTER ONE

## INTRODUCTION

### 1.1 BACKGROUND OF THE STUDY

Protozoa and helminth parasites are intestinal parasitic infections that cause many gastrointestinal illnesses which affect not only human but also animals. Gastrointestinal parasites are abundant in temperate and tropical countries that suitable for their development and survival together with low standard of living and education. Small ruminants are important to the country as they serve as source of income and protein to the people. Severe gastrointestinal parasitic infection in goats may lead to higher morbidity rate in goats and eventually lead to higher mortality rate in goats (Agbajelola et al., 2015). Gastrointestinal parasitic infection becomes the main constraint in developing goat's rearing industry and the way to control and eradicate the infection becomes more difficult due to increasing anthelmintic resistance in goats (Japhet et al., 2015). Common parasites infected the goats is nematode group especially Trichostrongylidae family. High burden of Trichostrongylidae in goats lead morbidity and mortality of the goats and eventually reduces the goat's production in the country (Ijaz et al., 2009).

Agriculture is one of the largest sectors in Malaysia that contribute to development of Malaysian economy. Livestock industry is one of the sector that contribute to the increment of Gross Domestic Product (GDP) in Malaysia with 0.8%. Even though the contribution of livestock industry in GDP is small, the industry had grown steadily over the years and become well-known in national economy. Livestock industry provides animal proteins to the Malaysian people and employment too. This

industry comprises production of eggs, mutton, beef, poultry meat, pork and milk as food sources. Besides that, livestock animals are used in rural areas as drought power for pulling carts and ploughing (Arshad et al., 2007). The increasing contribution of livestock industry to Malaysian economy had lead to many development of private farms in many countries in Malaysia including Terengganu. Terengganu is one of the region in Malaysia that contributed to development of livestock and agricultural industry. According to DVS 2016, the number of goats reared in Terengganu was 27,174 goats in 2015. The number of goats reared in Terengganu will be expected to be increased in 2017 due to new mission of Terengganu to become the centre of goat rearing in Malaysia (The Star Online, 2015).

There are three common types of management systems applied in Malaysian livestock's farms which are extensive system, intensive system and semi-intensive system. Most of the farm owners prefer extensive system due to low cost and easy to manage (Hashim & Yusof, 2016). Wrong selection of farm management system by farm owner can affect the production of meat and milk at the farm and also total profit gained by the owner.

Hence, the present study aims to measure the prevalence of intestinal parasites among goat flocks in three farms located at Terengganu and to identify the variance in goat management systems at the risk factors of protozoa and helminth infections raised in farms. Goat faecal samples were collected from three farms located at Terengganu.

## **1.2 PROBLEM STATEMENT**

Zoonotic infections are among the most common transmission caused by protozoa (Manyawe et al., 2010) and helminth parasites (Robinson and Dalton, 2009) which commonly affecting people and livestock (Nwigwe et al., 2013). WHO defines zoonosis as the diseases or infections that naturally transmitted between man and vertebrate animal. There are 1415 pathogens infected humans and from 1415, 61% are zoonotic. Zoonotic diseases have indirect and direct impact to livestock production and health. The direct impact of the infection is illness, monetary loss, unfavorable publicity and legal implications and adverse impact on personnel morale. Indirect impacts are occur due to risk of human infection, added costs related with control programs, barriers to livestock trades, loss of market awing and marketing produce to convince the safety of livestock product to human (Samad, 2011). Zoonotic infection is dangerous to farm owner and workers as they are frequently in contact with animals. Improper handling of the animals and precaution can lead to easily transmitted of the disease to the farm owner and worker.

In Malaysia, goat farming is one of the crucial agricultural sectors representing as a major source of food to people. It has been reported that the production of mutton and milk in this country continued to increase during 2006 to 2010 (Zainalabidin et al., 2011). The increment of goat's production in Malaysia can be prevented when the farmers chose wrong management system. Farm owners are normally preferred extensive management system that relies on natural grazing. Extensive management system often lead to malnutrition due to shortage of forage and water and this lead to lower production of animals and profit. Besides that, malnutrition also lead lo stress and increase the suscpetibility of animlas to parasitic diseases (Ntonifor et al., 2013).

In 2013, the number of goats in Malaysia is the third highest after buffalo and cattle with approximately 482,280 (Department of Veterinary Services, 2013). According to data from Consumption of Livestock Products, from 2004 to 2013, the consumption of mutton showed the third highest after pork and beef with a total consumption of 26,990 metric tons (Department of Veterinary Services, 2013). This data indicates that mutton is one of the most important livestock products in Malaysia. However, the production from goats can be reduced due to protozoa and helminth infections. The awareness of protozoa and helminth parasites as one of the causes of diseases and production losses in ruminants has received a little attention. Presently, there is a little study about the importance of intestinal parasites as a health hazards to goats (Manyawe et al., 2010).

Hence, this study is the first attempt to determine the prevalence of protozoa and helminth parasites in goat flocks in farms located in Terengganu associated with different farm management systems. The findings from present study will be compared with the existing information at local and global regions. Therefore, this study will be beneficial in terms of know-how and know-what the effective control measures and promote proper management practices in farms in order to help the government to reduce economic losses due to these parasitic infections.

### **1.3 RESEARCH OBJECTIVES**

This study embarks on the following objectives:

1. To measure the prevalence of protozoa and helminth in goat flocks in three farms located in Terengganu.
2. To determine the species of protozoa and helminth parasites that infected goat flocks in three farms located in Terengganu.
3. To identify the association of goat management practices with the prevalence and species of protozoa and helminth parasites.

### **1.4 RESEARCH HYPOTHESES**

The prevalence rate of protozoa and helminth infection in goat flocks in three farms in Terengganu will be high mainly in extensive management system and there is a significant association between the prevalence of protozoa and helminth and different goat management practices.

### **1.5 SIGNIFICANCE OF THE STUDY**

The purpose of this study is to enable the identification of the prevalence of protozoa and helminth parasites in goat flocks in three farms in Terengganu. Therefore, this study was involved extensive sampling of goats in Terengganu for a better understanding about the exact prevalence of protozoa and helminth parasitic infections in goats. The findings from present study may lead to better control measurement of protozoa and helminth parasitic infections in goats especially in the aspect of reducing government cost in treating the infected goats.

## 1.6 THEORETICAL FRAMEWORK

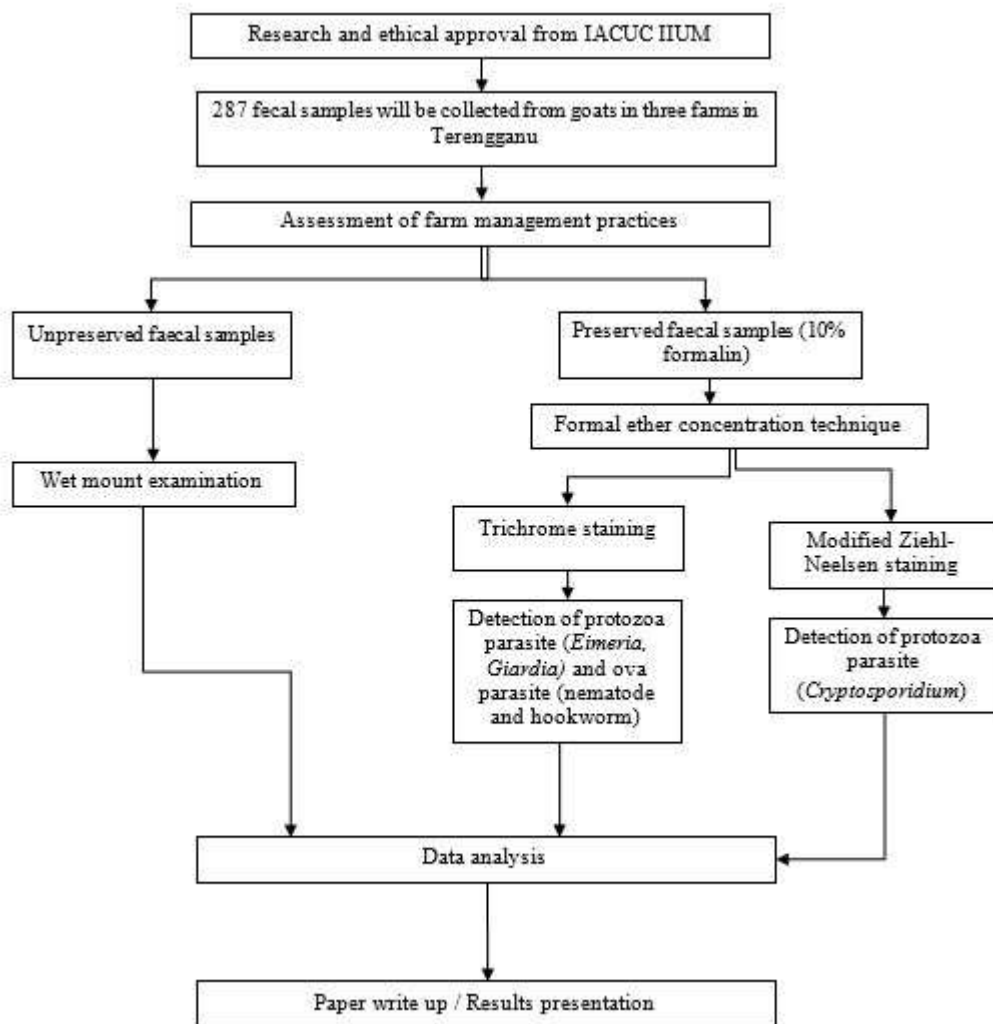


Figure 1.1 Theoretical framework of the study

## **CHAPTER TWO**

### **LITERATURE REVIEW**

#### **2.1 INTRODUCTION**

Goat is one of the important ruminants for many countries. Goat serves as source of food and source of income especially to the farmers that live in rural areas. For instance, in Ethiopia, goat is an important animal that use as a source of income to poor families because of fewer resources and costs of maintenance (Beyene et al., 2012). The goat is used for their milk and meat for protein sources and to generate income for rural farmers (Beyene et al., 2012). In India, goats were used as energy sources for agricultural operations and rural economy (Ahmad et al., 2013). Goat is considered as element of economic importance because rearing the goat has been a major source of income to the farmers and labours in India (Pal and Patnak, 2008). In Argentina, goat is very important to the local rural development based on two reasons which are goats are excellent converters from low-quality forages to high quality products and goat is used as a source of high quality of protein (Cuervo et al., 2013).

In Malaysia, goat is an important source of food to its population. Consumption of mutton is the third highest after buffalo and cattle with approximately 24,311 metric tons (Australasian Dairy Goat Network (AADGN) Country Reports, 2014). The production of goats in Malaysia is not parallel with the consumption of mutton. In 2013/2014, the production of mutton is 2,774 metric tons and the consumption of mutton is 24,331 metric tons. This data shows that the consumption of mutton is very high but the production of mutton is very low in Malaysia (AADGN Country Reports,

2014). This problem was arisen due to many factors such as the environment, the cost of feed, the marketing approaches and gastrointestinal parasitic infections.

Gastrointestinal parasitic infections in goats are a serious problem in this industry. The kid production are low when get infected with intestinal parasites. The intestinal parasites can cause serious diarrheal disease leading to mortality of the kids (Das et al., 2013). In addition, the intestinal parasites infection in small ruminants especially goats can cause health problem to humans when there is cross-contamination occurred. The common parasites that infect small ruminants are *Haemonchus*, *Trichostrongylus*, *Teladorsagia*, *Marshallagia*, and *Cooperia* (Faridnia et al., 2014).

## **2.2 MODE OF TRANSMISSION**

Intestinal protozoa and helminthes can infect goats in many ways. Eggs, larvae and cysts of helminthes and intestinal protozoa can infect goats through contaminated water, food or soil (Albonico et al., 2013). The goats infected with the helminthes through consumption of helminthes' eggs in contaminated food or water with fecal material (Akintayo et al., 2014). Meanwhile, goats infected with protozoa through consumption of cyst through contaminated water and soil with faeces of infected animals (Apio et al., 2013).

## **2.3 LIFE CYCLE OF INTESTINAL PROTOZOA AND HELMINTHES**

The intestinal protozoa and helminthes infect humans through their unique life cycles. The first example of intestinal protozoan is *Eimeria* spp. which infected ruminants through contaminated food and water (Kheirandish et al., 2014). The life cycle of *Eimeria* spp. is divided into two stages which are environmental stage and intestinal

stage. In intestinal stage, the sporozoites invade host's epithelial cells, differentiate into schizonts, and replicate into merozoites. The cycle followed by male and female gametes production. Then, the gametes undergo fertilization and lead to formation of unsporulated oocysts. In environmental stage, unsporulated oocysts were released into environment and the oocysts matured into infective sporulated oocysts (Brossier et al., 2014). The sporulated oocysts released sporozoites in small intestine and invaded the intestinal epithelial cells of the host (Kheirandish, et al., 2014).

The second protozoan is *Cryptosporidium* spp. which is transmitted through faeco-oral route or ingestion of contaminated water supplies with oocysts. The production of an encysted oocyst stage that excreted in host's faeces initiated the infection cycle of *Cryptosporidium*. The oocysts were fully sporulated when excreted. There are two types of *Cryptosporidium* oocysts which are thin walled oocysts and thick walled oocysts. The thick-walled oocysts excreted in faeces and transmitted to other hosts while thin walled oocysts remained in the intestine and become a source of endogenous autoinfection when releasing sporozoites (Banerjee et al., 2014).

Helminthes constitutes three important groups which are nematodes, trematodes and cestodes. The nematodes are the stomach and intestinal parasites. The examples of nematodes that commonly infected the goats are *Haemonchus* spp., *Trichostrongylus* spp., and *Strongyloides* spp.. The adult worms are live in stomach or intestine of host and producing eggs which are excreted in faeces. In environment, the first stage larvae (L1) are developed within the egg within 1 day and molt into L2. Within 7-10 days, L2 larvae are molt into the infective stage L3 if the temperature and moisture are optimal. L3 larvae migrate to the top of grasses and ingested by susceptible host. The L3 burrow into the host's intestine and developed into L4 within 1-2 days. L4 larvae remain in the host's tissue for approximately 10 days, then return to surface and molt into adult stage.

The whole nematode's life cycle takes around 3-4 weeks to complete (Smith and Stehman, 2004).

The second group is cestodes. The common tapeworm infecting ruminants is *Moniezia* spp. There is no asexual phases occur in cestode's lifecycle. Cestodes need one intermediate host to become infected to other host. Proglottid of cestodes leaves the body through anus and eaten by susceptible host with the grass. The susceptible animal become intermediate host if the cestodes compatible with the animal. The non-infective worm enter the host and forming cyst in intermediate host's body tissue such as muscle. The parasite completes its life cycle when intermediate host passed the parasite to definitive host when the definitive host eats the intermediate host (Smith and Stehman, 2004).

The third group of helminthes is trematodes or flukes. The common flukes infecting ruminants is *Fasciola hepatica*. The adult worms are lived in bile duct and passed eggs in host faeces. In water, the eggs develop into free living stage within 10-12 days and infecting some snail's species. Within 5 weeks to 10 months, the immature stages develop in snail, released into water and attached to grass. The host becomes infected through ingestion of immature stages. Within 6-7 weeks, the immature stages penetrate intestinal wall, migrate to liver, penetrate capsule and lastly, migrate to bile ducts. This stage takes around 2-4 weeks to mature into adult worms. The whole life cycle usually occurs during spring and summer seasons (Smith and Stehman, 2004).

## **2.4 PATHOGENESIS OF INTESTINAL PROTOZOA AND HELMINTHES**

When the small ruminants harboring the parasite's oocysts in their body, infected ruminants shown some clinical signs such as diarrhea, decreasing in appetite, weight loss and anorexia (Claerebout et al., 2014). In the severe cases, small ruminants showed a serious clinical sign which is excretion of faeces containing blood (Bathmanaban et al., 2015). These oocysts can lead to malabsorption and maldigestion to the ruminants and cause the reduction in absorptive area and action of the enzymes in gastrointestinal tract due to destruction of epithelia and diminution of microvilli caused by the parasites (Banarjee et al., 2014). The parasite can cause acute invasion and intestinal mucosa destruction causing blood and electrolyte loss and poor absorption of nutrients (Bathmanaban et al., 2015). The gastrointestinal nematodes infection in goats also can affect the absorption of mineral especially phosphate and calcium and impaired the digestion (Banu et al., 2011). Severe gastrointestinal parasitic infection in goats lead to mortality to the goat and the infection is ranked as the second most important cause of mortalities to goats after pneumonia (Hashim & Yusof, 2016).

## **2.5 FACTORS AFFECTING THE PREVALENCE OF INTESTINAL PROTOZOA AND HELMINTH IN GOATS**

The intestinal protozoa and helminthes can infect the goats through many factors including farm management, the seasonal factors, the host sex, age, grazing habits, and the economic capacity of farmers (Duguma, et al., 2011). The high prevalence of intestinal parasitic infections can be seen in management system that applied free scavenging and feeding on anything they come in contact with. Keeping the goats in poor and small ranches also increases the intensity of parasitic infection in goats. Poorly

managed small ranches with high number of goats will increase stress among the goats and increasing the parasitic rate in the goats. Small ranches will reduce the percentage of air circulation in the farm and promote development of infective parasitic stages in the goats (Villarroel, 2013). The parasites were spread faster among goats kept in overcrowding and poor hygienic practices because goats serve as potential carrier of these parasites and consistently contaminate the environment with oocysts and eggs of parasites (Japhet et al., 2015). When the goats were confined in the small contaminated environment, the intensity of parasitic infection increases because of continuous parasitic infection (Akbar, et al., 2014).

The economic capacity of farmer also influences the prevalence of parasitic infections in ruminants. Goats rearing are an important source of income to poor rural people in some countries. Due to lack of money, poor and rural people practice extensive management and do not give any treatment against the helminth infections (Anisuzzaman et al., 2011). The high prevalence of intestinal parasites was seen in extensive managed goat compared to intensive managed goat (Smith and Stehman, 2004). Extensive managed goats feed on the grazing land or browsing area while intensive managed goat feed only the food or drink gave by the goat handlers in sheds (Japhet et al., 2015). The pasture and grazing management influence the development and survival of helminth larvae (Bandopadhyay et al., 2015). The browsing goats shown less parasitic infections compared to the grazing goats due to low contamination of oocysts and eggs on browsing area compared grazing land (Smith and Stehman, 2004). The frequent contact of grazing land with contaminated natural water sources with intestinal parasites leading to infection of parasites to goats (Japhet et al., 2015).

Local environmental condition such as temperature, rainfall and humidity also caused the high prevalence of parasitic infections in small ruminants (Bandopadhyay et

al., 2015). The temperature affects the speed development of free-living larvae and the survivability. For example, the larvae can survive without hatching at 32°F for more than 30 days, have delayed development at 68-77°F (in 14 days), can develop maturely at 86-95°F (in 8-9 days), and the larvae cannot survive when the temperature exceeding 104°F (Smith and Stehman, 2004).

The prevalence of parasitic infections was higher in rainy seasons as compared to dry seasons. The optimum temperature and moisture during rainy seasons allow the development, translocation and survival of pre-parasitic stages (Anbarasi et al., 2015). The high humidity and lower temperature in rainy seasons promoting the development and survival of protozoa cysts and helminthes eggs into infective stages (Anbarasi, et al., 2015). The humidity also prevents the larvae from drying out and helping larvae to leave from faeces onto vegetation (Smith and Stehman, 2004).

Another factors affecting the prevalence of intestinal parasitic infections are age and sex of hosts. The intensity of parasitic infection was higher in young goats compared to adult goats because of overstocking, contaminated environment and lack of immunity (Akbar et al., 2014). The adult goats developed partial immunity against parasitic infections as the age increases (Akbar et al., 2014). Besides that, the high prevalence of intestinal parasites was seen in males goat compared to female goats due to different type of hormones excreted after puberty. Male goats excreted androgen while female goats excreted estrogen after puberty. The study done by Akbar et al. (2014) showed that the difference in the prevalence of parasitic infection between male and female goats is because androgen suppresses immune response and estrogen stimulates immune response against intestinal parasites.