

## A Preliminary Study on Hernia in Domestic Animals in Gondar Town, North Gondar, North West Ethiopia

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### Abstract

The Five years retrospective and a cross-sectional study were conducted from October 2009 to February, 2011 in Gondar town, North Gondar, Ethiopia to assess the prevalence of hernia problems and related risk factors. Both retrospective and cross-sectional study methods were employed to collect data on hernia problems in different group of livestock. A cross-sectional study on cases brought to veterinary clinics was undertaken using pre-structured data collection checklist for species, breed, age, herd size, activity engagement (management, stocking), presence or absence of hernia, distribution, intensity and type of hernia. A five year retrospective data about any of the hernia problems encountered was collected from two veterinary clinics, namely: Gondar University and Gondar office of agriculture veterinary clinics at Gondar town. Physical and surgical examination was also conducted to characterize the type of hernia, type of hernial content and its site. A total of 459 animals of which 193 cattle, 160 sheep, 2 goats, 57 equines (horse and donkey), 37 canines and 9 swine cases were observed and only 3.5% (16 out of 459) has revealed any of the clinically visible hernia problem. Out of the total observed hernial cases 95.75% and 6.25% were acquired and congenital respectively. Mechanical trauma contributes the highest percentage of the total causes of hernia. From hernia cases brought about 62.5%, 6.3% and 6.3% were related to abdominal, scrotal and umbilical type of hernia respectively. From retrospective data obtained from a total of 10,765 recorded cases the highest percentage was related to abdominal hernia followed by scrotal and umbilical hernia.

**Keywords:** Cause of hernia; Domestic animals; Gondar town; Ethiopia

### Introduction

A hernia is the protrusion of the content of body cavity through a defect in the body wall [1]. This may be from accidental or normal anatomical opening, which does not completely fulfill its physiological function. The majority of hernia involves the protrusion of the abdominal contents through the part of the abdominal wall, diaphragm, or perineum, although Herniations can occur elsewhere in the body. The presence of a defect or opening in the wall is the important factor in Herniations in respect of weather a protrusion through the opening is present [2]. There are three parts of hernia including the ring, the sac and the contents. The ring is the actual defect in the limiting wall, and it may be as small as a few millimeters or up to several centimeters [3].

Epidemiologically genetic and traumatic factors, surgical intervention, certain drugs and chemicals may involve in some hernias like congenital umbilical hernia and inguinal hernias are often apparent at birth [4]. Generally, there are two types of causes in hernia, which are predisposing cause and exiting causes.

Hernia can be classified into different parts depending on: the anatomical site of herniation (ventral or lateral abdominal hernia, diaphragmatic, inguinal or scrotal, umbilical, perineal, pelvic and femoral hernia), based on cause of hernia (congenital versus acquired hernia), depending on the type of the herniated tissue as enterocel (containing portion of intestine), epiploce or omentocel (of omentum), enteroepiploce (of intestine and omentum), Gastrocele (of stomach), vesicocoele (of bladder), hepatocoele (of liver), hysterocoele (of uterus) and it may be, external or internal hernia [1].

Pathophysiologically alteration in the function of the body cavities of hernial contents may be important in the herniation. Swelling of the herniated body is the classical sign of hernia but in uncompleted hernia

no sign of pain is elicited on palpation and the consistency of swelling depends on the contents [5].

It is difficult to generalize about the diagnosis of herniation, but observation and palpation is important in most cases. Specific diagnostic features of the various types of hernia are done in different ways [2]. In addition to physical examination, plain or contrast radiography and trans-scrotal ultrasonography can be used in the diagnosis of scrotal hernia in sheep and goat (Ahemed et al.; Abdin-Bey and Ramadan) [6,7].

Hernia can be treated in different ways like reduction and retention by bandage, by application of blisters or injection of irritant solutions close to hernial ring after reducing hernia, by a ligature or by asset of through and through mattress sutures may be applied at the base of hernial sac and by radical operation in which herniorrhaphy. Even though it is treated in different ways herniorrhaphy is the most common of veterinary important, in which hernial ring approached together by incision over the sac or ring. Adequate surgical exposure and access to the hernial contents is essential and the tissue may be friable requiring gentle handling [8]. Post-operative care of patient minimizes the load on the surgical repair [9].

Ethiopia has the largest livestock population in Africa, with an estimated 49.3 million heads of cattle, 46.9 million sheep and goats,

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7.55 million equines, and 2.3 million camels. However, the contribution from these huge livestock resources to the national income is disproportionately small, owing to several factors such as draught or mal-nutrition, management problems, poor genetic performance and prevalent livestock diseases [9].

In Ethiopia despite many efforts tried to study infectious diseases prevalent in the country, hernia has been given lesser attention to be treated as a separate health problem. There are no researches undertaken to address livestock hernia problems separately. This also holds true in and around Gondar except some efforts done to assess and record hernia problems in clinic case book that related to trauma. Studying the existing problems of hernia in livestock seems extremely important for improving livestock health.

Domestic animals are frequently presented with different form of surgical cases (like spaying, ruminotomy, caesarian section, amputation of limbs and horn, drainage of abscess, herniorrhaphy and tumor extraction) to the Gondar university veterinary clinic. But also this university is used as referral clinic. Due to this Gondar university veterinary clinic when compared to other veterinary clinical (Gondar office of agriculture veterinary clinic and Azezo veterinary clinic) treat many surgical cases.

### The objective of the study is:

- ❖ To determine the prevalence and type of hernia in domestic animals found in Gondar town and around it
- ❖ To identify the risk factors for the occurrence of hernia

## Literature Review

### Classification and cause of hernia

Depending on anatomical site: The anatomical site of herniation is used for classification such as ventral or lateral abdominal hernia, diaphragmatic, inguinal or scrotal, umbilical, perennial, pelvic and femoral hernia (Slatter) [4].

**Abdominal hernia:** It is a term used to describe hernia through any part of the abdominal wall other than anatomical orifice. If hernia is ventral to stifle skin fold, it is termed as ventral hernia and the rest; e.g., in the flank region are known as lateral abdominal hernia. Such types of hernias are common in ruminants and are generally acquired in nature. Any trauma such as a kick in camel, horn thrust in cattle or violent contact with blunt object or an abscess in abdominal cavity may lead to wearing of abdominal muscle there by resulting in herniation of the abdominal contents [10]. Abdominal distension due to pregnancy or violent straining during parturition may lead to ventral hernia, especially in sheep. An excessively long caudal flank incision for caesarean section in the camel may subsequently cause hernia [11].

**Diaphragmatic hernia:** It is caused by passage of abdominal viscera into the thoracic cavity, through a tear or a congenital defect in diaphragm [12]. Diaphragmatic hernia is very rare in animals. It is seen in dogs more frequently than in other species. Diaphragm is a muscular partition between abdomen and thoracic cavity. Central area of diaphragm is tendinous. The posterior aorta, posterior venacava and the esophagus pass through it. Herniations are usually noticed close to these structures or at the costal attachments of the diaphragm. The weakest portion of diaphragm where it gets torn is close to the posterior venacava, because the vein collapses when the part is subjected to the pressure. The portion close to the esophagus constitutes the 3<sup>rd</sup> weak portion [5]. The abdominal organs in contact with diaphragm are the

liver and stomach. The hernial contents are usually portion of omentum, stomach, or liver; very rarely the intestine. The extent of herniation depends on the size and location of the tear. Most diaphragmatic defects are acquired and may be associated with thoracic trauma or sudden increase in intra abdominal pressure but congenital hernias are occur less frequently and are a result of incomplete fusion of pleuroperitoneal folds. Therefore, most congenital defects are in the dorsal tendinous portion of diaphragm and represent an enlargement of the esophageal hiatus [10].

**Inguinal or scrotal hernia:** It occurs when intestine or abdominal organs descend into inguinal canal. If the content descends into the scrotum the term scrotal hernia is used. Inguinal hernia occurs mainly in mature bull and swine but also it can occur in rams and boars. The internal inguinal ring is palpable per-rectum [12,13]. The normal inguinal ring permits insertion of one or two finger. Bulls with internal inguinal ring sufficiently wide to permit insertion of four finger are predisposed to herniation and the owner should be warned. The majority of inguinal hernia occurs in the left side of the scrotum, probably as a result of the rumens weight and the mature bull laying in the sterna position with the left rear leg abducted [9]. Most hernias are indirect (the intestinal components is contained within the tunica vaginalis), but occasionally direct herniation occurs when herniated intestine goes through a rent in the vaginal tunic and is contained within own peritoneal pouch [10].

**Umbilical hernia:** Umbilical hernia (omphalocele) result from failure or delayed fusion of lateral folds (rectus abdominus muscle and fascia). It occurs frequently in bovine calves but, is rare in lambs and kids. The condition is comparatively more frequent in females than males. It can be congenital or acquired in nature [11]. The acquired umbilical hernia occurs due to resection of the umbilical cord too close to the abdominal wall, excessive straining due to diarrhea and constipation and infection of umbilical cord preventing the natural closure of umbilical orifice [10]. Umbilicus in calves consist of urachus, umbilical vein and umbilical arteries, which are known as umbilical remnants. The urachus, umbilical vein and arteries are normally regress after birth to become vestigial part of the bladder apex, round ligament of the liver and lateral ligament of the bladder respectively. Due to improper closure of umbilical opening at birth a defect may remain in the mid ventral to form the congenital hernial ring [5]. Umbilical masses in calves may be divided in five categories: uncomplicated umbilical hernias, umbilical hernia with sub cutaneous infection or abscess, umbilical hernia with umbilical remnant infection, umbilical abscess or chronic omphalities and urachus cyst or rupture [14]. The hernia are usually present during the first few days of the life and typically enlarge uniformly as the calves grows. Umbilical masses completely educable with a palpable circumferential hernial ring. The hernial sac may contain intestine enterocel) abomasum (most commonly), Omentum or both. Strangulation of small intestine, omentum or abomasum with the hernial sac is possible, although rare [11].

**Femoral hernia (crural hernia):** This is a very rare condition in veterinary practice it is recognized as swelling on the inner aspect of the thigh between the sartorius and gracilis muscle due to the protrusion of abdominal viscera through the femoral canal. The content protrude between the ligament and Sertorius muscle, lifting the facial covering the Sertorius and gracilis muscle [15]. The symptoms in case of femoral hernia, there is interference with normal gait of the animal. The affected limb is carried forward in an abducted fashion during progression. The treatment is usually not attempted but radical operation can be done in which skin is incised over the swelling and to facilitate reduction the

incision may extend upward. Care is necessary to prevent injury to the femoral vessels. After return of contents into the abdomen re-herniation is prevented by suturing the inguinal ligament to the Sertorius muscle [16,17].

Generally, there are two types of causes in hernia, which are predisposing cause and exiting causes: Predisposing causes include imperfect closure of an embryonic defect e.g., umbilicus predisposing to an umbilical hernia and imperfect formation of diaphragm predisposing to diaphragmatic hernia. Exiting cause increase in the intra abdominal pressure due to straining from constipation, diarrhea, during parturition, violent coughing, gastric or intestinal tympani and direct violence due to falling on the blunt object [3].

Depending on cause (congenital versus acquired) hernia: A congenital hernia is due to defect or ready present at birth, although the herniation may not develop until later. The defect an acquired hernia occurs after birth and may be due to blunt trauma, Surgical trauma or degeneration (perennial hernia) [4]. Inguinal hernias, particularly in mature, overweight females may be associated with increased diameter of a normal body opening, possibly caused by weakening of surrounding collagenous tissues and the deposition of fat in inguinal canal [12].

Reducible, incarcerated, and strangulated hernia: When the protruded hernia contents are freely movable and readily be manipulated back in to the cavity the hernia is classified as reducible. If the adhesion form between the contents and surrounding tissue, and the contents therefore fixed in the abnormal location, the hernia is classified as incarcerated [4]. Incarceration of a hollow organ viscous may cause obstruction of the lumen and sign of bowel or bladder obstruction may follow. Incarceration may also obstruct the vascular supply to the herniated tissue, usually at the edge of the defect, and the hernia is then classified as strangulated eventually results in tissue necrosis and is most serious problem, especially when intestinal loops are involved [12].

Depending on type of herniated tissue (sack contents): Hernia may also classified according to their contents such as enterocel (containing portion of intestine), epiploce or omentocel (of omentum), enteroepiplocele(of intestine and omentum); Gastrocele (of stomach); vesicocele (of bladder); hepatocele (of liver); hysterocel(of uterus) [2].

### Parts of hernia

There are three parts of hernia including the ring the sac and the contents [5]. The ring is the actual defect in the limiting wall, and it may be a small as a few millimeters or up to several centimeters. Spontaneous attempts at healing may be lead to thickening of the edge of the ring through the collagen maturation. As the sac, contracts the contents may become strangulated. Hernia caused by trauma is often affected in this way [1].

The hernial sac consists of the tissues that cover the herniated contents. The contents of hernia are the organs or tissues that have moved to the abnormal location. The nature of the contents can usually be predicted from the site of the herniation, although mobile structures such as omentum and parts of the intestine can be involved in most sites [18,19].

### Possible changes in hernia

The following changes may occur in case of hernia: These are adhesion, incarceration, Torsion, strangulation and hydrocele of the sac [20].

An adhesion may take place between the sac and a content making

reduction difficult or impossible. Hydrocele of the sac is caused by exudation from hernial contents. A constrict hernial ring favors such exudation [12].

An incarcerated hernia is a hernia where hernial contents have become very voluminous so that they cannot be reduced. e.g., an enterocel may become incarcerated either due to more and more intestinal segments entering into the hernial sac or as a result of the accumulation of food material within the lumen of herniated segment [3]. The accumulating food materials become hard masses as the water gets absorbed from them and these hard masses make reduction of hernia very difficult. They may also cause partial or complete obstruction of bowel segment and thus favors further accumulation of food material [5]. Torsion or twisting of hernial contents within the hernial sac interfere with the blood supply to the tissue and may lead into gangrene and toxemia [21].

Strangulation (compression caused by hernial ring causing interference with the blood supply to the hernial contents). When hernia is strangulated soon after the time of its occurrence; it is spoken of as an acute hernia e.g., strangulated inguinal hernia in race horse. In strangulated hernia the constriction at the hernial ring interferes with blood supply to the hernial content and venous drainage causing congestion and edema. Blood and mucus escape into the lumen and blood-stained effusions take place from the peritoneal surface [12]. Gangrene sets in gradual and the hernial content appears black but also peritoneum loses its shining luster. Pathogen organism from the gut pass through the intestinal wall and death may occur from toxemia (septicemia) and peritonitis [5].

### Pathophysiology

Alteration in the functions of the body cavities and of hernial contents may be important in herniation [22]. This changes in the function may be vary in severity from insignificant to lethal and can be due to a space occupying effect, obstruction of hollow viscous, or strangulation of hernia contents leading to tissue death [10]. Space occupying effects are mostly associated with diaphragmatic hernias when abdominal contents prevent pulmonary expansion but also it occurs within the pericardial sac in the peritoneum pericardial hernia [4].

Obstruction of the lumen of the bowel by incarceration in hernia can rapidly lead to an accumulation of gas and fluid, with fluid and electrolyte disturbance. Semen quality can also affected by altering the scrotum thermo regulation, which mostly associated with chronic scrotal hernia [9].

### Signs of herniation

There are physical symptom and functional symptoms:

Physical symptoms include presence of hernial swelling which is the classic sign of herniation [23]. The swelling varies in size and shape. In uncomplicated hernia no pain is elicited on palpation, and has consistency of the doughy in if the content is epiploce. The swelling may increase in size while coughing [12].

Inflammation due to trauma or infection can be super-imposed on these sign, making palpation difficult [24]. The site of a swelling may be some distance from the hernial ring, because of the migration of the contents in the subcutaneous space [1]. In diaphragmatic hernia, swelling is usually not seen and respiratory signs are predominate. Additional signs depend mainly on the nature and status of the contents of hernia [10].

Functional symptoms are ordinary absent in reducible hernia. Colic may seen in incarcerated hernia. Sever pain, rise of temperature and colic are pronounced in strangulated hernia [5].

In case of umbilical hernia, a discrete spherical swelling is obvious at the umbilicus. The hernial contents are usually omentum or intestine. The circular or oval hernial ring can be palpated without any pain, if hernial contents are reducible. However, presence of adhesion or umbilical abscess can prevent reduction. Hernial contents may be get strangulated with symptom of pain and intestinal obstruction [12].

In case of inguinal hernia strangulation is not common but may occur rapidly. Affected bull shows signs of intestinal obstruction including abdominal pain, and decreases fecal out put. The condition must be distinguished from intussusceptions and volvulus of the root of mesentery. The hernia may be contained entirely within inguinal canal without visible scrotal swelling [3].

In ventral or lateral abdominal hernia, the hernial swelling is very prominent. Systemic symptoms are usually absent. The contents of hernia are usually omentum or intestines or both. The hernia may be reducible or irreducible, and strangulation is rare [3].

## Diagnosis

It is difficult to generalize about the diagnosis of herniation. Physical and surgical diagnosis is important in most cases. Specific diagnostic features of the various types of hernia are done in different ways [2].

In umbilical hernia, hernial swelling at the umbilicus is easily observed. The hernia can be usually reduced after putting the animal on its back and the hernial ring can be felt [12].

In inguinal or scrotal hernia, the hernial swelling is recognized close to or including the scrotum. The swelling can be easily differentiated from a sarcocele (a hard tumor of testicle), hydrocele, cyst, enlarged lymph node, and cirrhosis cord and so on. A sarcocele is a hard swelling on testicle; Hydrocele has characteristics of wave-like felling of fluid, which is deferent from hernial content. Drawing up of the testacies of the affected side accompanied by symptom of continuous abdominal pain, is an almost path gnomonic sign of strangulation of an inguinal hernia. In large animals diagnosis may be confirmed by rectal examination and in small animals it is done by Radiography or fluoroscopy [3].

In diaphragmatic hernia, a lateral and a ventrodorsal radiography of the thorax may help to confirm the diagnosis. Condition like hydrothorax, aspiration pneumonia, cardiac diseases, and foreign bodies in the esophagus should differentiate from diaphragmatic hernia. I n case of ventral or lateral abdominal hernia diagnosis is easy as the hernial ring can be felt in most cases [12].

## Deferential diagnosis

A hernia should be differentiated from abscess, tumor, hematoma and cyst. Abscess, tumor and cyst develop slowly where as hernia is of sudden occurrence [3].

In developing abscess, there are symptoms of local inflammation and it does not fluctuate under the skin. An abscess has a tendency to point. In hematoma, the collection of blood may feel like free fluid or may give a slight crepitating sound on palpation. A cyst fluctuates uniformly and has no tendency to point and pain or functional symptoms' are absent. The presence of hernial ring confirms hernia. Exploratory puncture or radiography may also be done for conformation [3,25].

## General principle and treatment of hernia

Most hernias are best approached by incision over the sac or ring. In acute, traumatic abdominal hernias, a midline laparotomy approach may be preferred if the surgeon requires access to abdominal viscera to evaluate concurrent injury. Adequate surgical exposure and access to the hernia contents are essential, and the tissue may be friable requiring gentle handling. It may be necessary to enlarge hernia ring to achieve proper access [4].

The hernial ring best closed by direct suture approximation of local tissue. Knowledge of anatomy of the area is necessary so that suture can be placed in specific anatomical structures that have sufficient holding power to resist disruption [3,24]. The mobility of the local tissue can be increased by local dissection or creation of local muscle of facial flaps, such as superficial gluteal or internal obturator muscle flap in perennial Herniorrhaphy [10]. When large defect makes the approximation of local tissue impossible without tension, prosthetic implants are used. The most commonly used synthetic material is a monofilament plastic mesh made of polypropylene or polyethylene which is well tolerated in wounds, does not disintegrated with age, and can stretch in two directions to distribute the load more evenly [4].

Numerous techniques have been described for inserting prosthetic mesh, including the use of 1-3 layer of mesh at various levels between the layers of the abdominal wall. The mesh extends 1.5-3 cm beyond the margin of the defect and is anchored to a strong supporting structure with interrupted suture of synthetic monofilament non-absorbable material [1]. Despite the many reports of reduced recurrent rate of incision hernia after mesh repair compared with the use of autologous tissues, early postoperative complications, such as pain, seroma formation, and wound infection remain problem [9]. Postoperative care of patients minimize the load on the surgical repair. Any cause of increased intra-abdominal pressure, such as vomiting or excessive barking, can predispose to failure of the repair. Other causes of recurrence are infection, extreme tension and inadequate nutrition of the exposed tissue. Technical failures, such as the use of incorrect suture materials or inappropriate tissue layers, are important cause of recurrence [4].

Reduction and retention by the bundles: In this case, the hernia is reduced by local manipulation and bandages applied around the abdomen to prevent its return. An "Elastoplasts" bandages better to avoid interference with breathing. The bandages retained for two to three weeks. This method of treatment is effective in some cases of umbilical hernia [2].

By application of blisters or injection of irritant solutions: Injection of irritant solutions close to hernia ring after reducing the hernia causes inflammatory swelling, which is sometimes sufficient to prevent recurrence of small hernia and to facilitate closure of hernia orifice. The solutions commonly employed for this purpose are sodium chloride 5-15% and zinc chloride 5-10% [2].

By ligature or hernia clamp: A set of through and through mattress sutures may be applied at the base of hernia sac after reducing the hernia to facilitate sloughing of the sac and simultaneously closure of the hernia ring. This method is also not effective in some cases [2].

By radical operation: In this case, the hernia sac is incised and the hernia contents are returned through the hernia ring. The hernia sac is ligatured at its neck, amputated, and its stamp is pushed through hernial ring. The borders of hernia ring are then freshened and sutured together. Closed suturing of hernia ring is called herniorrhaphy. If the



hernia ring is very large, suturing its edge is not possible. In such cases, hernioplasty is performed by covering the gap with facialata or stainless steel wire mesh and suturing it to the borders [2].

## Materials and Methods

### Study area

The study was conducted in Gondar town veterinary clinic and Gondar University Veterinary clinic. Gondar town is the capital city of Northern Gondar Administrative Zone of Amhara National Regional State. Gondar town is located 740 km Northwest of Addis Ababa and it is located at latitude of 12°04' north, longitude of 27°02' east and the altitude range between 1800-2500 masl. The climate of the town is somewhat warm with mean annual temperature of 20.5°C (17.2-23.9°C) and mean annual rainfall of about 1000 mm (600-1400 mm). The production system observed around the area is cereal based agricultural activities and livestock farming activities.

The population size of Gondar town in 2008/2000 E.C. is about 112,249 out of which 60,883 are males and 51,366 are females. According to Zone Office of Agriculture and Rural Development (GAO, 2006; CSA 2008) [26,27] the livestock population in the area comprises of cattle (8,202), goat (22,590), sheep (2,695), horses (1,065) and donkey (9,001).

### Study animal

All domestic animals that came to Gondar University veterinary clinic (from October 2010 to February 2011) and, Gondar town veterinary clinic (from 2005 to 2010) for different reasons like diagnosis (PD, infectious disease diagnosis), AI, vaccination, castration and others were considered as study animals. Domestic animals were considered for the estimation of prevalence of hernia and predisposing factors. The majority of the animals were expected to come from Gondar town and its surrounding.

### Sampling and sample size determination

The sample was taken by non-probability sampling technique in which purposive sampling is used to take sample from the study area to meet the objective of the study. Since there was no any study conducted in Ethiopia, concerning the occurrence of hernia in domestic animals and it was the first study in this area, a 50% expected prevalence were taken to determine the sample size and the desired sample size was calculated by using the formula given by Thrushfield [28] with 95% confident interval and 0.05 absolute precision. By substituting the value in the following formula, we can determine sample size.

$$n = \frac{1.96^2 \times Pexp (1 - Pexp)}{d^2}$$

Where, n=required sample size; Pexp=expected prevalence; d=required precision (0.05), Substituting the value in the formula gives as, n=384.

However, to increase the accuracy, the sample size was increased to 459.

### Study design

**Cross-sectional study:** A Cross -sectional study was conducted to determine the prevalence of hernia in domestic animals that came to Gondar University veterinary clinic.

**Retrospective studies:** A retrospective studies on the prevalence of

hernia since last five years from the Gondar Main Office of Agricultural clinic was collected and the prevalence and type of hernia was determined to compare with cross-sectional studies.

### Study methodology

A cross-sectional study was under taken in Gondar university veterinary clinic. A total of 459 domestic animals were recorded on prepared data collection case sheet), which have a list of species, breed, age, herd size, activity engagement (management, stocking), presence or absence of hernia from which. during study period animals were daily diagnoses for the presences of hernia. diagnoses procedure was done according to Ducherman and Susan [29].

Recording was done based on history and physical examination in which animals were separated as hernia positive or negative. After recording, suspected animals for hernia was differentiated from the abscess, tumor, Edema and hematoma were differentiated by the help of inspection and palpation. Then positive animals were treated surgically which depends on owner's interest. After performing the above performance prevalence of the disease cause and type of hernia was determined.

A five year retrospective data about any of the hernia problems encountered was collected from Gondar Main Office of Agricultural veterinary clinic recorded case book, as positive or negative with corresponding to species, sex. Breed and type. Lastly prevalence was determined and compared with cross-sectional study.

### Data management and analysis

Cross-sectional data was collected and recorded on specially designed format sheet and subjected to chi-square statistical analysis for possible significance difference. All observations were entered to Microsoft excel and analyzed using SPSS window version 16.

## Results

### Cross-sectional study

On a total sample size of 459 domestic animals a consecutive follow up were done and 16 (3.5%) animals were found with various hernia problems. Of the patients with hernia (62.5%) had abdominal hernia (6.3%) had scrotal hernia and (6.3%) umbilical hernia (Figure 1).

Table 3 represent deferent type of hernia observed in domestic. From the total of the animal with hernia, three type of hernia were obtained by performing physical examination. Examination was done after taking history from the owner and lastly the animal were treated surgically which depends on owners interest. From the total of animals observed 26 (3.5%) were found with different type of hernia. From the animals with hernia abdominal hernia has the highest prevalence followed by scrotal and umbilical hernia (Figure 2).

### Retrospective study

From a total of 10,765 domestic animals 4140 bovine, 3490 ovine, 1023 equine, 1643 canine, 500 caprine and 40 swine examined 0.32% (34 of 10,765) were positive for hernia (Table 4). The different level of prevalence among different species of domestic animal were given as, 0.58% (24 of 4140 in bovine) and 0.29% (10 out of 3490 in ovine)] were detected. Of the patients with hernia 94.12% had abdominal hernia, 2.94% had scrotal hernia and 2.94% umbilical hernia (Tables 1-6).

## Discussion

The result of the present study indicated that there was a problem of



**Figure 1:** Different type of abdominal hernia in bovine.



**Figure 2:** Umbilical hernia in calf.

No	Type of hernia	Species of animal encountered
1	Umbilical hernia	Foals, pigs, calves, and puppies
2	Ventral or lateral abdominal hernia	Horses and cattle
3	Inguinal hernia	Bitches, bulls, horses and male and female pig
4	Diaphragmatic hernia	Horse, adult dog and puppies
5	Perinea hernia	Un-castrated old male dog
6	Pelvic hernia (gut tie)	Bullocks (steer)
7	Femoral hernia (crural hernia)	Not common in animals

**Table 1:** Types of hernia frequently encountered in different animal species.

Species	No. of animal observed	Hernia encountered	Prevalence (%)
Bovine	193	10	5.9
Ovine	161	5	3.1
Equine	57	0	
Caprine	2	0	
Canine	37	0	
Swine	9	1	11.1
Total	459	16	3.5

**Table 2:** Prevalence of hernia encountered during crosssectional observation in domestic animals in Gondar University Veterinary clinic.

hernia in domestic animals, which appeared at a prevalence of 3.5% (16 of 459) and most of these hernia were encountered on bovine followed by ovine and swine, with an estimated prevalence of 5.9%, 3.1% and

Species	Hernia cases encountered	Types of hernia		
		Abdominal hernia (%)	Scrotal hernia (%)	Umbilical hernia (%)
Bovine	10	8(4.1)	0	1(0.5)
Ovine	5	5(3.1)	0	0
Equine	0	0	0	0
Caprine	0	0	0	0
Canine	0	0	0	0
Swine	1	0	1(11.1)	0
Total	16(3.5%)	10(62.5%)	1(6.3%)	1(6.3%)

**Table 3:** Types of hernia in different group of domestic animal (%).

Risk factor		No. of animals examined	No. of hernia encountered	Prevalence (%)	X <sup>2</sup>	p-value
Age	Young	136	4	2.9	0.93	0.93
	Adult	248	8	3.2		
	Old	75	4	5.3		
Management	Extensive	411	12	2.9	3.95	0.14
	Semi-intensive	47	4	8.5		
Herd size	1 up to 5	135	3	2.2	2.195	0.33
	6-10	142	4	2.8		
	11-15	178	9	5.0		
Month	October	1	4	6.9	2.9	0.72
	November	70	2	2.9		
	December	67	3	4.5		
	January	114	3	2.6		
	February	102	3	2.9		
	March	48	1	2.1		
Stocking	Mixed	184	8	4.4	0.68	0.41
	Separated	275	8	2.9		

Table 4 shows the relation of potential risk factors with occurrence of hernia in inspected domestic animal in university of Gondar veterinary clinic during this study period. The prevalence of hernia was not significant among all suspected risk factors (p-value>0.05)

**Table 4:** Prevalence of hernia related to different risk factors.

Spps	Total record encountered	Hernia recorded	Prevalence
Bovine	4140	24	0.58%
Ovine	3419	10	0.29%
Equine	1023	—	—
Caprine	500	—	---
Canine	1676	—	---
Swine	7	—	---
Total	10,765	34	0.32%

**Table 5:** Prevalence of hernia in different species of animals during the retrospective study.

11.1% respectively. But, on that of equine, canine and caprine there was no any hernial case observed. This study also shows that there were different types of hernia encountered on live stock, which was abdominal, scrotal and umbilical hernia. As the result indicates the incidence of abdominal hernia were 62.5%, while that of scrotal and umbilical hernia accounts an incidence of 6.3% and 6.3% consecutively. Of these hernia 93.7% were acquired by trauma, and 6.3% congenital. Mechanical trauma was appeared to be the most common cause of hernia on the majority of domestic animals except calve.

The prevalence of abdominal hernia in domestic animals at the

Spss	Hernia recorded	Type of hernia recorded		
		Abdominal	Scrotal	Umbilical
Bovine	24	23	—	1
Ovine	10	9	1	—
Equine	—	—	—	—
Caprine	—	—	—	—
Canine	—	—	—	—
Swine	—	—	—	—
Total	34(0.32)	32(94.12%)	1(2.94%)	1(2.94%)

**Table 6:** Different types of hernia encountered in domestic animals.

present study was 2.83%. The current study shows that abdominal hernia were a more frequently observed injuries as compared to other types of hernias like scrotal and umbilical hernia. These variation type of hernia depends on a number of factors such as anatomical location of hernia site and management system. Environmental and /or animal handling factors can create predisposition to increase the prevalence of the hernia and some of the site of hernia were securely protected to be occur by trauma e.g., scrotal hernia which occur can during improper castration procedure and congenitally if there is enlarged inguinal ring. Scrotal hernia defects can be significantly affected by genetic and environmental factors. During this investigation there was a high occurrence of abdominal hernia in cattle and sheep, which have an estimated prevalence of 0.58% and 0.29% respectively. Majority of abdominal hernia in this species of animals were caused by traumas (93.7%) such as horn injury, castration and accidental fall. This might be due to mismanagement (like mixing of different species of animals during feeding and housing) and competition for feed. Also, it might be due to the higher sensitivity of the abdominal muscle for trauma since there were only a single layer of transverse abdominus muscle at the ventral side of the abdomen. Jubb [30] and Jettennavar et al. [31] who reports the prevalence of hernia in (cattle and sheep) accounts for 32.3%. So that the present study was slightly correlates with the previous above works.

With respect to species the prevalence of abdominal hernia were higher on cattle (62.5%) followed by sheep (31.3%), while that of scrotal hernia on pig (6.2%). However, there were no any hernial cases observed in case of equine, caprine and canine. But, the previous work reported by Al-sobayil and Ahemed indicated that abdominal hernia had the highest incidence both on sheep (68.2%) and goat (71.43%), while as Nagara et al. [32] in Veterinary Hospital Gadga indicate the incidence of abdominal hernia on bovine and ovine accounts 32.3%. But on current investigation, there was no any hernial cases examined on goat in the study area due to lack of goat population at clinic level (only 2 goat were present to Gondar university veterinary clinic), but also in case of horse there is no horn which reduce trauma and also our investigation on incidence of hernia on sheep were low which may be due to study methodology and management system.

During this investigation the incidence of scrotal hernia were 6.3% and it was encountered in swine and it was acquired, scrotal hernia in type and traumatic in origin. As the owner told us the trauma was as a result of faulty castration by owner's themselves. This finding were highly related with Robbers [20] he stated that scrotal hernia in small ruminant is rear disorder (although inguinal hernia is relatively common in bull, boar and ram [5]. However, scrotal hernia is rear because the anatomic narrowing of the vagina tunic with in the neck of the scrotum normally prevents the bowels from descending in to the scrotum [9]. In addition, this type of hernia is mostly acquired, and probably results of horn injury, increase intra-abdominal pressure during mounting [5,9,33,34]. However, congenital scrotal hernia has been reported at necropsy in two lambs [35].

During this investigation the estimated prevalence of umbilical hernia were 0.52% and these appeared just after birth, as the owner said these result at one week of the calf's age. This may be due to infection of umbilical cord after birth which more or less correlates with Herrmann et al. [36]. Who says the overall prevalence of congenital umbilical hernia was 1.8%. The prevalence of hernial ring in the first week of life can vary between 18 -24% depending up on the farm sampled. Umbilical hernias are the most common birth defects in calves, especially in Holstein-Friesians [19,24,37]; however, excess traction on an over sized fetus or cutting the umbilical cord too close the abdominal wall are other possible causes. Many umbilical hernias are secondary to umbilical sepsis [24]. They may occur as isolated defect or may be associated with defect of other part of the body [35,36]. In addition to hereditary, the etiology of an umbilical hernia may be an umbilical infection or abscesses [25]. In one study, almost all calves >1 month old showed a history of umbilical infection early in life. Very similar reported in other study, in which sire and umbilical infection were closely associated with umbilical hernia. The distribution of this hernia in calves by age and sex were accounts a value of 0% and 8.34% at a minimum age less than 2 and 4 week, and 40% and 20.84% at a maximum age of greater than 8 weeks for male and female calves respectively. Gender had an effect on the incidence of umbilical hernia. Female shows a higher incidence than males [38]. The result of the current study showed umbilical hernia were encountered in cattle (calve) at age of one week. During this investigation there was equally occurrence of hernia on both sexes (8 female case of hernia and 8 male case of hernia), so that sex has no effect on the prevalence of hernia in livestock since it was a mechanical injury in origin, most of the time it does not select a specific sex like other infectious disease. But, this finding were completely disagreed with that of Al-sobily and Ahmed [5] investigated in Qussim University in Saudi Arabia, which showed that the effect of gender on the incidence of hernia in sheep and got (female=37 and male=21). This difference might be due to the high rate of slaughtering of male animals at the time of severe injury and the female animals protected for further production purpose even if they were injured severely.

During risk factor analysis all selected risk factors were obtained as non significant ( $p>0.05$ ). As the result of the present study indicated hernia were occurs equally for all livestock that housed in grouped, fed in group/mixed (8 out of 184) and separated (8 out of 275) way of management. But, this result were disagreed with the previous work of Al-sobayil and Ahemed [5] they found that in grouped rams the incidence of hernia were higher and common. This might be due to missed information a bout there exact way of stocking system of their animal. Also, as the result reveals from a total of 411 animals that managed extensively, 2.92% animals were found with hernia, while from a total of 48 animals which kept under semi-intensive on 4 (8.51%) animals, different types of hernia were observed.

### Retrospective study

As the result gained from the retrospective study in GMOA veterinary clinics indicates (Table 6) from the total of 10,765 domestic animals obtained from record book of GMOA veterinary clinic a total of 0.32% prevalence of hernia was obtained in different species of domestic animals. Of this hernia problems majority of the hernia were occurs on bovine 0.23% (24 of 4140) followed by ovine 0.09% (10 of 3439). Also, as the result showed there was no any hernia cases or problems were encountered on canine, caprine and equines. But, there was a disagreement between the present observation and the retrospective study, even if majority of the hernias were found on bovine and ovine. on both studies, there was a variation on the result, for example; the estimated prevalence of hernia on domestic animals



during the current study were 2.1% on bovine, 1.09% on ovine and 0.22% on swine. But, when we see the estimated prevalence of hernia with that of the retrospective study it was 0.23% on bovine and 0.09% on ovine that recorded in GMOA (Gondar Main office of agriculture) veterinary clinic for the past five year. In addition, record on hernia of swine species were found only during the cross sectional study at a prevalence rate of 0.22%, but the retrospective investigation from 8 pigs treated at clinic, there were no occurrence of hernia on swine. All this variation might be most probably due to improper record management especially when there was a huge number of animals treat per day or a variation due to missing to record treated animal but also it may be due to lack of surgical instrument for treatment of hernia. This make retrospective data to be less as compared to cross sectional study.

Concerning the type of hernia obtained from record only abdominal, scrotal and umbilical hernia was observed in the case of cattle and sheep. The present study was also correlates with the previous reports, because the result shows that there was a rear occurrence of scrotal hernia in domestic animals. These results also have a similar estimation with the result of the retrospective data that was collected from clinic case books, which was 0.23% in cattle and 0.09% sheep.

## Conclusion and Recommendation

From the present study hernial cases were encountered in almost major domestic animals including cattle, swine and sheep under all age and sex categories related to different attributable causes, site and severity. Majority of the hernias that accounts in domestic animals are abdominal hernia followed by scrotal hernia and umbilical hernia. Cattle and sheep were known to be frequently affected by hernial problems, due to traumatic hernia which seem to happen in most of the cases were due to horn puncture and falling on sharp materials.

Moreover, there in services rendered for hernia management violet was used to be spilled over the hernia in majority of the cases.

From the above observations so far made the following recommendation are forwarded.

- Government should give attention on non infectious disease like hernia.

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