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An Abattoir-Based Study on Relative Prevalence of Histopathologic Patterns of Hepatic Lesions in One-Humped Camels (*Camelus deromedari*), Semnan, Iran

Keivan Jamshidi^{1*} and Afshin Zahedi²

¹Department of Veterinary Pathology, Faculty of Veterinary Medicine, Islamic Azad University, Garmsar Branch, Garmsar, Iran.

²Department of Veterinary Pathology, Faculty of Veterinary Medicine, Islamic Azad University, Rasht Branch, Rasht, Iran.

*Corresponding author: oia@iau-garmsar.ac.ir, drjamshidi2000@gmail.com

ABSTRACT

An abattoir based study was carried out during spring 2011 to investigate pathological conditions of the liver in camels (*Camelus deromedari*) slaughtered in Semnan slaughter house, Northerneast of Iran. In this study, 40 carcasses out of 150 randomly selected carcasses inspected at postmortem, found with liver lesions. Proper tissue samples obtained from livers with macroscopic lesions, fixed in 10% neutral buffer formaldehyde, processed for routin histopathological techniques, and finally embedded in paraffin blocks. Sections of 5µm thickness then cut and stained by H&E staining techniques.

In histopathological examination of hepatic tissue the following changes were observed:

Hydatid cysts; 65%, Cirrhosis; 10%, Hepatic lipidosis (Mild to Severe fatty changes); 12.5%, Glycogen deposition; 2.5%, Cholangitis; 2.8%, Cholangiohepatitis; 5%, Calcified hydatid cyst; 2.5%, Hepatic abscess; 2.5%, lipofuscin pigments; 17.5%. It is concluded that the highest and lowest prevalent patterns of hepatic lesions were Hydatid cysts and Hepatic abscess respectively.

Keywords: Camel, Liver, Lesion, Pathology, Slaughterhouse

The family Camelidae include two subfamilies: Camelinae (Old World Camelids) and Laminae (New World Camelids). There are two species

of camel within the genus *Camelus*. The Dromedary one-humped camel (*Camelus dromedaries*) is most widely distributed in the hot arid areas of the Middle East and Africa, whereas the Bactrian two-humped camel (*Camelus bactrianus*) is found in parts of central Asia and China (Dorman, 1986). Four species of the New World camelids are found in South America: the guanaco (*Lama guanacoe*) and the vicuna (*Vicugna vicugna*) are wild, whereas the llama (*Lama glama*) and the alpaca (*Lama pacos*) are domesticated (Murray, 1989 and Skidmore, 2005). The Llama and Alpaca are mainly used for meat and fibre production. The camel originated in North America and was domesticated by secondary nomads around 4000 years ago in South Arabia primarily for transport and labour rather than as a producer of meat, milk or clothing. The dromedary is more numerous than the Bactrian camel and represents almost 90% of the genus *Camelus*. Generally, there has been relatively little differentiation into specialized types in the camels (Wilson, 1998). Camels are multipurpose animals with females used primarily as milk producers, the males for transport or draught and both sexes providing meat as tertiary product. The dromedary camel (nicknamed as ship of desert) is a good source of meat especially in areas where the climate adversely affects the performance of other meat animals. This is because of its unique physiological characteristics, including a great tolerance to high temperatures, solar radiation, water scarcity, rough topography and poor vegetation (Kadim et al., 2005).

However, camels are generally raised in less developed countries and research for improving their reproductive and productive characteristics (Skidmore, 2005) particularly organ diseases has been limited. The liver diseases diversity and classification amongst the dromedary population are poorly documented. Most of the studies have been conducted, so far, in Iran and other countries, have focused on the incidence and prevalence of a particular disease of camels, and no one have yet focused on different patterns of hepatic lesions of camels.

The OIE (Office International des Epizooties) lists transmissible diseases of serious socio-economic or public health importance under lists A and B in the International Animal Health Code. This Code is applied as the standard by the World Trade Organisation member countries to meet their obligations for world trade under the *Sanitary and Phytosanitary Measures* agreement. Diseases listed in these sections, are discussed as

they relate to camels in Central Australia. The OIE list A diseases are “transmissible diseases that have the potential for very serious and rapid spread, irrespective of national borders, that are of serious socio-economic or public health consequence and that are of major importance in the international trade of animals and animal products.” List A diseases which are known or suspected to affect camels are: Bluetongue, Foot and mouth disease, Vesicular stomatitis, Rinderpest, Rift Valley fever (OIE, 2003)

The camel (*Camelus dromedarius*) found in Iran is a hardy animal with a unique physiological constitution that enables it to thrive under arid conditions. It is well adapted to the hot, dry desert areas of interior plateau of Iran, where it is isolated from many disease vectors and contagious diseases.

There are approximately 148,000 heads of dromedary camels in Iran, placing it at the 5th position in camel rearing countries in Asia. Out of this, majority of animals (50,000) are found in Sistan and Baluchestan (33.8%), which is the largest province, followed by Khorasan (27.7%), Kerman (9.59%), and Semnan (3.51%) (FAO, 2003). .

The objective of this study was to determine the relative incidence and prevalence rate of hepatic lesions and their classification in dromedary camels, on histopathologic basis, in Semnan district, Iran.

Materials and Methods:

In the present study which was conducted in Semnan slaughter house during the spring season 2010, out of 150 slaughtered camels, 100 camels were randomly examined postmortem. At the beginning all inspected livers were macroscopically examined for their texture, color and presence of lesion. Finally total of 40 livers were found with macroscopic changes. Proper samples were then obtained, in approximate size of 1×1×0.5 cm, fixed in 10% neutral buffer formaldehyde, and finally processed for routine histopathological processing and eventually H&E staining.

All microscopic slides were properly examined under light microscopy, proper microphotographs were taken, and finally incidence and percentage of different patterns of hepatic lesions were recorded.

Results

After proper examination of stained slides under light microscopy, the following histopathologic patterns of hepatic lesions were observed:

Hydatid cysts; 65%, Cirrhosis; 10%, Hepatic lipidosis (Mild to Severe fatty changes); 12.5%, Glycogen deposition; 2.5%, Cholangitis; 2.8%, Cholangiohepatitis; 5%, Calcified hydatid cyst; 2.5%, Hepatic abscess; 2.5%, lipofuscin pigments; 17.5%.

In the present study no neoplastic changes either primary or metastatic, inclusion bodies either intracytoplasmic or intranuclear, amyloidosis, congenital anomalies like congenital cysts, biliary atresia, or congenital vascular disorders were noted (Figs :1-5).

Discussion

Hydatid cyst disease is an important medical and veterinary problem in the world. It is a condition of livestock and humans that arises from eating infective eggs of the cestode *Echinococcus granulosus*. Domestic intermediate hosts (cattle, camel, sheep, goats and buffaloes) are major reservoirs for the disease in humans.

The hydatid cysts were composed of different layers containing from inward, a thin syncytial germinal layer, an acellular lamellar hyaline outer layer, and a capsule containing inner portion of the fibrous capsule comprised of mature collagenous connective tissue that was relatively acellular, and an outer portion of the fibrous capsule, a layer of granulation tissue containing round cells and eosinophils.

In this study, Cystic Echinococcosis (CE) lesions of 65% in camels was indicated. This is in agreement with similar study by (Borji and Parandeh, 2010) in which almost 92.4% of the condemned liver were rejected because of parasitic infection. The parasitic lesions observed in the condemned livers in Khorasan province were attributed to *E. granulosus*, *F. hepatica* and / or *D. dendriticum* (cattle, sheep and goats) or entirely to *E. granulosus* (camels). According to the (Njoroge *et al.*, 2002), CE was shown to be highest in camels, (61.4%).

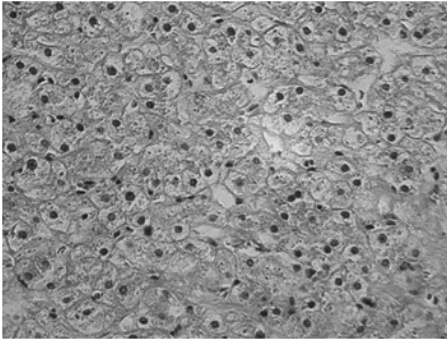


Fig 1: Glycogen deposition. Intracellular vacuoles formation and centrally located nuclei are suggestive of glycogen deposition in hepatocytes. × 100

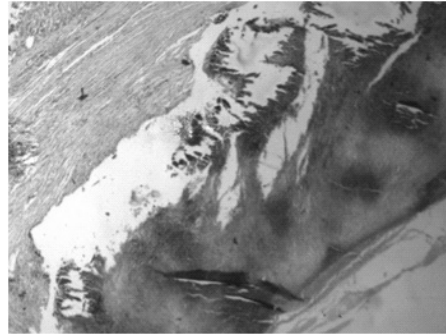


Fig. 2: Calcified hydatid cyst. Occurs as the result of degeneration of hydatid cyst, in which the inner structure collapsed and the mass became mineralized. × 40

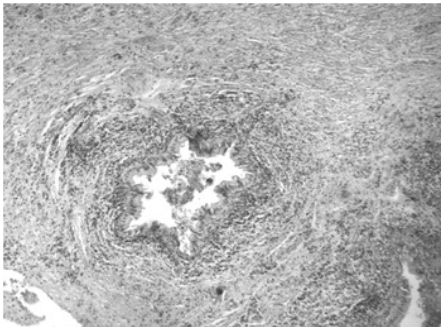


Fig. 3. Lipidosis: Microscopic appearance of liver with lipidosis. Note the single, clear and large vacuoles within the hepatocytes which have displaced nucleoli to periphery. × 40

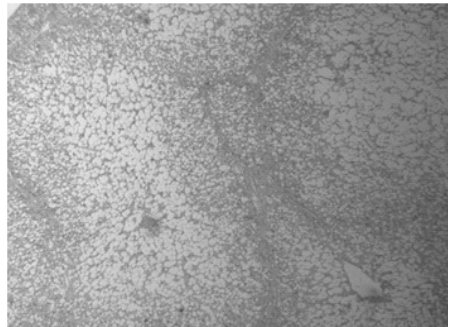


Fig. 4. Chronic cholangiohepatitis / portal fibrosis: Inflammation of biliary tract and surrounding parenchyma, along with significant fibrosis. × 40

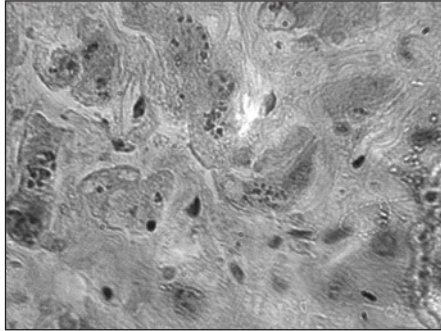


Fig. 5: Lipofuscin: note the golden brown pigments within the hepatocytes.× 100

This figure is much similar to the result obtained by the present study. Camel may play an important role in the epidemiology of this disease in the area. In general, livestock infection vary from one country to the other, but countries with known hyper endemic infection with cystic echinococcosis include Kenya, Nigeria, Somalia, Sudan, Swaziland, and Uganda. In these countries, hydatid disease occurs in more than 10% of cattle. Nevertheless, the observed frequency of hydatid cysts and *C. tenuicollis* and liver fasciolosis at slaughter house should be considered as a risk for public health since they are zoonotic (Mellau et al , 2010).

In contrast, low level of infection rates of HC were reported by (Njoroge et al., 2002) and (Ansari-Lari, 2005).

The differences in prevalence of HC may arise due to differences in environmental conditions that are conducive to the perpetuation of the parasite, abundance of infected definitive host, livestock husbandry, stocking rate, nature of the pasture and grazing patterns of animals.

In this study 12.40% cirrhosis was recorded in slaughtered camels liver. Cirrhotic liver is characterized by hard and leatherly in consistency. In such livers capsule were wrinkled, and there were some whitish spots, slightly depressed and were focally distributed in the parenchyma of the liver. Considerable proliferation of fibrous connective tissue were marked mainly in the portal areas. Numerous newly formed bile ducts and nodular regeneration in cirrhotic liver have been observed in the present study. Similar lesions of cirrhosis (9.86%) was recorded in cattle liver by (Basak et al., 2011) in his study in Bangladesh, and (Dawes,1963a) and (Gupta, 1983) too.

In 12.5% of cases, mild to severe accumulation of lipid within the hepatocytes (hepatic lipidosis, fatty change) was observed, which might be due to either excessive rate of triglyceride metabolic degradation or their release as lipoproteins. As this change was observed in many cases under study, it is proposed that the preslaughter condition of transport, which forced animals to use their readily available energy source, might be the etiology. Similar lesions with lower result (5.1%) was also reported by (Tej Singh et al., 2006).

Abscess was found in 0.4% cases in the present study. Histopathological changes were characterised by the presence of polymorphonuclear leukocytes at the center surrounded by thin fibrous capsules. Hepatic abscess has been reported by others in different countries in livestock. (Ahmadallah et al., 2007) and (Basak et al., 2011) in their studies also reported higher results in buffalo (3.75%) and cattle (3.95%) respectively. Raji et al., 2010 also reported almost the same result as 4.55% abscess in liver of cattle. This much lower percentage of hepatic abscess in camel, might be due to this reason that this animal fed on semi desert pastures and not being kept under intensive farming husbandry as being adapted by cattle.

In 2.5% of cases, excessive accumulation of glycogen within the hepatocytes was observed. As this lesion was observed in only one liver out of 40 apparently abnormal livers (out of 100 examined livers), the cause of this individual disorder could be related to certain metabolic perturbations involving glucose regulation, including diabetes mellitus and glycogen storage disease. For confirmed diagnosis, special staining is needed.

In 6% of cases acute hepatitis was detected, in which the proportion and type of inflammatory cells involved varied considerably depending on the cause of inflammation, the host response, and the stage or age of the lesion. In many forms of acute hepatitis detected in this study, neutrophilic accumulations in response to the usual chemotactic stimuli were observed, which are suggested to be of bacterial and protozoal in origin. Those cases of acute hepatitis in which the lymphocytic infiltration was the predominant inflammatory cells, might be due to certain viral infection, such as herpesvirus.

In 20% of cases lipofuscin pigments were found in hepatocytes. It is the term given to small, golden, granular cytoplasmic deposits derived from the lipid component of membranous organelles. Lipofuscin accumulates in hepatocellular lysosomes and indicates senility, atrophy, or increased turnover of membrane lipids. The pigment is particularly common in the liver of old animals. In this study these pigments were observed in livers belong to camels older than 25 years old.

Calcified cysts (Mineralized hydatid cysts), occurring as the result of degeneration of hydatid cysts, in which the inner structure collapsed and the mass became mineralized were also among the lesions which significantly contributed to the liver condemnation in camel (2.5%) in the present study. Our findings is almost similar to the results obtained by Mellau et al (2010) in cattle (1.9%), sheep (1.1%) and goats (1.8%) respectively. Higher from the current finding, (Swai and Ulicky, 2009) reported a prevalence of 7.3% of calcified cysts in Hai Tanzania. The actual causes of the cysts was not established but a number of parasitic conditions can be listed like hydatidosis, *C. tenuicollis*, *C. bovis*, *Linguatula larvae* and toxocariasis (Mellau et al , 2010).

Cholangitis and Cholangiohepatitis were recorded in 7.5% and 5% of cases respectively. Cholangitis is characterized by inflammation that is centered on the biliary tract and cholangiohepatitis is characterized by inflammation that affects both the biliary ducts and hepatic paranchyma, and are supposed to be the result of an extension of biliary disease involving the periportal hepatocytes.

The findings of this study show the prevalence of liver diseases in camels slaughtered at Semnan abattoir, north eastern Iran. and hydatosis was the leading cause of condemnation of the liver, in this species. The fact that only clinically healthy camels are slaughtered the true prevalence of different liver diseases could probably be much higher as many cases were likely to remain unnoticed or undiagnosed because of meat inspectors' personal error, non-cooperativeness of the butchers, use of gross pathology in the diagnosis of the diseases and general poor record keeping. Furthermore, given the large size of the liver in camel and inadequate meat inspectors, it is also possible that prevalence of some diseases has been underestimated. Furthermore, some livers with localized or partial infection might have been passed as fit for human consumption after trimming off the affected

parts of which such cases might have not been recorded. This merits for more extensive epidemiological investigations to better determine the prevalence, economic impact and the public health importance of the diseases. Although, abattoir surveys have limitations, they are an economical way of gathering information on livestock diseases.

Despite all its ecological and economic importance and significant role in the life of pastoral community, until recently the animals were neglected by researchers and development planners in Iran.

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