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UNDERSTANDING ECHINOCOCCOSIS: A REVIEW OF ITS EPIDEMIOLOGICAL OUTLOOK

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ABSTRACT: Echinococcosis is an ignored silent cyclozoonotic illness in many resource-poor pastoral regions impacting a variety of animal species, such as wildlife and cattle, causes of substantial morbidity and mortality and it also has zoonotic implications. The damage produced by these tapeworm larvae constitutes a complicated and multi-faceted threat to human health. This manuscript digs into the essence of this parasite ailment, examining its causative agents, varied forms, and perilous dissemination. The diagnosis becomes a detective story, employing immunological clues and imaging's vigilant eye. Finally, the vital role of prevention, a harmonious concerto including deworming, hygiene, and education, takes the stage, trying to silence the parasite's silent melody. This abstract is a call to action, a rallying cry against the silent pain produced by echinococcosis. Echinococcosis, with its many forms and convoluted life cycle, reminds us of the intricate interactions between people, animals, and the environment in the world of infectious diseases. By understanding its complexities, we may work towards effective prevention, diagnosis, and treatment, guaranteeing a safer travel for all.

Key words: Echinococcosis, Cattle, Zoonotic, Deworming, Infectious disease.

INTRODUCTION

Echinococcosis, a significant zoonotic illness caused by cestodes belonging to the genus *Echinococcus*, is found globally (Horton 2023). The two primary types are cystic echinococcosis (CE) and alveolar echinococcosis (AE), which arise from the metacestodes of *Echinococcus granulosus* and *E. multilocularis*, respectively. Carnivores serve as the definitive hosts for CE, also known as hydatidosis, while herbivores act as intermediate hosts; humans typically experience accidental infections through contact with carnivores. The larval forms of *E. granulosus* can invade the internal organs of both animals and humans, leading to significant health issues and fatalities. India accounts for the highest incidence of CE globally, representing 12% of all cases. Beyond the health implications for humans and animals, economic repercussions in

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livestock include production losses, condemnation of affected carcasses, and decreased reproductive efficiency, with many losses often going unreported (krauss *et al.*, 2003). In humans, approximately 871,000 disability-adjusted life years (DALYs) each year illustrate the severity of the disease. Several risk factors compound the issue in India, including illegal slaughter practices in unregulated facilities, a large population of stray dogs, the rural reliance on livestock farming, and the habit of feeding dogs with the offal of home-slaughtered animals. These factors facilitate the spread of CE, rendering it a public health, veterinary, and social concern. Comprehensive and systematic surveillance, along with awareness campaigns about its zoonotic potential, is essential for addressing this crisis (Grakh *et al.*, 2020).

In western China, both cystic echinococcosis (CE) and alveolar echinococcosis (AE) remain highly prevalent. Recent years have seen significant progress in understanding the genetics, genomics, and molecular epidemiology of *Echinococcus* species, along with improvements in diagnostics, treatment strategies, and disease control efforts. Notable surgical advancements—such as total cystectomy for CE and auto-transplantation for AE—alongside percutaneous and endoscopic innovations, have enhanced treatment outcomes and patient quality of life.

Despite these advances, albendazole remains the sole pharmacological option for treating echinococcosis, underscoring the urgent need for new therapeutic agents. Continued research in genomics and proteomics holds promise for improving diagnostics and identifying novel targets for drug and vaccine development, which could fundamentally reshape future control and prevention strategies for CE and AE.

Echinococcosis primarily stems from two serious zoonotic tapeworm infections: cystic echinococcosis (CE) caused by Echinococcus granulosus sensu lato, and alveolar echinococcosis (AE) caused by Echinococcus multilocularis (McManus *et al.,* 2012). While CE is more widespread and prevalent globally, specific island nations have reported successful elimination (Craig and Larrieu 2006). In areas where the disease is endemic, CE's annual incidence ranges from less than 1 to 200 cases per 100,000, compared to AE, which falls between 0.03 and 1.2 per 100,000 (Schweiger *et al.*, 2007). The mortality rate for untreated or inadequately treated patients with AE exceeds 90% within 10 to 15 years post-diagnosis, whereas CE has a lower mortality rate of 2% to 4%, which can increase substantially due to inadequate management. Echinococcosis, commonly referred to as hydatid disease, arises from infections with either *Echinococcus granulosus* or *Echinococcus multilocularis* tapeworms. Infection occurs when individuals ingest eggs of tapeworm found in contaminated food. Once ingested when the eggs hatch and form cysts within body. Cyst refers to

shut pocket or pouch that continues to grow and causes a variety of symptoms. *E. granulosus* typically infects canines and livestock, including goats, sheep, pigs and cattle, with the tapeworm measuring between 2 to 7 mm in length. The main effect of this illness is development of cysts in the lungs as well as in the heart, bones, and brain damage may also occur. In contrast, *E. multilocularis* infections are caused by tapeworms which cause diseases in dogs, cats, rodents, and foxes are 1 to 4 mm long. Because it causes growths that resemble tumours and can affect the brain and lungs, this invasive disease poses a threat to life. Children are typically more susceptible to infection.

Cystic echinococcosis (CE) and alveolar echinococcosis (AE) impose a significant global health burden, with CE alone accounting for an estimated 285,500 disability-adjusted life years (DALYs), a figure that may exceed 1 million when underreporting is considered. AE contributes an additional 666,434 DALYs globally (Budke et al. 2006, 2013; Torgerson et al. 2010; Frider et al. 1999). Recognizing the severity of these diseases, the World Health Organization (WHO) has classified echinococcosis among 17 neglected tropical diseases prioritized for control or elimination by 2050. Despite recent advancements that could transform current management approaches, there remains an urgent need for better diagnostic tools and the development of novel pharmacological treatments and vaccines. Current diagnostic methods are limited, and existing treatments—particularly albendazole—have issues related to toxicity, suboptimal efficacy, and surgical limitations. These challenges underscore the necessity for intensified research and investment in prevention, control, and therapeutic innovation.

The biology and lifecycle of *Echinococcus* spp. have been reviewed, correlating with the clinical manifestations, epidemiology and transmission of echinococcosis. The diagnosis has advanced diagnosis, medical treatment, management, prevention, and control of both disease types, alongside insights from genomic and transcriptomic studies revealing the developmental biology. Understanding biodiversity and interactions with mammalian hosts presents an opportunity for crafting effective new interventions and treatments against echinococcosis. Echinococcosis has emerged as a zoonotic disease transmitted to humans, both directly and indirectly, from canine species. This parasitic illness results from the *Echinococcus* metacestode stage. While adult forms aren't pathogenic, the encysted larval stages can lead to severe injuries in people. Consequently, echinococcosis is a serious issue of public health, especially in emerging countries with limited financial resources (Otero-Abad & Torgerson, 2013). The hydatid worm, typically measures around 5 mm long, featuring three proglottids and four suckers on its scolex (Stallbaumer, 1996). Humans become infected by consuming food contaminated with the larval

stages of *Taenia* cestodes from dog feces (Grakh *et al.,* 2020). Only four of the six species that have been identified are significant for human health: *Echinococcus granulosus* (causing cystic echinococcosis), *E. multilocularis* (responsible for alveolar echinococcosis), *E. vogeli*, and *E. oligarthrus* (which lead to polycystic echinococcosis) (Moro & Schantz, 2009).

Classification: Scientific classification: *Echinococcus granulosus* Phylum: Platyhelminthes, Class: Cestoda, Order: Cyclophyllidea, Family: Taeniidae Genus: *Echinococcus,* Species: *E. granulosus*(Batsch 1786) Common name: Hydatid worm, hyper tape-worm or dog tapeworm.

Geographical distribution: Hydatid disease is found worldwide but is especially prevalent in regions with cattle and sheep farming, where there is a close interrelationship among humans, sheep, and dogs. Temperate climates are more conducive to the spread of this disease compared to tropical regions. In areas of Africa, Central Asia, Southern South America, the Mediterranean, and the Middle East are mostly endemic. In the United States, sporadic cases have been reported in California, Arizona, New Mexico, and Utah. Cystic echinococcosis from *Echinococcus granulosus* is recognized as one of the most critical zoonoses globally, with the most prevalent in countries such as Russia, China, Northern and Eastern Africa, Australia, South America, and Europe. The yearly occurrence in India, varies from 1 to 200 cases per 100,000 individuals, particularly in regions like Kashmir, Andhra Pradesh, Tamil Nadu, and Central India, where higher prevalence rates have been documented (Parikh, 2012).

Morphology: Adult worm: A small tapeworm measuring 3 to 6 mm in length, distinguished by a body that is separated into three sections (often four), which include a head or scolex, neck and strobila. The segments are immature, in the first, mature in the second, and gravid in the third (and potentially fourth) segments. The final section is noticeably bigger, approximately 0.6mm in width and 2-3 mm in length. The head possess four suckers and a retractable rostellum having two circular rows of hooks. The neck is thick and short.

Egg: Oval-shaped, measuring about 25-32 µm in breadth and 32-36 µm in length containing a hexacanth embryo with 06 hooks. This egg has the ability of infecting humans, cattle, sheep, and other herbivores.

Larval form: In intermediate hosts, hydatid cysts develop, representing the shape of the adult worm's scolex, which is still invaginated in a vesicular body. Upon entering the definitive host, the scolex with four suckers and rostellar hooklets becomes extruded and develops into the adult worm (Fig. 2).

Epidemiology: Epidemiological studies of echinococcosis involve analyzing data to understand disease distribution, spread, evolution, and the strategies for prevention or control. This includes examining factors such as age, gender,

socioeconomic status, behavior, and environmental context(Moro & Schantz 2009). Echinococcosis is classified as one of the seventeen neglected human diseases worldwide, with over one million human cases documented (Vuitton & The Coordinating Board of the WHO-IWGE, 1997). It is distributed globally among human and animal populations, with the highest incidences found in parts of Eurasia, Africa, Antarctica, and South America (Eckert, 2003). Human infections of cystic echinococcosis range from fewer than 1 case per 100,000 to more than 200 per 100,000 in certain rural communities closely associated with domestic dogs. The incidence of human alveolar echinococcosis usually remains below 0.5 per 100,000, but may exceed 100 per 100,000 in specific areas.

Life Cycle: The life cycle involves two types of hosts.

Definitive hosts: Include dogs, wolves, foxes, and cattle.

Intermediate hosts: Comprise sheep, pigs, cattle, horses, goats, and humans. *Echinococcus granulosus* has indirect life cycles involving the encystment of larvae (metacestodes) within the tissues of intermediate hosts, facilitated by carnivorous behaviors. Adult worms (2-7 mm long) reside in the small intestine of the definitive host, where gravid proglottids release eggs in feces, which are immediately infectious. Once inside the small intestine, eggs hatch, releasing six-hooked oncospheres that infiltrate the liver and lungs. In these organs, the oncospheres mature into thick-walled hydatid cysts that produce daughter cysts (protoscolices).

Pathology of Echinococcosis: When eggs from animal feces, often found on the fur of dogs or other animals, are ingested, they hatch in the gastrointestinal tract, releasing oncospheres, immature parasite forms enveloped within an embryonic layer. These oncospheres penetrate the intestinal wall, enter the bloodstream, and subsequently lodge in the liver, lungs, or, less commonly, the brain, bones, or various other tissues. Adult worms do not inhabit the human gastrointestinal tract. The oncospheres of E. granulosus develop into cysts in tissues, gradually enlarging, often spanning many years, into extensive unilocular fluid-filled lesions known as hydatid cysts(Cosgrove & Doherty 2010). These cysts generate brood capsules filled with hundreds of small infective protoscolices. A large cyst may contain over 1 liter of highly antigenic hydatid fluid, harboring several million protoscolices, and daughter cysts can form both inside and outside the main cyst. If a liver cyst ruptures, the infection can disseminate into the peritoneum.

Echinococcus Life Cycle: Echinococcus multilocularis causes spongiform lesions characterized by locally invasive growth, often rendering surgical treatment difficult or impossible. These cysts primarily develop in the liver but can also occur in the lungs or other organs. Although individual cysts remain

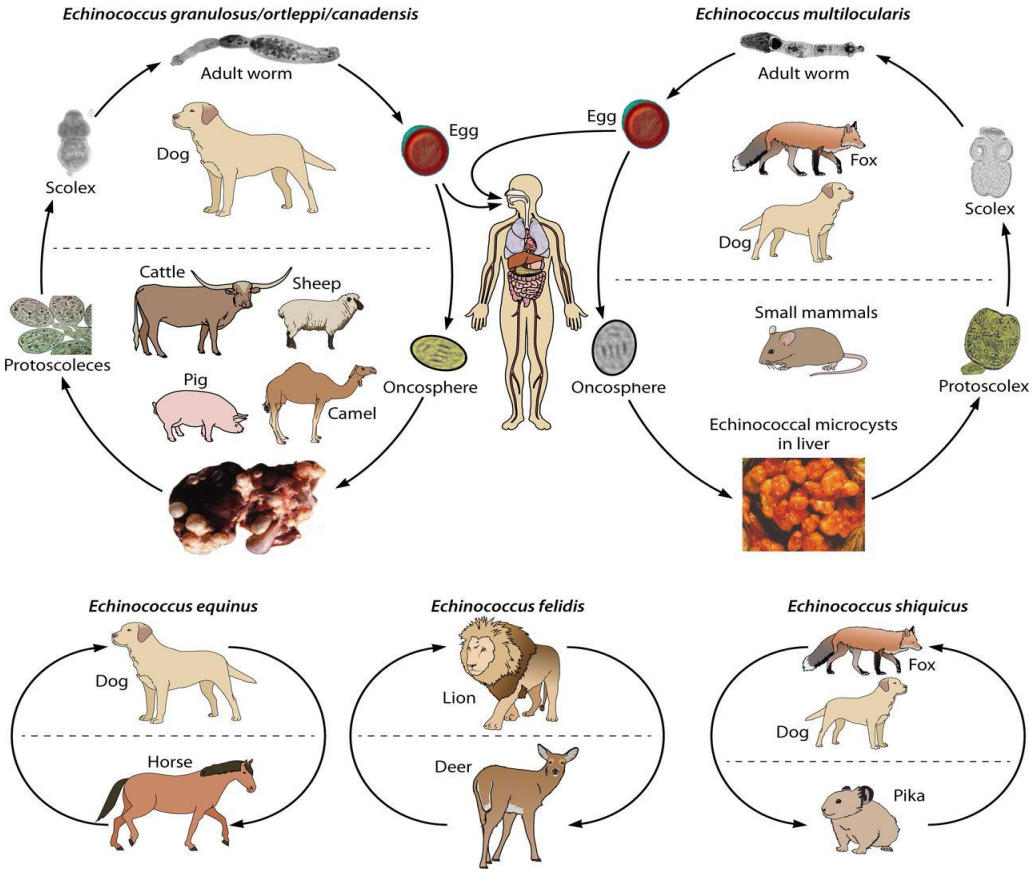

Fig. 1. Life cycles of *Echinococcus* spp. cause human infection (namely*E. granulosus* , *E. ortleppi*, and *E. canadensis* [within *E. granulosus* sensu lato] and *E. multilocularis*) are illustrated at the top of the figure. In contrast, the species shown at the bottom (*E. shiquicus*, closely related to *E. multilocularis*, as well as *E. equinus* and *E. felidis*, (both within *E. granulosus* sensu lato) -are not currently recognized as human pathogen. The diagram depicts only the primary definitive and intermediate hosts involved in transmission; however, additional hosts particularly wildlife hosts for *E. granulosus* sensu lato and domestic animals for *E. multilocularis*)may also play roles in the parasite's ecology.Notably, *E. vogeli* and *E. oligarthra*, which are responsible for polycystic echinococcosis in humans in Central and South America, are not included in this figure (Won *et al.* 2019).

small, their infiltrative behavior damages surrounding tissues, potentially resulting in hepatic failure and death. The definitive host becomes infected by ingesting cyst-containing organs from an infected intermediate host. Upon ingestion, the daughter cysts evaginate and attach to the intestinal mucosa, maturing into adult worms within 32 to 80 days. Humans serve as aberrant intermediate hosts, acquiring infection through ingestion of eggs. Once in the intestine, oncospheres are released, leading to hydatid cyst formation—mainly in the liver or lungs. If a cyst ruptures, whether spontaneously or due to trauma, liberated protoscolices can seed secondary cysts at other sites, causing secondary echinococcosis (Echinococcosis, CDC 2023). Risk factors for infection include exposure to feces of cattle, deer, dogs, foxes, wolves, or coyotes, as well as contact with pigs, sheep, and camel.

Diagnosis and Symptoms: Diagnosis of echinococcosis in definitive hosts relies on the detection of adult worms through post-mortem examinations, diagnostic testing, arecoline purgation, or identification of proglottids (tapeworm segments) in feces. In intermediate hosts, diagnosis is typically based on the post-mortem identification of cysts, particularly in the liver and lungs, as seen in cases of *E. granulosus* (Guiral et al., 2004). Cysts may remain asymptomatic for a decade or longer; symptoms generally arise once the disease has progressed and cysts enlarge. Clinical signs include right upper abdominal pain caused by liver cysts, abdominal swelling due to cyst enlargement, coughing with blood or bloody sputum, chest pain, and cough associated with lung cysts. An acute allergic reaction, or anaphylaxis, can occur if cysts rupture (Finla et al., 1999).

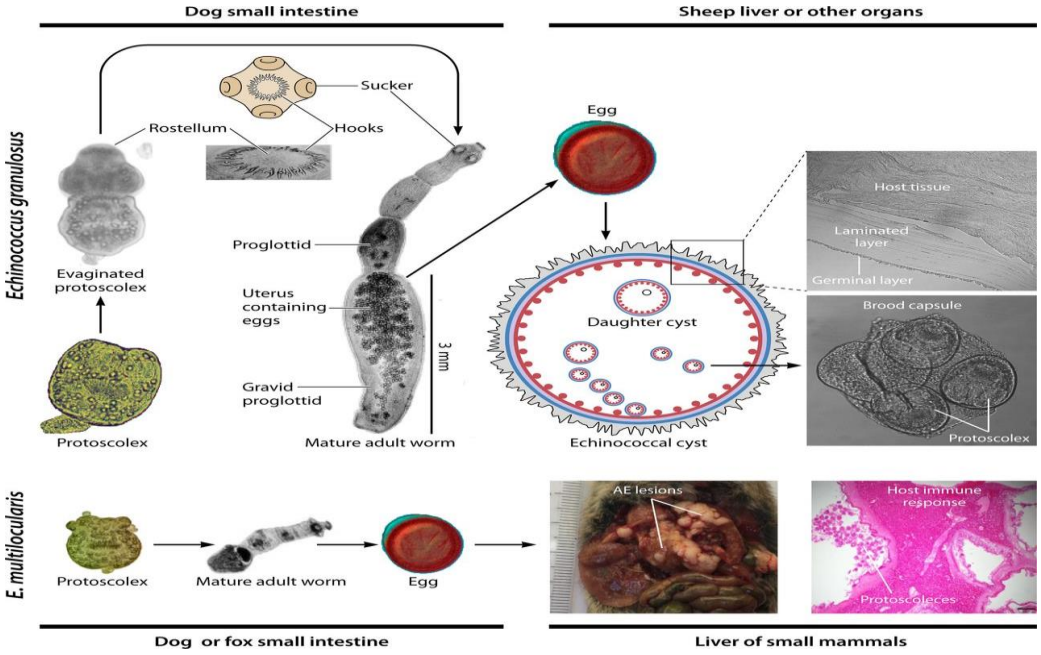

Fig. 2. Echinococcus granulosus and *E. multilocularis* development phases are depicted. Larval cysts can grow indefinitely, particularly in *E. granulosus* (adopted from, Guiral et al., 2004)

Echinococcus spp. tapeworms lack digestive, circulatory, and respiratory organs, relying instead on a highly adapted parasitic relationship with their mammalian hosts for nutrient acquisition, as well as for modulating signaling pathways and neuroendocrine functions. A remarkable feature of cestode biology is strobilization, a process by which proglottids (segments) bud from the anterior scolex, forming a chain of tandem reproductive units at varying stages of development. *Echinococcus* is monoecious, and the terminal segment, known as the gravid proglottid, produces diploid eggs that develop into ovoid embryos called oncospheres. A unique aspect of *Echinococcus* biology is the dual developmental potential of the protoscolex: it can mature into an adult

tapeworm within the intestine of a definitive host (typically a canid), where it produces sexually derived eggs, or—if released through cyst rupture in an intermediate or human host—it can differentiate asexually into a new cyst, a process known as secondary echinococcosis. The larval stage of *E. granulosus* develops into a unilocular, fluid-filled hydatid cyst, whereas the metacestode of *E. multilocularis* forms a cluster of small, multilocular vesicles, which are embedded within the host's immune response—characterized by granuloma formation and fibrosis. These vesicles proliferate via cells in the germinal layer of the metacestode (Won *et al.,* 2019).

Prevention and Control: The efficiency of hydatid disease prevention programs may be increased by improvements in diagnosis and therapy for human and animal cystic echinococcosis, as well as by the genomic characterisation of strains and vaccination campaigns for *Echinococcus granulosus* in animals (Ma *et al.*, 2020). Due to the consistent use of control methods like dog deworming, education on public health, inspection of meat, and careful surveillance in both cattle and human populations, human cystic echinococcus (CE) has dramatically decreased in a number of endemic regions. In contrast, echinococcosis has been a rise in human alveolar membrane (AE) throughout continental Europe. Challenges persist in controlling AE, necessitating effective interventions in resource-limited communities, improved access to surveillance tools, optimal livestock vaccination methods, and better management of dog and wildlife host populations. Preventive strategies for controlling CE and AE encompass: avoiding contact with wild animals like foxes, wolves, and coyotes, steering clear of stray dogs, washing hands thoroughly after interacting with pet dogs or cats, and before handling food.

The ongoing control of *Echinococcus* spp. transmission presents a significant hurdle; however, accurately identifying specific infecting genotypes could enable public health organizations to streamline and enhance the efficiency of control measures. Wild animals' role in the life cycle of *Echinococcus* complicates disease control, heavily influenced by environmental and climate changes. Notable developments in diagnostics based on molecular biology to detect *Echinococcus* spp. in definitive hosts and environmental samples may simplify the monitoring of control programs. Finding the best targets for vaccine development that may successfully break human transmission chains will be a challenge in managing AE and CE in the future, in line with the WHO's objective of eradicating echinococcosis by 2050 (Mal *et al* 2020).

MATERIAL AND METHODS

The articles were searched using Google Scholar, PUBMED, ResearchGate applying the key words- *Echinococcus granulosus*, Echinococcosis - Infectious

Diseases, *Echinococcus* Life Cycle, Current state of echinococcosis diagnosis and therapy etc. from 1996-2023, a total of 31 articles were reviewed, and pertinent data were collected.

RESULT AND DISCUSSION

Echinococcosis imposes a substantial economic burden globally, stemming from both human health care costs and productivity losses in livestock. The global disease burden of cystic echinococcosis (CE) and alveolar echinococcosis (AE) has been estimated at approximately 1 million and 600,000 disability-adjusted life years (DALYs), respectively. In response, the World Health Organization (WHO) has recently advocated for a veterinary public health strategy as a critical component of comprehensive control efforts. This paper presents a detailed analysis of parameters strongly associated with *Echinococcus* infection in animal hosts, aiming to enhance understanding of the parasite's epidemiology. Such insights are essential for developing targeted and effective control measures to reduce transmission to humans. Additionally, environmental factors—such as high elevation and increased annual rainfall—have been identified as being significantly associated with CE prevalence in animals.

E. granulosus's primary life cycle occurs in a cycle of synanthropy with house dogs and cattle. The incidence and severity of canine echinococcosis have been found to be influenced by several factors. The most important of them is that dogs may get access to tainted and undercooked offal. Understanding the epidemiology of *Echinococcus* in animal hosts is essential for developing an effective control strategy. During the winter, when more animals are killed for winter food, dogs from a semi-adventural pastoral group displayed greater degree of infection. Being a farming dog has been linked to an increased risk of contracting *E. granulosus* since these dogs tend to interact with animals more frequently, which could be seen as a substitute for searching on contaminated bodies.

Cystic echinococcosis (CE), though commonly found in Bangladesh, remains poorly understood in terms of its epidemiology and clinical characteristics. This retrospective study reviewed hospital records from tertiary referral centers in Dhaka between 2002 and 2011 to analyze 130 cases of abdominal and hepatic CE. The majority of patients were female (70.8%) and predominantly from rural areas (76.2%). All cases originated from the northern regions of the country, with none reported from the south or southeast.

Most patients were aged 21–40 years, and nearly all presented with liver cysts; only 8.5% had cysts in multiple sites, including the lungs or abdominal cavity. CE1-stage cysts, indicating recent infections, accounted for 58.5% of hepatic cases, suggesting ongoing transmission of *Echinococcus granulosus* in the community. Various factors such as sex, age, education, occupation, water source, and dog ownership were considered in the analysis. The findings

highlight the urgent need for community-based ultrasonography screening and further research into transmission dynamics and regional risk factors.

Pathogenicity: In many parts of the world, echinococcosis consider as an endemic zoonosis. The larval stages can parasitise the liver, lungs and other parts of humans, sheep, cattle, buffalo, pigs and other animals (Otero-Abad & Torgerson, 2013).

Table 1. Region wise prevalence(%) of *Echinococcus granulosus* in intermediate host

Region	Prevalence						References
	Dogs	Cats	Human	Sheep	Buffalo	Cattle	
Asia	73-87%		36%	50%	33.06%	38.90-44%	(Alvi & Alsayeqh, 2022)
Africa	82.1%		40%				
North/ South America							& (Grakh, *et al.*2020)
Europe		5.3%	65%		10.24%	40.1%	

Table 2. Influences of Risk factors in different host species

Risk factors	Causative agents	Host	References
- Feeding with raw viscera, stray dog or being untied or free to roam - Dogs owners' ethnic origin (linked with poor health education and deprived living conditions)	*E. granulosus*	Dog (definitive host)	(Otero-Abad & Torgerson, 2013) (Horton, 1997)
Increasing hosts' age, geographical location, meteorological conditions, female gender, host species and type of farming management	*E. granulosus*	Domestic livestock (intermediate hosts)	
- Hosts' age, female gender and hosts' densities	*E. granulosus*	Wild life (intermediate hosts)	
- Being a young and/or male fox - Climatic conditions and geographic location (marked spatial distribution) - Host population dynamics and interactions with intermediate hosts	*E. multilocularis*	Fox (definitive host)	(Nabarro *et al.*, 2014)
- Feeding with raw viscera, being hunting dogs or free to roam and availability of rodents	*E. multilocularis*	Other canids (definitive host)	(Bildik *et al.*, 2007)
- Increasing adult age - Meteorological and geographical conditions - Rodent's densitie	*E. multilocularis*	Rodents (intermediate hosts)	

Table 3. Taxonomy, Host Specificity and Geographic Distribution of The genus *Echinococcus*

Species	Definitive host (s)	Intermediate host(s)	Human cases	Distribution
Echinococcus granulosus sensu stricto	Household dog, dingo, jackal, wolf other canids	Sheep, goat, cattle, pig, camel, buffalo, horse, wild ungulates, marsupials, etc.	Yes	Cosmopolitan
Echinococcus canadensis	Domestic dog, wolf	Pig, camel, cervids	Yes	Eurasia, Africa, North and South America
Echinococcus ortleppi	Domestic dog	Cattle	Yes	Eurasia, Africa
Echinococcus felidis	Lion	Various antelopes,hyena, warthog, zebra, wildebeest, bush pig, buffalo, giraffe, *Hippopotamus*	Not reported	Africa
Echinococcus equinus	Household dog	Horse, other equids, cervids	Not reported	Eurasia, Africa
Echinococcus multilocularis	Wolf, raccoon dog, domestic dog, cat, All fox species	Small herbivorous mammals, including lagomorphs (e.g., pika); Arvicoline and microtine rodents pigs, boars, horses, cattle, nonhuman primates, and dogs are accidental hosts	Yes	Eurasia, North America
Echinococcus oligarthra	Wild felids (e.g., *Puma concolor* [puma])	*Didelphis marsupialis* (opossum), *Dasyprocta azarae* (agouti),	Yes	Central and South America
Echinococcus vogeli	Bush dog, domestic dog	*Cuniculus paca* Linnaeus, 1766 (paca)	Yes	Central and South America
Echinococcus	Tibetan fox	*Ochotona curzoniae* (Tibetan plateau pika)	Not reported	Tibetan Plateau
		Microtine rodents and small herbivorous mammals, including lagomorphs (e.g., pika); pigs, boars, horses, cattle, nutrias, nonhuman primates, Arvicoline and dogs are accidental hosts	Yes	Eurasia, North America
Echinococcus oligarthra	Wild felids (e.g., *Puma concolor* [puma])	*Didelphis marsupialis* (opossum), *Dasyprocta azarae* (agouti),	Yes	Central and South America
Echinococcus vogeli	Domestic dog, Bush dog	*Cuniculus paca* Linnaeus, 1766 (paca)	Yes	Central and South America
Echinococcus	Fox(Tibetan)	*Ochotona curzoniae* (Tibetan plateau pika)	Not reported	Tibetan Plateau

Table 4. Characteristics of hydatid cysts in different livestock

Types of hydatid cyst	Camel		Sheep		Cattle		Human		References
	Liver	Lung	Liver	Lung	Liver	Lung	Liver	Lung	
Fertile	68%	75%	26%	21%	8%	38%	66%	75%	(Mandal &
Sterile	11%	10%	15%	31%	38%	25%	23%	24%	Deb
Calcified	28%	10%	62%	50%	55%	50%	9%	0	Mandal, 2012)

Because of the participation of canines, it is of veterinary and socioeconomic relevance around the world. Because encysted larval stages are often restricted to visceral tissues, they rarely cause clinical illness in domestic livestock. Depending on the location of the cyst, Hydatidosis might seem like a variety of other illnesses.

Liver abscess, liver cysts, Budd-Chiari syndrome, biliary colic, biliary cirrhosis, tuberculosis, primary hepatic cancer and others are examples of differential diagnosis for liver hydatidosis (Bouraoui *et al.* 2005; Macpherson *et al.* 2003).

In order to diagnose and rule out conditions that could mimic hydatidosis, a thorough history and physical examinations are essential, as is a suitable workup that includes imaging and serology .With proper care, the prognosis is worse for cysts that form in surgically challenging locations like the spine and heart . Sometimes there is recurrence at the cyst site or at other locations (Sayek *et al.* 2004; Dhar *et al.* 1996).

Regarding the consequences of echinococcosis, site specific problems might occasionally arise from the rupture of the cyst or from other sites. Whereas, lung cyst rupture the bronchial tree can cause pneumothorax, pneumonia, pleural effusion, and secondary pleuritis. Besides, liver cyst rupture the biliary tree can cause biliary obstruction, super infection of the cyst and secondary periodonitis. Regarding the disease in endemic locations, its route of transmission is very important. Education regarding the disease's transmissibility and appropriate handling techniques for sheep viscera should be provided to those who work with dog and cattle (Moore *et al* 1994). Particularly in places where the disease is not endemic, the practitioner or primary care physician may find it challenging to diagnose hydatidosis. options for management should be assessed on a patient by patient basis. Surgeons, anesthetists, experts in infectious disease specialists and possibly interventional radiologist might all contribute to the decision of what might result in the patient's best prognosis. These physicians can offer the greatest possible outcome when they work with nurses and chemists as part of a larger inter professional team approach (Moro & Schantz

2009). In complex patients or at unusual sites for hydatidosis, where the research is less instructive on results, this inter-discussion is particularly important.

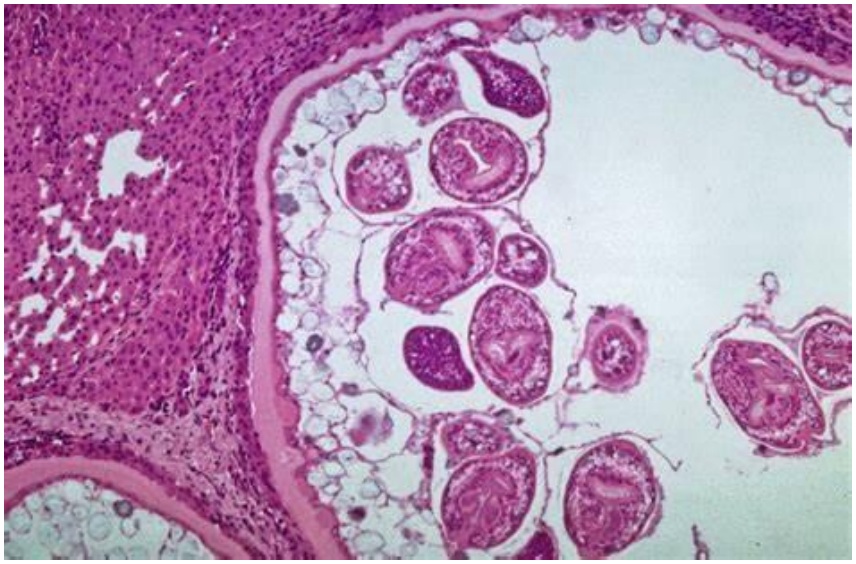

Fig. 3. Hydatid Cysts of *Echinococcus*

When slowly growing cysts push against the surrounding tissues, they produce a large number of medium, big and extremely large sized cysts (can develop around 1 mm per month) that contain thousands of protoscoleroces causing certain pathological alterations in people. For example; chest pain and dyspnoea, or trouble breathing, can be caused by lung cysts. Among the numerous neurological sequelae, coughing up blood in the spinal cord or brain might cause acute reactions to inflammation. (Brunetti *et al* 2010).

CONCLUSION

Echinococcosis is a significant, albeit underappreciated, zoonotic disease that has a variety of effects and a significant financial and health cost, especially in low-income areas. Understanding the relationships between definitive hosts (dogs, foxes), intermediate hosts (sheep, rodents), and environmental conditions (contamination) is vital for management measures. Socioeconomic factors play a crucial role such as poverty, poor hygienic procedures, and traditional animal husbandry techniques might enhance transmission. Improved diagnosis and surveillance are necessary. Further research is needed in the gaps in information persist about parasite genetic diversity, environmental contamination dynamics, and the efficiency of control efforts in varied situations. In conclusion, echinococcosis control requires a comprehensive

approach that blends epidemiological information, tailored therapies, community engagement, and continuing research (Fleming 2006).

The findings from the studies indicate a noteworthy connection between the cystic echinococcosis seroprevalence and contributing factors such as age, gender, and occupation. Additionally, these studies offer important insights regarding cystic echinococcosis in specific regions, which are crucial for understanding its epidemiology. Furthermore, there is a scarcity of previously published research on the cystic echinococcosis in asymptomatic individuals within this area; consequently, this current study will establish foundational data that can be used to track future changes in infection rates and assist in the development of control measures (Brunetti *et al.*, 2015).

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