



Knowledge, Awareness, Attitudes and Practices Regarding Cystic Echinococcosis in Khartoum State, Sudan

Sara S Abdalla^{1,2,3}, Mohamed E Ahmed^{2,3,4*}, Tarig A Elbakhit^{2,4}, Imadeldin E Aradaib^{2,3}, Mazin K Mohamed⁵ and Martin P Grobusch^{2,6}

¹Department of Medical Parasitology and Entomology, Al Neelain University, Khartoum, Sudan

²Zamzam University College, Sudan

³Molecular Biology Laboratory, Khartoum University, Sudan

⁴Department of Surgery, Al Neelain University, Sudan

⁵Alsalam Alrayed Medical centre, Sudan

⁶Department of Infectious Diseases, Amsterdam University Medical Centres, Netherlands

Abstract

Background: Cystic echinococcosis is a cosmopolitan disease occurs throughout the globe, it is important disease as it is neglected. It is a parasitic disease of a tape worm which belongs to the genus. Controls of echinococcosis require awareness and understanding of the disease. The objectives in our study were to describe, a survey based on a questionnaire, the characteristics, attitudes, understanding, awareness and practices of population regarding CE and to know some of the bad practices that might be the cause of the disease.

Methods: Cross-sectional survey was conducted in Khartoum state - Sudan; a study to assess the knowledge, attitude and practice. The data which has been collected of KAP study was found to be the direct cause of echinococcosis disease. The descriptive survey was performed between December 2017 and April 2018 by face-to-face communication.

Results: We interviewed 512 people, 314 (61%) female and 198 (39%) male, all of them were originated from Khartoum state (three localities: Khartoum, Omdurman and Bahry). Their ages ranges from 18 to 90 years with age mean (41.3 ± 18.08 SD). 9% of people dog ownership in the area. Of whom, only (13.6%) dewormed their owned dogs. Moreover, participants' response also showed that 10% had contact with dogs. Almost (91%) of the participants found to slaughter their animals near or at home, of whom, (23.5%) they provide raw infected organ and uneatable offal like lung, intestine, etc... for their dog and cats. 94% reported that they drink water which is unboiled. On the other hand, small proportions (17%) of study participants had heard of hydatid disease prior, but (4.7%) from them had wrong knowledge about this disease as some of them think that the hydatid cyst is a sebaceous cyst, more than half of participants knew about the hydatid disease were at university educational level. The involved interviewed persons were not aware about how humans get infected with CE disease.

Conclusion: The candidates whom they have been in the survey are found to be unaware of the disease. It has been noticed that it is concluded as the disease is less aware in the community and it is important that close collaboration between clinicians and community physicians with veterinary service by sharing all necessary data concerning KAP study, to know and help echinococcosis disease control.

The study shows the importance of the importance of health education in Khartoum state, an elaborate health program depends on health education can minimize cystic echinococcosis.

Introduction

Cystic echinococcosis (CE) is a parasitic disease caused by tapeworm (*Echinococcus granulosus*) which principally affect herbivorous and carnivorous animal, human get accidentally affected by disease and it is not part of life cycle. According to World Health Organization (WHO) echinococcosis is a neglected disease. An affected case of cystic echinococcosis in the world is estimated to be more than one million, causing one billion dollars per annum [1]. Pathology is known to cause unilocular or multilocular cysts, with different sizes small like an orange to larger sizes like small football [2].

OPEN ACCESS

*Correspondence:

Mohamed E Ahmed, Department of Surgery, Al Neelain University, Sudan,
E-mail: rector@zamzam.edu.sd

Received Date: 13 Jul 2021

Accepted Date: 02 Aug 2021

Published Date: 05 Aug 2021

Citation:

Abdalla SS, Ahmed ME, Elbakhit TA, Aradaib IE, Mohamed MK, Grobusch MP. Knowledge, Awareness, Attitudes and Practices Regarding Cystic Echinococcosis in Khartoum State, Sudan. *Ann Clin Immunol Microbiol.* 2021; 3(1): 1017.

Copyright © 2021 Mohamed E Ahmed. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

They are four different types' *E. granulosus*, *multilocularis*, *olgaris* and *oligarsus*. According to molecular classification, their geographical distribution, and according to their host relationship they are many types like *E. Ortleppi* and *E. equinus* [3]. DNA extraction has led to taxonomic divisions, G1-G3 grouped as *E. Granulosus* sensu stricto, G4 known as *E. equinus*, G5 *E. ortleppi*, G6-G10 *E. canadensis* and *E. felidis* which is loin strain [4]. *E. granulosus* definitive host are carnivorous, mainly dogs were it get harbored in their intestine, eggs hatched through the excreta get access to the environment, picked up by herbivores in their feed or drinking water. Echinococcosis is cause of morbidity for animals and humans [5]. The life cycle of Cystic *granulosus* start by carnivores like dogs eat infected meat with *Echinococcus* cysts of the intermediate hosts, sheep, goat, cattle, camels... Etc, in the intestine of the carnivores which is the dog tape worm with the size of 3 mm to 6 mm will develop. Hatched eggs from the intestine of the dog will spoil the nearby environment with multiple of eggs which get access to grass, unclean water and infect animals and human, where in their intestine and through portal and systemic circulation get access to liver and lungs and other organs in the body of infected animal or human. Once get impeded at the infected animal or human organs they change to different sizes of cysts, within which they reproduce asexually into protoscolices. A single cyst can have thousands of protoscolices, and each protoscolex is capable of developing into an adult worm if ingested by the definitive host [6]. There are many social reasons favoring the life cycle of *E. granulosus* and prevalence of CE in various parts of the world. Many families in rural have small plots of land and live in close proximity with their flocks and dogs. Grouping of animals together specifically with dogs as guards will help spreading of the disease, including CE. Slaughtering of animals in or near homes will help spread of the disease [7]. Poor equipped with unacceptable sanitation will spread the disease easily. Carnivorous like dogs, wolves, foxes who can feed on infected offal will complete echinococcosis cycle. Close proximity of grazing animals dogs and human will help spread of the disease. Humans incidentally get infected by ingestion of hatched egg which soil unclean water or feed. But they are not part of the cycle [8]. Dogs are particularly important in zoonotic transmission due to their close relationships with humans. Cystic echinococcosis is a cosmopolitan disease which is found all the world including Sudan. Echinococcosis in Sudan is common and it is a cause of financial loss for both human

and animals.

Prevalence of the disease is different in different area, which needs different measures [9]. It is essential to have adequate knowledge of the disease before contemplating control programs. In case of control of disease needs better understanding of Knowledge, Attitude (KAP) and Practice in the community. Three areas have been assigned in Khartoum state to study KAP using structured well designed questionnaires.

Materials and Methods

Study design

This is descriptive cross sectional study was conducted over a period from December 2017 and April 2018 to determine up on the knowledge, awareness, attitudes and practice regarding cystic echinococcosis among human in Khartoum state, Sudan.

Study area

This study conducted in three townships in Khartoum state (Khartoum, Omdurman and Bahry), a part of central Sudan (Figure 1).

Khartoum State is between the Blue Nile and White Nile were the meet to form river Nile and the around area on the starts of River Nile. The main area of Khartoum State 20,736 Km² wit elevation up to 400 m.a.s, its climate arid and semiarid. The rains in Khartoum state is scares few months in summer. Winter is dry and cold. Rain ranges between 10 to 300 in Sudan, all this in summer. Temperature in whole year range between 20°C to 40°C. Temperature degrees continue to fall during the winter period between November to March to the level of 15°C to 25°C. Khartoum State is divided into three clusters (cities), built at the convergence of the Blue and White Niles: Omdurman to the northwest across the White Nile, North Khartoum, and Khartoum itself on the southern bank of the Blue Nile.

Data collection

Clinical data were collected by the facility medical staff via study structured questionnaire.

Questionnaires:

Participants involved in KAP study were above the age of 18 years.

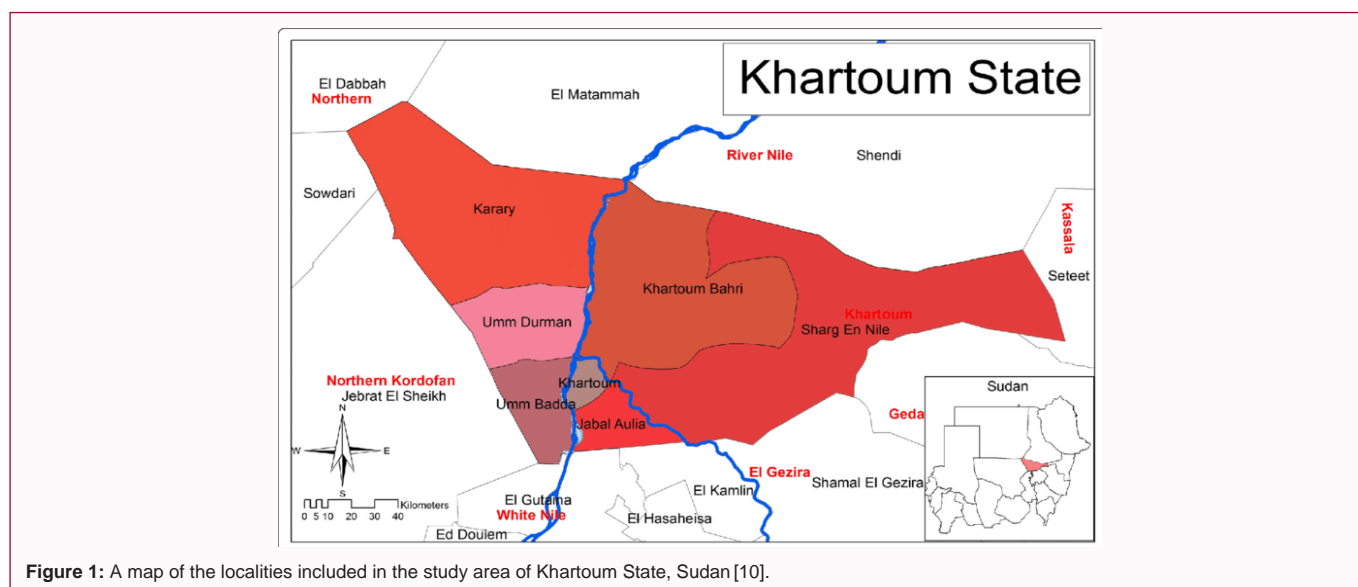


Figure 1: A map of the localities included in the study area of Khartoum State, Sudan [10].

The consent according to ethical committee approval is verbal from the participant. A questionnaire was administered to obtain basic epidemiological and individual information regarding known CE risk factors. Important information were addressed by the structured questionnaire which include age, sex, educational level, residence, occupation, hygiene, dog information and other domestic animals records. The questionnaire was well structured which minimize interrogators differences.

Study variables

The following are the variables utilized by this study:

- Demographic data
- Dog ownership
- Dog contacts
- Treatment of owned dog
- Home slaughtering and raw offal disposal
- Education level
- Knowledge of disease

Study population

Five hundred and twelve individuals were enrolled in this study, 198 males and 314 females, their place of resident is in Khartoum state and their age range from ≥ 18 years.

Statistical analysis

Statistical Package for Social Science (SPSS) has been used of version 21.0. Data was analyzed descriptively using the frequency table and cross tabulation.

Ethical approval

This study was approved by the Institutional Review Board Committee of Alneelain University, Khartoum, Sudan. Then study participants were first asked whether they accept to take part in the survey.

Results

Socio-demographic characteristics of the study population

We interviewed 512 individuals, 314 (61%) female and 198 (39%) male; all of them were originated from Khartoum state. Their ages ranges from 18 to 90 years with age mean (41.3 ± 18.08 SD) (Table 1). Regarding the populations' level of education, 24% of the population had completed primary school, 25% for secondary school, 35% at university level, and 16% of them were unable to read and write (Table 1). Sheep and goat was the main livestock species owned by the population interviewed in this study (Table 1).

Practices towards CE prevention

Of all the participants interviewed, 9% (44/512) indicated owning dogs on their houses (Table 2). The result showed substantial negligence for owned dogs. For instance, among participants owning dogs, 13% (6/44) dewormed their dogs. Added to that, approximately all 91% (468/512) of the participants reported slaughtering livestock at home for their families' consumption, of whom, 23.5% (110/512) they provide raw infected organ and uneatable offal like lung, intestine, etc. for their dog and cats. 94% of the participants (479/512) has been noted they don't boil unclean water for drinking. On the other hand, 10% (53/512) of study participants come in close contact

Table 1: Socio-demographic characteristics of people (N=512) participated in Cystic Echinococcosis (CE) knowledge, awareness and practices survey in Khartoum, Sudan.

Variables	Frequency (%)
Age	
Young	271 (53%)
Old	241 (47%)
Gender	
Female	314 (61%)
Male	198 (39%)
Locality	
Omdurman	164 (32%)
Khartoum	180 (35%)
Bahry	168 (33%)
Owned animal	
Sheep	26 (5%)
Goat	24 (5%)
Cattle	19 (4%)
Educational level	
Primary	123 (24%)
Secondary	128 (25%)
University	181 (35%)
Illiterate	80 (16%)

Table 2: Descriptive results of study population practices relevant to CE prevention and control.

Variables	Frequency (%)
Dog-ownership	
Yes	44 (9%)
No	468 (91%)
Dog-treatment(from 44dogownership)	
Yes	6 (13%)
No	38 (86%)
Dog-contact	
At house	53 (10%)
Outside	459 (90%)
Home Slaughter	
Yes	468 (91%)
No	44 (9%)
Raw offal disposal from home slaughter	
Yes	110 (23.5%)
No	358 (76.5%)
Water Supply	
Filtered	33 (6%)
Tap	479 (94%)

to their dogs (Table 2).

Knowledge and awareness about CE infection

83% of the participants (427/512) they didn't know about diseases affects human and animals (zoonosis). Small proportions 17% (85/512) of study participants had heard of hydatid disease prior, but

Table 3: Descriptive results of study populations' knowledge about and awareness of sources of infection with CE.

Variables	Frequency (%)
Knowledge	
Yes	85 (17%)
No	427 (83%)

4.7% from them had wrong knowledge about this disease as some of them think that the hydatid cyst is a sebaceous cyst (Table 3).

Discussion

The objective of this study to know the awareness, family practices, attitudes of Khartoum State inhabitants, this to enable to set guidelines and preventive measures for future practice regarding the disease. Chronic parasitic diseases such as echinococcosis can be serious and lead to deleterious complications [11]. Sudan being a hot climate country this is a good whether for many parasitic diseases.

Uncontrolled well looked after dogs almost none existing according to our questionnaire results. Forty four (9%) of the surveyed person owned one or more dogs. Of these, six reported to deworm their dogs. His finding correlate with poor awareness of participants about the role of dogs in cystic echinococcosis disease. Most of the participants they aren't aware of dogs role in this disease, usually they feed dogs with lungs and some infected viscera of slaughtered animals. Such practices are direct causes of the owned dogs to be infected with the disease by feeding them with infected meals [12]. Similar practices have been noted in similar settings. In Sardina Italy dogs get access to slaughtered animals offal [13]. A study in Tibet demonstrated that uncooked viscera fed to dogs were the likely case of spread of the disease [14]. Contaminated water or food can be a source of direct infection at endemic areas [15]. Our results show that almost 94% of the respondents drink water directly without boiling. Unclean water is well known to be a cause of getting the infection of the disease [15,16]. Studies in Jordon [17] and Kenya [18] had showed contaminated water is an important cause of spread of the disease. Water disinfection at endemic area is very important to prevent spreading of the disease. Personal hygiene is paramount important in endemic areas.

In Sudan recently increase in stray as well as poorly looked after owned dogs had been notice is a source of spreading the infection. In Sudan bad set up as well as open access slaughter house were direct cause of spread of the disease. The practice of house slaughtering increase the chance of dogs to get access to infected unwanted viscera of animals.

Awareness level of the disease has to be improved to get better control of the disease. Many KAP studies have been published with similar finding of our study [19-21].

Participant in our KAP study were found to have insufficient knowledge for cystic echinococcosis. It has been concluded that public understanding of the disease as well as collaboration between health works in human and animal with water and food safety for both human and animals will help future control of echinococcosis.

References

- Agudelo Higuaita NI, Brunetti E, McCloskey C. Cystic Echinococcosis. *J Clin Microbiol.* 2016;54(3):518-23.
- Surhio AS, Bhutto BJ, Gadahi A, Akhtar N, Arijio A. Studies on the

prevalence of canine and bovine hydatidosis at slaughter houses of Larkana, Pakistan. *Res Opinions Animal Vet Sci.* 2011;1:40-3.

- Bowles J, Blair D, McManus DP. A molecular phylogeny of the genus *Echinococcus*. *Parasitology.* 1995;110(3):317-28.
- Nakao M, McManus DP, Schantz PM, Craig PS, Ito A. A molecular phylogeny of the genus *Echinococcus* inferred from complete mitochondrial genomes. *Parasitology.* 2007;134(5):713-22.
- Neumayr A, Tamarozzi F, Goblirsch S, Blum J, Brunetti E. Spinal cystic echinococcosis - a systematic analysis and review of the literature: Part 2. Treatment, follow-up and outcome. *PLOS Negl Trop Dis.* 2013;7(9):e2458.
- Eckert J, Gemmell MA, Meslin F-X, Pawłowski ZS, editors. WHO/OIE manual on Echinococcosis in humans and animals: a public health problem of global concern. World Organisation for Animal Health (Office; International des Epizooties). 2001, Paris, France, and World Health Organization. Geneva: Switzerland.
- Odero JK. The burden of Cystic Echinococcosis in selected regions in Kenya. Thesis submitted in partial fulfillment for the degree of Master of Science in animal Parasitology in the Jomo Kenyatta University of Agriculture and Technology. 2015.
- Romig T. Epidemiology of echinococcosis. *Langenbecks Arch Surg.* 2003;388(4):209-17.
- Bour'ee P. Hydatidosis: Dynamics of transmission. *World J Surg.* 2001;25(1):4-9.
- Karamalla ST, Gubran AI, Adam IA, Abdalla TM, Sinada RO, Haroun EM, et al. Sero-epidemiological survey on African horse sickness virus among horses in Khartoum State, Central Sudan. *BMC Veterinary Res.* 2018;14:230.
- Aydın MF, Adıgüzel E, Güzel H. A study to assess the awareness of risk factors of cystic echinococcosis in Turkey. *Saudi Med J.* 2018;39(3):280-9.
- Possenti A, Manzano-Román R, Sánchez-Ovejero C, Boufana B, La Torre G, Siles-Lucas M, et al. Potential risk factors associated with human cystic echinococcosis: Systematic review and meta-analysis. *PLoS Negl Trop Dis.* 2016;10(11):e0005114.
- Varcasia A, Tanda B, Giobbe M, Solinas C, Pipia AP, Malgor R, et al. Cystic echinococcosis in Sardinia: Farmers' knowledge and dog infection in sheep farms. *Vet Parasitol.* 2011;181(2-4):335-440.
- Li D, Gao Q, Liu J, Feng Y, Ning W, Dong Y, et al. Knowledge, Attitude, and Practices (KAP) and risk factors analysis related to cystic echinococcosis among residents in Tibetan communities, Xiahe County, Gansu Province, China. *Acta Trop.* 2015;147:17-22.
- Torgerson P, Helminth-Cestode R. *Echinococcus granulosus* and *Echinococcus multilocularis*. *Encycl. Food Saf.* 2014;2:63-9.
- Yang YR, Sun T, Li Z, Zhang J, Teng J, Liu X, et al. Community surveys and risk factor analysis of human alveolar and cystic echinococcosis in Ningxia Hui Autonomous Region, China. *Bull World Health Organ.* 2006;84(9):714-21.
- Dowling PM, Abo-Shehadeh MN, Torgerson PR. Risk factors associated with human cystic Echinococcosis in Jordan: Results of a case-control study. *Ann Trop Med Parasitol.* 2000;94(1):69-75.
- Craig PS, Macpherson CN, Watson-Jones DL, Nelson GS. Immunodetection of *Echinococcus* eggs from naturally infected dogs and from environmental contamination sites in settlements in Turkana, Kenya. *Trans R Soc Trop Med Hyg.* 1988;82(2):268-74.
- Yazar S, Akman MAA, Yay M, Hamamcı B, Yalçın Ş. Investigation of anti-echinococ antibodies in shoe-repairers. *İnönü Üniversitesi Tıp Fakültesi Dergisi.* 2003;10:21-3.
- Karaman U, Aycan MO, Atambay M, Miman O, Daldal N. Analysis of anti-echinococcus antibodies in garbage men in Malatya. *Türkiye Parazitoloj Derg.* 2005;29(4):244-6.
- Besbes M, Sellami H, Cheikhrouhou F, Makni F, Ayadi A. Clandestine slaughtering in Tunisia: Investigation on the knowledge and practices of butchers concerning hydatidosis. *Bull Soc Pathol Exot.* 2003;96(4):320-2.