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Knowledge, attitudes and risk practices on echinococcosis in Aysén District, Chile

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ABSTRACT

Echinococcosis, a zoonotic disease caused by *Echinococcus granulosus* and *E. multilocularis*, presents significant health and economic challenges globally. This study assessed knowledge, attitudes, and practices regarding cystic echinococcosis in the rural communities, health professionals, and educators of Capitán Prat Province, Aysén Region, Chile. A survey of 243 participants revealed a high general awareness of the disease (81.6 %), with significant variations in knowledge levels and practices across sectors. Risk behaviours, such as allowing dogs to roam freely and improper disposal of animal viscera, were prevalent, particularly in rural areas. While preventive measures, including deworming and education, were highly valued, gaps in their consistent application persisted. The findings underscore the need for targeted educational campaigns and culturally sensitive interventions to address behavioural risk factors. Strengthening One Health initiatives through community engagement and intersectoral collaboration is critical to reducing the burden of hydatidosis in endemic regions.

1. Introduction

Echinococcosis, also known as hydatidosis, is a zoonotic disease of global significance caused by the parasitic tapeworm *Echinococcus granulosus* and *Echinococcus multilocularis* [1]. These parasites primarily affect domestic livestock and dogs, with *E. multilocularis* also infecting cats, rodents, and foxes [1,2]. The disease, classified as cystic echinococcosis (CE), follows a complex life cycle involving definitive hosts, such as dogs and other canids, which harbour the adult parasite in their small intestine, and intermediate hosts, including sheep, pigs, goats, cattle, and horses, which ingest the parasite's eggs from contaminated environments [1]. Once inside the intermediate host, the larvae penetrate the intestinal wall and migrate to various organs, predominantly the liver and lungs, forming hydatid cysts [3]. Humans can inadvertently become intermediate hosts through the ingestion of eggs, though they do not contribute to the parasite's transmission cycle [3]. Hydatidosis predominantly affects rural regions where livestock is raised for subsistence purposes, and its transmission is facilitated by poor sanitary practices, environmental contamination, and the unregulated slaughter of infected animals. The disease has a significant impact on both public health and the agricultural economy, causing severe health complications in humans, such as organ damage due to cyst formation [3], as well as reduced livestock productivity, lower fertility rates, and economic losses due to the condemnation of infected meat [4–6]. In highly endemic areas such as the Neuquén Province in Argentina [7] and several regions in Bolivia [8], echinococcosis remains a persistent problem despite the implementation of control measures, due to socioeconomic factors and traditional animal husbandry practices [9–11]. Control and prevention strategies for hydatidosis require a One Health approach, integrating veterinary, environmental, and public health interventions [12,13]. Key measures include routine deworming of dogs, restricting their access to raw offal, promoting safe slaughtering practices, and increasing public awareness through health education at the community level [14]. Vaccination efforts, such as the EG95 recombinant vaccine developed in New Zealand, have shown promise in breaking the parasite's transmission cycle by providing immunity to livestock [14]. In Chile, hydatidosis is still a public health issue with a mean prevalence of 1.29 cases/100000 habitants [15]. Government-led initiatives such as vaccination campaigns and strategic deworming programmes have been implemented to mitigate the prevalence of the disease [15]. However, the persistence of hydatidosis in endemic regions highlights the necessity for sustained efforts, improved surveillance, and

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community engagement to achieve long-term disease control [16–19]. The Province of Capitán Prat in the Aysén Region faces significant challenges with hydatidosis. Despite its small population of 4638, it recorded the highest national incidence in 2021, with four cases reported by early 2023 [15]. The rural nature of the province contributes to risky behaviours, such as feeding viscera to dogs, irregular deworming, and allowing dogs to roam freely, which sustain the parasite's lifecycle. The present study aims to assess the level of knowledge, attitudes and practices regarding cystic echinococcosis among rural communities, healthcare professionals and educators in Capitán Prat Province, Aysén Region, Chile. An understanding of local perceptions and practices is crucial for developing targeted interventions to reduce transmission rates and enhance the effectiveness of ongoing control programmes. By addressing gaps in education and public health strategies, this research seeks to contribute to a more comprehensive approach in combating hydatidosis within endemic settings [20].

2. Materials and methods

The study was conducted in the Province of Capitán Prat, Aysén Region, from January to July 2023. This province is in the southern part of the region and comprises three communes: Cochrane, Caleta Tortel, and O'Higgins, as can be seen in Fig. 1. According to the latest 2017 census, the urban-rural population distribution was 2841–648 for Cochrane, 0–523 for Caleta Tortel, and 0–625 for O'Higgins [21]. To determine the level of knowledge, attitudes and practices, a survey was conducted to people aged 18 and above, based on data obtained from the census [21]. The present study was approved by the Ethical-Scientific Committee of Universidad de Las Américas (Project ID CEC_FP_2023018).

The survey was randomly assigned within the following sample groups:

1. Rural Community: Based on data from the Sipec-Web system of the Agricultural and Livestock Service [22], the number of registered livestock establishments per commune.
2. Health Establishment Staff: Based on the number of staff obtained through the Transparency Law from hospitals and rural health posts.
3. Educational Establishment Staff: Based on the number of staff obtained through the Transparency Law of Chile.

A Likert-scale survey was conducted based on previous studies [23] and structured into four sections: i) general demographic data, ii) information about the disease (knowledge), iii) animal ownership and practices, and iv) perception of the importance of different activities (attitudes). The survey was designed in clear language appropriate for the target population, and respondents were given the option to seek clarification either directly, by telephone, or online.

The survey was conducted in person in rural areas (written or Microsoft Office® Forms) and via an online form (Microsoft Office® Forms) for health and educational institutions.

Paper-based surveys were registered into Microsoft Office® Forms

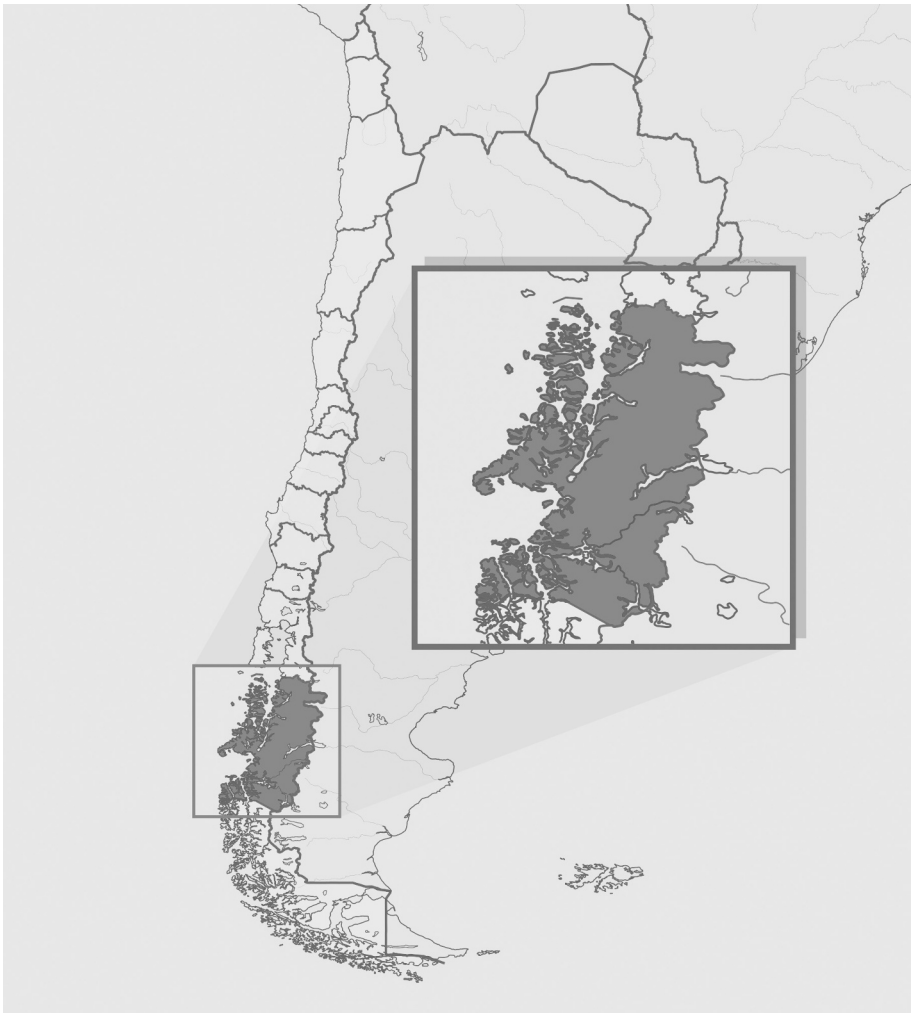

Fig. 1. Location of the Aysen Region in Chile.

and stored. The data were exported to an Excel spreadsheet and analysed using the free statistical software JASP [24]. The first section of the survey underwent a descriptive analysis of the socio-demographic information of the population. To validate the proposed hypothesis, a chi-square (X^2) test and the non-parametric Kruskal-Wallis test were performed to determine significant differences in knowledge levels among the population. The knowledge level was determined using the second section of the survey (disease knowledge). Responses to closed questions were scored (Yes = 2 points, No = 1 point), with a minimum possible score of 6 and a maximum of 12. Final scores were classified into three knowledge levels: low (6–7), medium (8–10), and high (11−12). Comparisons between levels were conducted using Kruskal-Wallis tests. From the section on animal ownership and practices, the most frequent actions contributing to disease maintenance were identified. The final section on perception analysed the levels of importance (attitudes) that respondents attributed to various disease prevention practices.

3. Results

3.1. Demographic characteristics of the population

A total of 243 individuals from the Province of Capitán Prat participated in the survey. The distribution of respondents was 69.5 % from Cochrane, 12.7 % from Caleta Tortel, and 17.7 % from O'Higgins. The surveyed sectors included Education (28.0 %), Rural (54.3 %), and Health (17.7 %).

In terms of gender distribution, 56.2 % of the respondents were women and 43.8 % were men in Cochrane; 58.1 % were women and 49.1 % were men in Caleta Tortel; and 53.5 % were women and 46.7 % were men in O'Higgins.

Most respondents were aged between 31 and 60 years (66.3 %; $X^2 = 119$, df = 2, $p < 0.001$), followed by those aged 61 or older (17.7 %), and finally, those aged 18 to 30 (16.0 %). This age distribution was consistent across the three communes: Cochrane (66.3 %), Caleta Tortel (64.5 %), and O'Higgins (67.4 %) ($X^2 = 2.26$, df = 4, $p = 0.688$).

Regarding educational attainment, respondents in rural areas predominantly had incomplete and complete primary education (24.2 % and 25.0 %, respectively). Conversely, those in the education and health sectors had a higher level of university education (48.5 % and 51.2 %, respectively, $X^2 = 145$, df = 18, $p < 0.001$).

3.2. Knowledge of the disease

A significant 81.6 % of respondents demonstrated a high level of knowledge regarding hydatidosis, while 14.8 % exhibited a moderate level, and only 3.7 % had a low level ($X^2 = 260$, df = 2, $p < 0.001$). Knowledge levels were consistent across the three communes ($X^2 = 0.894$, df = 2, $p = 0.64$).

For the rural sector, significant differences were observed in knowledge levels ($X^2 = 264$, df = 3, $p < 0.001$), with 75 % of respondents displaying a high level of knowledge. However, knowledge levels varied across communes, with Caleta Tortel having a significantly lower knowledge level (71.4 %) ($X^2 = 94.702$, df = 2, p < 0.001).

In the health sector, 83.7 % of respondents had a high level of knowledge, with no significant differences between communes ($X^2 = 0.858$, df = 4, $p = 0.931$). Similarly, in the education sector, 91.2 % of respondents demonstrated a high level of knowledge, with no significant differences between communes ($X^2 = 1.568$, df = 2, $p = 0.457$).

Regarding specific questions on hydatidosis, 95.5 % of respondents had heard of the disease ($X^2 = 18.077$, df = 2, $p < 0.001$), with significant differences observed between communes, particularly between Caleta Tortel and Cochrane ($X^2 = 18.003$, df = 2, p < 0.001). Moreover, 81.9 % of respondents knew what causes hydatidosis, with no significant differences between communes ($X^2 = 4.957$, df = 2, $p = 0.084$).

3.3. Dog ownership and practices

A total of 74.0 % of respondents owned at least one dog, with an average of 2.8 dogs per respondent (SD = 2.142, range = 0–11). The primary reasons for ownership were work (43.0 %), companionship (32.7 %), and security (9.0 %).

Also, 49.4 % of dog owners allowed their dogs to roam freely at some point during the day ($X^2 = 0.022$, df = 1, $p = 0.88$) with no significant differences were observed between communes ($X^2 = 4.625$, df = 2, $p = 0.099$). However, significant differences were noted between sectors, with the rural sector reporting the highest percentage of dogs roaming (80.9 %) compared to urban areas ($X^2 = 14.272$, df = 2, $p < 0.001$).

Deworming was considered an important method of prevention (97.9 % of respondents, $X^2 = 0.747$, df = 2, $p = 0.688$) and 91.7 % actively dewormed their dogs periodically ($X^2 = 15$, df = 2, $p < 0.001$). No significant differences were observed between communes ($X^2 = 7.457$, df = 2, $p = 0.024$).

3.4. Perception and importance of preventive measures (attitudes)

Respondents considered the following practices to be very important:

- Dog deworming (98.7 %; $X^2 = 223$, df = 1, $p < 0.001$),
- Washing hands (97.7 %; $X^2 = 227$, df = 1, $p < 0.001$),
- Educating children and adolescents about hydatidosis (95.9 %; $X^2 = 428$, df = 2, $p < 0.001$),
- Providing health professionals with training on hydatidosis prevention (94.6 %; $X^2 = 412$, df = 2, p < 0.001),
- Preventing dogs from entering vegetable gardens (94.3 %; $X^2 = 412$, df = 2, p < 0.001),
- Ensuring access to potable water (88.1 %; $X^2 = 330$, df = 2, p < 0.001).

These results highlight a high awareness of preventive measures among the population, with no significant differences between communes regarding their perceived importance.

4. Discussion

A high overall level of knowledge about hydatidosis was observed among the surveyed population (81.6 %), consistent across the three communes. This finding aligns with studies conducted in Tambool, Sudan, and other endemic regions, where high levels of awareness were reported [25]. However, despite this general awareness, detailed knowledge about the specific transmission mechanisms of the disease remains inadequate, as evidenced by the low percentage (4.1 %) of respondents correctly identifying the parasite as the cause.

The rural sector exhibited notable differences in both knowledge and practices. Although a significant proportion of the rural population demonstrated awareness of the disease, high-risk behaviours, such as allowing dogs to roam freely and insufficient faeces management, persist. These behaviours contribute to the perpetuation of the parasite's lifecycle, emphasising the need for targeted education and behavioural change campaigns. Similar findings were reported in other countries such as Chile and Iraq with strong rural traditions [23,26].

Healthcare professionals in Cochrane exhibited higher levels of knowledge compared to those in other communes, likely due to the availability of healthcare facilities. However, limited participation from the health sector across the region highlights a critical gap in the engagement of professionals. This finding suggests the need for comprehensive training programs for healthcare providers, particularly in rural and remote areas, as also emphasised by Riquelme et al. in Chile [19].

The education sector demonstrated a strong level of knowledge (91.2 %), suggesting potential for leveraging this sector in preventive

efforts. However, there is room for improvement in integrating zoonotic disease education into school curricula, as noted in a study in northern Chile in 2017 [26]. Schools can play a pivotal role in disseminating knowledge and fostering long-term behavioural changes within the community.

The study also reveals the prevalence of risky practices related to the handling of dogs and livestock. While most respondents acknowledged the importance of deworming dogs, a significant proportion did not provide regular veterinary care. Furthermore, the continued practice of home slaughter in itself is not risky, but improper disposal of offal is, and indicates persistent gaps in awareness and adherence to recommended preventive measures. Similar behaviours were documented in the studies in Chile, Pakistan and Iraq [19,23,27,28], reinforcing the need for culturally sensitive interventions.

Geographical and cultural factors, including the remote and rural nature of the Province of Capitán Prat, further complicate disease prevention and control efforts. The strong attachment to traditional practices and limited access to healthcare services necessitate a multifaceted approach such as One Health, involving community engagement, educational campaigns, and government support. Collaboration among municipal authorities, health services, academic institutions, and regional governments is essential to achieve sustainable disease control and eradication.

Finally, limitations of this study, such as the small sample size in specific sectors and geographic isolation, may have influenced the findings. Future research should address these limitations by including broader and more representative samples to provide a comprehensive understanding of the factors affecting hydatidosis prevention and control in the region.

5. Conclusion

In conclusion, despite encouraging levels of awareness about hydatidosis in Capitán Prat, significant gaps persist in knowledge, attitudes, and preventive practices, particularly in rural communities. A One Health approach in Capitán Prat Province would involve coordinated efforts led by municipal and local authorities in partnership with regional human health services, the Agricultural and Livestock Service (SAG) and academia. This initiative should integrate community education, regular dog deworming programs, safe slaughtering practices and environmental sanitation plans. The active participation from local schools, rural healthcare services, veterinarians, and livestock producers will be essential to ensure culturally sensitive interventions that reduce transmission of echinococcosis while strengthening collaboration across human, animal, and environmental health sectors.

CRediT authorship contribution statement

Nicole Sepulveda: Writing – review & editing, Writing – original draft, Software, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Marcela Fresno:** Writing – review & editing, Writing – original draft, Validation, Methodology. **Yanina Poblete:** Writing – review & editing, Writing – original draft, Validation, Methodology, Conceptualization. **Hernan Cañon Jones:** Writing – review & editing, Writing – original draft, Validation, Supervision, Software, Methodology, Formal analysis, Data curation, Conceptualization.

Ethical statement

This research was conducted in compliance with ethical standards established in Chile and internationally, ensuring respect for participants' rights, privacy, and well-being. All participants provided informed consent, and data were handled in accordance with applicable data protection regulations. The study adhered to principles of integrity, transparency, and fairness throughout.

The present study was approved by the Ethical-Scientific Committee of Universidad de Las Américas (Project ID CEC_FP_2023018).

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Declaration of competing interest

The authors declare no conflict of interest.

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Data availability

Data will be made available on request.

References

[1] M.W. Lightowlers, R.B. Gasser, A. Hemphill, T. Romig, F. Tamarozzi, P. Deplazes, P.R. Torgerson, H.H. Garcia, P. Kern, Advances in the treatment, diagnosis, control and scientific understanding of taeniid cestode parasite infections over the past 50 years, Int. J. Parasitol. 51 (2021) 1167–1192, https://doi.org/10.1016/J.IJPARA.2021.10.003.

[2] K. Wells, R. Flynn, Managing host-parasite interactions in humans and wildlife in times of global change, Parasitol. Res. 121 (2022) 3063–3071, https://doi.org/10.1007/S00436-022-07649-7.

[3] R.W. Ammann, J. Eckert, Cestodes. Echinococcus, Gastroenterol. Clin. N. Am. 25 (1996) 655–689, https://doi.org/10.1016/S0889-8553(05)70268-5.

[4] C.S. Wilson, D.J. Jenkins, V.J. Brookes, T.S. Barnes, C.M. Budke, Assessment of the direct economic losses associated with hydatid disease (Echinococcus granulosus sensu stricto) in beef cattle slaughtered at an Australian abattoir, Prev. Vet. Med. 176 (2020) 104900, https://doi.org/10.1016/J.PREVETMED.2020.104900.

[5] C. Benner, H. Carabin, L.P. Sánchez-Serrano, C.M. Budke, D. Carmena, Analysis of the economic impact of cystic echinococcosis in Spain, Bull. World Health Organ. 88 (2010) 49–57, https://doi.org/10.2471/BLT.09.066795.

[6] H. Borji, S. Parandeh, The abattoir condemnation of meat because of parasitic infection, and its economic importance: results of a retrospective study in North-Eastern Iran, Ann. Trop. Med. Parasitol. 104 (2010) 641–647, https://doi.org/10.1179/136485910X12851868780261.

[7] M.F. Debiaggi, C.A. Alvarez Rojas, L.E. Lazzarini, D. Calfunao, P. Titanti, L. Calanni, M. Iacono, S.V. Soriano, P. Deplazes, N.B. Pierangeli, Differences in clinical aspects of human cystic echinococcosis caused by Echinococcus granulosus sensu stricto and the G6 genotype in Neuquén, Argentina, Parasitology 150 (2023) 599–605, https://doi.org/10.1017/S0031182023000264.

[8] V. Ali, E. Martinez, P. Duran, E. Villena, P. Deplazes, C.A. Alvarez Rojas, Past and present of cystic echinococcosis in Bolivia, PLoS Negl. Trop. Dis. 15 (2021) e0009426, https://doi.org/10.1371/JOURNAL.PNTD.0009426.

[9] J. Morales, J.J. Martí, J. Garcia-Castella, N. Peña, V. Maza, N. Villalobos, A. S. Aluja, A. Fleury, G. Fragoso, C. Larralde, E. Sciutto, Taenia soliumi: the complex interactions, of biological, social, geographical and commercial factors, involved in the transmission dynamics of pig cysticercosis in highly endemic areas, Ann. Trop. Med. Parasitol. 100 (2006) 123–135, https://doi.org/10.1179/136485906X86275.

[10] R.D. Yelina, J.M. Elisa, H.I. Henry, L.C. Daphne, F.P. Néstor, Knowledge, perceptions and practices related to cystic echinococcosis in families with history of this illness, Rev. Investig. Vet. Del Peru 29 (2018) 240–252, https://doi.org/10.15381/RIVEP.V29I1.14193.

[11] J.E. Palomares Velosa, S. Riaño Sánchez, A. Martínez Marín, N.M. Cediel Becerra, Prevention of exposure to zoonoses in rural Latin America: social ecological factors in a diverse regional context, One Health 15 (2022) 100444, https://doi.org/10.1016/J.ONEHLT.2022.100444.

[12] K.R. Mcleroy, D. Bibeau, A. Steckler, K. Glanz, An ecological perspective on health promotion programs, Health Educ. Behav. 15 (1988) 351–377, https://doi.org/10.1177/109019818801500401.

[13] M.A. Barrett, T.A. Bouley, Need for enhanced environmental representation in the implementation of one health, Ecohealth 12 (2015) 212–219, https://doi.org/10.1007/S10393-014-0964-5.

[14] E.J. Larrieu, G. Mujica, D. Araya, M. Arezo, E. Herrero, G. Santillan, K. Viscaychipi, J.L. Labanchi, C. Grizmado, A. Calabro, G. Talmón, L.L. Sepúlveda, J.M. Galvan, M. G. Cabrera, M. Seleiman, P. Crowley, G. Céspedes, M.A.G. Cachau, L.M. Gino, L. Molina, J.F. Daffner, Impacto de la vacuna EG95 contra la hidatidosis ovina en el programa de control de la provincia de Río Negro, Argentina. Ocho años de trabajo (informe preliminar) /Pilot field trial of the EG95 vaccine against ovine cystic echinococcosis in Rio Negro, Ar, Ciencia Vet. 19 (2017) 30–49, https://doi.org/10.19137/CIENVET-20171913.

[15] Instituto de Salud Pública, Vigilancia de laboratorio de Echinococcosis quística/Hidatidosis Chile, 2011-2021, Bol. Hidatidosis 13 (2023).
[16] S. Colombe, E. Togami, F. Gelaw, M. Antillon, R. Fuentes, D.M. Weinberger, Trends and correlates of cystic echinococcosis in Chile: 2001–2012, PLoS Negl. Trop. Dis. 11 (2017), https://doi.org/10.1371/journal.pntd.0005911.
[17] S. Cortés A, C. Valle B, Hidatidosis humana: Generalidades y situación epidemiológica en chile según egresos hospitalarios y notificación obligatoria entre los años 2001 y 2005, Rev. Chilena Infectol. 27 (2010) 329–335, https://doi.org/10.4067/s0716-10182010000500008.
[18] G. Acosta-Jamett, F.A. Hernández, N. Castro, F. Tamarozzi, L. Uchiumi, J. C. Salvitti, M. Cueva, A. Casulli, Prevalence rate and risk factors of human cystic echinococcosis: a cross-sectional, community-based, abdominal ultrasound study in rural and urban north-Central Chile, PLoS Negl. Trop. Dis. 16 (2022) e0010280, https://doi.org/10.1371/JOURNAL.PNTD.0010280.
[19] N. Medina, N. Riquelme, J. Rodríguez, O. Aguirre, S. Ayala, M. Canals, N. Medina, N. Riquelme, J. Rodríguez, O. Aguirre, S. Ayala, M. Canals, Distribución y factores de riesgo de hidatidosis en la Región del Libertador Bernardo O'Higgins entre 2010 y 2016, Rev. Chilena Infectol. 36 (2019) 591–598, https://doi.org/10.4067/S0716-10182019000500591.
[20] P. Zucca, M.C. Rossmann, M. Dodic, Y. Ramma, T. Matsushima, S. Seet, S. Holtze, A. Bremini, I. Fischinger, G. Morosetti, M. Sitzia, R. Furlani, O. Greco, G. Meddi, P. Zambotto, F. Meo, S. Pulcini, M. Palei, G. Zamaro, What do adolescents know about one-health and zoonotic risks? A School-Based Survey in Italy, Austria, Germany, Slovenia, Mauritius, and Japan, Front. Public Health 9 (2021) 658876, https://doi.org/10.3389/FPUBH.2021.658876/BIBTEX.
[21] Instituto Nacional de Estadísticas, Censo de Población Vivienda 2017, Bases de Datos, 2017.
[22] Servicio Agrícola y Ganadero, Sistema de Información Pecuaria, 2023.
[23] M.F. Abdulhameed, I. Habib, S.A. Al-Azizz, I. Robertson, Knowledge, Awareness and Practices Regarding Cystic Echinococcosis among Livestock Farmers in Basrah Province, Iraq, Vet. Sci. 5 (2018) 17, https://doi.org/10.3390/VETSCI5010017.
[24] JASP Team, JASP, 2024.
[25] M.E. Ahmed, O.A. Hassan, A.K.A. Khalifa, E. Elobied, A.A.A. Osman, S.L. Brair, O.I. E. Ahmed, M.M.A. Elfadul, A.L. Cremers, M.P. Grobusch, Echinococcosis in Tambool, Central Sudan: a knowledge, attitude and practice (KAP) study, Int. Health 10 (2018) 490–494, https://doi.org/10.1093/INTHEALTH/IHY055.
[26] J.I. Gajardo, M.J. Castillo, Risk factors for hydatid disease in high school students in the district of Punitaqui, Chile, Rev. Chilena Infectol. 34 (2017) 227–234, https://doi.org/10.4067/S0716-10182017000300004.
[27] D. Li, Q. Gao, J. Liu, Y. Feng, W. Ning, Y. Dong, L. Tao, J. Li, X. Tian, J. Gu, D. Xin, 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. 147 (2015) 17–22, https://doi.org/10.1016/J.ACTATROPICA.2015.02.018.
[28] A. Khan, K. Naz, H. Ahmed, S. Simsek, M.S. Afzal, W. Haider, S.S. Ahmad, S. Farrakh, W. Weiping, G. Yayi, Knowledge, attitudes and practices related to cystic echinococcosis endemicity in Pakistan, Infect. Dis. Poverty 7 (2018) 1–15, https://doi.org/10.1186/S40249-017-0383-2/TABLES/8.