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Research Article

Demographic Characteristics and Trends of Hydatid Disease in Kyrgyz Republic: A Comprehensive Analysis from 1986 to 2022

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A B S T R A C T

Background: Hydatid disease (HD), caused by Echinococcus granulosus larvae, is a significant public health problem worldwide. Kyrgyzstan has a high prevalence of hepatic HD, with a two to three-times increase in teenagers. Hospitalisation is often required during the critical phase. We aimed to assess the current demographic situation of patients with HD in the Kyrgyz Republic.

Methods: This study investigated the epidemiological characteristics of patients with HD in the Kyrgyz Republic using state statistics, annual infectious disease reports, epidemiological examination records, and Center for State Sanitary and Epidemiological Surveillance reports.

Results: The study found that the incidence of HD in the Kyrgyz Republic has been increasing, with a moderate increase and yearly growth rate (GR) of 3% over the long-term dynamics of the prevalence of HD in the population. The study also found that the prevalence of HD in children has a significant yearly rise, with a moderate GR from 1986 to 2004 and an estimated moderate trend with a yearly GR of 3.2% from 2005 to 2022.

Conclusion: The prevalence of HD in the Kyrgyz Republic has increased significantly over the past three decades, particularly in the southern region, which includes Osh, Batken, and Jalal-Abad.

Keywords: Hydatid Disease, Demography, Kyrgyz Republic, Growth Rate

Introduction

Echinococcus (E.) granulosus larvae are responsible for causing Hydatid disease (HD), a condition characterised by the development of cysts and significant harm to essential organs such as the liver and lungs.[1] HD has been regarded as a substantial public health issue since 1950.[2] This disease poses a major threat to both the economy and global health worldwide.[3] In the Kyrgyz Republic, the prevalence of hepatic HD is particularly high, with an increase of two to three times in teenagers.[4] Patients with severe HD often require hospitalisation during the critical phase.[5]

The prevalence of HD differs considerably, in the range of 18 cases per every 1,000 people in regions with high disease prevalence, to 2.3 cases per 1,000,000 inhabitants in areas experiencing outbreaks. However, some countries may experience even higher rates, with up to 30 cases every 100,000 people annually. By contrast, alveolar HD is primarily found in the Northern Hemisphere and is most prevalent in Asian, Russian, European, and North American countries. Alveolar echinococcosis has been reported to cause 18,400 new cases and 6,87,800 disability-adjusted life-years annually.[6]

The incidence of HD varies across Europe; it is relatively rare in the northern and eastern regions but is either endemic or highly prevalent in the south and southeast. A cross-ultrasound screening study conducted as part of the framework project discovered that abdominal HD was prevalent in Turkey (0.59%), as well as Bulgaria and Romania (0.41%).[7]

Mainly Chkalov, Rostov, Saratov, and Siberia (East and West) cities in Russia have increased prevalence of HD.[8] In Georgia, the incidence rate of HD was reported to be 1.4 cases per 1,000 individuals in 2011, 2.1 cases in 2012, and 2.7 cases in 2013.[9] HD is both endemic and prevalent in various regions of Kazakhstan, with E. granulosus and E. multilocularis being commonly found in the country.[10] In recent years, there has been a steady increase in the number of HD cases with over 1,000 cases documented annually.

According to epidemiological data from 2000 to 2008, Tajikistan had an increased prevalence of HD, with a mean of 190 incidences annually. In particular, the majority of the confirmed cases of HD affected urban residents. It is worth noting that the majority of documented cases of HD were found in the main operative areas of Dushanbe and Khodjent, where there are institutions dedicated to health care and preventative measures that conduct tests to diagnose CE. [10]

Each year in Uzbekistan, a substantial number of cases ranging from 1.5 thousand to 4.5 thousand HD operations are performed. The liver is the most commonly affected organ, comprising approximately 80% of the cases, followed by the lungs and other organs. Between 2011 and 2018, 7,309 HD cases were documented in Uzbekistan. During this period, the average incidence rates per 1,000 people were 2.4 and 2.3, with a statistically significant difference observed between the two years ($p = 0.016$).[11]

The prevalence of HD has increased significantly in the Kyrgyz Republic over the past three decades, presenting a significant medical and social challenge. The severity of this condition is compounded by the fact that it often lacks visible signs of deterioration in affected individuals and is widespread in locations where it occurs naturally, with a prevalence that varies between 3.6 and 21.2 for every 1,000 individuals.[12] Despite the frequency of HD has increased, the prevalence of HD in the Kyrgyz Republic has also risen. We aimed to assess the current demographic situation of HD in the Kyrgyz Republic.

Materials and Methods

We investigated the demographic situation of HD in the Kyrgyz Republic from 1986–2022 using reports, yearly infectious disease reports, epidemiological examination records, and Center for State Sanitary and Epidemiological Surveillance reports. Data is evaluated by the Department of Disease Prevention and Epidemiological Surveillance at the Ministry of Health in conjunction with medical records from various regions of the Kyrgyz Republic.

The Kyrgyz Republic's public health services have investigated over 500 grievances from both national and regional sources by 2023. This research was conducted by the Department of Disease Prevention and State Sanitary and Epidemiological Surveillance of the Ministry of Health of the Kyrgyz Republic in conjunction with the I.K. Akhunbaev Kyrgyz State Medical Academy in Bishkek, Kyrgyz Republic. The total population morbidity rate (per 100,000 persons) was calculated using the following formula: The formula for morbidity rate is: $(k \times an)/b$, where k is the targeted metric, an is the total number of cases given year, and b is the mean annual population.

Statistical analysis was performed utilising Statistica v8.0, a software program produced by StatSoft, Inc. (Tulsa, USA). Data are presented as mean ± standard deviation and n (%). Student's t-test was used to evaluate differences in parameters, and statistically significant differences were determined at a significance level of $p < 0.05$. MedCalc Software Ltd., located in Ostend, Belgium, was used to compute significant odds ratios. The Ethical Committee of the Research and Production Association "Preventive Medicine" under the Ministry of Health of the Kyrgyz Republic approved the study with ethical approval and protocol no. 1, which was dated February 19, 2010.

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Results

Recent studies indicate that the population of the Kyrgyz Republic is seven million, which is equivalent to 37,600 individuals. Of the total, 3,557,300 individuals were women, accounting for 50.5%, while 3,480,300 individuals were men, accounting for 49.5%. The number of rural residents of the Kyrgyz Republic is now four million, accounting for 65.1% of the total population. These individuals engage in livestock farming and cultivating agricultural land. A total of 2,453,700 individuals, representing 34.9% of the population, resided in the urban areas. Compared to 2018, the number of rural residents has decreased by 368 thousand, while the urban population has increased by 280.1 thousand persons.

During the observation period, 19,262 HD cases were registered and verified using surgical procedures. According to the standard, 520 occurrences were detected per year. The average intensity index (AII) was 9.980/0000, reaching a maximum of 16.9 in 2015, and a minimum of 2.9 in 1986. During the observation period, there was a steady increase in the long-term incidence of HD, with a yearly growth rate (GR) of three percent. The occurrence of HD changed from infrequent to widespread parasitism. The incidence rate showed a substantial 4.5-fold increase from 1986 to 2022, resulting in the classification of the republic in the endemic area category. The occurrence rate of HD can be assessed at different intervals over a span of 3–4 years all over the epidemic phase (Figure 1).

In recent years, changes in economic circumstances have led to an increase in private-sector stakes in farm animals. As a result, there has been an increase in household slaughters with respect to the norms for veterinary monitoring. In such situations, dogs are highly susceptible to echinococcosis larvae. This action causes environmental contamination owing to the growth of parasites and subsequent infection of intermediate hosts.

The increase in the prevalence of HD in humans in the Kyrgyz Republic can be attributed to the administration methods and insufficient veterinary supervision.

During the initial 11 years of the investigated period (1986–1996), the AII was relatively low at 4.5%. This may be attributed to the foundation of a new country and the prioritisation of animal husbandry. Between 1997 and 2009, the AII increased by 2.1 times, or 9.8%, as private veterinary services and animal farms were established. According to the National Statistical Committee's Livestock Accounting Report in Kyrgyzstan, as of the end of 2021, the cattle population has increased by 34.6 thousand, reaching a total of 1 million 750.4 thousand. The horse population increased by 7.6 thousand, reaching 547.2 thousand. However, the sheep and goat population decreased by 632, reaching a total of 6 million 278.1 thousand.

The AII showed a 1.8-fold increase compared to the preceding indicator and a 3.9-fold increase compared to the beginning indicator as a result of professional veterinary care (Figure 2).

Figure 1.Long-Term Dynamics of the Incidence of HD in the Population of the Kyrgyz Republic (1986–2022)

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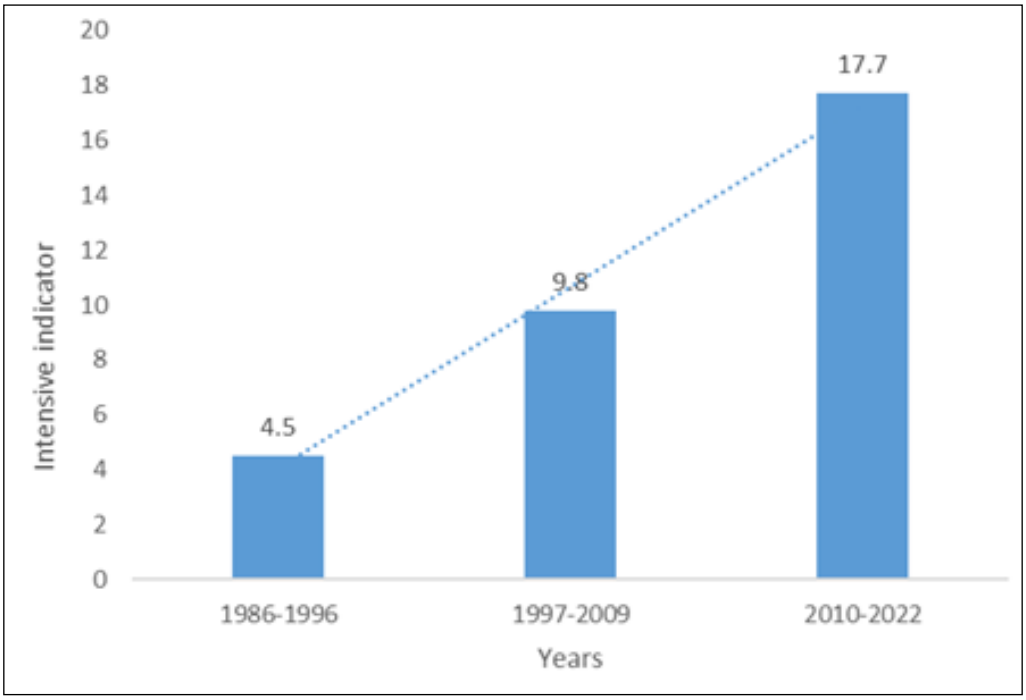

Figure 2.Dynamics of Indicators of the Incidence of HD in the Population of Kyrgyz Republic (1986–2022)

HD is prevalent throughout a vast area, with varying levels of severity in different regions. The southern region comprises 54% of the documented cases of HD. Most documented cases of illness (22%) in Osh have been linked to the surgical treatment centre, which serves patients from the southern regions. The prevalence in the Batken group was 13%. The Jalal-Abad region accounted for 8% of the total, whereas the Osh region accounted for 11% (Figure 3).

The prevalence of HD varies geographically, with the southern area having a high-intensity indication. The most intense indicators in Osh were 25.4%, in Batken it was 14.7%, in Osh it was 12.2%, and 9.3% in Jalal-Abad. A significant prevalence of HD was observed in Naryn (15.7%), Issyk-Kul (13.2%), and Talas and Chuy (9.8% and 9.0%, respectively) regions in the north (Figure 4).

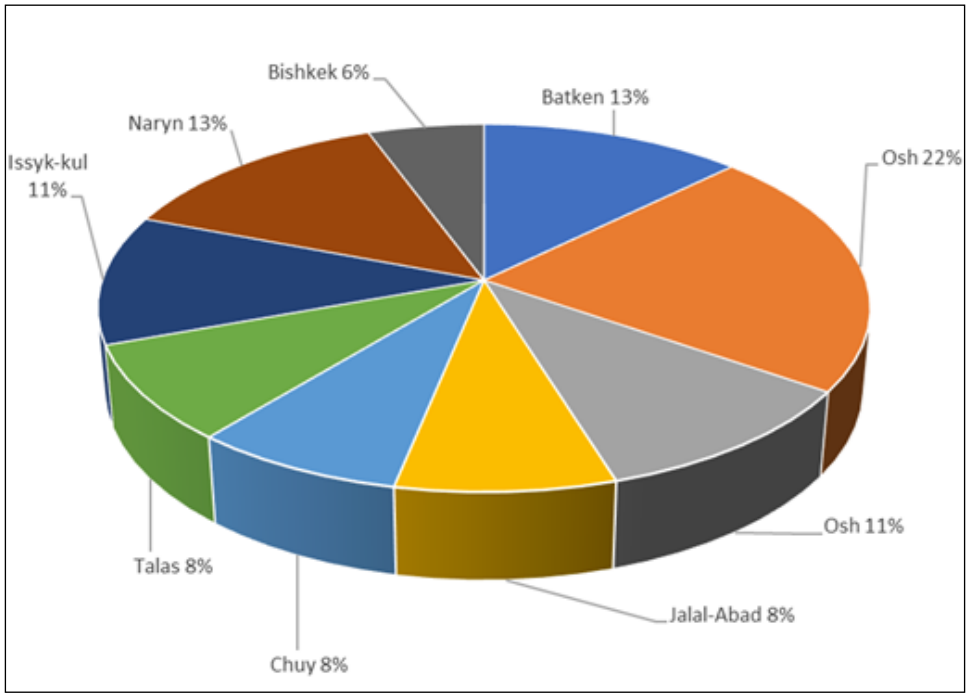

Figure 3.Distribution of Patients with HD by Regions of Kyrgyz Republic (1986–2022)

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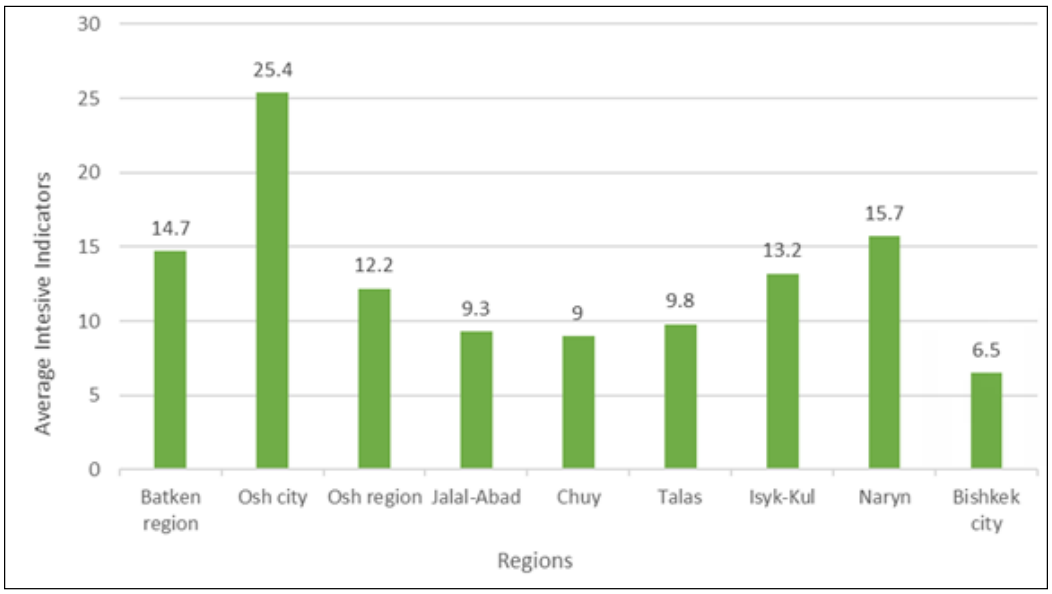

Figure 4.Average Intensive Indicator by Regions of Kyrgyz Republic (1986–2022)

This study recorded instances of congenital epilepsy in 4304 children who were under the age of 14 years. In these cases, the specific gravity was 22.3%. Over an extended period, the occurrence of HD in children has a distinct yearly GR. From 1986 to 2004, there was a moderate GR, characterised by a yearly GR of 1.1%. From 2005 to 2022, this trend is projected to remain modest, with an yearly GR of 3.2%. Over the course of several years of monitoring, the AII among the children was 3.9%. The lowest rate recorded was 1.0% in 2006-2007, while the highest rate reached 10% in 2019 (Figure 5).

Regional data on the prevalence of HD in children revealed a significant occurrence of HD in children under the age of 14 in Jalal-Abad, with an AII of 14.9% for the investigated period. The Batken region exhibits high morbidity rates among children, varying between 4.9%–3.2% in the Osh and Naryn regions. Figure 6 shows that Talas is now leading in the northern area with an AII of -1.5%.

Analysis of the prevalence of Huntington's disease (HD) in children categorised by location revealed that a significant number of cases were recorded in Osh and Jalal-Abad, accounting for 27.9% and 20.0% of the total cases, respectively. The prevalence of registered cases of Huntington's disease (HD) in children is particularly high in the Chuy and Bishkek regions (11.8% and 11.3 %, respectively). The percentage of registered HD varied across different locations, ranging from 9.7% in Naryn to 3.4% in Osh (Figure 7).

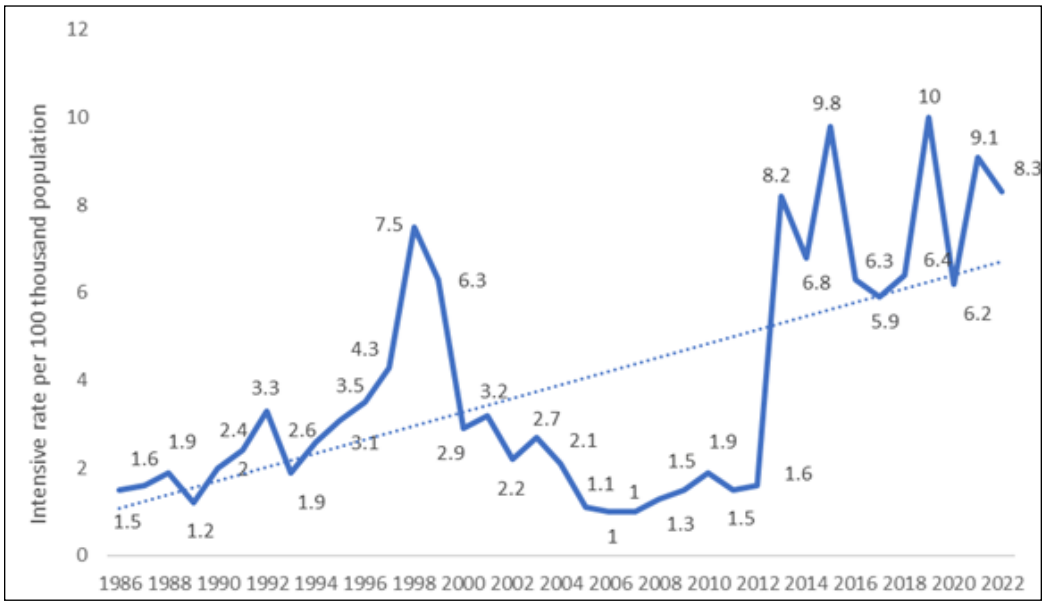

Figure 5.Long-Term Dynamics of the Incidence of HD in Children Under 14 Years of Age (1986–2022)

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Of the 19,262 instances of HD, 11,114 (57.7%) were men and 8,148 (42.3%) were women. For men, this indication is 2.8 per 100,000 individuals, while for women it is 3.0 per 100,000 individuals.

Discussion

The long-term trend revealed a significant increase in the incidence of chronic encephalopathy, with an increase of 4.5 times between 1989 and 2022. Notably, during this period, HD was reclassified from its previous classification as rare helminthiasis to a more common invasive category.[13]

It is estimated that 280,000 registered dogs and stray animals play a vital role in maintaining the life cycle of Echinococcus. Notably, 54% of the reported cases of HD were found in Southern Kyrgyzstan. Among the northern areas, Naryn had the highest proportion, accounting for 13% of the total area. Jalal-Abad (14.9%), Batken (4.9%), Naryn (3.2%), and Osh (3.2%) all had very high invasion rates. In terms of the age distribution of those affected, 22.3% of the children were under 14 years of age, and there was no statistically significant difference in the sex distribution of HD.

The incidence of E. granulosus infections in humans ranged from 0.10 to 7.74 cases per 100,000 individuals, as determined by a systematic review of 79 publications on the demography of this parasite in human beings and animals from 2000 to 2019. The prevalence of E. granulosus in cattle, sheep, and dogs varied between 0.003% and 64.09%, 0.004% and 68.73%, and 0% and 31.86%, respectively. This study found increased E. granulosus infection in both human beings and animals.[14]

During the period spanning from 1997 to 2021, Europe documented a total of 64,745 cases of HD. In European Union member states, the annual incidence rate of HD ranges from 0 to 50 per 100,000 individuals, whereas in Europe as a whole, it averages from 0 to 64 per 100,000 people. This study found that endemic European Mediterranean countries typically experienced a decrease in the incidence of HD, but the present epicentre of the disease's expansion in Europe is situated in these areas.[15] HD is frequently reported in the Ciscaucasia, South Caucasus, Moldova, Kazakhstan, Kyrgyz Republic, and Ukraine within the Commonwealth of Independent States.[16] Echinococcosis poses a significant socioeconomic challenge in Central Asia, where an estimated 58% of the population is affected by the disease.[17]

HD is prevalent in certain regions of the world. In endemic areas, the incidence rate of HD can be as high as 50 cases per 100,000 individuals each year, and prevalence rates of 5–10% have been reported in regions such as China, Argentina, Peru, East Africa, and Central Asia.[18] From 1982 to 2000, 559 cases of alveococcosis were documented in Central Europe.

The World Health Organization has emphasised the importance of addressing neglected zoonotic diseases, particularly HD and alveolar echinococcosis. approximately 2–3 million cases of human HD are estimated to occur worldwide each year. This has a significant impact on the economy, causing a yearly financial loss of approximately three billion United States dollars, which is primarily attributed to livestock compensation and healthcare expenditures for patients.[7]

Conclusion

The increasing prevalence of HD in the Kyrgyz Republic, which has experienced an annual increase of 3.5 %, poses a substantial medical challenge. This disease has an especially high incidence rate in southern regions, where it affects 54% of the population. Naryn had the highest incidence rate (13%) in the northern regions. A substantial proportion of children aged < 14 years (22.3%) also had HD. In Jalal-Abad, Batken, and Naryn, the incidence rates were particularly high at 14.90/0000, 4.90/0000, and 3.20/0000, respectively.

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Conflict of Interest: None

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