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## Epidemiological aspects of echinococcosis of the liver and other organs in the Republic of Uzbekistan

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## ABSTRACT

**Introduction:** Recently, in international medical organizations, more and more interest is shown towards diseases in humans, among which the cystic form of echinococcosis (CE) is given special importance. As a zoonotic parasitic disease caused by the larval stage of cestodes belonging to the genus *Echinococcus* and the Taeniidae family, CE in 2014 was recognized globally by the UN Food and Agriculture Organization (FAO) and WHO as the second most important foodborne parasitic pathology. In the 2018, the European Food Safety Authority (EFSA) considered CE among the food-borne parasites of highest relevance in Europe.

**Purpose:** to study the actual epidemiology of human echinococcosis lesion in the Republic of Uzbekistan for 2015–2019 to highlight the mean annual incidence of this pathology in all regions of the country, as well as the extensive value of the proportion of echinococcosis of the liver (EL), lungs (LE) and other localizations.

**Material and methods:** The officially registered data for all regions of the country for 2015–2019 were studied. An ultrasound screening of the abdominal organs of the population of the Khorezm region was carried out during 2019 to determine the effectiveness of early diagnosis of EL. A total of 104,284 inhabitants were examined, of which 38,660 were children and 65,624 were adults. **Results:** According to the processed statistical data for all regions of the Republic of Uzbekistan for 2015–2019 on average, 2105.0 ± 43.3 patients with echinococcosis of various localizations were diagnosed. The mean annual incidence was 6.5 ± 0.09 per 100,000 inhabitants. The extensive value of the EL share was 79.4 ± 0.9% (1672.2 ± 35.6 on average per year), high-level rate - 5.2 ± 0.08 per 100,000 inhabitants; the proportion of LE was 14.0 ± 0.8% (295.2 ± 17.8), the prevalence was 0.9 ± 0.06 per 100,000 inhabitants; the proportion of echinococcosis of other localizations was 6.5 ± 0.5% (137.6 ± 13.4), the high-level value was 0.4 ± 0.03 per 100,000 inhabitants. The frequency of detection of the liver or other abdominal organs echinococcosis during screening ultrasound in the Khorezm region was 0.009%, in turn, the examination of family members of these patients increased this indicator to 0.011%.

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## 1. The urgency of the problem

Recently, in international medical organizations, more and more interest is shown towards various parasitic diseases in humans, among which the cystic form of echinococcosis (CE) is given special importance (Gessese, 2020; Ohiolei et al., 2020). As a zoonotic parasitic disease caused by the larval stage of cestodes belonging to the genus *Echinococcus* and the Taeniidae family, CE in 2014 was recognized globally by the UN Food and Agriculture Organization (FAO) and WHO as the second most important foodborne parasitic pathology (FAO/WHO, 2014). In the 2018, the European Food Safety Authority (EFSA) considered CE among the food-borne parasites of highest relevance in Europe (EFSA Panel on Biological Hazards (BIOHAZ) et al., 2018).

The peculiarities of echinococcosis parasitizing affect not only medical but also social aspects of the state, necessitating close inter-sectoral cooperation to actively develop programs to prevent the spread of this pathology. The high proportion of the need for surgical treatment of CE, as well as the risk of recurrence of the disease, not only lead to public health issues but also to high economic costs. Therefore, studies on the local incidences of CE is increasingly attracting scientific researchers and is of practical interest among the medical community.

The Republic of Uzbekistan is the largest country in terms of population in the Central Asia region. In 2019, the population exceeded 33 million. At the same time, this region is classified as an epidemiologically favorable in terms of the prevalence of echinococcosis, which is associated with high incidence rates and medical aid appealability in all regions of the country, exceeding 5 people per 100,000 inhabitants, wherein more than 1500 patients are operated on annually.

In this article, we provide data on the number of cases of echinococcosis officially registered in the Republic of Uzbekistan over a five-year observation period (2015–2019). Also, in Khorezm region, one of the 14 regions of the country, we showed the effectiveness of detecting liver echinococcosis during ultrasound screening among children and adults, to highlight the chemotherapeutic or surgical treatment proportion of this pathology.

## 2. Purpose

to study the actual epidemiology of human echinococcosis in the Republic of Uzbekistan for 2015–2019 to highlight the high-level rate of the prevalence of this pathology in all regions of the country, as well as the extensive value of the proportion of echinococcosis of the liver (EL), lungs (LE) and other localizations.

## 3. Material and methods

For an objective determination of the prevalence rate, we studied the data of regional health care units for 2015–2019. It should be noted that the largest number of patients was viewed in Tashkent the capital of Uzbekistan, while patients were admitted from different regions. Since some patients from other regions sought medical advice in Tashkent and were operated on in clinics of Tashkent, they were not included in the annual regional summary. Therefore, these patients were added to the data for the respective regions to clarify the morbidity rates by the region.

The ultrasound screening of the abdominal organs was carried out in order to determine the effectiveness of early diagnosis of EL among the population of the Khorezm region during 2019 (the population this period was 1835,690 inhabitants). The survey was conducted among children and adults. For this, ultrasound diagnostics was done directly at the exit of schools. A total of 104,284 inhabitants were examined, of which 38,660 were children from 18 schools and 65,624 adults from 3 institutes and 6 enterprises.

## 4. Results

The prevalence of CE in different countries of the world is heterogeneous, from single cases to hyperendemic zones, in which this rate can exceed 50 cases per 100,000 inhabitants. The highest incidence of CE is noted in Argentina, Peru, East Africa, Central Asia, China, etc., while the annual losses associated with this pathology is approximately \$ 3 billion (WHO, 2016). Local surveys on CE in various regions in Palestine showed a six-year average incidence of 3.7 per 100,000 inhabitants (Bethlehem), while the annual CE incidence in particular villages and urban areas varied between 9.6 and 23.3 per 100,000 inhabitants (Al-Jawabreh et al., 2017). Higher rates were obtained in a study of the prevalence of echinococcosis in Tibet (Tibet Autonomous Region, China), out of 80,384 inhabitants examined, this pathology was detected in 1.66% of cases, and females (1.92%) were more prone to CE infection than males (1.41%) (Li et al., 2019). In turn, in some other regions of China, a more favorable situation is determined. In particular, according to a study in Yixing, China, only 7 cases of echinococcosis have been reported since 2007 with a prevalence of 0.56 per 100,000 inhabitants, while serological tests performed on 1861 residents from 2011 to 2018 showed 0.54% seropositivity (Liang et al., 2019). But even with such a rare incidence, scientists come to the conclusion that it is necessary to control the prevalence of CE. Another analysis, carried out in Morocco, showed an overall abdominal CE prevalence of 1.9%, with significantly higher values in rural communities (Chebli et al., 2017). Conducting several series of mass screening examinations in different regions of Turkey showed a level of echinococcosis ranging from 0.2% to 0.5%, which led to the conclusion that it is necessary to develop an effective control program and amend the current legislation (Ok et al., 2020).

The study of the dynamics of the echinococcosis prevalence among the population of Uzbekistan between 2015 and 2019, showed almost equivalent annual rates fluctuating between 308 and 327 patients per year, which correspond to incidence rates ranging from 2.7 to 3.1 per 100,000 inhabitants. Noting that, only about a fifth of the patients (from 64 to 77) were directly residents of the city. These indicants mean that for the period from 2015 to 2019, from 308 to 327 patients were diagnosed annually (2015–315; 2016–327;

**Table 1**  
Cumulative prevalence of echinococcal lesions in the country.

Total	2015	2016	2017	2018	2019
Population of the country	31,298,929	31,575,332	32,388,561	32,956,100	33,255,538
The number of patients with echinococcosis	2049	2075	2126	2159	2116
Prevalence per 100,000 inhabitants	6,5	6,6	6,6	6,6	6,4
Liver (absolute number)	1627	1665	1656	1720	1693
Liver (per 100,000 inhabitants)	5,2	5,3	5,1	5,2	5,1
Lungs (absolute number)	289	293	326	287	281
Lungs (per 100,000 inhabitants)	0,9	0,9	1,0	0,9	0,8
Other localizations (absolute number)	133	117	144	152	142
Other localizations (per 100,000 inhabitants)	0,4	0,4	0,4	0,5	0,4
Number of operations (absolute number)	2006	2033	2078	2120	2079
The number of operations (per 100,000 inhabitants)	6,4	6,4	6,4	6,4	6,3

**Table 2**  
The prevalence of echinococcosis lesions in different regions of the Republic of Uzbekistan per 100,000 inhabitants. (M ± σ).

Region	Average for 2015–2019	On average for 2015–2019 per 100,000 inhabitants	Validity	
			t	p
Andijan region	164,8 ± 4,3	5,5 ± 0,16	12,10	<0,05
Bukhara region	173,4 ± 5,3	9,4 ± 0,26	-22,91	<0,05
Jizzakh region	142,8 ± 22,4	10,9 ± 1,41	-6,90	<0,05
Kashkadarya region	145,4 ± 4,7	4,7 ± 0,24	15,85	<0,05
Navoi region	60,2 ± 10,3	6,3 ± 0,94	0,46	>0,05
Namangan region	135,6 ± 8,0	5,1 ± 0,4	7,60	<0,05
Samarkand region	215,4 ± 5,3	5,9 ± 0,23	6,01	<0,05
Surkhandarya region	221,4 ± 43,2	9,0 ± 1,88	-2,90	<0,05
Syrdarya region	113,0 ± 12,5	14,0 ± 1,38	-12,07	<0,05
Tashkent region	248,8 ± 17,8	8,8 ± 0,49	-10,13	<0,05
Fergana region	224,8 ± 10,5	6,3 ± 0,16	3,01	<0,05
Khorezm region	108,6 ± 6,3	6,1 ± 0,43	2,16	<0,05
Republic of Karakalpakstan	82,4 ± 5,5	4,5 ± 0,30	14,55	<0,05
Tashkent city	68,4 ± 2,8	2,8 ± 0,18	42,46	<0,05
<b>Uzbekistan</b>	<b>2105,0 ± 43,3</b>	<b>6,5 ± 0,09</b>	0,00	-

Note: The validity of differences is given in relation to the average value for Uzbekistan.

**Table 3**  
Indicants for Tashkent region and Tashkent city for 2015–2019.

Tashkent region	2015	2016	2017	2018	2019
Population of the region	2,776,212	2,794,125	2,845,272	2,879,875	2,898,505
The number of patients with echinococcosis	234	239	235	265	271
Prevalence per 100,000 inhabitants	8,4	8,6	8,3	9,2	9,3
Liver	194	201	199	213	225
Lungs	34	32	32	42	40
Other localizations	6	6	4	10	6
The number of operations for echinococcosis	232	238	231	260	266
Tashkent city	2015	2016	2017	2018	2019
Population of the city	2,382,222	2,393,176	2,444,539	2,487,451	2,509,969
The number of patients with echinococcosis	315	327	324	308	316
The number of patients with echinococcosis from Tashkent	64	67	65	77	69
The number of patients with echinococcosis from other regions treated in Tashkent	251	260	259	231	247
Prevalence per 100,000 inhabitants (Tashkent)	2,7	2,8	2,7	3,1	2,7
Liver (total)	265	267	249	241	259
Liver (Tashkent)	52	55	48	60	54
Liver (from other regions)	213	212	201	181	205
Lungs (total)	36	43	55	46	40
Lungs (Tashkent)	8	9	12	13	10
Lungs (from other regions)	28	34	43	33	30
Other localizations (total)	14	17	20	21	17
Other localizations (Tashkent)	4	3	5	4	5
Other localizations (from other regions)	10	14	15	17	12
Number of operations (total)	308	316	312	300	307
Number of operations (Tashkent)	59	62	58	73	63
Number of operations (from other regions)	249	254	254	227	244

**Table 4**  
Summary data on the prevalence of echinococcosis in the Republic of Uzbekistan.

Indicant		On average, annually for 2015–2019	On average for 2015–2019 per 100,000 inhabitants
All cases	abs.	2105,0 ± 43,3	6,5 ± 0,09
Liver	abs.	1672,2 ± 35,6	5,2 ± 0,08
	%	79,4 ± 0,9%	
Lungs	abs.	295,2 ± 17,8	0,9 ± 0,06
	%	14,0 ± 0,8%	
Other organs	abs.	137,6 ± 13,4	0,4 ± 0,03
	%	6,5 ± 0,5%	

2017–324; 2018–308; 2019–316 patients). The EL was determined in most cases, the share of it was 75–80%. From 300 to 316 patients were operated, in other cases, either chemotherapy was recommended due to the small size of the cysts, or surgical treatment was contraindicated due to the somatic status of the patients.

The total number of detected cases of echinococcosis in the Republic of Uzbekistan over a five-year observation period ranged from 2049 to 2159 patients per year (Table 1).

If we consider the average rate for 2015–2019, then in 13 regions of the country and the city of Tashkent as a whole ( $M \pm \sigma$ ) 2105.0 ± 43.3 patients with echinococcosis of various localizations were detected, the prevalence rate was 6.5 ± 0, 09 per 100,000 inhabitants. Utmost prevalence of this disease among all regions of the country was identified in Tashkent - 248.8 ± 17.8 and Fergana regions - 224.8 ± 10.5 patients. However, relative to the population, the highest prevalence was verified in the Syrdarya region - 14.0 ± 1.38 ( $t = 12.07$ ;  $p < 0.05$  in relation to the national average) and Jizzakh region - 10.9 ± 1.41 per 100,000 inhabitants ( $t = 6.90$ ;  $p < 0.05$ ). In turn, the lowest rate was in Tashkent city - 2.8 ± 0.18 ( $t = 42.46$ ;  $p < 0.05$ ) and in Kashkadarya region - 4.7 ± 0.24 per 100,000 inhabitants ( $t = 15.85$ ;  $p < 0.05$ ) (Table 2).

Attention is drawn to the fact of the minimum prevalence of echinococcosis in the capital of the country, which is 1.7 to 5.0 times lower than in other regions. difference in regional distribution of CE is closely related with specific socio-economic conditions, including extensive livestock farming, the presence of numerous stray or shepherd dogs, unsupervised home slaughtering, and improper disposal of carcasses (Varcasia et al. 2004, 2011) (Varcasia et al., 2004; Varcasia et al., 2011). Moreover, if the factor of direct contact when keeping infected and untreated dogs is dangerous in terms of the development of family cases of the disease, then invasion through the consumption of fresh crude foodstuffs from natural or agricultural sources (berries, fruits, vegetables, herbs, etc.), as well as drinking water contaminated with parasite *E. granulosus* eggs has a more significant effect on the likelihood of infection (Tazayan, 2019).

Tashkent region is considered separately from the city of Tashkent (Table 3). Only patients directly from Tashkent city were included in Tashkent city, the rest of those operated on in Tashkent were transferred to the corresponding regions.

The study of the high-level rate for the share of EL among all forms of the disease showed that on average in the country this localization accounts for 79.4 ± 0.9% of cases, while fluctuations in different regions ranged from 59.7% - in the Surkhandarya region to 87.8% in Jizzakh region. The average prevalence rate of EL in all regions was 5.2 ± 0.08 per 100,000 inhabitants, while the maximum rate was found again in Syrdarya - 9.8 ± 0.76 ( $t = 13.48$ ;  $p < 0.05$ ) and Jizzakh regions - 9.6 ± 1.34 per 100,000 inhabitants ( $t = 7.30$ ;  $p < 0.05$ ). The minimum rates were determined in the capital - 2.2 ± 0.17 ( $t = 36.09$ ;  $p < 0.05$ ) and in the Kashkadarya region - 3.9 ± 0.23 per 100,000 inhabitants ( $t = 11.39$ ;  $p < 0.05$ ).

It should be noted that the proportion of EL will be slightly higher, since the combined lesion of the liver and lungs and (or) other organs is of considerable importance, the frequency of which can be about 1–2% in combination with the lungs and up to 4–5% in combination with other localization, in particular, with dissemination against the background of EL breakthrough or inadequate treatment tactics into the abdominal cavity.

The second localization in terms of the echinococcosis prevalence is the lungs. The extensive indicant for the proportion of the lung echinococcosis (LE) among all forms of the disease averaged 14.0 ± 0.8% throughout the country, while in various regions the fluctuations of this indicant were determined in the range from 8.0% - in the Jizzakh region to 24.5% in Surkhandarya region. The average value of LE prevalence was 0.9 ± 0.06 per 100,000 inhabitants, while the maximum indicant was found in Syrdarya - 3.5 ± 0.89 ( $t = 6.39$ ;  $p < 0.05$ ) and Surkhandarya regions - 2,1 ± 0.84 per 100,000 inhabitants ( $t = 3.19$ ;  $p < 0.05$ ). The minimum values were determined in Tashkent city - 0.4 ± 0.08 ( $t = 10.90$ ;  $p < 0.05$ ) and Khorezm region - 0.5 ± 0.05 per 100,000 ( $t = 11.39$ ;  $p < 0.05$ ).

Other localizations of echinococcosis are much less common than in the liver and lungs (Joanny et al., 2021). These include cases with extrahepatic damage to the abdominal organs, more often the spleen, or with breakthroughs with dissemination into the free abdominal cavity, as well as localization in the heart, cerebrum and bones (Shevchenko and Nazirov, 2016). The extensive value of echinococcosis of other localizations (EOL) outside the liver or lungs averaged 6.5 ± 0.5% throughout the country, while in different regions the fluctuations of this value were determined in the range from 2.6% - in the Tashkent region to 17.4% in Surkhandarya region. The intensive value of the prevalence of EOL was 0.4 ± 0.03 per 100,000 inhabitants, while the maximum was found in Surkhandarya - 1.5 ± 0.18 ( $t = 13.51$ ;  $p < 0.05$ ) and Bukhara regions - 0,8 ± 0.12 per 100,000 inhabitants ( $t = 7.36$ ;  $p < 0.05$ ). The minimum values are determined in Tashkent city - 0.2 ± 0.03 ( $t = 12.13$ ;  $p < 0.05$ ) and Tashkent, Namangan, Kashkadarya and Andijan regions - within 0.2 ± 0.05–0, 08 per 100,000 inhabitants ( $p < 0.05$ ).

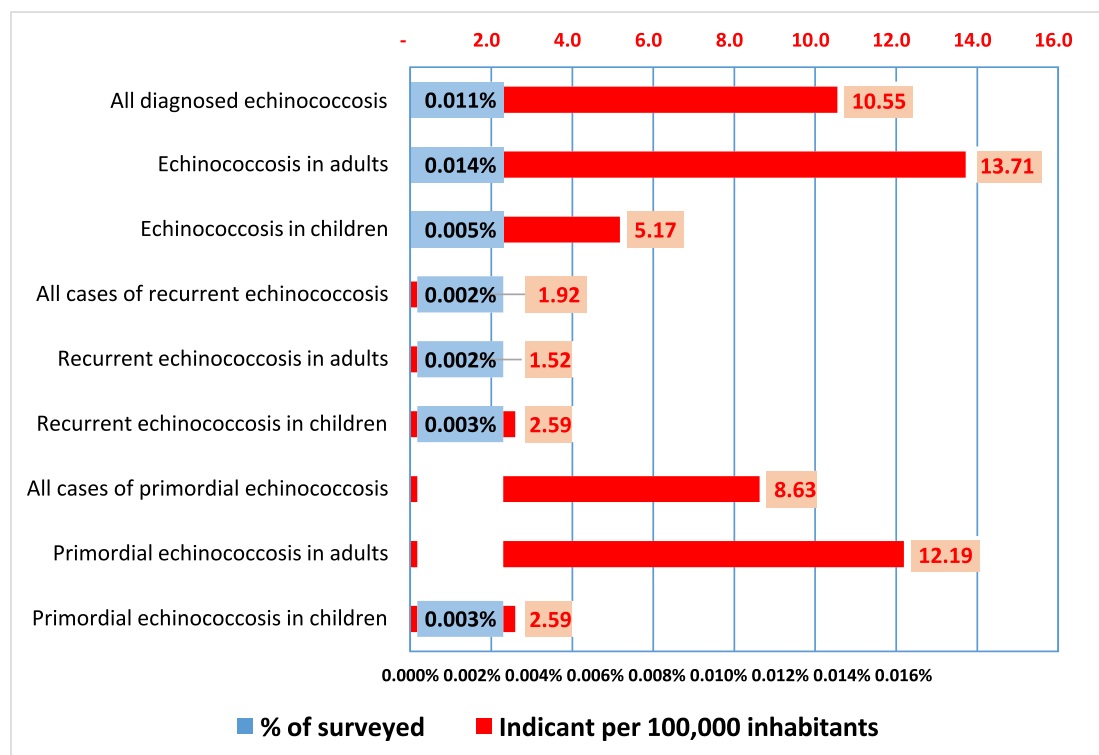
Table 4 shows summary data on the prevalence of echinococcosis in the Republic of Uzbekistan, taking into account absolute, intensive and extensive indicants.

**The frequency of detection of echinococcosis of the liver and other abdominal organs during ultrasound screening. The**

**Table 5**

Consolidated frequency of detection of echinococcosis of the liver or other organs of the abdominal cavity during ultrasound screening in the Khorezm region.

Indicant	Men		Women		Total	
	Abs.	%	Abs.	%	Abs.	%
Number of examined	60,756	100,0%	43,528	100,0%	104,284	100,0%
Echinococcosis of the liver revealed	3	0,005%	4	0,009%	7	0,007%
Echinococcosis of other abdominal organs revealed	2	0,003%	0	0,000%	2	0,002%
Total with echinococcosis	5	0,008%	4	0,009%	9	0,009%



**Fig. 1.** Frequency of liver and abdominal echinococcosis verified by ultrasound screening in children and adults.

long latent course of echinococcosis causes a high probability of latent forms of the disease. In many cases, a cyst formation is detected as an accidental finding during an ultrasound or X-ray survey. Accordingly, regular diagnostics of the population would improve the verification of early forms of echinococcosis of various localizations. This fact, on the one hand, would clarify the true prevalence rates, and on the other hand, it would increase the likelihood of using therapeutic chemotherapy (detection of cysts up to 5 cm in size). Accordingly, the active conduct of regular screening surveys will reduce the surgical activity in relation to this pathology.

Ultrasound screening of the abdominal organs was carried out among the population of the Khorezm region, which in 2019 was 1835,690 inhabitants. 104,284 inhabitants were examined, of which 38,660 were children and 65,624 were adults. Among all the examined children, 5 children had already been operated on for echinococcosis, and in 1 of them (a 16-year-old boy) a relapse in the abdominal cavity was verified (the primary operation was performed 1.5 years before this examination). In another case, EL was first detected during ultrasound screening (a 12-year-old girl). In general, echinococcosis was identified in 2 children (0.005%).

The share of newly diagnosed echinococcosis in adults was 0.011% - in 7 inhabitants. EL was detected in 6 (0.009%) cases, recurrent echinococcosis in the small pelvis (apparently as a consequence of seeding during the primary intervention) was verified in 1 man (0.002%).

The total number of patients with previously not diagnosed cases of echinococcosis was 9 (0.009%), 5 men (0.008%) and 4 (0.009%) women (Table 5), respectively, 8.63% per 100,000 inhabitants.

Further, patients' families were examined, taking into account the revealed latent echinococcosis of the liver and other abdominal organs. A total of 56 inhabitants were examined in 9 families, of which EL was detected in 2 (3.6%) cases. Accordingly, in addition to the results of the ultrasound screening, the number of detected latent EL and other abdominal organs was 11 inhabitants, which was 0.011% of 104,284 examined, and 10.55% per 100,000 inhabitants. Of these, in adults, echinococcosis was detected in 9 (0.014% and

**Table 6**  
Officially registered indicant in Khorezm region for 2019.

Khorezm region	2015	2016	2017	2018	2019
Population of the region	1,731,255	1,746,882	1,790,832	1,820,312	1,835,690
The number of patients with echinococcosis	110	116	99	111	107
Prevalence per 100,000 inhabitants	6,4	6,6	5,5	6,1	5,8
Liver	93	106	86	97	94
Lungs	9	7	9	9	10
Other localizations	8	3	4	5	3
The number of operations for echinococcosis	108	114	98	109	105

13.7 per 100,000 inhabitants, respectively), 2 cases in children (0.005% and 5.2 per 100,000 inhabitants) (Fig. 1).

Taking into account the data obtained during the ultrasound screening, it is possible point out the prevalence of EL and other organs of the abdominal cavity in the Khorezm region. Accordingly, 94 cases of EL and 3 patients with echinococcosis of other abdominal organs were officially presented in 2019, 97 patients in total. Ultrasound screening revealed 11 more cases, respectively the total number of echinococcosis of these localizations will be 108 patients. The population of the Khorezm region in 2019 was 1,835,690, of which 635,149 (34.6%) were children under 18 years old and 1,200,541 (65.4%) were adults. The prevalence of echinococcosis based on the number of children and adults as a whole increased due to additionally detected cases from 5.3 to 5.9 per 100,000 inhabitants.

Among children (under 18 years of age) this indicant was 1.26 per 100,000 inhabitants (8 children - 7.4%), among adults - 8.3 per 100,000 inhabitants (100 patients - 92.6%). The proportion of additional cases detected by ultrasound screening was 10.2%, of which 8.3% was primary echinococcosis, and 1.9% was a recurrent form.

An interesting issue is a possibility of changing the spectrum of treatment of echinococcosis with the obligatory ultrasound screening among the population to detect early forms of the disease. Thus, out of 11 patients with a detected echinococcal lesion, only for 4 (36.4%) of them a surgical treatment was assigned due to the large size of cysts (9.0–12.0 cm), in turn, in 7 (63.6%) cases since the verified cysts had a size of 3.0 to 5.0 cm a conservative treatment strategy was recommended. Again, out of 97 patients treated in 2019, 95 patients (97.9%) had an operation, and 2 patients (2.1%) got a chemotherapy course.

If using the example of the Khorezm region, we transfer the data into all indicants for the country as a whole, the following can be noted. In 2019, 1869 cases of EL and other abdominal organs were registered in the Republic of Uzbekistan, of which 1835 (98.2%) patients were operated on, and 1.8% (34) patients underwent medical chemotherapy. 11 additional cases of echinococcosis were detected during ultrasound screening in the Khorezm region. That was 11.3% (out of 97 patients) of all registered forms of echinococcosis, respectively, when conducting ultrasound screening throughout the country, the number of registered forms of only EL and other abdominal organs will increase by approximately 11.3%, that is, from 1869 to 2081 patients (212 inhabitants).

At the same time, according to the data of the Khorezm region, the estimated possibility of chemotherapy treatment has increased 4 times from 2.1% to 8.3%, respectively, for the whole country, this indicator may increase from 34 (carried out in fact) to 150 patients, which will be 7.2% (will also increase 4 times from 1.8%). The rest 1931 (92.8%) patients will undergo surgical treatment. Even with this calculated value, the proportion of the possibility of chemotherapy will significantly increase ( $\chi^2 = 64.385$ ;  $df = 1$ ;  $p < 0.001$ ). The introduction of regular screening surveys as mandatory dispensary diagnostics once a year or two years will significantly reduce the proportion of active surgical approaches for treating EL and other abdominal organs over the course of several years.

## 5. Conclusion

According to the processed statistical data for 2015–2019 for all regions of the Republic of Uzbekistan in average  $2105.0 \pm 43.3$  ( $M \pm \sigma$ ) patients with echinococcosis of various localizations were detected, respectively, the mean incidence was  $6.5 \pm 0.09$  per 100,000 inhabitants, while the maximum rate was evaluated in Syrdarya ( $14.0 \pm 1.38$ ;  $p < 0.001$  to the average) and Jizzakh ( $10.9 \pm 1.41$ ;  $p < 0.001$ ) regions, and the minimum values in Tashkent ( $2.8 \pm 0.18$ ;  $p < 0.001$ ) and Kashkadarya region ( $4.7 \pm 0.24$ ;  $p < 0.001$ ).

The frequency of detection of EL or other abdominal organs during ultrasound screening in the Khorezm region was 0.005% among children, 0.011% in adults, and 0.009% in general (in 9 out of 104,284 inhabitants). The examination of family members of these patients increased this indicant up to 0.011% (2), which in general significantly differed from the registered prevalence indicant (5.8 versus 10.6 per 100,000 inhabitants, Table 6), while in the total aggregate of detected cases this value increased by 11.3% (from 97 to 108), with primary invasion - 91.7% (5.39 per 100,000 inhabitants), recurrent - 8.3% (0.49 per 100,000 inhabitants), of which liver damage was verified in 95.4% of cases. 4.6% of patients had echinococcosis lesion of other organs of the abdominal cavity.

Taking into account the example for the Khorezm region for 2019, the estimated efficiency of ultrasound screening throughout the country can increase the number of registered forms of EL and other abdominal organs by 11.3% (from 1869 to 2081 patients), with an increase in the prevalence of parasitic invasion of this localization from 5.62 to 6.26 per 100,000 inhabitants, respectively, the estimated probability of chemotherapy treatment may increase from 1.8% to 7.2%, with a decrease in the proportion of surgical treatment from 97.9% to 92.8% ( $p < 0.001$ ).

The combination of factors of mandatory ultrasound screening among the population at least once a year or in two years, taking into account the slow growth of echinococcosis, will provide an annual increase in the likelihood of therapeutic chemotherapy by improving the diagnostic aspects with verification of echinococcosis of the abdominal organs in the early stages, when there is still a possibility for a conservative approach.

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