Liver cirrhosis in the elderly population: analysing prevalence and gender characteristics within the biotechnological framework

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Abstract. Liver cirrhosis stands as the predominant cause of mortality within digestive system diseases, excluding tumours, with a prevalence of 2-3 per cent among liver diseases. The temporal trajectory of liver cirrhosis development is intricately linked to diverse risk factors, underscoring the pivotal role of early detection and coordinated treatment. This study emphasizes the significance of mitigating complications associated with cirrhosis, ranging from gastrointestinal bleeding to spontaneous bacterial peritonitis, liver encephalopathy, and kidney failure. In this article, we present the outcomes of a rigorous 21-year clinical epidemiological monitoring initiative focused on the distribution of liver cirrhosis among the elderly population in the Andijan region of the Republic of Uzbekistan, with specific attention to gender characteristics. The findings not only contribute to the scientific understanding of liver cirrhosis prevalence within the elderly demographic but also align with the biotechnological framework. The results promise to optimize practices for primary, secondary, and tertiary prevention of liver cirrhosis within the specified biotechnological perspectives. Moreover, the data serves as a foundational basis for the creation of prognostic tables and the development of innovative technologies. The article concludes with practical recommendations derived from the analytical results, offering valuable insights to address the complexities of liver cirrhosis in the elderly within the context of the biotechnological framework.

1 Introduction

It is known from available scientific sources that the number and scope of research devoted to the epidemiology and prevention of liver diseases of social importance have increased and are being carried out. It is noteworthy that they expressed different opinions and indicated new clinical-epidemiological directions, and drew a general meaningful conclusion: early detection, prevention and treatment of cirrhosis of the liver caused by

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viral or other hepatitis and the increase of specific risk factors in the population is a current scientific direction.

Liver cirrhosis (LC) is the leading cause of death from diseases of the digestive system, excluding tumours. The prevalence of liver diseases is 2-3%. Risk factors determine the amount of time that cirrhosis of the liver takes to develop, thus early detection and treatment planning are crucial. It is crucial to manage this condition and avoid its complications, which include bleeding from the stomach and intestines, spontaneous bacterial peritonitis, liver encephalopathy, and kidney failure [1].

According to the latest international studies and recommendations, there are all reasons to consider liver diseases of social importance (chronic hepatitis (CH)+LC) as an important problem of preventive medicine:

1) It leads to a significant increase in the cost of medical services [2].

2) 60-80 per cent of them are cryptogenic [3];

3) Epidemiological indicators (clinical, biochemical, instrumental, questionnaire, demographic, environmental, gender, ethnic, social, geographic and pharmaco-epidemiological) can serve as reliable non-invasive predictors of the development of chronic hepatitis (CH) and liver cirrhosis [4];

4) A rational and safe pharmacotherapy algorithm has a preventive hepatoprotective effect and allows choosing a safe drug for patients with CH and LC [5];

5) Deterioration of epidemiological conditions and situations relative to socially important liver diseases (SILD) is confirmed [6,7].

The purpose of the study is to study the 21-year dynamics of the spread of liver cirrhosis among the elderly population of the Andijan region and gender characteristics and to develop advanced technologies for prevention.

2 Material and methods

Research work, following the scientific work plan of the Andijan State Medical Institute for the years 2000-2021, PZ-201205194 "Development of advanced innovative technologies for studying the epidemiology of chronic non-infectious diseases in various regions of Uzbekistan, ways to improve treatment and prevention" completed within the framework of the project.

A population of men and women aged 18-74 with a diagnosis of chronic hepatitis and treated in the departments of the Andijan State Medical Institute (4585) were included in the study.

General description of the population included in the study: the same conditions for the compared population groups (a single clinical centre, the same access and capacity of the medical institution, the same qualification level of specialists, the same criteria for diagnosis, the same direction of treatment programs), 18 years old and older, 75 younger patients, the following diseases are excluded: acute inflammatory diseases, pregnancy, tumour diseases, alcoholism and drug addiction, glomerular diseases (chronic kidney diseases), respiratory diseases (bronchial asthma, chronic obstructive pulmonary diseases), endocrine diseases (diabetes, hyperthyroidism, hypothyroidism), acquired immunodeficiency viral infection and major cardiovascular diseases (arterial hypertension, acute and chronic ischemic heart disease, heart defects). By design, the study is a non-experimental study of epidemiological and clinical nature.

It follows that a study was carried out with the sole purpose (to determine the prevalence of liver cirrhosis among the elderly population and the dynamics of gender characteristics over 21 years).

The medical history data of patients with a confirmed diagnosis of SILD (by clinical, questionnaire, biochemical, instrumental, functional and autopsy methods) were studied

using a special questionnaire, and subjective and objective clinical condition was evaluated. This questionnaire [8], approved and recommended for the detection of chronic non-infectious diseases, is standardized and unified, used in epidemiological studies and approved by the Ministry of Health of the Republic of Uzbekistan. The method of questionnaire identification
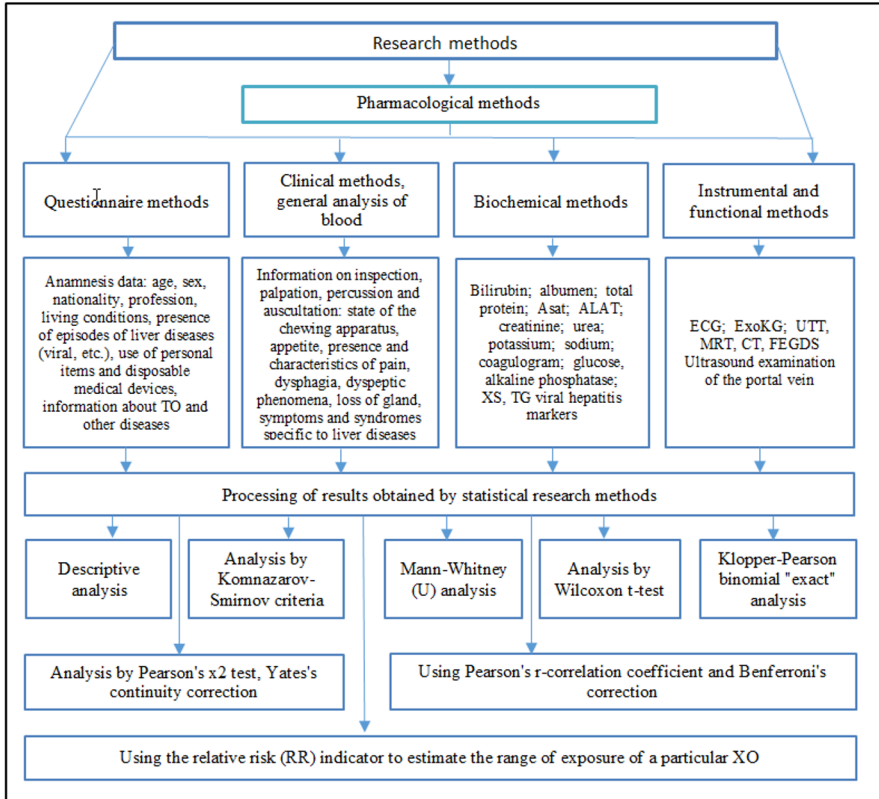
Fig. 1. Estimation of liver cirrhosis dynamics and methods of statistical processing

and assessment of CH and LC were expanded with additional investigations.

In a 21-year clinical-epidemiological study, questionnaire, clinical, biochemical, instrumental and statistical processing methods were used to determine the situation and evaluate the dynamics of liver cirrhosis (Fig. 1).

3 Clinical examination methods

In addition to the use of physical examination methods, the stage of the infection process in the blood serum of patients was determined using immunofluorescence assays (IFA) analysis. This approach is confirmed and approved by modern spiritual research. Using the Russian standard set "Vetor-Best", markers of viral hepatitis were identified: HBs - antigen for HBV infection, HBe - antigen, anti HBs antibody, HDV marker; HCV infection: Anti-HCV total, Anti-HCV coreIgG, Anti-HCV coreIgM, Anti-HCVNS3, AntiHCVNS4, Anti-HCVNS5; HBeIgG, HBcIG, HbcIgM. Based on the possibility of the clinical hospital, liver enzymes aspartate aminotransferase (AST), alanine aminotransferase (ALT), alkaline phosphatase, as well as total protein, creatinine, urea, potassium, sodium, coagulogram, glucose, iron were checked.

4 Instrumental inspection methods

Abdominal organs (liver, spleen, portal veins, gall bladder, kidneys) were subjected to ultrasound examination (USE) of the patients. The test was carried out on the ALOKA-5500 Prosound (Japan) device in one-dimensional (M), two-dimensional (V) order, with a convex sensor of 2-7.5 MHz waves, following the generally accepted rules [9].

The electrocardiographic examination was recorded using 6-NEK electrocardiography in 12 channels at rest, and its results were evaluated according to the Minnesota code. FEGDS, MRI and CT, and ultrasonography of the portal vein were used individually as needed. Echocardiography (ExoKG) test. In accordance with the recommendations of the American Association of Echocardiography (ASE, 2015) and using the facilities of the local clinical hospital, it was performed transthoracically on the ALOKA-5500 ProSound (Japan) equipment with an S 1-5 MHz sensor.

In it, central hemodynamic indicators were evaluated using the index of heart activity indicators. In addition, left ventricular end-diastolic and systolic size, end-diastolic and systolic volume, left ventricular posterior wall thickness and interventricular septal thickness, left ventricular size, left ventricular ejection fraction Simpson left ventricular measurement, left ventricular ejection fraction and heart rate diagnosis, and were used in the evaluation [10].

When using these methods, the international standards for the detection and diagnosis of SILD (CH, LC) were followed**.**

5 Research results

A 21-year epidemiological description of liver cirrhosis in the adult Andijan population was studied and specific gender aspects of its changes were determined. Analytical results in this regard are summarized in Table 1.

Table 1. Gender-specific aspects of the 21-year description and trend of the prevalence of liver cirrhosis in the elderly population of Andijan

Audit years	Male population			P	Female population			Total population		
	N	LC			N	LC		N	LC	
		n	%			n	%		N	%
2000	136	92	67.6	<0.01	104	54	51.9	240	146	60.8
2001	186	146	78.5	<0.05	122	78	63.9	308	224	72.7
2002	156	97	62.2	>0.05	110	65	59.1	266	162	60.9
2003	146	101	69.2	>0.05	114	75	65.8	260	176	67.7
2004	149	79	53.0	>0.05	118	59	50.0	267	138	51.7
2005	73	59	80.8	>0.05	56	44	78.6	129	103	79.8
2006	164	121	73.8	>0.05	140	92	65.7	304	213	70.1
2007	74	59	79.7	>0.05	68	50	73.5	142	109	76.8
2008	127	115	90.6	>0.05	123	109	88.6	250	224	89.6
2009	116	91	78.4	>0.05	95	75	78.9	211	166	78.7
2010	186	161	86.6	>0.05	154	134	87.0	340	295	86.8
2011	144	125	86.8	>0.05	106	95	89.6	250	220	88.0
2012	128	96	75.0	>0.05	108	87	80.6	236	183	77.5
2013	150	114	76.0	>0.05	107	84	78.5	257	198	77.0
2014	40	29	72.5	>0.05	61	46	75.4	101	75	74.3
2015	28	18	64.3	>0.05	34	21	61.8	62	39	62.9
2016	40	16	40.0	>0.05	32	12	37.5	72	28	38.9
2017	111	89	80.2	>0.05	97	82	84.5	208	171	82.2
2018	106	80	75.5	>0.05	100	65	65.0	206	145	70.4
2019	109	80	73.4	>0.05	143	109	76.2	252	189	75.0

| 2020	115	90	78.3	>0.05	109	77	70.6	224	167	74.6
2000	2484	1858	74.8	>0.05	2101	1513	72.0	4585	3371	73.5
– 2020	χ2 =0.350; C=0.009; RR=0.989; 95%CL=0.956-1.023									

It was found that total cirrhosis of the liver was detected with a prevalence of 73.5% in the elderly population. In the last 21 years, the frequency of detection has increased by 13.8 per cent or 1.2 times. During the follow-up years, the lowest detection frequency was 38.9 per cent (2016) and the highest confirmed rate was 89.6 per cent (2011), with a regular increase of 0.7 per cent each year and an increase in some years (2008) "wave" sharply increased up to 1.5 times (X2 = 0.350; C=0.009; RR=0.989; 95%Cl=0.956-1.023).

Gender differences in the frequency of the disease are expressed at an insignificant level (R>0.05). LC is characterized by a detection frequency of 74.4 per cent in men and 72.0 per cent in women. In the male population, the highest prevalence of LC was 90.6% (in 2008) and in women, it was 89.6% (in 2011).

Gender-specific aspects are observed in the growth rate of the disease, LC in women increased by 18.7% in 21 years and in men by 10.7%, that is, with a difference of 8.0%, the tendency to increase in women was confirmed as a characteristic (R<0.05).

The high prevalence of liver cirrhosis in both men and women and the fact that it continues to increase in the population is noteworthy and shows that the problem is becoming more urgent.

In general, it can be concluded that the distribution of LC among the elderly population of Andijan and its gender characteristics were determined to have a specific aspect according to the results of 21-year clinical-epidemiological monitoring (Fig. 2).
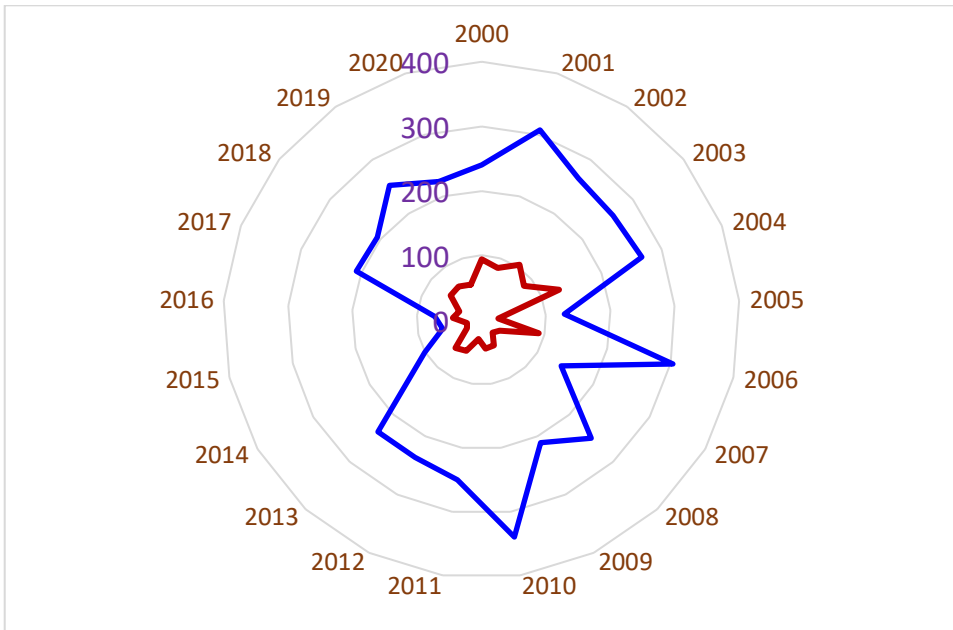
Fig. 2. 21-year dynamics of LC distribution frequency in Andijan conditions.

These are expressed as follows:

1) Total LC was confirmed with a prevalence of 73.5 per cent (from 74.8 per cent in men and 72.0 per cent in women);

2) STDs are noted with the highest prevalence (39.1 per cent in men - 39.4 per cent and 38.7 per cent in women);

3) LCV was observed with a prevalence of 24.1 per cent (24.2 per cent in men and 23.9 per cent in women);

4) VLCS – confirmed with a prevalence of 15.8 per cent (15.9 per cent in men and 15.6 per cent in women);

5) Prevalence and frequency of LCR were observed with an indicator of 13.6 per cent (14.2 per cent in men and 13.0 per cent in women);

6) LC was confirmed with a detection frequency of 10.7 per cent (from 10.7 per cent in men and 10.7 per cent in women).

A similar trend was confirmed to be specific for specific types of LC, in particular, liver cirrhosis V (LCV) and liver cirrhosis S (LCS) (tables 2 and 3 present the 21-year analysis of these data).

Table 2. Gender-specific aspects of the 21-year description and trend of the prevalence of viral liver cirrhosis V in the elderly population of Andijan

Audit years	Male population			P	Female population			Total population		
	N	LC V			N	LC V		N	LC V	
		n	%			N	%		n	%
2000	136	29	21.3	>0.05	104	22	21.2	240	51	21.3
2001	186	43	23.1	<0.01	122	44	36.1	308	87	28.2
2002	156	72	46.2	>0.05	110	47	42.7	266	119	44.7
2003	146	0	0.0	-	114	0	0.0	260	0	0.0
2004	149	49	32.9	>0.05	118	48	40.7	267	97	36.3
2005	73	18	24.7	<0.05	56	6	10.7	129	24	18.6
2006	164	27	16.5	>0.05	140	22	15.7	304	49	16.1
2007	74	25	33.8	>0.05	68	25	36.8	142	50	35.2
2008	127	14	11.0	>0.05	123	13	10.6	250	27	10.8
2009	116	22	19.0	>0.05	95	19	20.0	211	41	19.4
2010	186	16	8.6	>0.05	154	14	9.1	340	30	8.8
2011	144	6	4.2	>0.05	106	1	0.9	250	7	2.8
2012	128	23	18.0	>0.05	108	22	20.4	236	45	19.1
2013	150	36	24.0	>0.05	107	23	21.5	257	59	23.0
2014	40	10	25.0	>0.05	61	10	16.4	101	20	19.8
2015	28	14	50.0	>0.05	34	13	38.2	62	27	43.5
2016	40	1	2.5	>0.05	32	1	3.1	72	2	2.8
2017	111	26	23.4	>0.05	97	22	22.7	208	48	23.1
2018	106	60	56.6	>0.05	100	56	56.0	206	116	56.3
2019	109	49	45.0	>0.05	143	55	38.5	252	104	41.3
2020	115	62	53.9	<0.05	109	39	35.8	224	101	45.1
2000 – 2020	2484	602	24.2	>0.05	2101	502	23.9	4585	1104	24.1
	$\chi^2 =0.055$; C=0.004; RR=1.014; 95%CL=0.915-1.125									
2000– 2020	2484	395	15.9	<0.005	2101	328	15.6	4585	723	15.8
	$\chi^2 =34.253$; C=0.085; RR=1.019; 95%CL=0.892-1.167									

The presented numerical data confirm that the prevalence of JSV in the general elderly population is 24.1%. The frequency of acute spread was noted in men (24.2%) and women (23.9%) with an insignificant difference (0.3%) (R>0.05).

Analytical data also confirmed that the prevalence of LCV in men and women differs by the fact that it is detected in different years, as well as by the specificity of its changes. First, the progression of the disease is 2.3 times faster in men (32.6%) than in women (14.6%) (R<0.01). Secondly, if 21 years ago the intensity of such gender difference was statistically insignificant, by 2020, on the contrary, the influence of the gender factor (in men) has increased from 0.1 per cent (in 2000) to 27.1 per cent (in 2020). We believe that this should be considered as an important, first of all, scientific result that requires increased attention to define and develop the course of preventive activities, as well as alternative treatment programs. This information is important in the development and implementation of disease control and prevention measures.

Epidemiological description of viral liver cirrhosis S (VLCS) and 21-year changes in the conditions of Andijan, specific gender aspects are presented in Table 3.

Table 3. Gender-specific aspects of the 21-year description and trend of the prevalence of viral liver cirrhosis S in the elderly population of Andijan

Audit years	Male population			P	Female population			Total population		
	N	VLC S			N	VLC S		N	LC S	
		n	%			N	%		n	%
2000	136	43	31.6	<0.001	104	13	12.5	240	56	23.3
2001	186	47	25.3	<0.01	122	16	13.1	308	63	20.5
2002	156	15	9.6	>0.05	110	16	14.5	266	31	11.7
2003	146	0	0.0	-	114	0	0.0	260	0	0.0
2004	149	24	16.1	>0.05	118	18	15.3	267	42	15.7
2005	73	23	31.5	>0.05	56	17	30.4	129	40	31.0
2006	164	25	15.2	>0.05	140	19	13.6	304	44	14.5
2007	74	39	52.7	>0.05	68	35	51.5	142	74	52.1
2008	127	5	3.9	>0.05	123	4	3.3	250	9	3.6
2009	116	24	20.7	>0.05	95	26	27.4	211	50	23.7
2010	186	9	4.8	>0.05	154	7	4.5	340	16	4.7
2011	144	5	3.5	>0.05	106	3	2.8	250	8	3.2
2012	128	25	19.5	>0.05	108	20	18.5	236	45	19.1
2013	150	27	18.0	>0.05	107	17	15.9	257	44	17.1
2014	40	4	10.0	>0.05	61	11	18.0	101	15	14.9
2015	28	4	14.3	>0.05	34	2	5.9	62	6	9.7
2016	40	1	2.5	>0.05	32	2	6.3	72	3	4.2
2017	111	19	17.1	>0.05	97	20	20.6	208	39	18.8
2018	106	15	14.2	>0.05	100	14	14.0	206	29	14.1
2019	109	25	22.9	>0.05	143	38	26.6	252	63	25.0
2020	115	16	13.9	<0.01	109	30	27.5	224	46	20.5

In the general population of Andijan ≥ 18-74 years of age, VLCS is recorded with an average detection frequency of 15.8 per cent during the years 2000-2020, and it is detected at 15.9 and 15.6 per cent in men and women with an insignificant difference (R>0.05).

In general, the prevalence of VLCS has increased over 21 years - from 23.3 per cent (in 2000) to 25 per cent (as of 2019). In some years, the growth rate accelerated to 27.8% (R<0.01), or in most years such a trend was confirmed ($X2 = 34.253$; C=0.085; RR=1.019; 95%Cl=0.892-1.167).

These results will optimize the practice of primary, secondary and tertiary prevention against LC in a scientifically based way, and will serve as a basis for creating forecasting tables and technologies. It is possible to increase the effectiveness of treatment and prevention work by more than 70 per cent. Our analysis gives us the basis to make such predictions.

6 Conclusions

1. Complications (ascites - 30% and liver failure in every third patient) and other complications (portotic bleeding, hepatorenal syndrome, hepatocellular carcinoma, spontaneous bacterial peritonitis, bleeding from esophageal varices) were confirmed.

2. Total LC were identified with a prevalence of 73.5 per cent in the examined population. In the last 21 years, the frequency of detection increased by 13.8%, it was characterized by the frequency of detection in men - 74.8% and in women - 72.0%.

3. The prevalence of LCV was 24.1 per cent, with insignificant differences confirmed in men (24.2 per cent) and women (23.9 per cent). In the 21-year trend, it was confirmed that it changed from 21.3 per cent to 45.1 per cent, that is, 23.8 per cent, or a 2.2-fold increase. It was noted that the frequency of growth was 2.3 times faster in men (32.6 per cent) than in women (14.6 per cent).

4. VLCS, on the other hand, was detected with an average prevalence of 15.8 per cent in the general population and with a significant difference in men and women - 15.9 and 15.6 per cent. The incidence has increased from 23.3% to 25.0% in 21 years. A decrease in men (17.7 per cent) and a decrease (15.0 per cent) in women was confirmed.

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