The prevalence and characteristics of hepatitis B/D in 48,522 HBsAg tested individuals in Mongolia

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Background

- Mongolia is a central Asian country that has the highest worldwide prevalence of hepatitis D virus (HDV) infection (1).
- National estimates report 8-11% of the general population are infected with HBV and 4.8% infected with HDV (2).
- Characterisation of large cohorts of chronic hepatitis D (CHD), especially in hyperendemic regions is lacking in the litterature.
- CHD shows severer course of liver disease than other viral hepatides (3).

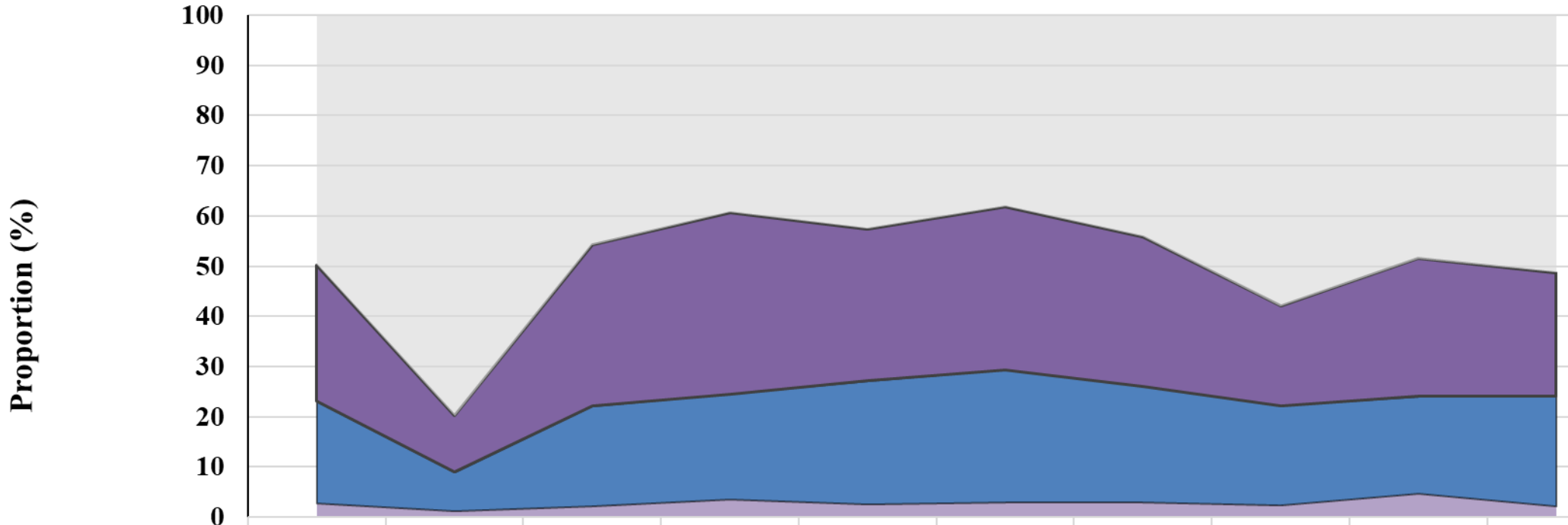
Aim
To analyse the characteristics of individuals with HBV/HDV coinfection, ”resolved” HDV infection and HBV-monoinfection in a large cohort.

Design
Cross-section analysis

Setting of this study
Liver Center Mongolia capital city Ulaanbaatar
The center provides outpatient care for patients with liver diseases referred or self-seeking care.

Source population
Attendees (adults ≥ 18 years of age) to this center who have at least one HBsAg test assessment from 2015-2023
Further subgrouping based on anti-HDV+, HDV RNA ≥ 50 IU/mL

Figure 1a: The prevalence of viral hepatitis B and D at first HBsAg test



	Overall (average)	2015	2016	2017	2018	2019	2020	2021	2022	2023
None HBV+/HDV+/not classified	49.7	79.8	45.8	39.3	42.6	38.2	44.1	58.0	48.5	51.3
Anti-HDV+/HDV RNA+	27.1	11.2	32.1	36.2	30.3	32.4	29.8	19.8	27.5	24.6
HBV-monoinfection	20.4	7.8	20.0	21.0	24.6	26.4	23.1	19.8	19.3	21.9
Anti-HDV+/HDV RNA-	2.7	1.2	2.1	3.5	2.5	3.0	3.0	2.4	4.7	2.2

Table 1: Baseline characteristics of patients in the three cohorts

Parameters	Anti-HDV+/ HDV RNA+	Anti-HDV+/ HDV RNA –	HBV-monoinfection	p-value, gp1 vs gp2	p-value, gp1 vs gp3
Total number	3970	388	2879		
Sex, male, n (%)	1809 (45.6)	182 (46.9)	1487 (51.6)	0.61	<0.001
Age at first HBsAg test, years, mean (sd)	43.4 (10.7)	43.7 (10.6)	37.5 (10.2)	0.62	<0.001
ALT, IU/L, median (IQR)	57.9 (35.8-97.0)	34.0 (21.5-58.7)	30.0 (19.7-50.4)	<0.001	<0.001
ALT level categories, n (%)	3625	360	2232		
Normal ALT level	803 (22.2)	187 (51.9)	1352 (60.6)	<0.001	<0.001
>ULN- <2*ULN	1396 (38.5)	113 (31.4)	538 (24.1)	0.008	<0.001
≥2*- <5*ULN	1125 (31.0)	56 (15.6)	257 (11.5)	<0.001	<0.001
≥5*-<10*ULN	255 (7.0)	3 (0.8)	58 (2.6)	<0.001	<0.001
≥10*ULN	46 (1.3)	1 (0.3)	27 (1.2)	0.09	0.84
HBsAg log10, IU/mL, median (IQR)	3.8 (3.4-4.1)	2.8 (2.1-3.6)	3.3 (2.7-3.9)	<0.001	<0.001
HBV DNA log10, IU/mL, median (IQR)	2.2 (1.3-3.2)	2.4 (1.5-3.2)	3.2 (2.3-4.2)	0.27	<0.001
HDV RNA log10, IU/mL, median (IQR)	5.3 (4.2-6.2)	1.0 (0.5-1.4)	na	<0.001	na
LS, kPa, median (IQR) earliest visit	8.4 (6.3-12.0)	6.9 (4.8-12.0)	5.3 (4.3-7.0)	0.05	<0.001
LS <7.5 kPa	710/1786 (39.8)	72/131 (55.0)	442/564 (78.4)	<0.001	<0.001
LS ≥12.5 kPa	394 (22.1)	30 (22.9)	35 (6.2)	0.82	<0.001
LS ≥15.2 kPa	259 (14.5)	19 (14.5)	27 (4.8)	1.00	<0.001

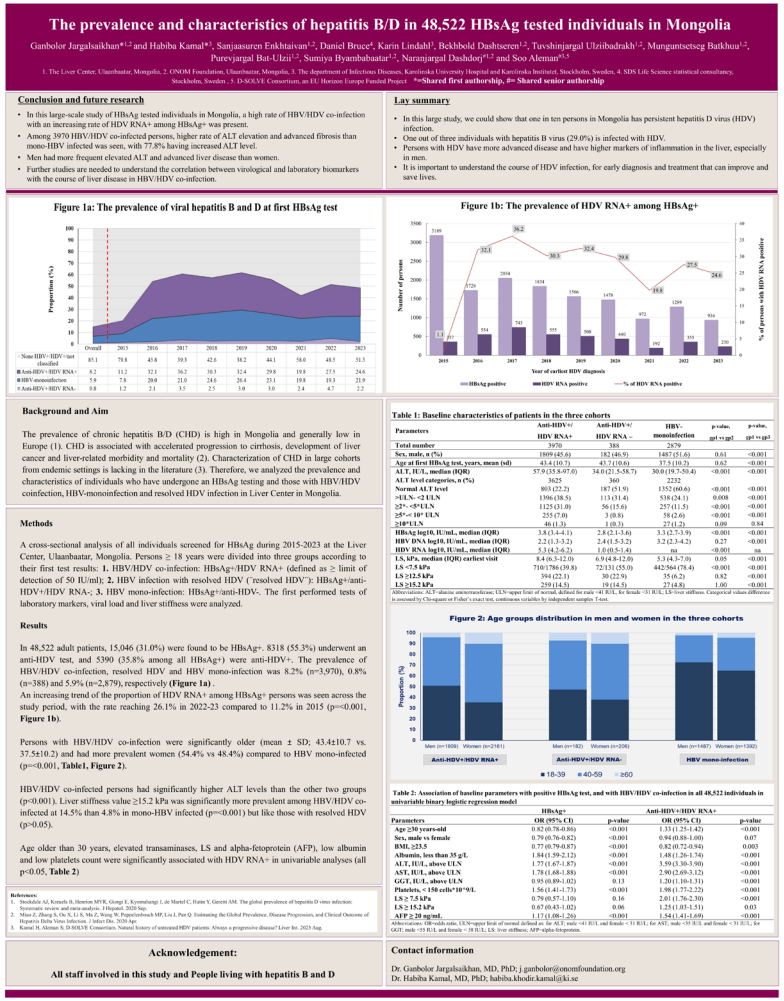
Abbreviations: ALT=alanine aminotransferase; ULN=upper limit of normal, defined for male <41 IU/L, for female <31 IU/L; LS=liver stiffness. Categorical values difference is assessed by Chi-square or Fisher's exact test, continuous variables by independent samples T-test.

Conclusions

- In this large-scale study of HBsAg tested individuals in Mongolia, a high rate of HBV/HDV co-infection with 54.9% (95% CI 53.7-56.0) prevalence of HDV RNA+ among HBsAg+ was present.
- Among 3970 HBV/HDV co-infected persons, higher rate of ALT elevation and advanced fibrosis/cirrhosis than mono-HBV infected was seen, with 77.8% having increased ALT level.
- Men had more frequent elevated ALT and advanced liver disease than women.
- Further studies are needed to understand the correlation between virological and laboratory biomarkers with the course of liver disease in HBV/HDV co-infection.

Thanks to:

- Patients living with HBV/HDV
- Co-authors/colleagues/collaborators
- Statistical consultancy in this study
- Nordic HIV and Viral Hepatitis Conference organizers and audience.



The prevalence and characteristics of hepatitis B/D in 48,522 HBsAg tested individuals in Mongolia

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Conclusion and future research

- In this large-scale study of HBsAg tested individuals in Mongolia, a high rate of HBV/HDV co-infection with an increasing rate of HDV RNA+ among HBsAg+ was present.
- Among 3970 HBV/HDV co-infected persons, higher rate of ALT elevation and advanced fibrosis than mono-HBV infected was seen, with 77.8% having increased ALT level.
- Men had more frequent elevated ALT and advanced liver disease than women.
- Further studies are needed to understand the correlation between virological and laboratory biomarkers with the course of liver disease in HBV/HDV co-infection.

Lay summary

- In this large study, we could show that one in ten persons in Mongolia has persistent hepatitis D virus (HDV) infection.
- One out of three individuals with hepatitis B virus (29.0%) is infected with HDV.
- Persons with HDV have more advanced disease and have higher markers of inflammation in the liver, especially in men.
- It is important to understand the course of HDV infection, for early diagnosis and treatment that can improve and save lives.

Figure 1a: The prevalence of viral hepatitis B and D at first HBsAg test

Figure 1b: The prevalence of HDV RNA+ among HBsAg+

Background and Aim

The prevalence of chronic hepatitis B/D (CHD) is high in Mongolia and generally low in Europe (1). CHD is associated with accelerated progression to cirrhosis, development of liver cancer and liver-related morbidity and mortality (2). Characterization of CHD in large cohorts from endemic settings is lacking in the literature (3). Therefore, we analyzed the prevalence and characteristics of individuals who have undergone an HBsAg testing and those with HBV/HDV coinfection, HBV-monoinfection and resolved HDV infection in Liver Center in Mongolia.

Methods

A cross-sectional analysis of all individuals screened for HBsAg during 2015-2023 at the Liver Center, Ulaanbaatar, Mongolia. Persons ≥ 18 years were divided into three groups according to their first test results: **1.** HBV/HDV co-infection: HBsAg+/HDV RNA+ (defined as ≥ limit of detection of 50 IU/ml); **2.** HBV infection with resolved HDV (˜resolved HDV˜): HBsAg+/anti-HDV+/HDV RNA-; **3.** HBV mono-infection: HBsAg+/anti-HDV-. The first performed tests of laboratory markers, viral load and liver stiffness were analyzed.

Results

In 48,522 adult patients, 15,046 (31.0%) were found to be HBsAg+. 8318 (55.3%) underwent an anti-HDV test, and 5390 (35.8% among all HBsAg+) were anti-HDV+. The prevalence of HBV/HDV co-infection, resolved HDV and HBV mono-infection was 8.2% (n=3,970), 0.8% (n=388) and 5.9% (n=2,879), respectively **(Figure 1a)** .
An increasing trend of the proportion of HDV RNA+ among HBsAg+ persons was seen across the study period, with the rate reaching 26.1% in 2022-23 compared to 11.2% in 2015 (p=<0.001, **Figure 1b**).

Persons with HBV/HDV co-infection were significantly older (mean ± SD; 43.4±10.7 vs. 37.5±10.2) and had more prevalent women (54.4% vs 48.4%) compared to HBV mono-infected (p=<0.001, **Table1, Figure 2**).

HBV/HDV co-infected persons had significantly higher ALT levels than the other two groups (p=0.001). Liver stiffness value ≥15.2 kPa was significantly more prevalent among HBV/HDV co-infected at 14.5% than 4.8% in mono-HBV infected (p=<0.001) but like those with resolved HDV (p>0.05).

Age older than 30 years, elevated transaminases, LS and alpha-fetoprotein (AFP), low albumin and low platelets count were significantly associated with HDV RNA+ in univariable analyses (all p<0.05, **Table 2**)

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Acknowledgement:

All staff involved in this study and People living with hepatitis B and D

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Figure 2: Age groups distribution in men and women in the three cohorts

Table 2: Association of baseline parameters with positive HBsAg test, and with HBV/HDV co-infection in all 48,522 individuals in univariable binary logistic regression model

	HBsAg+		Anti-HDV+/HDV RNA+	
Parameters	OR (95% CI)	p-value	OR (95% CI)	p-value
Age ≥30 years-old	0.82 (0.78-0.86)	<0.001	1.33 (1.25-1.42)	<0.001
Sex, male vs female	0.79 (0.76-0.82)	<0.001	0.94 (0.88-1.00)	0.07
BMI, ≥23.5	0.77 (0.79-0.87)	<0.001	0.82 (0.72-0.94)	0.003
Albumin, less than 35 g/L	1.84 (1.59-2.12)	<0.001	1.48 (1.26-1.74)	<0.001
ALT, IU/L, above ULN	1.77 (1.67-1.87)	<0.001	3.59 (3.30-3.90)	<0.001
AST, IU/L, above ULN	1.78 (1.68-1.88)	<0.001	2.90 (2.69-3.12)	<0.001
GGT, IU/L, above ULN	0.95 (0.89-1.02)	0.13	1.20 (1.10-1.31)	<0.001
Platelets, < 150 cells*10^9/L	1.56 (1.41-1.73)	<0.001	1.98 (1.77-2.22)	<0.001
LS ≥ 7.5 kPa	0.79 (0.57-1.10)	0.16	2.61 (1.76-2.30)	<0.001
LS ≥ 15.2 kPa	0.67 (0.43-1.02)	0.06	1.25 (1.03-1.51)	0.03
AFP ≥ 20 ng/mL	1.17 (1.08-1.26)	<0.001	1.54 (1.41-1.69)	<0.001

Abbreviations: OR=odds ratio, ULN=upper limit of normal defined as for ALT, male =41 IU/L and female =31 IU/L for AST, male =35 IU/L and female = 31 IU/L, for GGT: male =55 IU/L and female = 38 IU/L; LS liver stiffness; AFP=alpha-fetoprotein.

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Methods:
Serological and virological tests used at the study center

HBsAg, anti-HCV, and anti-HIV were qualitatively tested by rapid diagnostic test (CTK Co.LtD, USA) while anti-HDV were tested using ELISA (Wantai Co.Ltd, PRC). Quantitative HBsAg was estimated by HISCL-5000 fully automated chemiluminescence analyzer (Sysmex Co.Ltd, Japan) and for HBeAg status (CLIA, Sysmex, Japan, lower level of detection (LOD) of 1 COI). HBV DNA, HCV RNA, and HDV RNA were quantified using real time reverse transcriptase polymerase chain reaction with LOD of 10 IU/mL (GeneXpert, Cepheid, USA), 10 IU/mL (GeneXpert, Cepheid, USA), and 50 IU/mL (Bioactiva diagnostica, Germany; Boi-Rad, USA), respectively.