

Search strategy

The search terms comprising combinations of different Medical Subject Headings (MeSH) terms were applied for the three English databases (PubMed, EMBASE and Cochrane Library). The details are shown as follows:

Pubmed

#1: (Hepatitis B[MeSH]) OR (Hepatitis B, Chronic [MeSH]) OR (Hepatitis B virus [MeSH]) OR (Hepatitis B Antigens [MeSH]);

#2: (Hepatitis B[Title/Abstract]) OR (HBV[Title/Abstract]) OR (B virus, Hepatitis[Title/Abstract]) OR (Dane Particle[Title/Abstract]) OR (Particle, Dane[Title/Abstract]) OR (type b hepatitis [Title/Abstract]) OR (HBAg[Title/Abstract] OR (B Antigens, Hepatitis[Title/Abstract]));

#3: #1 OR #2;

#4: (Fatty Liver [MeSH]) OR (Non-alcoholic Fatty Liver Disease [MeSH]);

#5: (steatohepat*[Title/Abstract] OR (Steatosis [Title/Abstract] OR (Steatoses [Title/Abstract]));

#6:(Non alcoholic Fatty Liver Disease [Title/Abstract] OR (NAFL*[Title/Abstract] OR (NASH[Title/Abstract] OR (Liver [Title/Abstract] AND (fatty [Title/Abstract] OR steato*[Title/Abstract]));

#7: #4 OR #5 OR #6;

#8: #3 AND #7.

Result: 2168

Embase

#1: 'hepatitis b'/exp;

#2: 'chronic hepatitis b'/exp;

#3: 'hepatitis b virus'/exp;

#4: 'hepatitis b antigen'/exp;

#5: #1 OR #2 OR #3 OR #4;

#6: 'hbv': ab,ti;

#7: 'hepatitis b': ab,ti;

#8: 'b virus, hepatitis': ab,ti;

#9: 'dane particle': ab,ti;

#10: 'type b hepatitis': ab,ti;

#11: 'hbag': ab,ti;

#12: 'b antigens, hepatitis': ab,ti;

#13: #6 OR #7 OR #8 OR #9 OR #10 OR #11 OR #12;

#14: #5 OR #13;

#15: 'fatty liver'/exp;

#16: 'nonalcoholic fatty liver'/exp;

#17: steatohepat*: ab,ti;

#18: 'steatosis': ab,ti;

#19: 'steatoses': ab,ti;

#20: 'non alcoholic fatty liver disease': ab,ti;

#21: 'naf*': ab,ti;

#22: 'nash': ab,ti;

#23: 'fatty': ab,ti;

#24: 'steato*': ab,ti;

#25: #23 OR #24;

#26: 'liver': ab,ti;

#27: #25 AND #26;

#28: #15 OR #16 OR #17 OR #18 OR #19 OR #20 OR #21 OR #22 OR #27;

#29: #14 AND #28.

Result: 7118

Cochrance

#1: MeSH descriptor: [Hepatitis B] explode all trees

#2: MeSH descriptor: [Hepatitis B Antigens] explode all trees

#3: MeSH descriptor: [Hepatitis B virus] explode all trees

#4: #1 or #2 or #3

#5: (HBV): ti,ab,kw

#6: (hepatitis b): ti,ab,kw

#7: (B virus, Hepatitis): ti,ab,kw

#8: (Dane Particle): ti,ab,kw

#9: (type b hepatitis): ti,ab,kw

#10: (HBAg):ti,ab,kw

#11: (B Antigens, Hepatitis): ti,ab,kw

#12: #5 or #6 or #7 or #8 or #9 or #10 or #11

#13: #4 or #12

#14: MeSH descriptor: [Fatty Liver] explode all trees

#15: MeSH descriptor: [Non-alcoholic Fatty Liver Disease] explode all trees

#16: (steatohepat*): ti,ab,kw

#17: (steatosis): ti,ab,kw

#18: (steatoses): ti,ab,kw

#19: (non alcoholic fatty liver disease): ti,ab,kw

#20: (naf*): ti,ab,kw

#21: (nash): ti,ab,kw

#22: (fatty): ti,ab,kw

#23: (steato*): ti,ab,kw

#24: #22 OR #23

#25: (liver): ti,ab,kw

#26: #24 AND #25

#27: #14 OR #15 OR #16 OR #17 OR #18 OR #19 OR #20 OR #21 OR #26

#28: #27 AND #13

Result: 225

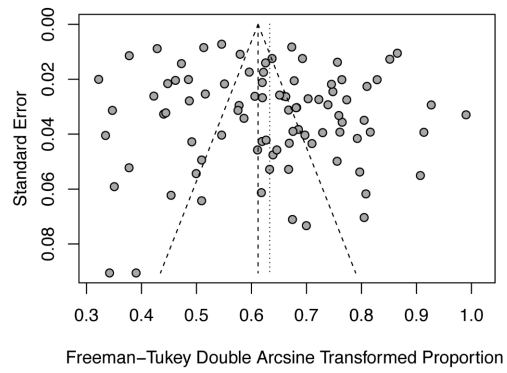


Figure S1 Funnel plots of the HS prevalence in CHB patients were used to assess publication bias

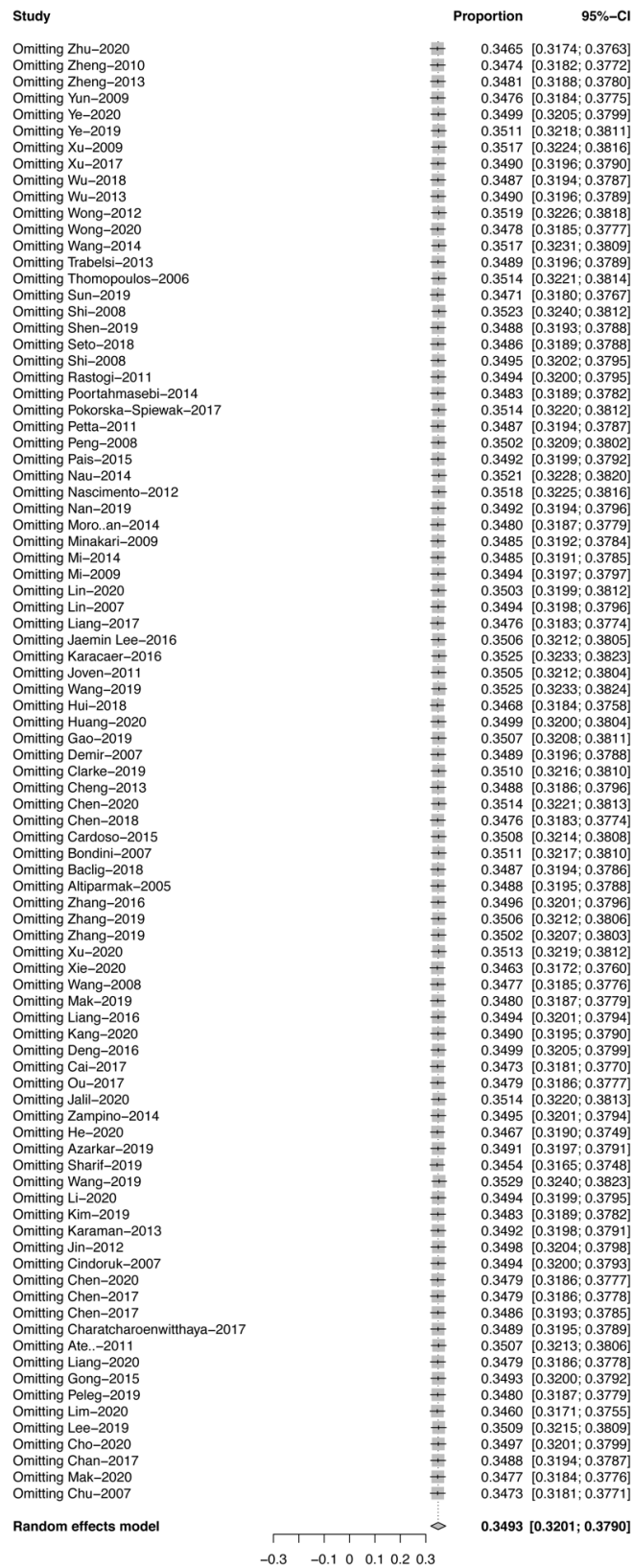


Figure S2 Sensitivity analysis of omitting each study on the overall pooled estimate of the prevalence of HS in CHB patients

Table S1 Diagnostic criteria of HS in CHB patients

Defined as HS	Studies	Pool prevalence (%) [estimate (95%CI)]	I ²	P value between groups
Liver biopsy (affected hepatocytes)				<0.0001
>5%	40	35.81 (31.13–40.63)	97.30%	
>10%	3	20.35 (17.64–23.20)	0.00%	
Others	9	32.56 (21.50–44.66)	95.60%	
CAP score				0.0549
≥248 dB/m	5	43.50 (38.33–48.73)	91.30%	
≥238 dB/m	3	57.27 (45.49–68.64)	95.10%	
Others	4	50.44 (44.41–56.46)	91.20%	

Interpretation of the diagnostic criteria of HS in CHB patients: (I) Liver biopsy: liver biopsy is the gold standard diagnostic method as well as the most commonly used method for HS diagnosis in the studies (57/90). The prevalence of HS in CHB was also stratified by diagnostic criteria for HS using liver biopsy. HS defined as 10% or more of hepatocytes affected had a lower prevalence rate of HS in CHB patients (20.35%; 95% CI: 17.64–23.20%) than that of HS defined as 5% or more (35.81%; 95% CI: 31.13–40.63%; Table S1). Furthermore, HS defined as 5% or more of hepatocytes affected was the dominant diagnostic criteria (40/52) for HS using liver biopsy. (II) Controlled attenuation parameter (CAP) score: The lower limit of the CAP score to determine HS in CHB patients was slightly heterogeneous (220–248 dB/m). The subgroup analysis showed that HS defined as CAP ≥248 dB/m (43.50%; 95% CI: 38.33–48.73%) had a lower prevalence rate of HS in CHB patients than that of HS defined as CAP ≥238 dB/m (57.27%; 95% CI: 45.49–68.64%; Table S1). However, due to the limited subgroup studies reporting CAP scores, we cannot draw a straightforward conclusion to determine the heterogeneity associated with the diagnostic CAP score. (III) Abdominal ultrasonography: HS was assessed using criteria including the presence of liver and kidney echo discrepancy, with or without the presence of posterior attenuation of ultrasound beam, vessel blurring, difficult visualization of the gallbladder wall, and difficult visualization of the diaphragm. CAP, central attenuation parameter; HS, hepatic steatosis.

Table S2 The studies and characteristics included in this meta-analysis

No	Author, year	country	Study period	Study design	Diagnostic tools	Sample size	Hepatic steatosis in CHB patients
1	Zhu, 2020 (36)	China	2017.1–2019.12	Cross-sectional study	Liver biopsy	82	51
2	Zheng, 2010 (37)	China	2005.5–2009.3	Cross-sectional study	Liver biopsy	204	106
3	Zheng, 2013 (13)	China	2008.1–2011.6	Cross-sectional study	Liver biopsy	291	132
4	Yun, 2009 (38)	Korea	2005.1–2006.3	Cross-sectional study	Liver biopsy	86	44
5	Zheng, 2010 (39)	China	2001.1–2009.1	Case-controlled study	Liver biopsy	36	18
6	Ye, 2020 (40)	China	2015.2–2018.12	Prospective cohort study	Liver biopsy	440	85
7	Ye, 2019 (41)	China	2011.1–2018.12	Cross-sectional study	Ultrasound	1,223	253
8	Xu, 2017 (35)	China	2012.7–2014.4	Cross-sectional study	Liver biopsy	366	137
9	Wu, 2018 (42)	China	2019.12–2018.3	Cross-sectional study	Liver biopsy	272	108
10	Wu, 2013 (43)	China	2016–2010	Cross-sectional study	Liver biopsy	89	34
11	Wong, 2012 (44)	China	NA	Cross-sectional study	MRS	91	12
12	Wong, 2020 (45)	Malaya	2013–2017	Cohort study	Fibroscan	614	294
13	Wang, 2014 (46)	China	2002–2011	Cross-sectional study	Liver biopsy	3,212	554
14	Trabelsi, 2013 (47)	Tunisie	2002–2011	Cross-sectional study	Liver biopsy	133	51
15	Thomopoulos, 2006 (48)	Greece	1999.1–2004.12	Cross-sectional study	Liver biopsy	233	42
16	Sun, 2019 (49)	China	2014.3–2017.3	Cross-sectional study	Fibroscan	615	334
17	Shi, 2008 (50)	China	2005.1–2007.6	Cross-sectional study	Liver biopsy	1,915	260
18	Shen, 2019 (51)	China	2014.2–2015.8	Cross-sectional study	Liver biopsy	593	233
19	Seto, 2018 (52)	China	2015.1–2016.9	Cross-sectional study	Fibroscan	1,606	655
20	Shi, 2008 (53)	China	2005.1–2008.4	Cohort study	Liver biopsy	119	39
21	Rastogi, 2011 (54)	India	NA	Cross-sectional study	Liver biopsy	350	118
22	Poortahmasebi, 2014 (55)	Iran	2010–2011	Cross-sectional study	Liver biopsy	160	71
23	Petta, 2011 (56)	Italy	2000.1–2008.12	Cohort study	Liver biopsy	170	68
24	Peng, 2008 (24)	China	2002–2006	Cross-sectional study	Liver biopsy	153	41
25	Pan, 2015 (57)	China	2012.1–2013.6	Case-controlled study	Liver biopsy	108	57
26	Pais, 2015 (58)	Romania	2010.7–2013.4	Cross-sectional study	Others	110	39
27	Nascimento, 2012 (59)	Brazil	2010.1–2011.10	Retrospective transversal study	Liver biopsy	30	3
28	Nan, 2019 (60)	China	2017.1–2018.12	Cross-sectional study	Fibroscan	1,621	574
29	Minakari, 2009 (61)	Iran	NA	Cross-sectional study	Liver biopsy	132	56
30	Mi, 2014 (62)	China	2012.7–2013.12	Cross-sectional study	Liver biopsy	340	142
31	Mi, 2009 (63)	China	2005.1–2008.6	Cross-sectional study	Liver biopsy	1,263	422
32	Lin, 2020 (64)	China	2016.4–2018.4	Cross-sectional study	Ultrasound	4,734	1275
33	Lin, 2007 (65)	China	2004.1–2005.12	Cross-sectional study	Ultrasound	817	277
34	Liang, 2017 (66)	China	2013.9–2015.6	Cross-sectional study	Liver biopsy	65	34
35	Joven, 2011 (67)	Spain	NA	Cross-sectional study	Liver biopsy	60	14
36	Hui, 2018 (9)	China	2014.12–2016.7	Case-controlled study	Fibroscan	1,548	876
37	Huang, 2020 (68)	China	2016.4–2018.2	Cross-sectional study	Ultrasound	2,110	632
38	Gao, 2019 (69)	China	2014.5–2017.12	Cross-sectional study	Ultrasound	3,477	838
39	Demir, 2007 (70)	Turkey	NA	Cross-sectional study	Liver biopsy	49	19
40	Clarke, 2019 (71)	USA	2004–2015	Cohort study	Ultrasound	617	134
41	Chen, 2020 (72)	China	2013.10–2018.8	Cross-sectional study	Liver biopsy	535	100
42	Cardoso, 2015 (73)	France	2002.11–2004.12	Cohort study	Liver biopsy	136	30
43	Bondini, 2007 (74)	USA	2000.10–2006.6	Cross-sectional study	Liver biopsy	64	12
44	Bačlig, 2018 (75)	Philippines	2012.1–2013.12	Cross-sectional study	Liver biopsy	46	19
45	Altıparmak, 2005 (76)	Turkey	1997–2002	Cross-sectional study	Liver biopsy	164	64
46	Zhang, 2016 (77)	China	2011.1–2015.1	Cross-sectional study	Liver biopsy	364	118
47	Zhang, 2019 (78)	China	2013.7–2018.2	Cross-sectional study	Liver biopsy	387	94
48	Zhang, 2019 (79)	China	2013.7–2018.2	Cross-sectional study	Liver biopsy	530	145
49	Yang, 2017 (80)	China	2012.5–2014.5	Case-controlled study	Liver biopsy	39	22
50	Xu, 2020 (81)	China	2014.1–2017.12	Cohort study	Liver biopsy	601	119
51	Xie, 2020 (82)	China	2017.3–2018.3	Cross-sectional study	Liver biopsy	161	101
52	Wang, 2008 (83)	China	NA	Cross-sectional study	Ultrasound	50	26
53	Mak, 2019 (84)	China	2015.1–2016.9	Cohort study	Fibroscan	415	192
54	Pan, 2017 (85)	China	2012.1–2013.6	Case-controlled study	Liver biopsy	99	52
55	Liang, 2016 (86)	China	2013.9–2015.4	Case-controlled study	Liver biopsy, US	137	46
56	Kang, 2020 (87)	China	2009.1–2014.6	Cross-sectional study	Liver biopsy	360	146
57	Deng, 2016 (88)	China	2013.3–2015.3	Cross-sectional study	Liver biopsy	254	75
58	Cai, 2017 (89)	China	2013.1–2015.12	Cross-sectional study	Liver biopsy	488	256
59	Ou, 2017 (90)	China	2013.6–2016.1	Cross-sectional study	Fibroscan	1,312	618
60	Liu, 2019 (91)	China	2016.1–2018.8	Case-controlled study	Liver biopsy	248	124
61	Jalil, 2020 (92)	PAK	2016.7–2017.5	Cross-sectional study	Ultrasound	240	44
62	Zampino, 2014 (93)	Italy	2009–2013	Case-controlled study	Liver biopsy	66	22
63	Azarkar, 2019 (94)	Iran	2013–2014	Case-controlled study	Ultrasound	376	138
64	Sharif, 2019 (95)	PAK	2018.6–2019.5	Cross-sectional study	Fibroscan	230	161
65	Xu, 2009 (96)	China	2007.1–2008.3	Cross-sectional study	Ultrasound	365	61
66	Pokorska, Spiewak, 2017 (97)	Poland	2002–2013	Cross-sectional study	Liver biopsy	30	4
67	Nau, 2014 (98)	Brazil	2011.8–2012.9	Cross-sectional study	Ultrasound	71	8
68	Moroşan, 2014 (99)	Romania	NA	Cross-sectional study	Liver biopsy	100	47
69	Lee, 2016 (100)	Korea	2009.1–2012.12	Retrospectively cohort study	Ultrasound	102	24
70	Karacaer, 2016 (101)	Turkey	2012.1–2014.10	Cross-sectional study	Liver biopsy	254	29
71	Wang, 2019 (102)	China	2011.10–2014.3	Cohort study	Ultrasound	152	16
72	Cheng, 2013 (103)	China	2002–2009	Cross-sectional study	Ultrasound	3,642	1416
73	Chen, 2018 (104)	China	2015.1–2017.4	Cross-sectional study	Liver biopsy	144	73
74	Zhao, 2011 (105)	China	2008.4–2009.12	Case-controlled study	Liver biopsy	70	30
75	He, 2020 (106)	China	2014.12–2018.8	Cross-sectional study	Fibroscan	2,266	1313
76	Zhu, 2016 (107)	China	2008.6–2013.6	Case-controlled study	Ultrasound	125	61
77	Xu, 2015 (108)	China	2005–2009	Case-controlled study	Liver biopsy	50	22
78	Wang, 2019 (109)	China	2010.1–2018.3	Cohort studies	Liver biopsy	622	62
79	Li, 2020 (110)	USA	2000–2016	Cohort studies	Others	555	187
80	Kim, 2019 (111)	Korea	2007–2016	Cohort studies	Fibroscan	334	146
81	Karaman, 2013 (14)	Turkey	2005–2010	Cohort studies	Liver biopsy	119	43
82	Jin, 2012 (32)	China	2007.1–2009.11	Cohort studies	Ultrasound	213	65
83	Cindoruk, 2007 (112)	Turkey	2002.10–2006.1	Cross-sectional study	Liver biopsy	140	48
84	Chen, 2020 (15)	China	2003.4–2016.10	Cohort studies	Liver biopsy	196	94
85	Chen, 2017 (113)	China	2008.3–2010.3	Cohort study	Liver biopsy	162	77
86	Chen, 2017 (114)	China	2013.3–2014.3	Cohort study	Fibroscan	153	63
87	Charatcharoenwiththaya, 2017 (115)	Thailand	2010–2013	Cohort study	Liver biopsy	256	98
88	Ateş, 2011 (116)	Turkey	2006.12–2009.7	Cross-sectional study	Liver biopsy	84	19
89	Liu, 2016 (117)	China	2012.1–2014.12	Case-controlled study	CT	60	40
90	Liang, 2020 (118)	China	2010.3–2016	Cohort study	Liver biopsy	226	107
91	Gong, 2015 (119)	China	2010.1–2013.12	Cohort study	Liver biopsy	89	31
92	Peleg, 2019 (10)	Israel	2007.1–2017.12	Cohort study	Liver biopsy	524	241
93	Lim, 2020 (120)	Singapore	2000.1–2014.12	Cohort study	Liver biopsy	289	185
94	Lee, 2019 (29)	Korea	2007.1–2015.12	Retrospective cohort study	Liver biopsy	321	70
95	Cho, 2020 (28)	Korea	2009.1–2015.12	Cohort study	Ultrasound	826	260
96	Chan, 2017 (12)	China	2006.1–2009.12	Cohort study	Liver biopsy	270	107
97	Mak, 2020 (121)	China	2015.1–2016.9	Cohort study	Fibroscan	330	161
98	Chu, 2007 (27)	China	2001–2004	Cross-sectional study	Ultrasound	162	86

Table S3 Relationship between HBV viral load and HS in CHB patients

Characteristics	Studies	Pooled OR or WMD [estimate (95%CI)]	I ²	P value
DNA >1,000 copies/mL	3	0.57* [0.31–1.03]	77.70%	0.0636
DNA >5,000 copies/mL	3	0.88* [0.61–1.27]	40.70%	0.1851
DNA (lg IU/mL)	14	−0.35 [−0.89–0.19]	97.60%	0.2096

*OR, odds ratio; WMD, weighted mean difference.

Table S4 The influence of the diagnostic mode of HS on the outcomes

Defined as hepatic steatosis	Studies	Pooled OR [estimate (95% CI)]	I ²	P value
Cirrhosis				>0.05
Liver biopsy (affected hepatocytes) > 5%	10	OR 1.17 (0.74–1.86)	72.80%	
Liver biopsy (affected hepatocytes) > 0%	1	OR 5.00 (0.23–107.28)	–	
CAP >238 dB/m	1	OR 1.35 (0.14–13.13)	–	
Unclear	3	OR 0.77 (0.37–1.59)	0.00%	
Fibrosis score 2–4				>0.05
Liver biopsy (affected hepatocytes) >5%	11	OR 0.75 (0.49–1.14)	87.80%	
Liver biopsy (affected hepatocytes) >0%	2	OR 1.04 (0.61–1.77)	0.00%	
CAP >238 dB/m	1	OR 0.78 (0.51–1.19)	–	
Unclear	3	OR 0.35 (0.03–4.29)	97.50%	

OR, odds ratio; CAP, central attenuation parameter.

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