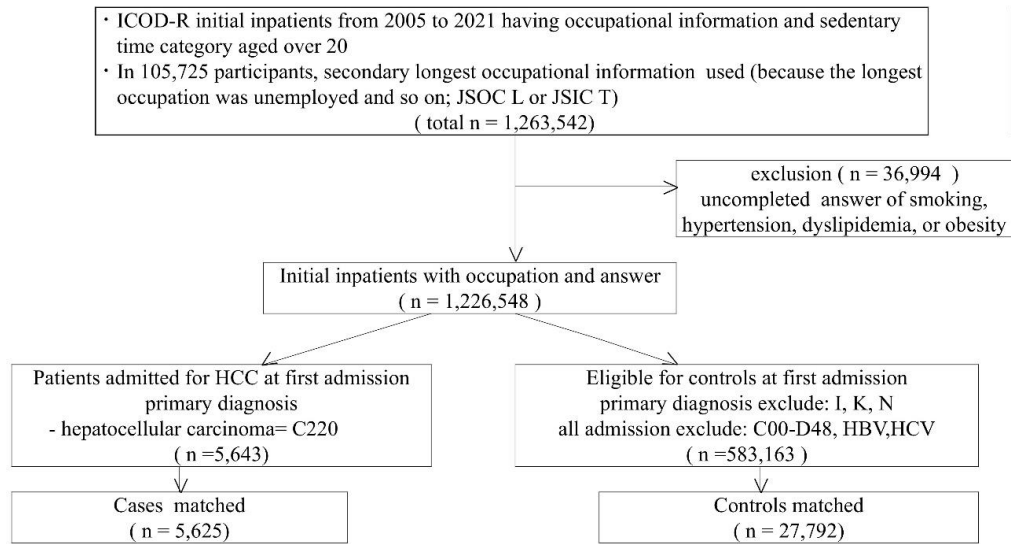**Supplementary materials:**

Nakazawa S, et al. Association of occupational physical activity and sedentary behaviour with the risk of hepatocellular carcinoma: A case-control study based inpatients data from a nation-wide hospital group in Japan

Supplemental material

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Supplementary Figure 1. Dataset diagram.

· ICOD-R initial inpatients from 2005 to 2021 having occupational information and sedentary time category aged over 20
· In 105,725 participants, secondary longest occupational information used (because the longest occupation was unemployed and so on; JSOC L or JSIC T)
(total n = 1,263,542)

exclusion (n = 36,994)
uncompleted answer of smoking, hypertension, dyslipidemia, or obesity

Initial inpatients with occupation and answer
(n = 1,226,548)

Patients admitted for HCC at first admission
primary diagnosis
- hepatocellular carcinoma= C220
(n =5,643)

Eligible for controls at first admission
primary diagnosis exclude: I, K, N
all admission exclude: C00-D48, HBV,HCV
(n =583,163)

Cases matched
(n = 5,625)

Controls matched
(n = 27,792)

Supplementary Methods: Japan Standard Occupational Classification (JSOC) and Japan Standard Industrial Classification (JSIC) [1,2]

The JSOC categories were as follows: A) managers; B) professionals; C) clerical workers; D) sales workers; E) service workers; F) security workers; G) agricultural, forestry, and fishery workers; H) manufacturing workers; I) transportation workers; J) construction and mining workers; K) carrying, cleaning, and packing workers; and L) students, homemakers, unemployed individuals, and those unclassifiable.

The JSIC categories were as follows: A) Agriculture and forestry; B) Fisheries; C) Mining and quarrying of stone; D) Construction; E) Manufacturing; F) Electricity, gas, heat supply, and water; G) Information and communication; H) Transport and postal services; I) Wholesale and retail trade; J) Finance and Insurance; K) Real estate and goods rental and leasing; L) scientific research, professional, and technical services; M) Accommodations, eating and drinking services; N) Living-related and personal services and amusement services; O) Education and learning support; P) Medical, health care, and welfare; Q) compound services; R) services not classified elsewhere; and S) Government services not classified elsewhere.

Reference)

1. Japanese ministry of internal affairs and communications. Japan standard industrial classification (Rev. 13, October 2013). https://www.soumu.go.jp/english/dgpp_ss/seido/sangyo/san13-1.htm (Accessed 3 Oct, 2023).

2. Japanese ministry of internal affairs and communications. Japan standard occupational classification (Rev. 5th December 2009). https://www.soumu.go.jp/english/dgpp_ss/seido/shokgyou/co09-2.htm (Accessed 3 Oct, 2023).

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Supplementary Methods: OPA

Supplementary Table 1. OPA and occupation

OPA category defined by Steeves et al. [3]	occupational category in National health and examination survey 2003-2004 [3]	total activity counts (standard error) [3]	Mean score	summary rank [3]	JSOC category	OPA category in our study
High OPA	Farm and nursery workers	434,533 (72,549)		1	G	high
	Other helpers, cleaners, hand packagers, laborers	422,397 (43,719)		2	K	high
	Construction laborers	471,863 (54,189)		3	J	high
	Related agricultural, forestry, and fishing	485,767 (29,836		4	G	high
	Cleaning and building service occupations	450,084 (30,591)		5	K	high
	Construction trades	424,700 (19,785)		6	J	high
	Freight, stock, and material movers (hand)	425,193 (22,221)		7	K	high
	Farm operators, managers, and supervisors	436,923 (295.8)		8	G	high
	Textile, apparel, furnishings machine operators	389,395 (72,764)		9	H	medium
	Machine operators, assorted materials	356,234 (37,952)		10	I	medium
	Waiters and waitresses	332,931 (32,540)		11	E	medium
	Other mechanics and repairers	358,301 (15,423)		12	H	medium
	Motor vehicle operators	358,903 (21,335)		13	I	medium
intermediate OPA	Supervisors and proprietors, sales occupations	346,590 (35,260)		14	D	medium
	Fabricators, assemblers, inspectors, and samplers	332,848 (17,945)		15	H	medium

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	Other transportation and material moving	363,428 (19,964)	16	K	high
	Private household occupations	320,474 (84,755)	17	-	-
	Vehicle and mobile equip. mechanics, repairers	320,773 (40,082)	18	H	medium
	Material recording, scheduling, distributing clerks	334,085 (60,295)	19	C	low
	Cooks	298,019 (19,802)	20	E	medium
	Miscellaneous food preparation and service	288,423 (20,262)	21	E	medium
	Extractive and precision production occupations	327,915 (17,333)	22	H	medium
	Laborers, except construction	305,925 (71,578)	23	-	-
	Sales workers, retail and personal services	314,124 (18,394)	24	D	medium
	Health service occupations	290,882 (22,132)	25	E	medium
	Sales reps., finance, business, & commodities	303,648 (23,216)	26	D	medium
Low OPA	Technicians and related support occupations	296,734 (17,082)	27	B	low
	Information clerks	280,789 (44,557)	28	B	low
	Health diagnosing, assessing and treating	284,889 (13,572)	29	B	low
	Executive, administrators, and managers	293,657 (10,403)	30	A	low
	Writers, artists, entertainers, and athletes	296,033 (30,519)	31	B	low
	Personal service occupations	246,259 (19,502)	32	E	medium
	Management related occupations	299,487 (16,539	33	B	low
	Teachers	292,993	34	B	low

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	(23,268)			
Protective service occupations	281,516 (33,814)	35	F a)	medium
Engineers, architects and scientists	294,668 (33,219)	36	B	low
Miscellaneous administrative support occupations	277,748 (14,067)	37	C	low
Other professional specialty occupations	279,639 (16,847)	38	B	low
Records processing occupations	243,927 (11,345)	39	C	low
Secretaries, stenographers, and typists	223,662 (15,790)	40	C	low

a) Because JSOC F includes self-defence force personnel, so it is classified as medium OPA.

Reference)

3. Steeves JA, Tudor-Locke C, Murphy RA et al. Classification of occupational activity categories using accelerometry: NHANES 2003–2004. Int J Behav Nutr Phys Act 2015;12:89.

Supplementary Methods: Sedentary time (ST)

These methodologies were also in article by Sano et al. and Fukai et al. [4,5]

First, we evaluated ST among 40,598 participants who were admitted to the hospitals between 1 April 2020, and 31 March 2021, without missing information regarding sedentary time or occupational information. Their categorised answers about sedentary time were 1 to 5 (1: <1 h, 2: 1–4 h, 3: 4–8 h, 4: 8–12 h, 5: >12 h). We converted the groups to numerical values (category 1, 0.5 h; category 2, 2.5 h; category 3, 6 h; category 4, 10 h; and category 5, 14 h). In addition, we used the analysis of co-variance and calculated the adjusted mean of ST with adjustments for age and sex. We calculated means for each JSOC and JSIC category (a total of 113 occupational groups) and ranked

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them as long, medium, and short categories based on the textiles of the adjusted means. We excluded the results from a small number of occupational groups comprising <10 people and the JSOC L categories, such as students, homemakers, unemployed individuals and those unclassifiable. Finally, we adapted the 113 occupational sedentary categories to all participants.

Reference)

4. Fukai K, Sano K, Terauchi R, et al. Developing a Job-Exposure Matrix for Sedentary Behavior: A Study Based on the Inpatient Clinico-Occupational Database of Rosai Hospital Group. J Occup Environ Med. 2025;67(1):73-7.

5. Sano K, Fukai K, Terauchi R, et al. Association between ocular diseases and screen time and sedentary time derived from job-exposure matrices. Sci Rep. 2024;14(1):27042.

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Supplementary Figure 2. ST according to occupational and industrial exposure

	A	B	C	D	E	F	G	H	I	J	K	
A	L	L	M				L				L	A
B	L						L					B
C										L		C
D	M	M	S	M			L	L	S	L	L	D
E	M	S	S	M	L	S		L	M	M	L	E
F	M	M	S	S		S		M		L		F
G	S	S	S	S				S		M		G
H	S	S	S	S	L	S		M	S	S	L	H
I	M	M	S	L	L	M		M	L	L	L	I
J	S	S	S	M				S				J
K	M	S	S	M	M	S		S			L	K
L	S	S	S	M	M	L		S		L	L	L
M	M	M	S	L	L	S		S			L	M
N	M	L	S	M	L	M		S	S		L	N
O	M	M	S		M	L		M	S		L	O
P	M	M	S	M	L	M		M	L		M	P
Q	M	M	S	L	L		L	L			L	Q
R	M	M	S	M	L	M	L	M	M	M	L	R
S	S	S	S		L	M		S	L		L	S
	A	B	C	D	E	F	G	H	I	J	K	

Industries

occupations

L	Long ST
M	Medium ST
S	Short ST

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Japan standard occupational classification

A	Managers
B	Professionals
C	Clerical workers
D	Sales workers
E	Security workers
F	Agricultural, forestry, and fishery workers
G	Manufacturing workers
H	Transport and postal services
I	Transportation workers
J	Construction and mining workers
K	Carrying, cleaning, and packing workers

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Japan standard industrial classification

A	Agriculture and forestry
B	Fisheries
C	Mining and quarrying of stone
D	Construction
E	Manufacturing
F	Electricity, gas, heat supply and water
G	Information and communication
H	Transport and postal services
I	Wholesale and retail trade
J	Finance and Insurance
K	Real estate and goods rental and leasing
L	Scientific research, professional and technical services
M	Accommodations, eating and drinking services
N	Living-related and personal services and amusement services
O	Education, learning support
P	Medical, health care and welfare
Q	Compound services
R	Services not classified elsewhere
S	Government services not classified elsewhere

Supplementary Methods: Alcohol consumption

The questionnaire contained the following questions regarding alcohol consumption.

	Question	Answer	Calculation of frequency per week
Until March 2016	Drinking habit	I have never drunk alcohol.	0
		I used to drink but stopped.	3
		I have only drunk occasionally.	3
		I used to drink almost daily, but now drink occasionally.	7
		I drink almost daily.	7
	Drinking duration	Age at drinking initiation and age at drinking termination	
	Average quantity per day	Alcohol amount converted into Japanese sake amount (1 unit＝20 g pure ethanol) per day	
From April 2016	Drinking habit	I have never drunk alcohol.	0
		I cannot drink alcohol.	0
		I used to drink daily but stopped now.	7
		I drink once or twice a week	2
		I drink almost daily (more than 4 times a week)	5
		I drink daily (7 times a week)	7

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Drinking duration	Age at drinking initiation and age at drinking termination
Average quantity per day	Less than 1 unit (converted into Japanese sake amount, 1 unit = 22 g pure ethanol)
	More than 1 unit and less than 2 units
	More than 2 units and less than 3 units
	More than 3 units

We used the quantity of alcohol converted to pure ethanol equivalent in grams. The data from April 2016 were converted into continuous variables (10 g ethanol, 30 g ethanol, 50 g ethanol and 65 g ethanol). We calculated the amount of alcohol consumed per weeks by multiplying the daily amount by frequency per week. Furthermore, the ALD amount was defined as alcohol consumption of over 60 g per day and over 420 g per week in men and over 50 g per day and over 350 g per week in women. MetALD amount was defined as alcohol consumption of 30–60 g per day and 210–420 g per week in men and 20–50 g per day and 140–350 g per week in women. Finally, the low MetALD amount was defined as alcohol consumption of below 30 g per day and below 210 g per week in men and below 20 g per day and below 140 g per week in women.

ALD, alcohol-related liver disease; MASLD, metabolic dysfunction-associated steatotic liver disease; MetALD, MASLD with a higher alcohol intake; OPA, occupational physical activity; ST, sedentary time

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Supplementary Table **2**. Top 10 primary diagnosis of controls

Ranking	primary diagnosis	ICD-10 code	Number	Percentage (%) [a]
1	Senile cataract	H25.0	1727	6.21
2	spinal canal stenosis of the lumbar spine	M48.0	1651	5.94
3	Geriatric cataract, unknown details	H25.9	882	3.17
4	Pneumonia, unknown details	J18.9	633	2.28
5	Other explicit disc herniation(displacement)	M51.2	596	2.14
6	Insulin-independent diabetes mellitus <NIDDM> without complications	E11.9	541	1.95
7	Geriatric nuclear cataract	H25.1	489	1.76
8	Fracture of the thigh bone, closed	S72.00	473	1.70
9	Other spondylolisthesis with myelopathy (spinal cord disorder)	M47.1	456	1.64
10	Lumbar spondylolisthesis	M43.1	404	1.45

a) Number of diagnosis / all controls × 100

ICD-10, International Statistical Classification of Diseases and Related Health Problems, Tenth Revision

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Supplementary Table 3. Background characteristics of men

	Patients	Controls
Population, no.	4,085	20,114
Age, years	69.5±9.8	69.5±9.9
Smoking status		
Never	811 (19.9%)	5,229 (26%)
Former	1,948 (47.7%)	9,722 (48.3%)
Current	1,326 (32.5%)	5,163 (25.7%)
Alcohol use		
ALD (week)	154 (3.8%)	382 (1.9%)
MetALD (week)	928 (22.7%)	4,159 (20.7%)
Low MetALD (week)	3,003 (73.5%)	15,573 (77.4%)
ALD (day)	238 (5.8%)	557 (2.8%)
MetALD (day)	1,350 (33%)	5,590 (27.8%)
Low MetALD (day)	2,497 (61.1%)	13,967 (69.4%)
Diagnose of hypertension, yes	1,566 (38.3%)	7,606 (37.8%)
Diagnose of type 2 diabetes, yes	559 (13.7%)	2,267 (11.3%)
Diagnose of dyslipidaemia, yes	203 (5%)	2,326 (11.6%)
Obesity, yes	362 (8.9%)	2,192 (10.9%)
Occupational physical activity of longest job		
Low OPA	1,132 (27.7%)	6,012 (29.9%)
Medium	1,823 (44.6%)	8,808 (43.8%)
High OPA	791 (19.4%)	3,747 (18.6%)
Uncategorized	339 (8.3%)	1,547 (7.7%)
Sedentary time		
Long	1,054(25.8%)	5,177(25.7%)
Medium	756(18.5%)	4,233(21%)
Short	1,934(47.3%)	9,151(45.5%)
Uncategorized	341(8.3%)	1,553(7.7%)
HBV	511 (12.5%)	0 (0%)
HCV	1,670 (40.9%)	0 (0%)

a) Percentage may not add up to 100 because of rounding.

ALD, alcohol-related liver disease; HBV, hepatitis B virus; HCV, hepatitis C virus;

MASLD, metabolic dysfunction-associated steatotic liver disease; MetALD, MASLD

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with a higher alcohol intake; OPA, occupational physical activity; ST, sedentary time

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Supplementary Table 4. Background characteristics of women

	Patients	Controls
Population, no.	1,540	7,678
Age, years	73.2±9.8	73.2±9.8
Smoking status		
Never	1,245 (80.8%)	6,678 (87%)
Former	158 (10.3%)	585 (7.6%)
Current	137 (8.9%)	415 (5.4%)
Alcohol use		
ALD (weeks)	16 (1%)	27 (0.4%)
MetALD (weeks)	80 (5.2%)	371 (4.8%)
LowMetALD (weeks)	1,444 (93.8%)	7,280 (94.8%)
ALD (days)	28 (1.8%)	42 (0.5%)
MetALD (days)	243 (15.8%)	1,190 (15.5%)
Low MetALD (days)	1,269 (82.4%)	6,446 (84%)
Diagnose of hypertension, yes	667 (43.3%)	3,058 (39.8%)
Diagnose of type 2 diabetes, yes	166 (10.8%)	587 (7.6%)
Diagnose of dyslipidaemia, yes	79 (5.1%)	1,022 (13.3%)
Obesity, yes	137 (8.9%)	731 (9.5%)
Occupational physical activity of longest job		
Low OPA	347 (22.5%)	1,677 (21.8%)
Medium OPA	508 (33%)	2,178 (28.4%)
High OPA	118 (7.7%)	738 (9.6%)
Uncategorized	567 (36.8%)	3,085 (40.2%)
Sedentary time		
Long ST	253(16.4%)	1,136(14.8%)
Medium ST	142(9.2%)	802(10.4%)
Short ST	577(37.5%)	2,654(34.6%)
Uncategorized	568(36.9%)	3,086(40.2%)
HBV	151 (9.8%)	0 (0%)
HCV	719 (46.7%)	0 (0%)

a) Percentage may not add up to 100 because of rounding.

ALD, alcohol-related liver disease; HBV, hepatitis B virus; HCV, hepatitis C virus;

MASLD, metabolic dysfunction-associated steatotic liver disease; MetALD, MASLD

with a higher alcohol intake; OPA, occupational physical activity; ST, sedentary time

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Supplementary Table 5. Regional characteristics of patients

	Patients	ALD (%)[a]	HBV (%)[b]	HCV (%)[c]
Region				
Hokkaido	304	2.0	3.4	6.0
Tohoku	848	1.8	1.5	6.7
Kanto	786	1.7	1.5	7.2
Chubu	414	1.7	1.8	6.6
Kansai	1,476	1.9	1.8	8.1
Chugoku-shikoku	1,055	2.1	2.4	6.2
Kyushu	742	0.77	2.3	7.9

a) Patients with ALD amount alcohol consumption / patients in the region (ALD amount is defined as alcohol consumption over 420 g per week in men and over 350 g per week in women)

b) Patients with HBV / patients in the region

c) Patients with HCV / patients in the region

ALD, alcohol-related liver disease; HBV, hepatitis B virus; HCV, hepatitis C virus

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Supplementary Table 6. Details of liver diseases in the cases

	Number (%)
Total number of HCC patients at admission of diagnosis	5625 (100%)
with liver disease (K70-77) at diagnosis	2216 (39.4%)
without liver disease (K70-77) at diagnosis	3409 (60.6%)
(they did not have liver diagnosis at diagnosis of HCC, however, they have it during all admissions)	1084 (19.3%)
HBV positive	662 (11.8%)
HCV positive	2389 (42.5%)
no HBV /HCV /liver disease (K70-77) a)	1397 (24.8%)

a) 131 cases had the diagnosis of type 2 diabetes. 391 cases had only HCC diagnosis at first time admission.

HBV, hepatitis B virus; HCV, hepatitis C virus

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Supplementary Table 7. Characteristics of alcohol consumption and occupation in cases

		OPA	case	ALD	MetALD	low MetALD	Z a)	P a)
A	Managers	Low	301	17(5.65%)	70(23.3%)	214(71.1%)	-3.38	0.0007 b)
B	Professionals	Low	472	14(2.97%)	96(20.3%)	362(76.7%)	-1.25	0.2112
C	Clerical workers (reference)	Low	706	17(2.41%)	126(17.8%)	563(79.7%)	- (ref)	-
D	Sales workers	Medium	525	20(3.81%)	88(16.8%)	417(79.4%)	-0.6	0.542
E	Security workers	Medium	377	15(3.98%)	65(17.2%)	297(78.8%)	-0.8	0.416
F	Agricultural, forestry, and fishery workers	Medium	75	1(1.33%)	19(25.3%)	55(73.3%)	-0.9	0.353
G	Manufacturing workers	High	245	5(2.04%)	51(20.8%)	189(77.1%)	-0.6	0.525
H	Transport and postal services	Medium	982	30(3.05%)	183(18.6%)	769(78.3%)	-0.9	0.386
I	Transportation workers	Medium	372	17(4.57%)	89(23.9%)	266(71.5%)	-3.2	0.001 b)
J	Construction and mining workers	High	460	19(4.13%)	116(25.2%)	325(70.7%)	-3.6	0.0004 b)
K	Carrying, cleaning, and packing workers	High	204	5(2.45%)	37(18.1%)	162(79.4%)	-0.1	0.920

a) Cochrane-Armitage tests were performed compared to clerical workers as reference.

b) Two-sided p value was <0.05 in Cochran-Armitage test.

ALD, alcohol-related liver disease; MASLD, metabolic dysfunction-associated steatotic liver disease; MetALD, MASLD with a higher alcohol intake

Supplementary Table 8. Characteristics of alcohol consumption and occupation in controls

		OPA	control	ALD	metALD	low MetALD	Z a)	P a)
A	Managers	Low	1439	23(1.6%)	284(19.7%)	1132(78.7%)	-2.8	0.006 b)
B	Professionals	Low	2725	29(1.06%)	479(17.6%)	2217(81.4%)	-0.5	0.591
C	Clerical workers (reference)	Low	3525	54(1.53%)	566(16.1%)	2905(82.4%)	- (ref)	-
D	Sales workers	Midium	2675	41(1.53%)	496(18.5%)	2138(79.9%)	-2.2	0.027 b)
E	Security workers	Midium	1421	42(2.96%)	220(15.5%)	1159(81.6%)	-1.6	0.104
F	Agricultural, forestry, and fishery workers	Midium	447	8(1.79%)	99(22.1%)	340(76.1%)	-3.0	0.003 b)
G	Manufacturing workers	High	1475	22(1.49%)	198(13.4%)	1255(85.1%)	2.1	0.039 b)
H	Transport and postal services	Midium	4874	70(1.44%)	911(18.7%)	3893(79.9%)	-2.5	0.012 b)
I	Transportation workers	Midium	1569	27(1.72%)	365(23.3%)	1177(75%)	-5.6	<.0001 b)
J	Construction and mining workers	High	2077	46(2.21%)	502(24.2%)	1529(73.6%)	-7.5	<.0001 b)
K	Carrying, cleaning, and packing workers	High	933	26(2.79%)	137(14.7%)	770(82.5%)	-0.7	0.481

a) Cochrane-Armitage tests were performed compared to clerical workers as reference.

b) Two-sided p value was <0.05 in Cochran-Armitage test.

ALD, alcohol-related liver disease; MASLD, metabolic dysfunction-associated steatotic

liver disease; MetALD, MASLD with a higher alcohol intake

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Supplementary Table 9. OPA and the risk of HCC stratified with alcohol consumption amount (per week and per day) in men without HBV/HCV infection

Men		OR (95% CI)		
	Patients	Model 1[a]	Model 2[b]	Model 3[c]
In participants without HBV/HCV infection				
ALD level: >420 g per week				
Low OPA	28	1(reference)	1(reference)	1(reference)
Medium OPA	56	0.67 (0.11–3.99)	1.75 (0.11–29.3)	2.36 (0.18–30.3)
High OPA	19	-[d]	-[d]	-[d]
MetALD level: 210–420 g per week				
Low OPA	175	1 (reference)	1 (reference)	1 (reference)
Medium OPA	204	0.73 (0.53–1.01)	**0.72 (0.52–0.99)**	**0.70 (0.50–0.97)**
High OPA	109	0.97 (0.66–1.42)	0.93 (0.63–1.38)	0.96 (0.64–1.43)
Low MetALD level: <210 g per week				
Low OPA	400	1 (reference)	1 (reference)	1 (reference)
Medium OPA	560	0.96 (0.83–1.12)	0.95 (0.82–1.11)	0.94 (0.81–1.09)
High OPA	244	0.92 (0.76–1.1)	0.93 (0.77–1.12)	0.91 (0.76–1.1)
In participants without HBV/HCV infection				
ALD level: >60 g per day				
Low OPA	37	1 (reference)	1 (reference)	1 (reference)
Medium OPA	77	0.57 (0.13–2.43)	0.67 (0.15–3.02)	0.60 (0.12–3.16)
High OPA	29	0.83 (0.12–5.8)	1.01 (0.12–8.81)	0.71 (0.057–8.73)
MetALD level: 30–60 g per day				
Low OPA	250	1 (reference)	1 (reference)	1 (reference)
Medium OPA	306	0.86 (0.67–1.09)	0.84 (0.66–1.08)	0.82 (0.64–1.05)
High OPA	144	0.89 (0.66–1.2)	0.86 (0.64–1.16)	0.85 (0.63–1.15)
Low MetALD amount: <30 g per day				
Low OPA	316	1 (reference)	1 (reference)	1 (reference)
Medium OPA	437	0.92 (0.78–1.10)	0.92 (0.77–1.09)	0.92 (0.77–1.09)
High OPA	199	0.92 (0.75–1.14)	0.93 (0.75–1.14)	0.92 (0.75–1.14)

a) Conditional logistic regression matched for sex, age, admission date, and admitting hospital.

b) Additional adjustment for smoking in Model 1.

c) Additional adjustment for diagnosis of hypertension, type 2 diabetes, dyslipidaemia,

and obesity in Model 2.

d) ORs and 95% CIs could not be calculated because of insufficient number of cases and matched controls.

ALD, alcohol-related liver disease; CI, confidence interval; HBV, hepatitis B virus; HCC, hepatocellular carcinoma; HCV, hepatitis C virus; MASLD, metabolic dysfunction-associated steatotic liver disease; MetALD, MASLD with a higher alcohol intake; OR, odds ratio; OPA, occupational physical activity

Supplementary Table 10. OPA and the risk of HCC stratified with alcohol consumption amount (per week and per day) in women without HBV/HCV infection.

Women		OR (95% CI)		
	Patients	Model 1[a]	Model 2[b]	Model 3[c]
In participants without HBV/HCV infection				
ALD level: >350 g per week				
Low OPA	4	-[d]	-[d]	-[d]
Medium OPA	5	-[d]	-[d]	-[d]
High OPA	0	-[d]	-[d]	-[d]
MetALD level: 140–350 g/week				
Low OPA	7	-[d]	-[d]	-[d]
Medium OPA	18	-[d]	-[d]	-[d]
High OPA	0	-[d]	-[d]	-[d]
Low MetALD level: <140 g per week				
Low OPA	147	1 (reference)	1 (reference)	1 (reference)
Medium OPA	205	1.09 (0.86–1.38)	1.06 (0.83–1.34)	1.03 (0.81–1.31)
High OPA	48	0.73 (0.51–1.04)	0.71 (0.49–1.02)	**0.69 (0.48–0.99)**
In participants without HBV/HCV infection				
ALD level: >50 g per day				
Low OPA	4	-[d]	-[d]	-[d]
Medium OPA	5	-[d]	-[d]	-[d]
High OPA	0	-[d]	-[d]	-[d]
MetALD level: 20–50 g per day				
Low OPA	24	1 (reference)	1 (reference)	1 (reference)
Medium OPA	44	2.04 (0.90–4.64)	2.11 (0.88–5.03)	2.49 (0.98–6.31)
High OPA	7	0.77 (0.18–3.28)	0.91 (0.21–3.96)	0.95 (0.20–4.53)
Low MetALD level: <20 g per day				
Low OPA	130	1 (reference)	1 (reference)	1 (reference)
Medium OPA	179	1.05 (0.81–1.36)	1.01 (0.78–1.31)	0.97 (0.75–1.26)
High OPA	41	**0.66 (0.45–0.98)**	**0.64 (0.43–0.95)**	**0.62 (0.42–0.93)**

a) Conditional logistic regression matched for sex, age, admission date, and admitting hospital.

b) Additional adjustment for smoking in Model 1.

c) Additional adjustment for diagnosis of hypertension, type 2 diabetes, dyslipidaemia,

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and obesity in Model 2.

d) ORs and 95% CIs could not be calculated because of insufficient number of cases and matched controls.

ALD, alcohol-related liver disease; CI, confidence interval; HBV, hepatitis B virus; HCC, hepatocellular carcinoma; HCV, hepatitis C virus; MASLD, metabolic dysfunction-associated steatotic liver disease; MetALD, MASLD with a higher alcohol intake; OR, odds ratio; OPA, occupational physical activity

Supplementary Table 11. Sedentary time and the risk of HCC stratified with alcohol consumption amount (per week and per day) in men without HBV/HCV infection.

Men		OR (95% CI)		
	Patients	Model 1[a]	Model 2[b]	Model 3[c]
In participants without HBV/HCV infection				
ALD level: >420 g per week				
Long ST	58	1 (reference)	1 (reference)	1 (reference)
Medium ST	17	3.06 (0.20–46.6)	2.08 (0.13–33)	3.56 (0.11–113)
Short ST	28	0.71 (0.087–5.8)	0.77 (0.088–6.62)	0.95 (0.087–10.3)
MetALD level: 210–420 g per week				
Long ST	224	1 (reference)	1 (reference)	1 (reference)
Medium ST	108	0.88 (0.59–1.3)	0.86 (0.58–1.28)	0.84 (0.56–1.26)
Short ST	156	0.75 (0.54–1.04)	0.74 (0.53–1.03)	0.73 (0.52–1.03)
Low MetALD level: <210 g per week				
Long ST	586	1 (reference)	1 (reference)	1 (reference)
Medium ST	266	0.90 (0.76–1.08)	0.91 (0.76–1.09)	0.91 (0.76–1.09)
Short ST	351	0.92 (0.79–1.07)	0.93 (0.79–1.08)	0.92 (0.79–1.08)
In participants without HBV/HCV infection				
ALD level: >60 g per day				
Long ST	77	1 (reference)	1 (reference)	1 (reference)
Medium ST	27	1.65 (0.30–9)	1.49 (0.27–8.37)	2.51 (0.31–20)
Short ST	39	0.74 (0.16–3.38)	0.72 (0.15–3.47)	0.51 (0.065–4.05)
MetALD level: 30–60 g per day				
Long ST	323	1 (reference)	1 (reference)	1 (reference)
Medium ST	157	0.87 (0.64–1.18)	0.85 (0.62–1.15)	0.85 (0.62–1.16)
Short ST	220	0.83 (0.64–1.06)	0.82 (0.64–1.05)	0.82 (0.63–1.06)
Low MetALD level: <30 g per day				
Long ST	468	1 (reference)	1 (reference)	1 (reference)
Medium ST	207	0.88 (0.71–1.08)	0.88 (0.71–1.09)	0.87 (0.71–1.08)
Short ST	276	0.91 (0.76–1.08)	0.92 (0.77–1.09)	0.91 (0.76–1.09)

a) Conditional logistic regression matched for sex, age, admission date, and admitting hospital.

b) Additional adjustment for smoking in Model 1.

c) Additional adjustment for diagnosis of hypertension, type 2 diabetes, dyslipidaemia,

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and obesity in Model 2.

d) ORs and 95% CIs could not be calculated because of insufficient number of cases and matched controls.

ALD, alcohol-related liver disease; CI, confidence interval; HBV, hepatitis B virus; HCC, hepatocellular carcinoma; HCV, hepatitis C virus; MASLD, metabolic dysfunction-associated steatotic liver disease; MetALD, MASLD with a higher alcohol intake; OR, odds ratio; OPA, occupational physical activity; ST, sedentary time

Supplementary Table 12. Sedentary time and the risk of HCC stratified with alcohol consumption amount (per week and per day) in women without HBV/HCV infection.

Women		OR (95% CI)		
	Patients	Model 1[a]	Model 2[b]	Model 3[c]
In participants without HBV/HCV				
ALD level: >350 g per week				
Long ST	5	-[d]	-[d]	-[d]
Medium ST	2	-[d]	-[d]	-[d]
Short ST	2	-[d]	-[d]	-[d]
MetALD level: 140–350 g/week				
Long ST	17	1 (reference)	1 (reference)	-[d]
Medium ST	3	-[d]	-[d]	-[d]
Short ST	5	1.41 (0.085–23.6)	2.55 (0.21–31.4)	-[d]
Low MetALD level: <140 g per week				
Long ST	233	1 (reference)	1 (reference)	1 (reference)
Medium ST	57	**0.67 (0.47–0.96)**	**0.66 (0.46–0.94)**	**0.68 (0.47–0.97)**
Short ST	109	0.90 (0.70–1.16)	0.87 (0.67–1.13)	0.86 (0.66–1.12)
in participants without HBV/HCV				
ALD level: >50 g per day				
Long ST	5	-[d]	-[d]	-[d]
Medium ST	2	-[d]	-[d]	-[d]
Short ST	3	-[d]	-[d]	-[d]
MetALD level: 20–50 g per day				
Long ST	47	1 (reference)	1 (reference)	1 (reference)
Medium ST	10	0.88 (0.25–3.08)	0.84 (0.22–3.24)	1.07 (0.26–4.37)
Short ST	18	1.72 (0.70–4.24)	1.69 (0.65–4.35)	2 (0.74–5.43)
Low MetALD level: <20 g per day				
Long ST	203	1 (reference)	1 (reference)	1 (reference)
Medium ST	50	**0.66 (0.45–0.96)**	**0.65 (0.44–0.95)**	**0.67 (0.45–0.98)**
Short ST	96	0.86 (0.65–1.13)	0.82 (0.62–1.09)	0.82 (0.62–1.08)

a) Conditional logistic regression matched for sex, age, admission date, and admitting hospital.

b) Additional adjustment for smoking in Model 1.

c) Additional adjustment for diagnosis of hypertension, type 2 diabetes, dyslipidaemia,

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and obesity in Model 2.

d) ORs and 95% CIs could not be calculated because of insufficient number of cases and matched controls.

ALD, alcohol-related liver disease; CI, confidence interval; HBV, hepatitis B virus; HCC, hepatocellular carcinoma; HCV, hepatitis C virus; MASLD, metabolic dysfunction-associated steatotic liver disease; MetALD, MASLD with a higher alcohol intake; OPA, occupational physical activity; OR, odds ratio; ST, sedentary time

Supplementary Table 13. OPA and the risk of HCC stratified with metabolic diseases in men without HBV/HCV infection and ALD.

Men	Patients	OR (95% CI)	Patients	OR (95% CI)
		With hypertension[a]		Without hypertension[a]
Low OPA	261	1 (reference)	314	1 (reference)
Medium OPA	315	0.82 (0.66–1.02)	449	0.95 (0.80–1.13)
High OPA	150	1.03 (0.78–1.35)	203	0.99 (0.80–1.22)
	Patients	With type 2 diabetes[b]	Patients	Without type 2 diabetes[b]
Low OPA	89	1(reference)	486	1(reference)
Medium OPA	119	0.66 (0.37–1.18)	645	**0.86 (0.75–0.98)**
High OPA	44	1.43 (0.63–3.26)	309	0.94 (0.80–1.11)
	Patients	With dyslipidaemia[c]	Patients	Without dyslipidaemia[c]
Low OPA	56	1(reference)	519	1(reference)
Medium OPA	42	1.22 (0.52–2.87)	722	0.89 (0.78–1.01)
High OPA	20	1.96 (0.48–7.99)	333	0.93 (0.80–1.09)
	Patients	With obesity[d]	Patients	Without obesity[d]
Low OPA	89	1(reference)	486	1(reference)
Medium OPA	79	0.63 (0.33–1.21)	685	0.90 (0.79–1.03)
High OPA	26	1.73 (0.69–4.33)	327	0.97 (0.83–1.14)

a) Conditional logistic regression matched for sex, age, admission date, and admitting hospital and adjustment for smoking, diagnosis of type 2 diabetes, dyslipidaemia, and obesity.

b) Conditional logistic regression matched for sex, age, admission date, and admitting hospital and adjustment for smoking, diagnosis of hypertension, dyslipidaemia, and obesity.

c) Conditional logistic regression matched for sex, age, admission date, and admitting hospital and adjustment for smoking, diagnosis of hypertension, type 2 diabetes, and obesity.

d) Conditional logistic regression matched for sex, age, admission date, and admitting hospital and adjustment for smoking, diagnosis of hypertension, type 2 diabetes, and dyslipidaemia.

ALD, alcohol-related liver disease; CI, confidence interval; HBV, hepatitis B virus; HCC, hepatocellular carcinoma; HCV, hepatitis C virus; OPA, occupational physical activity;

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Supplementary Table 14. OPA and the risk of HCC stratified with metabolic diseases in women without HBV/HCV infection and ALD

Women	Patients	Odds ratio (95% confidence interval)	Patients	Odds ratio (95% confidence interval)
		With hypertension[a]		Without hypertension[a]
Low OPA	66	1(reference)	88	1(reference)
Medium OPA	109	1.16 (0.78–1.71)	114	0.93 (0.66–1.31)
High OPA	27	0.85 (0.48–1.5)	21	**0.49 (0.28–0.87)**
	Patients	With type 2 diabetes[b]	Patients	Without type 2 diabetes[b]
Low OPA	31	1(reference)	219	1(reference)
Medium OPA	6	4.00 (0.68–23.5)	54	1.01 (0.79–1.3)
High OPA	11	0.56 (0.032–10)	103	0.69 (0.47–1.00)
	Patients	With dyslipidaemia[c]	Patients	Without dyslipidaemia[c]
Low OPA	18	1 (reference)	232	1(reference)
Medium OPA	7	-[d]	53	1.05 (0.82–1.35)
High OPA	9	-[d]	105	0.72 (0.50–1.05)
	Patients	With obesity[e]	Patients	Without obesity[e]
Low OPA	18	1(reference)	136	1(reference)
Medium OPA	31	1.66 (0.44–6.22)	192	1.03 (0.8–1.32)
High OPA	5	2.27 (0.077–66.9)	43	0.71 (0.48–1.04)

a) Conditional logistic regression matched for sex, age, admission date, and admitting hospital and adjustment for smoking, diagnosis of type 2 diabetes, dyslipidaemia, and obesity.

b) Conditional logistic regression matched for sex, age, admission date, and admitting hospital and adjustment for smoking, diagnosis of hypertension, dyslipidaemia, and obesity.

c) Conditional logistic regression matched for sex, age, admission date, and admitting hospital and adjustment for smoking, diagnosis of hypertension, type 2 diabetes, and obesity.

d) ORs and 95% CIs could not be calculated because of insufficient number of cases and matched controls.

e) Conditional logistic regression matched for sex, age, admission date, and admitting hospital and adjustment for smoking, diagnosis of hypertension, type 2 diabetes, and dyslipidaemia.

ALD, alcohol-related liver disease; CI, confidence interval; HBV, hepatitis B virus; HCC, hepatocellular carcinoma; HCV, hepatitis C virus; OPA, occupational physical activity; OR, odds ratio

Supplementary Table 15. OPA and the risk of HCC stratified with number of metabolic diseases in participants without HBV/HCV infection and ALD.

	Patients	OR (95% CI)[a]	Patients	OR (95% CI)[a]
Men		No factor		One factor
Low OPA	236	1(reference)	227	1(reference)
Medium OPA	374	0.98 (0.80–1.2)	258	**0.73 (0.57–0.94)**
High OPA	167	0.90 (0.70–1.15)	141	0.97 (0.72–1.31)
		Two factors		Three factors
Low OPA	73	1(reference)	34	1(reference)
Medium OPA	103	1.50 (0.75–2.99)	25	0.36 (0.027–4.76)
High OPA	36	1.82 (0.73–4.55)	9	-[b]
		Four factors		
Low OPA	5	-[b]		
Medium OPA	4	-[b]		
High OPA	0	-[b]		
	Patients	OR (95% CI)[a]	Patients	OR (95% CI)[a]
Women		No factor		One factor
Low OPA	74	1(reference)	55	1(reference)
Medium OPA	96	1.04 (0.71–1.52)	81	1.01 (0.63–1.63)
High OPA	19	0.59 (0.32–1.09)	22	1.12 (0.58–2.15)
	Patients	Two factors	Patients	Three factors
Low OPA	17	1(reference)	7	1(reference)
Medium OPA	34	2.76 (0.62–12.3)	10	0.29 (0.01–8.32)
High OPA	6	1.77 (0.31–10.2)	1	-[b]
	Patients	Four factors		
Low OPA	1	-[b]		
Medium OPA	2	-[b]		
High OPA	0	-[b]		

a) Conditional logistic regression matched for sex, age, admission date, and admitting hospital and additional adjustment for smoking.

b) ORs and 95% CIs could not be calculated because of insufficient number of cases and matched controls.

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ALD, alcohol-related liver disease; CI, confidence interval; HBV, hepatitis B virus; HCC,

hepatocellular carcinoma; HCV, hepatitis C virus; OPA, occupational physical activity;

OR, odds ratio

Supplementary Table 16. Sedentary time and the risk of HCC stratified with metabolic diseases in men without HBV/HCV infection and ALD.

Men	Patients	OR (95% CI)	Patients	OR (95% CI)
		With hypertension[a]		Without hypertension[a]
Long ST	334	1(reference)	476	1(reference)
Medium ST	171	1.03 (0.80–1.34)	203	0.91 (0.73–1.13)
Short ST	221	0.91 (0.73–1.15)	286	0.94 (0.79–1.12)
		With type 2 diabetes[b]		Without type 2 diabetes[b]
Long ST	107	1(reference)	703	1(reference)
Medium ST	67	1.02 (0.55–1.91)	307	0.91 (0.77–1.07)
Short ST	78	1.08 (0.60–1.93)	429	0.89 (0.78–1.02)
		With dyslipidaemia[c]		Without dyslipidaemia[c]
Long ST	47	1(reference)	763	1(reference)
Medium ST	28	0.73 (0.26–2.06)	346	0.93 (0.79–1.09)
Short ST	43	1.07 (0.39–2.92)	464	0.90 (0.79–1.03)
		With obesity[d]		Without obesity[d]
Long ST	69	1(reference)	741	1(reference)
Medium ST	56	0.61 (0.28–1.33)	318	0.89 (0.76–1.05)
Short ST	69	0.67 (0.34–1.31)	438	0.92 (0.80–1.05)

a) Conditional logistic regression matched for sex, age, admission date, and admitting hospital and adjustment for smoking, diagnosis of type 2 diabetes, dyslipidaemia, and obesity.

b) Conditional logistic regression matched for sex, age, admission date, and admitting hospital and adjustment for smoking, diagnosis of hypertension, dyslipidaemia, and obesity.

c) Conditional logistic regression matched for sex, age, admission date, and admitting hospital and adjustment for smoking, diagnosis of hypertension, type 2 diabetes, and obesity.

d) Conditional logistic regression matched for sex, age, admission date, and admitting hospital and adjustment for smoking, diagnosis of hypertension, type 2 diabetes, and dyslipidaemia.

ALD, alcohol-related liver disease; CI, confidence interval; HBV, hepatitis B virus; HCC,

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hepatocellular carcinoma; HCV, hepatitis C virus; OR, odds ratio; ST, sedentary time

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Supplementary Table 17. Sedentary time and the risk of HCC stratified with metabolic diseases in women without HBV/HCV infection and ALD.

Women	Patients	OR (95% CI)	Patients	OR (95% CI)
		With hypertension[a]		Without hypertension[a]
Long ST	125	1(reference)	125	1(reference)
Medium ST	28	0.81 (0.45–1.44)	32	**0.56 (0.34–0.94)**
Short ST	48	1.02 (0.66–1.57)	66	0.73 (0.51–1.06)
		With type 2 diabetes[b]		Without type 2 diabetes[b]
Long ST	31	1(reference)	219	1(reference)
Medium ST	6	1.52 (0.044–52.1)	54	**0.68 (0.47–0.98)**
Short ST	11	9.67 (0.35–265)	103	0.86 (0.66–1.12)
		With dyslipidaemia[c]		Without dyslipidaemia[c]
Long ST	18	1(reference)	232	1(reference)
Medium ST	7	0.27 (0.011–6.87)	53	0.65 (0.45–0.94)
Short ST	9	8.65 (0.20–382)	105	0.86 (0.66–1.12)
		With obesity[d]		Without obesity[d]
Long ST	33	1(reference)	217	1(reference)
Medium ST	11	1.97 (0.20–19.6)	49	0.55 (0.38–0.80)
Short ST	10	2.23 (0.42–11.8)	104	0.79 (0.60–1.04)

a) Conditional logistic regression matched for sex, age, admission date, and admitting hospital and adjustment for smoking, diagnosis of type 2 diabetes, dyslipidaemia, and obesity.

b) Conditional logistic regression matched for sex, age, admission date, and admitting hospital and adjustment for smoking, diagnosis of hypertension, dyslipidaemia, and obesity.

c) Conditional logistic regression matched for sex, age, admission date, and admitting hospital and adjustment for smoking, diagnosis of hypertension, type 2 diabetes, and obesity.

d) Conditional logistic regression matched for sex, age, admission date, and admitting hospital and adjustment for smoking, diagnosis of hypertension, type 2 diabetes, and dyslipidaemia.

ALD, alcohol-related liver disease; CI, confidence interval; HBV, hepatitis B virus; HCC, hepatocellular carcinoma; HCV, hepatitis C virus; OR, odds ratio; ST, sedentary time

Supplementary Table 18. Sedentary time and the risk of HCC stratified with number of metabolic diseases in participants without HBV/HCV and ALD.

	Patients	OR (95% CI)[a]	Patients	OR (95% CI)[a]
Men		No factor		One factor
Long ST	398	1(reference)	294	1(reference)
Medium ST	160	1.04 (0.80–1.35)	137	0.90 (0.67–1.2)
Short ST	218	0.96 (0.80–1.18)	195	0.86 (0.67–1.1)
		Two factors		Three factors
Long ST	93	1(reference)	23	1 (reference)
Medium ST	50	0.80 (0.37–1.73)	23	-[b]
Short ST	69	1.40 (0.70–2.77)	22	1.3 (0.61–2.77)
		Four factors		
Long ST	2	-[b]		
Medium ST	4	-[b]		
Short ST	3	-[b]		
	Patients	OR (95% CI)	Patients	OR (95% CI)
Women		No factor		One factor
Long ST	106	1(reference)	94	1(reference)
Medium ST	24	**0.4 (0.22–0.73)**	25	0.88 (0.46–1.69)
Short ST	59	0.70 (0.47–1.05)	38	0.99 (0.59–1.66)
		Two factors		Three factors
Long ST	39	1(reference)	9	1(reference)
Medium ST	6	0.67 (0.043–10.4)	5	-[b]
Short ST	12	1.7 (0.41–7.15)	4	-[b]
	Patients	Four factors		
Long ST	3	-[b]		
Medium ST	0	-[b]		
Short ST	0	-[b]		

a) Conditional logistic regression matched for sex, age, admission date, and admitting hospital and additional adjustment for smoking.

b) ORs and 95% CIs could not be calculated because of insufficient number of cases and matched controls.

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ALD, alcohol-related liver disease; CI, confidence interval; HBV, hepatitis B virus; HCC, hepatocellular carcinoma; HCV, hepatitis C virus; OR, odds ratio; ST, sedentary time

Supplementary Table 19. OPA and the risk of HCC in MASLD and MetALD populations[a].

MASLD and MetALD		OR (95% CI)	
	Patients	Model 1	Model 2
Men			
Low OPA	339	1 (reference)	1 (reference)
Medium OPA	390	**0.82 (0.68–0.98)**	**0.80 (0.67–0.96)**
High OPA	186	1.03 (0.82–1.28)	1.02 (0.81–1.28)
Women			
Low OPA	80	1 (reference)	1 (reference)
Medium OPA	127	1.22 (0.87–1.72)	1.14 (0.81–1.62)
High OPA	29	0.91 (0.55–1.5)	0.82 (0.49–1.37)

a) MASLD and MetALD population = population without HBV/HCV, without ALD, and who had hypertension, diabetes, dyslipidaemia, or obesity.

b) Conditional logistic regression matched for sex, age, admission date, and admitting hospital and additional adjustment for smoking.

c) Additional adjustment for smoking in Model 1.

ALD, alcohol-related liver disease; CI, confidence interval; HBV, hepatitis B virus; HCC, hepatocellular carcinoma; HCV, hepatitis C virus; MASLD, metabolic dysfunction-associated steatotic liver disease; MetALD, MASLD with a higher alcohol intake; OPA, occupational physical activity; OR, odds ratio; ST, sedentary time

Supplementary Table 20. Sedentary time and the risk of HCC in MASLD and MetALD populations[a].

MASLD and MetALD		OR (95% CI)	
Men	Patients	Model 1	Model 2
Long ST	412	1 (reference)	1 (reference)
Medium ST	214	0.95 (0.77–1.17)	0.95 (0.76–1.17)
Short ST	289	0.90 (0.75–1.08)	0.91 (0.75–1.09)
Women			
Long ST	144	1 (reference)	1 (reference)
Medium ST	36	0.92 (0.56–1.51)	0.88 (0.54–1.46)
Short ST	55	1.14 (0.78–1.66)	1.05 (0.71–1.53)

a) MASLD and MetALD population = population without HBV/HCV, without ALD, and who had hypertension, diabetes, dyslipidaemia, or obesity.

b) Conditional logistic regression matched for sex, age, admission date, and admitting hospital and additional adjustment for smoking.

c) Additional adjustment for smoking in Model 1.

ALD, alcohol-related liver disease; CI, confidence interval; HBV, hepatitis B virus; HCC, hepatocellular carcinoma; HCV, hepatitis C virus; MASLD, metabolic dysfunction-associated steatotic liver disease; MetALD, MASLD with a higher alcohol intake; OR, odds ratio; ST, sedentary time

Supplementary Table 21. Characteristics in the sensitivity analysis which we changed the controls to patients with liver disease.

	Cases	Controls
Population, no.	3,383	3,383
Male	2,336	2,336
Age,y	68.4±9.9	68.3±9.9
Smoking status		
Never	1,260 (37.2%)	1,399 (41.4%)
Former	1,186 (35.1%)	1,040 (30.7%)
Current	937 (27.7%)	944 (27.9%)
Alcohol use		
ALD (week)	107 (3.2%)	188 (5.6%)
MetALD (week)	647 (19.1%)	765 (22.6%)
under MetALD (week)	2,629 (77.7%)	2,430 (71.8%)
ALD (day)	172 (5.1%)	244 (7.2%)
MetALD(day)	987 (29.2%)	1,040 (30.7%)
under MetALD (day)	2,224 (65.7%)	2,099 (62%)
Diagnose of hypertension, yes	1,330 (39.3%)	1,384 (40.9%)
Diagnose of type 2 diabetes, yes	479 (14.2%)	609 (18%)
Diagnose of dyslipidemia, yes	192 (5.7%)	543 (16.1%)
obesity, yes	327 (9.7%)	369 (10.9%)
Occupational physical activity of longest job		
Low OPA	865 (25.6%)	874 (25.8%)
Middle OPA	1,376 (40.7%)	1,304 (38.5%)
High OPA	566 (16.7%)	550 (16.3%)
uncategorized	576 (17%)	655 (19.4%)
Sedentary time		
Long	770(22.8%)	760(22.5%)
Midium	512(15.1%)	524(15.5%)
Short	1,524(45%)	1,443(42.7%)
uncategorized	577(17.1%)	656(19.4%)
HBV	474 (14%)	67 (2%)
HCV	1,410 (41.7%)	271 (8%)

a) Percentage may not add up to 100 because of rounding.

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ALD, alcohol-related liver disease; HBV, hepatitis B virus; HCV, hepatitis C virus; MASLD, metabolic dysfunction-associated steatotic liver disease; MetALD, MASLD with a higher alcohol intake; OPA, occupational physical activity; ST, sedentary time

Supplementary Table 22. OPA and the risk of HCC in men and women in the sensitivity analysis which we changed the controls with liver disease.

		Odds ratio (95% confidence interval)		
	Patients	Model 1[a]	Model 2[b]	Model 3[c]
All men				
Low OPA	632	1(reference)	1(reference)	1(reference)
Medium OPA	1,031	1.05 (0.91–1.21)	1.05 (0.91–1.22)	0.98 (0.85–1.14)
High OPA	477	1.07 (0.90–1.27)	1.08 (0.91–1.29)	1 (0.83–1.2)
stratified by HBV/HCV infection				
With HBV/HCV infection				
Low OPA	308	1(reference)	1(reference)	1(reference)
Medium OPA	578	0.55 (0.28–1.07)	0.57 (0.29–1.13)	0.53 (0.26–1.08)
High OPA	270	0.54 (0.26–1.12)	0.55 (0.26–1.18)	0.46 (0.21–1.03)
Without HBV/HCV infection				
Low OPA	324	1(reference)	1(reference)	1(reference)
Medium OPA	453	0.86 (0.69–1.07)	0.86 (0.69–1.08)	0.83 (0.66–1.03)
High OPA	207	1.02 (0.78–1.33)	1.03 (0.78–1.36)	0.98 (0.74–1.3)
All women				
Low OPA	233	1(reference)	1(reference)	1(reference)
Medium OPA	345	1.16 (0.90–1.48)	1.11 (0.86–1.42)	1.04 (0.79–1.35)
High OPA	89	0.95 (0.66–1.34)	0.89 (0.63–1.28)	0.77 (0.53–1.13)
stratified by HBV/HCV infection				
With HBV/HCV infection				
Low OPA	128	1(reference)	1(reference)	1(reference)
Medium OPA	187	0.95 (0.41–2.24)	0.92 (0.38–2.25)	0.77 (0.29–2.03)
High OPA	53	2.65 (0.62–11.4)	2.94 (0.61–14.1)	1.54 (0.26–9.22)
Without HBV/HCV infection				
Low OPA	182	1(reference)	1(reference)	1(reference)
Medium OPA	158	1.18 (0.80–1.74)	1.17 (0.79–1.73)	1.06 (0.70–1.6)
High OPA	36	0.77 (0.43–1.37)	0.74 (0.41–1.32)	0.62 (0.34–1.15)

a) Conditional logistic regression matched for sex, age, admission date, and admitting hospital.

b) Additional adjustment for smoking in Model 1.

c) Additional adjustment for diagnosis of hypertension, type 2 diabetes, dyslipidaemia, and obesity in Model 2.

CI, confidence interval; HBV, hepatitis B virus; HCC, hepatocellular carcinoma; HCV, hepatitis C virus; OPA, occupational physical activity; OR, odds ratio

Supplementary Table 23. SED and the risk of HCC in men and women in the sensitivity analysis which we changed the controls with liver disease.

		Odds ratio (95% confidence interval)		
	Patients	Model 1[a]	Model 2[b]	Model 3[c]
All men				
Long ST	1,125	1(reference)	1(reference)	1(reference)
Midium ST	417	1 (0.84–1.2)	0.99 (0.83–1.19)	0.99 (0.82–1.19)
Short ST	597	1.06 (0.92–1.22)	1.06 (0.92–1.22)	0.98 (0.84–1.14)
stratified by HBV/HCV infection				
With HBV/HCV infection				
Long ST	643	1(reference)	1(reference)	1(reference)
Midium ST	210	1.05 (0.50–2.18)	1.05 (0.49–2.25)	1.23 (0.55–2.75)
Short ST	303	0.54 (0.28–1.08)	0.57 (0.28–1.14)	0.60 (0.29–1.24)
Without HBV/HCV infection				
Long ST	482	1(reference)	1(reference)	1(reference)
Midium ST	207	0.98 (0.75–1.28)	0.99 (0.76–1.3)	0.96 (0.73–1.26)
Short ST	294	0.92 (0.74–1.14)	0.93 (0.75–1.16)	0.88 (0.7–1.09)
All women				
Long ST	399	1(reference)	1(reference)	1(reference)
Midium ST	95	0.83 (0.59–1.18)	0.82 (0.58–1.17)	0.82 (0.57–1.2)
Short ST	173	0.99 (0.76–1.3)	0.94 (0.72–1.23)	0.86 (0.65–1.14)
stratified by HBV/HCV infection				
With HBV/HCV infection				
Long ST	221	1(reference)	1(reference)	1(reference)
Midium ST	54	0.62 (0.16–2.34)	0.65 (0.17–2.53)	0.62 (0.14–2.8)
Short ST	93	1.01 (0.38–2.7)	1.02 (0.37–2.83)	0.83 (0.28–2.49)
Without HBV/HCV infection				
Long ST	178	1(reference)	1(reference)	1(reference)
Midium ST	41	0.78 (0.47–1.31)	0.80 (0.48–1.34)	0.83 (0.49–1.42)
Short ST	80	0.93 (0.62–1.41)	0.92 (0.61–1.39)	0.83 (0.54–1.28)

a) Conditional logistic regression matched for sex, age, admission date, and admitting hospital.

b) Additional adjustment for smoking in Model 1.

c) Additional adjustment for diagnosis of hypertension, type 2 diabetes, dyslipidaemia,

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and obesity in Model 2.

CI, confidence interval; HBV, hepatitis B virus; HCV, hepatitis C virus; OR, odds ratio;

ST, sedentary time