The U-shaped association between body mass index and gastric cancer risk in the *Helicobacter pylori* Biomarker Cohort Consortium: a nested case-control study from eight East Asian cohort studies

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SUPPLEMENTARY TABLES

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Supplementary Table 1. Characteristics of non-cardia gastric cancer cases and their matched controls with information on body mass index, the *H. pylori* Biomarker Cohort Consortium (HpBCC)

	Cases (N=1,591)	Controls (N=1,953)	
	Median (IQR)	**Median (IQR)**	**_P_**
Age, years	58.5 (51.4, 64.8)	58.2 (49.9, 65.2)	0.26
BMI, kg/m^2	22.9 (21.1, 25.5)	23.5 (21.5, 25.7)	<0.01
	N (%)	**N (%)**	**_P[1]_**
Gender			
Female	683 (42.9)	971 (49.7)	<0.01
Male	908 (57.1)	982 (50.3)	
Smoking			
Never smoker	850(53.4)	1198(61.3)	<0.01
Former smoker	225(14.1)	264(13.5)	
Current smoker	516(32.4)	490(25.1)	
Missing	0 (0)	1 (0.1)	
Education			
≤Elementary school	606 (38.1)	697 (35.7)	0.09
Junior high school	290 (18.2)	418 (21.4)	
High school	273 (17.2)	347 (17.8)	
≥Professional education	209 (13.1)	285 (14.6)	
Missing	213 (13.4)	206 (10.5)	
History of gastritis			
Yes	948 (59.6)	1230 (63.0)	0.30
No	186 (11.7)	269 (13.8)	
Missing	457 (28.7)	454 (23.2)	
H. pylori infection status			
Negative	125 (7.9)	362 (18.5)	<0.01
Positive	1466 (92.1)	1591 (81.5)	
H. pylori and CagA status			
H. pylori-	125 (7.9)	362 (18.5)	<0.01
H. pylori+ and CagA-	75 (4.7)	117 (6.0)	
H. pylori+ and CagA+	1391 (87.4)	1474 (75.5)	
Omp and HP0305 status			
Omp- and HP0305-	143 (9.0)	452 (23.1)	<0.01
Omp+ or HP0305+	403 (25.3)	564 (28.9)	
Omp+ and HP0305+	1045 (65.7)	937 (48.0)	

Abbreviations: IQR, interquartile range.
1. Chi-square test was done within those non-missing subjects.

Supplementary Table 2. The association of body mass index (BMI) and non-cardia gastric cancer risk, by various BMI categorization schemes, the *H. pylori* Biomarker Cohort Consortium (HpBCC)

BMI (kg/m²)	Cases N (%)	Controls N (%)	OR (95% CI) [1]	OR (95% CI) [2]
< 18.5	60 (3.8)	55 (2.8)	**1.54 (1.04-2.29)**	**1.60 (1.07-2.40)**
18.5-22.9	743 (46.7)	798 (40.9)	**1.33 (1.12-1.59)**	**1.33 (1.11-1.59)**
23.0-24.9	329 (20.7)	489 (25.0)	1.00	1.00
25.0-29.9	405 (25.5)	543 (27.8)	1.19 (0.98-1.44)	1.19 (0.98-1.45)
≥ 30.0	54 (3.4)	68 (3.5)	**1.47 (1.00-2.18)**	1.46 (0.98-2.17)
< 18.5	60 (3.8)	55 (2.8)	**1.54 (1.04-2.29)**	**1.60 (1.07-2.40)**
18.5-20.0	141 (8.9)	140 (7.2)	**1.43 (1.08-1.89)**	**1.40 (1.05-1.85)**
20.0-22.9	602 (37.8)	658 (33.7)	**1.31 (1.09-1.58)**	**1.32 (1.09-1.59)**
23.0-24.9	329 (20.7)	489 (25.0)	1.00	1.00
25.0-27.9	316 (19.9)	436 (22.3)	1.14 (0.93-1.40)	1.14 (0.92-1.40)
28.0-29.9	89 (5.6)	107 (5.5)	**1.39 (1.01-1.92)**	**1.42 (1.02-1.96)**
≥ 30.0	54 (3.4)	68 (3.5)	1.48 (1.00-2.18)	1.46 (0.98-2.18)
Revised Asian cutpoint				
< 18.5	60 (3.8)	55 (2.8)	**1.54 (1.04-2.29)**	**1.60 (1.07-2.40)**
18.5-20.0	141 (8.9)	140 (7.2)	**1.43 (1.08-1.89)**	**1.40 (1.05-1.85)**
20.0-22.9	602 (37.8)	658 (33.7)	**1.31 (1.09-1.58)**	**1.32 (1.09-1.59)**
23.0-24.9	329 (20.7)	489 (25.0)	1.00	1.00
25.0-27.9	316 (19.9)	436 (22.3)	1.14 (0.93-1.40)	1.14 (0.92-1.40)
≥ 28.0	143 (9.0)	175 (9.0)	**1.42 (1.09-1.86)**	**1.43 (1.09-1.88)**
Based on NEJM paper				
< 18.5	60 (3.8)	55 (2.8)	**1.50 (1.01-2.22)**	**1.55 (1.04-2.30)**
18.5-20.0	156 (9.8)	159 (8.1)	**1.35 (1.04-1.75)**	**1.31 (1.01-1.71)**
20.1-22.5	502 (31.6)	532 (27.2)	**1.31 (1.11-1.57)**	**1.29 (1.08-1.55)**
22.6-25.0	422 (26.5)	612 (31.3)	1.00	1.00
25.1-27.5	271 (17.0)	388 (19.9)	1.06 (0.87-1.30)	1.05 (0.85-1.29)
27.6-30.0	128 (8.1)	142 (7.3)	**1.48 (1.12-1.95)**	**1.47 (1.11-1.94)**
>30.0	52 (3.3)	65 (3.3)	**1.45 (0.98-2.15)**	**1.46 (0.98-2.17)**
Modified revised Asian cutpoint				
< 18.5	60 (3.8)	55 (2.8)	**1.54 (1.04-2.29)**	**1.60 (1.07-2.40)**
18.5-22.9	743 (46.7)	798 (40.9)	**1.33 (1.12-1.59)**	**1.33 (1.11-1.59)**
23.0-24.9	329 (20.7)	489 (25.0)	1.00	1.00
25.0-27.9	316 (19.9)	436 (22.3)	1.14 (0.93-1.40)	1.14 (0.92-1.40)
≥ 28.0	143 (9.0)	175 (9.0)	**1.42 (1.09-1.86)**	**1.43 (1.09-1.88)**

1. Conditional logistic regression stratified by cohort

2. Conditional logistic regression stratified by cohort, and adjusted for age, sex, smoking status, and *H. pylori* (dual Omp/HP0305 sero-positivity)

Supplementary Table 3. The association of body mass index (BMI) and non-cardia gastric cancer risk according to the time periods from BMI measurement to GC diagnosis, in the *H. pylori* Biomarker Cohort Consortium (HpBCC)

A. Diagnosed ≥1 year from BMI measurement

BMI (kg/m^2)	Cases N (%)	Controls N (%)	OR (95% CI) [1]	OR (95% CI) [2]	OR (95% CI) [3]	OR (95% CI) [4]	OR (95% CI) [5]
< 18.5	37 (3.8)	30 (2.3)	**1.92 (1.15, 2.21)**	**1.85 (1.11, 3.09)**	**2.13 (1.25, 3.65)**	**1.91 (1.13, 3.24)**	**1.93 (1.14, 3.27)**
18.5-20.0	66 (6.8)	101 (7.7)	1.02 (0.72, 1.45)	1.00 (0.70, 1.42)	1.07 (0.74, 1.54)	1.06 (0.74, 1.52)	1.06 (0.74, 1.52)
20.1-22.5	284 (29.1)	296 (22.4)	**1.54 (1.23, 1.93)**	**1.52 (1.22, 1.91)**	**1.53 (1.21, 1.94)**	**1.57 (1.24, 1.98)**	**1.56 (1.24, 1.97)**
22.6-25.0	269 (27.5)	440 (33.3)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)
25.1-27.5	178 (18.2)	286 (21.6)	1.08 (0.85, 1.38)	1.08 (0.85, 1.38)	1.09 (0.84, 1.40)	1.08 (0.84, 1.39)	1.08 (0.84, 1.39)
>27.5	143 (14.6)	168 (12.7)	**1.67 (1.26, 2.20)**	**1.64 (1.24, 2.17)**	**1.69 (1.27, 2.26)**	**1.63 (1.23, 2.17)**	**1.62 (1.22, 2.15)**

B. Diagnosed ≥2 years from BMI measurement

BMI (kg/m^2)	Cases N (%)	Controls N (%)	OR (95% CI) [1]	OR (95% CI) [2]	OR (95% CI) [3]	OR (95% CI) [4]	OR (95% CI) [5]
< 18.5	35 (3.9)	30 (2.4)	**1.83 (1.09, 3.08)**	**1.77 (1.05, 2.99)**	**2.08 (1.21, 3.60)**	**1.83 (1.07, 3.12)**	**1.85 (1.08, 3.16)**
18.5-20.0	61 (6.8)	93 (7.6)	1.04 (0.72, 1.49)	1.01 (0.70, 1.46)	1.07 (0.73, 1.57)	1.07 (0.74, 1.55)	1.07 (0.73, 1.55)
20.1-22.5	258 (28.8)	279 (22.7)	**1.50 (1.19, 1.90)**	**1.48 (1.17, 1.88)**	**1.50 (1.18, 1.92)**	**1.52 (1.20, 1.94)**	**1.51 (1.19, 1.93)**
22.6-25.0	247 (27.5)	410 (33.4)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)
25.1-27.5	165 (18.4)	261 (21.3)	1.12 (0.87, 1.45)	1.07 (0.76, 1.50)	1.11 (0.85, 1.45)	1.11 (0.86, 1.45)	1.11 (0.86, 1.44)
>27.5	131 (14.6)	155 (12.6)	**1.69 (1.26, 2.26)**	**1.46 (1.10, 1.93)**	**1.72 (1.27, 2.33)**	**1.65 (1.23, 2.22)**	**1.63 (1.22, 2.20)**

C. Diagnosed ≥3 years from BMI measurement

BMI (kg/m^2)	Cases N (%)	Controls N (%)	OR (95% CI) [1]	OR (95% CI) [2]	OR (95% CI) [3]	OR (95% CI) [4]	OR (95% CI) [5]
< 18.5	29 (3.7)	27 (2.5)	1.72 (0.99, 3.01)	1.64 (0.93, 2.87)	**1.86 (1.04, 3.34)**	1.56 (0.89, 2.76)	1.59 (0.90, 2.81)
18.5-20.0	55 (7.0)	82 (7.5)	1.07 (0.73, 1.58)	1.04 (0.71, 1.54)	1.07 (0.71, 1.59)	1.07 (0.72, 1.60)	1.07 (0.72, 1.59)
20.1-22.5	225 (28.7)	237 (21.8)	**1.57 (1.22, 2.03)**	**1.56 (1.21, 2.01)**	**1.57 (1.21, 2.04)**	**1.60 (1.24, 2.08)**	**1.59 (1.23, 2.06)**
22.6-25.0	215 (27.4)	361 (33.2)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)
25.1-27.5	143 (18.3)	234 (21.5)	1.11 (0.85, 1.46)	1.11 (0.84, 1.46)	1.08 (0.81, 1.43)	1.08 (0.82, 1.42)	1.07 (0.81, 1.42)
>27.5	117 (14.9)	147 (13.5)	**1.62 (1.19, 2.20)**	**1.60 (1.17, 2.17)**	**1.63 (1.19, 2.24)**	**1.57 (1.15, 2.14)**	**1.56 (1.14, 2.13)**

D. Diagnosed ≥5 years from BMI measurement

BMI (kg/m^2)	Cases N (%)	Controls N (%)	OR (95% CI) [1]	OR (95% CI) [2]	OR (95% CI) [3]	OR (95% CI) [4]	OR (95% CI) [5]
< 18.5	19 (3.2)	23 (2.7)	1.37 (0.72, 2.63)	1.27 (0.66, 2.45)	1.47 (0.75, 2.89)	1.22 (0.63, 2.37)	1.23 (0.63, 2.38)

18.5-20.0	43 (7.3)	64 (7.5)	1.13 (0.73, 1.75)	1.09 (0.70, 1.70)	1.12 (0.71, 1.77)	1.13 (0.72, 1.77)	1.14 (0.73, 1.78)
20.1-22.5	174 (29.5)	183 (21.5)	**1.65 (1.23, 2.21)**	**1.62 (1.21, 2.17)**	**1.66 (1.23, 2.24)**	**1.68 (1.25, 2.26)**	**1.67 (1.24, 2.25)**
22.6-25.0	153 (26.0)	272 (32.0)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)
25.1-27.5	113 (19.2)	192 (22.6)	1.13 (0.83, 1.54)	1.12 (0.82, 1.53)	1.11 (0.81, 1.54)	1.10 (0.80, 1.51)	1.11 (0.81, 1.52)
>27.5	87 (14.8)	116 (13.7)	**1.58 (1.12, 2.25)**	**1.54 (1.08, 2.19)**	**1.59 (1.10, 2.28)**	**1.54 (1.08, 2.20)**	**1.53 (1.07, 2.19)**

1. Conditional logistic regression stratified by cohort

2. Conditional logistic regression stratified by cohort, and additionally adjusted for age, sex, smoking status

3. Conditional logistic regression stratified by cohort, and additionally adjusted for age, sex, smoking status, and dual Omp/HP0305 sero-positivity

4. Conditional logistic regression stratified by cohort, and additionally adjusted for age, sex, smoking status, and *H. pylori* infection (+ *vs.* -)

5. Conditional logistic regression stratified by cohort, and additionally adjusted for age, sex, smoking status, and *H. pylori* and CagA status (HP-, HP+CagA-, and HP+CagA+)

Supplementary Table 4. The association of body mass index and non-cardia gastric cancer risk by smoking status, the *H. pylori* Biomarker Cohort Consortium (HpBCC)

BMI (kg/m^2)	Never smokers		Ever smokers		Never smokers		Former smokers		Current smokers	
	Ca/Co[1]	OR (95% CI)[2]	Ca/Co[1]	OR (95% CI)[2]	Ca/Co[1]	OR (95% CI)[2]	Ca/Co[1]	OR (95% CI)[2]	Ca/Co[1]	OR (95% CI)[2]
< 18.5	29/26	**1.80 (1.02, 3.17)**	30/25	1.32 (0.74, 2.35)	29/26	**1.80 (1.02, 3.17)**	7/6	1.83 (0.56, 6.02)	23/19	1.16 (0.59, 2.27)
18.5-20.0	74/91	1.37 (0.95, 1.97)	71/62	1.24 (0.82, 1.86)	74/91	1.37 (0.95, 1.97)	7/14	0.72 (0.27, 1.91)	64/48	1.30 (0.81, 2.07)
20.1-22.5	255/280	**1.59 (1.24, 2.05)**	222/216	1.16 (0.87, 1.54)	255/280	**1.59 (1.24, 2.05)**	37/53	0.94 (0.54, 1.62)	185/163	1.19 (0.84, 1.67)
22.6-25.0	187/358	1.00 (reference)	181/199	1.00 (reference)	187/358	1.00 (reference)	63/79	1.00 (reference)	118/120	1.00 (reference)
25.1-27.5	130/218	1.18 (0.89, 1.57)	85/122	0.80 (0.57, 1.14)	130/218	1.18 (0.89, 1.57)	39/47	1.10 (0.64, 1.90)	46/75	0.64 (0.41, 1.01)
>27.5	104/146	**1.50 (1.10, 2.06)**	62/49	**1.56 (1.01, 2.44)**	104/146	**1.50 (1.10, 2.06)**	27/16	**2.51 (1.20, 5.23)**	35/33	1.19 (0.68, 2.10)

1. N of cases / N of controls
2. Conditional logistic regression stratified by cohort and adjusted for age and sex

Supplementary Table 5. The association of body mass index and non-cardia gastric cancer risk among those without missing education or dietary variables, respectively, the *H. pylori* Biomarker Cohort Consortium (HpBCC)

A. Among those without missing value in education (without KNCC)

BMI (kg/m^2)	Cases N (%)	Controls N (%)	OR (95% CI) [1]	OR (95% CI) [2]	OR (95% CI) [3]	OR (95% CI) [4]
< 18.5	45 (3.7)	45 (2.9)	1.49 (0.95, 2.32)	1.42 (0.91, 2.21)	1.55 (0.98, 2.46)	1.54 (0.97, 2.45)
18.5-20.0	124 (10.1)	133 (8.4)	**1.38 (1.03, 1.85)**	**1.33 (1.00, 1.79)**	1.32 (0.98, 1.79)	1.33 (0.98, 1.79)
20.1-22.5	411 (33.5)	433 (27.3)	**1.42 (1.16, 1.74)**	**1.40 (1.14, 1.72)**	**1.39 (1.13, 1.71)**	**1.39 (1.13, 1.72)**
22.6-25.0	305 (24.9)	489 (30.8)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)
25.1-27.5	188 (15.3)	308 (19.4)	1.04 (0.82, 1.31)	1.01 (0.80, 1.28)	1.00 (0.79, 1.28)	1.01 (0.79, 1.28)
>27.5	153 (12.5)	178 (11.2)	**1.63 (1.25, 2.13)**	**1.57 (1.20, 2.05)**	**1.62 (1.23, 2.13)**	**1.62 (1.23, 2.13)**

B. Among those without missing value in total energy intake and fruit intake (without KNCC)

BMI (kg/m^2)	Cases N (%)	Controls N (%)	OR (95% CI) [1]	OR (95% CI) [5]	OR (95% CI) [6]	OR (95% CI) [7]
< 18.5	35 (4.1)	23 (1.9)	**2.21 (1.18, 4.17)**	**2.15 (1.14, 4.06)**	**2.10 (1.09, 4.05)**	**2.10 (1.09, 4.07)**
18.5-20.0	57 (6.8)	84 (7.0)	1.38 (0.94, 2.02)	1.37 (0.93, 2.02)	1.27 (0.85, 1.90)	1.27 (0.85, 1.89)
20.1-22.5	240 (28.4)	260 (21.8)	0.88 (0.60, 1.28)	0.88 (0.60, 1.29)	0.86 (0.58, 1.28)	0.85 (0.57, 1.27)
22.6-25.0	228 (27.0)	399 (33.4)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)
25.1-27.5	155 (18.3)	264 (22.1)	0.95 (0.64, 1.42)	0.96 (0.64, 1.43)	0.90 (0.59, 1.36)	0.89 (0.59, 1.35)
>27.5	130 (15.4)	165 (13.8)	1.42 (0.94, 2.16)	1.40 (0.92, 2.14)	1.35 (0.87, 2.09)	1.34 (0.87, 2.08)

1. Conditional logistic regression stratified by cohort (within those without missing values of smoking).
2. Conditional logistic regression stratified by cohort, and additionally adjusted for age, sex, smoking status (within those without missing values of smoking).
3. Conditional logistic regression stratified by cohort, and additionally adjusted for age, sex, smoking status, and dual Omp/HP0305 sero-positivity (within those without missing values of smoking).
4. Conditional logistic regression stratified by cohort, and additionally adjusted for age, sex, smoking status, **education,** and dual Omp/HP0305 sero-positivity (within those without missing values of smoking).
5. Conditional logistic regression stratified by cohort, and additionally adjusted for age, sex, smoking status, and **total energy intake** (within those without missing values of smoking).
6. Conditional logistic regression stratified by cohort, and additionally adjusted for age, sex, smoking status, **total energy intake,** and dual Omp/HP0305 sero-positivity (within those without missing values of smoking).
7. Conditional logistic regression stratified by cohort, and additionally adjusted for age, sex, smoking status, **total energy intake**, fruit intake, and dual Omp/HP0305 sero-positivity (within those without missing values of smoking).