

Supplementary material

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Table S1 Comparison of baseline characteristics between the COPD group (defined by clinical history and lung function) and the healthy control group

Variables	COPD (n=296)	Controls (n=542)	p-value
weight samples	3735153	8643007	
Age (years)	59.85 (10.64)	57.40 (10.92)	0.287
Female	102(34.46%)	218 (40.22%)	0.20
BMI (kg/m ²)	27.48 (5.70)	29.18 (6.10)	0.036
Waistline (cm)	102.01 (16.84)	103.89 (16.12)	0.092
Race			0.156
White	19(6.42%)	27 (4.98%)	
African American	22(7.43%)	35 (6.46%)	
Mexican American	207(69.93%)	414 (76.40%)	
Hispanic (other)	39(13.18%)	57 (10.50%)	
Other	9(3.04%)	9 (1.66%)	
Education beyond high school	197(66.55%)	372 (68.6%)	0.615
Material status			0.405
Married/living with partner	115 (38.85%)	185 (34.13%)	
Other conditions	181 (61.15%)	357 (65.87%)	
Covered by health insurance	237(80.07%)	459 (84.69%)	0.135
Former smoker	259(87.50%)	312 (57.56%)	0.003
Current smoker	179(60.47%)	114 (21.03%)	0.001
Hypertension	155(52.36%)	262 (48.34%)	0.565
Diabetes mellitus	58 (19.59%)	80 (14.76%)	0.474
Hemoglobin (g/dL)	14.95 (1.47)	14.65 (1.37)	0.069
MCV (fl)	92.32 (5.15)	90.43 (4.86)	0.058
SII	636.17 (319.01)	587.18 (346.46)	0.034
ALT (U/L)	24.65 (16.47)	26.70 (16.40)	0.078
Albumin (g/L)	42.30 (2.68)	42.49 (2.74)	0.236
TC (mmol/l)	5.27 (1.19)	5.30 (1.08)	0.398
eGFR (ml/min)	82.38 (17.91)	84.76 (17.21)	0.308
UA (umol/l)	344.30 (80.10)	342.49 (85.62)	0.789
HbA1c	5.87 (0.75)	5.79 (0.84)	0.395
GNRI	104.38 (4.37)	104.80 (4.29)	0.21

Note: MCV, mean corpuscular volume; SII, systemic immune-inflammation index; ALT, alanine transaminase; TC, total cholesterol; eGFR, estimated glomerular filtration rate; GNRI, Geriatric nutritional risk index. Data were presented as mean (SD) or frequency (%). All statistics are weighted to account for NHANES complex survey design.

Table S2 Supplement analyses of the association between nutritional status and COPD defined by clinical history and lung function

Variables	Diagnose of COPD		Severe COPD	
	OR (95%CI)	p	OR (95%CI)	p
Continuous index				
BMI	0.936 (0.915, 0.959)	0.032 ^a	1.024 (0.909, 1.155)	0.732 ^b
Albumin	1.005 (0.998, 1.011)	0.309	0.981 (0.906, 1.062)	0.68
Hb	1.175 (1.111, 1.243)	0.030	1.345 (1.139, 1.590)	0.073
GNRI	0.992 (0.984, 1.001)	0.212	0.995 (0.975, 1.014)	0.638
Category index				
Normal weight	Reference		Reference	
Overweight	0.581 (0.532, 0.634)	0.007 ^a	0.513 (0.084, 3.128)	0.545 ^b
Obesity	0.346 (0.273, 0.438)	0.013 ^a	0.865 (0.173, 4.327)	0.876 ^b
Normal HGB				
Anaemia	0.939 (0.621, 1.419)	0.793	0.503 (0.197, 1.284)	0.287
Normal GNRI				
Malnutrition	1.219 (0.488, 3.047)	0.713	0.798 (0.200, 3.193)	0.78

Note: OR, odds ratio; CI, confidence interval; BMI, body mass index; Hb, hemoglobin; GNRI, geriatric nutritional risk index. All models were adjusted for age, sex, race, education levels, hypertension, diabetes mellitus, and smoke status. After adjusting for waist circumference, p^a was represented as p<0.05, while p^b was represented as p>0.05.

Table S3 Supplement analyses of the association between nutritional status and mortality in clinical history and lung function defined COPD

Variables	All-cause mortality		Lower respiratory mortality	
	HR (95%CI)	p	HR (95%CI)	p
Continuous index				
BMI	1.002(0.959, 1.048)	0.916 ^b	0.894 (0.794, 1.007)	0.065 ^b
Albumin	0.949 (0.876, 1.029)	0.203	0.968 (0.815, 1.150)	0.712
Hb	0.897 (0.765, 1.051)	0.179	1.596 (1.102, 2.313)	0.013
GNRI	0.943 (0.899, 0.989)	0.017	0.861 (0.784, 0.946)	0.002
Category index				
Normal weight	Reference		Reference	
Overweight	0.581 (0.331, 1.019)	0.058 ^b	0.299 (0.087, 1.028)	0.055
Obesity	1.031 (0.584, 1.820)	0.916 ^b	0.776 (0.239, 2.521)	0.673 ^a
Normal Hb	Reference		Reference	
Anaemia	2.557 (1.230, 5.317)	0.012	NA	NA
Normal GNRI	Reference		Reference	
Malnutrition	2.319 (1.369, 3.928)	0.002	3.951 (1.445, 10.805)	0.007

Note: HR, hazard ratio; CI, confidence interval; BMI, body mass index; Hb, hemoglobin; GNRI, geriatric nutritional risk index. In COPD participants with anaemia, there were no cases of death due to lower respiratory tract diseases. Consequently, the HR and 95%CI were reported as NA (not available). After adjusting for waist circumference, p^a was represented as p<0.05, while p^b was represented as p>0.05.

Table S4 Association between nutritional status and pulmonary function in lung function defined COPD

Variables	FEV1		FVC		FEV1/FVC %	
	β (SE)	p	β (SE)	p	β (SE)	p
Continuous index						
BMI	-10.39 (9.18)	0.375 ^b	-19.03 (9.30)	0.177 ^b	0.06 (0.11)	0.61 ^a
Albumin	17.51 (4.29)	0.055	24.35 (8.00)	0.093	0.07 (0.02)	0.117
Hb	-28.27 (20.75)	0.306	20.56 (41.15)	0.667	0.40 (0.17)	0.145
GNRI	14.35 (1.89)	0.017	18.50 (0.93)	0.002	0.11 (0.06)	0.224
Category index						
Normal weight	Reference		Reference		Reference	
Overweight	65.97 (56.12)	0.361 ^a	49.53 (72.95)	0.567 ^b	0.90 (0.51)	0.215 ^a
Obesity	-92.61 (79.60)	0.365 ^a	-185.22 (65.77)	0.106 ^a	0.85 (1.10)	0.52 ^a
Normal HGB	Reference		Reference		Reference	
Anaemia	-30.74 (95.52)	0.778	-124.17 (141.07)	0.472	0.90 (0.26)	0.077
Normal GNRI	Reference		Reference		Reference	
Malnutrition	-218.57 (8.90)	0.002	-313.78 (25.88)	0.007	-0.13 (0.41)	0.11

Note: FEV1, forced expiratory volume in one second; FVC, forced vital capacity; SE, standard error; BMI, body mass index; Hb, hemoglobin; GNRI, geriatric nutritional risk index. All models were adjusted for age, sex, race, education levels, hypertension, diabetes mellitus, and smoke status. After adjusting for waist circumference, p^a was represented as p<0.05, while p^b was represented as p>0.05.

Table S5 Association between nutritional status and pulmonary function in clinical history and lung function defined COPD

Variables	FEV1		FVC		FEV1/FVC %	
	β (SE)	p	β (SE)	p	β (SE)	p
Continuous index						
BMI	-26.26 (17.57)	0.274 ^b	-43.89 (23.47)	0.202 ^b	0.03 (0.11)	0.834 ^b
Albumin	8.27 (12.45)	0.575	12.36 (12.84)	0.437	0.03 (0.07)	0.738
Hb	-89.09 (25.85)	0.075	-98.52 (15.14)	0.023	-0.96 (0.50)	0.195
GNRI	6.76 (5.63)	0.353	11.62 (6.71)	0.225	0.02 (0.004)	0.024
Category index						
Normal weight	Reference		Reference		Reference	
Overweight	52.53 (173.65)	0.791 ^b	51.89 (250.31)	0.855 ^b	0.01 (0.002)	0.028 ^a
Obesity	-235.91 (22.95)	0.397 ^b	-416.43 (290.73)	0.288 ^b	1.00 (1.16)	0.480 ^b
Normal HGB	Reference		Reference		Reference	
Anaemia	85.54 (126.02)	0.567	-28.74 (163.43)	0.877	3.54 (0.72)	0.039
Normal GNRI	Reference		Reference		Reference	
Malnutrition	-222.30 (38.06)	0.028	-365.73 (88.77)	0.054	-0.65 (0.82)	0.513

Note: FEV1, forced expiratory volume in one second; FVC, forced vital capacity; SE, standard error; BMI, body mass index; Hb, hemoglobin; GNRI, geriatric nutritional risk index. All models were adjusted for age, sex, race, education levels, hypertension, diabetes mellitus, and smoke status. After adjusting for waist circumference, p^a was represented as p<0.05, while p^b was represented as p>0.05.

Table S6 Supplement analyses of the relationship between BMI and COPD excluding underweight participants

Variables	Diagnose of COPD		Severe COPD	
	OR (95%CI)	p	OR (95%CI)	p
Continuous index				
BMI	0.932 (0.930, 0.934)	<0.001	1.032 (1.004, 1.062)	0.155
BMI ^a	0.874 (0.837, 0.912)	0.025	0.862 (0.753, 0.988)	0.166
BMI categories				
Normal weight	Reference		Reference	
Overweight	0.677 (0.627, 0.732)	0.010	0.671 (0.267, 1.686)	0.485
Obesity	0.393 (0.379, 0.407)	<0.001	1.430 (1.019, 2.006)	0.174
Normal weight	Reference		Reference	
Overweight ^a	0.622 (0.499, 0.777)	0.052	0.370 (0.242, 0.565)	0.044
Obesity ^a	0.322 (0.211, 0.491)	0.034	0.362 (0.163, 0.801)	0.129

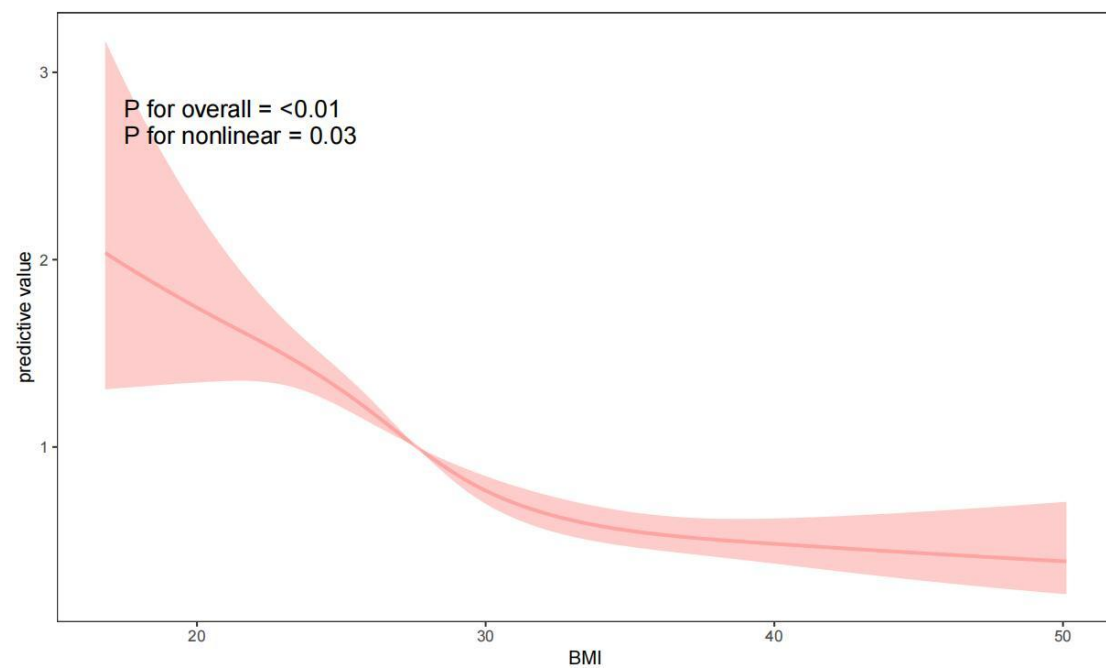
Note: OR, odds ratio; CI, confidence interval; BMI, body mass index..

Table S7 Supplement analyses of the relationship between BMI and COPD

Variables	Diagnose of COPD		Severe COPD	
	OR (95%CI)	p	OR (95%CI)	p
Quartile				
Q1	Reference		Reference	
Q2	0.692 (0.577, 0.829)	0.057	0.806 (0.695, 0.934)	0.103
Q3	0.472 (0.445, 0.500)	0.002	0.771 (0.246, 2.412)	0.698
Q4	0.349 (0.322, 0.378)	0.002	1.294 (1.145, 1.464)	0.054
BMI categories				
Underweight	Reference		Reference	
Normal weight	0.428 (0.218, 0.842)	0.133	0.241 (0.07, 0.832)	0.153
Overweight	0.290 (0.155, 0.541)	0.06	0.161 (0.019, 1.357)	0.235
Obesity	0.168 (0.089, 0.318)	0.032	0.338 (0.070, 1.634)	0.31

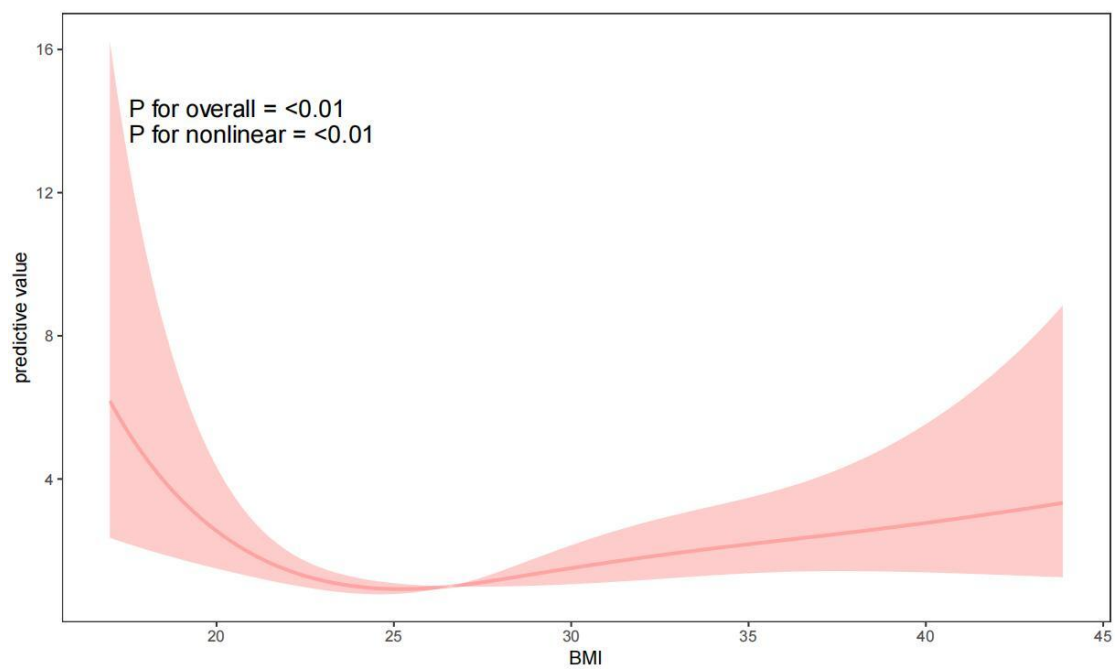
Note: OR, odds ratio; CI, confidence interval; BMI, body mass index..

Figure S1 The nonlinear association between body mass index and the presence of chronic obstructive pulmonary disease



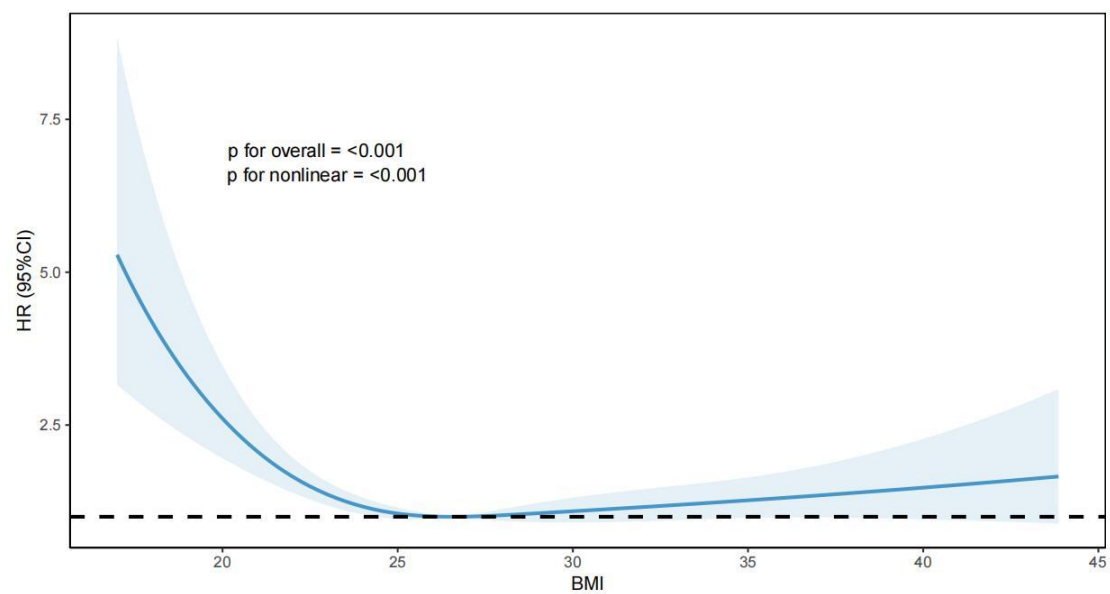
Note: BMI, body mass index.

Figure S2 The nonlinear association between body mass index and the risk of more severe chronic obstructive pulmonary disease



Note: BMI, body mass index.

Figure S3 The nonlinear association between body mass index and mortality risk in chronic obstructive pulmonary disease participants



Note: BMI, body mass index.