Supplementary Information

Figure S1 Differences in all-cause death, cardiovascular death and MACCEs across BMI groups
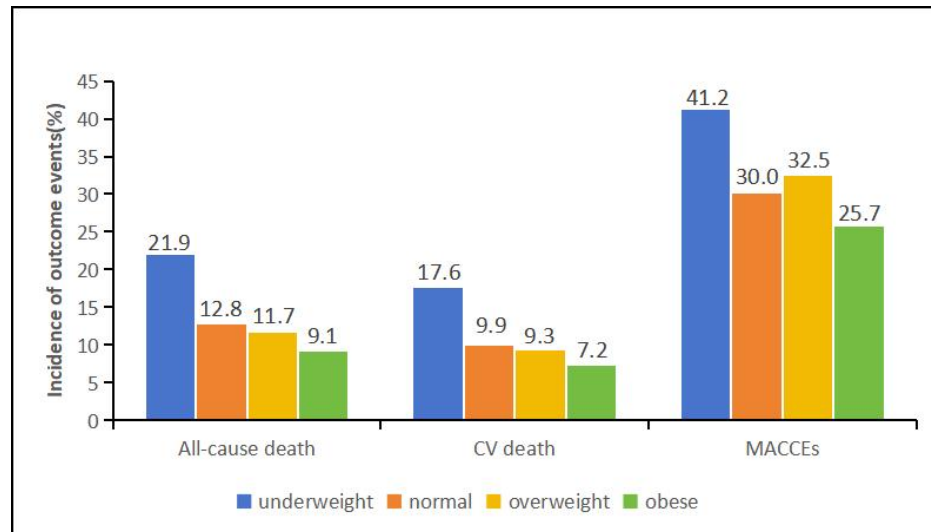

Table S1 Results of taking the optimal cutoff value according to the Akaike information criterion

BMI take	Model 1(≤BMI take)	Model 2(>BMI take)	Model 1+Model 2
23.5	2691.698	3759.732	6451.430
24.0	2949.311	3489.725	6439.036
24.5	3449.670	2992.221	6441.891
25.0	3894.371	2562.900	6457.271
25.5	4359.095	2134.861	6493.956

Based on the Akaike information criterion, combined with the RCS curve, BMI was taken to be 23.5, 24, 24.5, 25, and 25.5, respectively, and these values divided the Cox regression model into two (≤BMI take and >BMI take). The sum of the -2 log-likelihoods of model 1 + model 2 was calculated based on the -2 log-likelihoods of the two models, respectively, with the BMI take at the lowest time being the best cutoff value.

Table S2 Results of Subgroup Cox Regression Analysis According to Median BNP and Glucose

Outcomes	Group	BNP≤347 pg/mg (n=832)		BNP > 347 pg/mg (n=831)		Glu≤4.95 mmol/L (n=847)		Glu > 4.95 mmol/L (n=816)	
		HR(95%CI)	p Value	HR(95%CI)	p Value	HR(95%CI)	p Value	HR(95%CI)	p Value
All-cause death	underweight	Reference		Reference		Reference		Reference	
	Nomal	0.54 (0.34,0.85)	0.007	0.57 (0.34,0.97)	0.039	0.73 (0.45,1.17)	0.194	0.37 (0.22,0.62)	<0.001
	Overweight	0.50 (0.31,0.80)	0.004	0.52 (0.30,0.89)	0.018	0.50 (0.30,0.84)	0.009	0.46 (0.28,0.76)	0.002
	obese	0.44 (0.25,0.78)	0.005	0.52 (0.29,0.93)	0.027	0.54 (0.31,0.93)	0.027	0.34 (0.19,0.62)	<0.001
CV death	underweight	Reference		Reference		Reference		Reference	
	Nomal	0.58 (0.35,0.96)	0.033	0.49 (0.27,0.90)	0.022	0.75 (0.44,1.29)	0.301	0.35 (0.20,0.61)	<0.001
	Overweight	0.48 (0.28,0.83)	0.009	0.55 (0.30,0.99)	0.048	0.60 (0.34,1.06)	0.076	0.40 (0.23,0.71)	0.002
	obese	0.49 (0.26,0.91)	0.024	0.47 (0.24,0.91)	0.026	0.56 (0.30,1.05)	0.070	0.34 (0.18,0.65)	0.001
MACCEs	underweight	Reference		Reference		Reference		Reference	
	Nomal	0.68 (0.49,0.94)	0.019	0.72 (0.51,1.01)	0.055	0.73 (0.53,1.01)	0.061	0.62 (0.44,0.86)	0.005
	Overweight	0.82 (0.60,1.11)	0.200	0.68 (0.48,0.96)	0.029	0.73 (0.53,1.01)	0.060	0.72 (0.52,1.00)	0.052
	obese	0.68 (0.48,0.98)	0.038	0.71 (0.49,1.02)	0.065	0.64 (0.45,0.91)	0.013	0.67 (0.47,0.97)	0.032

Adjusted for age, sex, hypertension, diabetes, LVEF, CRP and eGFR

Table S3 Results of Subgroup Cox Regression Analyses Based on Median ALT and AST

Outcomes	Group	ALT≤20.1 U/L (n=843)		ALT > 20.1 U/L (n=820)		AST≤21.3 U/L (n=845)		AST > 21.3 U/L (n=818)	
		HR(95%CI)	p Value	HR(95%CI)	p Value	HR(95%CI)	p Value	HR(95%CI)	p Value
All-cause death	underweight	Reference		Reference		Reference		Reference	
	Nomal	0.42 (0.26,0.69)	<0.001	0.70 (0.43,1.15)	0.163	0.46 (0.28,0.75)	0.002	0.67 (0.41,1.09)	0.109
	Overweight	0.50 (0.31,0.81)	0.005	0.52 (0.30,0.88)	0.016	0.45 (0.27,0.72)	0.001	0.59 (0.35,1.00)	0.052
	obese	0.36 (0.21,0.64)	<0.001	0.63 (0.36,1.11)	0.109	0.42 (0.24,0.74)	0.003	0.53 (0.30,0.94)	0.029
CV death	underweight	Reference		Reference		Reference		Reference	
	Nomal	0.53 (0.31,0.91)	0.021	0.72 (0.45,1.16)	0.178	0.48 (0.28,0.83)	0.009	0.59 (0.34,1.04)	0.069
	Overweight	0.48 (0.35,1.03)	0.063	0.52 (0.31,0.87)	0.013	0.41 (0.23,0.72)	0.002	0.64 (0.36,1.13)	0.122
	obese	0.35 (0.18,0.69)	0.002	0.51 (0.30,0.86)	0.011	0.41 (0.22,0.77)	0.006	0.53 (0.28,1.01)	0.053
MACCEs	underweight	Reference		Reference		Reference		Reference	
	Nomal	0.56 (0.40,0.79)	<0.001	0.85 (0.61,1.17)	0.322	0.67 (0.48,0.93)	0.017	0.72 (0.52,1.01)	0.056
	Overweight	0.79 (0.58,1.09)	0.148	0.71 (0.50,0.99)	0.047	0.74 (0.54,1.02)	0.064	0.76 (0.54,1.07)	0.112
	obese	0.53 (0.37,0.78)	<0.001	0.89 (0.63,1.27)	0.527	0.69 (0.48,0.99)	0.041	0.68 (0.47,0.98)	0.040

Adjusted for age, sex, hypertension, diabetes, LVEF, CRP and eGFR

Table S4 Results of Subgroup Cox Regression Analyses According to Comorbid Hyperlipidemia and Statin Use

Outcomes	Group	Hyperlipidemia (n=244)		NO Hyperlipidemia (n=1419)		Statins (n=1005)		NO Statins (n=658)	
		HR(95%CI)	p Value	HR(95%CI)	p Value	HR(95%CI)	p Value	HR(95%CI)	p Value
All-cause death	underweight	Reference		Reference		Reference		Reference	
	Nomal	2.49 (0.50,12.33)	0.264	0.49 (0.34,0.70)	<0.001	0.51 (0.32,0.82)	0.005	0.58 (0.35,0.97)	0.037
	Overweight	1.69 (0.32,8.94)	0.534	0.49 (0.34,0.71)	<0.001	0.47 (0.30,0.76)	0.002	0.60 (0.34,1.06)	0.077
	obese	1.52 (0.28,8.24)	0.628	0.44 (0.29,0.67)	<0.001	0.50 (0.30,0.85)	0.010	0.39 (0.21,0.74)	0.004
CV death	underweight	Reference		Reference		Reference		Reference	
	Nomal	4.04 (0.47,34.48)	0.202	0.46 (0.31,0.70)	<0.001	0.49 (0.28,0.84)	0.009	0.58 (0.33,1.01)	0.053
	Overweight	2.54 (0.28,23.03)	0.407	0.49 (0.32,0.75)	<0.001	0.49 (0.29,0.84)	0.010	0.59 (0.32,1.09)	0.092
	obese	2.27 (0.25,20.74)	0.467	0.43 (0.27,0.70)	<0.001	0.56 (0.31,1.01)	0.054	0.36 (0.18,0.72)	0.004
MACCEs	underweight	Reference		Reference		Reference		Reference	
	Nomal	0.80 (0.30,2.10)	0.650	0.50 (0.35,0.71)	<0.001	0.64 (0.47,0.88)	0.006	0.79 (0.55,1.12)	0.183
	Overweight	1.11 (0.49,2.51)	0.809	0.50 (0.35,0.71)	<0.001	0.80 (0.60,1.07)	0.135	0.67 (0.44,1.00)	0.051
	obese	1.36 (0.60,3.08)	0.457	0.38 (0.26,0.57)	<0.001	0.70 (0.50,0.98)	0.037	0.64 (0.43,0.96)	0.031

Adjusted for age, sex, hypertension, diabetes, LVEF, CRP and eGFR

Table S5 Results of Cox Regression Analyses after adjusting for other confounders

Outcomes	Group	Events(n,%)	Model 1[a] HR(95%CI)	p Value	Model 2[b] HR(95%CI)	p Value	Model 3[c] HR(95%CI)	p Value
All-cause death	underweight	91(21.9)	Reference		Reference		Reference	
	Nomal	53(12.8)	0.57 (0.40, 0.80)	0.001	0.56 (0.39,0.79)	0.001	0.57 (0.40,0.82)	0.003
	Overweight	49(11.7)	0.54 (0.38,0.78)	<0.001	0.51 (0.36,0.74)	<0.001	0.61 (0.42,0.90)	0.011
	obese	38(9.1)	0.47 (0.31,0.70)	<0.001	0.42 (0.28,0.63)	<0.001	0.45 (0.30,0.68)	<0.001
CV death	underweight	73(17.6)	Reference		Reference		Reference	
	Nomal	41(9.9)	0.55 (0.37,0.81)	0.003	0.54 (0.36,0.81)	0.003	0.58 (0.38,0.88)	0.010
	Overweight	39(9.3)	0.55 (0.37,0.83)	0.004	0.54 (0.36,0.81)	0.003	0.67 (0.44,1.03)	0.065
	obese	30(7.2)	0.46 (0.29,0.73)	<0.001	0.41 (0.26,0.65)	<0.001	0.46 (0.29,0.73)	<0.001
MACCEs	underweight	171(41.2)	Reference		Reference		Reference	
	Nomal	124(30.0)	0.71 (0.56,0.90)	0.005	0.70 (0.55,0.88)	0.003	0.70 (0.55,0.89)	0.004
	Overweight	136(32.5)	0.78 (0.62,0.99)	0.041	0.76 (0.60,0.96)	0.023	0.81 (0.64,1.04)	0.094
	obese	107(25.7)	0.69 (0.53,0.89)	0.005	0.64 (0.49,0.83)	<0.001	0.65 (0.50,0.85)	0.002

Model 1: Adjusted for age, sex, hypertension, diabetes, LVEF, CRP, eGFR, HR, DBP and NYHA Class
Model 2: Adjusted Model 1 +LAD、LDH、TP、ALB/GLB、UA、Cr、Ca、Cl、GRA、RBC、HGB、PLT and HbA1c
Model 3: Adjusted Model 2 +AF、ACEI/ARB/ARIN、SGLT2i、Beta-blocker、MRA、Diuretic and Digoxin

Table S6 Results of mediation effects analysis of TG in different heart failure patients groups

Group	Events(n,%)	All-cause death Percentage of mediation effect	P value	CV death Percentage of mediation effect	P value	MACCEs Percentage of mediation effect	P value
HFrEF+HFmrEF[a]	1211 (72.8)	10.5 (3.3,28.7)	0.0197**	12.8 (4.2,33.0)	0.0128**	13.3 (4.0,36.0)	0.0154**
HFpEF[a]	452 (27.2)	2.6 (0.0,82.9)	0.3483	–	–	6.5 (0.3,63.4)	0.2577
No MI[b]	1442 (86.7)	3.8 (1.0,13.8)	0.0666*	4.4 (1.2,14.7)	0.0575*	5.7 (1.4,20.4)	0.0601*
With MI[b]	221 (13.3)	68.3 (0.1,100.0)	0.0567	–	–	–	–

* p＜0.1, ** p＜0.05
a: adjusted for age, sex, hypertension, DM , eGFR, CRP
b: adjusted for age, sex, LVEF, hypertension, DM , eGFR, CRP

Table S7 Results of Subgroup Cox Regression Analyses Between HFrEF+HFmrEF and HFpEF

Outcomes	Group	HFrEF+HFmrEF (n=1211)		HFpEF (n=452)	
		HR(95%CI)	p Value	HR(95%CI)	p Value
All-cause death	Underweight	Reference		Reference	
	Normal	0.62 (0.42, 0.92)	0.017*	0.55 (0.27, 1.12)	0.001*
	Overweight	0.48 (0.32, 0.73)	<0.001**	0.64 (0.32, 1.28)	<0.001**
	Obese	0.58 (0.38, 0.91)	0.016*	0.32 (0.12, 0.82)	<0.001**
CV death	Underweight	Reference		Reference	
	Normal	0.60 (0.39, 0.93)	0.021*	0.53 (0.22, 1.25)	0.146
	Overweight	0.49 (0.31, 0.77)	0.002*	0.65 (0.28, 1.48)	0.306
	Obese	0.57 (0.35, 0.93)	0.025*	0.29 (0.09, 0.91)	0.035*
MACCEs	Underweight	Reference		Reference	
	Normal	0.75 (0.57, 0.97)	0.030*	0.64 (0.39, 1.05)	0.075
	Overweight	0.69 (0.53, 0.91)	0.008*	0.99 (0.63, 1.55)	0.965
	Obese	0.69 (0.52, 0.93)	0.015*	0.77 (0.47, 1.28)	0.316

* $p < 0.05$

** $p < 0.001$

Adjusted for age, sex, hypertension, diabetes, CRP and eGFR