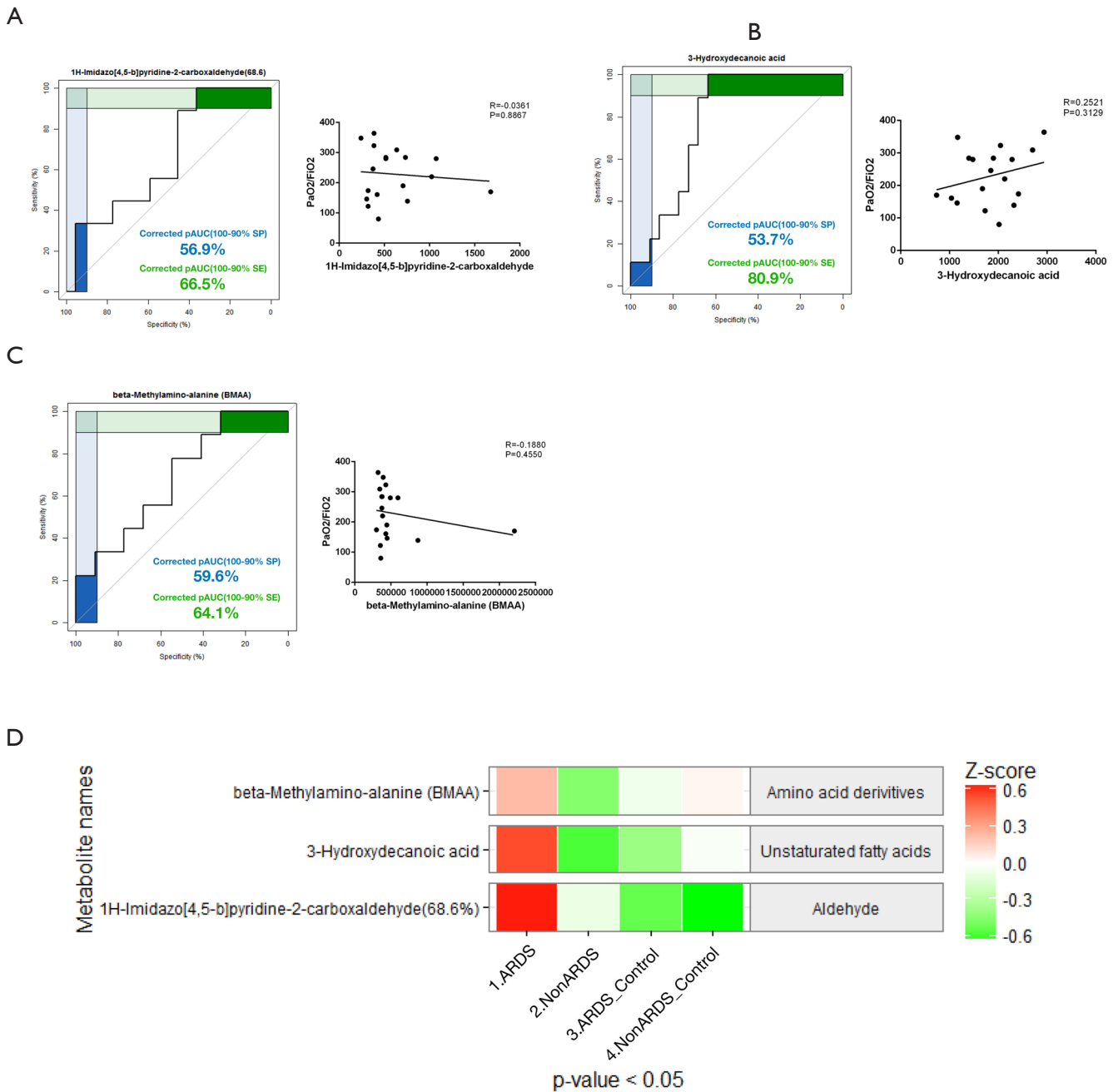**Figure S1** Comparison of metabolites in the AKI and non-AKI groups. (A) The basic information of 2-(4-(2-Acetoxyethyl)-2,5-dimethoxyphenyl) acetic acid, methyl ester that showed significant differences between the AKI and non-AKI groups. Left: Area under the curves (AUCs) of metabolite, sensitivity (SE) and specificity (SP) is shown. Right: The correlation analysis of clinical indictors of carbamind, creatinine, uric acid, and KDIGO scores. (B) The basic information of benzeneacetic acid, 3,4-dimethoxy-(methyl ester) that showed significant differences between the AKI and non-AKI groups. Left: AUCs of metabolite, sensitivity (SE) and specificity (SP). Right: The correlation analysis of clinical indicators of carbamind, creatinine, uric acid, and KDIGO scores. (C) The basic information of phenylalanine that showed significant differences between the AKI and non-AKI groups. Left: AUCs of metabolite, sensitivity (SE) and specificity (SP) is shown on the figure. Right: The correlation analysis of clinical indicators of carbamind, creatinine, uric acid, and KDIGO scores. (D) The basic information of 2-hydroxyglutaramic acid MCF1 that showed significant differences between the AKI and non-AKI groups. Left: AUCs of metabolite, sensitivity (SE), and specificity (SP). Right: The correlation analysis of clinical indicators of carbamind, creatinine, uric acid, and KDIGO scores. (E) The basic information of nonadecanoic acid that showed significant differences between the AKI and non-AKI groups. Left: AUCs of metabolite, sensitivity (SE), and specificity (SP). Right: The correlation analysis of clinical indicators of carbamind, creatinine, uric acid, and KDIGO scores. (F) The basic information of 1,2-hydrazinedicarboxylic acid (dimethyl ester) that showed significant differences between the AKI and non-AKI groups. Left: AUCs of metabolite, sensitivity (SE), and specificity (SP). Right: The correlation analysis of clinical indicators of carbamind, creatinine, uric acid, and KDIGO scores. (G) The basic information of 2-coumaranone that showed significant differences between the AKI and non-AKI groups. Left: AUCs of metabolite, sensitivity (SE), and specificity (SP). Right: The correlation analysis of clinical indicators of carbamind, creatinine, uric acid, and KDIGO scores. (H) The metabolic heat map of subgroup analysis. P<0.05, comparison of the AKI and the non-AKI groups; the matched controls are shown as the basic metabolic activity. The classifications of metabolites are listed on the right side of the figure and the names of metabolites are on the left. Z-score was used to standardize the level of metabolites, and metabolic activity is shown as colors.

Table S1 The basic information and clinical characteristics of AKI, Non AKI, AKI-Control and Non AKI-Control.

Information	AKI (N=16)	Non AKI (N=15)	AKI-Control (N=14)	Non AKI-Control (N=13)	P value
Gender	0.57±0.51	0.67±0.49	0.57±0.51	0.62±0.51	>0.99
Male	10 (62.50%)	9 (60%)	8 (57.14%)	8 (61.54%)	
Female	6 (37.50%)	6 (40%)	6 (42.86%)	5 (38.46%)	
Ration (male:female)	1.67	1.50	1.33	1.60	
Age	70.75±13.67	66.07±19.43	70.43 12.49	65.62±18.41	0.45
≤50	2 (12.50%)	3 (20.00%)	1 (7.14%)	2 (15.38%)	
>50 and ≤60	1 (6.25%)	0 (0%)	1 (7.14%)	1 (7.69%)	
>60 and ≤70	3 (18.75%)	4 (26.67%)	3 (21.43%)	2 (15.38%)	
>70 and ≤80	5 (31.25%)	5 (33.33%)	4 (28.57%)	4 (30.77%)	
>80	5 (31.25%)	3 (20.00%)	5 (35.72%)	4 (30.77%)	
BMI	21.28±3.52	23.03±5.38	21.20±2.62	22.12±2.27	0.30
≤18.5	4 (25.00%)	2 (13.33%)	3 (21.43%)	1 (7.69%)	
18.5<BMI≤23	8 (50.00%)	7 (46.67%)	7 (50.00%)	7 (53.85%)	
>23	4 (25.00%)	6 (40.00%)	4 (28.57%)	5 (38.46%)	
Degree of risk score					
KIDGO	2.38±0.81	0	–	–	–
Clinical data					
Carbamide (mmol/L)	21.88±11.25	11.34±6.28	–	–	–
Creatinine (µmol/L)	280±139.71	145±166.46	–	–	–
Uric acid (µmol/L)	518.63±219.39	315.27±110.81	–	–	–
Nationality					
Ethnic Han	16 (100%)	15 (100%)	14 (100%)	13 (100%)	
Minority	0	0	0	0	

The table described the basic information of each group. The basic information of age, gender, BMI, clinical data and degree of risk score was shown in form of Mean ± SD, others used the form of number (percent of number in each group) to describe the information we get. Mann-Whitney Test was used to test the statistical significances between AKI and Non-AKI, the P value was shown on table. We mark the gender of male is 1, and female is 0.
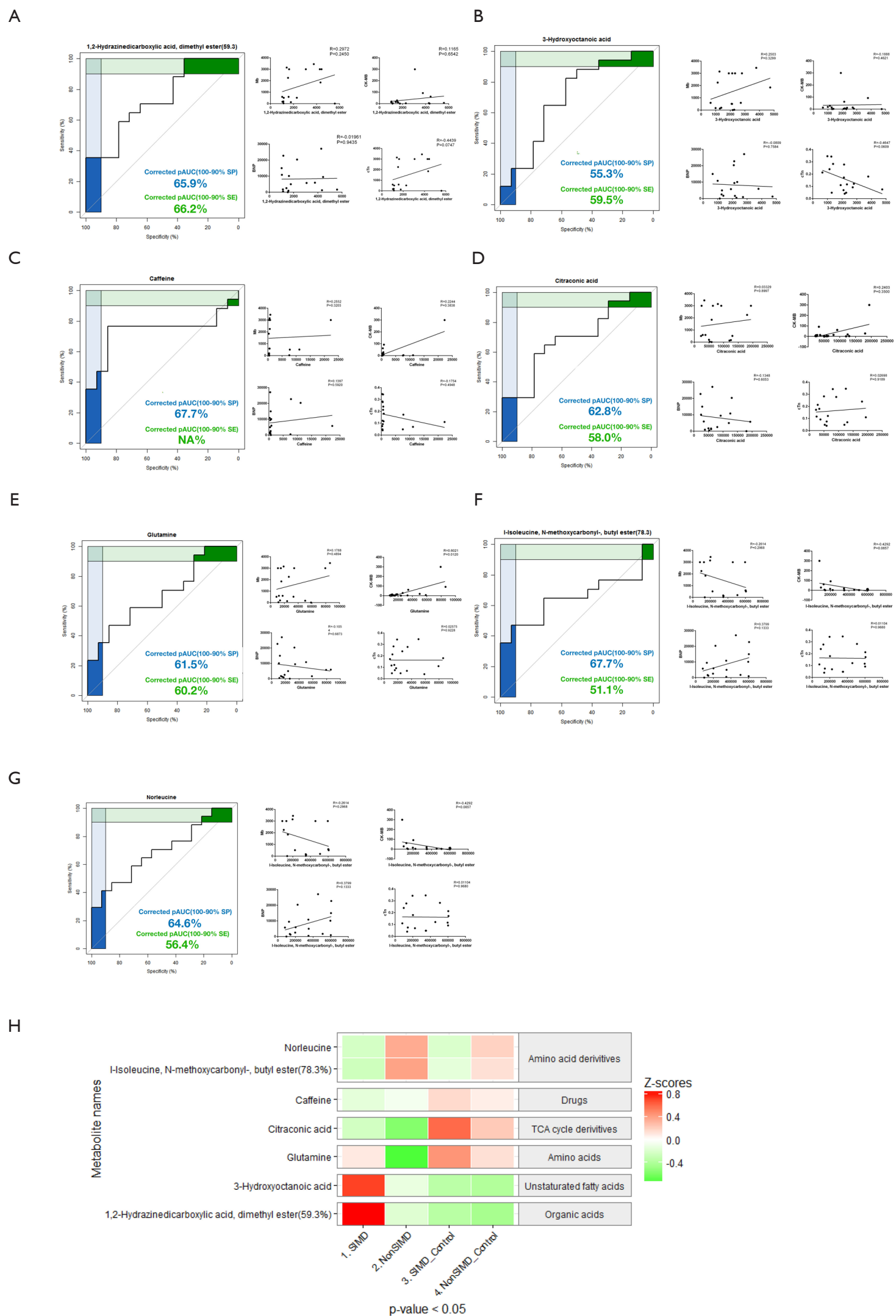
Figure S2 Comparison of metabolites in the ARDS and non-ARDS groups. (A) The basic information of 3-hydroxydecanoic acid that showed significant differences between the ARDS and non-ARDS groups. Left: AUCs of metabolite, sensitivity (SE), and specificity (SP). Right: The correlation analysis of clinical indicators of PaO_2/FiO_2. (B) The basic information of BMAA that showed significant differences between the ARDS and non-ARDS groups. Left: AUCs of metabolite, sensitivity (SE), and specificity (SP). Right: The correlation analysis of clinical indicators of PaO_2/FiO_2. (C) The basic information of 1H-imidazo[4,5-b]pyridine-2-carboxaldehyde that showed significant differences between the ARDS and non-ARDS groups. Left: AUCs of metabolite, sensitivity (SE), and specificity (SP). Right: The correlation analysis of clinical indicators of PaO_2/FiO_2. (D) The metabolic heat map of subgroup analysis. P<0.05, comparison of the ARDS and non-ARDS groups; the matched controls are shown as the basic metabolic activity. The classifications of metabolites are listed on the right side of the figure, and the names of metabolites are on the left. Z-score was used to standardize the level of metabolites, and metabolic activity is shown as colors.

Table S2 The basic information and clinical characteristics of ARDS, Non ARDS, ARDS-Control and Non ARDS-Control

Information	ARDS (N=22)	Non ARDS (N=9)	ARDS-Control (N=17)	Non ARDS-Control (N=7)	P value
Gender	0.64±0.49	0.67±0.50	0.59±0.51	0.57±0.53	0.49
Male	14 (63.64%)	6 (66.67%)	10 (58.82%)	4 (57.14%)	
Female	8 (36.36%)	3 (33.33%)	7 (41.18%)	3 (42.86%)	
Ration (male:female)	1.75	2.00	1.43	1.33	
Age	69.41±15.39	66.22±20.04	67.12±15.22	67.43±19.67	>0.99
≤50	3 (13.64%)	2 (22.22%)	2 (11.76%)	1 (14.29%)	
>50 and ≤60	1 (4.55%)	0 (0%)	2 (11.76%)	0 (0%)	
>60 and ≤70	5 (22.73%)	2 (22.22%)	3 (17.65%)	2 (28.57%)	
>70 and ≤80	8 (36.36%)	2 (22.22%)	7 (41.18%)	1 (14.29%)	
>80	5 (22.73%)	3 (33.33%)	3 (17.65%)	3 (42.86%)	
BMI	22.76±5.12	20.56±2.04	22.04±2.39	20.94±2.28	0.67
≤18.5	4 (18.18%)	2 (22.22%)	2 (11.76%)	1 (14.29%)	
18.5 < BMI≤23	9 (40.91%)	6 (66.67%)	8 (47.06%)	5 (71.43%)	
>23	9 (40.91%)	1 (11.11%)	7 (41.18%)	1 (14.29%)	
Clinical data					
PaO_2/FiO_2 (mmHg)	227.95±107.73	266.44±92.81	/	/	/
Therapy					
Mechanical Ventilation	15 (68.18%)	0	/	/	/
Nationality					
Ethnic Han	22 (100%)	9 (100%)	17 (100%)	7 (100%)	
Minority	0 (0%)	0 (0%)	0 (0%)	0 (0%)	

The table described the basic information of each group. The basic information of age, gender, BMI, clinical data and degree of risk score was shown in form of Mean ± SD, others used the form of number (percent of number in each group) to describe the information we get. Mann-Whitney Test was used to test the statistical significances between ARDS and Non ARDS, the P value was shown on table. We mark the gender of male is 1, and female is 0.
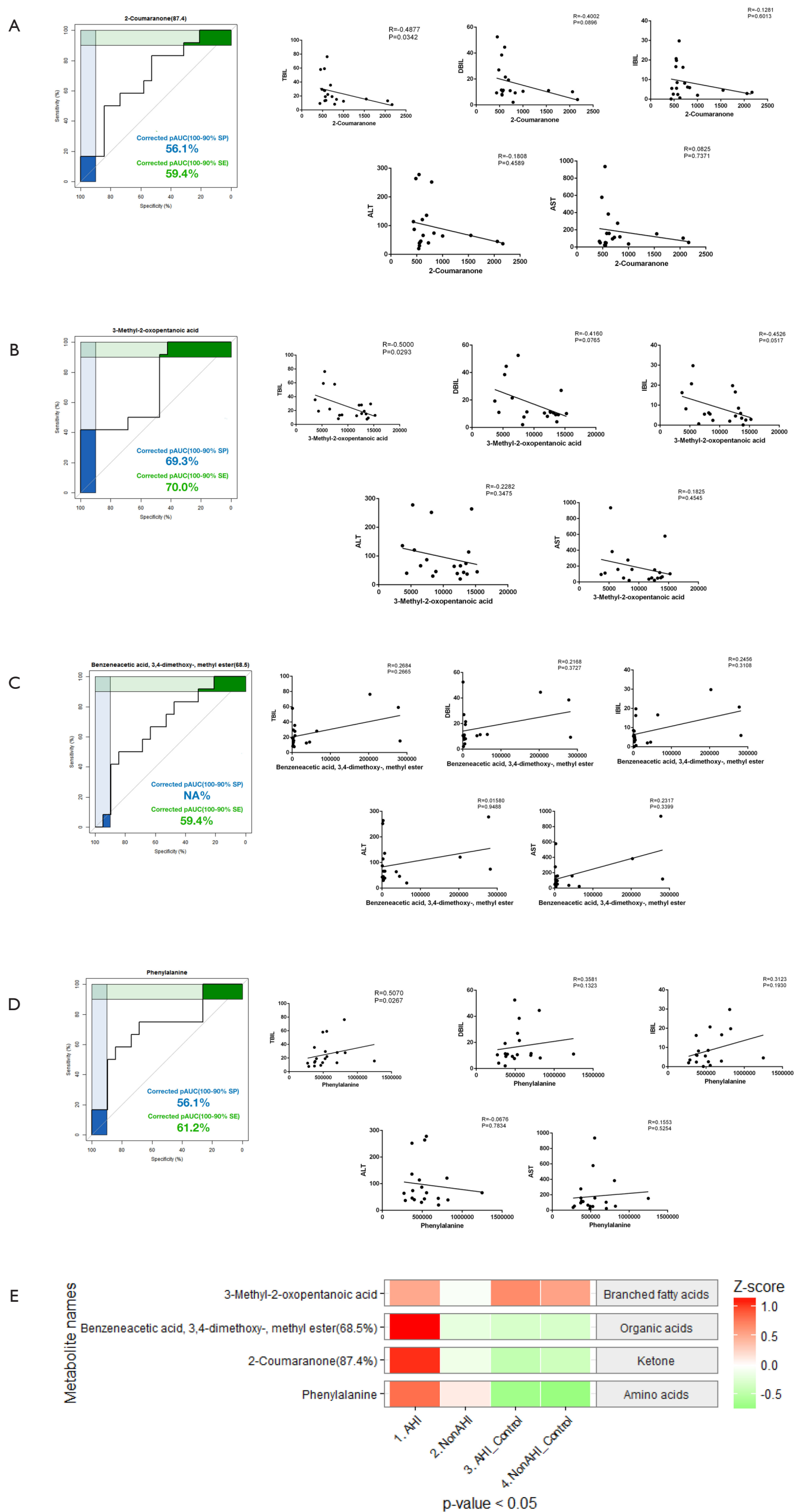
Figure S3 Comparison of metabolites in the SIMD and non-SIMD in the groups. (A) The basic information of caffeine that showed significant differences between the SIMD and non-SIMD groups. Left: AUCs of metabolite, sensitivity (SE), and specificity (SP). Right: The correlation analysis of clinical indicators of BNP, Mb, CK-MB, and cTn. (B) The basic information of l-isoleucine(N-methoxycarbonyl-butyl ester) that showed significant differences between the SIMD and non-SIMD groups. Left: AUCs of metabolite, sensitivity (SE), and specificity (SP). Right: The correlation analysis of clinical indicators of BNP, Mb, CK-MB, and cTn. (C) The basic information of norleucine that showed significant differences between the SIMD and non-SIMD groups. Left: AUCs of metabolite, sensitivity (SE), and specificity (SP). Right: The correlation analysis of clinical indicators of BNP, Mb, CK-MB, and cTn. (D) The basic information of 1,2-hydrazinedicarboxylic acid (dimethyl ester) that showed significant differences between the SIMD and no-SIMD groups. Left: AUCs of metabolite, sensitivity (SE), and specificity (SP). Right: The correlation analysis of clinical indicators of BNP, Mb, CK-MB, and cTn. (E) The basic information of glutamine that showed significant differences between the SIMD and non-SIMD groups. Left: AUCs of metabolite, sensitivity (SE), and specificity (SP). Right: The correlation analysis of clinical indicators of BNP, Mb, CK-MB, and cTn. (F) The basic information of 3-hydroxyoctanoic acid that showed significant differences between the SIMD and non-SIMD groups. Left: AUCs of metabolite, sensitivity (SE), and specificity (SP). Right: The correlation analysis of clinical indicators of BNP, Mb, CK-MB, and cTn. (G) The basic information of citraconic acid that showed significant differences between the SIMD and non-SIMD groups. Left: AUCs of metabolite, sensitivity (SE), and specificity (SP). Right: The correlation analysis of clinical indicators of BNP, Mb, CK-MB, and cTn. (H) The metabolic heat map of subgroup analysis. P<0.05, comparison of the SIMD and non-SIMD groups; the matched controls are shown as the basic metabolic activity. The classifications of metabolites are listed on the right side of the figure, and the names of metabolites are on the left. Z-score was used to standardize the level of metabolites, and metabolic activity is shown as colors.

Table S3 The basic information and clinical characteristics of SIMD, Non SIMD, SIMD-Control and Non SIMD-Control

Information	SIMD (N=17)	Non SIMD (N=14)	SIMD-Control (N=15)	Non SIMD-Control (N=12)	P value
Gender	0.65±0.49	0.64±0.50	0.60±0.51	0.580.51	>0.99
Male	11 (64.71%)	9 (64.29%)	9 (60%)	7 (58.33%)	
Female	6 (35.29%)	5 (35.71%)	6 (40%)	5 (41.47%)	
Ration (male:female)	1.83	1.80	1.50	1.40	
Age	72.12±12.83	64.07±18.06	70.27±14.09	64.50±17.22	>0.99
≤50	1 (5.88%)	4 (28.57%)	1 (6.67%)	2 (16.67%)	
>50 and ≤60	0 (0%)	1 (7.14%)	0 (0%)	2 (16.67%)	
>60 and ≤70	4 (23.53%)	3 (21.43%)	4 (26.67%)	2 (16.67%)	
>70 and ≤80	7 (41.18%)	3 (21.43%)	6 (40%)	3 (25%)	
>80	5 (29.41%)	3 (21.43%)	4 (26.67%)	3 (25%)	
BMI	22.11±4.46	22.14±4.79	21.05±2.50	22.03±2.55	0.19
≤18.5	3 (17.65%)	3 (21.43%)	3 (20%)	2 (16.67%)	
18.5<BMI≤23	9 (52.94%)	6 (42.86%)	8 (53.33%)	5 (41.47%)	
>23	5 (29.41%)	5 (35.71%)	4 (26.67%)	5 (41.47%)	
Clinical data					
Mb (µg/L)	1497.9±1359.7	334.4±409.86	/	/	/
CK-MB (µg/L)	34.0±72.8	3.7±3.8	/	/	/
NT-Pro BNP (µg/L)	8289.9±8453.9	3911.9±4916.0	/	/	/
TnT (µg/L)	0.2±0.1	0.1±0.07	/	/	/
Nationality					
Ethnic Han	17 (100%)	14 (100%)	15 (100%)	12 (100%)	
Minority	0 (0%)	0 (0%)	0 (0%)	0 (0%)	

The table described the basic information of each group, The basic information of age, gender, BMI, clinical data and degree of risk score was shown in form of Mean ± SD, others used the form of number (percent of number in each group) to describe the information we get. Mann-Whitney Test was used to test the statistical significances between SIMD and Non SIMD, the P value was shown on table. We mark the gender of male is 1, and female is 0.

Figure S4 Comparison of metabolites in the AHI and Non-AHI groups. (A) The basic information of 3-,ethyl-2-oxopentanoic acid that showed significant differences between the AHI and non-AHI groups. Left: AUCs of metabolite, sensitivity (SE), and specificity (SP). Right: The correlation analysis of clinical indictors of TBIL, direct bilirubin (DBIL), indirect bilirubin (IBIL), alanine aminotransferase (ALT), and aspartate aminotransferase (AST). (B) The basic information of phenylalanine that showed significant differences between the AHI and non-AHI groups. Left: AUCs of metabolite, sensitivity (SE), and specificity (SP). Right: The correlation analysis of clinical indicators of TBIL, DBIL, IBIL, ALT, and AST. (C) The basic information of 2-coumaranone that showed significant differences between the AHI and non-AHI groups. Left: AUCs of metabolite, sensitivity (SE), and specificity (SP). Right: The correlation analysis of clinical indicators of TBIL, DBIL, IBIL, ALT, and AST. (D) The basic information of benzeneacetic acid (3,4-dimethoxy-, methyl ester) that showed significant differences between the AHI and non-AHI groups. Left: AUCs of metabolite, sensitivity (SE), and specificity (SP). Right: The correlation analysis of clinical indicators of TBIL, DBIL, IBIL, ALT, and AST. (E) The metabolic heat map of subgroup analysis. P<0.05, comparison of the AHI and non-AHI groups; the matched controls are shown as the basic metabolic activity. The classifications of metabolites are listed on the right side of the figure, and the names of metabolites are on the left. Z-score was to standardize the level of metabolites, and metabolic activity is shown as colors.

Table S4 The basic information and clinical characteristics of AHI, Non AHI, AHI-Control and Non AHI-Control

Information	AHI (N=19)	Non AHI (N=12)	AHI-Control (N=16)	Non AHI-Control (N=11)	P value
Gender	0.63±0.50	0.67±0.49	0.56±0.51	0.63±0.50	0.93
Male	12 (63.16%)	8 (66.67%)	9 (56.25%)	7 (63.64%)	
Female	7 (36.84%)	4 (33.33%)	7 (43.75%)	4 (36.36%)	
Ration (male:female)	1.71	1.75	1.29	1.75	>0.99
Age	67.47±16.18	70.08±17.81	68.00±15.81	68.18±16.42	
≤50	3 (15.79%)	2 (16.67%)	2 (12.5%)	1 (9.09%)	
>50 and ≤60	1 (5.26%)	0 (0%)	1 (6.25%)	1 (9.09%)	
>60 and ≤70	4 (21.05%)	3 (25%)	3 (18.75%)	3 (27.27%)	
>70 and ≤80	7 (36.84%)	3 (25%)	5 (31.25%)	3 (27.27%)	
>80	4 (21.05%)	4 (33.33%)	5 (31.25%)	3 (27.27%)	
BMI	21.71±3.30	22.78±6.11	21.18±2.44	21.77±2.57	0.46
≤18.5	3 (15.79%)	3 (25%)	3 (18.75%)	2 (18.18%)	
18.5<BMI≤23	10 (52.63%)	5 (41.67%)	9 (56.25%)	5 (45.45%)	
>23	6 (31.58%)	4 (33.33%)	4 (25%)	4 (36.36%)	
Clinical data					
ALT (U/L)	95.9±81.49	35.5±14.09	/	/	/
AST (U/L) score	180.5±230.32	44.4±18.80	/	/	/
TBIL (μmol/L)	25.5±19.28	13.4±5.17	/	/	/
DBIL (μmol/L)	16.9±14.03	9.0±2.54	/	/	/
IBIL (μmol/L)	8.5±8.18	4.4±3.97	/	/	/
Nationality					
Ethnic Han	19 (100%)	11 (100%)	16 (100%)	11 (100%)	
Minority	0 (0%)	0 (0%)	0 (0%)	0 (0%)	

The table described the basic information of each group. The basic information of age, gender, BMI, clinical data and degree of risk score was shown in form of Mean ± SD, others used the form of number (percent of number in each group) to describe the information we get. Mann-Whitney Test was used to test the statistical significances between AHI and Non AHI, the P value was shown on table. We mark the gender of male is 1, and female is 0.