

Table S1 Differential expression of HLA-DQB1 protein between IgAN patients and healthy control patients

	IgAN	Control	P
Number	47	39	
Nucleated cell	665.00 (559.00, 886.00)	790.00 (598.00, 1,042.00)	0.04*
Lymphocyte	1,195.00 (806.00, 1,550.00)	1,396.00 (1,030.00, 2,108.00)	0.10
T cell	246.00 (197.00, 298.00)	246.00 (204.00, 317.00)	0.46
B cell	7,279.00 (5,037.00, 10,498.00)	11,239.00 (7,685.00, 14,948.00)	<0.01**
NK cell	363.00 (260.00, 529.00)	593.00 (430.00, 919.00)	<0.001***
Monocyte	1,458.00 (983.00, 2,576.00)	1,416.00 (931.00, 1,930.00)	0.27
Granulocyte	332.00 (299.00, 396.00)	387.00 (361.00, 408.00)	0.01*

*P<0.05; **P<0.01; ***P<0.001.

Table S2 Differential expression of HLA-DRB1 protein between IgAN patients and healthy control patients

	IgAN	Control	P
Number	47	39	
Nucleated cell	800.00 (559.00, 1,143.00)	878.00 (598.00, 1,081.00)	0.88
Lymphocyte	1,601.00 (1,009.00, 2,204.00)	1,510.00 (1,124.00, 2,190.00)	0.88
T cell	193.00 (109.00, 313.00)	192.00 (98.00, 316.00)	0.65
B cell	10,526.00 (6,914.00, 16,466.00)	11,627.00 (8,451.00, 19,526.00)	0.23
NK cell	331.00 (102.00, 584.00)	532.00 (257.00, 904.00)	<0.01**
Monocyte	3,849.00 (2,785.00, 6,522.00)	3,720.00 (2,238.00, 4,930.00)	0.24
Granulocyte	191.00 (172.00, 222.00)	168.00 (155.00, 183.00)	<0.001***

P<0.01; *P<0.001.

Table S3 Correlation between HLA-DQB1 and HLA-DRB1 mRNA and clinical characteristics

Clinical indicator	HLA-DQB1 mRNA		HLA-DRB1 mRNA	
	P	r	P	r
Gd-IgA1 (ng/mL)	0.79	0.03	0.13	0.17
SBP (mmHg)	0.46	-0.08	0.24	-0.13
DBP (mmHg)	0.67	-0.05	0.96	0.01
BMI (kg/m ²)	0.54	-0.07	0.09	-0.19
Urinary protein (g)	0.07	-0.20	0.74	-0.04
GFR (mL/min/1.73 m ²)	0.79	0.03	0.64	-0.05
BUA (umol/L)	0.19	-0.14	0.41	-0.09
SCr (umol/L)	0.61	-0.56	0.77	0.03
Alb (g/L)	0.19	0.14	0.58	0.06
WBC (10 ⁹ /L)	0.03*	-0.24	0.12	-0.17
Hb (g/L)	0.95	-0.01	0.18	-0.15
IgA (g/L)	0.13	0.17	0.69	0.04
TG (mmol/L)	0.55	-0.06	0.75	-0.04
TC (mmol/L)	0.72	0.04	0.69	-0.04
HDL-C (mmol/L)	0.84	-0.02	0.95	-0.01
LDL-C (mmol/L)	0.18	-0.15	0.64	0.05

Gd-IgA1, galactose-deficient IgA1; SBP, systolic blood pressure; DBP, diastolic blood pressure; BMI, body mass index; 24-h urinary protein, 24 hour urinary protein; eGFR, estimated glomerular filtration rate; UA, uric acid; SCr, serum creatinine; Alb, serum albumin; WBC, white blood cells; Hb, hemoglobin; TC, total cholesterol; TG, triglyceride; LDL-C, low density lipoprotein cholesterol; HDL-C, high density lipoprotein cholesterol; *P<0.05.

Table S4 Differential expression of HLA-DQB1 and HLA-DRB1 mRNA in different clinical pathological groups

Variable	Number	HLA-DQB1 mRNA	P	HLA-DRB1 mRNA	P
Blood pressure			0.61		0.78
Hypertension	36	0.92 (0.09, 1.42)		0.23 (0.01, 2.68)	
Normotensive	50	0.98 (0.32, 2.02)		0.08 (0.01, 4.44)	
24-h urinary protein(g)					
<1	27	1.02 (0.45, 1.90)	0.12	0.69 (0.01, 3.19)	0.83
≥1	59	0.71 (0.07, 1.48)		0.08 (0.01, 3.35)	
GFR (mL/min/1.73m ²)					
≤60	27	1.00 (0.36, 1.36)	0.72	1.50 (0.01, 2.48)	0.92
>60	59	0.97 (0.08, 1.88)		0.22 (0.01, 4.65)	
Oxford classification (%)					
M					
M0	51	1.00 (0.33, 2.49)	0.61	0.23 (0.01, 4.64)	0.76
M1	17	0.90 (0.07, 1.89)		1.00 (0.01, 4.31)	
E					
E0	51	1.00 (0.33, 1.87)	0.97	0.44 (0.01, 3.55)	0.54
E1	17	0.90 (0.07, 4.30)		0.22 (0.01, 4.83)	
S					
S0	45	1.00 (0.28, 1.80)	0.84	0.69 (0.01, 4.96)	0.58
S1	23	1.00 (0.05, 2.50)		0.10 (0.01, 2.00)	
T					
T0	62	1.00 (0.12, 2.00)	0.57	0.23 (0.01, 3.83)	0.32
T1	6	0.83 (0.31, 5.23)		1.29 (0.11, 17.29)	
C					
C0	50	0.82 (0.07, 1.83)	0.08	0.08 (0.01, 5.03)	0.27
C1-2	18	1.17 (0.85, 3.91)		1.18 (0.08, 3.21)	

eGFR, estimated glomerular filtration rate; M, mesangial cell proliferation; E, endothelial cell proliferation; S, glomerular segmental sclerosis; T, tubular atrophy, interstitial fibrosis; C, crescentic lesion.

Table S5 Expression of HLA-DQB1 and HLA-DRB1 protein between high and low urinary protein excretion groups.

	24-h urinary protein <1 g	24-h urinary protein ≥1 g	P
Number	16	31	
DQB1-nucleated cell	661.00 (570.00, 1,065.00)	665.00 (538.00, 842.00)	0.66
DQB1-lymphocyte	1,195.00 (806.00, 2,458.00)	1,170.00 (787.00, 1,391.00)	0.38
DQB1-T cell	238.00 (183.00, 319.00)	248.00 (213.00, 298.00)	0.61
DQB1-B cell	7,339.00 (6406.00, 10,900.00)	6,322.00 (4556.00, 10,199.00)	0.12
DQB1-NK cell	276.00 (211.00, 452.00)	373.00 (296.00, 676.00)	0.05
DQB1-monocyte	1,566.00 (981.00, 2,574.00)	1,456.00 (1,055.00, 2,641.00)	0.99
DQB1-granulocyte	316.00 (283.00, 360.00)	352.00 (317.00, 429.00)	<0.01**
DRB1-nucleated cell	837.00 (458.00, 1166.00)	799.00 (662.00, 1,143.00)	0.67
DRB1-lymphocyte	1,453.00 (849.00, 2,016.00)	1,946.00 (1,027.00, 2,533.00)	0.22
DRB1-T cell	156.00 (126.00, 284.00)	224.00 (109.00, 340.00)	0.43
DRB1-B cell	9,098.00 (5,458.00, 13,545.00)	10,526.00 (7,686.00, 19,152.00)	0.21
DRB1-NK cell	171.00 (61.00, 438.00)	415.00 (118.00, 803.00)	0.02*
DRB1-monocyte	3,849.00 (2,417.00, 4,705.00)	3,852.00 (3,143.00, 7,490.00)	0.36
DRB1-granulocyte	191.00 (162.00, 219.00)	190.00 (172.00, 230.00)	0.66

*P<0.05; **P<0.01.

Table S6 Expression of HLA-DQB1 and HLA-DRB1 protein between hypertensive and normotensive groups.

	Normal blood pressure	hypertension	p
Number	29	18	
DQB1-nucleated cell	633.00 (564.50, 831.50)	715.50 (537.00, 955.00)	0.44
DQB1-lymphocyte	1,106.00 (785.50, 1,418.00)	1,252.00 (1,045.50, 2,057.50)	0.28
DQB1-T cell	237.00 (191.00, 264.00)	271.50 (201.50, 356.75)	0.15
DQB1-B cell	6,322.00 (4,745.00, 10,164.00)	7485.50 (6147.00, 12605.00)	0.14
DQB1-NK cell	338.00 (263.50, 486.00)	450.00 (244.75, 684.25)	0.35
DQB1-monocyte	1,458.00 (1,176.00, 2,339.50)	1,474.00 (910.00, 2,746.50)	0.74
DQB1-granulocyte	334.00 (305.50, 394.00)	325.50 (297.50, 426.00)	0.88
DRB1-nucleated cell	875.00 (687.00, 1,252.00)	724.00 (506.75, 906.25)	0.09
DRB1-lymphocyte	1,937.00 (949.00, 2,626.50)	1,394.00 (1,046.50, 2,137.25)	0.58
DRB1-T cell	226.00 (113.50, 314.50)	161.50 (101.75, 318.50)	0.61
DRB1-B cell	11,100.00 (7,289.00, 17,460.50)	8,316.00 (6,679.25, 13,008.00)	0.21
DRB1-NK cell	344.00 (101.00, 529.00)	322.00 (105.50, 699.50)	0.86
DRB1-monocyte	4,313.00 (3,401.50, 6,919.50)	3,278.00 (2,353.50, 4,358.00)	0.07
DRB1-granulocyte	198.00 (175.00, 234.50)	188.00 (160.50, 220.50)	0.59

Table S7 Expression of HLA-DQB1 and HLA-DRB1 protein between low and high eGFR groups

	eGFR \leq 60 mL/min/1.73 mm ²	eGFR >60 mL/min/1.73 mm ²	P
Number	16	31	
DQB1-nucleated cell	667.50 (479.50, 760.75)	663.00 (570.00, 964.00)	0.29
DQB1-lymphocyte	1,077.50 (781.50, 1,311.75)	1,315.00 (806.00, 1,739.00)	0.17
DQB1-T cell	255.50 (218.00, 350.25)	231.00 (183.00, 283.00)	0.13
DQB1-B cell	6,638.50 (4,740.50, 7,558.75)	7,490.00 (5,341.00, 11,426.00)	0.19
DQB1-NK cell	357.50 (253.25, 656.25)	363.00 (267.00, 525.00)	0.89
DQB1-monocyte	1,421.00 (937.00, 2,525.75)	1,505.00 (1,055.00, 2,576.00)	0.46
DQB1-granulocyte	343.00 (314.75, 393.75)	332.00 (298.00, 429.00)	0.93
DRB1-nucleated cell	784.50 (444.25, 947.25)	818.00 (662.00, 1,200.00)	0.24
DRB1-lymphocyte	1,413.50 (1043.25, 2,120.00)	1,937.00 (910.00, 2,533.00)	0.54
DRB1-T cell	264.00 (112.25, 326.50)	172.00 (106.00, 296.00)	0.20
DRB1-B cell	9,791.50 (5,821.25, 15,945.00)	10,526.00 (7,331.00, 16,466.00)	0.59
DRB1-NK cell	223.00 (128.25, 551.00)	369.00 (80.00, 663.00)	0.87
DRB1-monocyte	3,731.50 (1,859.00, 6,068.75)	3,849.00 (2918.00, 6,613.00)	0.54
DRB1-granulocyte	187.00 (163.50, 227.50)	198.00 (178.00, 222.00)	0.49

eGFR, estimated glomerular filtration rate.

Table S8 Differential expression of HLA-DQB1 and HLA-DRB1 protein in M0 and M1 groups

	M0	M1	P
Number	30	10	
DQB1-nucleated cell	664.00 (580.50, 930.75)	788.00 (478.25, 904.75)	0.91
DQB1-lymphocyte	1,200.00 (836.00, 1,700.00)	1,138.00 (981.50, 1,458.00)	0.89
DQB1-T cell	234.00 (196.00, 320.75)	229.50 (183.75, 264.25)	0.57
DQB1-B cell	6,909.00 (5,164.50, 10,498.00)	7,274.50 (4,232.75, 12,446.25)	0.91
DQB1-NK cell	326.00 (229.75, 497.00)	357.50 (312.50, 629.50)	0.26
DQB1-monocyte	1,451.50 (1037.00, 2,423.25)	1,656.00 (831.75, 2,474.25)	0.84
DQB1-granulocyte	332.00 (308.75, 402.50)	372.50 (294.50, 433.50)	0.72
DRB1-nucleated cell	802.00 (521.75, 1,174.50)	784.50 (673.50, 899.25)	0.77
DRB1-lymphocyte	1,782.50 (778.75, 2,545.25)	1,496.00 (1,113.25, 2,119.25)	<1.00
DRB1-T cell	182.50 (104.50, 296.50)	161.50 (101.75, 393.00)	0.72
DRB1-B cell	9,346.00 (5,727.75, 14,826.50)	10,147.00 (8,057.25, 11,557.00)	0.96
DRB1-NK cell	203.00 (73.25, 513.50)	410.50 (336.25, 524.75)	0.07
DRB1-monocyte	3,700.50 (2528.75, 6,544.75)	3,907.00 (3,326.00, 6,341.25)	0.49
DRB1-granulocyte	188.00 (176.50, 219.00)	210.50 (174.00, 227.00)	0.53

M0, mesangial cell proliferation score <0.5; M1, mesangial cell proliferation score >0.5.

Table S9 Differential expression of HLA-DQB1 and HLA-DRB1 protein in E0 and E1 groups

	E0	E1	P
Number	34	6	
DQB1-nucleated cell	703.50 (609.00, 945.25)	531.00 (418.50, 660.25)	0.02*
DQB1-lymphocyte	1,215.50 (891.00, 1,700.00)	1,075.00 (675.00, 1,206.50)	0.14
DQB1-T cell	229.50 (192.00, 267.25)	264.50 (234.00, 391.25)	0.11
DQB1-B cell	7,320.00 (5,164.50, 11,031.50)	5,679.00 (4471.75, 8,077.00)	0.18
DQB1-NK cell	339.00 (250.25, 506.25)	333.50 (241.00, 548.50)	0.90
DQB1-monocyte	1,457.00 (978.25, 2,373.00)	1,523.00 (924.00, 2,961.50)	0.93
DQB1-granulocyte	333.00 (313.50, 404.25)	328.00 (283.25, 428.25)	0.52
DRB1-nucleated cell	809.00 (674.00, 1174.50)	429.00 (330.25, 753.00)	0.01*
DRB1-lymphocyte	1,782.50 (1022.50, 2,545.25)	1,023.50 (541.25, 2,045.00)	0.13
DRB1-T cell	168.50 (102.25, 296.50)	196.00 (102.25, 500.75)	0.67
DRB1-B cell	10,285.50 (7,226.75, 14,156.25)	6,923.00 (4,175.25, 11,207.25,)	0.12
DRB1-NK cell	337.50 (95.00, 518.75)	223.00 (89.25, 422.75)	0.52
DRB1-monocyte	3,912.50 (2741.00, 6,544.75)	3,256.00 (1,579.00, 4,743.00)	0.27
DRB1-granulocyte	197.50 (180.25, 226.25)	187.00 (145.25, 198.50)	0.14

E0, endocapillary hypercellularity absent; E1, endocapillary hypercellularity present; *P<0.05.

Table S10 Differential expression of HLA-DQB1 and HLA-DRB1 protein in S0 and S1 groups

	S0	S1	P
Number	30	10	
DQB1-nucleated cell	666.50 (548.50, 945.25)	669.00 (580.50, 781.25)	0.70
DQB1-lymphocyte	1,271.00 (1,061.75, 1,918.75)	826.00 (718.25, 1111.75)	<0.01**
DQB1-T cell	242.50 (188.75, 320.75)	227.50 (207.75, 255.75)	0.77
DQB1-B cell	7,320.00 (5,756.75, 11,031.50)	5,379.50 (4,631.50, 10,016.50)	0.15
DQB1-NK cell	352.50 (263.00, 526.00)	315.00 (222.25, 430.50)	0.27
DQB1-monocyte	1,481.50 (1,010.00, 2,574.50)	1,451.50 (920.50, 2,010.00)	0.70
DQB1-granulocyte	323.50 (297.50, 394.50)	383.50 (346.75, 448.75)	0.04*
DRB1-nucleated cell	792.50 (553.50, 1,023.00)	906.50 (627.50, 1,682.50)	0.33
DRB1-lymphocyte	1,769.00 (1046.50, 2,245.25)	1,243.50 (705.00, 3,009.25)	0.63
DRB1-T cell	182.50 (105.25, 296.50)	141.50 (97.00, 380.00)	0.89
DRB1-B cell	9,493.00 (6,679.25, 13,008.75)	10,138.50 (5,751.75, 20,812.50)	0.47
DRB1-NK cell	322.00 (79.25, 518.75)	284.50 (113.50, 522.50)	0.96
DRB1-monocyte	3,581.50 (2,528.75, 5,935.25)	4,186.00 (3,341.00, 7,859.00)	0.17
DRB1-granulocyte	186.00 (167.75, 207.25)	229.00 (194.25, 301.50)	0.01*

S0, segmental glomerulosclerosis absent; S1, segmental glomerulosclerosis present; *P<0.05; **P<0.01.

Table S11 Differential expression of HLA-DQB1 and HLA-DRB1 protein in C0 and C1-2 groups

	C0	C1-2	P
Number	30	10	
DQB1-nucleated cell	671.50 (600.00, 900.25)	634.50 (449.00, 907.00)	0.35
DQB1-lymphocyte	1,260.00 (948.75, 1,700.00)	1,122.50 (704.25, 1,305.75)	0.21
DQB1-T cell	234.00 (192.00, 296.50)	231.50 (203.75, 285.00)	0.96
DQB1-B cell	7,373.50 (5,398.75, 10,598.50)	5,498.50 (3,889.00, 8,332.25)	0.08
DQB1-NK cell	331.50 (250.25, 497.00)	357.50 (244.75, 1,035.50)	0.55
DQB1-monocyte	1,457.00 (1,010.00, 2,423.25)	1,431.00 (884.75, 2,379.25)	0.59
DQB1-granulocyte	330.00 (308.75, 402.50)	377.00 (297.50, 433.50)	0.36
DRB1-nucleated cell	751.00 (521.75, 970.50)	1,050.50 (661.50, 1,519.75)	0.12
DRB1-lymphocyte	1,492.50 (778.75, 2,089.00)	2,258.50 (1,215.50, 2,931.25)	0.06
DRB1-T cell	157.00 (98.50, 264.50)	332.00 (145.00, 502.25)	0.02*
DRB1-B cell	9,157.50 (5,727.75, 13,082.25)	11,795.00 (7,944.50, 15,667.00)	0.15
DRB1-NK cell	215.00 (79.25, 420.25)	544.50 (394.25, 1993.00)	<0.01*
DRB1-monocyte	3,484.00 (2,528.75, 5,000.00)	5,232.50 (3,595.25, 8,409.50)	0.05
DRB1-granulocyte	186.00 (176.50, 209.50)	232.00 (184.50, 269.00)	0.08

C0, cellular/fibro-cellular crescents absent; C1-2, cellular/fibro-cellular crescents present. *P<0.05.