RESULTS

The present study covered 33 patients, 19 males and 14 females, and as for sex incidence, the males constitute 57.6% and the females constitute 42.4%.. The males predominate over females.

Table (1) shows the age incidence and the mean age of patients. The reported cases were divided into 3 age groups:

Group I: Their ages were less than 5 years, representing 42.4% of all patients.

Group II: Their ages ranged from 5 to 10 years, representing 39.4% of all patients.

Group III: Their ages were more than 10 years, representing 18.2% of all patients.

The mean age was 6.1 ± 3.6 for the diseased patients.

Table 2 shows the seasonal variation in PSAGN. The disease had one peak incidence in spring and another peak incidence in winter. There were only two patients in summer representing 6.1% of all patients, while there was no any affected cases in autumn.

Table 1. Age incidence of patients.

Age	Acute glomerulonephritis	
	No	%
< 5 years	14	42.4
< 10 years	13	39.4
> 10 years	6	18.2

Mean ($\bar{X}$) 6.1

S.D.± 3.6

Table 2. Seasonal variations in acute glomerulonephritis.

Season	Acute glomerulonephritis	
	No	%
Winter	18	54.5
Spring	13	39.4
Summer	2	6.1
Autumn	0	0.0

Table 3 shows the incidence of group A β hemolytic streptococci isolated from throat swabs taken from patients and identified by both streptex kits and by using bacitracin sensitivity disks.

All the seven beta-hemolytic isolates were identified by streptex kits, while 6 strains out of the seven beta-hemolytic isolates were sensitive to bacitracin disks. Bcitracin sensitivity disks showed one negative result in APSGN, while streptex test showed no negative result.

Table 3. Comparison of streptex and bacitracin test in identification of group A beta hemolytic streptococci in throat swabs taken from cases.

Techniques used	Acute glomeronephritis group beta-hemolytic streptococci (7 cases)	
	No. of group A identified	%
Streptex kits	7	100
Bacitracin test	6	85.7

Table 4 shows the results of antistreptolysin O titre in cases of PSAGN from which beta-hemolytic streptococci were isolated and cases without isolates by latex method.

The comparative study between the two groups shows elevation of A.S.O. titre above normal of both the two groups, however there is more elevation of the A.S.O titre with the group having beta-hemolytic streptococci isolates

The mean (x) antistreptolysin O titre and their corresponding standard deviation (S.D) of cases with isolated and non isolated streptococci are 742.86 ± 97.59 and 384.62 ± 61.27 respectively.

Table 4. Comparative study antistreptolysin O titre in studied groups using latex method.

ASO Titre	Cases from which beta-hemolytic streptococci were isolated (7 cases)		Cases from which no beta-hemolytic streptococci were isolated (26 cases)	
	No.	%	No	%
<200	0.0	0.0	0.0	0.0
200	0.0	0.0	0.0	0.0
300	0.0	0.0	6.0	18.18
400	0.0	0.0	19.0	57.58
600	2.0	6.06	1.0	3.03
800	5.0	15.15	0.0	0.0
Total	7.0	100.0	26.0	100.0
Mean(X)	742.86		384.62	
S.D±	97.59		61.27	

Upper limit of normal is <200 IU.

Table 5 shows the HLA-Haplotypes of the patients. Statistical comparison between the frequencies of the HLA-A, B and DR antigens among the patients and those of normal controls given by Hafez et al. (1986) and of individuals taken up from the same locality. Some antigens are blank either due to the unavailable specificity of the antisera or the homozygosity. Fisher exact test which is an exact test for small numbers, was used to determine the significance of difference between the frequencies. Since 30 antigens have been used, the level of significance was calcualted to be at 0.0016. Furthermore the relative risk (RR) which determines how many times those individuals having the antigen are more susceptible compared to those laking it. Moreover, the strength of association between the antigen and the genetic control of the disease has been evaluated by calculating the etiologic fraction, which indicates the proportion of the responsibility of the HLA-antigen in the development of the disease.

Table 5. The HLA-haplotypes of the patients.

Case no.	HLA-haplotypes					
1	A2	A10	B8	B2	DR3	DR_
2	A1	AW19	B5	B18	DR4	DR_
3	A9	A28	B14	B_	DR5	DR_
4	A2	A11	B8	B	DR3	DR
5	A1	A3	B8	B21	DR7	DR3
6	A2	A	B15	B37	DR1	DR4
7	A1	A11	B8	B	DR3	DR
8	A1	A9	B8	B12	DR7	DR3
9	A2	A10	B5	B22	DR3	DR5
10	A1	AW19	B16	B27	DR1	DR_
11	A2	A	B8	B40	DR4	DR
12	A9	A29	B14	B21	DR2	DR3
13	A2	A	B12	B22	DR4	DR5
14	A1	AW19	B5	B	DR1	DR
15	A2	A28	B16	B18	DR	
16	A3	A11	B17	B_	DR3	DR_
17	A1	A9	B5	B	DR4	DR3
18	A2	A29	B14	B37	DR2	DR3
19	A10	A28	B8	B12	DR4	DR_
20	A2	A9	B8	B14	DR5	DR_
21	A1	A10	B5	B21	DR3	DR
22	A3	A9	B14	B37	DR	
23	A2	A_	B15	B_	DR1	DR_
24	A1	A	B5	B_	DR7	DR_
25	A2	A28	B8	B	DR2	DR_
26	A11	A29	B8	B14	DR4	DR_
27	A1	A	B8	B40	DR7	DR_
28	A2	A28	B5	B_	DR4	DR_
29	A2	A_	B8	B_	DR1	DR
30	A9	A_	B5	B	DR2	DR5
31	A2	A	B12	B14	DR	
32	A1	A10	B8	B_	DR3	DR_
33	A2	A	B8	B	DR1	DR

Tables 6,7,8 show the number of patients, antigen frequency and gene frequency for each allele of the HLA, A,B and DR.

Statistical comparison has been done between the frequencies of the antigens among patients and controls taken up from the same area (Hafez and El-Shennawy, 1986). The level of significance was decided according to the number of the antigens used which is 30, thus the probability should be less than 0.0016.

Table 6. HLA-A antigens frequencies and genes frequencies among patients and controls.

HLA-A antigens	Control antigens (n=380)			Patients (n=33)		
	No.	Antigen frequency %	Gene frequency	No.	Antigen frequency %	Gene frequency
A1	76	20	0.1056	10	30.3	0.1625
A2	112	29.5	0.1586	15	45.5	0.2614
A3	31	8.1	0.0413	3	9.1	0.0465
A9	34	9.2	0.0471	8	24.2	0.1292
A10	54	14.2	0.0737	5	15.1	0.0788
A11	49	12.8	0.0661	4	12.1	0.0152
AW19	34	8.9	0.0455	3	9.1	0.0465
A28	31	8.1	0.0413	5	15.1	0.0788
A29	24	6.3	0.0320	3	9.1	0.0465

Table 7. HLA-B antigens frequencies and genes frequencies among patients and controls.

HLA-B antigens	Control antigens (n=380)			Patients (n=33)		
	No.	Antigen frequency %	Gene frequency	No.	Antigen frequency %	Gene frequency
B5	67	17.8	0.093	8	24.24	0.1295
B7	25	6.5	0.034			
B8	25	6.5	0.034	14	42.42	0.2411
B12	78	20.5	0.109	5	15.15	0.0788
B13	12	3.1	0.016			
B14	28	4.3	0.038	7	21.21	0.1123
B15	19	5	0.026	2	6.06	0.0307
B16	12	3.1	0.016	2	6.06	0.0307
B17	19	5	0.026	1	3.03	0.0788
B18	20	5.2	0.027	2	6.06	0.0307
B21	21	5.5	0.028	3	9.09	0.0465
B22	20	5.2	0.027	2	6.06	0.0307
B27	18	4.7	0.024	1	3.03	0.0152
B37	16	4.2	0.022	3	9.09	0.0465
B40	12	3.1	0.016	2	6.06	0.0307

Table 8. HLA-DR antigens frequencies and genes frequencies among patients and controls.

HLA-DR antigens	Control antigens (n=380)			Patients (n=33)		
	No.	Antigen frequency %	Gene frequency	No.	Antigen frequency %	Gene frequency
DR1	18	9.2	0.048	6	18.1818	0.0954
DR2	40	20.6	0.109	3	9.0909	0.0465
DR3	29	14.9	0.078	9	27.2727	0.1471
DR4	31	20.8	0.111	8	24.2424	0.12925
DR5	12	6.1	0.031	5	15.1515	0.0788
DR7	19	9.7	0.050	7	9.0909	0.0465

Table 9 presents the HLA-A antigens frequencies among the patients and normal controls. Also it shows HLA-A gene frequency, fisher exact, relative risk, and etiologic freaction. Statistical analysis revealed insignificant difference in any of the antigens. The relative risks are insignificant as revealed from the total chisquare. Also the etiologic fractions are low ranging from 0.0022 to 0.24.

Table 9. Statistical comparison between the HLA-A antigens frequencies among patents and controls.

HLA-A antigens	Control antigens (n=380)			Patients (n=33)			Fisher* exact	RR	S
	No.	Antigen frequency %	Gene frequency	No.	Antigen frequency %	Gene frequency			
A1	76	20	0.1056	10	30.3	0.1625	0.1762	1.7	0.1287
A2	112	29.5	0.1586	15	45.5	0.2614	0.986	3.3	0.2253
A3	31	8.1	0.0413	3	9.1	0.0465	0.1248	1.1	0.24
A9	34	9.2	0.0471	8	24.2	0.1292	0.0062	3.2	0.163
A10	54	14.2	0.0737	5	15.1	0.0788	0.2321	1.1	0.012
A11	49	12.8	0.0661	4	12.1	0.0152	0.2482	0.9	0.008
AW19	34	8.9	0.0455	3	9.1	0.0465	0.2048	1.1	0.0022
A28	31	8.1	0.0413	5	15.1	0.0788	0.1269	1.7	0.076
A29	24	6.3	0.0320	3	9.1	0.0465	0.2314	1.5	0.0298

* Corrected level of significance is 0.0016

RR = Relative risk

S = Etiologic fraction

(Etiologic fractions are low ranging from 0.0022 to 0.24)

Statistical analysis revelaed insignificant difference in any of the antigens.

Table 10 illustrates the HLA-B antigens frequencies among patients and normal controls. Statistical analysis revealed that the only significant difference is only between the frequencies of HLA-B8. The frequency of HLA-B8 in the patients (14/33 = 42%) is significantly high compared to normal controls (25/380 = 6.5%). Fisher exact is 0.3×10^{-5} and RR = 10.6. Furthermore, the contribution of the antigen as measured by the etiologic frqction = 0.684 which is considered high. Using the total (multiple) X^2 for testing the significance of the relative risk, it is found significantly increased $Wy^2 = 34.03 : P<0.001$. (table 12)

Table 10. Statistical comparison between the HLA-B antigens frequencies among patients and controls.

HLA-B antigens	Control antigens (n=380)			Patients (n=33)			Fisher* exact	RR	S
	No.	Antigen frequency %	Gene frequency	No.	Antigen frequency %	Gene frequency			
B5	67	17.8	0.093	8	24.24	0.1295	0.0989	1.47	0.0786
B7	25	6.5	0.034						
B8	25	6.5	0.034	14	42.42	0.2411	$0.3x10^{-5}$	10.6	0.684
B12	78	20.5	0.109	5	15.15	0.0788	0.2762	0.7	-0.068
B13	12	3.1	0.016						
B14	28	4.3	0.038	7	21.21	0.1123	0.323	0.9	-0.386
B15	19	5	0.026	2	6.06	0.0307	0.2122	1.2	0.585
B16	12	3.1	0.016	2	6.06	0.0307	0.1964	2.0	0.593
B17	19	5	0.026	1	3.03	0.0788	0.4266	0.58	-0.021
B18	20	5.2	0.027	2	6.06	0.0307	0.2148	1.2	0.008
B21	21	5.5	0.028	3	9.09	0.0465	0.1347	1.8	0.037
B22	20	5.2	0.027	2	6.06	0.0307	0.1994	1.2	0.008
B27	18	4.7	0.024	1	3.03	0.0152	0.4891	0.6	-0.018
B37	16	4.2	0.022	3	9.09	0.0465	0.0989	2.3	0.05
B40	12	3.1	0.016	2	6.06	0.0307	0.1236	2.1	0.029

Statistical analysis revelaed that significant difference is only between the frequencies of HLA-B8.

Table 11 presents the frequencies of HLA-DR antigens among patients and controls. Statistical analysis revealed that the only significant difference is that between the frequencies of HLA-DR3. The DR3-antigen frequency in the patients (9/33 = 27.3%) compared to that of control (29/380 = 14.9). Chi-square = 0.2×10^{-4}; RR = 7.14; and etiologic fraction = 0.4445. Furthermore, the test of significance of the RR(total X^2) shows significant RR; $Wy^2 = 20$; $P<0.001$ (table 11).

Table 11. Statistical comparison between the HLA-DR antigens frequencies among patients and controls.

HLA-DR antigens	Control antigens (n=380)			Patients (n=33)			Fisher* exact	RR	S
	No.	Antigen frequency %	Gene frequency	No.	Antigen frequency %	Gene frequency			
DR1	18	9.2	0.048	6	18.1818	0.0954	0.0163	2.2	0.0989
DR2	40	20.6	0.109	3	9.0909	0.0465	0.2143	0.4	-0.145
DR3	29	14.9	0.078	9	27.2727	0.1471	0.2×10^{-4}	7.14	0.4445
DR4	31	20.8	0.111	8	24.2424	0.12925	0.0851	1.2	0.0429
DR5	12	6.1	0.031	5	15.1515	0.0788	0.0382	2.8	0.0969
DR7	19	9.7	0.050	7	9.0909	0.0465	0.2462	0.9	0.0079

Statistical analysis revealed that the only significant difference is that between the frequencies of HLA-DR3.

Table 12. The significance of the RR of the HLA-antigens that showed significant difference.

HLA-antigen	1/H	1/h	1/K	1/k	Y	W	Wy^2	P
B8	0.07	0.052	0.04	0.0028	2.3	6.06	34.03	<0.001
DR3	0.111	0.042	0.035	0.003	1.96	5.23	20.24	<0.001

where:

H = number of controls having the antigen (25 individuals for B8, 29 individuals for DR3))

h = numbe rof patients having the antigen (14 patients for B8, 9 patients for DR3)

K = number of control lacking the antigen (355 individuals for B8, 351 for DR3))

k = number of patients lacking the antigen (19 patients for B8, 21 patients for DR3)

The significance of the RR (total X^2) is significant; with HLA-B8 and HLA-DR3.

Table 13. Patients having and lacking B8, DR3 antigens.

Antigen	Patients with the antigen		Patents without the antigen	
	No.	%	No.	%
B8	14	42.42	19	57.57
DR3	9	27.27	24	72.73

Table 14 shows the linkage studies between HLA-B8 and DR3. The Δ-value which indicates the genetic association revealed weak negative linkage disequilibrium. The haplotype frequency indicates a biological association.

Table 14. Linkage studies between HLA-B8 and DR3.

Δ -value (deviation):

$$= \sqrt{\frac{d}{N}} - \sqrt{\frac{(b+d)(c+d)}{N^2}}$$

$$= \sqrt{\frac{24}{66}} - \sqrt{\frac{(19+24)(9+24)}{(66)^2}}$$

$$= 0.603 - 0.609$$

$$= -0.006$$

This indicates weak negative linkage disequilibrium. Thus Haplotype frequency:

$$h = \Delta + (\text{Gene frequency B8} \times \text{Gene frequency DR3})$$

$$= -0.006 + (0.2411 \times 0.1471)$$

$$= 0.0294$$

- The Δ-value as an index of genetic association revealed weak negative linkage disequilibrium.
- The haplotype frequency indicates a biological association.

Table 15 presents the individual data, mean and ±SD of IgG, IgM, IgA, C3, C4, CIC and CRP.

Table 16 illustrates the mean and ±SD of the IgA, IgG, IgM, C3 and C4 amongst the patients and controls. The levels of IgG and C3 were significantly lower in the patients than of controls ($P<0.05$). On the other hand the levels of IgA and IgM were significantly high than those of controls ($P<0.05$). Furthermore, there was no significant difference between the levels of C4 ($P>0.05$).

Table 15. Individual data for studied cases.

No	800-1800	60-280	90-450	50-120	20-50	up to	1.5 mg/dL
	IgG	IgM	IgA	C3	C4	CIC	CRP
1	1121.6	129.0	77.9	41.6	31.6	6.55	6.24
2	108.6	517.4	127.5	128.5	34.37	4.82	7.2
3	500.0	279.9	39.8	103.3	31.22	7.09	5.76
4	674.1	395.9	20.8	36.4	29.12	2.00	5.76
5	803.0	58.07	5.0	6.6	48.36	4.18	5.28
6	515.2	1748.7	292.7	138.4	52.00	5.35	4.8
7	162.4	221.6	202.9	39.9	23.14	2.48	50.76
8	192.8	821.25	308.8	50.3	31.40	2.89	6.72
9	165.2	393.79	180.0	277.9	33.28	1.92	5.76
10	117.52	521.56	284.9	137.3	30.78	4.53	5.28
11	636.0	55.69	502.2	16.92	41.62	9.49	5.28
12	660.6	417.1	504.9	43.2	30.91	2.21	50.28
13	4116.0	39.69	121.6	51.3	24.85	3.36	6.76
14	10.4	403.3	141.5	135.9	31.64	11.46	4.8
15	16.24	235.6	26.15	105.1	28.41	8.06	4.6
16	1821.6	79.5	89.5	27.53	32.83	5.00	6.24
17	150.8	162.0	267.2	56.6	37.44	2.19	5.28
18	257.5	108.5	89.2	172.0	40.35	12.79	4.8
19	291.0	99.6	15.6	43.0	29.17	1.84	5.76
20	177.2	86.1	148.5	40.8	19.78	4.16	4.32
21	150.4	64.1	263.1	58.8	28.75	10.23	3.84
22	689.4	164.6	394.1	133.0	37.29	4.17	4.32
23	153.6	47.5	72.5	133.7	26.62	1.82	5.76
24	284.0	146.8	379.9	27.79	51.89	11.53	4.32
25	269.0	298.3	299.1	57.3	34.66	2.17	3.84
26	132.4	76.8	362.8	56.9	25.92	2.92	4.32
27	154.4	215.2	186.3	110.2	27.74	4.81	7.2
28	155.0	56.1	296.9	50.1	31.64	3.27	5.76
29	539.2	27.3	411.2	36.0	35.51	14.80	5.28
30	1691.2	66.66	719.0	160.2	31.25	2.99	4.23
31	194.4	92.7	21.0	104.8	34.68	0.75	3.84
32	241.0	208.0	319.0	32.0	24.54	4.20	7.68
33	1560.0	243.0	190.0	96.0	24.18	2.61	4.8
Mean	955.67	301.348	199.478	51.838	32.65	5.26	4.987

Table 16. Mean values ±S.D. of IgA, IgG, IgG, IgM, C3 & C4 of the patients and controls and the normal range of the control (mean ±2 SD).

Group	IgA	IgG	IgM	C3	C4
Patients					
Mean	199.4*	955.6**	301.3*	51.838**	32.6
±SD	52.6	116.2	84.7	38.8	6.9
Controls					
Mean	154.0	1489.6	164.2	142.7	33.2
±SD	7.8	117.6	17.3	11.3	5.4
Normal range (Mean±2 SD)	138.4-169.6	1254.4-1724.8	129.6-198.2	120.1-165.3	22.4-44.0

* Significantly high compared to controls ($P<0.05$)

** Significantly low compared to controls ($P<0.05$).

Table 17 shows the correlation between IgG level and HLA- haplotypes of the patients. There was a significant aggregation of the low IgG among those having B8, DR3 and B8/DR3.

Table 18 and 19 show insignificant correlation between the levels of IgM and IgA and HLA-haplotypes.

Table 17. Correlation between IgG level and the HLA- haplotype of the patients.

HLA	Low IgG	Normal IgG
B8/X	7	1
DR3/$\bar{X}$	5	1
B8/DR3	5	1
X/$\bar{X}$	11	2

X : (DR3(-)

$\bar{X}$: (B8)(-)

Table 18. Correlation between IgM level and HLA-haplotype of the patients.

HLA	Low IgM	Normal IgM or high
B8/X	3	5
DR3/$\bar{X}$	3	3
B8/DR3	2	4
X/$\bar{X}$	4	9

X : (DR3(-)

$\bar{X}$: (B8)(-)

$P>0.05$

Insignificant correlation between the levels of IgM and HLA-haplotypes.

Table 19. Correlation between IgA level and HLA-haplotype of the patients.

HLA	Low IgA	Normal IgA or high
B8/X	1	7
DR3/$\bar{X}$	2	4
B8/DR3	3	3
X/$\bar{X}$	4	9

X : (DR3(-)

$\bar{X}$: (B8)(-)

$P>0.05$

Insignificant correlation between the levels of IgA and HLA-haplotypes.