Results

Personal data of the studied adolescents are shown in tables 1, 2, 3 and figures 1, 2, 3

Degree of parents education are illustrated by tables 4, 6 and figures 4, 6.

Table 5 and figure 5 show distribution of studied adolescents according to mother's work.

Table 7 and figure 7 show distribution of studied adolescents according to past history of chickenpox. Only 14.4% of studied adolescents were affected by chickenpox diagnosed by medical personell.

Past history of exposure to chickenpox either from diseased sibling or classmate was looked for in all studied adolescents and results are shown in tables 8, 18 and figure 8, 18.

Table 9 and figure 9 show distribution of studied adolescents according to VZV IgG status. Only 6.7% of all cases were VZV immunoglobulin negative.

Table 11 and figuer 11 show the effect of sex on the number of VZV IgG positive cases. No significant difference was found between males and females (P > 0.05).

Table 12 and figure 12 illustrate the relation between the number of VZV IgG positive cases and residence. The number was significatly higher in rural than urban dwellers.

Regarding the effect of socioeconomic classes on the number of VZV IgG positive cases, the number was significantly lower in high socio-economic class compared to lower socioeconomic classes. This is illustrated by table 13 and figure 13.

Table 14, 16 and figure 14, 16 illustrate the number of VZV IgG positive cases in relation to parental education. The number was significantly higher with illiterate than with higher degrees of education (P < 0.05).

The relation between mother's work and the number of VZV IgG positive cases is shown by table 15 and figure 15. soeropositivity was signifiantly higher with nonworking mothers compared to working mothers (P < 0.05).

Past history of chickenpox and its effect on the number of VZV IgG positive cases were looked for in all studied adolescents. Table 17 and figure 17 show that the number was significantly higher with positive past history than with negative past history.

Past history of exposure to chickenpox whether from diseased classmate or sibling in relation to the number of VZV IgG positive cases was illustrated by table 19, 20 and figure 19, 20. there was no significant difference between positive and negative history.

Table 21, 23 and figure 21, 23 a, b show the relation between the number of siblings and the number of VZV IgG positive cases. The number of positive cases increases significantly with the increase in the number of siblings till it reaches 100% seropositivity at 4 or more siblings.

There was no signifiant effect exerted by age (11-15 years) on the number of VZV IgG positive cases. This is illustrated by table 10, 22 and figure 10, 22 a,b.

Table 24 and figure 24 show the effect of different variants on VZV IgG titre. The mean titre was significantly high in VZV IgG positive cases compared to negative cases, with rural compared to urban dwellers and with positive past history of chickenpox compared to negative past history. Also, the mean titre was non significantly affected by past history of exposure to sibling with chickenpox, exposure to classmate with chickenpox, sex and maternal work.

As regard the relation between socioeconimic classes and VZV IgG titre, the mean VZV IgG level was significantly lower with high socioecomic class compared to lower classes. This is shown by table 25 and f igure 25.

Table 26, 27 and f igure 26. 27 illustrate the effect of degree of parents education on VZV IgG titre. The mean VZV IgG level was significantly low in highly educated parents compared to lesser degrees of education.

Table (28) shows that there is no correlation between vzv IgG level and both age of adolescents, and number of siblings.

Table 1. Sex distribution of the studied adolescents.

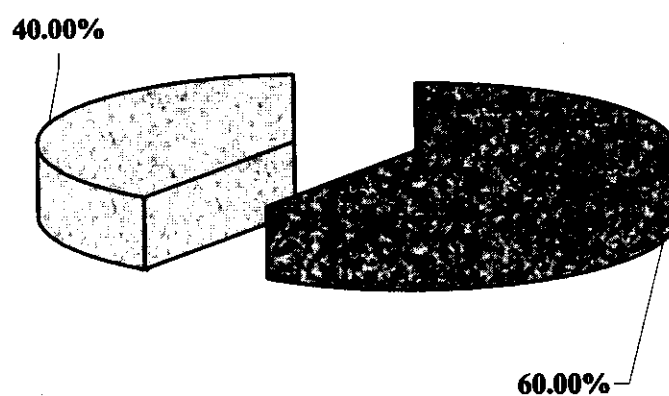| Sex				
	No	%	X^2	P-value
Female	54	60.0	3.600	0.058
Male	36	40.0		

Fig. 1. sex distribution of the studied adolescents

Table 2. Distribution of the studied adolescents according to their residence.

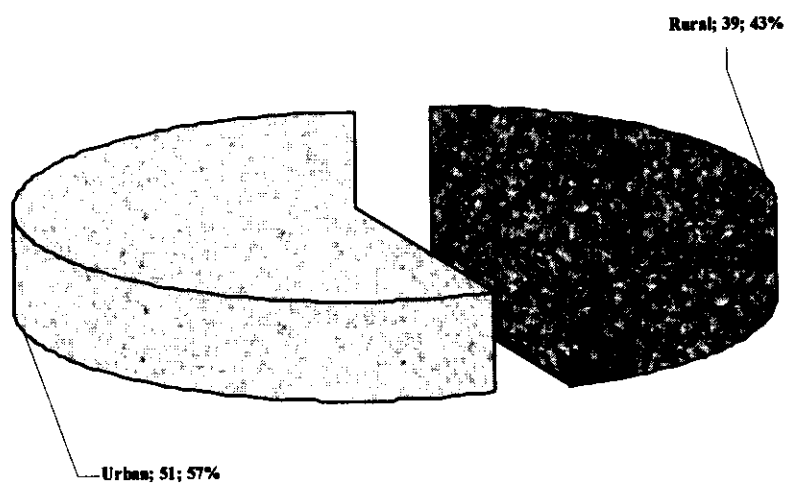| Residence				
	No	**%**	**X^2**	**P-value**
Rural	39	43.3	1.600	0.20
Urban	51	56.7		

Rural; 39; 43%

Urban; 51; 57%

Fig. 2. Distribution of the studied adolescents according to their residence.

Table 3. Distribution of the studied adolescents according to socioeconomic status.

Socio-economic status				
	No	%	X^2	P-value
Low	33	36.7		
Moderate	47	52.2	25.800	0.00*
High	10	11.1		

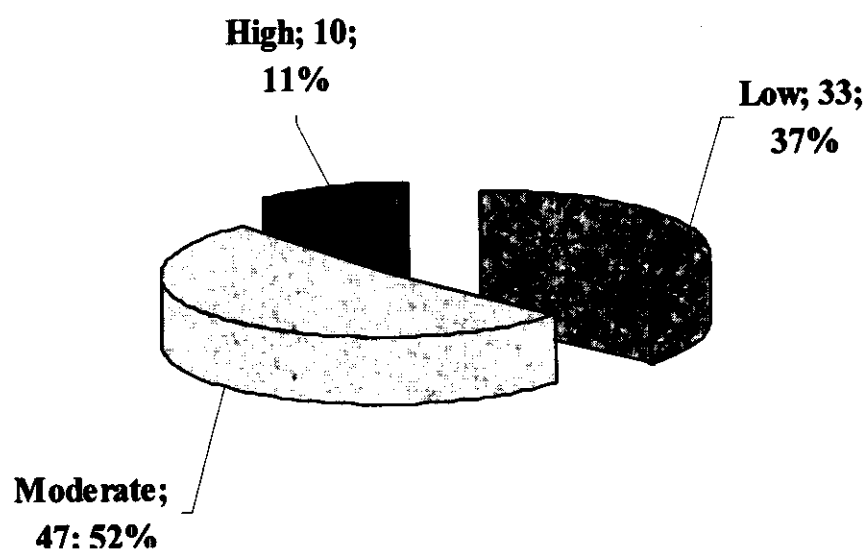

High; 10; 11%

Low; 33; 37%

Moderate; 47: 52%

Fig. 3. Distribution of the studied adolescents according to socioeconomic status.

Table 4. Distribution of the studied adolescents according to maternal education.

Mother education				
	No	**%**	**X^2**	**P-value**
Graduate	11	12.2		
Moderate	18	20.0	20.489	0.00*
Read and Write	21	23.3		
Illiterate	40	44.4		

Mother education

Illiterate; 40; 44.44%

Graduate; 11; 12.22%

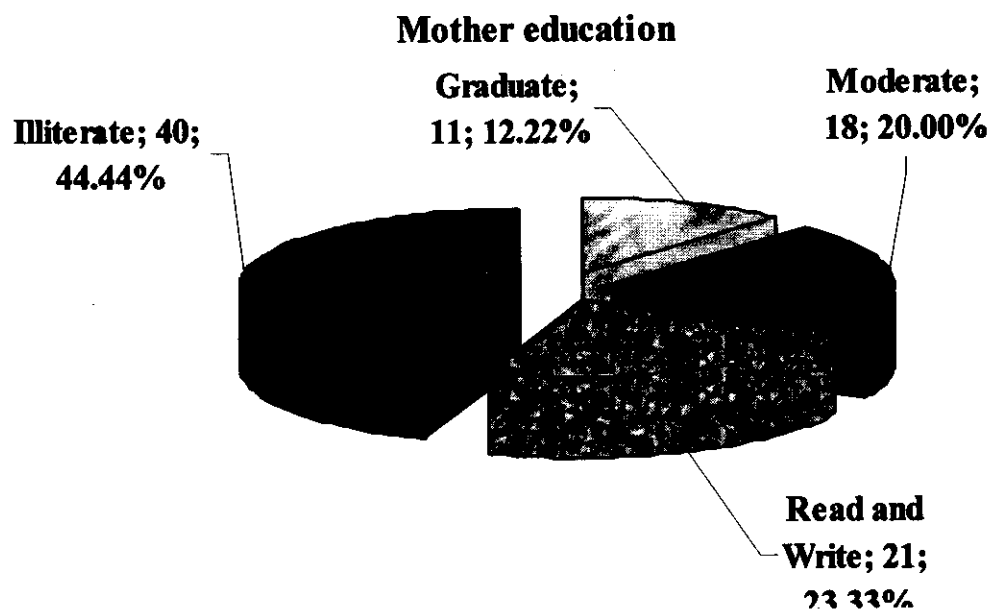Moderate; 18; 20.00%

Read and Write; 21; 23.33%

Fig. 4. Distribution of the studied adolescents according to maternal education.

Table 5. Distribution of studied adolescents according to mother's work

Mother's work				
	No	**%**	**X^2**	**P-value**
Non-working	68	75.6	23.511	0.00*
Working	22	24.4		

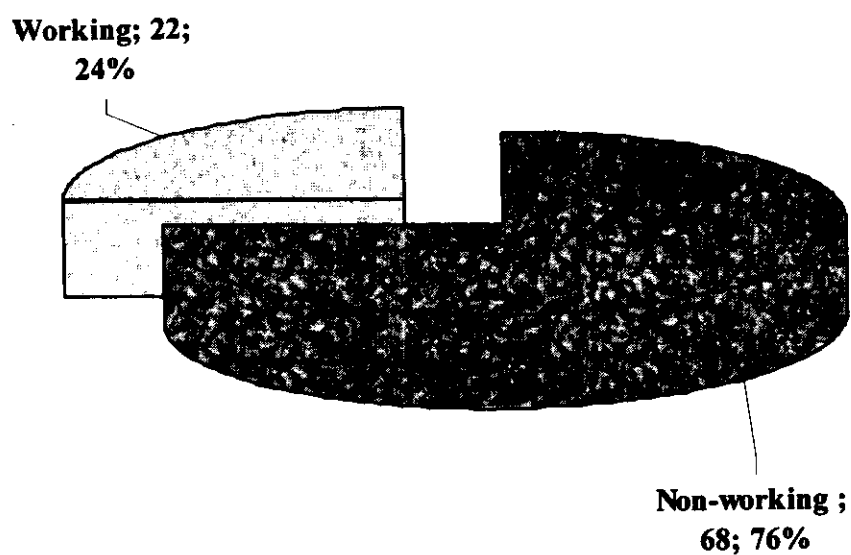Working; 22; 24%

Non-working ; 68; 76%

Fig. 5. Distribution of studied adolescents according to mother's work

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Table 6. Distribution of studied adolescents according to father's education .

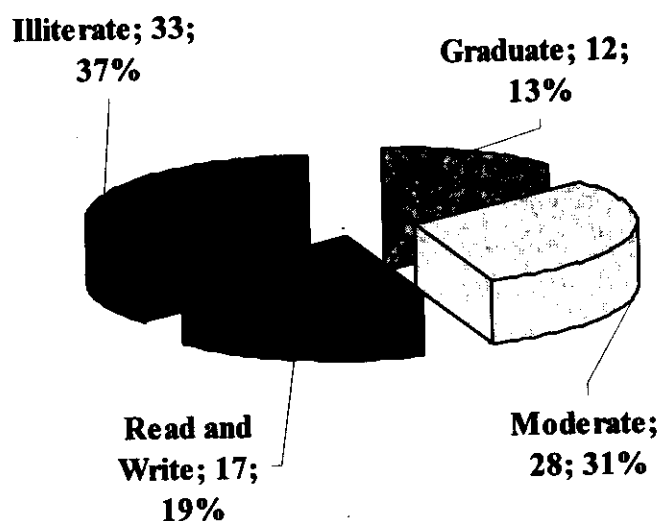| Father's education				
	No	%	X^2	P-value
Graduate	12	13.3		
Moderate	28	31.1	12.489	0.00*
Read and Write	17	18.9		
Illiterate	33	36.7		

Fig. 6. Distribution of studied adolescents according to father's education .

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Table 7. Distribution of studied adolescents according to past history of chickenpox .

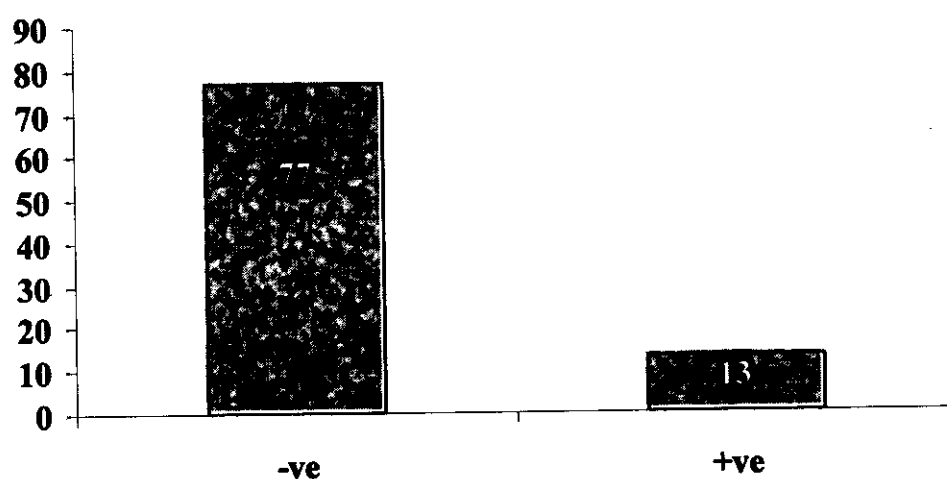| Past history of chickenpox				
	No	%	X^2	P-value
-ve	77	85.6	45.511	0.00*
+ve	13	14.4		

Fig. 7. Distribution of studied adolescents according to past history of chickenpox .

Table 8 Distribution of adolescents previously exposed to chickenpox according to source of exposure (classmate or sibling)

Source of Exposure to chickenpox			
	No	**%**	**Fisher's exact test (P-value)**
Classmate	12	60	0.293
Sibling	8	40	

Sibling; 8; 40%
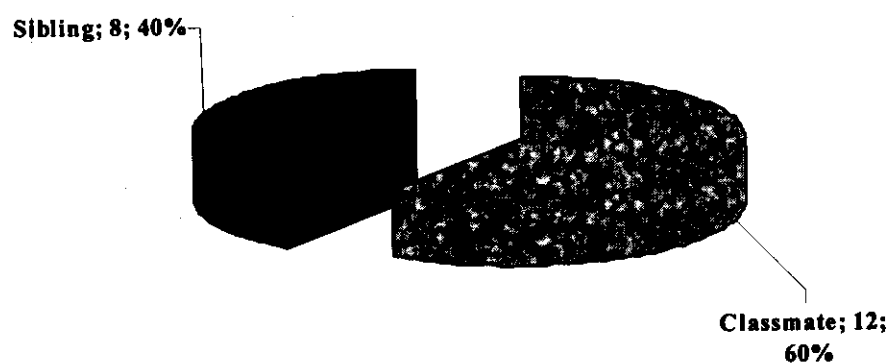
Classmate; 12; 60%

Fig .8. Distribution of adolescents previously exposed to chickenpox according to source of exposure (classmate or sibling)

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Table 9. Distribution of the studied adolescents according to VZV serological status

VZV IgG				
	N	%	X^2	P-value
-ve	6	6.7	67.600	0.00*
+ve	84	93.3		

-ve; 6; 7%
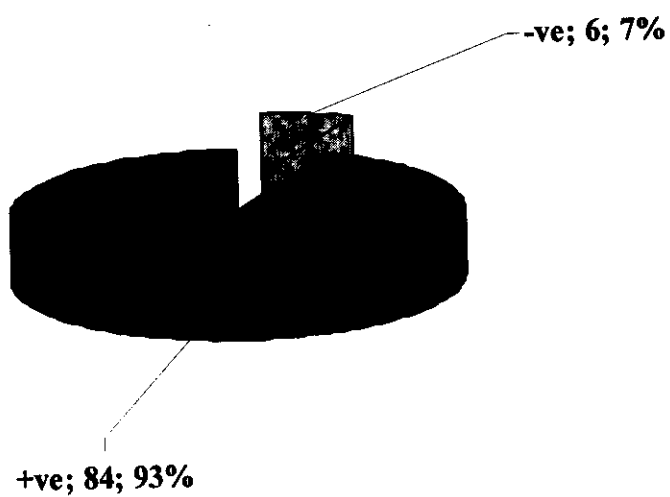
+ve; 84; 93%

Fig. 9. Distribution of the studied adolescents according to VZV serological status

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Table 10. Mean ages of studied adolescents according to vzv serological status

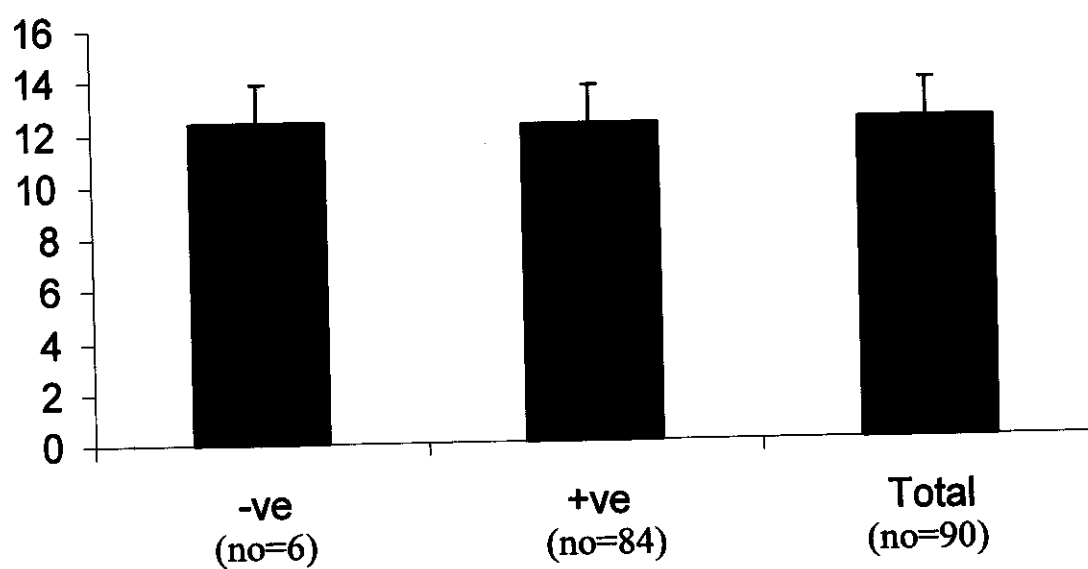| vzv IgG	Age in years Mean ± SD	T-test	
		T	P-value
-ve (No=6)	12.33±1.505		
+ve (No=84)	12.214±1.448	0.194	0.847
Total (No= 90)	12.272± 1.476		

Fig. 10. Mean ages of studied adolescents according to vzv serological status

Table 11. Varicella zoster virus serological status of studied adolescents according to sex

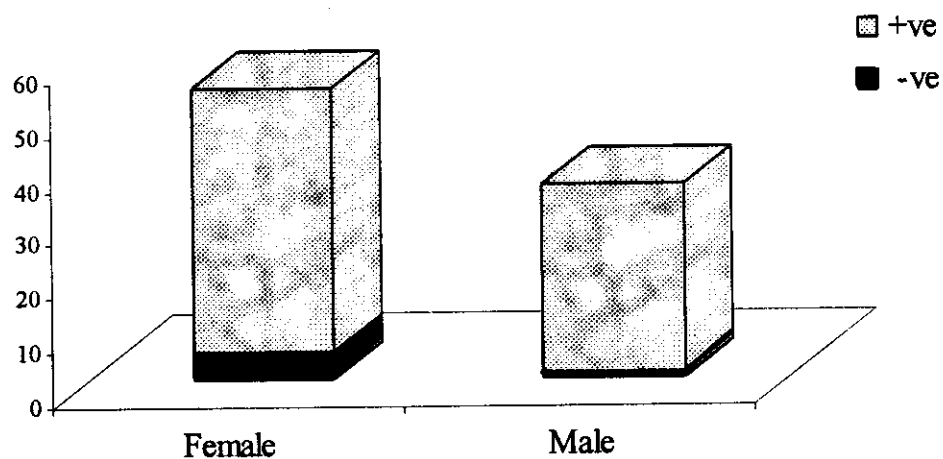| Cross table			VZV IgG		Total
			-ve	+ve	
Sex	Female	No	5	49	54
		% of Total	5.6%	54.4%	60.0%
	Male	No	1	35	36
		% of Total	1.1%	38.9%	40.0%
Total		No	6	84	90
		% of Total	6.7%	93.3%	100.0%
Fisher's Exact Test	P-value		0.224		
Odd ratio	Value		3.57		
	95% CI		(0.4: 31.92)		

Fig. 11. Varicella zoster virus serological status of studied adolescents according to sex

Table 12. Varicella zoster virus serological status of studied adolescents according to their residence .

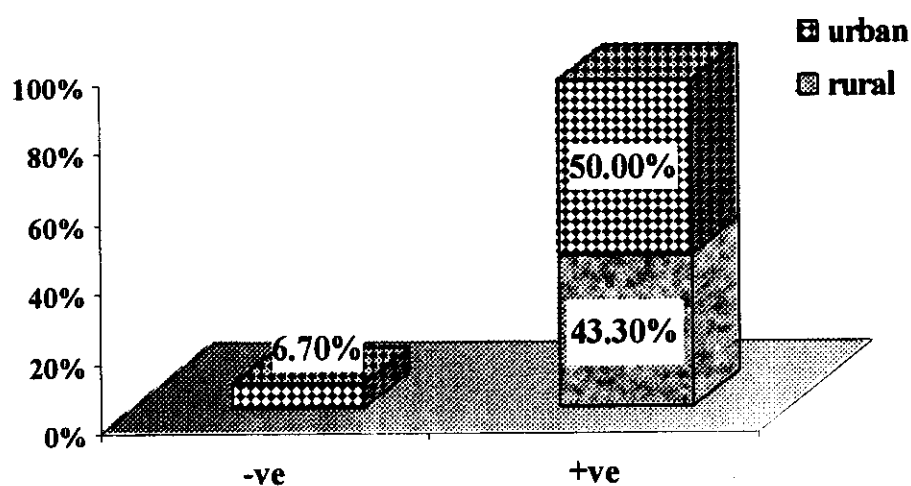|			VZV IgG		Total
			-ve	+ve	
Residence	**rural**	**No**	0	39	39
		% of Total	0	43.3%	43.3%
	urban	**No**	6	45	51
		% of Total	6.7%	50.0%	56.7%
Total		**No**	6	84	90
		% of Total	6.7%	93.3%	100.0%
Fisher's Exact Test		**P-value**	0.029*		

Fig . 12. Varicella zoster virus serological status of studied adolescents according to their residence .

Table 13. Varicella zoster virus serological status of studied adolescents according to socioeconomic state

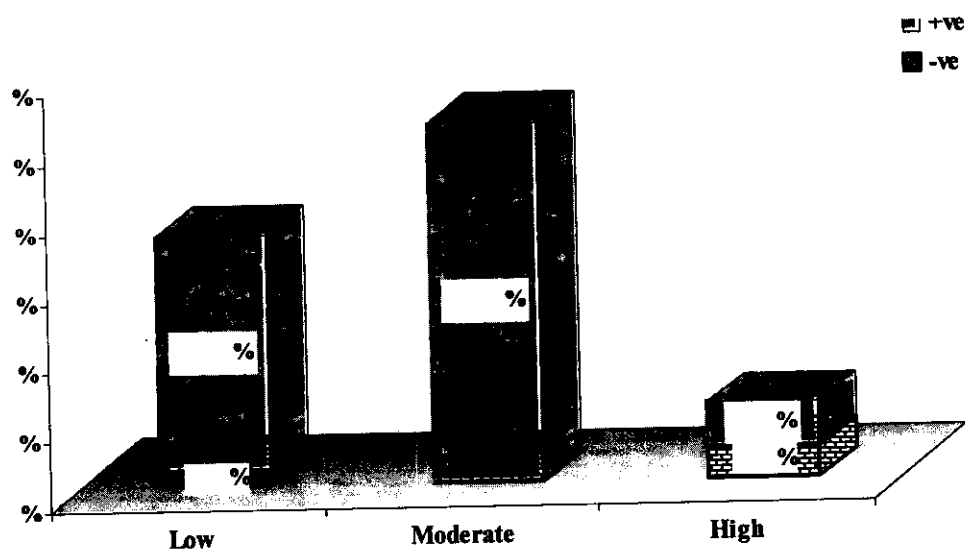|			VZV IgG		Total
			-ve	+ve	
Socio-economic state	Low	No	2	31	33
		% of Total	2.2%	34.4%	36.7%
	Moderate	No	0	47	47
		% of Total	0	52.2%	52.2%
	High	No	4	6	10
		% of Total	4.4%	6.7%	11.1%
Total		No	6	84	90
		% of Total	6.7%	93.3%	☐100.0%
Likelihood Ratio		value	16.63		
		P-value	0.00*		

Fig. 13. Varicella zoster virus serological status of studied adolescents according to socioeconomic state

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Table 14. Varicella zoster virus serological status of studied adolescents according to maternal education .

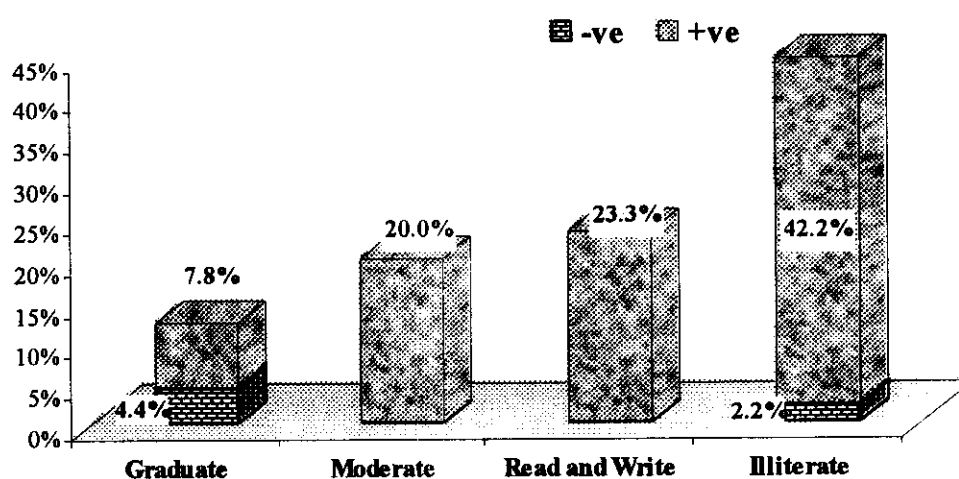|			VZV IgG		Total
			-ve	+ve	
Mother's education	Graduate	No	4	7	11
		% of Total	4.4%	7.8%	12.2%
	Moderate	No	0	18	18
		% of Total	0	20.0%	20.0%
	Read and Write	No	0	21	21
		% of Total	0	23.3%	23.3%
	Illiterate	No	2	38	40
		% of Total	2.2%	42.2%	44.4%
Total		No	6	84	90
		% of Total	6.7%	93.3%	100.0%
Likelihood Ratio		value	13.78		
		P-value	0.003*		

Fig . 14. Varicella zoster virus serological status of studied adolescents according to maternal education .

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Table 15. Varicella zoster virus serological status of studied adolescents according to mother's work

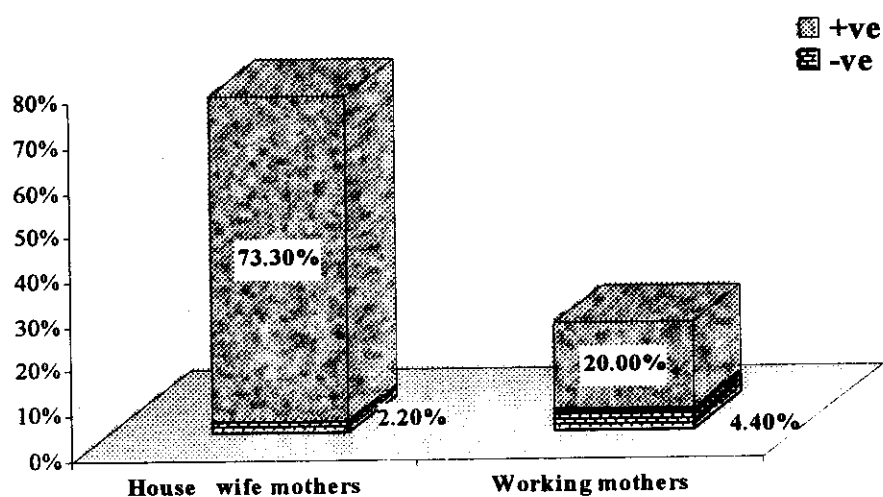|			VZV IgG		Total
			-ve	+ve	
Mother's work	Non working	No	2	66	68
		% of Total	2.2%	73.3%	75.6%
	Working	No	4	18	22
		% of Total	4.4%	20.0%	24.4%
Total		No	6	84	90
		% of Total	6.7%	93.3%	100.0%
Fisher's Exact Test		P-value	0.03*		
Odd ratio		Value	0.136		
		95% CI	(0.023:0.805)		

Fig 15. Varicella zoster virus serological status of studied adolescents according to mother's work

Table 16. Varicella zoster virus serological status of studied adolescents according to father's education

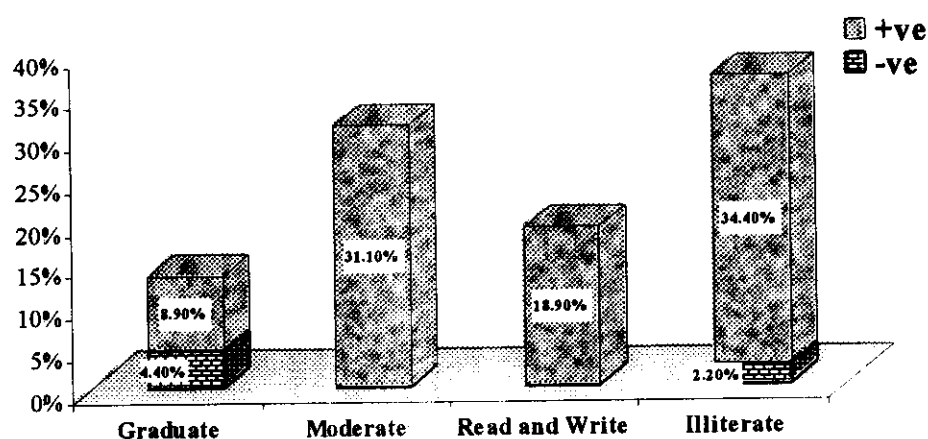|			VZV IgG		Total
			-ve	+ve	
Father's education	**Graduate**	No	4	8	12
		% of Total	4.4%	8.9%	13.3%
	Moderate	No	0	28	28
		% of Total	0	31.1%	31.1%
	Read and Write	No	0	17	17
		% of Total	0	18.9%	18.9%
	Illiterate	No	2	31	33
		% of Total	2.2%	34.4%	36.7%
Total		No	6	84	90
		% of Total	6.7%	93.3%	100.0%
Likelihood Ratio		value	13.72		
		P-value	0.003*		

Fig 16. Varicella zoster virus serological status of studied adolescents according to father's education

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Table 17. Varicella zoster virus serological status of studied adolescents according to past history of chickenpox .

			VZV IgG		Total
			-ve	+ve	
Chickenpox history	-ve	No	6	71	77
		% of Total	6.7%	78.9%	85.6%
	+ve	No	0	13	13
		% of Total	0	14.4%	14.4%
Total		No	6	84	90
		% of Total	6.7%	93.3%	100.0%
Fisher's Exact Test		P-value	0.046		

Seropositivity 92.2%

☐ -ve   ☒ +ve

Seropositivity 100%
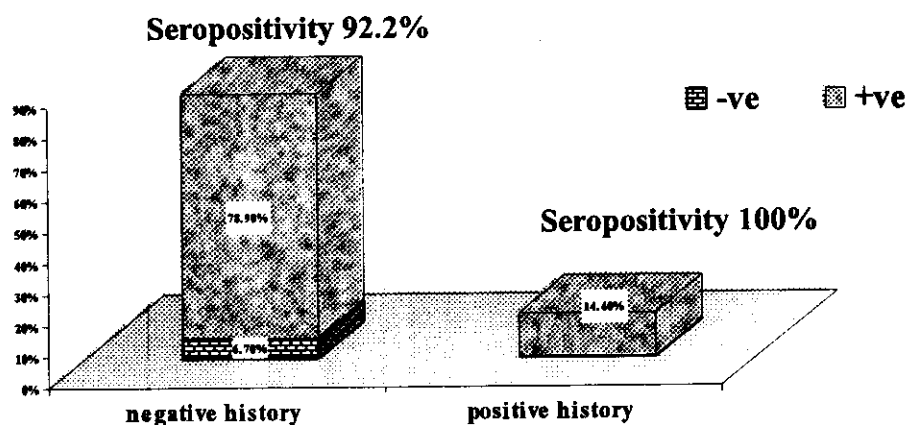
negative history   positive history

Fig.17. Varicella zoster virus serological status of studied adolescents according to past history of chickenpox .

Table 18. Past history of exposure to chickenpox in relation to VZV IgG seropositivity.

Past History of exposure					
		No	%	X^2	P-value
Exposed n=20	+ve	17	85	27.77	0.00*
	-ve	3	15		
Not exposed n=70	+ve	67	95.7		
	-ve	3	4.3		

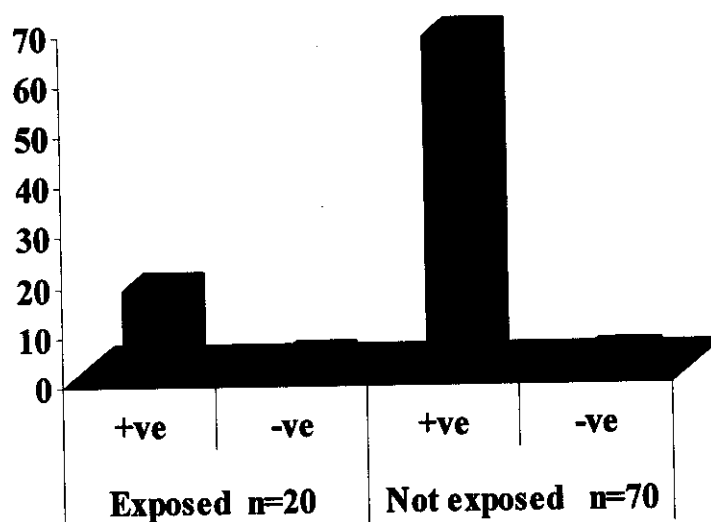+ve: VZV IgG positive cases

-ve: VZV IgG negative cases

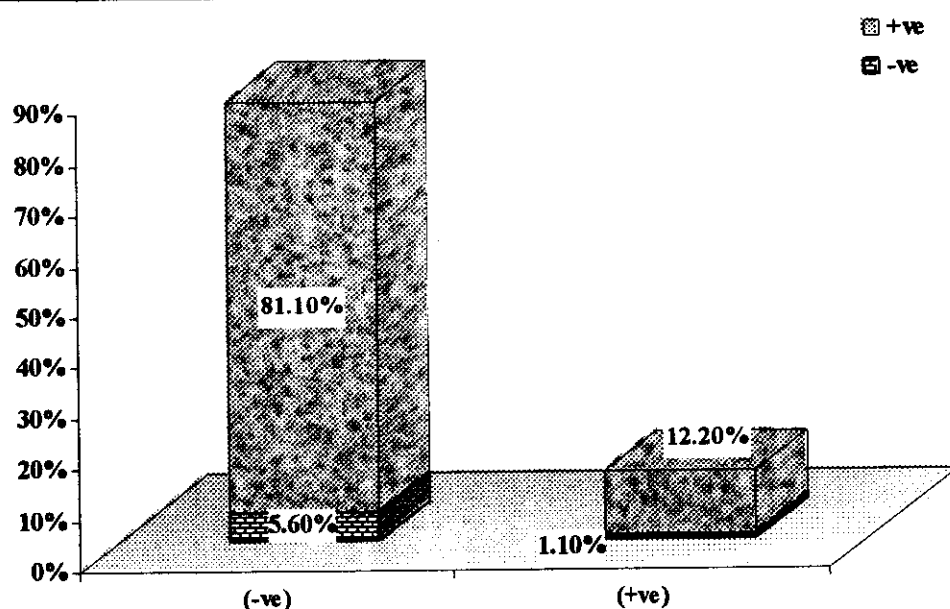**Fig. 18.** Past history of exposure to chickenpox in relation to VZV IgG seropositivity.

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Table 19. Varicella zoster virus serological status of studied adolescents according to past history of exposure to diseased classmate with chickenpox .

			vzv IgG		Total
			-ve	+ve	
Classmate	-ve	No	5	73	78
		% of Total	5.6%	81.1%	86.7%
	+ve	No	1	11	12
		% of Total	1.1%	12.2%	13.3%
Total		No	6	84	90
		% of Total	6.7%	93.3%	100.0%
Fisher's Exact Test		P-value	0.554		
Odd ratio		Value	0.676		
		95% CI	(0.071:6.387)		

Fig. 19 . Varicella zoster virus serological status of studied adolescents according to past history of exposure to diseased classmate with chickenpox .
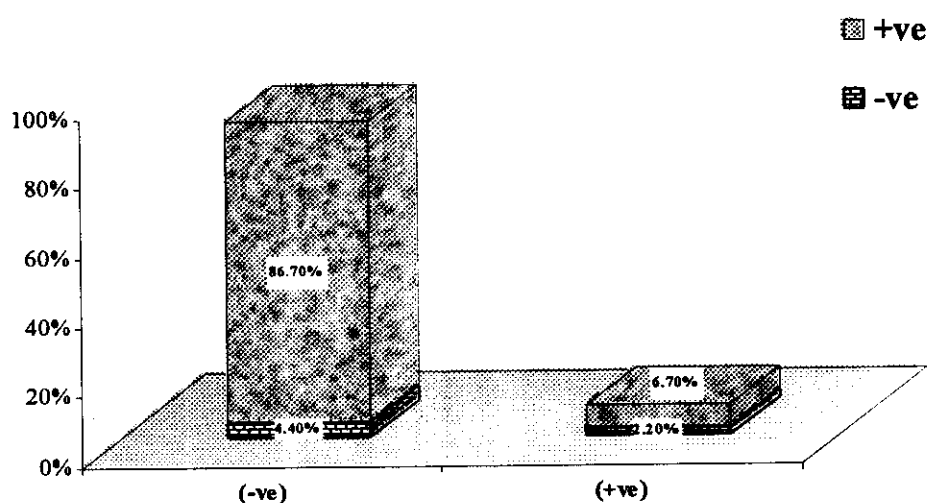
91

Table 20. Varicella zoster virus Serological status of studied adolescents according to past history of exposure to diseased siblings with chickenpox .

			vzv IgG		Total
			-ve	+ve	
Siblings	-ve	No	4	78	82
		% of Total	4.4%	86.7%	91.1%
	+ve	No	2	6	8
		% of Total	2.2%	6.7%	8.9%
Total		No	6	84	90
		% of Total	6.6%	%493.	100.0%
Fisher's Exact Test		P-value	0.087		
Odd ratio		Value	0.153		
		95% CI	(0.023: 1.017)		

Fig 20 Varicella zoster virus Serological status of studied adolescents according to past history of exposure to diseased siblings with chickenpox .

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Table 21 Number of siblings of studied adolescents in relation to their serological status

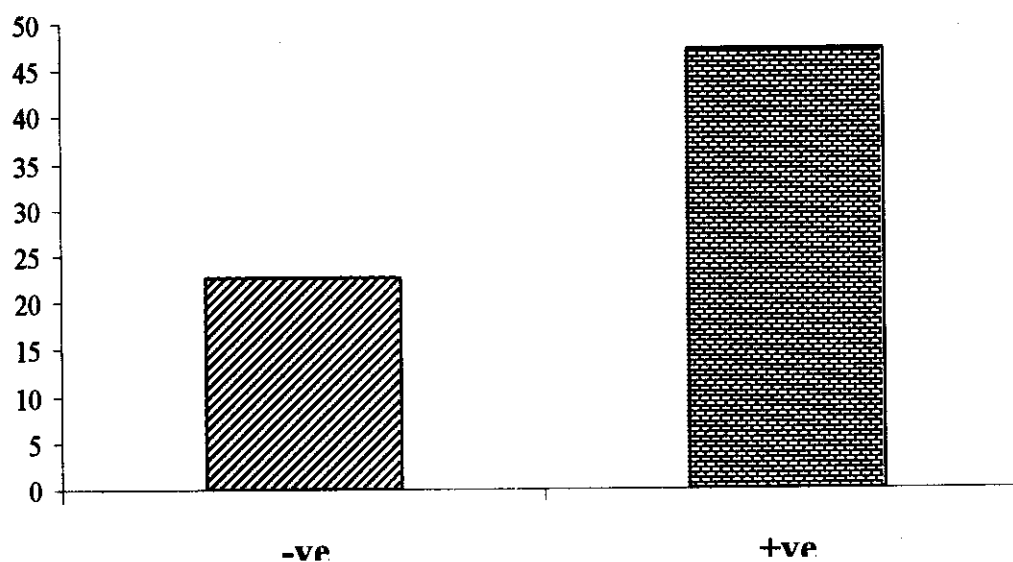| VZV IgG	No. of siblings		Mean rank	Mann-Whitney test	
	Range	Median		Z	P-value
-ve No=6	(1:3)	2.5	22.67	-2.27	0.02*
+ve No=84	(1:9)	3	47.13		

fig.21. Number of siblings of studied adolescents in relation to their serological status (using the mean rank).

Tale 22 Relation of age to serum VZV IgG

Age (ROC-curve) with IgG					
Cut off	Sens.	Spec.	+PV	-PV	Area under the ROC curve
<=11	46.4	66.7	95.1	8.2	0.547

sens. = sensitivity +pv = positive predictive value

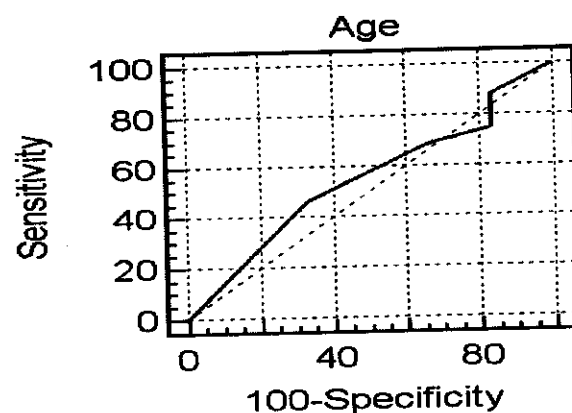spec. = specificity -pv = negative predictive value

Fig. (22.a) ROC – curve representing the effect of age (11-15years) on serum VZV IgG.
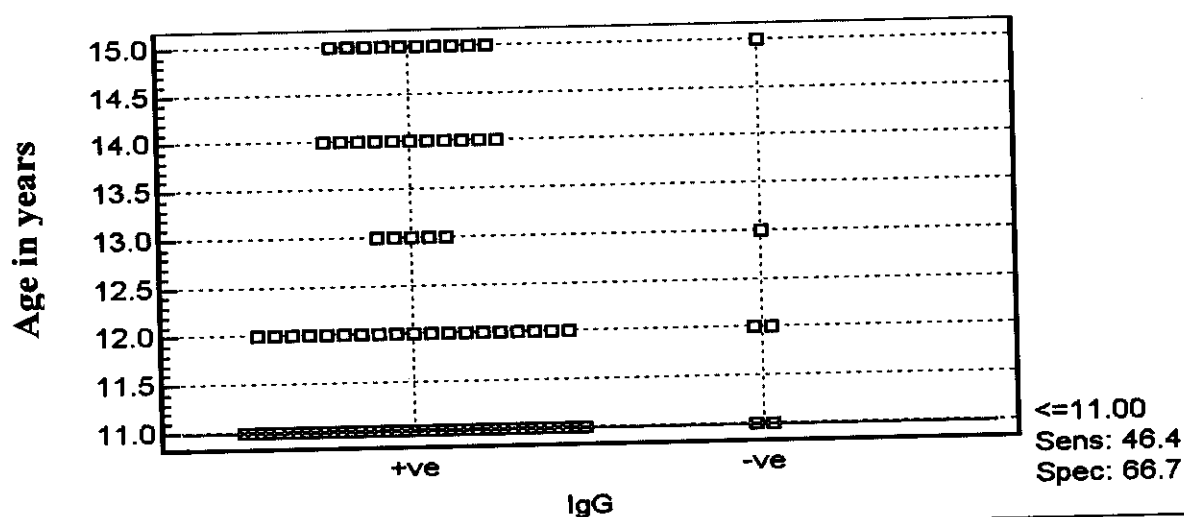

fig .(22.b) serum VZV IgG in relation to age (11-15years)

Table 23 Relation of number of siblings to serum VZV IgG

No. of siblings (ROC-curve) with IgG					
Cut off	Sens.	Spec.	+PV	-PV	Area under the ROC curve
> 3	48.8	100.0	100.0	12.2	0.772

sens. = sensitivity +pv = positive predictive value

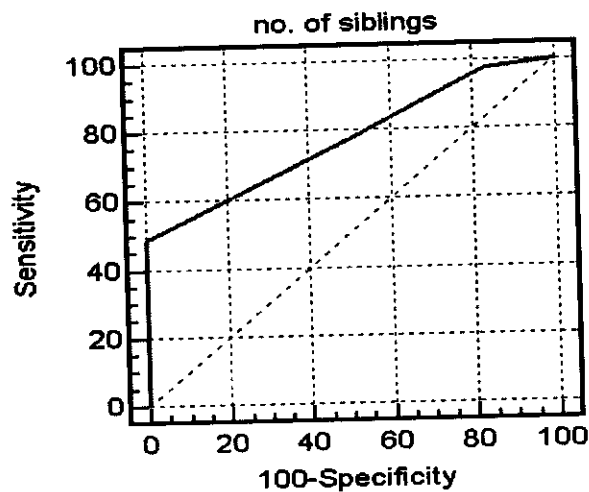spec. = specificity -pv = negative predictive value

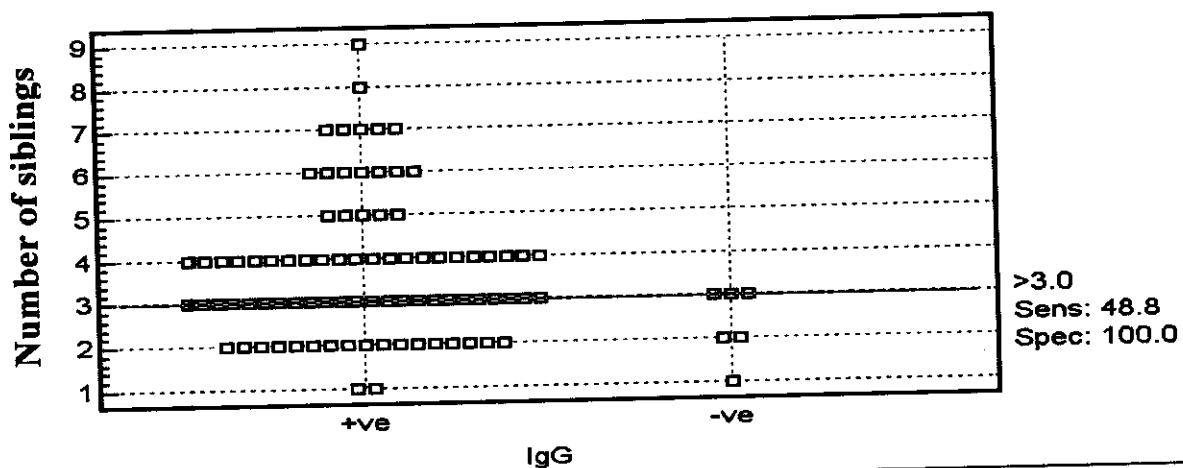**Fig. (23.a)** ROC – curve representing the effect of number of siblings on serum VZV IgG

Fig. (23.b) serum VZV IgG in relation to number of silbings

Table 24. Mean levels of serum VZV IgG with different variants

Variants		VZV IgG Titer (Iu/ml)			T – Test	
		Mean	±	SD	T	P-value
IgG	+ve	0.610	±	0.176	6.616	0.000
	-ve	0.130	±	0.037		
Past history of chicken pox	+ve	0.679	±	0.213	-2.084	0.035
	-ve	0.571	±	0.209		
Exposure to sibling with chicken pox	+ve	0.552	±	0.277	-0.364	0.717
	-ve	0.580	±	0.203		
Exposure to classmate with chicken pox	+ve	0.554	±	0.263	-0.568	0.572
	-ve	0.584	±	0.192		
Residence	Urban	0.538	±	0.232	-2.176	0.032
	Rural	0.629	±	0.162		
Sex	Male	0.564	±	0.172	-0.498	0.620
	Female	0.587	±	0.231		
Maternal work	1	0.508	±	0.269	-1.490	0.148
	2	0.600	±	0.182		

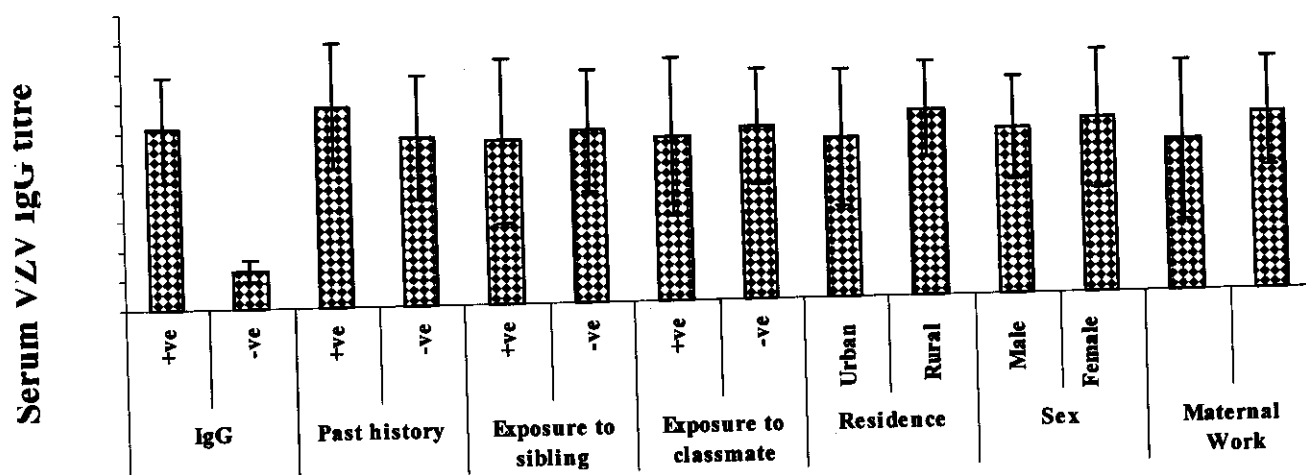1 = working mother   2 = non working mother

**Fig. 24. The effect of different variants on VZV IgG titre.**

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Table 25 Mean VZV IgG levels in relation to socioeconomic classes.

ANOVA (Socio economic state)				
	Mean ± *SD* (Iu/ml)		ANOVA	
			F	P
Group I	0.575 ± 0.197			
Group II	0.625 ± 0.175		7.243	0.001*
Group III	0.366 ± 0.274			
LSD test				
GI&	**GII**	0.261	**GII&GIII** 0.00*	
	GIII	0.004*		

group 1 = low socioeconomic class

group II = moderate socioeconomic class

group III = high socioeconomic class.
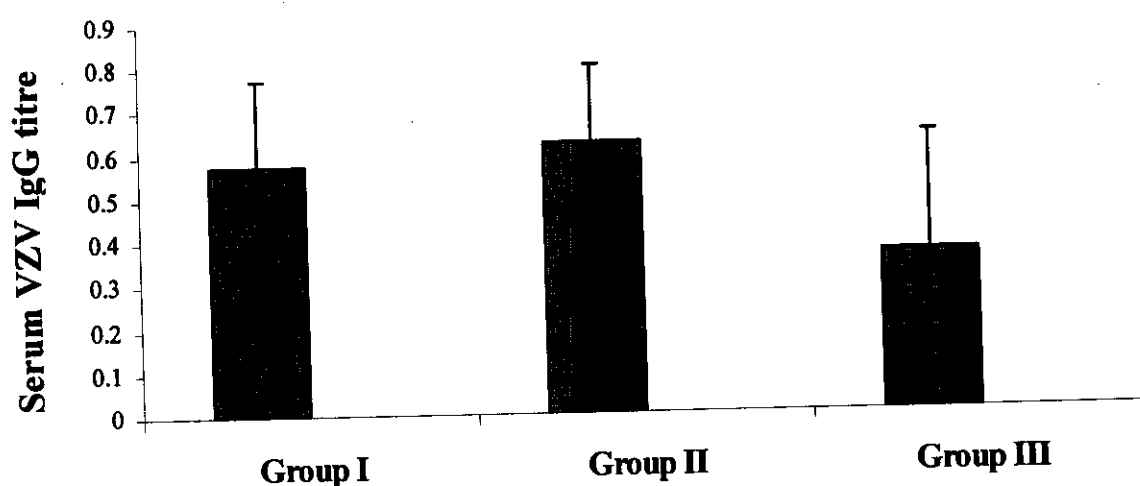
group 1 = low socioeconomic class

group II = moderate socioeconomic class

group III = high socioeconomic class.

Fig. 25 Mean serum VZV IgG titre in different socioeconomic classes.

Table 26. Mean serum VZV IgG titre in relation to mother's education.

ANOVA (mother's education)				ANOVA	
	Mean (Iu/ml)	±	SD	F	P
Group I	0.579	±	0.197		
Group II	0.644	±	0.143	4.029	0.010
Group III	0.615	±	0.212		
Group IV	0.386	±	0.263		
LSD test					
GI&	GII	0.233	GII&	GIII	0.659	GIII&GIV	0.006*

GI& : GII 0.233, GIII 0.538, GIV 0.009*
GII& : GIII 0.659, GIV 0.001*
GIII&GIV 0.006*

group I = illiterate   group II = read and write
group III = moderate   group IV = graduate
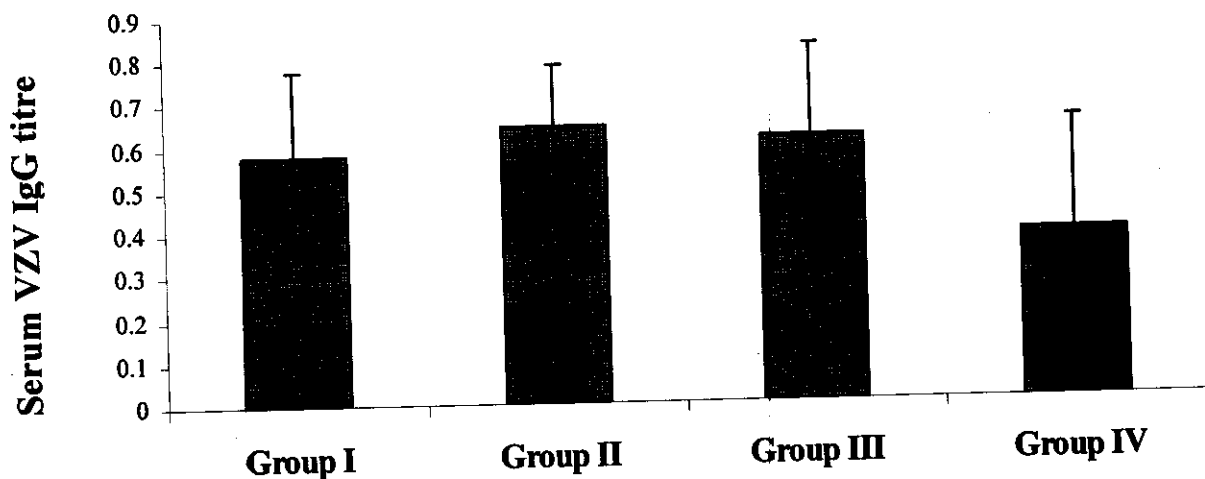
group I = illiterate   group II = read and write
group III = moderate   group IV = graduate

Fig.26. Mean serum VZV IgG titre in relation to mother's education.

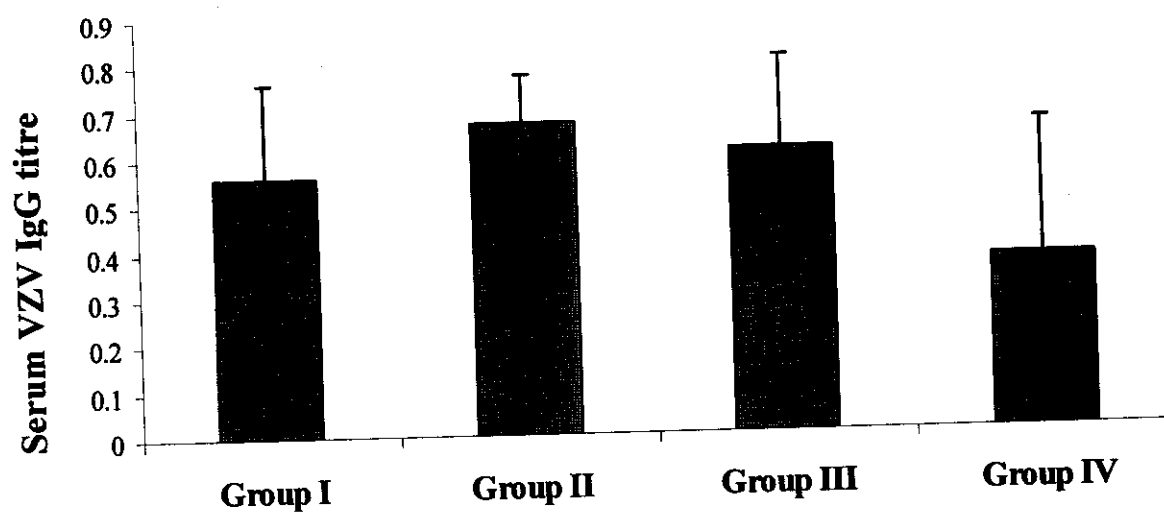**Table 27.** Mean serum VZV IgG titre in relation to father's education.

ANOVA (father's education)					
	Mean (Iu/ml)	±	SD	ANOVA	
				F	P
Group I	0.557	±	0.202	3.739	0.014
Group II	0.668	±	0.107		
Group III	0.610	±	0.195		
Group IV	0.372	±	0.289		
LSD test					
GI&	GII	0.067	GII&	GIII	0.350	GIII&GIV	0.010*
	GIII	0.305		GIV	0.002*		
	GIV	0.060					

group I = illiterate   group II = read and write

group III = moderate   group IV = graduate

group I = illiterate   group II = read and write

group III = moderate   group IV = graduate

fig. 27. Mean serum VZV IgG titre in relation to father's education.

Table 28. Correlation between serum VZV IgG level and both age of adolescents and number of siblings.

Correlation with VZV IgG titre		
Independant variables	r	P-value
No. of sibling	-0.032	0.763
Age of adolescents	-0.055	0.609