VARIATIONS OF IMMUNOGLOBULINS IN THE SERUM OF ADOLESCENTS OF PUBERTY AGE

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Abstract: The study was performed on 13 schoolboys and 13 schoolgirls at puberty age. The immunoglobulins (Ig G, Ig A and Ig M) concentrations were determined at rest conditions in the morning serum. The rest values of immunoglobulins are significantly higher in the schoolgirls than the values in the schoolboys of the same age (Ig G 13.3 ± 1.36 g/L vs. 9.45 ± 1.69 g/L $p<0.001$; Ig A 2.76 ± 0.31 g/L vs. 1.96 ± 0.63 g/L, $p<0.001$ and Ig M 2.96 ± 0,43 g/l vs. 1.72 ± 0.62 g/L, $p<0.001$). These values are significantly lower than the values determined in adults of both sexes. Simultaneously was determined the same parameters in the children of pre-puberty age. These determinations reveal concentrations situated much under the levels found in youths of puberty age, the differences being significant between them. The onset of puberty has effects not only on genital system, on sexual secundary features, on the growth and the development of the organism, but also on the immune system in the studied cases on specific humoural immunity.

INTRODUCTION

The puberty is a complex and polymorphous phenomenon and, in the view of a lot of specialists, it was contradictory or at least un-uniformly interpreted. (Berg et al., 1989; Cotuna., 1997; Cotuna et al., 1998; Cotuna, 2004; Kroop et al., 1976; Cotuna and Neacsu, 2003).

Some specialists consider that the puberty restricts to one moment - the first menstrual flow for girls and the first pollution for boys. In the present view, the puberty is a step of variable duration. During this step, primary sexual features become similar to that of adults by accelerating development process. The sexual secondary features have very important place in the body structure (Cotuna, 1997). Simultaneously, significant modifications appear in the process of growth and developmet. A series of investigations were performed on the sportsmen of different ages. (Green et al.1981, Lewicki et al., 1987, Cotuna and Neacsu, 2003, Cotuna, 2004).

Few investigations approached the puberty age influence on immune function of the organism, more exact on the existent differences between young and adult organisms (Cotuna and Neacsu, 2003). We did not yet find references regarding the ontogenesis of immunoglobulin synthesis in human and animal organism.

Starting from this general view, we give in this paper our results about the influence of puberty onset on immune function of the organism, namely of specific humoural immunity (the producing of the three types of immunoglobulins - IgG, IgA and IgM).

MATERIAL AND METHODS

The determinations of the three types of immunoglobulin concentration (IgG, IgA and IgM) in the puberty age children were made by nephelometric technique.

The blood samples (3 – 4 mL) were taken in the morning, without anticoagulating agent. The separation of serum was made by centrifugation 10 minutes at 30000 r.p.m.

It was demonstrated that serum proteins quantification by immunoprecipitation in liquid phase is well correlated with the determinations by Mancini radial immunodiffusion and have a good reproductibility. The immunoprecipitation in liquid phase with final nephelometric point was performed by Orion Diagnostica Turbox test.

The determinations were carried out on two equally groups of puberty age children (totally 26 persons), clinically healthy and also, on 10 pre-puberty children. All investigations were performed after the most three hours from blood sampling. Student “t” test was applied for the statistical analysis of the obtained data.

RESULTS AND DISCUSSIONS

The mean values of serum immunoglobulin concentrations in healthy adults are: IgG = 10.31 ± 0.48 g/L; IgA = 2.32 ± 0.22 g/L and IgM = 1.05 ± 0.11 g/L (Nieman, 1989), considered as reference data.

In the table 1 there are presented our results for puberty age subjects comparatively with this reference data.

Table 1. The serum immunoglobulin titre (Mean ± SE).

AD=adults, PUB=puberals

Author	n	IgG g/L	IgA g/L	IgM g/L
Nieman D.C.(AD)	9	10.31±0.48	2.32±0.22	1.05±0.11
Cotuna D. (PUB)	26	11.38±0.46	2.36±0.09	2.34±0.10

The determinations in a group of 26 individuals (girls and boys) revealed the following mean values: IgG = 11.38 ± 0.46 g/L; IgA = 2.36 ± 0.09 g/L; IgM = 2.34 ± 0.10 g/L

The mean values of serum immunoglobulins concentration registered in two sexes are different in the moment of puberty installation (table 2, a and b).

Table 2 a..The variations of the immunoglobulin titre depending on sex :

Parameter	n	IgG g/L	IgA g/L	IgM g/L
Girls (G)	13	13.31±0.14	2.76±0.08	2.96±0.12
Boys (B)	13	9.45±0.46	1.96±0.17	1.72±0.17
Mean (G + B)	26	11.38±0.46	2.36±0.09	2.34±0.10

b..Relations between sexes and statistical analysis:

Parameter		Mean ± SE	t	p
IgG	Girls	13.31 ± 0.14	5.43	< 0.001
	Boys	9.45 ± 0.46		
IgA	Girls	2.76 ± 0.08	4.06	< 0.001
	Boys	1.96 ± 0.17		
IgM	Girls	2.96 ± 0.12	4.70	< 0.001
	Boys	1.72 ± 0.17		

For establish if during individual development appears modifications of the titre of these parameters, the determinations in a group of 10 pre-puberty youths were performed. The mean values of these determinations are presented in the table 3.

The comparative study of reference data (Nieman et al.,1998) of normal concentration values of serum immunoglobulins for IgG = 7.16 –16 g/L, IgA = 0.70 - 4.00 g/L and IgM = 0.40 - 2.30 g/L and the results of our investigations in puberty individuals reveals that our data are situated in the middle area of the parameters variation. Our results can be compared also with data established by Nieman D.C. et al (1989) in healthy adults for IgG and IgA, but they are in a strong discordance for IgM, the differences being very significant. In the present stage of knowledge it is difficult to explain the high values of IgM in the puberty age individuals comparative with those of adults obtained by Nieman D.C. et al. (1989).

By statistical analysis of these data it is possible to infer that in puberty age the immune system, more exact humoural specific immunity, is perfectly developed in the same measure as in adults. There are few data about ontogenesis of immunoglobulins and a long period dominates the view that was not identified immunoglobulin synthesis in human fetus (Cotuna,1997; Cotuna et al., 1998, Cotuna, 2004). Our comparative investigations in two groups of puberty and pre-puberty age children reveal that in pre-puberty age subject there are much lower values than in puberty subject, the differences being significant (Table 3). Looking at the variations of

immunoglobulin titre separately registered in the two sexes (Table 2) we find superior mean values in the girls comparatively with the boys for all three types immunoglobulins : IgG, IgA, and IgM. The statistical analysis (Student) reveals that all differences are very significant.

Table 3 The immunoglobulins variations in the children of pre-puberty age (up) and comparative values of puberty and pre-puberty age youths (down). Mean ± SE;

P : puberty age, PP: pre-puberty age; t and p: Student “t” test

The sex	IgG	IgA	IgM
Girls	8.01±0.34	0.96±0.06	0.93±0.11(NS)
Boys	8.03±0.41	0.91±0.07	0.92±0.08 (NS)
Girls and Boys	8.02±0.37	0.93±0.07	0.92±0.08

Comparative values:

Parameter	Baseline	t	p
IgG (g/L)	P : 11.38±0.29 PP : 8.01±0.02	4.43	<0.001
IgA (g/L)	P : 2.36±0.05 PP: 0.93±0.05	3.95	<0.001
IgM (g/L)	P : 2.34±0.10 PP: 0.92±0.05	9.98	<0.001

During puberty modifications, the two sexes differentiate gradually. Complex phenomena of puberty developmet appear and are generally closed earlier in girls than in the boys; the same situation are also in the case of immune activity.

Concerning the pre-puberty period, the differences of immunoglobulin concentration in the girls and in the boys are not significant (Table 3). This convincing proves that till 10 – 11 year age there are not clear differences between girls and boys of equal age. After age 11 – 12 years the rhythm of the processes of growth and development of the girls is higher than in the boys, due to “neuro-endocrine storm” which carry on during this period. This phenomenon has evident consequences in immune status on the titre of serum immunoglobulin (Table 3), the Student test showing very significant differences (<0.001).

Additional investigations are still necessary for a complete elucidation of the mechanisms governing such phenomena and their correlations with other processes in this field, too.

CONCLUSIONS

The puberty onset has important effects not only on the growth and the development of the human organism, but also on the immune system

The IgG, IgA and IgM immunoglobulin values obtained in two groups of adolescents – of pre-puberty and puberty age – reveal significant differences of values , that of pre-puberty age subjects being much lower than that of puberty ones.

Also, the mean immunoglobulin values in the girl are superior comparatively with the values of boys for all three types of immunoglobulin.

Mean level of IgG and IgA immunoglobulins of the adolescents is similar with that of adults subjects, but IgM records higher values.

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