

**THE SIZE OF THE FAMILY – A FACTOR INFLUENCING
ALIMENTATION AND, IMPLICITLY, THE GROWTH AND
DEVELOPMENT PROCESSES IN TEEN-AGERS**

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Viewed as a phenomenon with multi-factorial determination, the growth and development of the human organism depend equally on the hereditary patrimony and on the environmental conditions, the socio-economic ones, especially. As a critical transition period from childhood to adult age, adolescence is characterized by increased nutritional needs. The main factor responsible for the variations manifested in human physical development is alimentation – a factor correlated with the socio-economic variations. Similarly with the case of other countries affected by transitions, the difficult economic transformations occurring in the Republic of Moldova have been accompanied by the installation of poverty – a phenomenon affecting especially the families formed of more than 5 members. The teen-agers of the Republic of Moldova register a deficit in the consumption of proteins, especially of animal origin, known as playing a critical role in the period of accelerated growing of the organism. Alimentation and family size are closely correlated with the socio-economic status of the family from which the child comes, while the attention and care given to the child by the family plays an essential part in the growth and development of the teen-ager. Child's development as a function of such an element is directly related to environmental factors, as follows: alimentation is poorer in more numerous families, as the monthly income per member of family is more reduced, which is immediately reflected in a scarce alimentary consumption; hygiene is insufficient; mother's care for the child is also reduced, etc. The study was performed on 1,525 subjects (boys and girls) with ages between 10 and 16 years, all from the city of Kishinev. The main parameters considered were: stature, weight and average puberal age. The results obtained show that family size influences both the average stature of the teenagers and their weight, over the 10-16 years interval, the situation being even more acute in boys than in girls – a phenomenon confirming their meso-sensitivity, especially in the most critical period of growing (adolescence). The teenagers coming from less numerous families are taller and fatter than the ones belonging to large families. A negative relation could be also established between the sexual maturation of the adolescent girls and the size of their family: the girls from large families show a 4 month retard of the average pubertal age, comparatively with those coming from less numerous families.

Key words: adolescent, nutrition, development, family size.

1. INTRODUCTION

The process of growing and, equally, that of development, represent two inseparable aspects of human evolution, being always occurring in parallels and being considered, besides alimentation, as most faithful indices of the health condition. As phenomena with multi-factorial determination, growing and development of the human

organism depend equally on the hereditary patrimony and on the living conditions – especially the socio-economic ones. The genetic control of such processes is fundamental, the subsequently intervening factors deviating, more or less reversibly, the genetically-established growth and development. In other words, the hereditary factors mark the limits within which, under the direct influence of the environmental factors, the growing organism will be developing [1, 9].

J.M. Tanner considers that the main factor responsible for the variations occurring in the physical development of human beings is alimentation – a factor correlated with the variations of socio-economic nature. Some longitudinal studies, performed on satisfactorily fed children from Chile, India, Uganda, Nigeria and America, evidenced that stature evolution depends on social, economic and nutritional factors more than on genetic or ethnic ones [11].

As a critical transition period from childhood to mature age, adolescence is characterized by higher nutritional needs; in this ontogenetic stage, there occur 25% of stature growth and 50% of the bony mass of an adult, which means a 50% higher demand of calcium, increased erythrocytic and mioglobin mass, and a higher iron demand. According to Elena Radu: “...*the adolescent faces a critical health situation, as he is no longer a child, to be taken after by parents, yet he is not an adult, capable of protecting himself alone and of being fully conscious of the risks induced by an unsuitable behavior on his health condition...*” [7].

Along the adolescent period, puberty is part of the development – not only quantitative, but mainly qualitative – of the organism and of its functions, as well as of the somatic and physiological transformations. The rhythm of physical development gets accelerated during puberty, even if to a different extent, from one system or organ to another, while the pre-pubertal stage (10-12 years) is characterized by an especially stature development. The important transformations suffered by the human organism during puberty express the essential modifications to which the neuro-endocrine system is subjected. Under the influence of the hormonal complex, the sexual differences get intensified; the primary sexual characteristics become functional and capable of performing the reproduction function, the secondary sexual characteristics appear – which indicates the sexual maturation of the adolescent, which is more advanced in time for the feminine sex [3].

The Republic of Moldova now faces a severe economic decline, being one of the poorest countries of East Europe. Similarly with other countries also in transition, the difficult economic transformations in the country have caused poverty. About half of the Moldavian population is living under the threshold of poverty. In most cases, this situation affects the large families, or the monoparental ones. An unsuitable alimentation exposes most of the children to microelement deficiencies and to malnutrition; the health condition of adolescents is increasingly threatened by severe risks, the cause being the absence of adequate information and services. The poor of the Republic of Moldova are persons with a low education level, non-qualified workers, usually coming from large or monoparental families. Among the poorest groups, special mention should be made of *the families with more than 5 members*, or with one or more vulnerable members [13, 15, 16, 21].

In the Republic of Moldova, each third family having minor children is affected by poverty. Under-feeding is frequently met in children, the situation getting worse and worse because of the low quality of alimentation [17].

The segment of adolescents forms 27% of the total population of the Republic of Moldova. Many of the factors contributing to the formation of the risky alimentary habits of adolescents originate in their social environment. Adolescents' alimentation has its peculiarities, determined - to a considerable extent - by the metabolic processes specific to this age. Over this period, the action of some unfavorable factors – a non-rational alimentation included – may cause a critical development of the systems and organs now formed. At the same time, from various reasons, the character and mode of alimentation at such ages are unsatisfactory in the Republic of Moldova [12, 18].

A study performed in the schools of Moldova by the *National Scientific and Practical Center of Preventive Medicine* has demonstrated that, as to the nutritional contribution, which is also the case of other groups of population, adolescents register a deficitary protein consumption, of animal origin especially, known as playing an essential role in the period of accelerated growth of the organism. An insufficient and incorrect alimentation, determined by economic, educational and behavioral factors, influence negatively the health condition of the adolescents [19].

The size of the family is a factor involved in the acceleration or reduction of growth processes, as well as in sexual maturation, a negative correlation being established

between family size and the level of physical development of the child. Nutrition and family size are well-correlated with the socio-economic status of the family from which the child comes, while the attention it gets from the part of family is essential for the future growth and development of the adolescent. Child's development as a function of this factor and of its social rank at birth is closely related with the environmental factors: alimentation is poorer in more numerous families, hygiene is scarce, morbidity is higher, as a result of family contagion, mother's care is divided, etc. Most of the authors interested in studying the variability of the processes of human growth and development consider that neither family size nor the attention given to the child or parent's profession influence them directly, a correlation being nevertheless necessary with the nutrition, socio-economic condition, degree of urbanization and – last but not least – with the “*genetic patrimony*”.

Maria Cristescu observed a retarded puberty, manifested in parallels with the increasing number of children in a family, a phenomenon to be correlated with the economic conditions, such as: the monthly income per member of family is lower in more numerous families, which results immediately in a more reduced alimentary consumption. Another observation to be made is that the boys are intensely negatively influenced by the size of their family, comparatively with the girls, which supports the idea that they are more meso-sensitive, especially during the critical growing period (adolescence). A negative correlation occurs between the size of the family and the physical development of children. The same conclusions are reached by G. Olivier, too: family size has a higher influence on masculine subjects, comparatively with the feminine ones [4, 5].

Ch. Susanne considers that the alimentary factor, which is a consequence of the social status and of the habits related to local traditions, influences significantly the installation of sexual maturation, while the continuous increase of the living standard tends to standardize the age at menarche. Several authors correlate family size with the biological characters of the children. A. Benech reaches the conclusion that, as to the differences of somatic and intellectual development between the child without brothers and the one having a brother, the data recorded are not significant, becoming important only if the group of subjects gets divided into two categories, namely: single child in a family and, respectively, a child with 2 up to 6 or even more brothers [2, 10].

The differences between the children coming from small families and those from numerous ones are even deeper in the developing countries, being manifested especially in teen-agers. In the populations in which aliments are sufficient, the genotype may be expressed in a more correct manner, the variations among individuals expressing rather genetic differences. C. Prado-Martinez observes that the size of a family is one of the causes producing differences between the number of pubescent and non-pubescent girls, while F. Raveau evidences the relation between the size of stature, age of menarche and the number of brothers, the girls from large families showing a retard – comparatively with those coming from families with only 1-2 children [6, 8].

The National Council for the Protection of Child's Rights from the Republic of Moldova has analyzed the socio-economic level of the households and the number of children and concluded that the families with many children have a lower socio-economic status than those with few children. Out of the total number of families taken into study, 40,1% - have only one child; 41.4% - two children; 12.5% - three children; 2.8% - four children; 1.2% - five children and 1.9% - six or more children [14].

2. MATERIALS AND METHOD

The experimental material, collected between 1999-2005, was subsequently completed with the 10 years class of age. The group under investigation was formed of 1,525 subjects (705 boys and 820 girls) with ages between 10-16 years, all from Kishinev, the capital of the Republic of Moldova (647,700 inhabitants) [22].

The anthropometric data for each subject in part were collected from the most prestigious education units of Kishinev. Special mention should be made of the fact that all subjects have been born and grown in the locality here under analysis. To better evidence the influence of the “*family size*” parameter upon the growth and development of the adolescents from Kishinev, there have been calculated the stature, weight and average puberal age. The subjects were divided into two distinct categories, as follows:

- subgroup 1 – adolescent - single child in the family or having at most one brother/sister
- subgroup 2 – adolescent from a family with several children, having 3 or more brothers/sisters

The observation should be made that the incidence of the numerous families is reduced.

For each subject in part, an anthropometric file was recorded, including: the date and place of birth, the profession and age of both parents, the number of children in the family, the rank at birth. Also, a series of anthropometric measurements was made, only part of them being discussed in the present paper. The above-mentioned parameters were analyzed and processed statistically separately for each sex and each class of age. Analysis of the phenomenon of sexual maturation was possible only in girls; the main index considered being the menarche. For establishing the age of the first menstruation, the “*status quo*” and, respectively, the “*collecting*” methods have been applied [3].

To illustrate statistically the significance of the differences evidenced in the present investigation, between the two sexes of a population or between two different populations, the “U” test – known as a test of statistical significance – was applied (being synonymous with the “T-student” test or with test “Z” for independent samples), as well as methods for testing the hypotheses referring to (average or ratio) values or parameters, in cases in which $30 < n_1 < 200$ and $30 < n_2 < 200$ [20].

3. RESULTS AND DISCUSSION

Stature: Figure 1 illustrates the age evolution of the average stature values in the ten-agers from Kishinev, as a function of family size, which evidences the negative influence of the high number of brothers/sisters upon this index, for both sexes. Over the whole interval considered for the study, the boys coming from small-size families (subgroup 1) show higher stature values than those grown and developed in families with numerous brothers/sisters (subgroup 2). The average values of stature between the two subgroups are almost equal for the first two classes of age, after which the boys from favored families get differentiated from their colleagues from subgroup 2, the differences varying – with the exception of the age of 15 years (0.21 cm – which is a statistically negligible value) – between 1.37 cm (16 years) and 3.52 cm (13 years).

In the case of girls, the differences observed between the two subgroups are of the same type; this, in all seven classes of age, the adolescents from larger families evidence lower mean stature values than those coming from small families. The differences between the two subgroups are subunitary at 11, 14, 15 and 16 years while, at 10 years,

they are of 1.51 cm, at 12 years – of 1.70 cm (the maximum, statistically significant difference, $U=1.96$; $p<0.05$) while, at 13 years, the difference is of only 1.12 cm, which is statistically insignificant ($p>0.05$).

The conclusion is that family size influences the average stature of adolescents over the 10-16 year interval, the situation being more obvious in boys than in girls, the adolescents belonging to small families being taller than the ones from more numerous families.

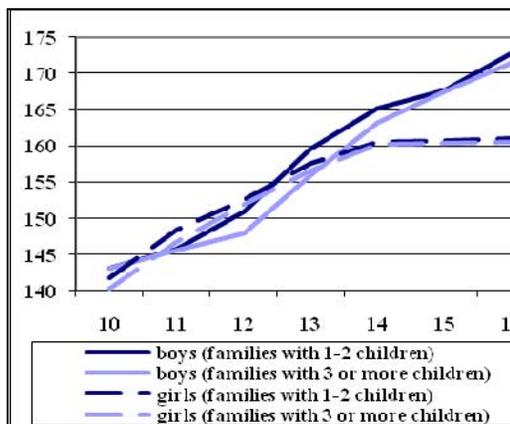


Fig. 1. Evolution of the average stature values

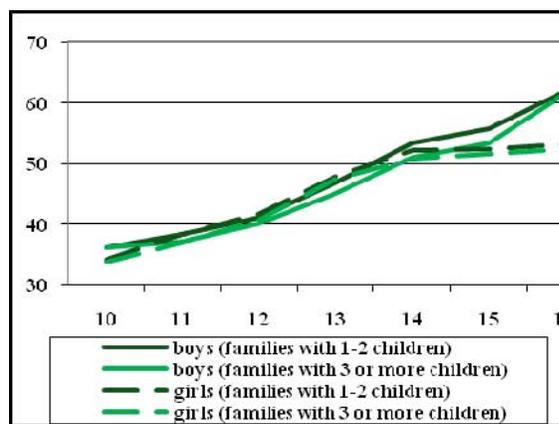


Fig. 2. Evolution of the mean weight values

Weight: The age evolution of the mean weight values in the adolescents from Kishinev is plotted graphically in Figure 2, as a function of family size - the situation being similar to that of the previously analyzed parameter, namely weight is influenced by family size more in boys than in girls.

Indeed, if considering the masculine series, in all classes of age, weight is – on the average – higher in the boys coming from families with 1-2 children, comparatively with the boys having 3 or more than 3 brothers/sisters. The differences between the two subgroups of boys are subunitary, having no statistical significance at extreme ages (10 and 16 years), but they increase for the other age values, being about 1 kg at 11 and 12 years, about 1.78 kg at 13 years, 2.42 kg at 14 years (which is, actually, the largest difference), and 2.21 kg, respectively, at 15 years. In the adolescent girls of Kishinev, too, weight records higher average values in subgroup 1 (small families), comparatively with subgroup 2 (large families), the differences recorded between the two categories of

girls being lower than in the case of boys, being subunitary at 10, 12, 13, 15 and 16 years, while they are supraunitary at ages of 11 and 14 years (1.42 kg and 1.35 kg, respectively).

Sexual maturation in girls: The table 1 evidences a negative relation between the sexual maturation of adolescent girls and family size.

Table 1

Sexual maturation of adolescent girls

Family size	N (sexual mature girls)	MAM (mean age of menarche)	δ (standard deviation)
1 or 2 children	308	12 years and 8 months	0,13
3 or more children	92	13 years	0,14

The girls coming from large families (having 3 or more children) show a 4 month retard of their puberal age, comparatively with those from families with only 1-2 children, namely *13 years* in the former case and *12 years and 8 month*, respectively, in the latter.

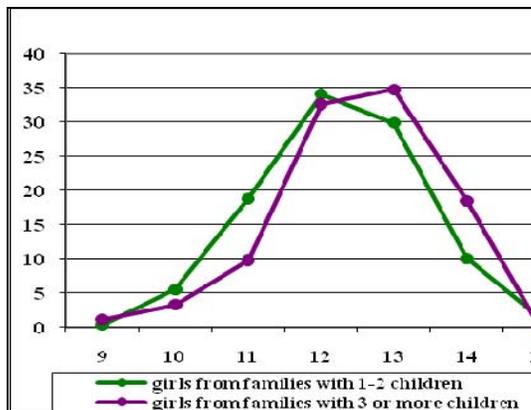


Fig. 3. Relative frequency depending on age at menarche (%)

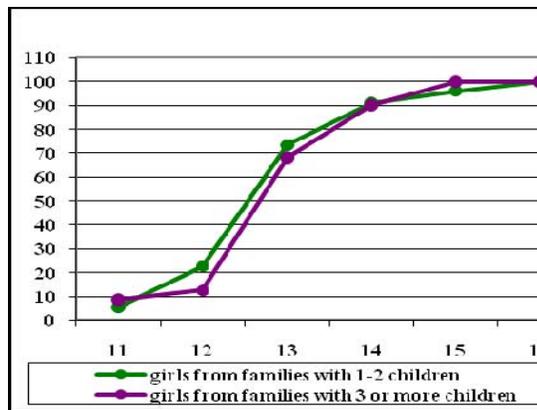


Fig. 4. Distribution of the percentage of girls after puberty age class (%)

The relative frequency of sexually mature girls on classes of age, as a function of their age at menarche, illustrated in Figure 3, shows that the highest frequency value occurs at the age of 12 years (34.09%) in the girls from small families (1-2 children), and one year later, respectively, in those coming from large-sized families (*i.e.*, at 13 years – 34.78%). On the other side, the values are higher in girls coming from small

families, comparatively with those having more than 2 brothers/sisters in the 10, 11 and 12 year classes of age, while they are lower at 13 and 14 years.

The percent distribution, on classes of age, of sexually mature girls, as a function of their size, is plotted in Figure 4. In the girls with small families, the growing ratio of the number of sexually mature girls from 11 to 12 years of 17.06%, increasing, from 12 to 13 years, up to a value of 50.65% while, after the age of 13 years, the ratio of sexually mature girls increases progressively, even if with low amplitudes, almost equal from one age to another. In the girls coming from numerous families, the growing ratio of the sexually mature girls is only 3.81% between 11 and 12 years, increasing up to 55.68% in the 12-13 year interval while, after the age of 13, the increase of sexually mature girls is uniform. At the age of 16 years, in both subgroups of adolescent girls, they are 100% sexually mature, whichever the family size. Comparatively with those coming from families with more than 3 children, the girls with only 1-2 brothers/sisters show higher percent values, in almost all classes of age.

4. CONCLUSIONS

The conclusion of the present study agrees with that stated by C. Prado-Martinez in 1986: the care and attention given to the child by its family represent essential factors for a harmonious growth and development of the descendants, according to their chronological age. The fact that, almost always, the larger families have low financial means is explained by parents' low intellectual training. This draws the attention upon a very exposed social group, such as that of *simple workers, with low educational level and large-sized families*.

The environment and the family background, nutrition and hygiene are influenced by the social and educational level of the family. It is known that the families with a higher socio-professional status, as well as the less numerous ones, assure to the children a richer food regime, not especially quantitatively, but qualitatively. The adolescents from Kishinev coming from families with a high socio-professional status (and, implicitly, with higher economic standards) are precocious, compared to those from less favored – i.e., poorer and more numerous – families. Nevertheless, the authors consider that such differences are not considerable and should not be viewed as alarming, as even the poor parents make efforts for assuring a suitable, sufficient

alimentation to their children. On the other side, numerous families from Kishinev possess land, either in the rural areas or at the outskirts of the city, which might assure part of the family food requirements.

As known, alimentation is a key factor, assuring to the infantile organism an as complete development of its capacities as possible, a harmonious physical growth included. By a rational alimentation, child's organism is provided with the optimum amounts and ratios of nutrients, in due time and in an accessible form. The disequilibrium of nutritive principles, the either insufficient or exaggerated consumption of nutriments, ignoring of an alimentary regime adapted to one's age, as well as other drawbacks appear as major risk factors, which may induce multiple negative consequences, among which a delayed physical development.

The interaction of certain factors, such as family accessibility to food, the manner in which a child is looked after, the sanitary conditions and the essential medical services influence the alimentation of the child/adolescent, being faithfully reflected in the processes of growth and development, at all ages. Once recognized that adolescence is characterized by risky behavioral attitudes, it should also be the most suitable period for guiding the young ones to live a healthy life. According to several behavioral theories, the young ones should be given specific information on their health condition, for adopting a healthy style of life and for avoiding any possible risk.

Author's contributions: Angela Simalcsik (first author) – 70%; Robert-Daniel Simalcsik (second author) – 30%.

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Received December 13, 2010