

ABOUT ELEVATED ARTERIAL BLOOD PRESSURE AND THE PREDICTIVE ROLE OF SOME RISK FACTORS IN ADOLESCENCE

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ABSTRACT

Screening of arterial blood pressure is carried out in 964 students (423 boys and 541 girls) aged 14 to 18 years from randomly selected schools in Sofia and Varna. The predictors of arterial hypertension in adolescence such as positive family history, increased body mass, nutrition patterns, hypokinesia and stress are studied by means of questionnaire interview. The results show that 57,4% of the adolescents with elevated systolic and diastolic arterial blood pressure have positive family history. In girls, a positive family history is found out by 2,3 times more often ($p < 0,001$). In 19,1% of the adolescents an increased body mass combined with hypokinesia (in 61,4% of the boys and in 72,8% of the girls) and non-balanced nutrition is established. Every second girl and every third boy are under distress conditions. Data of the present study show that prevention of arterial hypertension in adolescence must be carried out individually according to the predictor significance of medico-biological and behavioural risk factors.

Key words: arterial hypertension, risk factors, adolescents, prevention, town of Varna

INTRODUCTION

Cardiovascular diseases are a serious health, demographic and social problem and cause the highest relative part of mortality rate at active age. Among cardiovascular pathology, arterial hypertension (AH) occupies a particularly important place as a nosologic unit, on the one hand, and as a leading etiological factor for other cardiovascular diseases, on the other. According to statistical data available, the recent prevalence of AH in our country approaches 12-16% and is characterized by 'rejuvenating' (5). Longitudinal studies prove that the risk of developing AH in adults is already predetermined in childhood and adolescence. In adolescence, AH is a premise for worsening the quality of life in the next generations, i. e. genetic loading of the generations (4,6,12). For this reason the recognition of the risk and the necessity of prevention of the serious problems of AH is defined as a 'pediatric responsibility'. The preventive strategy must be oriented towards the main determinants of the elevated arterial blood pressure (EABP) in childhood and adolescence (2,13).

The aim of this study is to investigate ABP in teenagers aged 14 to 18 years and the influence of the basic medico-biological and behavioural risk factors in terms of AH prevention in school age. A preliminary hypothesis of the study is that family history, elevated body mass, nutrition

patterns, hypokinesia and psychosocial distress are directly related with EABP.

MATERIAL AND METHODS

Screening of ABP is carried out in 964 students (423 boys and 541 girls) aged 14 to 18 years, at mean age of $15,9 \pm 1,2$ years, or of 8th to 12th school class, from randomly selected schools in Sofia and Varna. ABP is measured with standard methods (7). The mean value of three measurements is analyzed and on its basis according to the recently accepted methods (12) the students are divided into 2 groups: group one - with normal systolic and diastolic ABP (SABP, DABP) values in the referent range for age and gender, i. e., under 90th percentile; group two - with elevated SABP and DABP values, i.e., above 90th percentile. Children and parents are interviewed by questionnaire for determination of the following risk factors: i) medico-biological - age, gender, and family history and ii) behavioural - nutrition patterns, physical activity, and psychosocial stress.

The estimation of the body mass index (BMI) is performed on the basis of the normal values for age and gender. In the groups designed as 'underweight', 'normal weight' and 'overweight', the adolescents with BMI values of $\cdot X < 1S$, $\cdot X = 1S$, and $\cdot X > 1S$, respectively, are included. Distress is determined by evaluation stage scale (11). Data processing is carried out by means of SPSS PC+ statistical package. The method of χ^2 and Cramer's coefficient of V_2 assessing the links and relations of category signs are used. The level of significance is determined for $p < 0,05$.

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RESULTS AND DISCUSSION

Familial predisposition for EABP is a prognostic criterion for the development of AH. Data analysis shows that 57,4% of the pupils with elevated SABP and DABP are with family history for AH, while those with normal SABP and DABP present with family history rate that is lower by 2,3 times ($p<0,001$) (Fig. 1).

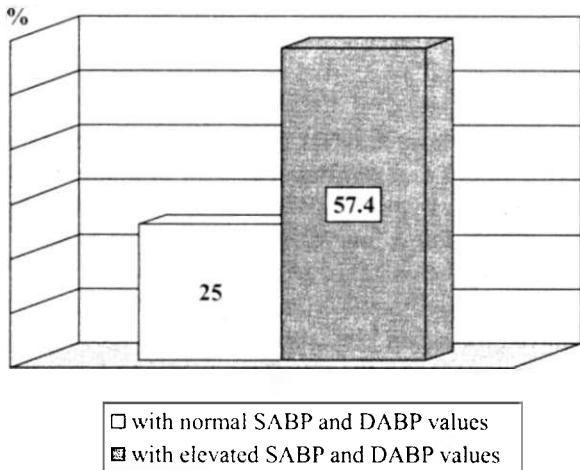


Fig. 1. Family history of AH according to anamnestic data available

According to some authors (6,8,10), parents with EABP have children, who being even normotensive, bare a risk of elevating the ABP later on.

Gender distribution of the pupils with EABP and positive family history for AH shows that family history for AH in girls is by 2,3 times more frequent as compared to that in boys (78,4% versus 34,5%; $p<0,001$) (Fig. 2).

This fact confirms a commonly accepted statement that women are a more susceptible gender and thus they bare a higher genetic risk to develop AH. In girls with elevated SABP and DABP the relative part of those with family history for AH originating on the side of the mother (mother-grandmother and grandfather) is by 2,2 times

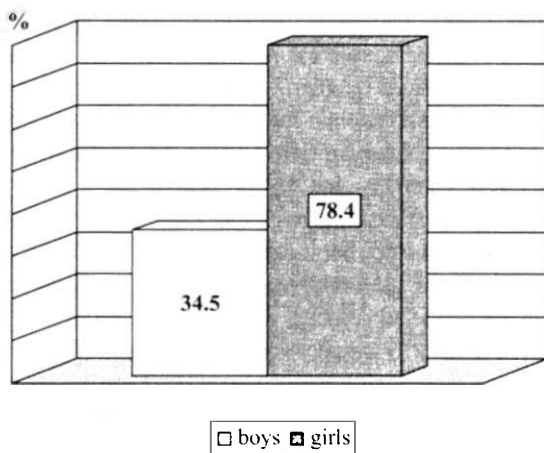


Fig. 2. Gender distribution of the pupils with positive family history of elevated SABP and DABP

higher when compared to that in boys ($p<0,001$). Family history originating on the side of the father (father-grandmother and grandfather) is reported by 65% of the boys and by 50% of the girls, i.e., almost by every second boy and girl. The relative part is significantly higher in boys than in girls ($p<0,01$) (Fig. 3).

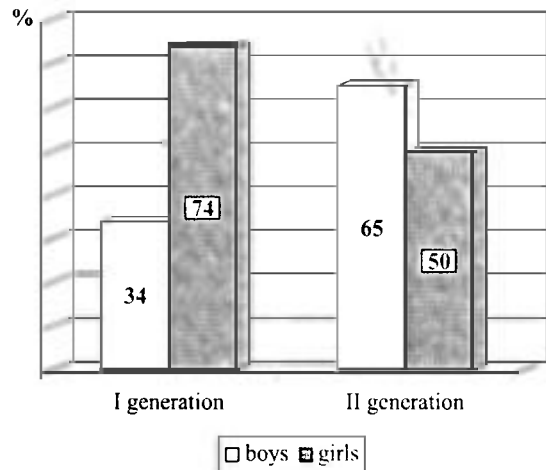


Fig. 3. Positive family history in pupils with EABP according to first and second generation lines

Our results are in agreement with data of other authors (5,8) according to which the relative genetic risk for developing AH in adolescents with family history is by 2 times higher compared to the other populations and women are the more susceptible gender in respect of hereditary AH.

Obesity is one of the most common risk factors for AH in early childhood. The increased BM enhances the coronary risk and it is an important predictor for AH in males and females (3,5,14).

The analysis of the results indicates that increased BMI has been found out in 19,5% of the studied contingent. It has been established that more than half of the pupils with elevated SABP and DABP (55% of the cases) present with abnormally high BMI ($p<0,001$) (Fig. 4). Incorrect nutrition patterns and hypokinesia are predictors of the increased BMI.

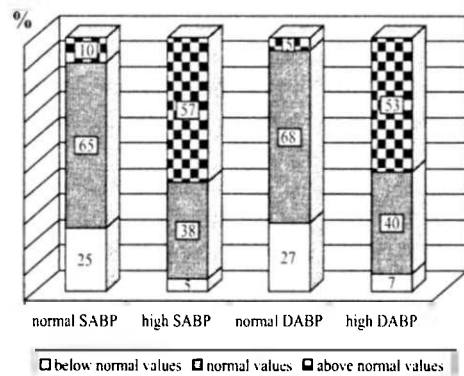


Fig. 4. BMI in adolescents with different ABP values

Table 1. Average daily consumption of food products by boys and girls with elevated SABP

Product	Boys			Girls		
	Recommended quantities (g/day)	Daily intake (g)	% of pupils with intake below the recommended	Recommended quantities (g/day)	Daily intake (g)	% of pupils with intake below the recommended
milk	400	302	80,0	380	213	100,0
diary products	40	26	88,6	40	30	76,5
eggs	40	22	91,4	25	13	92,5
meat, meat diet	120	140	60,0	80	83	60,0
fish	30	26	82,9	30	10	96,3
fats	36	31	68,6	27	34	36,1
sugar products		165			199	
cereals and paste products	417	592	22,9	296	390	32,2
fruits	300	295	54,3	300	310	88,0
juice, compote, nectar	200	200	65,7	150	234	48,2
vegetables	320	167	91,4	310	193	92,1
legumen	15	21	57,1	11	14	36,0
potatoes	160	149	85,7	160	131	56,3

Table 2. Average daily consumption of food products by boys and girls with elevated DABP

Product	Boys			Girls		
	Recommended quantities (g/day)	Daily intake (g)	% of pupils with intake below the recommended	Recommended quantities (g/day)	Daily intake (g)	% of pupils with intake below the recommended
milk	400	288	78,4	380	227	92,7
diary products	40	30	83,8	40	30	83,3
eggs	40	14	97,3	25	10	95,4
meat, meat diet	120	129	56,8	80	92	54,8
fish	30	16	82,7	30	17	88,1
fats	36	39	56,8	27	32	42,9
sugar products		183			178	
cereals and paste products	417	647	24,2	296	392	26,2
fruits	300	248	54,1	300	305	54,8
juice, compote, nectar	200	166	73,0	150	273	35,7
vegetables	320	165	86,5	310	199	85,7
legumen	15	24	51,4	11	14	42,9
potatoes	160	119	86,5	160	146	50,0

Table 3. Answers to the question "Have you the habit of adding salt to the food" by adolescents with different SABP and DABP values (in %)

Answer	SABP				DABP			
	boys		girls		boys		girls	
	normal	high	normal	high	normal	high	normal	high
Add before tasting	6,8	26,3	7,8	39,5	5,1	30,2	6,4	27,6
Taste and then add	30,7	57,3	40,3	39,0	36,6	47,3	39,5	42,8
Very rarely or never add	62,5	16,4	51,9	21,5	58,3	22,5	54,1	29,6
	$\chi^2 = 43,1$ $V^2 = 0,374$		$\chi^2 = 53,4$ $V^2 = 0,339$		$\chi^2 = 34,9$ $V^2 = 0,336$		$\chi^2 = 30,6$ $V^2 = 0,256$	
p	<0,001		<0,001		<0,001		<0,001	

The analysis of the nutrition patterns of the adolescents with elevated SABP and DABP demonstrates that the insufficient daily intake of milk, dairy products, eggs and fresh vegetables is combined with considerable consumption of fats, mainly of animal origin, corn, paste and sugar products (Table 1 and Table 2). It is noteworthy that in 39,5%-62,7% of the adolescents with EABP the consumption of fats of animal origin predominates. More than one third of the consumed meat is pork and meat products. The ratio of animal to plant fats is 1:1,2 at a standard 1:2. According to the literature available, the established considerable intake of saturated fatty acids and the disturbed proportion with the polyunsaturated ones exerts a negative effect on cholesterol level that increases the risk for AH (5,15). The strongly decreased daily intake of fish is an unfavourable nutrition factor because of the established preventive effect of the omega-3-polyunsaturated fatty acids contained in fish fats (15).

Data from the inquiry demonstrate a considerably higher relative part of the boys and girls with EABP (26,3%-39,5%) who 'add salt to the food before tasting it' compared to the pupils with normal ABP (5,1%-7,8%, re-

spectively) (Table 3). More than half of the adolescents with normal ABP 'very rarely or never add salt to the food'. The examination of the moderating interactions of the risk factors shows that the high intake of energy foods, fats and carbohydrates has no direct effect on ABP and leads to EABP only in the presence of family history for AH, increased BMI and hypokinesia. When there is high intake of fats and carbohydrates with food, sport activities (regular or as leisure activity) act as a protector for EABP (13,14). Physical inactivity is a behavioural pattern that increases the risk for AH (Fig. 5).

A trial carried out in the outset of SINDY program indicates that 35,2% of the Bulgarian adolescent boys and 53,7% of the girls do not go or go occasionally for physical exercises (1). Our present study confirms these data. A total of 61,4% of the boys and 72,8% of the girls with EABP are with decreased physical activity (on daily basis, when at leisure there is no physical activity for at least 35 min), or when not going for any sports at all (regularly or as leisure activity). Physical inactivity is by 9,4% more common in girls than in boys ($p < 0,01$).

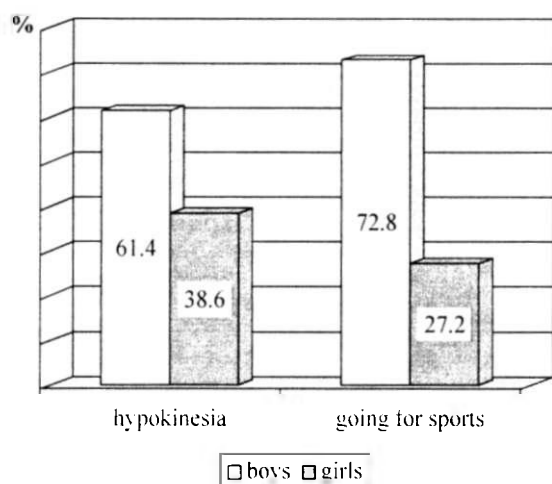


Fig. 5. Physical activity of pupils with EABP

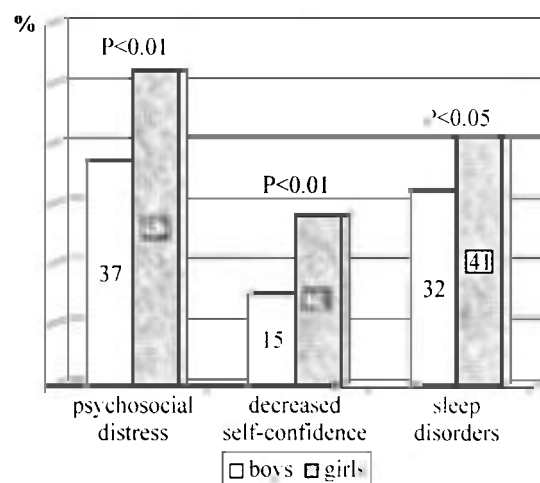


Fig. 6. Self-assessment of psychosocial distress, self-confidence, and sleep of pupils with EABP

The results from the self-evaluation of the psychosocial distress, self-confidence and sleep of pupils with EABP are presented on Fig. 6. Every second girl and third boy are under condition of distress. The relative part of the girls who present with psychosocial distress and diminished self-confidence is significantly higher than that of the boys ($p < 0.01$). Subjective complains of sleep disturbances are reported by 32% of the boys and 41% of the girls ($p < 0.001$). The sleep of the students in distress is characterized by difficulties in falling asleep, troubled sleep and a feeling of fatigue after sleep.

CONCLUSION

Our results demonstrate that 57,4% of the adolescents with elevated SABP and DABP present with family history of AH, 19,1% with increased BMI combined with low physical activity, non-balanced nutrition. The relative part of the students adding salt to the food prevails in this group. Therefore, our hypothesis about these main predictors for EABP in adolescence is confirmed. Having in mind the multifactorial genesis of AH, positive results from the application of preventive programs in adolescence may be expected only if they consider the predictor significance of the medico-biological and behavioural risk factors. The proper organization of AH prevention in childhood and adolescence requires the creation of a vast functional network of active interaction between the family, school, health institutions and the public.

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