REVIEW ARTICLE

Essential hypertension in children, a growing worldwide problem

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Hypertension is one of the most common diseases worldwide. For many decades, it was considered as a problem related to adult population; however, its incidence in children has also been increased in recent years. Although secondary causes of hypertension are more common in children, few studies have been published focusing on the growing epidemic rate of essential hypertension in children and adolescents. Considering the importance of essential hypertension and its cardiovascular consequences, we review briefly its epidemiology and risk factors in children.

Key words: Adolescent, cardiovascular disease, child, essential hypertension, obesity

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INTRODUCTION

Hypertension has been known not only as a common disease but also as one of the most prevalent human diseases, leading to high morbidity and mortality.[1] About 10.4 million deaths were attributed to high systolic blood pressure as the leading risk factor of cardiovascular disease.[2] In the past, hypertension and its harmful consequences were attributed to adult patients, and it was unusual in childhood and secondary to some disorders of the renal, endocrine, and cardiac.[3]

One of the first reports on the prevalence of pediatric hypertension was published in 1963.[4] Since then, many papers have been published regarding the prevalence and importance of hypertension in pediatric population.

While primary hypertension is more common in the adult population, secondary causes of hypertension are mostly found in children. Renal and renovascular diseases have their top position among identifiable causes of hypertension in children.[5] Glomerulonephritis, reflux nephropathy, renal artery stenosis, and coarctation of the aorta followed by endocrine disorders are main causes of secondary hypertension in the pediatric population.[3,6,7] Thus, in this paper, we aim to review the epidemiology of primary hypertension and its determinants including gender, obesity, lifestyles, and genetic factors in children and adolescents.

EPIDEMIOLOGY

In recent decades, an increase in primary hypertension in adolescents has been reported.[7-9] The prevalence of essential hypertension in adolescents is different among diverse ethnicities from as low as 0.3% up to approximately 21%.[8-13]

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Various factors such as obesity, diet, gender, and academic stress have been claimed as responsible causes in increasing the prevalence of primary hypertension in this age group.[11,13-15]

Gender

Some studies stated that essential hypertension is more common in boys than in girls. Sundar *et al*. reported a high rate of essential hypertension in boys, with a male/female ratio approximately equals to 3/1.[9] In another survey, Mohan *et al*. showed that hypertension was more common in boys not only in urban but also in rural area of Ludhiana, India.[16] A study by Buch *et al*. demonstrated slight increase in the prevalence of hypertension in boys aged older than 13 years compared to girls.[17] However, the gender effect has not been supported by all similar studies.[18]

Obesity and body mass index

Although the rising trend of obesity and mean body mass index (BMI) in high levels has been plateaued in high-income countries, it has enhanced rapidly in the south, east, and southeast of Asia.[19] Growing rate of obesity changes the incidence of overweight-related problems such as hypertension in the world.[11,12,20-22]

According to the results from the National Health and Nutrition Examination Survey between 1988 and 1994 and between 1999 and 2008, in parallel with increasing BMI, 3.4% and 4.4% rise in the prevalence of hypertension have been reported among boys and girls, respectively.[23]

By various mechanisms including insulin resistance, activation of renin-angiotensin-aldosterone system (RAS), retention of salt, and consequent changes in vascular endothelial function, obesity induces hypertension.[24]

A study on about 25,000 schoolchildren revealed a higher prevalence of hypertension in overweight and obese children in comparison to normal weight participants (17%–18% vs. 10%).[25]

The rise of the population with hypertension has been shown not only in adolescents but even in children. Based on the electronic medical data from a cohort of 14,000 children and adolescents aged 3–18 years, a prevalence of 3.4% of hypertensive population was reported and the presence of obesity was accompanied by higher blood pressure.[26]

Lifestyle factors

Dietary patterns, physical activity, and stress have main roles in the incidence and prevention of hypertension in children and adolescents.[27] A diet with high salt intake, saturated and trans-fatty acids, and low consumption of fruits and vegetables, nuts, and olive oil was associated with hypertension in both children and adults.[28] Due to urbanization, children have more consumption of processed food and energy-dense diet,[29] which cause obesity and consequently obesity-related hypertension in childhood.[30] Sedentary lifestyle and poor sleep quality promote hypertension in children.[22] Since the World Health Organization recommended to engage in moderate-to-vigorous physical activity for at least 1 h a day in childhood.[31] Elevated blood pressure in schoolchildren and adolescents can be attributed to high stress, particularly academic stress, because of difficult curriculum in the school and educational competition.[32]

Genetic factors

Although excess weight is the main factor responsible for increasing rate of hypertension among adolescent, genetic, and family history, susceptibility should not be ignored.[33,34]

Gene polymorphism of RAS has been proposed as a risk factor for essential hypertension and its cardiovascular consequences.

Aldosterone synthase gene (CYP11B2) polymorphism evaluation in Japanese participants with essential hypertension showed a significant difference in the distribution of three genotypes (TT, TC, and CC) between the hypertensive and normotensive population.[34]

A recent study in China demonstrated the higher risk of hypertension in children and adolescents with single-nucleotide polymorphism of ATP2B1 rs17249754.[35]

In addition to RAS, endothelial nitric oxide gene polymorphism has been targeted as a possible genetic factor to contribute to developing essential hypertension. More frequency of one of the most applicable polymorphisms in the NOS3 gene (rs1799983 in exon 7) has been reported in Sudanese patients with essential hypertension than control group.[36]

CONCLUSION

Concerning the growing rate of essential hypertension and its link to environmental, genetic, and anthropometric factors, assessing its prevalence and possible cardiovascular complications is necessary for every population and geographical area.

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Conflicts of interest

There are no conflicts of interest.

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