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Review article

Hypertension in Bangladesh: a review

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ABSTRACT

Hypertension (HTN) is an increasingly important medical and public health problem. In Bangladesh, approximately 20% of adult and 40–65% of elderly people suffer from HTN. High incidence of metabolic syndrome, and lifestyle-related factors like obesity, high salt intake, and less physical activity may play important role in the pathophysiology of HTN. The association of angiotensin-converting enzyme (ACE) gene polymorphism and low birth weight with blood pressure has been studied inadequately. Studies have found relationship between mass arsenic poisoning and HTN. Hypovitaminosis D presumably plays role in the aetiopathogenesis of HTN in Bangladeshi population. South Asians appear to respond to antihypertensive therapy in a similar manner to the Whites. The latest National Institute for Health and Clinical Excellence guideline advocates a calcium-channel blocker as step 1 antihypertensive treatment to people aged ≥55 years and an ACE inhibitor or a low-cost angiotensin-II receptor blocker for the younger people. Calcium-channel blockers and beta-blockers have been found to be the most commonly prescribed antihypertensive drugs in Bangladesh. Non-adherence to the standard guidelines and irrational drug prescribing are likely to be important. On the other hand, non-adherence to antihypertensive treatment is quite high. At the advent of the new millennium, we are really unaware of our real situation. Large-scale, preferably, nation-wide survey and clinical research are needed to explore the different aspects of HTN in Bangladesh.

Introduction

Hypertension (HTN) is an important medical and public health issue because it is common and increases the risks of cardiovascular and kidney disease. Bangladesh has been experiencing epidemiological transition from communicable disease to non-communicable disease. The overall mortality rate has decreased significantly over the last couple of decades. But, deaths due to chronic diseases, specially the 'fatal four' i.e. cardiovascular disease, cancer, chronic respiratory disease, and diabetes, are increasing in an alarming rate.[1] Hypertension is an important contributor to one of the four i.e. cardiovascular disease.

Rationality of the review

Data related to HTN in Bangladesh are often insufficient, suffer from statistical flaws, and are not readily available. Many articles were published in local, non-indexed journals, which are not available online, and difficult to procure. Recognising these limitations, the present review has been planned to compile the available data on this important public health issue. This review will hopefully stimulate future research and act as a valuable source of information.

Methods

Data have been collected from the articles available from MEDLINE and Bangla JOL supported by the International Network for the Availability of Scientific Publications (INASP)

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up to the year 2012. Besides this, local journals which are not available online but recognised by the Bangladesh Medical and Dental Council have also been considered.

Epidemiology

The prevalence of HTN varies considerably by country: 20% in the USA, and 25–50% in different regions in Europe.[2] The exact prevalence of HTN in Bangladesh is not known. Only a limited number of small-scale epidemiological studies are available. Probably the prevalence of HTN was first reported in 1976, which was 1.10%.[3] One meta-analysis,[4] a population-based study[5] and a recently published survey[6] found the prevalence 11.3%, 18.6%, and 20.1%, respectively. Bangladesh Non-communicable Disease (NCD) Risk Factor Survey 2010[7] was carried out by Bangladesh Society of Medicine in collaboration with Directorate General of Health Services and World Health Organization from November 2009 to April 2010 by using WHOSTEP wise Surveillance approach in adults aged ≥25 years. According to the survey, prevalence of HTN is 17.9% in general, 18.5% in men and 17.3% in women. Hypertension is probably more common in elderly population, in one study 65% in general, 75% in urban area, and 53% in rural area.[8] In another more recent study among senior citizens, 44.8% were found to be hypertensive.[9]

Contrary to the common belief, HTN is equally prevalent in rural population; 6.7% rural people had diastolic HTN in 1983,[10] 10.5% had high systolic blood pressure, and 9% high diastolic blood pressure in 1995,[11] 9.8 vs. 15.6% in males and females respectively.[12] Among the diabetics, the prevalence of systolic HTN was 23.2% and diastolic HTN 13.6%.[13] Heart rate variability was found low in hypertensive subjects in comparison to the normotensive subjects.[14]

Pathophysiology

The pathogenesis of primary HTN remains incompletely understood. Interplay between environmental and genetic factors likely contributes to the pathophysiology of HTN. Lifestyle-related factors, metabolic syndrome, angiotensin-converting enzyme (ACE) gene polymorphism, low birth weight, arsenicosis, and hypovitaminosis D appear to be important contributor to HTN in Bangladesh.

Lifestyle-related factors

As a result of socioeconomic transition, lifestyle, as well as the dietary pattern, is changing in Bangladesh. Increasing prevalence of obesity, tobacco use, high intake of processed foods, and less physical activity accompany the transition. In general, 21.5% adults (male 21%, female 22%) have body mass index (BMI) ≥25 kg/m^2; increased waist circumference is alarming especially in women (33.7%).[7] The prevalence of metabolic syndrome has been found to be 20.7%, 11.2%, and 8.6% following modified Adult Treatment Panel III, International Diabetes Federation, and by the World Health Organization definitions respectively.[15] In a recently published study, 19.5% of older persons in rural Bangladesh—20.8% women, and 18% men—had metabolic syndrome.[16] The prevalence is higher in women.[15,6] About half the metabolic syndrome patients were hypertensive in a study.[15] On the other hand, incidence of metabolic syndrome is higher in hypertensive subjects in comparison to the general population; in a study among hypertensive patients, 31.7% had hyperglycaemia, 38.7% high waist circumference, 68.8% low high density lipoprotein (HDL) cholesterol and 55.3% high triglycerides.[17] Serum total cholesterol, triglyceride, and LDL-cholesterol were markedly raised ($P<0.001$) whereas HDL-cholesterol was significantly lower ($P<0.001$) in hypertensive as compared to control subjects in a study investigating serum lipid profile in hypertensive subjects.[18]

Tobacco consumption is quite common in Bangladesh: prevalence is 51% for any form, 26.2% for smoking, and 31.7% for smokeless tobacco.[7] In a recently published study, betel quid chewing was found in 33.2% of rural people (35.5% in men, 31.6% in women; 17.5% without tobacco and 82.5% with tobacco); positive association was found between betel quid chewing and high blood pressure, particularly among women.[19]

Sedentary lifestyle may have association with HTN. In the Bangladesh NCD Risk Factor Survey 2010,[7] 27% of people (10.5% men and 41.3% women) were found to maintain low level of physical activity (<600 metabolic equivalent-minutes per week). Inadequate physical activity may contribute to obesity, especially in women.

Dietary pattern may play a role in aetiopathogenesis of HTN. A population-based cross-sectional study in rural Bangladesh revealed that the 'animal protein' pattern of diet (consisting of meat, milk, poultry, eggs, bread, large fish, and fruit) was associated with higher prevalence of HTN than the 'balanced' pattern (consisting of rice, some meat, small fish, fruit, and vegetables).[20] In the Bangladesh NCD Risk Factor Survey 2010, consumption of inadequate fruit and/or vegetables (<5 servings/day) was found in 95.7% people.[7]

The exact pattern of salt intake in Bangladeshi population is not known; however, based on the data from salt production and sales, average daily intake has been calculated to be 15 g.[21] A more recent study using spot urine analysis found very high average sodium intake of 21 g/day.[22] Considering these data, salt intake in this country appears to be much higher than what is recommended by the World Health Organization (sodium chloride <5 g/day, sodium <2 g/day)[23] or Dietary Guidelines for Americans 2010 (sodium <2.3 g/day in general, and <1.5 g/day for special group).[24] In a study, reversal of HTN was achieved in 56.7% of hypertensives by lifestyle modification and behavioural changes including reduction of salt intake.[6]

Chronic arsenicosis

Long-term arsenic ingestion has been associated with increased cardiovascular mortality.[25] Bangladesh is grappling

with the largest mass poisoning of a population in history because groundwater has been contaminated with naturally occurring inorganic arsenic.[26] A prevalence study conducted in Bangladesh demonstrates a dose-response relationship between inorganic arsenic exposure from drinking water and risk of HTN.[27] Another study found that arsenic exposure from drinking water, even at lower levels (<50 μg/L and <100 μg/L), was positively associated with high pulse pressure, and that the association was more apparent among those with lower intake of vitamins B_2, B_6, and B_{12} and folate.[28]

Angiotensin-converting enzyme gene polymorphism

The association between ACE gene polymorphism and blood pressure has been studied inadequately in Bangladeshi population. In 1998, Chowdhury et al. found no association between ACE insertion/deletion (I/D) polymorphism and HTN in Bangladeshi population[29] whereas in 2002, Morshed et al.[30] noted positive association between the two. Among the three ACE I/D variants, the DD genotype was associated with the highest value of both mean systolic and mean diastolic blood pressure ($P \leq 0.05$) in men. In the overall population, blood pressure was highest in DD, intermediate in I/D, and the least in II subjects.[30] Further research is needed to clarify the issue.

Low birth weight

The role of low birth weight in the aetiopathogenesis of essential HTN is unsettled. Observational studies identified significant inverse associations of birth weight with blood pressure levels at various ages in later life. Low birth weight (<2500 g) affects 36% of infants in Bangladesh, more than twice the 15% threshold that indicates a public health problem. Also, <1% of infants are born with very low birth weight (<1500 g).[31] Research is needed to explore association, if any, between the two public health problems, i.e. low birth weight and HTN in this community.

Hypovitaminosis D

Role of vitamin D in cardiovascular health is of much interest at present. Experimental, as well as some observational studies suggest that vitamin D and its metabolites are integrally related to blood pressure and the renin-angiotensin system, however, randomised controlled trials have thus far failed to confirm the blood pressure lowering effect of vitamin D supplementation. Vitamin D insufficiency affects almost 50% of the population worldwide. Few studies have been carried out to determine the prevalence of hypovitaminosis D in Bangladesh. High prevalence of suboptimal serum 25-hydroxycholecalciferol levels (<25 nmol/L) was described in lactating women of low socioeconomic status and those wearing Shari, a traditional ladies', wear.[32] In another survey of women aged 18–60 years, serum 25-hydroxycholecalciferol levels were <40 nmol/L in 78% of 36 university students and 83% of 30 veiled women.[33] Further research is needed to find out the association, if any, between vitamin D deficiency and HTN in Bangladesh.

Management

South Asians appear to respond to antihypertensive therapy in a similar manner to the Whites.[34] The standard guidelines are in general applicable to Bangladeshi population. However, in view of the special geography, ethnicity, climate, dietary habits, literacy levels, and socioeconomic variables, there could be some areas where significant differences need to be addressed.[35]

The latest guideline for the treatment of HTN was published by the National Institute for Health and Clinical Excellence (NICE) of UK in August, 2011.[36] The guideline advocates a calcium-channel blocker as step 1 antihypertensive treatment to people aged ≥55 years and to black people of any age. On the other hand, an ACE inhibitor or a low-cost angiotensin-II receptor blocker has been suggested for the younger people.

Overall scenario of control of HTN is poor. In Bangladesh, non-adherence to antihypertensive treatment was found in 85% of cases; factors determining non-adherence included lower level of education, low family income, duration of illness, perception related to the disease, lack of accompanying person, and insufficient information from the service provider.[37] Calcium-channel blockers (45%) and beta-blockers (40%) were the most commonly prescribed antihypertensive drugs; diuretics, ACE inhibitors, and angiotensin-receptor blockers were used in 30.8%, 25%, and 24.2% cases, respectively.[37] A prescription survey study in relation to the treatment of HTN revealed poor quality of prescriptions, irrational drug prescribing and undesirable influence on doctors by the pharmaceutical companies.[38]

Hypertension in children

Exact prevalence of HTN in children in Bangladesh is not known. One study involving 6–16-year-old school children of Dhaka city found a prevalence of 0.55%.[39] This is probably an underestimate of the true prevalence. Lifestyle patterns including dietary habits is changing in children, prevalence of obesity is increasing. 17.9% of the affluent school children and adolescents were found obese in a study.[39] In another study conducted in 4 kindergarten schools and 209 randomly selected children aged 6–10 years, the majority (73.2%) were obese, the rest were overweight (16.3%) and healthy (10.5%).[40] This is clearly an overestimate of the true scenario because kindergarten school children are not representative of the Bangladeshi children in general. Studies involving ethnic minorities in UK have shown increasing prevalence of obesity, greater risk of developing HTN, lower level of physical activity, higher mean total calorie intake, and altered perception to childhood obesity by the parents in south Asian population,

and the situation is even worse in Bangladeshi childen.[41–48] Further research is needed in this field to elucidate the different aspects of childhood HTN in Bangladesh and to chalk-out plan to prevent adult HTN more efficiently.

Future directions

- Large-scale studies are needed to determine the current prevalence of HTN, pattern of salt intake, and vitamin D deficiency in Bangladesh.
- Role of genetic factors including ACE gene polymorphism and low birth weight should be determined.
- Research should be carried out to determine the role of salt intake, vitamin D deficiency and arsenicosis in the aetiopathogenesis of HTN.
- National policy should be formulated to deal with HTN accordingly.

Conclusion

At the advent of the new millennium, we are really unaware of our real situation, whereas HTN is getting epidemic proportion worldwide. We have no more time to lapse. Large-scale, preferably, nation-wide survey, and clinical research should be conducted to determine the different aspects of HTN in Bangladesh. The information available thereby, would help to formulate national policy to combat the deadly epidemic more efficiently in future.

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