

NUTRITIONAL MANAGEMENT IN HEALTH AND DISEASE-II

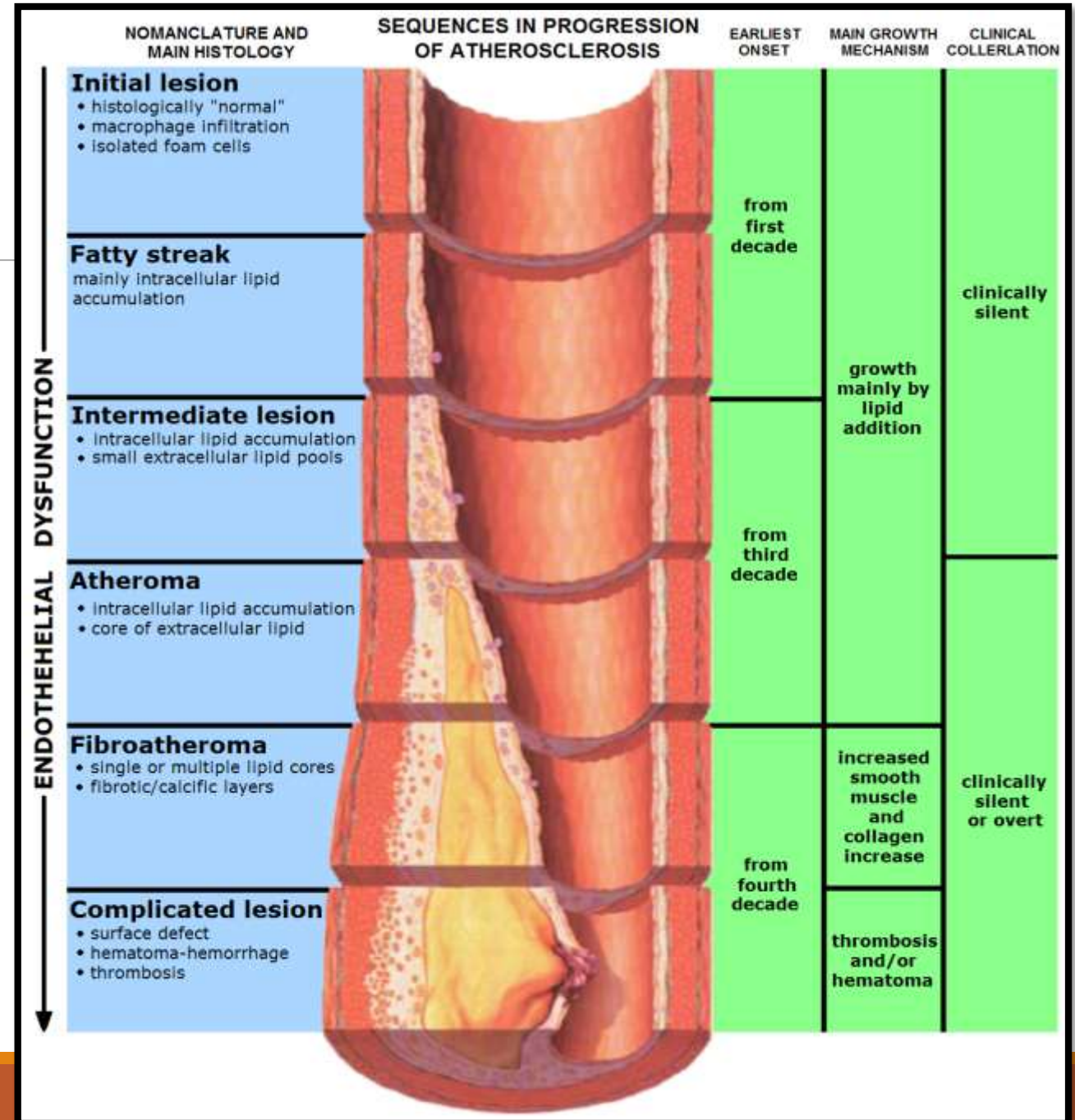
TOPIC-ATHEROSCLEROSIS

GOVERNMENT HOME SCIENCE COLLEGE

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INTRODUCTION

- Atherosclerosis is a pathological process in the coronary arteries, cerebral arteries and aorta that are responsible for coronary heart disease and stroke.
- The term *atherosclerosis* is derived from the Greek word *athere* meaning gruel, as the lesions formed have a deposit of yellow porridge like material.



PATHOPHYSIOLOGY

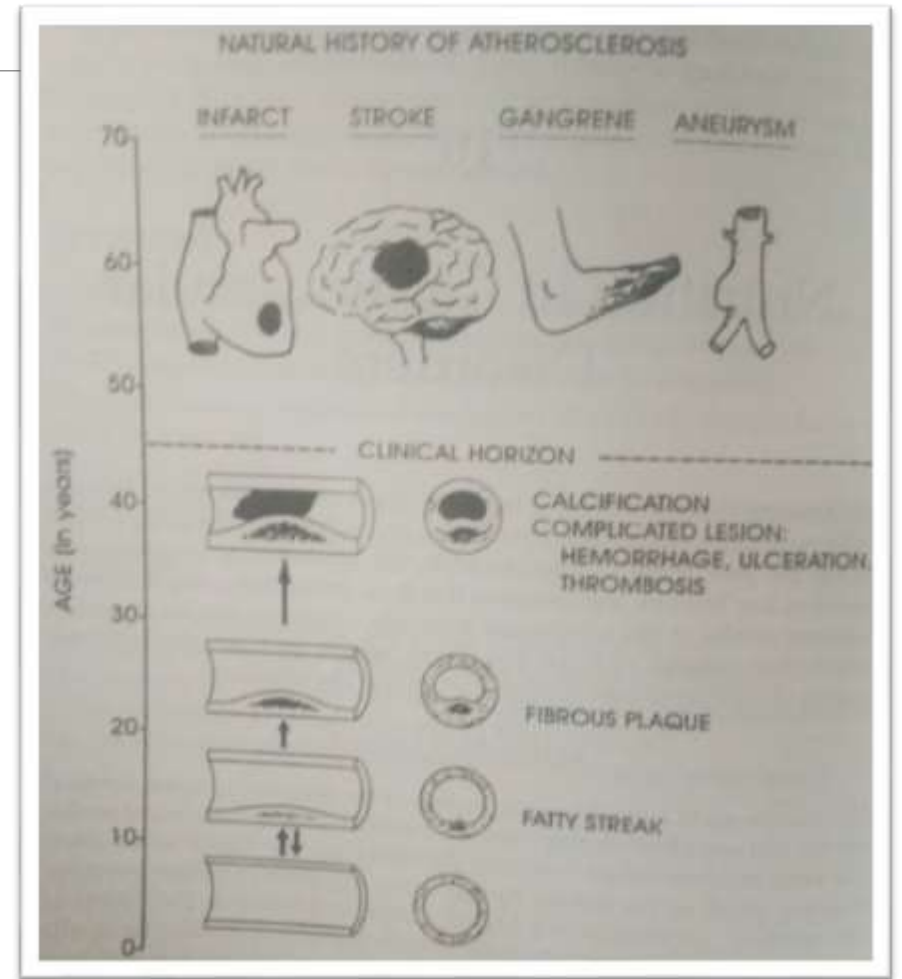
There are 5 stages of development of atherosclerosis:-

Phase 1 –

- Asymptomatic
- Due to chronic injury to the arterial endothelium there is formation of small fatty streaks (non-obstructive, lipid filled cells) at the bends in the artery.
- This phase is commonly seen in younger people usually less than 30 years of age.
- Not all fatty streaks progress to advanced lesions.

Phase 2 –

- Characterized by plaque of high lipid content that may be prone to rupture
- The lipid is derived from plasma LDL that enters the injured endothelial wall.
- The lesion is unstable so it may progress to Phase 3.



PATHOPHYSIOLOGY AND SYMPTOMS

Phase 3 –

- Acute, complicated lesions with rupture and non-occlusive thrombus(blood clot).

SYMPTOMS

☐ Excessive weight

☐ Hypertension

Phase 4 –

- Acute, complicated lesion with occlusive thrombus.
- This stage is associated with angina or MI or sudden death.

☐ High levels of cholesterol

☐ High levels of triglycerides

Phase 5 –

- This stage is characterized by fibrotic or occlusive(cutting off blood supply) lesions.

ETIOLOGY

■SEX

- Death rates are 3 times greater in men than in women however this difference becomes smaller after women pass menopause.

■AGE

- The prevalence, incidence and mortality rates rise steeply with age, doubling in each 5-year age span after the age of 24 years.

■HEREDITY(INCLUDING RACE)

- A positive family history of cardiovascular disease is also a risk factor in its early onset.
- Familial hypercholesterolemia is an inherited

condition but it affects only a very small percentage.

- Certain ethnic groups have higher incidence of risk factors and CVD e.g. African Americans, Hispanic, some Asian Americans.

■CIGARETTE SMOKING

- Nicotine and carbon monoxide in the smoke damage the heart and blood vessels.

■PHYSICAL INACTIVITY

- Physical inactivity poses an increased risk of heart disease.

ETIOLOGY (Continued...)

■ PSYCHOSOCIAL FACTORS

- Type A behavior pattern, i.e., a pattern composed primarily of competitiveness, excessive drive and an enhanced sense of time urgency is associated with increased risk of disease.

■ OBESITY

- Increased Body Mass Index leads to increased CHD risk.
- Dyslipidemia is directly related to BMI.
- Weight distribution is also predictive of CHD risk and affects glucose tolerance and serum lipid levels.

■ HYPERTENSION

- Increased coronary artery wall tension is believed to accelerate the atherosclerotic process by stimulating arterial smooth muscle cell hyperplasia and hypertrophy with resultant fibromuscular thickening.

■ DIABETES MELLITUS

- Hyperglycemia and diabetes mellitus are also risk factors.
- In Diabetes, blood lipids are increased and these contribute to premature or accelerated process of atherosclerosis.

ETIOLOGY (Continued...)

■ LIPID RISK FACTORS

- LDL cholesterol > 130 mg/dl
- HDL cholesterol > 40 mg/dl
- Total cholesterol > 200 mg/dl
- Triglycerides > 150 mg/dl
- Atherogenic dyslipidemia

■ HYPERHOMOCYSTEINEMIA

- Homocysteine was proposed as a risk factor when it was observed that children who were deficient in cystathionine B synthase, the essential catabolic enzyme for homocysteine were found to have

premature atherosclerosis.

■ THROMBOGENIC OR HEMOSTATIC FACTORS

- Plasma fibrinogen is an independent predictor of CHD risk. Factors associated are smoking, sedentary lifestyle, elevated triglycerides and genetic factors.

■ INFLAMMATORY MARKERS SUCH AS C-REACTIVE PROTEIN

- Atherogenesis is an inflammatory process, markers of inflammation, such as C-reactive protein, have been associated with angina, risk of coronary events, heart strokes and peripheral vascular diseases.

NUTRITIONAL MANAGEMENT

It is important to follow regular meal timings and develop good food habits. Any one meal should not be too heavy and some amount of rest after every meal is advisable.

PRUDENT DIET-a normal diet which is low in cholesterol and saturated fat.

- **ENERGY**- most patients are overweight or obese, hypocaloric diet is followed according to individual requirements. Slightly below the normal weight is advised for even normal weight patients.
- **PROTEIN**- 1 g of protein per kilogram of body weight. Use of vegetable protein is recommended.
- **FATS**- modified in both quantity and quality. Total fat should be 20-30% of energy. Consumption of unsaturated fats (PUFA & MUFA) is preferred over saturated fats. Dietary Cholesterol should be 200-300 mg/day (low cholesterol diet).
- **CARBOHYDRATES**-Complex starch and soluble fibres are recommended than simple sugars. 60% of total energy.
- **MINERALS AND VITAMINS**- provided in normal amounts. Deep yellow, orange and green coloured vegetables and fruits should be included in plenty to provide β - carotene which can be converted to retinol in body.

NUTRITIONAL MANAGEMENT(continued..)

- SODIUM- Reduction of dietary sodium to a moderate intake between 1.5 to 3g per day.
- FOOD TO BE USED IN RESTRICTED AMOUNTS OR AVOIDED
 - Animal foods that are high in saturated fats and cholesterol such as eggs, organ meats(liver, kidneys, brain), fatty meats(mutton, pork and their products).
 - Whole milk, khoa, ghee, cream and cheese.
 - Hydrogenated fats unsuitable as cooking medium because they are rich in SFAs and also contain trans fats.
 - Food high in sugars such as rich cakes, sweets, desserts, etc. used in limited amounts because of high energy contents.
 - Alcohol in moderation and the energy contributed by alcohol should be adjusted in the total day's intake.
- FOOD THAT CAN BE USED FREELY
 - Green leafy vegetables, tomatoes, cucumber, radish, lemon.
 - Clear soups, salty lassi, green chutneys, sour pickles without oil, vinegar, etc.

PREVENTION

- ❑ Most subjects with the elevated blood lipid levels have no overt symptoms and may be diagnosed during routine medical examinations.
- ❑ Individuals with two or more risk factors listed under multiple risk factors are highly susceptible to coronary heart disease.
- ❑ To avoid the risk of developing clinical manifestations of CHD, interventions in the form of diet and behavioral modification are essential for these persons.
- ❑ Moderation in all things should be followed. Regular daily exercise, cessation of smoking, a prudent diet and avoidance of alcohol.
- ❑ Regular physical activity such as walking, playing golf, etc., is beneficial. This not only improves circulation but also helps in weight reduction and lowering total and LDL- cholesterol.

GLOMERULONEPHRITIS

GLOMERULONEPHRITIS

GLOMERULONEPHRITIS, ALSO CALLED NEPHRITIS, LITERALLY MEANS AN INFLAMMATION OF THE NEPHRONS. THE INFLAMMATORY PROCESS AFFECTS THE GLOMERULI, THAT IS THE TUFT OF BLOOD CAPILLARIES IN THE HEAD OF NEPHRON. IT IS MOST COMMON IN ITS ACUTE FORM IN CHILDREN BETWEEN 3-10 YEARS OF AGE AND YOUNG ADULTS, ALTHOUGH A FEW CASES OF INITIAL ATTACKS DO OCCUR IN ADULTS OVER THE AGE OF 50 YEARS.

ALTHOUGH, THE GLOMERULI ARE PARTICULARLY AFFECTED, THE FUNCTIONING OF TUBULES IS ALSO DISTURBED. GLOMERULONEPHRITIS ACT AS ONE OF THE MOST COMMON CAUSE OF STAGE 5 CHRONIC KIDNEY DISEASE (ALSO KNOWN AS ESRD).

ETIOLOGY

The most common cause is a previous streptococcal infection. In the past, acute glomerulonephritis was common, frequently following infection with beta-haemolytic streptococci in children and young adults with tonsillitis, scarlet fever, respiratory tract infections or pneumonia. At present with the use of penicillin, the streptococci are usually rapidly obliterated and so acute glomerulonephritis has become less common, though it still follows infections of upper respiratory tract.

The glomerular damage is caused by deposition in the glomeruli of soluble immune complexes of streptococcal antigen with antibody formed in response to foreign organisms.

Glomerulonephritis is associated with endocarditis, abscesses or infected ventriculoperitoneal shunts. As the disease becomes progressive, the number of functioning nephrons of the kidney are reduced.

SYMPTOMS AND COURSE OF DISEASE

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- The disease in almost all patients is self limiting. It has more or less sudden onset, a brief course in its acute form lasting from several days to a week during which the glomerular inflammation resolves by itself, but the renal function returns to normal much more slowly.
 - Infrequently, it progresses to chronic form, involving an increased amount of renal tissue and eventually leading to chronic renal failure, requiring dialysis and other support treatment.
 - Typical symptoms of glomerulonephritis are haematuria and proteinuria.
 - Renal blood flow and glomerular filtration rate are reduced by as much as 50% or more and the damaged glomerular capillaries allow plasma proteins and blood cells to pass through into the bowman's capsule.

CONTD...

- The urine volume falls to between 500-1000 ml/day and sodium excretion is greatly reduced.
- The urine also contains moderate amounts of protein with red and white blood cells in abundance.
- Oedema develops, and blood pressure rises, leading to complaints of malaise, headache, swelling of face and hands in the morning and of ankles at night.
- The patient is generally anorexic and nausea and vomiting occur which contributes to feeding problems.
- If the disease progresses to renal insufficiency, oliguria or anuria results, which is a symptom of acute renal failure.

DIETARY MANAGEMENT

The major objectives of dietary management are:

- To spare the diseased kidneys
- To prevent uraemia
- To prevent oedema
- To maintain adequate nutrition.

To achieve these objectives, following dietary modifications are recommended:

- ❖ **ENERGY**: The energy requirement is essentially the same as is in good health. In the absence of fever and bed rest, these allowances can be reduced somewhat if there is no previous condition of malnutrition.
- ❖ **PROTEIN**: Restriction of protein is only needed when the blood urea nitrogen (BUN) is elevated and oliguria is present. Usually the diet provides about 0.5g of protein/kg of ideal body weight.

When the patient is able to maintain normal BUN level, then the protein is not restricted and the patient is able to tolerate normal protein intake.

❖ **CARBOHYDRATE:** In order to provide sufficient kilocalories for energy needs, carbohydrates need to be given liberally. Liberal carbs intake will also have a protein sparing action, reduce catabolism of protein, as well as prevent starvation ketosis.

❖ **FAT:** There is no need to restrict fat in diet. In fact, including emulsified and easily digestible fat in the diet will provide non-protein calories for energy needs, reduce the bulk of the diet as well as make the diet more palatable.

❖ **SODIUM:** There is a need to restrict sodium in the diet because of presence of oliguria, oedema and hypertension. If renal function is impaired and oliguria and oedema are present, sodium needs to be restricted to 500 to 1000mg/day.

❖ **POTASSIUM:** The renal clearance of potassium is impaired when severe oliguria is a complication. This may lead to potassium intoxication and even require dialysis, as hyperkalemia can result in cardiac arrest. Fruit and fruit juices being a good source of potassium, could be a cause of potassium intoxication, if included in large amount in diet. Therefore, their intake has to be restricted if oliguria is present.

❖ **WATER:** Water needs to be restricted according to the ability of the kidney to excrete urine. When oliguria is present, restriction of fluid intake is imposed. Volume of fluid to be given is calculated from the volume of urine passed in previous 24 hours plus the estimated insensible water loss, usually, 500ml daily. During the first few days of treatment, the fluid should be given less

LIFESTYLE MANAGEMENT

If you have kidney disease like glomerulonephritis, you should make some lifestyle changes:

- Restrict your salt intake to prevent or minimize fluid retention, swelling and hypertension.
- Consume less protein and potassium to slow the build up of wastes in your blood.
- Maintain a healthy weight.
- Control your blood sugar level if you have diabetes.
- Quit smoking.

HYPERTENSION

Hypertension is defined as sustained elevated arterial blood pressure measured indirectly by an inflatable cuff and pressure manometer-sphygmomanometer.

Hypertension can involve many organs and systems including the heart, endocrine glands, kidney and central and autonomic nervous systems.

It has shown to increase the risk of developing stroke, coronary heart disease, congestive heart failure, peripheral vascular disease and nephrosclerosis.

Blood pressure is a continuous or graded phenomenon and the risk of hypertension increases steadily with blood pressure level- either systolic blood pressure or diastolic blood pressure.

A new classification has been promoted by the **JOINT NATIONAL COMMITTEE** of USA for the detection, evaluation and treatment of high blood pressure.

CLASSIFICATION OF BLOOD PRESSURE

BLOOD PRESSURE CLASSIFICATION	SYSTOLIC BLOOD PRESSURE [SBP] (mm Hg)	DIASTOLIC BLOOD PRESSURE [DBP] (mm Hg)
NORMAL	<120	<80
PREYPERTENSIVE	120-139	80-9
STAGE 1 HYPERTENSION	140-159	90-99
STAGE 2 HYPERTENSION	>160	>100

ETIOLOGY

More than 90% of people with hypertension have no identifiable cause of elevated blood pressure and are said to have “primary” , “essential” Or “idiopathic” hypertension .

Rest of the people with hypertension do have an identifiable cause and are said to have “secondary” hypertension.

SECONDARY HYPERTENSION may be due to :

- 1) Renal diseases such as glomerulonephritis, chronic pyelonephritis, polycystic kidney disease, renal vascular disease.
- 2) Use of oral contraceptives in women
- 3) Endocrine diseases such as hyperaldosteronism , acromegaly , cushing's syndrome, hypothyroidism .

It is likely that a number of pathophysiologic processes contribute to elevated blood pressure in essential hypertension and that factors unrelated to diet are also involved.

A) AGE -: Systolic blood pressure rises steeply from infancy to adulthood and levels off once adult height is reached. Longitudinal studies show that SBP increases on an average by 20mm of Hg between ages 20 and 60 years and an additional 20mm between ages 60 and 80 years. Diastolic blood pressure on the other hand rises approximately 10 mm between the ages of 20 and 60 years and gradually declines thereafter.

B) SEX -: There is a higher mean pressure and higher prevalence of hypertension among males in industrialised societies from adolescence till 45 years of age. After this age , mean blood pressure values are higher in women .

C) ETHNIC , RACIAL AND MIGRANT DIFFERENCES -: Differences in the prevalence of hypertension have been found in different races in the world. Even in India , there are differences in the prevalence rates of hypertension in different communities.

Migrant studies have emphasized the effect of cultural and environmental factors on the development of hypertension in individuals. When people move from rural to urban setting , the average blood pressure and frequency of hypertension and its complications rise rapidly. Also , mean levels of blood pressure are very sensitive to diet and other environmental influences.

D) HEREDITY -: A genetic predisposition to hypertension is generally there for humans , although it has not been determined whether it is via a single gene or is a polygenic inheritance. The current consensus for humans is that the predisposition is polygenic and the tendency to develop hypertension remains latent unless one or more environmental influences (sodium & potassium intake, psychosocial stress , obesity and other nutritional factors) activate the mechanisms that raise blood pressure.

E) PSYCHOSOCIAL & SOCIOCULTURAL INFLUENCES -: Although many studies have related short-term changes in blood pressure to psychosocial and sociocultural factors, little is known about how these factors might interact with diet to increase the risk of sustained hypertension.

Cross-sectional and longitudinal studies of populations undergoing a cultural change from traditional to more westernized or industrialised way of life usually show an increase in both SBP and DBP.

F) OBESITY -: The prevalence of high blood pressure in persons with a BMI $>30\text{Kg/m}^2$ is 38% for men and 32% for women compared to 18% for men and 17% women with normal BMI ($\leq 25\text{Kg/m}^2$). The risk of developing elevated blood pressure is 2-6 times higher in overweight than in normal weight persons.

G) PHYSICAL ACTIVITY -: Less active persons are 30-50% more likely to develop hypertension than their active counterparts. Thus, to prevent hypertension, increasing the amount of physical activity of low to moderate intensity to 30-40 minutes most days is necessary.

H) DIETARY FACTORS -: A variety of physiological mechanisms , some of which may be influenced by diet can contribute to the development and maintenance of Hypertension. Some of the dietary factors such as total energy, dietary fat especially p/s ratio (polysaturated/saturated), dietary fibre, sodium , potassium, alcohol, and caffeine have been linked to blood pressure.

SYMPTOMS

Most patients with hypertension have no symptom and the condition is discovered in the course of a routine medical examination.

Common symptoms observed when the Blood Pressure is rising are -: headache, dizziness, impaired vision, failing memory, shortness of breath, pain and gastro-intestinal disturbances.

Extent of symptoms depends upon the elevation of the blood pressure and the length of time it has been present.

Management

- 1) Management of Secondary Hypertension is directed towards diagnosis and treatment of the underlying cause.
- 2) Patients generally suffering from idiopathic hypertension generally do not have any overt symptoms and continue to lead a normal life . Hypertension is a chronic, life long condition and may lead to development of Coronary Heart Disease (CHD) and stroke.
- 3) Therefore, the treatment is directed towards controlling the blood pressure within normal limits by the use of the drugs, diet and behavior modification.
- 4) In mild to moderate hypertension , this may be achieved by diet restriction , controlling weight , cessation of smoking , alcohol restriction, regular sustained physical activity and moderation in life.
- 5) However , in severe hypertension, there is danger of the involvement of other vital organs , therefore drugs such as diuretics and beta-blockers are used along with the above measures to reduce the elevated blood pressure.

NUTRITIONAL MANAGEMENT

The current nutritional therapy focusses on weight management , sodium control and nutrient balance .

Objectives of Diet Therapy -:

- 1) To achieve a gradual weight loss in overweight and obese individuals, and maintain their weight slightly below the normal weight .
- 2) To reduce the sodium intake .
- 3) To maintain adequate nutrition.

To achieve the above objectives , the prudent diet is further modified as below -:

- a) **ENERGY** – A weight loss in obese hypertensives is often accompanied with a fall in the blood pressures. Also , majority of hypertensive patients are overweight or obese so a hypocaloric diet is recommended. Even normal weight hypertensive patients benefit with a slight reduction in energy. Therefore , the energy intake should be adjusted in order to bring weight loss .

b) PROTEIN – A normal protein intake is recommended for hypertensive patients. It should contribute to 15-20% energy in a low energy diet. Excess of animal protein should be avoided as animal fat is usually high in animal fat as well as in sodium . Vegetable protein such as those of whole legumes and pulses should be included in the diet as they are low in fat and sodium and are high in dietary fibre .

c) FATS – Quantity of fat should be reduced to provide about 20% energy in the diet. Also , the type of fat in the diet has to be modified so as to raise the P/S ratio to 1 or above . To achieve this , saturated fats should be substituted with monosaturated and polysaturated fats .

d) CARBOHYDRATES – The rest of the dietary energy , i.e. about 60-65% should be from carbohydrate foods. Emphasis should be placed on including foods high in complex carbohydrates such as starches and dietary fibre rather than simple sugars.

e) Sodium – Various studies have shown that sodium restriction alongwith weight reduction is effective in controlling mild to moderate hypertension . The level of sodium restriction which by itself is effective in lowering blood pressure in hypertensive patients is so low as to be impractical (250-500 mg /day) . Moderate salt restriction is recommended for the treatment of hypertension . A value of 2.4g of sodium is equivalent to approximately 6g of sodium chloride (i.e. table salt).

f) Potassium and calcium – an adequate potassium intake is an essential part of the treatment . This can be achieved by including sufficient amount of foods rich in potassium such as milk, fruits and vegetables. Recent studies , though controversial , have demonstrated the beneficial effect of adequate calcium intakes in hypertension , therefore , sufficient amount of calcium rich foods such as milk , leafy vegetables , etc. , should be included in the diet .

DIET AND FEEDING PATTERN

The diet for hypertensive patients is essentially a normal diet . The major modification is in the salt or sodium content .

As no salt is to be used in cooking , the main aim in food preparation is to make it palatable by the use of alternative seasonings .

A variety of condiments (low sodium ones) and flavoring agents such as lemon , vinegar , tamarind extracts , herbs , spices , onion , garlic , etc. , can be used to improve palatability of salt free food.

Good food sources of Potassium should be included in the diet , especially for patients who are on drug therapy with diuretics .

Some of the foods that are high in potassium but low in sodium are potatoes , squashes , bananas, apricots and legumes can be included in the diet .

ROLE OF FIBER IN HEALTH AND DISEASES

FIBER

- **Fiber**, also known as roughage, is the part of plant-based foods.
- It passes through the body undigested, keeping your digestive system clean and healthy, easing bowel movements, and flushing cholesterol and harmful carcinogens out of the body.
- It includes polysaccharides, oligosaccharides, lignin and associated plant substances.



➤ Dairy products and white bread have little to no fiber.




➤ Cereal grains, seeds, vegetables, and fruits are good sources of fiber.

➤ Fiber helps speed up the elimination of toxic waste through the colon.

➤ Oat cereals, Brussels sprouts, oranges, flax seeds, and beans, such as kidney, black, and pinto, are all good sources of soluble fiber.



HOW MUCH FIBER DOES A PERSON NEED?

HOW MUCH FIBER PER DAY?		
The Institute of Medicine recommends:		
	Children	Amount:
	1 - 3 years	19g
	4 - 8 years	25g
	Adult Males	
	19-50 years	38g
	>50 years	30g
	Adult Females	
	19-50 years	25g
	>50 years	21g
	pregnancy	28g
	lactation	29g

ROLE OF FIBER IN HEALTH

➤ **Protection against heart disease** - The consumption of soluble fiber has been shown to protect against heart diseases by reducing cholesterol levels.

➤ **Gastrointestinal health** - The consumption of fiber promotes regular bowel movements and prevents constipation. It may also reduce the risk of developing colitis and hemorrhoids. There is also mixed evidence that consuming fiber might help reduce the risk of colon cancer.



➤ **Diabetes** - People with diabetes who consume a lot of fiber tend to need less insulin than those whose fiber intake is low. Fiber can help slow the absorption of sugar, helping to prevent spikes after meals.

➤ **Body weight** - a high-fiber intake can significantly contribute toward body-weight control. Fiber produces a feeling of fullness without adding calories (fiber calories are not absorbed by the body) - this can help treat or prevent overweight/obesity.

➤ **Helps you live longer:** Studies suggest that increasing your dietary fiber intake — especially cereal fiber — is associated with a reduced risk of dying from cardiovascular disease and all cancers.

DISEASES ASSOCIATED WITH LESS FIBER INTAKE

➤ **Diseases of the Colon and Gastrointestinal Disorders:** The data documenting the protective effect of dietary fiber on colon cancer is well-known. There is evidence for similar strong links with other common diseases of the colon: diverticulosis, irritable bowel syndrome, ulcerative colitis, as well as hemorrhoids, peptic ulcers, and hiatus hernia.

➤ **Diabetes:** Population-based studies clearly show Type 2 diabetes to be one of the diseases most clearly related to inadequate intake of dietary fiber. Clinical trials have demonstrated the beneficial therapeutic effect on diabetes of increased dietary fiber through diet and/or supplementation..

➤ **Constipation:** Constipation can result from lack of fiber, but also from too little exercise. Boosting your fiber intake can help form soft, bulky stools, relieving and preventing constipation. Be sure to add fiber slowly so your body gets used to it. And help yourself stay regular by drinking plenty of fluids and exercising regularly.

➤ **Weight gain:** A diet deficient in fiber can lead to weight gain because that type of food requires less chewing, which does not give your body time to register that you're no longer hungry. By not giving your body time to register, you're more likely to overeat.

