Introduction
Ischemia heart disease (IHD) is a major health problem, both for the developed and developing societies. It is the most fatal form of cardiovascular disease and is responsible for 80% of all cardiac mortality\(^1\) and 35% of all deaths in the United States\(^2\).

The developing countries like developed nations face an epidemic of ischemic heart disease, which is signalled by a slogan of the World Health Organisation in 1988, "Heart attacks are developing in developing countries, prevent them now". This disease is also very common in Bangladesh. Although very limited works are being done in this field, one study shows the prevalence rate of this disease is 3.3 per thousand population in Bangladesh\(^3\) and another study shows the rise of incidence rate of myocardial infarction is 0.5 per thousand population per year over a period of 1978-81\(^5\).

A big mountainous work has already been done in different societies to mark the risk factors associated with this disease and their prevention.

Coronary heart disease mortality has declined in a number of European countries including Belgium with a better application of prevention in addition to pharmacological and interventional approach\(^6\).

"Prevention is better than cure" runs the proverb. This particularly holds good in ischemic heart disease because failure of prevention may leads to sudden premature death.

Primary prevention of ischemic heart disease
Primary prevention means "Prevention of death and non fatal events in a healthy population." Ischemic heart disease is a health problem where many amenable risk factors are identified which can be controlled either by education or modification of life style and early treatment of related risk factors.

Primary prevention includes early identification of risk factors and their prevention e.g.:
- Cessation of smoking
- Correction of dyslipidaemia
- Control of hypertension
- Maintenance of physically active life
- Avoidance of obesity
- Control of diabetes mellitus
- Low to moderate daily consumption of alcohol
- Low dose aspirin
- Intake of anti-oxidant vitamins e.g. vitamin E & C, (a-tocopherol and betacarotene)
- Postmenopausal oestrogen replacement therapy
- Reduction of clotting factors (e.g. fibrinogen, factor VII) by physical exercise, low to moderate alcohol consumption, Post-menopausal oestrogen therapy, intake of polyunsaturated fatty acid in diet\(^7\).

Our observation
Efforts of primary prevention are lacking in our country because of the lack of adequate primary health care, health education and coordinated efforts of family physician and concerned personnel. Primary preventive measures should be the main object in this regard particularly in developing countries like ours, where poor socio-economic conditions fail to bear the huge cost of treatment of the disease during attacks and of secondary measures. Children or adolescents who are obese, inactive, have hypertension or diabetes, who smoke with family history of coronary heart disease or peripheral vascular

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Primary prevention can be accomplished by early detection of risk factors and their prevention by increasing public awareness through health education. Family physician, social workers & mass media must play positive role in this regard. Introduction of at least physical exercise & healthy diet in developing countries may contribute significantly in this connection.

Secondary prevention of ischemic heart disease
Secondary prevention of coronary heart disease may be defined as action taken to prevent recurrence of IHD, sudden death or fatal arrhythmia in a patient who experienced at least one event of coronary episode.

The concept of secondary prevention of reinfarction and death after recovery of AMI is gaining importance day by day. Patients, who survive the initial attack of MI, are at an increased risk of developing further serious attacks. Therefore it is obligatory to take adequate measures to control the amenable risk factors in a rational way, although ideally primary prevention should have been the ultimate goal in a conscious society. If this is not accomplished, it is a must to have at least secondary prevention to reduce morbidity and mortality in patients who have clinically apparent IHD. Secondary prevention following acute myocardial infarction begins at the very start of hospitalisation. An aggressive approach should focus on appropriate life style change as well as pharmacotherapy.

Strategies for secondary prevention of IHD
The strategy of secondary prevention of IHD will depend upon individual patient, nature of the disease, its complications, previous attacks, age of the patient and other serious associated disease. However the following strategies may be followed as a guideline:

• Life style modification
• Control of risk factors
• Drug therapy:

A. Drugs which prevent sudden death and reinforcing:
   (i) β-adrenoceptor blocking agents
   (ii) Anti-platelet agents and anticoagulants
   (iii) Calcium channel blockers

B. Drugs which prevent ventricular remodelling:-
   (i) Angiogenesis converting enzyme (ACE) inhibitors
   (ii) Anti-arrhythmic agents

• Revascularisation:
   (i) Coronary artery bypass grafting
   (ii) Coronary angioplasty

Life Style Modification: Modification of lifestyle after an ischemic attack is very important and proved to be very beneficial for long term survival. Cessation of smoking, increased physical activity and lipid lowering are key to life style modification objective.

In many studies; patients with coronary artery disease, it has been shown that intake of polyunsaturated fatty acids, fiber containing diet, exercise, weight reduction; cessation of smoking and modification favourably altered the rate of luminal narrowing of coronary arteries.

Physical exercise: It is recommended that exercise training should be instituted as soon as possible after an AMI in order to prevent reconditioning. Exercise improves oxygen transport, evident as an increase in cardiac output, a reduction in heart rate, systolic blood pressure and thereby myocardial oxygen consumption at rest and at sub maximal work levels. Other effects of exercise includes weight reduction, control of diabetes mellitus, improvement of lipid profile, psychological benefits including greater confidence of performing activities of daily life and overall improvement of functional status.

Exercise prescription needs prior assessment by ETT. Physical exercise after MI establishes natural bypass and increases left ventricular ejection fraction and correction of
risk factors. The reduction of risk factor of coronary heart disease after ischemic event is very important in prevention of reinforcing and sudden death.

Control of all risk factors
Early detection & reduction of risk factors after an attack of ischaemic heart disease is of prime importance in the prevention of reinfarction and sudden death. The most important steps in the area are the cessation of smoking, control of hypertension & diabetes mellitus, reduction of LDL, cholesterol & body weight and increase in blood HDL level.

Cigarette Smoking: It is an established risk factor for development of angina, myocardial infarction and increases the risk of reinfarction and death. Many studies proved that who remained abstinent from smoking for more than 3 years showed significant decline of second cardiac event similar to survivor who never smoked.

Cessation of smoking is facilitated by explaining physiological and psychological aspects of the habit and its strong association of cardiac disease. Gradual nicotine withdrawal may be done by tapering cigarette smoking, gradually changing to lower nicotine cigarettes and substituting chewing nicotine gum, if there is withdrawal symptoms.

Control of high Blood Pressure: The higher the blood pressure, whether systolic or diastolic, the greater is the risk of developing ischemic heart disease. Evidence from clinical trials suggests that antihypensive agents lower coronary modality only moderately - less than one might have anticipated.

Cholesterol: Elevated cholesterol is found in the genesis of atherosclerosis and ischemic heart disease, which is an established fact. Numerous trials proved that reduction of cholesterol lead to a reduction in morbidity and morality from cardiovascular disease.

Treatment of hyperlipidaemia
It should start with dietary measures. Weight reduction and alcohol restriction substantially reduce hypetriglyceridaemia. Total fat should be reduced to 25-30% of food energy having polyunsaturated fatty acids; especially linoleic acid should be 7-10%, substitution of vegetable oils, fish and carbohydrates, soluble fiber, garlic and soy protein & skimmed milk in the diet.

Drugs used to correct hyperlipidaemia include:
• Bile acid sequestrants (Cholestyramine) are effective in hypercholesterolaemia-
• Nicotinic acid reduces triglycerides and to lesser extent cholesterol-
• Fibrates reduces triglycerides and to lesser extent cholesterol.
• HMGCoA reductase inhibitor reduces plasma cholesterol by 25% or more and its use is recommended if cholesterol level is in excess of 7.8 mmol/L which is unresponsive to other therapy.
• Secondary causes like diabetes mellitus, myxoedema, biliary obstruction, nephrotic syndrome etc. should be treated. Severe form may need gastrointestinal bypass surgery.

Bile acid sequestrants: Adverse effect- GIT upset and interfere with absorption of certain drugs. Niacin causes flushing of skin, GIT upset. Common side effects are myopathy, neutropenia, impotency and abnormal liver function test.

β-adrenoceptive blocking agents: A number of placebo control secondary prevention trials involving >35000 patients indicate that chronic β -blockade began in the early phase of infarction improves survival, decrease the incidence of reinfarction and sudden death for at least the first several month after AMI. The Beta Blocker Heart Attack Trial (BHAFT), first International Study of Infarct Survival (ISIS-I), the Norwegian Multicentre Study Group, Multicentre International Study showed almost similar results.

Selection of patients for empirical long term blocker for prophylaxis:
- Patients at high risk (complicated MI) appears to be most benefited, provided there is no contraindication.
- In Q wave infarction, if one of the following
is present:
   i) In hospital, electrical complication (e.g. VT or cardiac arrest)
   ii) Asymptomatic non-sustained VT
   iii) Frequent ventricular premature beats
   iv) Objective evidence of ischaemia
   v) Recurrent myocardial infarction

Silent myocardial infarction:
Patient with non-Q wave infarction have no proven benefit from β-blocker. Dose and administration of β-blocker for acute β-blockade, drugs are used intravenously in a dose of atenolol 5-10 mg, metoprolol 5-15 mg. Over 5 minutes it relieves pain, reduces arrhythmia and improves short-term mortality provided there is no contraindication.

For long term oral administration it is preferable that the dose is adjusted as such to keep pulse rate between 50-75/minutes and systolic blood pressure does not go below 100-90mm of Hg.

**Contraindication of β-blockers**:
- Heart rate <60 beats/min
- Systolic blood pressure <100 InNof Hg
- Moderate to severe left ventricular failure
- Sign of peripheral hypoperfusion
- AV conduction abnormalities
- Chronic obstructive pulmonary disease

Relative contraindications are:
- History of asthma
- Severe peripheral vascular disease
- Difficult to control IDDM

**Adverse effects of blockers**: Fatigue, Depression, Sexual dysfunction, Nightmares, Bradycardia and Heart block.

**Thrombolytic agents, Anticoagulants & Antiplatelet agents**: The goals, of antithrombic therapy during and early after myocardial infarction includes:
   i) Prevention of deep vein thrombosis and pulmonary embolism
   ii) Prevention of arterial embolism
   iii) Reduction of early recurrence, extension of myocardial infarction and death
   iv) Reduction of early re-occlusion and death

v) Secondary prevention of late recurrence of myocardial infarction and death. ISIS-2 study showed that 5 weeks vascular mortality rate was reduced by 23% with aspirin alone and was reduced a further 19% when aspirin and streptokinase were both used.

**Aspirin as an antiplatelet agent**: In patients with stable angina aspirin decreases the risk of first myocardial infarction. Aspirin should be used in patients with unstable angina and in most severe cases in conjunction with heparin. It is also beneficial in the prevention of re-occlusion following coronary angioplasty, but does not prevent the late restenosis.

**Mechanism of action of aspirin**: Aspirin irreversibly inhibit cyclooxygenase by acetylating the serine residue at the active site of the enzyme and this inhibition lasts for the lifetime of the cell. As a result the synthesis of thromboxane A₂ is inhibited and the preaggregatory & vasoconstrictive action of thromboxane A₂ is prevented.

**Dose of aspirin**: The present recommendation is a single loading dose of 200-300 mg of aspirin followed by a daily dose of 75 to 100 mg. This dose is clinically efficacious and is safer than higher doses

**Adverse effect**: Gastrointestinal disturbances e.g. heart burn, erosive gastritis, peptic ulcer, GI bleeding etc.

**Dipyridamole**: It is a vasodilator and has different anti-platelet effects from aspirin. No convincing study report is yet available.

**Sulphapyrazine**: Anturan Reinfarction Trial claimed that sulphapyrazine prolongs survival after MI.

**Ticlopidin**: It is another anti-platelet agent as found effective in reducing the occurrence of death and myocardial infarction in patients with unstable angina. The dose of this drug is 250 mg twice daily.

**Anticoagulants**: Many studies are carried out for the rationality to use-anticoagulant as
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secondary cardioprotective agent, but results are not uniform. Anyway, use of anticoagulant where there is an increased risk of thromboembolism is definitely helpful to reduce death, reinfection and incidence of systemic or cerebral embolism. It to be noted that warfarin and aspirin cannot safely be taken together.

*Calcium channel blocker:* The joint task force of the American Heart Association & American College of Cardiology recommended that the patient with non-Q wave infarction should be given Diltiazem in the 1st 24 hours routinely and that therapy is to be continued at least for 1 year\(^1\). Verapamil may be used instead of -propranolol where there is contraindication (β-blockers) but nifedipine is not safe as it cause reflex tachycardia and potentiate the anginal attacks.

Common adverse effects are Headache, Flushing, Palpitation, Hypotension, Ankle oedema, Bradyarrhythmia and Constipation. Limitation of using calcium channel blocker is negative inotropic action & conduction defect.

*Angiotensin converting enzyme (ACE) inhibitors*\(^2\): Several major independent studies of clinical outcome involving almost 100,000 patients have reported results that demonstrated the prolongation of survival\(^3\), particularly in patients with MI with heart failure, impending heart failure, massive anterior infarction with reduced ejection fraction.

Cardioprotection by ACE inhibitors\(^4\):

- Reduces preload and after load & reduces ventricular remodelling. Increases coronary blood flow.
- Decreases infarct size.
- Scavenging of oxygen free radicals.
- Antiarrhythmic effect.
- Modulation of neurohormonal response.
- Prevention of inappropriate growth & hypertrophy.

Selection of patients\(^4\):

- Patients with acute Anterior MI.

- Maximum benefit patients having LV ejection fraction of 28%-32%.
- Systolic blood pressure more than 100mm of Hg.

ACE inhibitor is to be started soon after myocardial infarction without unnecessary delay.

ACE inhibitors are to be continued for at least one year or even longer.

*Adverse effects:* Persistent dry cough, angioneurotic oedema, skin rash, stomatosis, neutropenia, deterioration of renal failure, proteinuria and blood disorders.

*Antiarrhythmic drugs:* Arrhythmia accounts for a large number of mortality after AMI. So use of antiarrhythmic drugs as secondary preventive agents are studied by many trials. These drugs have got proarrhythmic activity and negative intropic effect. So it is recommended that treatment of symptomatic arrhythmias are justified and asymptomatic patient detected by ECG only should be left untreated. Amiodarone is found as one of the promising drug but with wider spectrum of side effects. Final recommendation for its use is to be decided according to the result of large trials. So its effectiveness as secondary prevention cannot be predicted.

*Interventional & Surgical techniques:* Surgical treatment in comparison to medical therapy in patient with unstable angina and after acute MI either by angioplasty or by bypass grafting was found superior in relieving symptoms regardless of severity of coronary disease and reducing the need for antianginal medications. There is no definite proof whether bypass grafting did really reduce the further attacks or not and same is applicable for LV function.

*Our experience:* CCU was started in Dhaka National Medical Institute Hospital in the year 1987, since then we have been treating patients with acute myocardial infarction and unstable angina. In order to have secondary preventive action, we used to prescribe Tab. Aspirin in a dose of 300mg initially followed...
by 75mg to 100 mg daily after meals &
continued indefinitely, if there was no
contraindication. Inj. Streptokinase was being
used in selected cases if the patient comes
within 12 hours of AMI and patients were
economically solvent. β-blockers were used
orally if there was tachycardia and
hypertension particularly in Q-wave
infarction provided there was no
contraindication. Maximum
dose requirements were usually less in our patients
compared to other study groups. Inj. Heparin
was used in very selected cases of unstable
angina and where there was strong suspicion
of thromboembolism and Aspirin was
discontinued during that period. Dipyridamole
was chosen if Aspirin was contraindicated.

Diltiazem (calcium channel blocker) was
preferred in non-Q wave infarction. ACE
inhibitors were selected when AMI was
complicated by heart failure and dry cough
was the commonly encountered side effect.

With all limitations only 10-15% patients got
admission in our center with re-infarction as
per hospital record. This low figure could
reflect the success of secondary prevention
although our patients had no fixed choice of
coming to our centre with re-infarction and
the second attack may be more fatal which did
not allow them to come for medicare.

Conclusion
Coronary heart disease mortality remains the
leading cause of mortality in man over 45
years and women over 56 years although
there have been a significant improvement in
the management of acute attacks.

That is why emphasis should be given to
ensure primary and secondary preventive
measure for the control of ischemic heart
disease. This can be easily done by health
education to increase people awareness.
Active participation of family physicians,
prompt and better medicare in CCU, better
follow up system and finally patient-physician
relationship must play a significant role in this
regard. For developing countries more
attention are to be given in the field of
primary prevention of ischaemnic heart disease
at least by introducing physical exercise and
appropriate nutrition for the vulnerable group.

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