Medical intervention based on the concept of total coronary risk in the asymptomatic population without cardiovascular disease (CVD) is widely advocated throughout the world.

All adults above 40 years, without history of CVD or diabetes, and who are not on treatment for blood pressure (BP) or lipids, should be considered for a comprehensive risk assessment in primary care once every five years.

Our patient is an asymptomatic obese, hypertensive, dyslipidaemic individual who is also a smoker. He has a family history of premature atherosclerotic disease. His co-morbidities include mild asthma and hepatic impairment. His estimated total cardiovascular risk according to Joint British Society risk score1 for 10 year cardiovascular event is 40% which qualifies him in the high risk category.

His estimated score according to HEART score based on the SCORE project2 is 7% which refers to a 10-year risk mortality. According to HEARTSCORE, a score of more than 5 is considered to be at high risk. The following discussion aims to cut down his cardiovascular risk by having life-style changes and use of cardio-protective medication where appropriate.
Estimation of cardiovascular risk:

His estimated total cardiovascular risk according to Joint British Society risk score for 10 year cardiovascular event is 40% which qualifies him in the high risk category. This is illustrated in (Fig 1):

The above figure shows the estimated total cardiovascular risk of this patient for a cardiovascular event in next 10 years is 40% and the relative risk is 97% according to JBS2 electronic risk assessor. The absolute risk gives the actual likelihood of an event in next 10 years whereas the relative risk can be used to encourage lifestyle change or to explain the benefits of anti-hypertensive or cholesterol lowering medication and of compliance with it.

His estimated score according to HEART score based on the SCORE project is 7% which refers to a 10-year risk mortality. According to HEARTSCORE, a score of more than 5 is considered to be at high risk.

The proportion of individual risk factors attributable to CHD deaths had been studied which found that about 6% CHD death was attributable to obesity, 12% to high blood pressure, 18% to smoking, 38% to physical inactivity and 46% to cholesterol.9 This shows how important it is to control and improve modifiable risk factors in order to reduce total CVD risk.

Management of the individual risk factors such as smoking, unhealthy diet, physical inactivity, high BP influences total cardiovascular risk. If perfect control of a risk factor is not achieved (such as high BP), total risk can still be reduced by reducing other risk factors such as smoking or blood lipids. The electronic version of JBS2 or SCORE can be used to show the patient how the total risk decreases if individual risk is controlled. Moreover the SCORE

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>Targets to achieve</th>
<th>Patient’s risk profile</th>
<th>Action Plan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smoking Habit</td>
<td>Stop smoking completely</td>
<td>Current smoker</td>
<td>*assessment of smoking status &amp; nicotine dependence</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>*counselling</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>*nicotine replacement therapy/ drugs</td>
</tr>
<tr>
<td>Physical inactivity</td>
<td>Regular aerobic physical activity at least 30 minutes per day for at least 5 days per week</td>
<td>No regular activity of moderate intensity for 30 minutes</td>
<td>Encourage him to increase his physical activity gradually in work place and in leisure time to reach target</td>
</tr>
<tr>
<td>Body weight distribution</td>
<td>Body mass index(BMI):&lt; 25 kg/square meter</td>
<td>BMI: 32.35 (class I obese)</td>
<td>*Increase in physical activity</td>
</tr>
<tr>
<td></td>
<td>Waist circumference:&lt;90 cm</td>
<td>Waist circumference: 116 cm(centrally obese)</td>
<td>*calorie reducing diet</td>
</tr>
<tr>
<td>Blood Pressure</td>
<td>Systolic pressure &lt; 140 mm Hg</td>
<td>Systolic pressure: 155 mm Hg</td>
<td>*Lifestyle management</td>
</tr>
<tr>
<td></td>
<td>Diastolic pressure &lt; 85 mm Hg</td>
<td>Diastolic pressure: 94 mm Hg</td>
<td>*drugs</td>
</tr>
<tr>
<td>Lipids</td>
<td>Total cholesterol: &lt; 4 mmol/l</td>
<td>Total cholesterol:6.1 mmol/l</td>
<td>*Lipid lowering diet</td>
</tr>
<tr>
<td></td>
<td>LDL cholesterol:&lt;2 mmol/l</td>
<td>Calculated LDL cholesterol: 3.5 mmol/TTotal cholesterol:</td>
<td>*Exercise</td>
</tr>
<tr>
<td></td>
<td>Total cholesterol:1</td>
<td></td>
<td>*drugs: statins</td>
</tr>
<tr>
<td></td>
<td>HDL-C ratio &lt; 4</td>
<td>HDL ratio 5.54</td>
<td></td>
</tr>
</tbody>
</table>

(1) There is no target for total cholesterol HDL ratio in JBS2

Fig.-1: Total cardiovascular risk according to Joint British Society (JBS2, 2005)

Table-1

(Summary of the targets, patient’s risk factors, and action plan according to JBS2)
The following data and figure (2 and 3) illustrates this patients’ risk score and contribution of individual risk factor to CVD mortality according to HEART-SCORE electronic version:

**Examination data of this patient:**

<table>
<thead>
<tr>
<th></th>
<th>Examination</th>
<th>Treatment goals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Systolic blood pressure</td>
<td>154</td>
<td>140</td>
</tr>
<tr>
<td>Cholesterol</td>
<td>6.1 mmol/L</td>
<td>5 mmol/L</td>
</tr>
<tr>
<td>Smoker</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Your total CVD risk*</td>
<td>7%</td>
<td>2%</td>
</tr>
</tbody>
</table>

* Total CVD risk refers to the 10-year risk mortality

**Actual Total CVD Risk Level**

The total cardiovascular disease risk level (left bar below) shows the percentage risk of having a fatal cardiovascular event, such as a stroke or heart attack. Based on examination results, his total CVD risk is 7%.

However, by becoming aware of his risk factors and taking a few preventive actions, he can reach the treatment goals and reduce his risk to 2% as shown by the treatment goal level (right bar below).

(1) His current risk is 7%
(2) His risk if he reaches his treatment goals will approach 2%

**Fig 2:** The above figure shows this patient’s total CVD risk and risk reduction if he reaches the treatment goal.

At present, his risk of dying from a heart attack or a stroke within the next ten years is increased. He can reduce this risk further by becoming aware of his risk factors and by changing his lifestyle.

**Distribution of Modifiable Risk Factors**

Cardiovascular disease is generally due to a combination of several risk factors. The more risk factors he has, the greater the chance of having a heart attack or stroke. The pie chart below shows the distribution of his modifiable risk factors and the impact they have on his total CVD risk level.

![Pie Chart](image)

(1) Systolic blood pressure (20%)
(2) Cholesterol (21%)
(3) Smoker (58%)

**Fig.-3:** The above pie chart shows contribution of individual risk factors to total CVD risk.

**Presence of metabolic syndrome:**

A diagnosis of metabolic syndrome can be made in this patient because he has increased waist circumference, elevated TG, and elevated BP. The clustering of these factors has been termed the metabolic syndrome. People with metabolic syndrome are at higher risk of CVD because this syndrome is based on several interrelated CVD risk factors.

**Lifestyle intervention:**

As part of lifestyle intervention he needs to discontinue smoking, make healthier food choices, increase aerobic physical activity and achieve optimal weight. Involvement of his family such as his wife may be helpful. The patient should be informed about the benefits of reducing weight, quitting smoking, participating in regular aerobic exercise and making healthier eating habits. Once he understands this, it can be used to gain commitment from the patient to lifestyle change. The progress can be monitored through follow-up contacts. The involvement of other health-care staff wherever possible is the key to success.
Management of individual risk factors:

**Smoking cessation**

All smokers like him should be professionally encouraged to permanently stop smoking. Detailed smoking history including his degree of addiction and his readiness to cease smoking should be assessed. The Fagerstrom Test for Nicotine Dependence (FTND) provides a validated tool which can be used to measure his physical dependence on smoking. He might be physically dependent on smoking as he has a 15 pack year of smoking history. Pharmacologic treatment for smoking cessation like bupropion & varenicline is not available in our country. Behavioural support includes setting up a firm quit date with him, guiding and informing him of the support services such as attending a smoking cessation clinic, ascertaining his motivation to quit smoking by using scaling questions, agreeing with him achievable goals and ensuring he understands what the medication can and cannot do and use it properly. Smoking is the single most important preventable cause of disease and early death. If asymptomatic smokers quit smoking it takes up to 10 years to reach the same level of CVD risk of those who have never smoked. An arrangement for the schedule of follow-up visits is helpful.

**Diet:**

Higher risk persons like him should be advised about food choices that are associated with lower CVD risk. As he is centrally obese energy intake should be adjusted to lose weight and he should be referred to a dietician. He should be encouraged to increase fresh fruit and vegetables to at least 5 portions per day along with wholegrain cereals and bread, oily fish (at least 2 servings per week), lean meat and low fat dairy products. The aim is to replace saturated fats to less than 10% of total fat intake with monounsaturated and polyunsaturated fats from vegetable and marine sources to reduce total fat to less than 30% of energy. This is also known as Mediterranean diet which is associated with a decreased risk of CVD. The intake of dietary cholesterol should be restricted to less than 300 mg/day. By adhering to a low cholesterol diet, up to 15% of total cholesterol can be reduced. In cohort studies, the positive relationship between fat intake and CVDs was related to their saturated fatty acid content. A meta-analysis of randomised controlled trials (RCT) of reducing saturated fat intake (using monounsaturated or polyunsaturated fats as a replacement) with at 2 years follow-up resulted in a significant reduction in CVD events by 24%. Plant stenols and sterols reduce LDL cholesterol (an average of 0.54 mmol/l for 2 gram plant stenol or sterol/day).

**Reduction of weight:**

Restriction of total calorie intake and regular physical exercise are the cornerstones of weight control. Replacing high-calorie food and reduction of total intake is a realistic option. Most people begin to gain weight a few months after their initial treatment. Sustained personal and family motivation and long term professional support is required for a successful weight reduction.

He currently weighs 79 kg. Benefits associated with a 10kg weight loss in a 100kg subject is mentioned in Table 3:

<table>
<thead>
<tr>
<th>Benefits of a 10 kg weight loss in a 100 kg subject</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mortality</td>
</tr>
<tr>
<td>BP</td>
</tr>
<tr>
<td>Lipids</td>
</tr>
<tr>
<td>Diabetes</td>
</tr>
</tbody>
</table>

This patient may be recommended drug therapy such as orlistat according to current guidelines with regular exercise and diet restriction. In a meta-analysis, orlistat reduced weight by 2.7 kg (95% CI 2.3 to 3.1 kg). In another trial the progression to diabetes was reduced by 39% compared to placebo by lifestyle change supplemented with orlistat. The risk of CVD proportionately increases with the increase in BMI. Increased CVD risk is also related to the distribution of visceral fat. Weight reduction leads to lower BP, LDL, TG and higher HDL cholesterol, and an improvement in other elements of the metabolic syndrome such as hyperinsulinaemia and hyperglycaemia.

**Physical Activity:**

Positive health benefits have been noticed with almost any increase in activity. He should be referred to a physical activity specialist ideally for professional assessment. He can increase his leisure-time activity by engaging in some more vigorous activity such as brisk walking which is an important determinant of long-term weight maintenance after initial weight loss. As he gradually increases his activity up to a minimum of 30 minutes of moderately vigorous exercise like fast walking in most days of the week will reduce risk and increase fitness. Exercise with family or friend tends to improve motivation. Continued encouragement and support from the physician may help...
Rationale for drugs:
The choice of risk assessment method will influence on the use of drug therapies in asymptomatic people. For asymptomatic individuals without CVD the total CVD risk threshold defined in guidelines for professional lifestyle intervention and appropriate drug therapies is more than 20% over 10 years, which is equivalent to a coronary heart disease (CHD) risk of more than 15% over the same period. According to HEARTSCORE the risk threshold for treatment is therefore defined as fatal CVD of more than 5% over the next 10 years at current age. This is equivalent to a CVD risk of more than 20% based on Framingham.

Control of high blood pressure:
As his BP is above the normal range, repeat measurements (2 measurements at each visit) over 4 visits to determine BP thresholds for treatment, including an assessment of target organ damage should be done. If his BP is persistently over 140/90 mm Hg, he should receive lifestyle advice to help reduce his BP and CVD risk. The aim is to reduce his BP to less than 140/85 mm Hg. Lifestyle recommendations include weight reduction, reduction of salt intake to less than 100 mmol/day by avoiding table salt and salt in cooking and by choosing fresh or frozen unsalted foods, restriction of alcohol consumption to less than 14 units/week (for females where applicable), regular physical activity, quitting smoking and dietary changes for dyslipidaemia.

The DASH study showed that a diet high in fruit and vegetable and low-fat dairy products, and low in saturated fat and cholesterol, produced a reduction of SBP by 11.4 mm Hg & DBP by 5.5 mm Hg. Reduced salt intake by patients with high BP leads to a reduction of SBP by 4.8 mm Hg and DBP by 2.5 mm Hg. Reduction of alcohol consumption can reduce SBP by 3.1 mm Hg and DBP by 2.04 mm Hg.

If BP is still more than 140/90 mm Hg despite lifestyle changes he should receive drug therapy. As his total CVD risk is > 20% drug treatment is justified. Presence of target organ damage or diabetes also justifies drug treatment in patients with high BP. The British Hypertension Society (BHS) ACD algorithm can be followed for drug treatment. He should be started initially with a angiotensin converting enzyme inhibitor (ACEI) or angiotensin receptor blocker (ARB). If BP is still > 140/85, a calcium channel blocker (CCB) may be added later on to reach the target. Common problem with ACEI is dry cough which is much less in ARBs. CCB like amlodipine is well tolerated but can cause pedal oedema. Use of diltiazem may further reduce heart rate as this patient has a resting heart rate of 62/minute. Lifestyle advice should continue even when drug therapy is initiated. The risk of CVD doubles for every 10 mm increase in diastolic BP or every 20 mm Hg increase in systolic BP. A reduction in systolic BP by an average of 12 mm Hg or diastolic BP of 6 mm Hg reduces stroke by 40% and CHD by 20%.

A meta-analysis of 147 RCTs showed that proportional reduction in CHD events and stroke for a given reduction in BP, an approximate halving of risk for each 10 mm Hg diastolic reduction, is the same in people with and without a history of vascular disease and in people without high BP as well as in those with high BP. There is benefit in lowering BP in anyone at sufficient cardiovascular risk whatever their BP.

Lipid management:
The aim of lipid management should be total cholesterol of less than 4 mmol/l or a 25% reduction and LDL cholesterol of less than 2 mmol/l or a 30% reduction. HDL cholesterol and TG values should also be considered in overall lipid management. The risk of CVD rises proportionately with the rise in TG when HDL values are low. He should receive intensive lifestyle advice to modify his lipoproteins favourably which will reduce CVD risk. His lipids should be monitored regularly, and not less than once per year. In addition to a lipid lowering diet treatment with statin therapy is justified as he has > 20% total CVD risk. Presence of atherosclerotic disease and diabetes also justifies statin therapy. Over a wide range of cholesterol concentrations, there is a strong and graded positive association in men and women between total as well as LDL-cholesterol and the risk of CVD. In contrast to LDL-cholesterol, the cardioprotective effects of HDL-cholesterol have been linked to reverse cholesterol transport, positive effects on endothelial cells, and to antioxidant activity. Statin trials in asymptomatic individuals at risk of CVD have shown significant reductions in coronary events and coronary mortality. The reduction of cholesterol by diet, drugs or other means decreases CVD risk.

A meta-analysis involving 10 trials investigated whether statins reduce all-cause mortality and major coronary and cerebrovascular events in people without established CVD.
but with cardiovascular risk factors. The results demonstrated statins significantly reduced all-cause mortality (odds ratio [OR] 0.88, 95% confidence interval [CI] 0.81 to 0.96), major coronary events (OR 0.70, 95% CI 0.61 to 0.81), and major cerebrovascular events (OR 0.81, 95% CI 0.71 to 0.93).\(^{38}\)

His fasting glucose is 6 mmol/l. In all high risk people the optimal fasting glucose should be less than 6 mmol/l. He should therefore receive lifestyle advice in the form of diet, weight reduction and regular exercise. Orlistat is helpful as he is obese and studies show that it reduces progression to diabetes.\(^{39}\)

Other comorbidities:

He has a mild asthma and frequent bouts of bronchitis. He should be emphasised that continuing smoking may further aggravate his asthma and bronchitis. This information may motivate him to quit smoking.

He has a past history of suspected hepatic impairment. This should be further explored in view of the fact that he might not prescribed statin for control of lipids. Therefore active hepatic disease should be ruled out. His liver function tests should include hepatic enzymes such as transaminase (ALT), gamma glutamyl transferase (GGT), serum total protein, albumin globulin ratio, prothrombin time, hepatic ultrasound and virology screen. Current recommendations include at least baseline hepatic enzymes before starting statin therapy. A 3 fold rise in ALT from upper normal limit suggests stopping statin therapy.

Suggested further investigations related to cardiovascular risk:

People like him who are found to be at high total CVD risk should be asked about any new symptoms related to CVD including family history. In subsequent visits further investigations may be offered for example an oral glucose tolerance test (OGTT) if fasting blood glucose is high (≥ 6.1 and ≤ 7 mmol/l), urine for microalbuminuria, serum creatinine, electrocardiography (ECG), echocardiography etc for the subsequent and comprehensive management of cardiovascular risk.

Conclusion:

Risk factor modifications have been shown to reduce CVD mortality and morbidity, particularly in high risk individuals. Total CVD risk in asymptomatic individuals based on major risk factors can be estimated by JBS2 risk score, QRISK assessment tool or by HEARTSCORE. Aggressive control of these risk factors thereby minimising the risk of future events is central to CVD prevention. This can be achieved by intensive and professional life style intervention and appropriate treatment where it is necessary.

In summary, his non-modifiable risk factors include ethnicity, gender, age and positive family history of premature CVD. His modifiable risk factors include high blood pressure, dyslipidaemia, smoking, physical activity not reaching the target and central obesity. His co-morbid states include mild asthma, frequent bouts of bronchitis and suspected hepatic impairment all of which should be considered during drug therapy.

The modifiable risk factors will be managed by a combination of behavioural approach, lifestyle changes and drug therapy. Drug treatment for hypertension is necessary when total CVD risk exceeds 20% as in this case or presence of target organ damage or diabetes. Similarly drug treatment for lipids is justified when total CVD risk exceeds 20% as in this case or presence of atherosclerotic disease and diabetes.

By modifying risk factors we aim to reduce CVD mortality and morbidity particularly in high risk individuals.

References:

8. www.escardio.org accessed on 10-03-2010