

Monitoring of noncommunicable diseases

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ABSTRACT

Noncommunicable diseases (NCDs) represent a major fraction of the global health burden in terms of morbidity and mortality, and its prevalence is on the rise across the world. As more and more people are living with various NCD, primary and secondary prevention becomes an important tool to contain this impending epidemic. The spectrum of major NCD includes cardiovascular disorders (CVD), diabetes mellitus (DM), chronic obstructive pulmonary disorder (COPD), and cancer, with CVD contributing to the majority of deaths attributed to NCD. Control of hypertension is important intervention which can significantly decrease the risk of CVD, which can be achieved by three-pronged approaches such as encompassing dietary, physical exercise, and pharmacological interventions. Monitoring is an integral part of this approach, wherein recording of blood pressure and various investigations are required to be done at variable intervals. DM is an important NCD where primary and secondary preventions are of paramount importance. Similarly, other NCDs such as COPD and cancer also require various monitoring protocols. In this article, we review the current concepts in monitoring and prevention of major NCDs along with the recommendations from the scientific societies.

Key words: Cardiovascular disorders, diabetes, monitoring, noncommunicable diseases, screening

INTRODUCTION

Noncommunicable diseases (NCDs) represent a major fraction of the global health burden and are responsible for over 38 million deaths each year.^[1] The spectrum of major NCD includes cardiovascular disorders (CVD), diabetes mellitus (DM), chronic obstructive pulmonary disorder (COPD), and cancer. CVD leads the pack with about 18 million deaths annually, followed by cancer (8 million), COPD (4 million), and DM (1.5 million). The World Health Organization estimates suggest that one in every seven human beings would have one of these diseases at some point in their lifespan. Commonly held belief of NCD being a chronic disease with little clinical significance are refuted, through rapidly evolving and sometimes fatal NCD such as autoimmune conditions,

malignancies, and CVD. The concept of NCD being more prevalent in developed nations is no longer true, with a staggering two-thirds of NCD mortality being reported from the resource-limited countries. The NCD is both heritable and acquired; their management is enigmatic, and there is no sustainable cure for them. In this article, we review the current concepts in monitoring and prevention of major NCD.

CARDIOVASCULAR DISORDERS

Hypertension (HTN), coronary artery disease (CAD), cerebrovascular accident (CVA), and peripheral

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arterial disease accounts for 15% of the 92 million disability-adjusted life years worldwide, thereby demonstrating its significance in global disease burden.^[2] HTN is the proverbial silent killer, which doubles the risk of CVD including heart failure, CAD, and CVA. The environmental and genetic factors contribute to regional and racial variations in HTN prevalence. Psychosocial stress, sedentary lifestyle, and alcohol consumption may contribute to the development of HTN. Evidence suggests that 15–35% of HTN is heritable, which is even higher in twins up to 60%. Furthermore, HTN occurs 3.8 times more commonly in males above the of age 55 years with a positive family history of the disease.^[2] While there is ample evidence to demonstrate heritability, a small fraction of this heritability is linked to specific genetic determinants. Therefore, both primary and secondary preventions play a pivotal role in prevention and control of this disease.^[3,4]

The effective control of HTN involves certain dietary and lifestyle modifications, which have been effective at an individual and societal level.^[5,6] Earlier studies pertaining to individual nutrients and micronutrients have now paved the way for dietary patterns as a whole, rather than focusing on the individual constituents. Two major dietary interventions exist for HTN, Mediterranean diet, and dietary approaches to stop HTN diet as shown in Table 1. The primary and secondary prevention of HTN is also based on certain lifestyle changes which include restricting sodium and potassium intake, cessation of smoking, and aerobic exercise as shown in Box 1.^[5,8] The follow-up visits after a diagnosis of HTN, CAD, or CVA are not strictly scheduled. Guidelines from the major scientific societies suggest a customized approach depending on the individual patient and the underlying clinical condition.^[9] The monitoring of a patient with HTN is described in Box 2.

CANCER

Improved understanding of pathogenesis and progression has allowed for earlier detection and treatment of various cancers. The goal of cancer treatment is to prevent morbidity and mortality through early detection and effective management. The early identification of cancer involves certain screening procedures as summarized in Table 2.^[10] The management of malignancy is a complex process which requires constant monitoring of patients being treated with chemotherapy or radiotherapy. The patient should be monitored for response to treatment, development of complications, and recurrence of cancer. Various oncological emergencies during the

Table 1: Dietary approaches to stop hypertension

Mediterranean pattern

A diet higher in fresh fruits, vegetables (root and green varieties) cereals, and fish containing PUFA. This diet is low in nondairy fat and consists of oils like olive oil and canola. The Mediterranean diet tends to be higher in unsaturated fat (35% of total calories) and dietary (25 g/day)

DASH pattern

The DASH dietary pattern is high in vegetables, fruits, low-fat dairy, products, whole grains, poultry, fish, and nuts and low in sweets, sugar-sweetened beverages, and red meats; low in saturated fat, total fat, and cholesterol; and rich in potassium, magnesium, and calcium, as well as in protein and fiber

PUFA: Polyunsaturated fatty acids; DASH: Dietary approaches to stop hypertension

Box 1: Lifestyle measures to prevent hypertension

Restrict sodium intake to below 2.3 g/day

Adequate potassium intake of >4.7 g/day

Reduce the carbohydrate content to <55% of total calories

Reduced consumption of sugar-sweetened beverages

Avoid alcohol consumption and smoking

Daily physical activity

Maintain the ideal body weight

Box 2: Monitoring of a hypertensive patient

Blood pressure measurement during every office visit or monthly intervals

Modify the antihypertensive drugs at 3 monthly intervals if required
Biochemistry panel, electrocardiography, fundus examination every year

Renal function tests and electrolytes every 3 monthly in patients on renin-angiotensin-aldosterone system blockers

treatment form an important hurdle to continue further management of the patient. Oncological emergencies range from dyselectrolytemia to life-threatening conditions such as anaphylaxis, acute airway obstruction, pericardial tamponade, and spinal cord compression. Early intervention during these oncological emergencies reduces the mortality and morbidity. Neoplasms of the lung, breast and bone, leukemia, and lymphomas are the common malignancies that lead to systemic complications. Figure 1 describes the systemic complications that require constant monitoring during the management of patients with cancer.

CHRONIC OBSTRUCTIVE PULMONARY DISORDER

Slow evolution and progressive nature present various avenues for the prevention of chronic respiratory diseases. However, a long-term and systematic approach is required for their effective prevention. Asthma, bronchiectasis, COPD, chronic rhinosinusitis, hypersensitivity pneumonitis, and lung fibrosis represent most of these illnesses. Smoking and consumption of tobacco are the major culprits behind

Table 2: Screening recommendations for the prevention of various cancers

Cancer type	Test or procedure	Screening recommendations*
Cervical	Pap smear	Women 21-64 years - every 3 years No screening for women for >65 years, if adequate prior screenings
Colorectal	HPV test	Women 30-65 years every 5 years
	Sigmoidoscopy	Adults 50-75 years every 5 years with annual high-sensitivity fecal occult blood testing
	Colonoscopy	Adults 50-65 years every 10 years
	Fecal DNA testing	Adults >50 years every 5 years
	Fecal immunochemical testing	Adults >50 years every year
Lung	CT colonography	Adults >50 years, every 5 years
	Low-dose CT	Adults 55-80 years with a >30 pack year smoking history, still smoking or having quit 15 years ago
Ovary	CA-125 TV USG	For women with persistent symptoms suggestive of CA ovary, a combination of CA-125 and TV USG may be done
Prostate	PSA	Men >50 years, frequency to be guided by PSA levels
Skin	Self-examination	Monthly
Breast	Self-examination	All ages
	Clinical exam	Women 20-39 years - every 3 years Women >40 years - annually
	Mammography	Women >40 years annually
	MRI	Women >20% lifetime risk, combine with annual mammography

*The American Cancer Society and the US Preventive Services Task Force Guidelines for Screening. HPV: Human papillomavirus; CT: Computed tomography; CA: Cancer antigen; TV: Transvaginal; USG: Ultrasonography; PSA: Prostate specific antigen; MRI: Magnetic resonance imaging

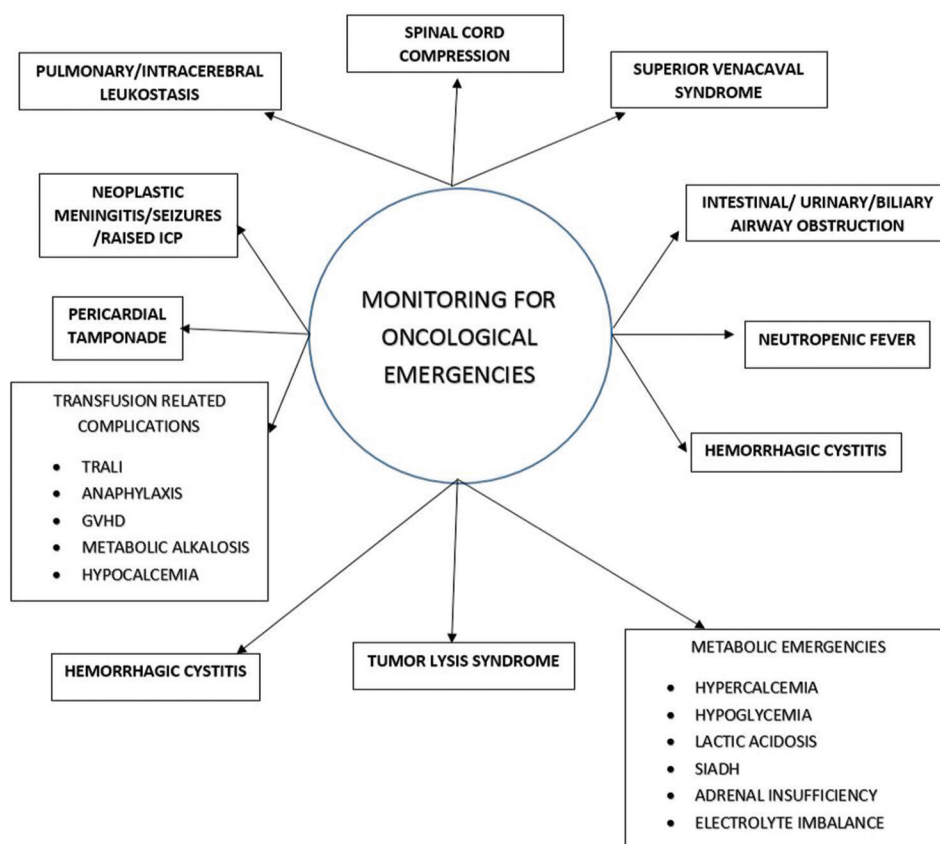


Figure 1: Monitoring for complications in cancer

the rise in the prevalence of the COPD. Table 3 gives the measures to be adopted at the community level to prevent the menace of the smoking.^[11] The only intervention which has shown benefit in preventing the progressive

deterioration in lung function among COPD patients is cessation of smoking. Monitoring smoking cessation and reemphasizing the need to quit may be beneficial for both short- and long-term.^[11]

COPD is a chronic progressive disease with varying course and high morbidity, and the need for effective monitoring has been emphasized by most of the treatment guidelines. The frequency of visit should be individualized and determined by the clinical status of the patient.^[12] The GOLD has classified patients into groups according to symptoms and risk; accordingly, monitoring should also assess these two by history taking and spirometry to assess airflow limitation.^[13] Symptom identification and early intervention in exacerbations should be included in monitoring to avoid hospital admissions and to increase the quality of life.^[14] Medications usage, correct technique of inhaler administration, and the possible side effects should be reviewed during every visit, and patient educational sessions may be added to the routine. The monitoring should also be aimed at identifying comorbidities which are more associated with COPD such as cardiac failure, osteoporosis, and bronchiectasis so as to initiate treatment at the early stage. Patients should be vaccinated against pneumococcus and influenza to prevent the recurrent exacerbations.^[13]

DIABETES MELLITUS

The sine-qua-non among all NCD is DM, which affects 420 million persons worldwide. The disease claims a life every 11 s and the annual health expenditure is close to 673 billion USD, reflecting 12% of the global health expenditure.^[15] Type 2 DM screening should be carried out in adults of who are overweight or obese, and who have one or more diabetes risk factors using A1C, fasting plasma glucose, or 2 h PG after 75 g oral glucose tolerance test criteria. If the initial test is normal,

it should be repeated every 3 years. On the other hand, screening for Type 1 DM is usually done in the setting of a clinical research study and blood glucose is preferred over A1C to diagnose the acute onset of Type 1 DM with symptoms of hyperglycemia.^[16] The International Diabetes Federation has issued guidelines for the “recommended care” category, as well as for the “limited care” in the resource limited locations. The goals of therapy, however, remain the same, regardless of the setting. These include control of hyperglycemia and prevention of microvascular and macrovascular complications, thereby facilitating a normal life for the patient.^[17]

The cornerstone of management in DM is lifestyle modification along with pharmacological therapies. However, comprehensive diabetes care consists of a multidisciplinary team that includes a diabetologist, nutritionist, podiatrist, and psychologist. Additional members include other specialists such as neurologists, nephrologists, vascular surgeons, cardiologists, ophthalmologists, gastroenterologists, and surgical specialists. A major fraction of the mortality and morbidity secondary to diabetes can be prevented using certain stringent surveillance measures. For example, The American Diabetes Association recommends initial eye examination within 5 years for Type 1 diabetes and at the time of diagnosis for Type 2 diabetes as shown in Figure 2. Self-monitoring of blood glucose (SMBG) is the preferred method for individuals receiving multiple dose insulin or insulin pump therapy. It is usually done before meals, at bedtime, prior to exercise, when hypoglycemia is suspected, and before high-risk activities such as driving. Continuous glucose monitoring is a useful supplement to SMBG in patients with intensive insulin therapy or hypoglycemic unawareness.^[16]

Table 3: Measures to reduce the community burden of tobacco use	
Reduce affordability of tobacco products by increasing tobacco excise taxes	
Create by law completely smoke-free environments in all indoor workplaces, public places, and public transport	
Warn people of the dangers of tobacco and tobacco smoke through effective health warnings and mass media campaigns	
Ban all forms of tobacco advertising, promotion, and sponsorship	

Management of DM involves screening for associated comorbidities and complications at regular intervals. HTN screening requires measurement of blood pressure at every visit. Lipid profile needs to be checked initially at the time of diagnosis and every 5 years thereafter. Consider investigating for CAD in the presence of suggestive clinical

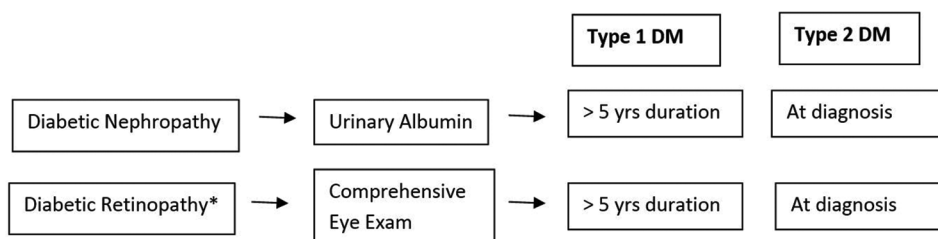


Figure 2: Monitoring for microvascular disease in diabetes mellitus

features of vascular disease, including carotid bruits, absent pulses, and electrocardiography abnormalities. In addition to the above annual foot exam to identify risk factors, predictive of ulcers and amputations have been recommended. Screening for autoimmune diseases in children and adolescents with Type 1 diabetes has also been recommended. Screening for celiac disease soon after Type 1 diabetes diagnosis by measuring tissue transglutaminase or deamidated gliadin antibodies, with documentation of normal total serum IgA levels is done. All patients with Type 1 DM should be screened for autoimmune thyroiditis by measuring thyroid peroxidase antibodies.^[18]

CONCLUSION

The burden of NCDs is increasing rapidly, and effective measures are required at various levels to combat this epidemic. CVD and DM affect a majority followed closely by cancer and COPD. Regular monitoring and effective screening strategies are essential to identify them early in the course and institute corrective measures. Patient education and awareness are also important objectives in combating the epidemic.

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Conflicts of interest

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