

## Guidelines

# World NCD Federation guidelines for prevention, surveillance and management of noncommunicable diseases at primary and secondary health-care for low resource settings

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# World NCD Federation guidelines for prevention, surveillance, and management of noncommunicable diseases at primary and secondary healthcare settings

## Executive Summary

Noncommunicable diseases (NCDs) have emerged as a major public health problem globally due to demographic, epidemiological, nutritional, and socioeconomic transition. NCDs attributed to 73% of global deaths in 2017 and need urgent action guided by the global action plan for prevention and control of NCDs 2013–2020 to achieve the Sustainable Development Goal (SDG). NCDs also cause premature deaths ( $\leq 70$  years) and nearly 80% of premature deaths happen in low- and middle-income countries (LMICs). In the global framework of “Public Health Approach” to combat any disease, it needs a standard protocol to screen, diagnose, and manage. However, there are no comprehensive guidelines or protocols available on the prevention, surveillance, and management of common NCDs at primary and secondary healthcare facilities of low resource settings, except for a few conditions. The current guideline provides simple and comprehensive guidance on the prevention, surveillance, and management aspects of common NCDs targeting primarily healthcare professionals, including community health workers (CHWs), program managers, policy maker, and implementers at these healthcare settings. These evidence-based, operational guidelines have been developed by experts from various national and international organizations and are explained under the heads of prevention, surveillance, and management. The management part is developed by nine subgroups

one for each NCD, namely type 2 diabetes mellitus (DM), hypertension, cardiovascular diseases (CVDs), chronic respiratory diseases (CRDs), cancers, mental health disorders, cerebrovascular diseases/Stroke, chronic kidney diseases (CKDs), and chronic liver diseases (alcoholic liver disease [ALD] and nonalcoholic fatty liver disease [NAFLD]). The guidelines describe the policy and non-policy interventions for the prevention of NCDs, management strategies separately for primary and secondary healthcare settings including when to refer to tertiary healthcare facility, and an implementation framework for uptake of these guidelines at gross root level. These guidelines will serve as a basic tool for the practicing physician and CHWs at every level of healthcare to deliver quality NCD prevention and care. It has been developed taking the primary and secondary health settings and the provisions and strategies under the National NCD Program.

The World NCD Federation envisions appropriate and effective implementation of these guidelines for reduction of premature NCD mortality, especially in the context of the low resource setting. In a way, this will help to reorient the existing health systems to combat the NCDs. The guidelines will be helpful to take further steps in capacity building for various cadres of healthcare staff on prevention, surveillance, and management of NCDs and evaluation at national, regional, and international levels.

## Introduction and process adopted for guideline development

NCDs are the leading cause of death globally. In 2017, a total of 41.1 million (73.4% of total deaths) estimated deaths were due to NCDs as compared to 33.5 million in 2007.<sup>[1]</sup> Similarly, NCDs are the most common cause of disability-adjusted life years (DALYs), which have increased to 62% in 2017 from 43% in 1990.<sup>[2]</sup> Of the total deaths due to NCDs, CVDs (17.8 million), cancer (9.6 million), CRDs (3.9 million), and diabetes and CKDs (2.6 million) contribute more than 80% of the deaths. Tobacco use, unhealthy diet, inadequate physical activity, and harmful use of alcohol have been found to be the common behavioral risk factors for most of the NCDs globally.<sup>[3]</sup>

Recognizing the global epidemic of NCDs, SDG Target 3.4 has been set: “by 2030, reduce premature mortality from NCDs by one-third through prevention and treatment and promote mental health and well-being.”<sup>[4]</sup> In line with SDG, a global action plan for the prevention and control of NCDs (2013–2020) was developed to guide the member countries to combat the NCD burden. The global action plan identified nine voluntary global targets to achieve 25% relative reduction in premature mortality from CVDs, cancer, diabetes, and CRDs by 2025.<sup>[5]</sup>

Of the nine voluntary targets, Target 8 and Target 9 are to provide drug therapy to eligible population and ensure the availability of essential drugs to treat NCDs, respectively. However, the healthcare system, especially in LMICs, is predominantly focused on providing services related to communicable, maternal, neonatal, and nutritional diseases even now.<sup>[6]</sup> To provide integrated care (both for communicable diseases and NCDs), the healthcare system needs to be redesigned or re-oriented for the prevention and control of double burden of diseases.

The redesigning of healthcare systems needs to be done at primary and secondary healthcare setting level as it will provide comprehensive and holistic care, i.e., preventive, promotive, curative, and rehabilitative, which is easily accessible and cost-effective compared to tertiary care.<sup>[7]</sup> In addition, this will also ensure equity and improve the efficiency of the healthcare delivery system. To ensure equity, cost-effective “16 Best Buy” interventions named Package of Essential NCD interventions (PEN) to be delivered at primary healthcare of low resource settings have been identified by the World Health Organization (WHO). However, PEN is not exhaustively covering all the NCDs, and it is not specific like any clinical guidelines for the management of NCDs.<sup>[8]</sup>

The NCD interventions need to be identified in the framework of “Public Health Approach” as used for the prevention and treatment of tuberculosis and HIV. Standard protocols are needed to (a) identify and address the NCD risk factors; (b) early detection of NCD through screening; and (c) confirmation of diagnosis, treatment, and follow-up at all levels of the healthcare settings. There are standard protocols available for most of the diseases which are primarily developed by the agencies of developed countries which can be applicable at tertiary healthcare settings of any country. The LMIC, a resource-limited setting, is struggling to implement these guidelines, especially in primary and secondary healthcare, due to high-resource investment and differing epidemiological and health system profile. The WHO has developed guidelines for prevention and control of diabetes and CRDs applicable to primary healthcare of low resource setting.<sup>[9]</sup> However, this is not exhaustive as it fails to cover all important NCDs. There is a dearth of guidelines comprehensively covering the prevention, surveillance, and management of important NCDs applicable to primary and secondary healthcare of resource-limited settings globally.

With this background in mind, the World NCD Federation, a professional and not-for-profit society, undertook an intensive exercise to compile and consolidate evidence-based, operational guidelines on “Prevention, Surveillance, and Management of Non-Communicable diseases at Primary and Secondary Healthcare of Low Resource Settings.”<sup>[10]</sup> This is a modest effort aimed at presenting in a practical way, means, solutions, procedures, and systems that could contribute toward preventing, controlling, and managing the ever-increasing menace of NCDs globally. We believe that such a compilation is long overdue and would provide useful reference material primarily to healthcare professionals, program managers, and policymakers/implementers at these healthcare settings and to the stakeholders, policymakers, medical fraternity, and program managers at national and subnational levels across countries. The overall objective is to improve the use of best practices, ensure quality of care, and reduce premature mortality due to NCDs in low resource settings.

### Process

The current guidelines have been developed by a group of experts working in the field of NCDs. Three broad groups of prevention, surveillance, and management were formed. The management group was further categorized into nine

subgroups, namely CVDs, cancer, CRDs, DM, hypertension, stroke, CKDs, chronic liver diseases, and mental health disorders. The experts prepared the guidelines keeping in mind the infrastructure, equipment, and workforce available at the primary and secondary levels of healthcare. The guideline development was split into three important parts for each group.

### **Setup**

This phase involved preparation and selection of the topic to be included followed by identification and formulation of expert groups, acceptance of work plan, and timeline by the chair and groups.

### **Adaptation**

This involved the determination of health questions, searching and assessing available guidelines and evidence, and selecting recommendations for the identified questions based on grading and evidence. For the identified health questions, the methodologists searched and retrieved the guidelines from guideline clearinghouses such as the US National Guideline Clearinghouse and the Guidelines International Network or country-specific databases. The websites of organizations developing guidelines and of relevant specialty societies were searched. PubMed search was done using the publication type as field search. Other search engines were also searched where required. The guidelines' relevancy, level of evidence, and consistency were reviewed. Finally, the acceptability/applicability of recommendations was assessed and a decision was made to either accept or reject; accept certain recommendations, accept with modifications, or accept recommendations from different guidelines.

### **Finalization**

The first draft of the guidelines was compiled by the writing group and was followed by successive expert group meetings for thorough discussion and brainstorming on the recommendations in the guidelines. Henceforth, revisions and re-revisions were done and repeated reviews generated a set of good evidence-based, operational, and cost-effective guidelines for NCDs at primary and secondary levels in low resource settings. The finalized draft guidelines by each group were sent for external review to check the strengths and weaknesses and the areas that needed modification. Similarly, the source guideline developers and professional associations/bodies were contacted for feedback. After incorporation of the relevant comments following external review, the guideline document was finalized and combined.

### **Level of Evidence**

The level of evidence of recommendation is classified as per the Oxford Centre for Evidence-based Medicine (March 2009) for prevention/therapy/etiology/harm criteria as below.

- Level 1: Meta-analyses or systemic reviews of randomized controlled trials or good-quality randomized controlled trials
- Level 2: Systematic review of cohort studies or individual cohort studies or low-quality randomized controlled trials
- Level 3: Systematic review of case–control studies or individual case–control studies
- Level 4: Case series and poor-quality cohort and case–control studies
- Level 5: Expert opinion.

# Guidelines for Prevention of Noncommunicable Diseases

## Prevention of Noncommunicable Diseases in Primary and Secondary Healthcare Settings

### Background

Tobacco use, harmful use of alcohol, physical inactivity, and unhealthy diet are the four major and common modifiable behavioral risk factors of NCDs.<sup>[11,12]</sup> All these risk factors are responsible for intermediate risk factors such as overweight/obesity, high blood glucose, high blood pressure (BP), and increased cholesterol. Similarly, the cerebrovascular diseases (stroke), chronic liver diseases such as NAFLDs and ALDs, and CKDs are also attributable to the above risk factors which can be prevented through integrated strategy.

Engagement and implementation of preventive, promotive, and curative NCD interventions need multisectoral involvement both at national, subnational, and local levels. Developing national (and subnational) multisectoral policies and plans is one of the mandatory requirements before rolling out any NCD intervention as most of the regulatory/legislation power is with departments/sectors other than health. The global action plan for prevention and control of NCDs (2013–2020) advocates for reducing the four common risk factors (tobacco use, harmful use of alcohol, physical inactivity, and unhealthy diet) to achieve 25% reduction in premature mortality due to CVDs, cancer, diabetes, or CRDs.<sup>[5]</sup>

### Scope of the prevention guidelines

The current guidelines for the prevention of NCDs at primary and secondary healthcare settings of low resource area is a compilation of evidence and consensus across all groups (especially management of specific NCD) involved in development of this guideline. The guideline dealt only the four common risk factors, namely tobacco use, harmful alcohol use, unhealthy diet, and inadequate physical activity using the following assumptions. At primary healthcare level, it was assumed that a community health volunteer (or local/rural health volunteer) delivers part of or whole of health services (primarily preventive and promotive sometimes curative) at community level for a specified population. However, they are supervised and assisted by multipurpose health workers or medical doctors who are formally attached to health system. In addition to four common risk factors, indoor air pollution is also included as this is an important problem in LMICs.

The interventions in the guidelines are classified as policy and nonpolicy interventions to identify the need for multisectoral action. Primarily, policy level interventions must be backed by multisectoral involvement such as finance, agriculture, education, human resource, transport, trade, urban planning, housing, and sports. Nonpolicy interventions are primarily to be implemented by the health department both at facility and community level as the primary provider of health services to respective population.

## Operational Definitions

### Types of healthcare setting

#### *Primary healthcare setting*

The first point of contact of the population or patient with the healthcare professional or health system is the primary healthcare setting. This includes both community-based and facility-based preventive, promotive, curative, and rehabilitative healthcare services to population. This primary healthcare setting is named differently in different country contexts. For example, health subcenter and primary health center (PHC) in India; community health center (CHC) or rural health center in Ghana; basic health units and rural health center in Pakistan; and health center/health post in Cambodia.

#### *Secondary healthcare setting*

Healthcare services provided by medical specialists at facility level and usually referred from primary healthcare setting areas. Although the services include preventive, promotive, curative, and rehabilitative services, it is predominantly of curative services, e.g., CHC, subdistrict hospitals, and district hospitals in India; district and regional hospitals in Ghana; tehsil and district headquarter hospitals in Pakistan; and referral and provincial hospital in Cambodia.

## Risk Factors

### Tobacco use

#### *Problem statement*

Tobacco use is one of the important risk factors for both communicable diseases and NCDs. It kills 7 million people every year, of which 1.2 million are passive smokers.<sup>[13]</sup> As per the estimation, 14% of all deaths from NCDs among adults aged 30 years and above are attributable to tobacco. Of the NCD deaths, 10% of CVDs, 22% of cancers, and 36% of CRDs deaths are due to tobacco use. The target is 30%

reduction in the prevalence of current tobacco use by 2025 for which demand reduction measures are proposed at country level using the six components of MPOWER strategy.<sup>[14,15]</sup>

**Strategic solution**

MPOWER strategy, i.e., **M**onitor tobacco use and prevention policies; **P**rotect people from tobacco smoke; **O**ffer help to quit tobacco use; **W**arn about the dangers of tobacco; **E**nforce bans on tobacco advertising, promotion and sponsorship; and **R**aise taxes on tobacco.

**Recommendations**

**Policy interventions**

The policy level interventions will have impact on reducing tobacco use and are applicable to community and facility level of primary and secondary healthcare settings.

- Raise taxes on tobacco
- Ensure smoke-free environments in all indoor workplaces, especially schools, health facilities, public places, and public transport
  - Institutional smoking bans.
- Ensure no forms of tobacco advertising, promotion, and sponsorship at the respective area
- Ensure that the size and shape of pictorial warning on tobacco products and different places
- Display warning messages with ill effects of tobacco
- Ban on sales of tobacco to minors.

**Nonpolicy interventions**

The nonpolicy interventions are applicable to community and facility level of primary and secondary healthcare

settings, and the actions to be taken by sectors other than health in prevention of tobacco use are given in Table 1.

- Level of evidence: Level 2
- Recommendation: Strong.

**Harmful use of alcohol**

- Intake of >20 g/day or 140 g/week for men and >10 g/day or 70 g/week for women (approximately 30 ml of whiskey = 100 ml of wine = 240 ml of beer = 10 g of alcohol).

**Problem statement**

Harmful use of alcohol is a component cause of more than 200 diseases and injury, most commonly chronic liver diseases, cancers, and injuries. Nearly, 3.3 million deaths or 5.9% global deaths were attributable to alcohol consumption in 2012 which amounts to 5.2% of global burden of disease and injury if calculated in DALY.<sup>[3]</sup>

**Strategic solution**

The various policy and nonpolicy interventions in the global action plan for prevention and control of NCDs.

**Policy interventions**

The policy level interventions are applicable to community and facility level of primary and secondary healthcare settings.

- Enforce restrictions on the physical availability of retailed alcohol (via reduced hours of sale)

**Table 1: Interventions at primary and secondary healthcare setting for prevention and control of tobacco use**

Intervention/activities	Health sector		Sectors other than health
	Primary healthcare	Secondary healthcare	
Ensure smoke-free environments in all indoor workplaces, especially health facilities and schools, public places, and public transport	Community health volunteers at population level and nodal officers such as health worker or medical officers at health facility	Nodal officers such as health supervisors or medical officers and district NTCP managers	Panchayat raj institutions or local governments Education Revenue and tax Agriculture Transport Rural and urban planning Housing Food, civil supplies, and consumer protection Civil society and nongovernmental organizations Mass media Law and Justice Labor
Ensure no forms of tobacco advertising, promotion, and sponsorship at respective area			
Ensure that the size and shape of pictorial warning on tobacco products and different places			
Display warning messages with ill effects of tobacco			
Health information material on tobacco use			
Regular awareness campaign on ill effects of tobacco at community, schools, and workplaces			
Tobacco use screening during household survey	Community health volunteers		
Opportunistic screening for tobacco use of all patients attending OPDs	Health workers and medical officers	Health supervisors, medical officers and district NTCP managers	
Provide brief advice and link them with cessation clinics or provide complete cessation services through cessation clinics			

NTCP - National tobacco control program, OPDs - Outpatient departments

- Enact and enforce bans or comprehensive restrictions on exposure to alcohol advertising (across multiple types of media)
- Increase excise taxes on alcoholic beverages
- Display warning messages with ill effects of harmful use of alcohol.

#### Nonpolicy interventions

The nonpolicy interventions are applicable to community and facility level of primary and secondary healthcare settings, and the actions to be taken by sectors other than health in prevention of harmful use of alcohol are given in Table 2.

- Level of evidence: Level 2
- Recommendation: Strong.

#### Unhealthy diet

##### **Problem statement**

Unhealthy diet primarily contains identified intervention areas such as adequate fruit and vegetable consumption, reduced salt and sugar intake, and reduced saturated and increased polyunsaturated fat intake. Unhealthy diet, i.e., reduced fruits and vegetable intake, is attributed to nearly 1.7 million deaths.<sup>[16]</sup> The reduction in salt intake directly reduces the burden of hypertension and reduced saturated fat intake reduces the overweight/obesity and the total cholesterol which are metabolic risk factors for NCDs.<sup>[17]</sup> Similarly, the intake of free sugars or sugar-sweetened beverages (SSBs) is also an important component of unhealthy diet that needs policy level interventions.

#### **Strategic solutions**

##### Policy level intervention

- Reduce population salt/sodium consumption
  - Food product reformulation; large-scale pricing strategies; food procurement policy in specific settings; restrictions on marketing to children; on-package nutrition information; levy higher tax on sugary drinks and processed food.
- Limit saturated fatty acids and virtually eliminate industrially-produced trans-fatty acids in the food supply
- Implement recommendations on marketing of foods and nonalcoholic sugary beverages such as colas to children
- Legislation/regulations for fully implementing the International Code of Marketing of Breast-milk Substitutes
- Nutritional labeling on food and drink products being retailed in market including menus in the restaurants
  - Color-coded labeling and stop sign labeling of unhealthy foods
  - Labeling should include:
    - Total calories (energy value)
    - Amounts of carbohydrate, sugars, fat, protein, sodium, dietary fiber
    - Amount of trans-fat.
- Healthy eating policy at schools
  - School curriculum that includes healthy eating
  - Improvements in nutritional quality of the food supply in schools.
- Reduce SSBs and fat sugar and salt food

**Table 2: Interventions at primary and secondary healthcare setting for prevention and control of harmful use of alcohol**

Intervention/activities	Health sector		Sectors other than health
	Primary healthcare	Secondary healthcare	
Ensure bans or comprehensive restrictions on exposure to alcohol advertising (across multiple types of media)	Community health volunteers at population level and nodal officers such as health worker or medical officers at health facility	Nodal officers such as health supervisors or medical officers and district NCD program managers	Panchayat raj institutions or local governments
Ensure restrictions on the physical availability of retailed alcohol (via reduced hours of sale and no sale to minors)			Education
Ensure no forms of alcohol advertising, promotion, and sponsorship at respective area			Revenue and tax
Display warning messages on ill effects of alcohol use			Agriculture
Health information material on alcohol use			Transport
Regular awareness campaign on ill effects of alcohol at community, schools, and workplaces			Rural and urban planning
Alcohol use screening during household survey	Community health volunteers		Food, civil supplies, and consumer protection
Opportunistic screening for alcohol use of all patients attending OPDs	Health workers and medical officers	Health supervisors, medical officers and district NCD program managers	Civil society and nongovernmental organizations
Provide brief counseling and link them with de-addiction clinic or complete cessation services through de-addiction clinics			Mass media
			Law and Justice
			Labor

NCD - Noncommunicable diseases, OPDs - Outpatient departments

- Labeling and food claim rules; interventions changing the availability of different foods and beverages in public institutions and other settings; pricing interventions (including both fiscal and nonfiscal interventions altering the absolute and relative prices of SSB expand when used first or low-calorie alternatives to SSB); advertisement regulation especially on channels largely viewed by children or shows viewed by children in particular; discouraging endorsements by celebrities; bringing social media portals onboard for the advertisement ban on unhealthy foods; reformulation; changes to the beverage retail and foodservice environment; food system approaches (including health-in-all policies approaches in sectors such as agriculture and trade); gradual progression in the direction of total ban; set evidence-based regulatory limits by establishing monitoring systems which can assess the food and beverages periodically.
- Policy to reduce the portion, package, or tableware size of food.

#### Nonpolicy level intervention

The nonpolicy interventions are applicable to community and facility level of primary and secondary healthcare settings, and actions to be taken by sectors other than health in promotion of healthy diet are given in Table 3.

- Level of evidence: Level 2 to Level 5
- Recommendation: Strong to moderate.

#### Physical inactivity

Physical activity includes leisure-time physical activity, transportation (e.g., walking or cycling), occupational (i.e., work), household chores, play, games, sports or planned exercise, in the context of daily, family, and community activities. Adequate physical activity includes 30 min/day of moderate-intensity physical activity (e.g., walking) throughout the week or do at least 15 min of vigorous-intensity aerobic physical activity (e.g., cycling and swimming) throughout the week or an equivalent combination of moderate- and vigorous-intensity activity.<sup>[18]</sup> The gap between physical activities should not be more than 48 h.

#### Problem statement

Physical inactivity is attributable to 6% of global deaths. Nearly 23% of adults and 81% school-going adolescents were insufficiently physically active as per the “Global recommendation on physical activity for health.”<sup>[18]</sup>

#### Strategic solution

Policy intervention

- Social marketing or mass media communication on improving physical activity
- Physical activity policy at school
  - School curriculum includes physical activity and body image
  - Increased sessions for physical activity and the development of fundamental movement skills throughout the school week.

**Table 3: Multisectoral interventions applicable to primary and secondary healthcare setting for promotion of healthy diet**

Intervention/activities	Health sector		Sectors other than health
	Primary healthcare	Secondary healthcare	
Nutritional labeling on food and drink products being retailed in market including menus in restaurants	Community health volunteers at population level and health workers and medical officers at facility level	Health supervisors or medical officers and district NCD program managers	Panchayat raj institutions or local governments
Regular awareness campaign at community, schools, and workplace on ill effects of unhealthy diet and uptake of healthy diet with special focus on salt reduction			Education
Ensure healthy eating option available at community, schools, and workplace			Revenue and tax
Ensure restricted advertising, promotion, and sponsorship of sugar-sweetened beverages and fat sugar and salt food			Agriculture
Counseling on reduced intake of salt <5 g/day	Community health volunteers at population level and health workers and medical officers at facility level	Health supervisors, and medical officers	Transport
Counseling on intake of fruits and vegetables at least 400 g (4-5 servings) per day			Rural and urban planning
Counseling on intake of less saturated fats and more polyunsaturated fats			Food, civil supplies and consumer protection
Counseling overweight patients to reduce weight by changing the diet and schedule			Civil society and nongovernmental organizations
Counseling all patients to give preference to low glycemic-index foods (beans, lentils, oats, and unsweetened fruit) as the source of carbohydrates in their diet			Mass media
			Law and justice
			Labor
			Civil society and nongovernmental organizations
			Education
			Mass media

NCDs - Noncommunicable diseases



- Enabling environment such as creation of playgrounds walking trails and infrastructure with legislative, fiscal, or policy requirements and planning for the broader population. Or the introduction of new environmental facilities including improvements of existing facilities (e.g., replacement of playgrounds in a park), improved access to facilities (e.g., improved opening hours, creation of new bridges), creation of new facilities (e.g., introduction of bicycle lanes or walking paths) or wider public transport initiatives (e.g., cycle hire schemes).

#### Nonpolicy intervention

The nonpolicy interventions are applicable to community and facility level of primary and secondary healthcare

settings, and actions to be taken by sectors other than health in promotion of physical activity are given in Table 4.

- Level of evidence: Level 2 to Level 3
- Recommendation: Strong.

#### Indoor air pollution

##### **Problem statement**

Around 3 billion people globally use solid fuels in their homes, which give exposure to fine particles and carbon monoxide. The exposure is high among women and children. The exposure to indoor air pollution causes chronic obstructive pulmonary disease (COPD), lung cancer, ischemic heart disease, and stroke. Nearly 4 million people per year die due to exposure to household air pollution.<sup>[19]</sup>

**Table 4: Multisectoral interventions applicable to primary and secondary healthcare setting for promotion of physical activity**

Intervention/activities	Health sector		Sectors other than health
	Primary healthcare	Secondary healthcare	
Ensure enabling environment such as playground, place for walking, cycling, sports, and other recreational activities which improves physical activity at community, school, and workplace	Community health volunteers at population level and health workers and medical officers at facility level	Health supervisors or medical officers and district NCD program managers	Panchayat raj institution, education Revenue and tax, rural and urban planning, civil society and nongovernmental organizations, mass media, law and justice, labor
Regular awareness campaign at community, schools, and workplace on promotion of physical activity			
Ensure promotion of physical activity by mass media advertisements			
Counseling on adequate physical activity	Community health volunteers at population level and health workers and medical officers at facility level	Health supervisors and medical officers	Civil society and nongovernmental organizations Education Mass media
<p>1. Age group 5-17 years: Daily routine of minimum 60 min of moderate-to-vigorous-intensity physical activity. Most of the physical activity undertaken should be aerobic. For additional health benefits, physical activity for a duration of &gt; 60 min should be undertaken. In a week, vigorous-intensity activities should be included at least thrice. These may include muscle and bone strengthening activities</p> <p>2. Age group 18-64 years and above 65 years: Minimum of 150 min of moderate-intensity aerobic physical activity over one week or minimum of 75 min of vigorous-intensity aerobic physical activity over one week or an equivalent combination of moderate- and vigorous-intensity activity. A minimum of 10 min' bouts of aerobic activity is also recommended. To further gain health benefits, moderate-intensity aerobic physical activity should be increased to 300 min a week or vigorous-intensity aerobic physical activity should be increased to 150 min a week or an equivalent combination of moderate- and vigorous-intensity activity may be undertaken. For adults with poor mobility, 3 or more days of physical activity can be undertaken over a week to enhance balance and prevent falls</p> <p>3. Muscle-strengthening activities should be undertaken which involve major muscle groups, on 2 or more days in a week. For the individuals' limitations due to their health conditions, it is recommended that they should be as much physically active as their abilities and conditions allow</p>			

NCDs - Noncommunicable diseases

### Strategic solution

#### Policy intervention

- Provide access to cleaner fuels-through subsidy
- Provide access to improved stoves-through subsidy.

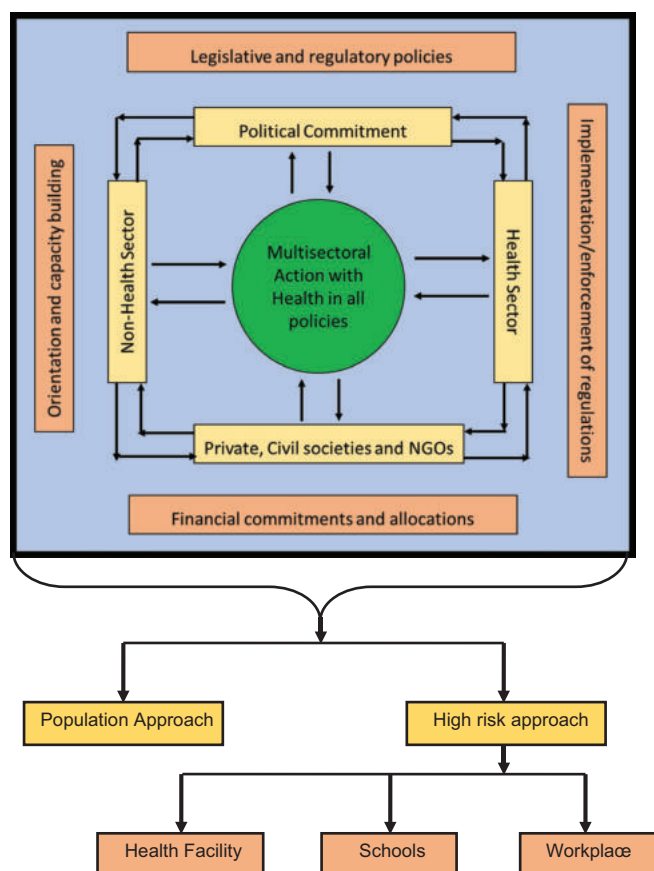


Figure 1: Proposed multisectoral action framework for prevention of noncommunicable diseases

### Nonpolicy intervention

The nonpolicy interventions are applicable to community and facility level of primary and secondary healthcare settings, and actions to be taken by sectors other than health in reducing indoor air pollution are given in Table 5.

- Level of evidence: Level 3 to Level 5
- Recommendation: Strong.

### Multisectoral Action

The extent of NCDs and their risk factors is such that only medical interventions are not sufficient to deal with them. No level of prevention is bereft of the scope of multisectoral action. The government, nongovernment, civil society, industries, other organizations, and the like have a great role to play in multisectoral approach for dealing with NCDs [Figure 1].

### Way Forward

The implementation of the recommendations in different countries may vary as per the structure of the health system of the country. Each country can modify the modality of implementation according to existing sociopolitical conditions as this needs multisectoral involvement. Future research needed to develop and show evidence on robust, both community and facility-based models to deliver these interventions in different country settings.

Table 5: Multisectoral interventions applicable to primary and secondary healthcare setting for reducing indoor air pollution

Intervention/activities	Health sector		Sectors other than health
	Primary healthcare	Secondary healthcare	
Ensure the availability and subsidization of the cleaner fuels and improved stoves			Panchayat raj institution Education Revenue and tax Agriculture Transport Rural and urban planning Food, civil supplies and consumer protection Civil society and nongovernmental organizations Mass media Law and justice Labor
Routine assessment and linking the role of indoor air pollution with diseases Counseling on use of cleaner fuels Regular awareness campaign at community, schools, and workplace on ill effects of solid cooking fuels and importance of cleaner fuels	Community health volunteers at population level and health workers and medical officers at facility level	Health supervisors, medical officers, and district program managers	Civil society and nongovernmental organizations Mass media

# Guidelines for Noncommunicable Disease Surveillance

## Background

Surveillance is defined as “the ongoing systematic collection, analysis, and interpretation of health data essential to the planning, implementation, and evaluation of public health practice, closely integrated with timely dissemination of these data to those who need to know.”<sup>[20]</sup> The goal of disease surveillance is to address a defined public health problem and to develop evidence-based measures to protect and promote population health.<sup>[21]</sup> Surveillance at local, regional, and national level on risk factors, morbidity, and mortality can be used by public health authorities for developing need-based health interventions and also support program development, monitoring, mid-course corrections, and impact evaluations. This is well applicable to NCDs which is the leading cause of mortality globally. Experiences in establishing the NCD surveillance systems can be drawn, especially from Brazil and China which have longitudinal data as they integrated the surveillance with the routine health information system.<sup>[22-24]</sup> The WHO has judged the current capacity for NCD surveillance as inadequate in several countries.<sup>[1,3]</sup>

Various types of surveillance systems have been established across countries which are described in Table 6. Surveillance at present is focused primarily on risk factors such as behavioral and biochemical risk factors. Given the continuous need for data for decision-making

and available resources, there is a need to combine the individual risk factor survey into one comprehensive survey so as to avoid survey fatigue, covering all relevant risk factors, and also to simplify the methodology and make it more feasible at district and state levels. Lack of comparability of data is one of the major challenges identified in global surveillance and monitoring as there is no uniformity in methodology.<sup>[25]</sup> Poor availability of resources including trained human resources, infrastructure, intersectoral coordination, and capacity in using the technology on NCDs affect the establishment of good surveillance systems in developing countries. With this background, the current guideline provides ways and means of establishing an efficient system for surveillance of NCDs and its risk factors

## Expectations from Noncommunicable Diseases Surveillance Guidelines

Standard tools for NCD diseases and risk factors surveillance are now available such as WHO STEPwise approach for surveillance (STEPS). While NCD surveillance systems cover information on deaths, disease, and risk factors, however, collecting data on NCD risk factors through surveys is the most common form of information being collected. Sustainable institutionalized systems are essential for a responsive surveillance system. A preliminary framework for NCD surveillance suggested by the WHO is given in Figure 2.<sup>[6]</sup> NCD surveillance

**Table 6: Noncommunicable diseases and its risk factors surveillance systems used across the world**

Surveillance system	Features	Risk factors covered
BRFSS <sup>[26]</sup>	Active system of repeated surveys that measure behavioral risk factors through telephone surveys	Health-related risk behaviors, chronic health conditions, and use of preventive services
The global school-based student health survey <sup>[27]</sup>	School-based survey among students aged 13-17 years	Data on health behaviors and protective factors among students
Global tobacco surveillance system <sup>[28]</sup>	Data are collected through four surveys aimed at youth (GYTS); school teachers and administrators (GSPS); 3 <sup>rd</sup> -year students pursuing degrees in medical and paramedical fields (GHPSS) and adults aged 15 years and older (GATS)	Each survey collects data about tobacco knowledge, attitude, use, and/or intention to quit in the target population
WHO STEPwise approach to surveillance <sup>[29]</sup>	STEPS is a simple, standardized method for collecting, analyzing, and disseminating data on NCD risk factors	Risk factor assessment is done in three steps 1. Questionnaire 2. Physical measurements 3. Biochemical measurements
YRBSS <sup>[30]</sup>	YRBSS monitors six categories of priority health-related behaviors among youth and young adults. YRBSS includes a national school-based YRBS	1. Injuries and violence 2. Tobacco use 3. Alcohol and drug use 4. Sexual behaviors and STIs, including HIV infection 5. Unhealthy dietary behaviors 6. Physical inactivity. YRBSS monitors the prevalence of other health-related behaviors, obesity, and asthma

GYTS - Global youth tobacco surveillance; GSPS - Global school personnel survey; GHPSS - Global health professions students survey; GATS - Global adult tobacco survey, BRFSS - Behavioral Risk Factor Surveillance System, YRBSS - Youth Risk Behavior Surveillance System, YRBS - Youth Risk Behavior Survey, NCD - Noncommunicable disease, STIs - Sexually transmitted infections

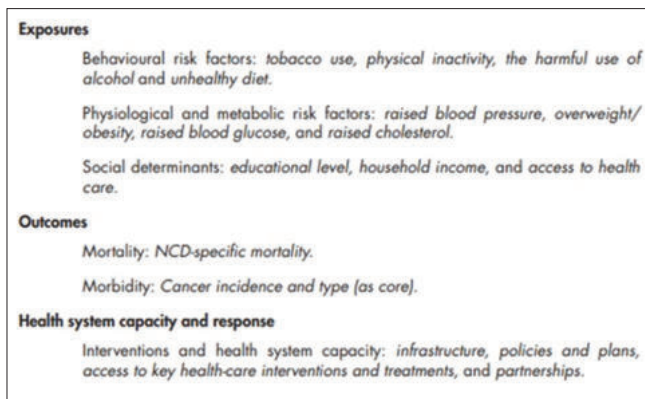


Figure 2: Framework for noncommunicable diseases surveillance

systems need to be integrated into existing national health information systems. Three major components of NCD surveillance include:

- a. Monitoring exposures (risk factors)
- b. Monitoring outcomes (morbidity and disease-specific mortality)
- c. Assessing health system capacity and response.

### Assumptions and Operational Definitions

Surveillance method involves sentinel augmented facility-based surveillance, supported by population-based surveys. Community-based approach for surveillance is the core of this surveillance framework to evaluate impact of implemented interventions and to assess the prevalence of NCD risk factors.

The framework calls for departmental and intersectoral coordination for the production of surveillance data on critical aspects of public health. The basic WHO NCD STEPS Framework has been adapted and used in the current guideline.

#### Diseases to be included

According to the WHO classification, NCDs have 16 major subgroups with 92 different diagnoses in total. As it will be difficult to collect and report data for each NCD, the five common NCDs can be included in the NCD Surveillance System [Table 7]. Mental health is emerging as a major disease, usually neglected and reported. It should be part of the surveillance systems if resources allow.

#### Level of healthcare system to plan noncommunicable disease surveillance

As countries differ in the level of resources and capacity in conducting NCD surveillance, the policy of a single system of surveillance cannot work. The WHO has proposed a hierarchical system called as STEPS for NCD surveillance of

Table 7: Diseases to be part of the noncommunicable disease surveillance system

Essential	Desirable	Optional
Cardiovascular diseases	Mental disorders	Sense organ diseases
Diabetes	Neurological disorders	Digestive diseases
Cancer		Genitourinary diseases
Stroke		Musculoskeletal diseases
Chronic respiratory diseases		Congenital anomalies
		Oral conditions
		Sudden infant death syndrome

\*Adapted from WHO classification of NCDs and GBD estimates.<sup>[12]</sup>

NCDs - Noncommunicable diseases, GBD - Global burden of disease

deaths, diseases, and risk factors. Level 1 health systems will be the most elementary and Level 3 is the most complex one. While at least Level 1 STEPS should be attempted in all countries, planning systems at higher levels should be based on available resources and capacity [Table 8].<sup>[31]</sup>

### Noncommunicable Disease Surveillance System for High-resource Setting

For settings with high resource allocation, local level annual surveillance at the lowest level of healthcare will involve CHWs at village/urban level for risk factor screening, morbidity history, verbal autopsy for deaths. Volunteers can be included for the surveys through prior training. CHW and his/her team can calculate NCDs risk factor score, get information regarding treatment and care-seeking status, as well as inform the concerned person about clinical tests and diagnosis at immediate health center which has been depicted in Figure 3.

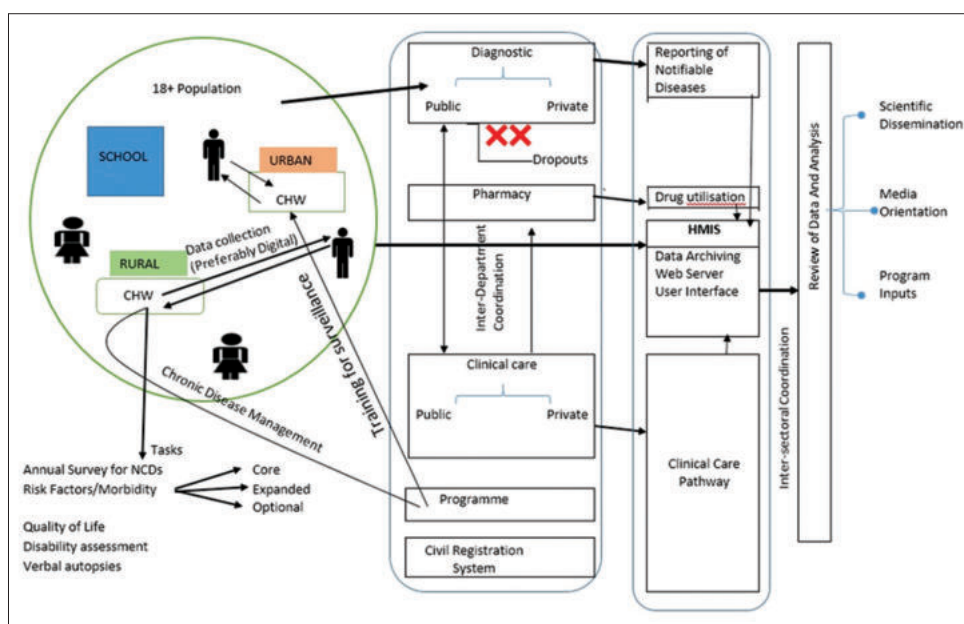
#### Prerequisites for Setting up a Noncommunicable Disease Surveillance System in High-resource Settings

- A program for addressing
- Functional hospital- and/or population-based registries
- Strengthened disease-wise facility-based reporting of NCDs
- Multisectoral participation and data sharing mechanisms
- Clinical tests and diagnostics of high-risk cases at primary and secondary care level as per treatment guidelines
- The role of CHWs is critical as they will be provided with the list of high-risk cases for clinical tests and diagnosis at primary healthcare level for follow-up
- Unique identification number for each patient should be generated with adequate information retained by

**Table 8: Levels of healthcare system and surveillance systems**

	Level 1	Level 2	Level 3	Source	Implementation method
Deaths (the past)	Death rates by age and sex	Death rates by age, sex and all cause of mortality	Death rates by age-, sex-, and cause-specific mortality	Verbal autopsy death certificate Administrative data	Civil registration, health system performance assessments for NCDs
Diseases (the present)	Hospital or clinic admissions, by age and sex	Rates and principal condition in 3 groups: Communicable diseases, NCDs, and injury	Cause-specific disease Incidence or prevalence	Disease registries Hospital activity data	Annual disease-wise reports of registries, HMIS facility-based reports Private hospitals
Risk factors (the future)	Questionnaire-based report on key risk factors	Questionnaires plus physical measurements	Questionnaires plus physical measurements plus biochemical measurements	NCD STEPS Surveillance framework	Annual Survey by CHW National/subnational cross-sectional surveys in every 5 years

Adapted from WHO STEPS Surveillance Manual. HMIS - Hospital Management Information System; CHW - Community health worker



**Figure 3: Operational framework for noncommunicable diseases surveillance in settings with better resources**

the system to ensure quick search of patient history during visits

- At the primary healthcare level, clinical tests and diagnostics can be performed using point-of-care diagnostics and measuring devices.

### Noncommunicable Disease Surveillance System for Low resource Setting

In low resource settings, population-based behavioral risk factor assessment can be held at regular intervals say every 5 years to assess the effectiveness of implementation of prevention and control interventions. National or subnational approach may be devised by considering aspects such as population, cost, and human resources requirement. However, it is suggested that this activity may be conducted in collaboration with external agency. The activity planning can be carried out at the local level, and external agency can

select the minimum required sample size from basic administrative units of the population. At the local level, household identity number and patient identity number should be generated. The operational framework for NCD surveillance in low resource setting is given in Figure 4.

#### Variables reported under surveillance system

Although the selection of variables is guided by the requirement of policymakers, a minimalistic list has been proposed to be part of any NCD surveillance system [Table 9].

### Recommendations

1. A standard surveillance instrument and methodology should be adopted
2. NCD risk factor surveys should be implemented periodically at regular intervals

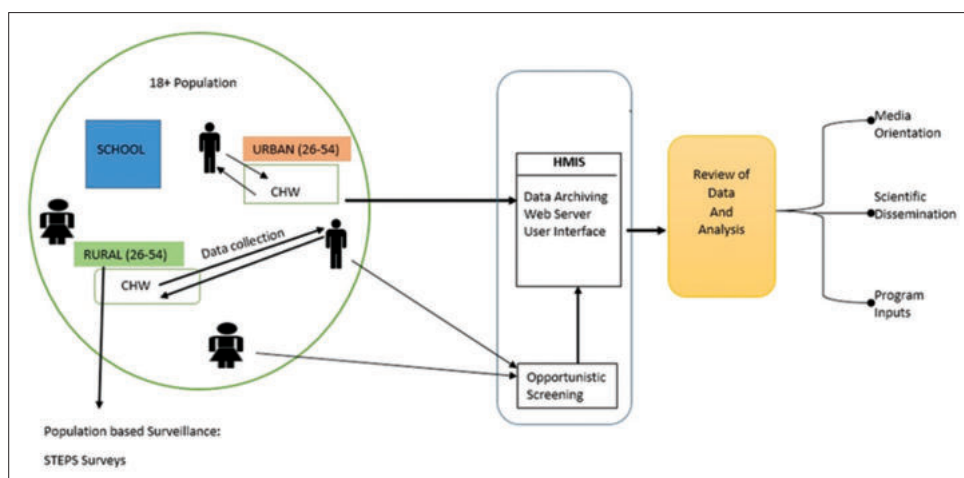


Figure 4: Operational framework for noncommunicable diseases surveillance in settings with low resources

Table 9: Variables to be reported under the surveillance system

Risk factors	Morbidity	Mortality	Health systems
Age	Incidence: Total and type	Age	Trained health human resource
Gender	Stage (if applicable)	Sex	Access to essential medicine and laboratory services
Tobacco Use	Diagnosis	Region	Access to essential Healthcare technologies
Alcohol	Test results	Cause	Cost to health system
Physical Activity	Prescriptions	Case fatality	Cost to individuals
Diet			
Family history	Number of patient contacts		Linkage of different data sources
Blood pressure	Referral		
Physical measurements	Complications		
BMI			

BMI - Body mass index

- Survey methodology should be designed in line with sustainable goals
- Data should represent administrative blocks as per the requirement of the country
- Data should be disseminated optimally and the data collected should be kept in public domain
- Policymakers at the central and subnational level should be motivated to use the existing data for targeted policy changes and people's education
- Stakeholders at all levels may be involved so that utility of data can be maximized.

## Management of Noncommunicable Diseases

### Cancer

#### Cancer burden

Cancer incidence is increasing with lifestyle changes, leading to increase in NCD burden. It is a major cause of morbidity and mortality in both developed and developing countries. One in eight men and one in nine women in India develop some form of cancer in lifetime. According to Globocan 2018 data, the number of new cases was around 1.16 million in 2018, leading to 784,000 deaths. In the next 20 years, incidence of cancer is expected to

go up to 1.73 million cases per year plunging the country to top the list of cancer as one of the NCDs.<sup>[32]</sup> It is a major cause of catastrophic expenditure and thereafter to impoverishment. Good news is that early detection allows for intervention either before cancer develops or at an early stage, when treatment is most often effective.

#### Oral cancer

Oral cavity cancer is one of the most common cancers in all sexes in LMICs and is the most common cancer among men in India. According to the Globocan 2018 data, 119,992

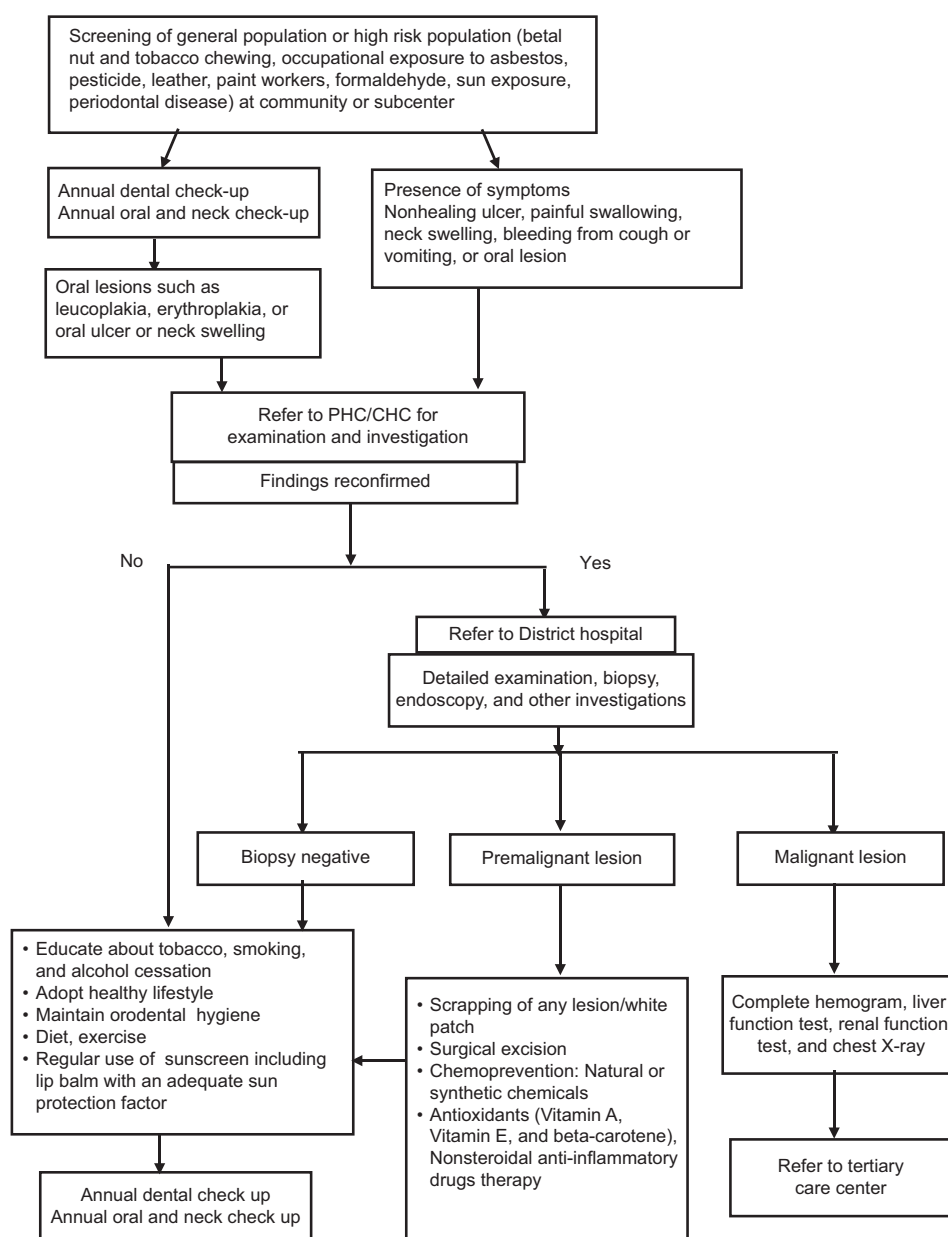


Figure 5: Screening, diagnosis, and management of oral cancer at primary and secondary healthcare

new cases were diagnosed in 2018, of which 76.7% were among men.<sup>[32]</sup> This is one of the cancers which can be prevented and identified early through population-based approach. The risk factors, presenting features, diagnosis, and management of oral cancer are given in Figure 5.

### Cervical cancer

Cervical cancer is the third leading cause of burden of cancer and the ninth leading cause of death due to cancer. It is the second most common cancer in women in India after breast cancer. It is preventable cancer

(following vaccination) and can be successfully treated when diagnosed in early stages where reported survival is more than 90%. The risk factors, presenting features, diagnosis, and management of cervical cancer at primary and secondary healthcare are given in Figure 6.<sup>[33]</sup>

### Breast cancer

Breast cancer is the most common cancer in females worldwide both in developed and developing countries. In India, breast cancer incidence has overtaken cervical cancer incidence because of several factors, including diet,

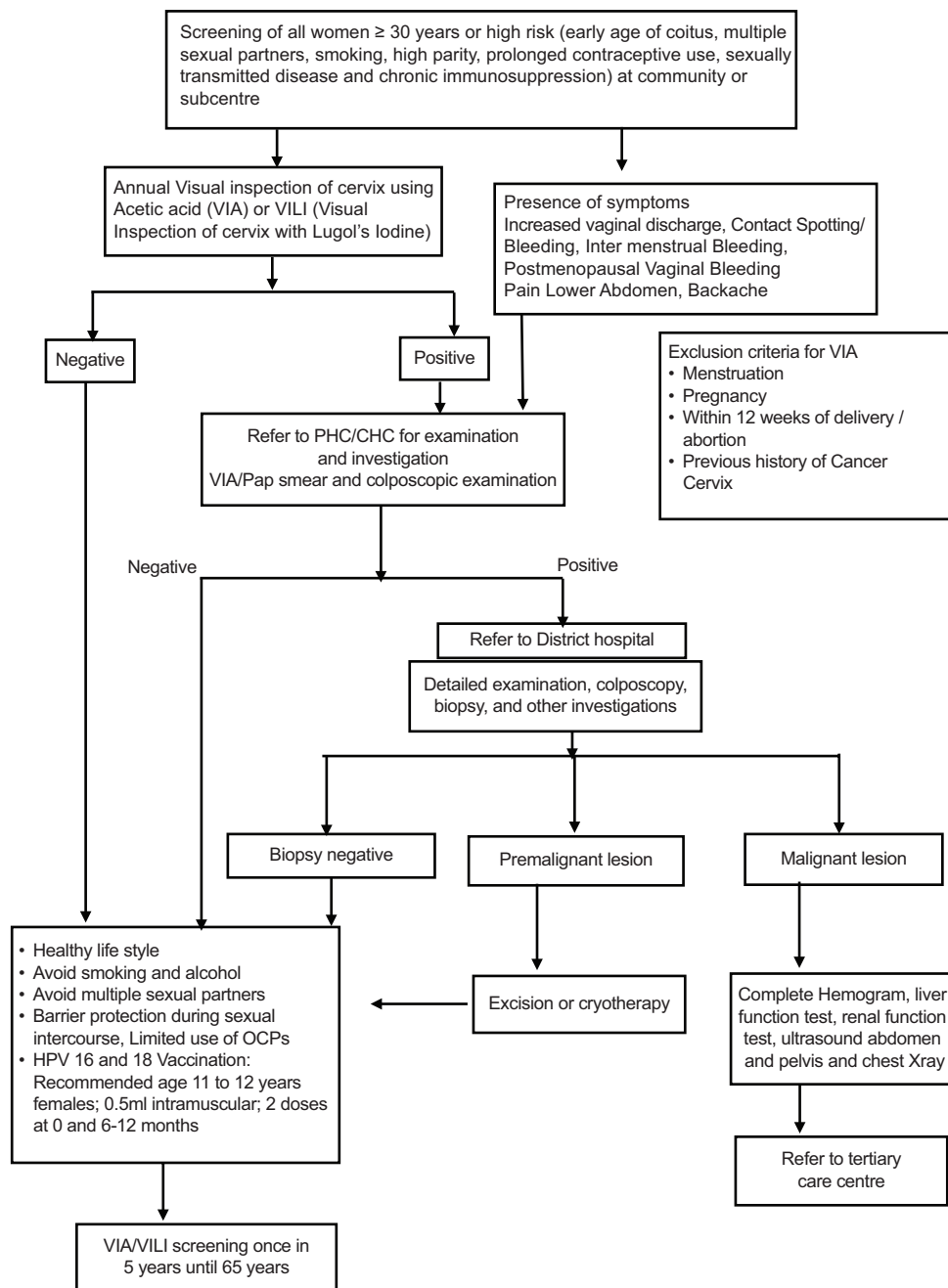


Figure 6: Screening, diagnosis, and management of cervical cancer at primary and secondary healthcare



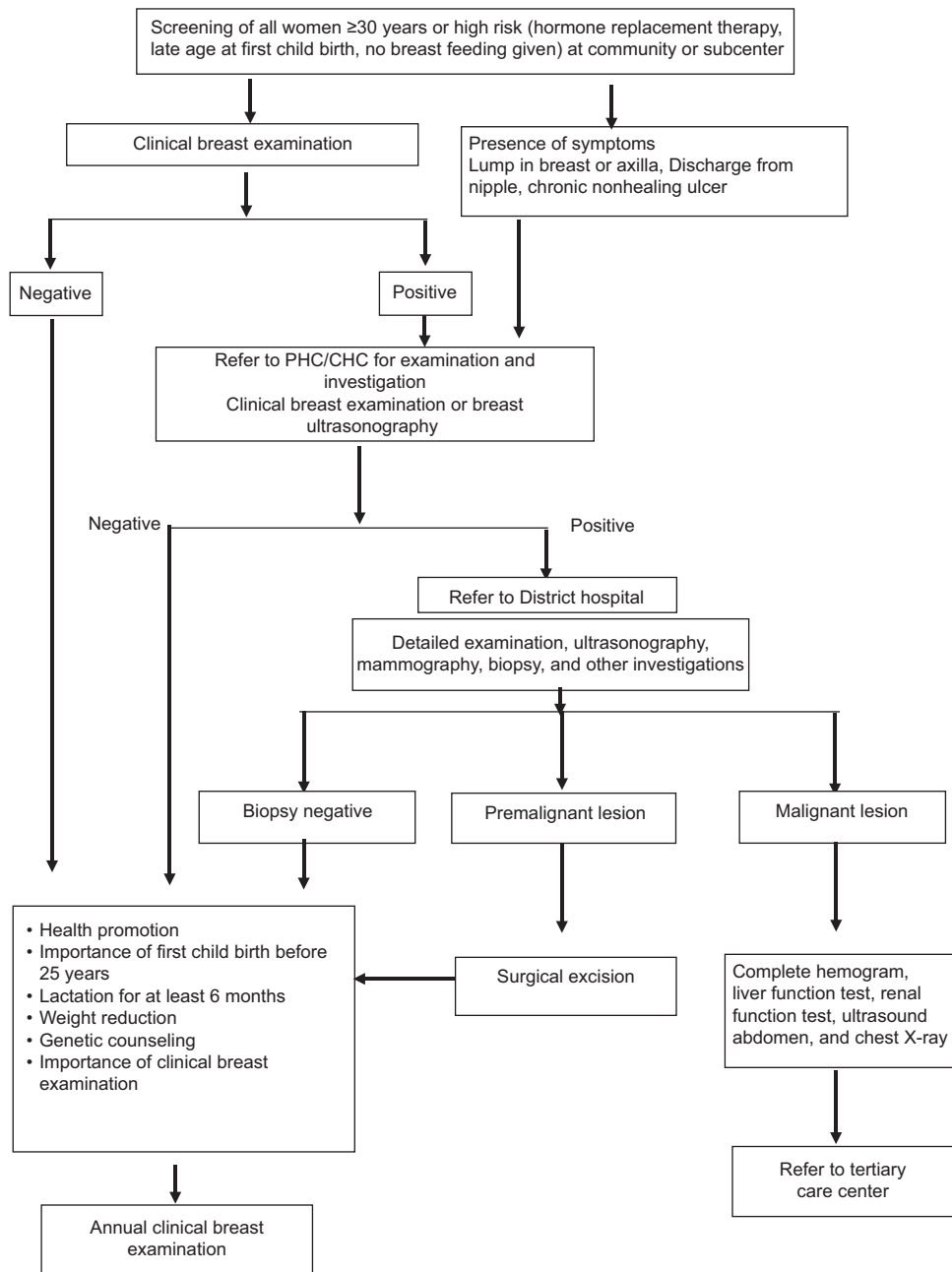


Figure 7: Screening, diagnosis, and management of breast cancer at primary and secondary healthcare

lifestyle, lowered fertility, increasing age at first childbirth, and obesity. According to Globocan 2018 data, breast cancer incidence in India is 24.7/100,000 population.<sup>[32]</sup> Approximately 162,468 women developed breast cancer and 87,090 patients died of breast cancer in 2018 in India. The risk factors, presenting features, diagnosis, and management of breast cancer at primary and secondary healthcare are given in Figure 7.

### Lung cancer

Lung cancer is the leading cause of cancer globally in all sexes and is the fourth leading cause in India. Overall survival is good in very early stage. However, in advanced stage, despite aggressive treatment outcome is poor. All efforts should be made to prevent it or at least to early diagnose it. The risk factors, presenting features, diagnosis, and management of oral cancer at primary and secondary healthcare are given in Figure 8.

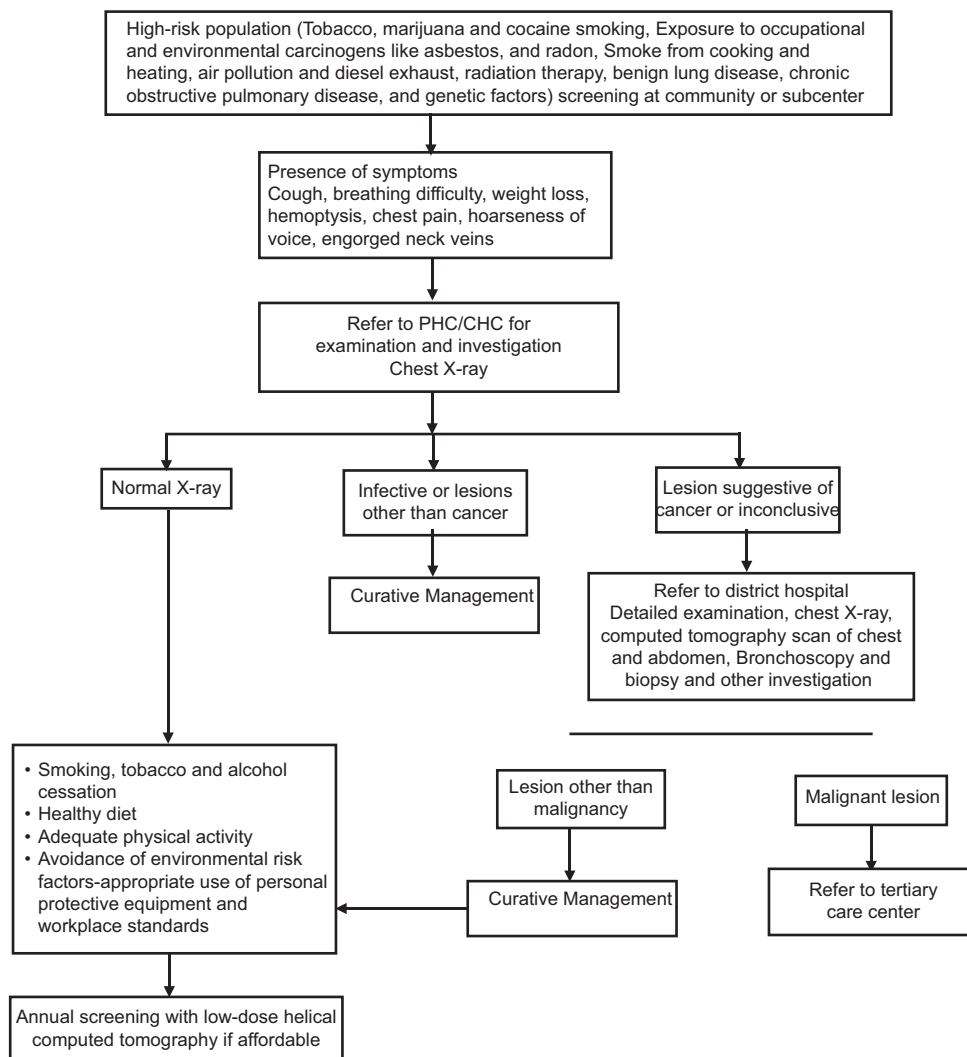


Figure 8: Screening, diagnosis, and management of lung cancer at primary and secondary healthcare

### Colorectal cancer

Colorectal cancer is among the top five cancers globally and is a lethal cancer.<sup>[32]</sup> The risk factors, presenting features, diagnosis, and management of colorectal cancer at primary and secondary healthcare are given in Figure 9.<sup>[34]</sup>

### Liver cancer

Liver cancer is one of the preventable cancers and is among the top ten causes of cancer burden and mortality due to cancer. The risk factors, presenting features, diagnosis, and management of liver cancer at primary and secondary healthcare are given in Figure 10.

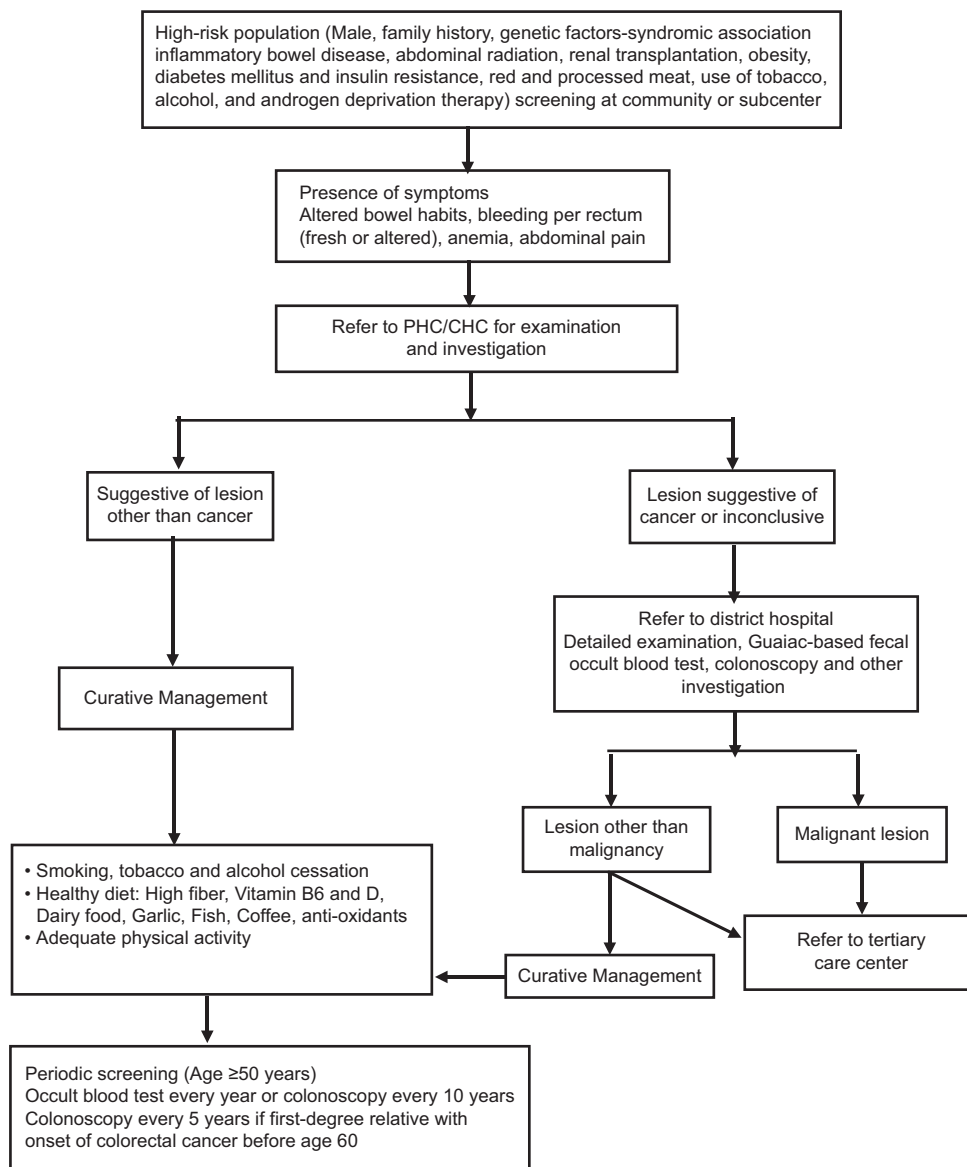


Figure 9: Screening, diagnosis, and management of colorectal cancer at primary and secondary healthcare

### Carcinoma esophagus

According to Globocan 2018, carcinoma esophagus is among top 10 causes of cancer and death due to cancer

globally and in India.<sup>[32]</sup> The risk factors, presenting features, diagnosis, and management of carcinoma esophagus at primary and secondary healthcare is given in Figure 11.

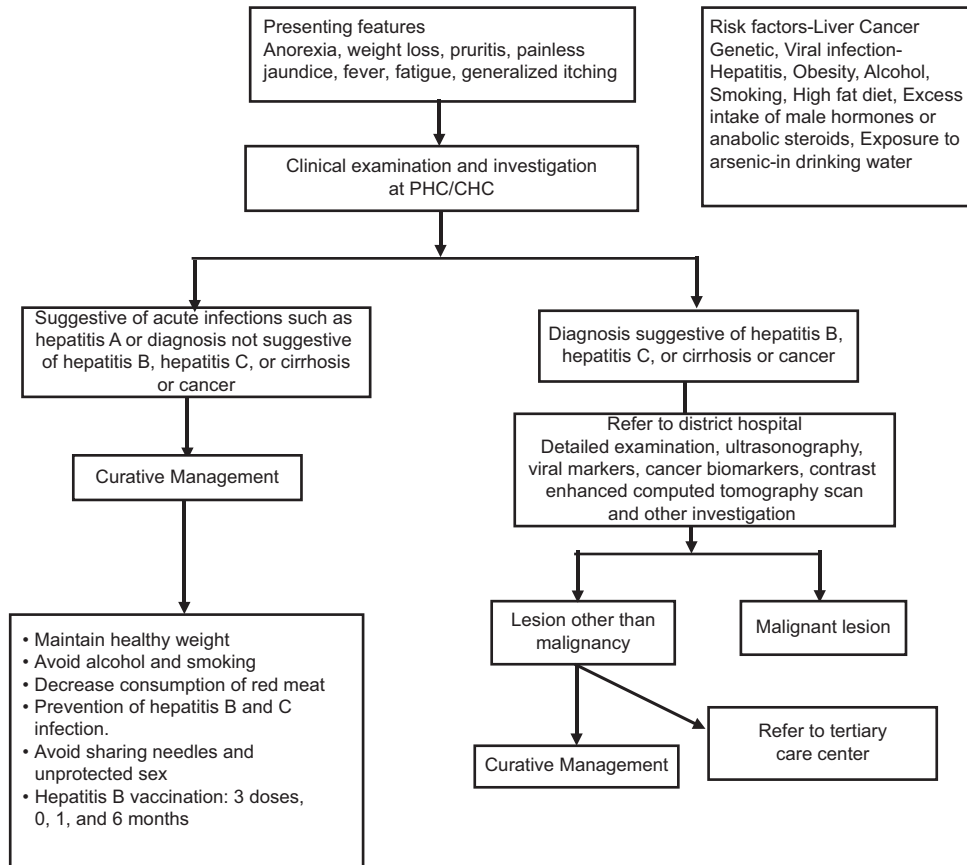


Figure 10: Screening, diagnosis, and management of liver cancer at primary and secondary healthcare

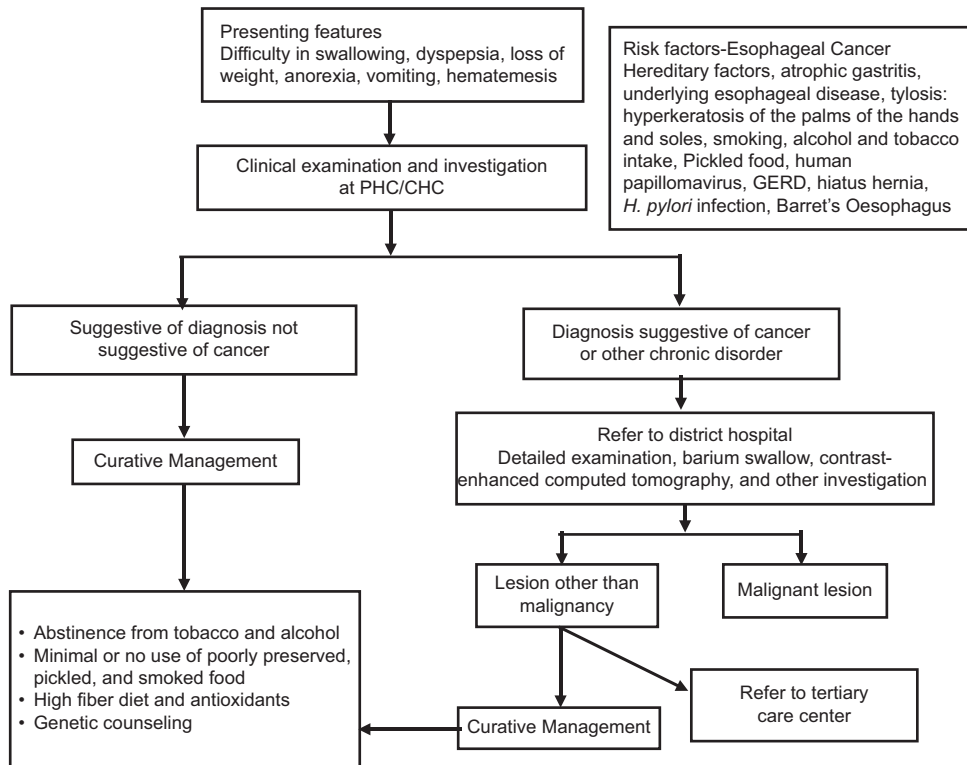


Figure 11: Screening, diagnosis, and management of esophageal cancer at primary and secondary healthcare

## Diabetes Mellitus

According to the International Diabetes Federation Atlas (2017), a total of 427 million individuals are suffering from diabetes and projected to be 629 million by 2045.<sup>[35]</sup> The prevalence of diabetes in LMICs is 8.73%, low-income countries (LICs) is 12.34%, upper-middle-income countries is 11.8%, high-income countries (HICs) is 6.68%, and overall, it is 9.45%.<sup>[36]</sup> The LMICs contribute immensely to the global burden. By virtue of population, India harbors the second largest number of diabetics of the world. The overall prevalence of diabetes is 7.3% (4.3%–10%), higher in urban areas and in mainland compared to northeastern states. The overall prevalence of prediabetes is 10.3% in India.<sup>[37]</sup>

### Operational definitions

Type 2 DM is diagnosed most widely using the American Diabetes Association which is given in Table 10. A glucometer can be used to assess capillary blood glucose levels as it is the only available means at most primary healthcare. However, plasma glucose measurement should be done wherever available. Urine glucose estimation is recommended neither for diagnosis and nor for monitoring of diabetes.<sup>[38]</sup> Only National Glycohemoglobin Standardization Program certified and standardized to the Diabetes Control and Complications Trial assay HbA1c test values should be accepted.

In addition to population-based screening of all people  $\geq 30$  years, the high-risk population approach is also needed as mentioned in Table 11.<sup>[39]</sup> They can be identified via house-to-house survey or opportunistic screening at health facilities and encouraged for diabetes screening. The preliminary physical examination and investigations are given in Table 12.

Diabetes education should be provided at the initial visit and at each follow-up visit, by addressing the following questions and topics as described in Table 13.

### Pharmacological management at primary health center

All patients with RBS  $\leq 300$  mg/dl can be further evaluated and treated at PHC. Metformin and sulfonylureas are the common oral antidiabetic drugs (OADs) used for the management of diabetes and the dose, indication, contraindication, and adverse events of the same are given in Table 14.<sup>[40]</sup>

Patients with RBG  $> 300$  mg/dl or presented with other red flag signs such as (a) glycemic targets not achieved in first 3 months of therapy even with maximum dose of OADs; (b) urine dipstick s/o proteinuria; (c) ketonuria +; (d) BP

$> 160/90$  mmHg; (e) abnormal neurological examination; (f) absent pedal pulses/foot ulcer; or (g) other chronic complications should be referred to secondary health facility for further evaluation and management.<sup>[40]</sup>

### Pharmacological management at secondary healthcare facility

- If initial RBG is  $\leq 300$  mg/dl, and/or if initial HbA1c is  $\leq 9\%$ , then monotherapy with metformin/sulfonylureas is advised
- If HbA1c is between 9% and 10%, dual OADs, i.e., metformin and sulfonylureas, should be started
- There is no preferred drug as add-on to metformin for dual therapy. Any of the classes of OADs or basal insulin can be considered, depending on availability and patient factors. Sulfonylureas and glitazones are low-cost options for add on therapy
- If HbA1c is  $\geq 10\%$  and/or RBG  $\geq 300$  mg/dl, insulin should be added along with OADs
- The insulin initiation requires proper counseling and shared decision making with the patient about its need, effects, administration and storage technique, advice for self-glucose monitoring, and associated risks of insulin therapy including hypoglycemia. A physician should start with basal insulin (insulin NPH or insulin glargine; depending on availability) at the dose of 0.2 IU/Kg/day at bedtime<sup>[41-43]</sup>
- If basal insulin has been titrated to an acceptable fasting blood glucose level (between 80 to 130 mg/dl) or if the dose is 0.5 units/kg/day and HbA1c remains above target, then combination injectable therapy should be started<sup>[41-43]</sup>
- When initiating combination injectable therapy, metformin therapy should be maintained while other oral agents may be discontinued
- The recommended starting dose of premeal insulin is 4 units, 0.1 units/kg, or 10% of the basal dose, which might be required to be given before one or two meals or before each meal, depending on glycemic control
- If basal insulin is not available, then premixed insulin (30:70) may be initiated divided into two doses at 0.2 IU/kg/day, with 70% of total dose administered before breakfast and rest 30% before dinner. Details of insulin therapy are given in Table 15.
- Insulin storage and injection techniques should be taught to all patients. Insulin vials should be stored at 4°C and hence can be kept in the door of the refrigerator. They must never be kept in the freezer compartment
- Insulin injection technique should be demonstrated to the patient at time of initiation. Subcutaneous

**Table 10: American Diabetes Association criteria for diagnosis of diabetes mellitus and gestational diabetes mellitus**

Diabetes	GDM
Fasting plasma glucose $\geq 126$ mg/dL (fasting is defined as no caloric intake for at least 8 h)	One-step strategy
or	A 75-g OGTT, with plasma glucose measurement in fasting, 1 h and 2 h, at 24-28 weeks of gestation in women not previously diagnosed with overt diabetes
2-h postprandial glucose $\geq 200$ mg/dL	The OGTT should be performed in the morning after an overnight fast of at least 8 h
or	Diagnose GDM when plasma glucose values are met or exceeded (mg/dL)
HbA1c $\geq 6.5\%$	Fasting: 92
or	1 h: 180
In a patient with classic symptoms of hyperglycemia or hyperglycemic crisis, a random plasma glucose $\geq 200$ mg/dL	2 h: 153

OGTT - Oral glucose tolerance test; GDM - Gestational diabetes mellitus; HbA1c - Hemoglobin A1c

**Table 11: High-risk individuals for diabetes mellitus**

High-risk individuals
Overweight (BMI $> 23$ kg/m <sup>2</sup> )
Physically inactive (exercises $< 3$ times/week)
High BP (BP $> 140/90$ mmHg)
Impaired fasting glucose
Family history of diabetes
Delivered a baby with birth weight $\geq 4$ kg
History of diabetes or even mild elevation of blood glucose during pregnancy
Polycystic ovary syndrome
Signs of insulin resistance (acanthosis nigricans, skin tags)
Pregnancy
Age $< 30$ years with obesity (body weight $> 120\%$ of ideal body weight or above 85 <sup>th</sup> centile)

BMI - Body mass index, BP - Blood pressure

injection in the abdominal wall, thigh, and forearm, with frequent site rotation should be advocated. Patients should be taught to check for site hypertrophy.

- Self-monitoring of blood glucose at home should be encouraged. Fasting and premeal blood glucose targets of 80–130 and 2-h postmeal blood glucose targets of  $< 180$  mg/dl should be achieved
- If urine dipstick test is suggestive of proteinuria,

then angiotensin-converting enzyme inhibitor (ACEI) or angiotensin receptor blockers should be started<sup>[44-47]</sup>

- For loss of sensation, patient education is a must. They should be encouraged to daily inspect the feet (along with sole) with a handheld mirror for any cracks, fissures, callus, or ulcers and to avoid exposing the feet and hands to extremes of temperature
- For painful diabetic neuropathy, drugs such as pregabalin/gabapentin or duloxetine should be started.

The algorithm for pharmacological management of DM in primary and secondary healthcare settings is given in Figure 12.

The patient should be screened for end-organ complications such as retinopathy, nephropathy, and neuropathy, including diabetic foot at the time of diagnosis and periodically at regular intervals in both primary and secondary healthcare facilities as given in Table 16. Patients found positive for any complication at primary healthcare facility should be referred to secondary healthcare facility for confirmation and further management.

**Table 12: Preliminary physical examination and investigations for newly diagnosed cases of diabetes at primary and secondary healthcare facility**

<b>PHC (by the medical officer)</b>	<b>Secondary healthcare facility This is in addition to the physical examination and investigation carried out in PHC</b>
Height and weight	Plasma glucose estimation
BMI	HbA1c
Waist circumference, Waist-hip ratio	Serum creatinine
Acanthosis nigricans, skin tags	24-h protein estimation
Blood pressure	Detailed evaluation for complications such as diabetic foot, neuropathy, nephropathy, and cardiovascular diseases
Palpation of pedal pulses at each visit	
Foot examination	
Peripheral nervous system - pinprick sensation, vibration sensation with 128 Hz tuning fork, ankle reflex and for LOPS and annually thereafter	
Thyroid examination	
Investigations	
Blood glucose estimation (glucometer)	
Hemoglobin	
Urine routine including urine ketone dipsticks (based on Rothera's nitroprusside test to detect ketones in the urine)	
Fundus examination	
Nephropathy assessment with spot urine protein evaluation with dipstick at diagnosis and annually thereafter/or depending on result	
CVD risk assessment at diagnosis (BP, ECG)	

LOPS - Loss of protective sensation, PHC - Primary health center, HbA1c - Hemoglobin A1c, BMI - Body mass index, ECG - Electrocardiogram, CVD - Cardiovascular disease, BP - Blood pressure

**Table 13: Diabetes education at diagnosis and follow-up visit**

<b>At 1<sup>st</sup> visit</b>	<b>Follow-up visits</b>
What is diabetes?	Importance of glycemic control
Why does it occur?	Prevention and screening for complications
Lifestyle measures: Diet, physical activity, quitting alcohol and smoking	Foot care
Use of oral drugs	Newer modalities of treatment
Identifying symptoms of hypoglycemia and hyperglycemia	Preconceptional counseling
Importance of factors other than glucose control: Cholesterol and blood pressure	

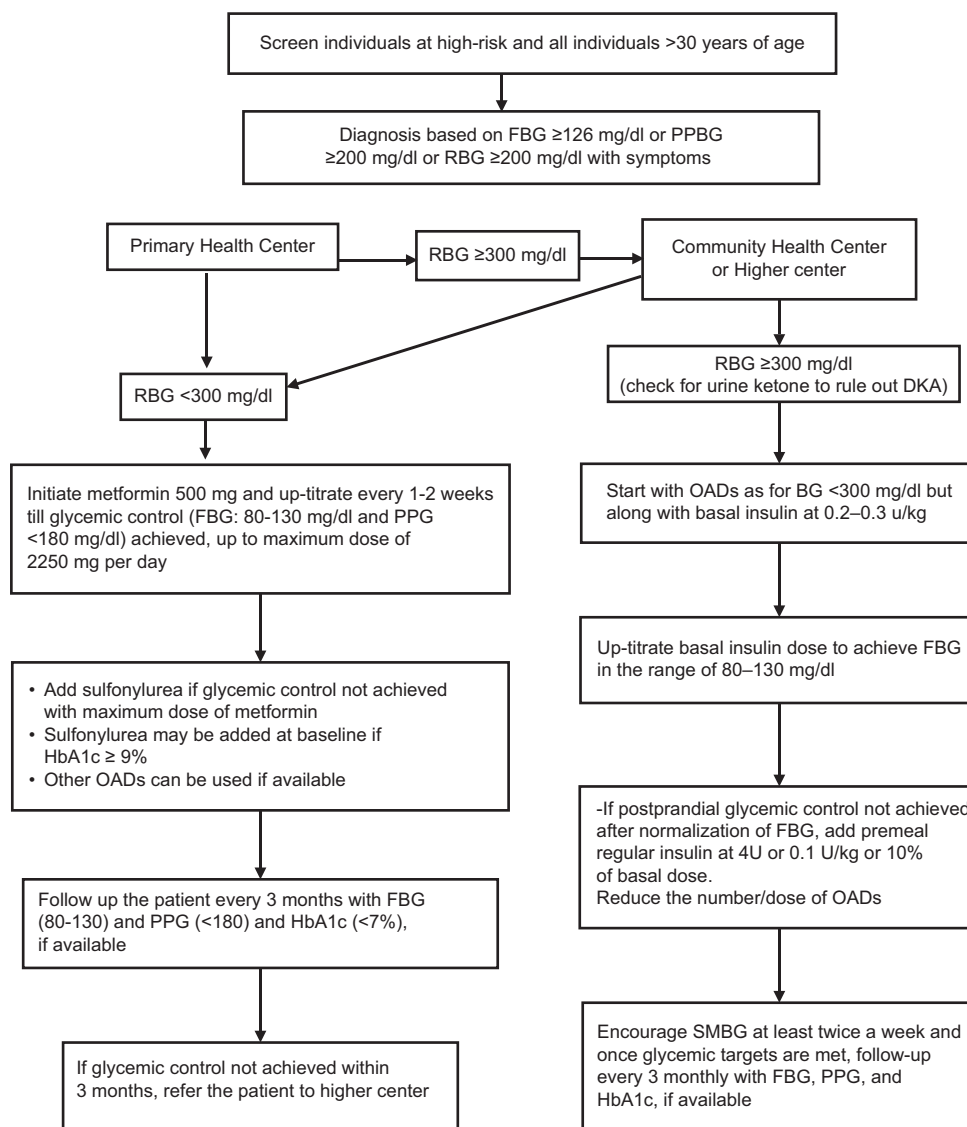


Figure 12: Pharmacological management of diabetes mellitus at primary and secondary healthcare setting. FBG- Fasting blood glucose; RBG- Random blood glucose; PPG- Postprandial glucose; SMBG-Self monitoring of blood glucose

Table 14: Summary of the available oral antidiabetic agents at primary healthcare and their practical utility

Drug	Dose	Efficacy	Advantages	Contraindications	Adverse effects	Preferred in
Metformin	500-2250 mg/day	High	Potentially beneficial for ASCVD Weight loss No hypoglycemia	Advanced renal failure (eGFR < 30 ml/min) Decompensated heart/liver failure Lactic acidosis	GI disturbance: Nausea, diarrhea Vitamin B12 deficiency	Young, obese, newly diagnosed cases Patients with insulin resistance
Sulfonylureas: (e.g., glibenclamide)	5-20 mg/day	High	Favorable cost	Advanced renal failure Avoid in elderly patients	Hypoglycemia Weight gain	Young, lean patients with low risk of hypoglycemia

ASCVD - Atherosclerotic cardiovascular disease



**Table 15: The details of types, indication, and side effects of insulin therapy**

Type of insulin	Onset of action/ peak action	Indication	Side effects
Glargine	1-2 h/peakless	FBG >300	Hypoglycemia (less common)
Premix (30/70)	1 h (regular component)/2-3 h	RBG >300	Hypoglycemia
Regular insulin	1 h/2-3 h	PPG >200	Hypoglycemia weight gain

FBG: Fasting blood glucose, RBG: Random blood glucose, PPG: Postprandial glucose

**Table 16: Screening and follow-up of diabetes mellitus for end organ complications**

Complication	Screening modality	Type of health facility	Screening frequency
Retinopathy	Dilated and comprehensive eye examination by an ophthalmologist or optometrist	Primary (desirable) and secondary healthcare facility	If no evidence of retinopathy and good glycemic control, examination every 1-2 years may be considered and glycemia is well controlled, then If any level of diabetic retinopathy present, repeat fundal examination annually More frequent fundal examination if retinopathy is progressing or sight threatening
Nephropathy	Urinary albumin Urinary albumin (spot urinary albumin-to-creatinine ratio) and estimated glomerular filtration rate	Primary healthcare Secondary healthcare	At diagnosis and then at least annually
Neuropathy	Temperature or pinprick sensation (small fiber function) and vibration sensation using a 128 Hz tuning fork (large fiber function) 10 g monofilament testing	Primary and secondary healthcare facility	At diagnosis and then at least annually
Foot	Inspection of the skin Assessment of foot deformities Neurological assessment Vascular assessment (pulses in the legs and feet)	Primary and secondary healthcare facility	At diagnosis and then at least annually

## Cardiovascular Diseases

Coronary artery disease (CAD) is the leading cause of death globally, including India. The case fatality attributable to CVD in LICs appears to be much higher than in middle-income countries and HICs. According to the Global Burden of Disease study age-standardized estimates (2010), nearly a quarter (24.8%) of all deaths in India are attributable

to CVDs.<sup>[48]</sup> Evaluation and management based on various cardiovascular symptoms are given below.

### Evaluation of chest pain

Clinically, most of the patients present with chest pain which should be differentiated with noncardiac cause of pain as given in Table 17.

**Table 17: The difference between chest pain of cardiac and noncardiac cause**

Chest pain or angina	Features not characteristics of cardiac chest pain
A substernal pain or pressure sensation radiating to neck, jaw, arm lasting around 20-30 min which may be associated with dyspnea, diaphoresis, palpitations, nausea, vomiting, or lightheadedness; this pain typically increases with exertion and decreases with rest or nitroglycerine	Sharp pain brought by respiratory movement or cough
Older patients, diabetics, patients with chronic renal failure and female patients are more likely to present with dyspnea as their primary symptom which should be regarded as angina equivalent. Some patients may have no chest discomfort but present solely with jaw, neck, ear, arm, shoulder, back, or epigastric discomfort or with unexplained dyspnea dyspnea is a discomfort. Need to verify whether it is without epigastric discomfort	Pain that may be localized by the tip of one finger, particularly over the left ventricular apex or a costochondral junction Very brief episode of pain that lasts a few seconds Pain reproduced by movement or palpation over the chest
If these symptoms have a clear relationship to exertion or stress or are relieved promptly with nitroglycerine, It should be considered equivalent to angina	Constant pain that lasts for many hours without other ischemic symptoms

**Table 18: Details of examination and investigations for diagnosis of cardiovascular diseases**

Examination/ Investigation	Details
Physical examination	Focused cardiovascular examination is recommended to detect evidence of heart failure (heart murmur, third and the fourth heart sound, elevated JVP, pulmonary edema) and peripheral hypoperfusion (pallor, diaphoresis, cool extremities)
Heart rate and blood pressure	Many patients have normal heart rate and blood pressure within the first hour of STEMI Patients with large infarctions have hypotension (SBP < 100 mmHg and/or sinus tachycardia > 100/min) Anterior infarction: About one-fourth of patients have manifestations of sympathetic nervous system hyperactivity (tachycardia and/or hypertension) Inferior infarction: Up to half of patients show evidence of parasympathetic hyperactivity (bradycardia and/or hypotension)
Auscultation	Transient midsystolic or late systolic apical systolic murmur due to dysfunction of the mitral valve apparatus may be present. New, loud ( $\geq$ Grade 3/6) precordial systolic murmur may be present in ruptured ventricular septum and mitral regurgitation Pericardial friction rub in pericarditis (usually develops 24-96 h after MI)
Laboratory studies	Blood samples should be sent for cardiac enzymes (Troponin I or T and CK-MB) for diagnosis of ACS. Other investigations include hemogram, blood urea, creatinine, electrolytes, fasting blood sugars, and fasting lipid profile. Cardiac troponin I or T is the preferred biomarker for diagnosis of STEMI. Troponin I may be preferred in patients of renal failure A portable chest radiograph is useful to exclude other causes of acute chest pain, but it should not delay the initiation of therapy
ECG*	A 12-lead resting, ECG ( $\pm$ RV3, RV4, for RV MI) should be obtained immediately in patients with ongoing chest pain as rapidly as possible within 10 min of presentation A normal ECG does not exclude the presence of severe CAD and should be repeated every 4-6 h or earlier if suspicion is strong ECG changes that mimic myocardial infarction may result from preexcitation, pericarditis, myocarditis, cardiomyopathy, COPD, pulmonary embolism, cholecystitis, and hyperkalemia; thus, the treating physician should be aware
Echocardiography	Abnormalities of wall motion are almost universally present in STEMI. Estimation of LV function is useful prognostically. It also helps to detect RV infarction, complication of myocardial infarction such as ventricular septal rupture, papillary muscle dysfunction/rupture, cardiac tamponade and LV thrombus

LV - Left ventricular, JVP - Jugular Venous Pressure, MI - Myocardial infarction, ACS - Acute coronary syndrome, CK-MB - Creatine kinase-MB, ECG - Electrocardiogram, CAD - Coronary artery disease, RV - Right ventricular, SBP - Systolic blood pressure.

\*ECG abnormality includes:

Resting ST segment changes (depression  $\geq$  0.5 mm horizontal or downsloping in NSTEMI-ACS, convex elevation > 1 mm in  $\geq$  2 consecutive leads in STEMI, pseudonormalization of ST segment or dynamic changes)

New pathological Q-waves (>0.4 s) is considered diagnostic of MI but may occur with prolonged ischemia

T wave-inversion ( $\geq$  2 mm symmetrical) or a peaked upright T waves may be the first ECG manifestations of myocardial ischemia

Recent onset Left Bundle Branch Block (LBBB) (QRS duration  $\geq$  20 ms, broad, notched, or slurred R waves in leads I, aVL, V5 and V6, absent septal Q waves in leads I, V5, and V6, prolonged time to peak R wave (>60 ms) in V5 and V6

RVMI is diagnosed with ST segment elevation in lead V4R, ST elevation in V1 in the presence of ST elevation in inferior leads

Nonspecific ST and T changes: ST depression < 0.5 mm, T wave inversion < 2 mm, isoelectric T wave or asymmetric T inversion is less suggestive of myocardial ischemia

The range of normal ST-segment deviation differs between men and women. ST-elevation (concave upward) in the V2 or V3 leads of 2.0 mV or less in men and 1.5 mV or less in women, or 1.0 mV or less in other leads, is normal

Electrocardiogram (ECG) and cardiac enzymes are the important investigations to diagnose acute cardiac event. However, the complete physical/clinical examination is needed for appropriate management [Table 18].

Based on the clinical examination and investigations, the chest pain can be classified into (a) chest pain of noncardiac cause; (b) chronic unstable angina; (c) ST-elevation myocardial infarction (STEMI), and (d) non-STEMI.<sup>[49,50]</sup> The

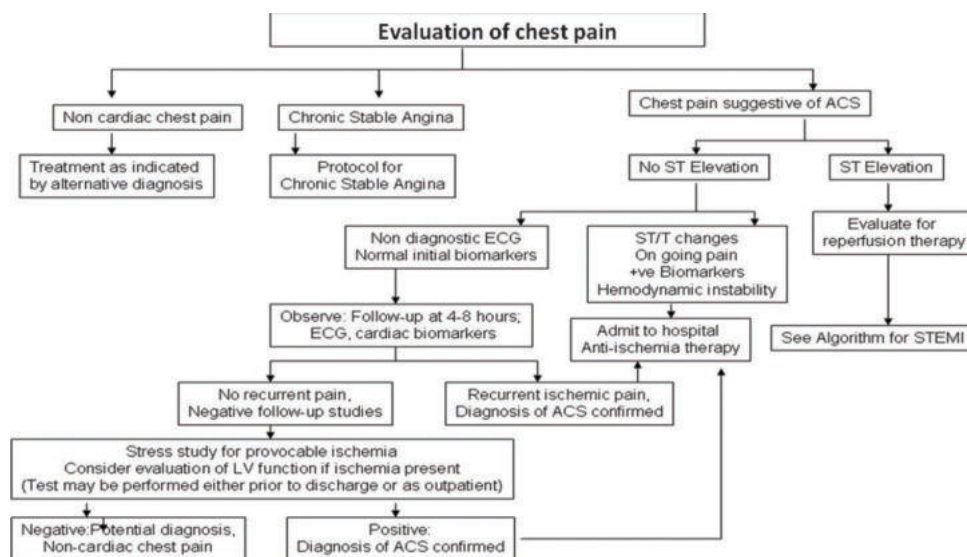


Figure 13: Algorithm for evaluation and management of patients with chest pain

Table 19: Diagnosis, investigation, and management of chronic stable angina

History	Investigations	Management
<p>Clinical Classification of Chest Pain</p> <p>Typical angina (definite if all 3 of the following present)</p> <ol style="list-style-type: none"> <li>1. Retrosternal chest discomfort with a characteristic quality and duration that is</li> <li>2. Provoked by exertion or emotional stress and</li> <li>3. Relieved by rest or nitroglycerin</li> </ol> <p>Atypical angina (probable if 2 of the above characteristics meet)</p> <p>Noncardiac chest pain</p> <p>Meets <math>\leq 1</math> of the typical angina characteristics</p>	<ol style="list-style-type: none"> <li>1. Hemoglobin</li> <li>2. FBG</li> <li>3. Fasting lipid profile, including total cholesterol, HDL, triglycerides, and calculated LDL cholesterol</li> <li>4. Rest ECG in patients without an obvious noncardiac cause of chest pain.</li> <li>5. Rest ECG during an episode of chest pain.</li> <li>6. Chest X-ray in patients with signs or symptoms of congestive heart failure, valvular heart disease, pericardial disease, or aortic dissection/aneurysm</li> <li>7. Stress testing (Tread Mill Test or stress thallium) and coronary angiography for risk stratification as indicated. Duke treadmill score tells us the probability of coronary artery disease by combining the treadmill exercise time, maximum net ST-segment deviation (depression or elevation) and exercise induced angina. High-risk category in Duke Treadmill* score requires elective coronary angiography</li> </ol>	<p>This includes risk factor reduction, pharmacotherapy and revascularization (if required)</p> <p>Identify precipitating factors such as anemia, hyperthyroidism, hypertension and others</p> <p>Start aspirin, beta blockers, statins, oral nitrates and consider ACE inhibitors for blood pressure control and sublingual nitroglycerin (for SOS purpose)</p> <p>Life style modification including healthy diet, regular exercise and weight reduction</p> <p>Optimize beta blocker dose with check on pulse rate and blood pressure</p> <p>Count the use of sublingual nitroglycerin to monitor the success of treatment</p> <p>Use of nitroglycerin patch at bedtime for nocturnal angina</p> <p>Consider coronary angiography if angina symptoms are refractory or if the exercise ECG is abnormal, especially with poor work capacity</p>

FBG - Fasting blood glucose, ECG - Electrocardiogram, HDL - High-density lipoprotein, LDL - Low-density cholesterol

\*Duke treadmill score=Exercise Time - (5×Max ST) - (4×Angina Index)

Exercise time	Treadmill exercise time (min)
Max ST	Maximum net ST deviation (except aVR)
Angina Index	Treadmill angina index
	0. No angina during exercise
	1. Nonlimiting angina
	2. Exercise limited angina
Duke treadmill score	Risk
$\geq +5$	Low risk
$+4 - -10$	Moderate risk
$\leq -11$	High risk

**Table 20: Indications and contraindications for fibrinolysis among patients with ST elevation myocardial infarction**

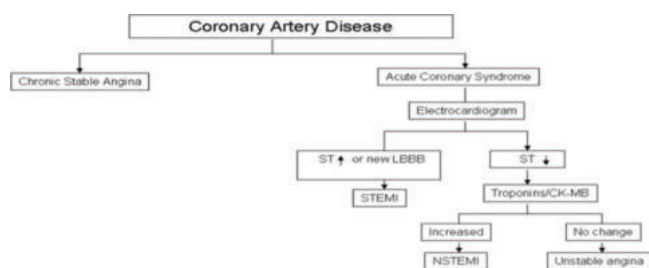
Fibrinolysis indications	Fibrinolysis Contraindication	
	Absolute	Relative
ST segment elevation >1 mm in two contiguous leads	Any prior intracranial hemorrhage	History of chronic, severe, poorly controlled hypertension
New LBBB	Known structural cerebral vascular lesion (e.g., arteriovenous malformation)	Severe uncontrolled hypertension on presentation (SBP >180 or DBP >110 mmHg)
Symptoms consistent with ischemia	Known malignant intracranial neoplasm (primary or metastatic)	History of prior ischemic stroke greater than 3 months, dementia, or known intracranial pathology not covered in contraindications
Symptom onset <12 h prior to presentation	Ischemic stroke within 3 months except acute ischemic stroke within 3 h	Traumatic or prolonged (>10 min) CPR or major surgery (<3 weeks)
	Suspected aortic dissection	Recent (<2-4 weeks) internal bleeding
	Active bleeding or bleeding diathesis (excluding menses)	Noncompressible vascular punctures
	Significant closed-head or facial trauma within 3 months	For streptokinase/anistreplase: Prior exposure (>5 days ago) or prior allergic reaction to these agents
		Pregnancy
		Active peptic ulcer
		Current use of anticoagulants: The higher the INR, the higher the risk of bleeding

LBBB - Left bundle branch block, CPR - Cardiopulmonary resuscitation, INR - International normalized ratio, SBP - Systolic blood pressure, DBP - Diastolic blood pressure

**Table 21: Common fibrinolytics used in myocardial infarction and its contraindication**

Drug	Initial treatment	Contraindications
STK	1.5 million units in 100 ml 5% DA or NS over 30-60 min	Prior STK
Urokinase	2.5 lakhs units IV over 10 min followed by 5 lakhs units IV over next 60 min. Alternatively given as intracoronary infusion of 6000 unit/min for 2 h	Nonantigenic and does not cause hypersensitivity, can be used if STK allergy or prior STK
Tenecteplase	Single IV bolus 30 mg if <60 kg 35 mg if 60 kg to <70 kg 40 mg if 70 kg to <80 kg 45 mg if 80 kg to <90 kg 50 mg if ≥90 kg	Non antigenic and does not cause hypersensitivity, can be used if STK allergy or prior STK
Retepase (r-PA)	10 units + 10 unit IV boluses given 30 min apart	Non antigenic and does not cause hypersensitivity, can be used if STK allergy or prior STK
Alteplase (t-PA)	90-min weight-based regimen (bolus of 15 mg, infusion of 0.75 mg/kg for 30 min (maximum, 50 kg), then 0.5 mg/kg (maximum 35 mg) over the next 60 min; the total dose not to exceed 100 mg	Nonantigenic and does not cause hypersensitivity, can be used if STK allergy or prior STK

\*Any of the above drugs can be used depending upon availability (STK is cheaper and is the usual fibrinolytic agent used in our set-up). STK - Streptokinase, DA - Dextrose, NS - Normal saline, IV - Intravenous



**Figure 14: Spectrum of coronary artery diseases**

algorithm for evaluation and management of patients with chest pain is given in Figure 13.

As ECG facility is available in PHC, diagnosis and initial management of chest pain/angina can be done at the level of both PHC and further referred to CHC or higher center for thrombolysis or risk stratification through further investigation.

**Chronic stable angina**

Chronic stable angina can be diagnosed and managed as summarized in Table 19.

**Acute coronary syndrome**

Figure 14 shows a spectrum of CAD. Acute coronary syndrome (ACS) includes both STEMI and non-ST elevation ACS (NSTEMI-ACS).<sup>[51]</sup>

**ST-elevation myocardial infarction**

All the patients presenting with acute anginal pain to a PHC should be given sublingual sorbitrate, a loading dose of aspirin (300 mg), clopidogrel (300 mg), and statin (atorvastatin 40 or 80 mg) after getting an ECG and should be referred to a CHC for thrombolysis and management of comorbidities. If needed, patients may be referred to higher center, i.e., district hospital for risk stratification in the form of treadmill test (after stabilization), echocardiography for assessing left ventricular ejection fraction, or referral to medical colleges/tertiary centers for angiography in case the patient has a contraindication to thrombolysis or failed thrombolysis or high-risk features such as ongoing chest pain and hemodynamic or electrical instability.<sup>[49,50]</sup>

**Table 22: Medical management of acute coronary syndrome patient**

Medications/Therapy	Details
Medical therapy (to consider as per the available facilities at the setup)	Hospitalize in the critical care unit with continuous ECG monitoring Intravenous line for emergency arrhythmia treatment
Oxygen	2-4 L/min by nasal cannula to maintain oxygen saturation >90%, only to be given if the resting SaO <sub>2</sub> is <90% or the patient is in respiratory distress Benefit: Limit ischemic myocardial damage by increasing oxygen delivery and reducing ST elevation (COR1/LOE C)
Aspirin	Administer aspirin immediately, unless the patient is aspirin intolerant Dosage: 300 mg chewed at presentation, then 150 mg PO OD Caution: Active peptic ulcer disease, hypersensitivity reactions. If contraindicated, give clopidogrel Benefit: Irreversibly inhibits platelet aggregation, stabilizes plaque and arrests thrombus, reduces mortality in patients with STEMI (COR1/LOE A)
Clopidogrel	A 300-mg loading dose followed by a 75-mg/day maintenance dosage should be added to aspirin in patients with STEMI regardless of whether they undergo reperfusion with fibrinolytic therapy or do not receive reperfusion therapy. Treatment with clopidogrel can be given for at least 1 year. Continue clopidogrel indefinitely in patients intolerant to aspirin Benefit: Irreversible inhibition of platelet aggregation (COR1/LOE A)
Beta blocker	Oral beta blocker therapy should be initiated in the first 24 h (metoprolol, 25-50 mg every 12 h, titrate dose up to 100 mg every 12 h based on BP and HR) Contraindications: signs of heart failure, increased risk for cardiogenic shock (age >70 years, SBP <120 mm Hg, HR >110 or <60 bpm), SBP <100 mmHg, HR <60 beats/min, PR interval >0.24 s or second- or third-degree heart block, active asthma, or COPD. Reassess as contraindications resolve Benefit: Reduces myocardial oxygen consumption, limits infarct size, and reduces mortality. Especially useful in patients with hypertension, tachycardia, or persistent ischemic pain
ACE inhibitors	ACE inhibitors should generally be started within the first 24 h, ideally after fibrinolytic therapy has been completed and blood pressure has stabilized Start with low dose oral administration and increase steadily to achieve a full dose. (captopril 6.25 mg TID, titrate up to 50 mg TID, ramipril 2.5-5 mg BD) Indefinite treatment: Patients with symptomatic heart failure, patients with diabetes, particularly with nephropathy, and hypertensive patients who have achieved blood pressure control on these agents. May be discontinued at 6 weeks in low-risk patients Benefit: Reduces systemic vascular resistance, and cardiac afterload, also reduces aldosterone release with consequent reduction of circulating fluid load, and lowers cardiac preload, attenuation of the remodeling process after large infarctions, reduces re-infarction and sudden cardiac death (COR1/LOE A)
Statins	High-dose statins such as atorvastatin 40 or 80 mg per day or rosuvastatin 20 or 40 mg per day is recommended in all the patients Benefit: Lower the LDL levels and stabilizes the plaque (COR1/LOE B)
Morphine	Morphine 2-4 mg IV every 5-10 min until pain is relieved or side effects (nausea and vomiting, respiratory depression, and hypotension) develop Benefit: Analgesia, reduces pain and anxiety, decreases sympathetic tone, systemic vascular resistance and oxygen demand
Nitroglycerin	Sublingual: Sorbitrate 5-10 mg every 5 min, up to 3 doses (If SBP>100 mmHg) Intravenous: Begin at 10 µg/min and titrate upward to a maximum of 100 µg/min with monitoring of blood pressure closely Avoid when there is clinical suspicion of RV infarction Benefit: Dilates coronary vessels-increase blood flow and reduces systemic vascular resistance and preload
Heparin	Low-molecular weight heparin (subcutaneous enoxaparin 1 mg/kg BD, Dalteparin 120 unit/kg BD till hospitalization), easy to administer, and no need of monitoring. Elective use with streptokinase (after 6 h of thrombolysis) (COR1/LOE A)

ECG - Electrocardiogram, BP - Blood pressure, HR - Heart rate, LDL - Low-density cholesterol, RV - Right ventricular, SBP - Systolic blood pressure, TID - Three times daily

The indication and contraindication for thrombo/fibrinolysis are given in Table 20.

The common fibrinolytics used in acute myocardial infarction (MI) are given in Table 21.

**Indicators of successful thrombolysis**

- Resolution of ST-segment elevation by ≥50%
- Resolution of ischemic discomfort or chest pain or hemodynamic instability.

Medical management including thrombolysis for stabilization of the patients presenting with ACS is given in Table 22.

**Non-ST elevation acute coronary syndrome**

NSTE-ACS include non-STEMI in the patient who has positive cardiac biomarkers (positive troponin T/I or elevated CPK-MB) or unstable angina in patients who have negative cardiac biomarkers. These patients have characteristic chest pain with ECG changes as mentioned above.<sup>[52]</sup>

The recommended medical management including oxygen, aspirin, clopidogrel, beta blockers, ACEIs, statin, morphine, nitroglycerine, and heparin is like STEMI. Patients after initial diagnosis and management in a CHC should be further referred to higher center, i.e., district hospital for risk stratification in the form of treadmill test

(after stabilization), echocardiography for LVEF or referred to medical colleges/tertiary centers for angiography.

The recommended management facilities to be available at different primary and secondary healthcare facilities are summarized in Table 23.

**Table 23: Recommendation for the management of coronary artery disease at various levels in primary and secondary healthcare settings**

Level of care	Subcenter	Primary health center	Community health center	District hospital
Prevention	Risk factor identification and primary prevention	Risk factor identification and primary prevention	Risk factor identification and primary prevention	Risk factor identification and primary prevention
Management				
History		Evaluation of chest pain and other angina equivalents	Reassess history	Reassess history
Examination		HR, BP, and cardiovascular examination	Reassess physical findings	Reassess physical findings
Investigations		ECG	ECG Cardiac biomarkers (Troponin T/I or CPKMB) FBS, fasting lipids, SERFT	Treadmill test, echocardiography (Risk stratification for CSA and low risk NSTEMI-ACS)
Treatment		CSA treatment: Risk factor reduction Pharmacotherapy including aspirin, statin, beta blockers, long-acting nitrates, ACE/ARB (for HTN), sublingual nitrates on SOS basis	STEMI treatment: Thrombolysis with streptokinase if presentation within 12 h NSTEMI-ACS treatment: Aspirin, statin, beta blockers, long-acting nitrates, ACE/ARB, Sublingual nitrates on SOS basis, heparin	STEMI treatment: Thrombolysis with streptokinase if presentation within 12 h NSTEMI-ACS treatment: Aspirin, statin, beta blockers, long-acting nitrates, ACE/ARB, sublingual nitrates on SOS basis, heparin cardiovascular rehabilitation
Referral	Any patient presenting with chest pain or angina equivalent should be referred to district hospital for diagnosis and management	CSA patient should be referred to District hospital for risk stratification All ACS patients should be referred immediately to CHC or higher facility after sublingual sorbitrate, loading dose of aspirin (300 mg), clopidogrel (300 mg) and atorvastatin 40 or 80 mg	STEMI and low risk NSTEMI-ACS patients should be referred to District hospital after thrombolysis for echocardiography and/or Treadmill test Failed STEMI and high risk NSTEMI-ACS should be directly referred to tertiary care for angiography	Patients with high Duke score on Treadmill test should be referred to tertiary care for angiography High-risk features such as refractory angina, hemodynamic or electrical instability should be referred to tertiary care for angiography

SERFT - Serum electrolytes and renal function tests; CSA - Chronic stable angina; STEMI - ST elevation myocardial infarction; NSTEMI-ACS - Non-ST elevation-acute coronary syndrome; ACE/ARB - Angiotensin-converting enzyme/angiotensin receptor blockers

## Cerebrovascular Disease or Stroke

Stroke is the second leading cause of death worldwide. In the US, approximately 700,000 people have a new or recurrent stroke annually. In the developing world, stroke causes around 3 million deaths. In India, stroke incidence is around 146 per 100,000, and it is predicted that in the next 30 years, the burden of stroke is primarily going to increase in the LMICs.<sup>[6]</sup> However, the public health systems of these countries are yet to be strengthened. Since stroke is also the leading cause of permanent neurological disability in adults, reversal of stroke symptoms through delivery of organized stroke care becomes of paramount importance nationwide. Central to stroke management is an efficient manner to capture stroke data and thereafter develop organized delivery of stroke care through well-established systems of care.

### Operational definitions

- Stroke: A sudden focal or global neurologic deficit of vascular origin lasting > 1 h; if the symptoms are fully reversible in < 1 h, it should be labeled as a transient ischemic attack (TIA)
- TIA: “A transient episode of neurologic dysfunction caused by focal cerebral, spinal cord, or retinal ischemia, without acute infarction.”

The symptoms to recognize stroke by the primary and secondary healthcare staff are given in Table 24.

### Recommendations

The following are the consensus recommendations for the management of stroke at various levels of healthcare.

### Development and training of emergency medical services

The nonmedical or paramedical staff in national ambulance

service (NAS) will be the primary responders for an acute stroke. As the resources needed to manage stroke is not available at PHC and resulting delay in initiation of treatment, the NAS system will rather can provide the appropriate services as part of primary healthcare system. The NAS personnel should be thoroughly trained to recognize stroke symptoms [Figure 15] using Face drooping, Arm weakness, Speech difficulty, and Time to call Ambulance and thereafter transfer to the closest stroke ready hospital where computed tomography (CT) services available.<sup>[54-56]</sup> This would increase both the number of patients treated and quality of care. Educational stroke programs for physicians, hospital personnel, and NAS personnel are recommended.

The summary of recommendations for initial assessment and management with NAS system is given in Table 25.<sup>[53]</sup>

Taking the example of the Indian health system, CT service is available only at the level of district hospital. Due to this reason, the primary management of stroke can be done only at district hospital. However, the patient with the symptoms of stroke may visit any level of healthcare facility. Similar to the NAS system, the summary of recommendations for initial assessment and management at primary and secondary healthcare facilities is given in Figure 15.

In addition to initial assessment, the clinical management of the patient is needed to stabilize and treat the cerebrovascular event or stroke at both primary and secondary healthcare levels [Figure 16].

The recurrence of ischemic stroke or TIA can be prevented by the following recommendations mentioned in Table 26.<sup>[54,56-58]</sup>


All stroke patients should be initiated the rehabilitation services after 24 h of thrombolysis or stroke and continued

**Figure 15: Recommendations for initial assessment and management of stroke at primary and secondary healthcare**

PHC/CHC	District hospital or higher center (In addition to full medical assessment and basic investigations at PHC/CHC)
<p>An organized protocol for the emergency evaluation of patients with suspected stroke is recommended. Training for identification of stroke/TIA should be done.</p> <p>A full medical assessment should be undertaken (by a trained physician) for all patients with acute stroke or TIA) to define the nature of the event, the need for investigations, further management and rehabilitation.</p> <p>A blood glucose level, hemogram, and ECG should be done for all patients with acute stroke.</p> <p>Referral to district hospital for CT scan (urgent)</p>	<p>All patients with TIA or an acute stroke syndrome should have a computed tomography brain scan as soon as possible, preferably within 24 h.</p> <p>Multimodal CT and MRI may provide additional information that may improve diagnosis of ischemic stroke. Emergency treatment of stroke should not be delayed to obtain multimodal imaging studies.</p> <p>Coagulogram, platelet count should be done in addition to the basic investigations outlined for PHC/CHC</p>

PHC - Primary health center, CHC - Community health center, TIA - Transient ischemic attack, CT - Computed tomography, MRI - Magnetic resonance imaging, ECG - Electrocardiography

**Table 24: Details of the symptoms to recognize stroke**

Recognition of Stroke	Signs
Symptoms of stroke*	Sudden onset of weakness of one-half of body or one part of body Sudden onset of dizziness or spinning Sudden onset of inability or difficulty in speech Sudden onset of imbalance Sudden severe headache Sudden loss of consciousness Sudden onset of blindness
Recognizing a stroke with "FAST"	

**Table 25: Recommendations for initial assessment and management of stroke with National Ambulance Service**

Recommendations*
NAS leaders, in coordination with local, regional, and state agencies and in consultation with medical authorities and local experts, should develop triage paradigms and protocols to ensure that patients with a suspected stroke are rapidly identified and assessed by use of a validated and standardized instrument for stroke screening, such as the FAST scale
A full medical assessment should be undertaken, and for all patients with acute stroke or TIA to define the nature of the event, the need for investigations, further management, and rehabilitation
NAS personnel should begin the initial management of stroke in the field. Implementation of a stroke protocol to be used by NAS personnel is strongly encouraged
Patients with a positive stroke screen and/or a strong suspicion of stroke should be transported rapidly to the closest healthcare facilities such as community health center/district hospital that can capably administer IV thrombolytic agents (alteplase and tenecteplase) after computed tomography
*All are Class I recommendations. TIA - Transient ischemic attack; FAST - Face, arm, speech test; NAS - National Ambulance Service; IV - Intravenous

**Table 26: Recommendations for secondary prevention following acute ischemic stroke and transient ischemic attack**

Primary/community healthcare	District hospital or higher center
Antiplatelet therapy should be continued for long term to prevent recurrent stroke and other vascular events. Aspirin 150 mg or Aspirin-Dipyridamole ER (25/200) twice a day may be started. Clopidogrel 75 mg is an alternative if indicated	In patients with transient ischemic attack and minor stroke combination of aspirin (75 mg) and clopidogrel (75 mg) for a period of 3 months is beneficial to prevent recurrent stroke
Blood pressure control after the acute phase of stroke	Long-term event recorder may help detect atrial fibrillation in patients with cryptogenic stroke
Lipid-lowering agent, i.e., statins	Long-term anticoagulation with adjusted dose warfarin (target INR 2.5, range [2.0-3.0]) is recommended in the secondary prevention of stroke following atrial fibrillation unless there are contraindications. Non-Vitamin-K oral anticoagulants-Dabigatran/Apixaban/Rivroxaban-are safe and effective alternatives to Warfarin
Blood glucose control for prevention of micro and macro vascular complications	In patients with cardioembolic strokes and definite contraindications to long-term anticoagulation, antiplatelet therapy should be considered
Smoking cessation, weight control (more specifically abdominal fat), regular physical activity, and a diet rich in fruits, vegetables, fish and low-fat dairy products	
ER - Extended release	

with community-based physiotherapy services, including chest physiotherapy.

**Referral to tertiary center**

Referral to a tertiary care center may be carried out in the following situations:

1. Large hemispheric infarct on CT/magnetic resonance imaging with impending herniation or malignant middle cerebral artery infarction
2. If a patient has comes within 4 h of an acute stroke, the patient should be immediately referred to a higher center with facilities for acute stroke thrombolysis if requisite facilities and expertise are not available at the district hospital
3. Patients with large vessel occlusion stroke should be referred if a tertiary care facility has endovascular treatment facility.

The consolidated algorithm for assessment and management of stroke at primary and secondary healthcare facilities is given in Figure 17.

**Hypertension**

**Introduction**

Hypertension is the most important risk factor for CVD. It accounts for 54% of all strokes and 47% of all ischemic heart disease events globally.<sup>[59]</sup> Hypertensive heart disease stood fourth among the CVD cause for DALYs in 2015 globally. The prevalence rose continuously for each age group, from 2.0 per 100,000 at ages 20–24 years to



**Figure 16: Recommendations for management of stroke at primary and secondary healthcare settings**

PHC/CHC	District Hospital or higher center (In addition to management recommendations mentioned at PHC/CHC)
Airway support is recommended for patients of acute stroke with decreased consciousness or compromised airway due to bulbar dysfunction; Oxygen by mask at the rate of 4-6 l/min should be started in comatose patients	Intravenous recombinant tissue plasminogen activator (Alteplase) is recommended for ischemic stroke patients within 4.5 h of stroke onset and without contraindication to this therapy, in centers with appropriate facilities and expertise.
Swallowing assessment should be carried by a simple bedside test (GUSS, etc.)	To avoid delay, thrombolysis maybe started before the results of the platelet count, PTI/INR, APTT are received and later aborted if platelet count is low or INR/APTT is deranged. Thrombolysis can be carried out if INR <1.7
Fever in patients with acute ischemic stroke should be treated; the temperature should be lowered with antipyretics (paracetamol).	Patients with hemorrhagic strokes who are receiving anticoagulants or have received recent thrombolytic therapy or those with bleeding diathesis require urgent correction of coagulation defects. Thrombolytics, antiplatelet therapy, and anticoagulants should be discontinued.
Intravenous line with normal saline to be started; Do not give dextrose containing solutions in acute stroke unless indicated	Antiplatelet therapy, normally aspirin (150 mg), should be prescribed immediately for patients who have sustained an ischemic stroke who are not candidates for thrombolytic therapy.
Hypoglycemia/Hyperglycemia in patients with acute ischemic stroke should be treated with a goal to achieve normoglycemia (Range 150-180 mg%)	Control of fever to keep normothermia is recommended
Blood pressure management (If patient is being considered for thrombolysis keep BP <180/110; *For nonthrombolysed patients BP lowering should be carried only if BP is >220/120)	Control of blood glucose to less than 180 mg in acute phase is recommended
Regular side change is recommended to prevent pressure sore in nonambulatory patients	Rehabilitation including passive physiotherapy to be instituted after 24 h of stroke.
Following the initial stabilization at PHC/CHC, the needs to be transferred to district or higher facility with CT facility	Deep venous thrombosis prophylaxis should be given in all patients
	The routine use of heparins in acute ischemic stroke, including cardioembolic strokes, is not recommended.
	The routine uses of drugs considered to limit neuronal damage, including the use of corticosteroids, neuroprotectants, plasma volume expanders, barbiturates and streptokinase, is of no proven benefit and should be discouraged.

\* depicts the special case i.e. For non thrombolysed patients BP lowering should be carried only if BP is >220/120) PHC - Primary health center, CHC - Community health center, CT - Computed tomography

1360 per 100,000 for those >80 years of age. In 2015, the United States, Russia, China, India, and Indonesia accounted for more than half of the global DALYs related to systolic BP of at least 110–115 mmHg.<sup>[60]</sup> Even though hypertension and CVDs predominantly affect the elderly population in HICs, in LMICs, younger populations are disproportionately affected.<sup>[61]</sup> Despite the availability of low-cost medications that are safe and effective, fewer than 15% of adults suffering from hypertension, worldwide, have their BP under control (140/90 or lower).<sup>[62]</sup>

**Operational definitions**

The cutoff for normal BP and hypertension is given in Table 27 as defined by the American College of Cardiology/ American Heart Association Task Force. Hypertensive urgency is defined as BP >180 mmHg systolic and/ or >120 mmHg diastolic. Hypertensive emergency is defined as BP >180 mmHg (systolic) with target organ damage and/or >120 mmHg (diastolic) with target organ damage.<sup>[63]</sup>

**Table 27: Operational definition of normal blood pressure and hypertension**

Category	SBP (mmHg)		DBP (mmHg)
Normal blood pressure	<120	and	<80
Elevated blood pressure	120-129		<80
Hypertension			
Stage 1 hypertension	130-139	and/or	80-89
Stage 2 hypertension	≥140		≥90

SBP - Systolic blood pressure, DBP - Diastolic blood pressure

According to the Joint National Committee 8 recommendations, pharmacological treatment should be started when the BP is >150/90 mmHg in adults aged 60 years or older or >140/90 in adults aged younger than 60 years. In patients with comorbidities of hypertension and diabetes, therapy should be initiated at BP of >140/90 mmHg, irrespective of the age of the individual.<sup>[64]</sup>

The primordial and primary prevention through lifestyle interventions should be delivered at community level. The pharmacological management in addition to

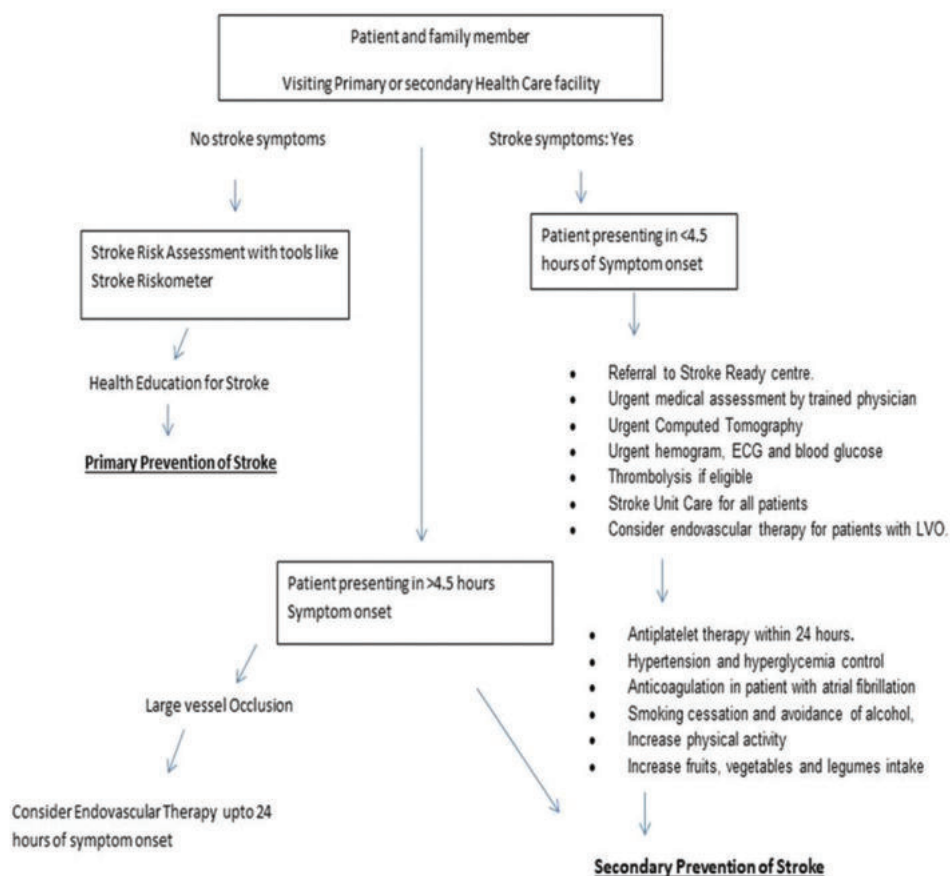


Figure 17: The assessment and management algorithm for stroke at primary and secondary healthcare setting. LVO - Large vessel occlusion

Table 28: Antihypertensive drugs used for co-existing morbidities or complications

Indication	Treatment choice
Heart failure	ACEI/ARB + BB + diuretic + spironolactone
Post-MI/clinical CAD	ACEI/ARB and BB
CAD	ACEI, BB, diuretic, CCB
Diabetes	ACEI/ARB, CCB, diuretic
CKD	ACEI/ARB
Recurrent stroke prevention	ACEI, diuretic
Pregnancy	Labetolol (first line), nifedipine, methyldopa

CCB - Calcium channel blockers, ACEI - Angiotensin converting enzyme inhibitor, ARB - Angiotensin receptor blockers, BB - Beta blocker, MI - Myocardial infarction, CAD - Coronary artery disease, CKD - Chronic kidney disease

lifestyle interventions initiated to all patients diagnosed with hypertension. The algorithm for diagnosis and management of hypertension at primary and secondary healthcare settings is given in Figure 18.

#### Pharmacological management of hypertension

- Four medication classes (calcium channel blockers [CCBs], ACEIs, angiotensin receptor blockers [ARBs], and diuretics) are effective drugs for the treatment of hypertension. Single drug or combination of drugs may be used for treatment<sup>[63]</sup>

- Stage 1 hypertension: First assessment for atherosclerotic CVD (ASCVD) risk is done. If ASCVD risk is less than 10%, lifestyle changes are recommended, and reassessment is done in 3–6 months. BP-lowering medications are initiated in patients with clinical CVD or a 10-year risk of 10% or greater
- For stage 2 hypertension, Two BP-lowering medications (of different classes) are recommended in addition to lifestyle changes. Reassessment is done after 1 month. If treatment goal is met, reassessment is done after 3–6 months. If the goal is not met after 1 month, change of medication is done or titration of dose is done. Reassessment is done after every month till goal is reached
- Hypertensive urgency can be managed by intensification of therapy and treatment of anxiety as applicable.
- Hypertensive emergency requires admission of patient to an intensive care unit for monitoring of BP and parenteral administration of BP-lowering drugs.
- Lifestyle changes include DASH diet, weight reduction, physical activity (90–150 min of aerobic and/or dynamic resistance exercise per week and/or 3 sessions per week of isometric resistance exercises) and alcohol restriction (two or fewer drinks daily for

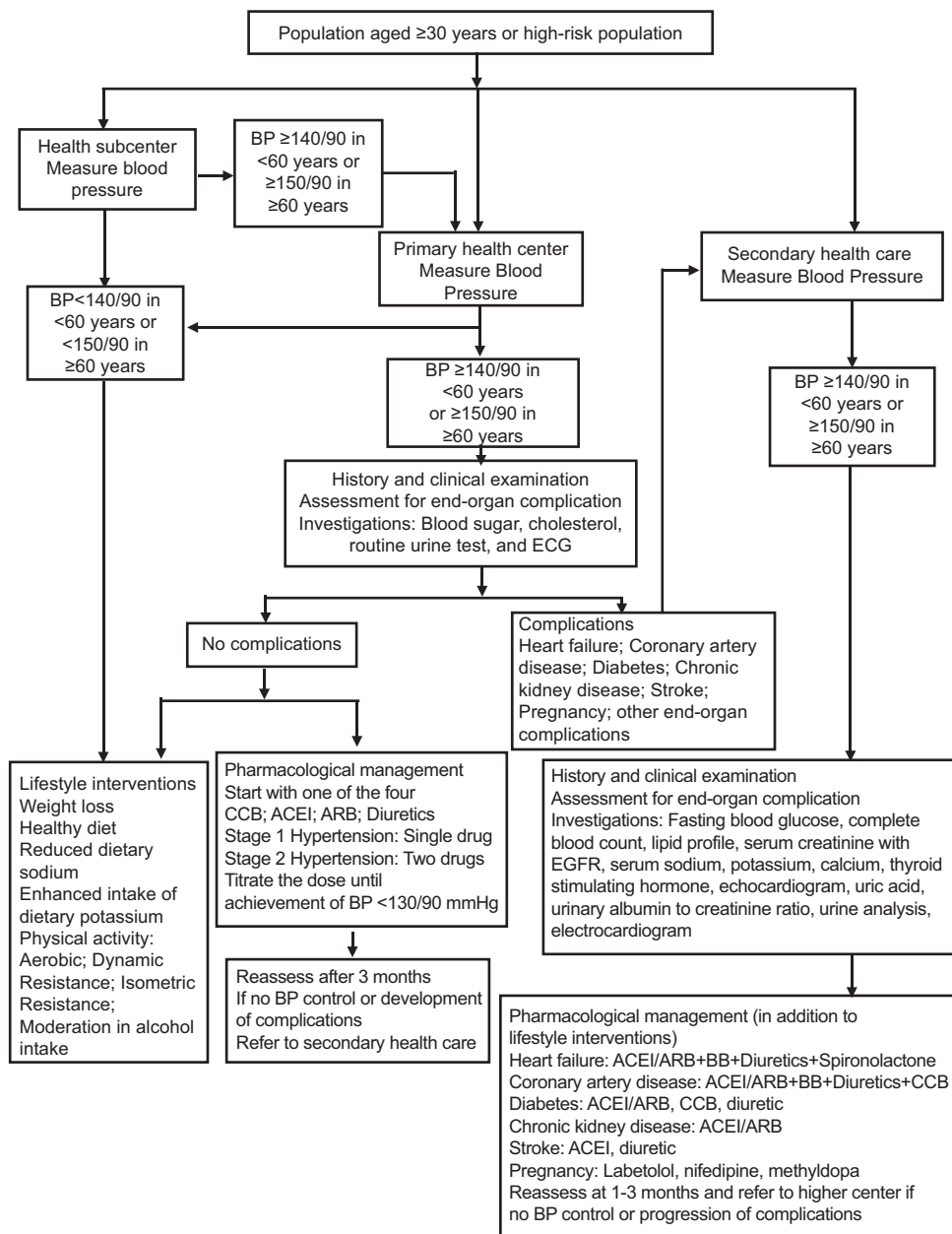


Figure 18: Diagnosis and management of hypertension at primary and secondary healthcare setting. ECG - Electrocardiogram, GFR - Glomerular filtration rate, CCB - Calcium channel blockers, ACEI - Angiotensin-converting enzyme inhibitor, ARB - Angiotensin receptor blockers, BB - Beta blocker

- men and not >1 drink daily for women)
- Goals of BP for pharmacological therapy: The treatment goal is to maintain the BP to <130/80 mmHg for all clinical conditions.
- If target BP is not reached, to reinforce lifestyle and adherence and/or titrate medications to maximum doses or consider adding another medication (ACEI, ARB, CCB, and thiazide)
- All patients with hypertension should be assessed through clinical examination and investigations at primary and

secondary healthcare facilities [Figure 18]. Patients with hypertension and complications/comorbidities such as heart failure, CVDs, stroke, and CKD should be referred to secondary healthcare facilities for further evaluation and management. The antihypertensive drug of choice for specific conditions is given in Table 28.<sup>[64]</sup>

The formulations and doses of individual drugs used for the treatment of hypertension are summarized in Table 29.

**Table 29: Details of commonly used antihypertensive drugs at primary and secondary healthcare settings**

Class	Name of drugs	Usual dose, range (mg/day)	Comments
Thiazide or thiazide-type diuretics	Chlorthalidone	12.5-25	Chlorthalidone preferred based on prolonged half-life and proven trial reduction of CVD
	Hydrochlorothiazide	25-50	
	Indapamide	1.25-2.5	Monitor for hyponatremia and hypokalemia, uric acid and calcium levels
	Metolazone drug	2.5-5	Use with caution in patients with history of acute gout unless patient is on uric acid-lowering therapy Do not use in combination with ARBs or direct renin inhibitor
ACEIs	Benazepril	10-40	Increased risk of hyperkalemia, especially in patients with CKD or in those on K <sup>+</sup> supplements or K <sup>+</sup> -sparing drugs
	Captopril	12.5-150	
	Enalapril	5-40	May cause acute renal failure in patients with severe bilateral renal artery stenosis
	Fosinopril	10-40	
	Lisinopril	10-40	Do not use if history of angioedema with ACEIs
	Moexipril	7.5-30	Avoid in pregnancy
	Perindopril	4-16	Do not use in combination with ACEIs or direct renin inhibitor
	Quinapril	10-80	
	Ramipril	2.5-20	
ARBs	Trandolapril	1-4	
	Azilsartan	40-80	Increased risk of hyperkalemia in CKD or in those on K <sup>+</sup> supplements or K <sup>+</sup> -sparing drugs
	Candesartan	8-32	
	Eprosartan	600-800	May cause acute renal failure in patients with severe bilateral renal artery stenosis
	Irbesartan	150-300	
	Losartan	50-100	Do not use if history of angioedema with ARBs. Patients with a history of angioedema with an ACEI can receive an ARB beginning 6 weeks after ACEI discontinued
	Olmesartan	20-40	
	Telmisartan	20-80	Avoid in pregnancy Avoid use in patients with HFrEF; amlodipine or felodipine may be used if required
CCBs	Valsartan	80-320	
	Amlodipine	2.5-10	Associated with dose-related pedal edema, which is more common in women than men
	Felodipine	2.5-10	
	Isradipine	5-10	Avoid routine use with beta blockers due to increased risk of bradycardia and heart block
	Nicardipine SR	60-120	
	Nifedipine LA	30-90	Do not use in patients with HFrEF
	Nisoldipine	17-34	Drug interactions with diltiazem and verapamil (CYP3A4 major substrate and moderate inhibitor)
	Diltiazem ER	120-360	
	Verapamil IR	120-360	
	Verapamil SR	120-360	
Verapamil-delayed onset ER	100-300		

ARBs - Angiotensin receptor blockers, CCBs - Calcium channel blockers, CVD - Cardiovascular disease, CKD - Chronic kidney disease, ACEIs - Angiotensin-converting enzyme inhibitors, HFrEF: Heart failure with reduced ejection fraction

## Chronic Respiratory Diseases

As per the WHO estimates, nearly 235 million people suffer from asthma globally, and the disease is the most common NCD among children. In addition, more than 200 million people (about 4%–20% adults over 40 years of age) suffer from COPD worldwide, but most present rather late in the course of illness. The WHO also estimates that globally around 65 million people have moderate-to-severe COPD; however, most of these data are from HICs. The recommendation for the management of chronic respiratory diseases in primary and secondary healthcare settings are given in the Table 30.

Both asthma and COPD [Table 31] are associated with considerable morbidity, especially if not diagnosed early or managed properly. While asthma results in reduction in overall functional capability among children and loss of productivity primarily among young adults, COPD is characterized by continued disease progression and symptomatic worsening, culminating in respiratory failure, and other complications in older adults. Current international guidelines rely heavily on objective demonstration of airflow limitation through spirometry, mainly for COPD but also for asthma, for characterization of disease severity/control [Table 32] and optimizing therapy.<sup>[65,66]</sup> However, spirometry is not currently available at primary (and frequently even secondary) healthcare

**Table 30: Recommendation for the management of chronic respiratory diseases in primary and secondary healthcare settings**

Management area	Details
Clinical diagnosis of asthma and COPD	A clinical diagnosis of asthma should be suspected in the presence of recurrent/episodic wheezing, breathlessness, cough, and/or chest tightness with no alternative explanation for these symptoms (1A). <sup>[66,68,69]</sup> Absence of signs and symptoms at the time of presentation does not rule out the presence of asthma A diagnosis of COPD should be considered in persons having chronic symptoms of cough, sputum production, shortness of breath, and/or wheezing, especially among those with prolonged exposure to risk factors for the disease (tobacco smoking, indoor or outdoor pollution, occupational dust exposure, etc.) (1A) <sup>[65,70]</sup> A diagnosis of COPD should not be excluded in the absence of physical signs (2A). Clinical features that may help in distinguishing between the asthma and COPD are outlined in Table 31
History	A history exploring morbidity and impact of disease (e.g., severity of breathlessness, frequency of exacerbations, need for hospitalization, absence from school/work, need for reliever medications for symptom relief) should be taken. Presence of fever, hemoptysis, chest pain, focal signs on physical examination, or significant radiographic abnormalities (if a chest radiograph is available) make a diagnosis of asthma or COPD less likely. <sup>[69,70]</sup> All patients with cough for more than two weeks duration should undergo sputum examination through their national tuberculosis control programs, and referred for treatment if the test is positive. <sup>[70,71]</sup>
Pulmonary function testing	A diminished FEV <sub>1</sub> /FVC ratio on spirometry should be considered as absolute evidence for airway obstruction (1A). <sup>[72]</sup> The severity of airflow limitation can be quantified by expressing FEV <sub>1</sub> as a percentage of its predicted value. <sup>[72]</sup> As far as possible, ethnically appropriate reference equations should be used to calculate predicted lung function. <sup>[8]</sup> Routine chest radiography is not recommended (2B). In case an alternative diagnosis, or some complication that cannot be tackled at the primary care level, is considered, patients should be referred to higher levels of healthcare for more detailed evaluation
Pharmacotherapy Based on clinical features and lung function testing, the disease should be stratified in terms of “severity” for COPD and “control” for asthma [Tables 31 and 32] (1A). <sup>[1,2,5,6]</sup> This will help in deciding on initial pharmacotherapy, and its further titration, for these patients	For asthma, ICS are the cornerstone of therapy (1A), and other drugs such as inhaled LABA need to be added if disease control remains inadequate (1A). <sup>[73,74]</sup> On the other hand, inhaled long-acting bronchodilators like tiotropium are prescribed for mild COPD (1A), and other drugs such as LABA or ICS added in a stepwise fashion if the disease is more severe or if current therapy provides suboptimal symptomatic relief (1A). Short-acting bronchodilators should be additionally used as reliever medication in both asthma and COPD during periods of symptomatic worsening (1A). A “single inhaler therapy” or SIT approach may be more appropriate for asthmatics taking ICS plus LABA combination (1A). <sup>[75]</sup> This involves using formoterol (a LABA with a rapid onset of action) and ICS through a single device for both maintenance and reliever therapy *Rapid worsening of breathlessness and/or change in character of sputum generally signifies an acute exacerbation of disease. Patients should be advised to take additional inhalations of reliever medications at home in such a scenario, and to report to their healthcare provider if symptoms do not improve or worsen despite therapy
Primary health center	Patients should receive reliever inhalations for three doses over 1 h, preferably using metered dose inhaler and spacer, or through nebulization if such facilities are available (3A). Patients of COPD should also receive oral broad-spectrum antibiotics (2A). All patients should also receive oral steroids (prednisolone 0.5 mg/kg/day for 5 days) (1A). In case patients are cyanosed or extremely breathless, or if pulse oximetry confirms oxygen saturation to be <90%, supplemental oxygen should be started if available (1A). Patients with COPD should receive only low-flow oxygen supplementation (2A). If such facilities are not available, or if patients do not improve, they should be referred to higher level of care
Counseling	All patients should be regularly counselled regarding smoking cessation, use of clean fuels, and avoidance of disease triggers as appropriate. It is also important to teach patients how to correctly use inhalers, and to verify their technique at each clinic visit. Therapy needs to be stepped up only if patients continue to remain symptomatic despite medication adherence and good inhaler technique. Patients should be educated about what to do, and when to seek medical help, in case their condition deteriorates. Patients requiring additional investigations or additional treatment modalities for advanced disease should be referred to higher levels of healthcare. Similarly, patients presenting with acute exacerbations of disease that is not relieved with measures taken at the primary care level should be referred for stabilization and further management. Routine and continued follow-up care after return from a higher level should be arranged at the primary care level itself so that patients and caregivers are not burdened with unnecessary expenses or travel

ICSs - Inhaled corticosteroids, LABAs - Long-acting beta agonists, COPD - Chronic obstructive pulmonary disease; FEV<sub>1</sub>: Forced expiratory volume in 1 s, FVC: Forced vital capacity

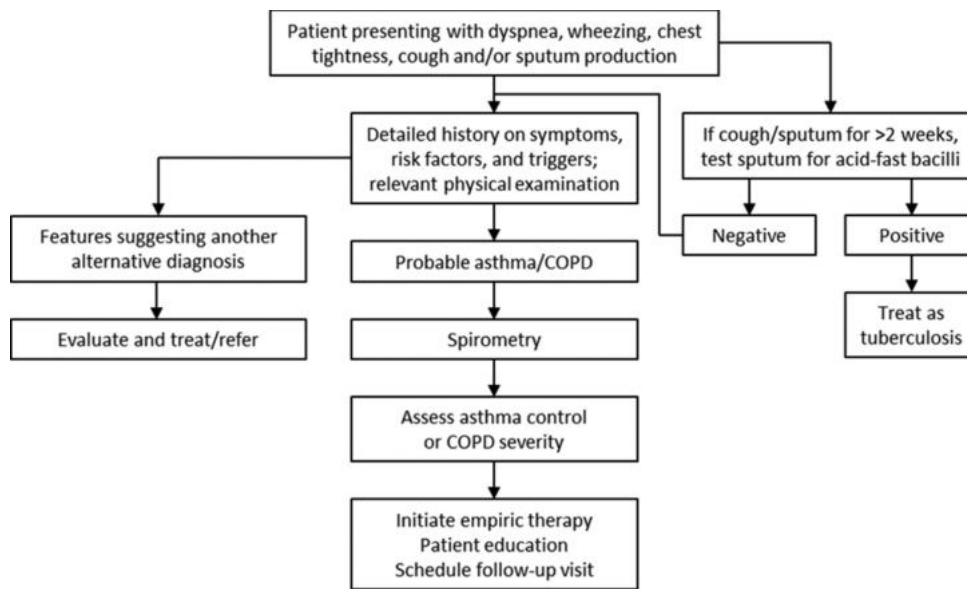


Figure 19: Flow process for diagnosis and management of asthma and chronic obstructive airway disease at primary care level

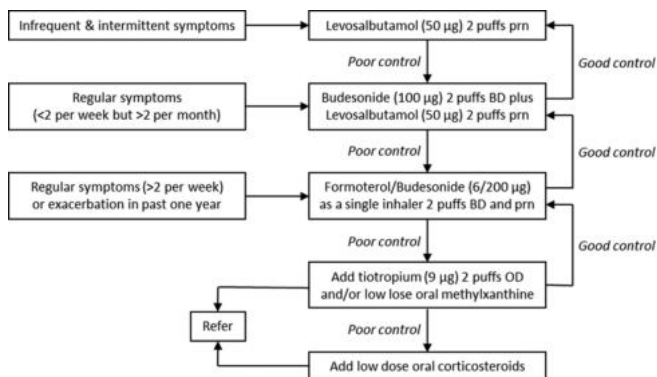


Figure 20: Initiation and modulation of asthma pharmacotherapy

settings in several countries. In addition, inhaled drugs, which currently form the cornerstone of managing both asthma and COPD, are not freely available at these levels due to cost issues. Moreover, the use of inhalers often carries a social stigma, and many patients (and sometimes even healthcare providers) consider them as being “habit-forming.” Both these present a major impediment to the early diagnosis and appropriate treatment of CRDs at the primary care level [Table 33].

Several countries have a well-functioning primary healthcare network that is providing services for NCDs to the community. However, it is yet not geared toward diagnosis and management of CRDs in most instances. This presents an opportunity to integrate CRDs in a vertical fashion into the program so that the existing infrastructure and workforce can be utilized to offer services related to CRDs at the primary healthcare level.<sup>[67,68]</sup> There is, of course, a need for capacity building and training, as well as augmentation of resources, by the health managers

to achieve this objective. This document presents an outline of the processes and options that may be used by healthcare providers and health managers to improve diagnosis and treatment of asthma and COPD at the primary care level.

#### Diagnosis and management at primary care level

Once a person enters the primary health system with respiratory symptoms, healthcare providers should aim to provide an accurate and timely diagnosis. They should try and differentiate between asthma and COPD, as well as attempt to exclude potential mimics of these diseases.

#### Planning and organizing care at primary healthcare level

Potential activities undertaken at primary healthcare level should be in three key areas: (a) prevention by reducing risk factor exposures, (b) early and accurate diagnosis, and (c) appropriate treatment, both pharmacologic and adjunct.

Preventive measures are aimed toward reducing/stopping exposure to risk factors in COPD and avoidance of allergens and other triggers in asthma as given in Table 34. Several overlapping activities can be easily advised at individual and household level by healthcare personnel involved in patient care.

Early and accurate diagnosis of asthma or COPD is essential to initiate timely therapy. The existing healthcare personnel at primary healthcare centers can be trained to integrate diagnosis and management of CRDs into their clinical activities related to other health programs at the community level. The diagnostic process flow is

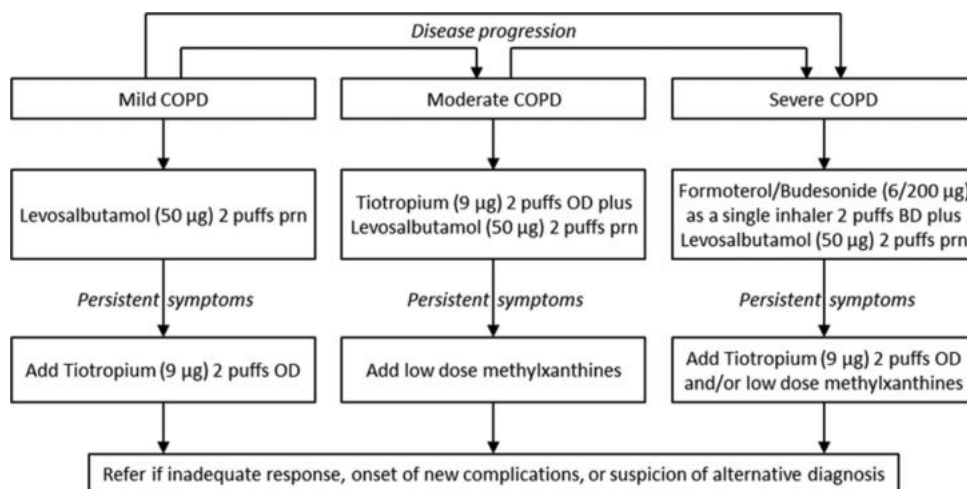


Figure 21: Initiation and modulation of chronic obstructive airway disease pharmacotherapy

Table 31: Differentiating between asthma and chronic obstructive airway disease (chronic obstructive pulmonary disease)

	Asthma	COPD
Age of onset	More often in childhood or early adulthood; variable	Usually later in life (4 <sup>th</sup> or 5 <sup>th</sup> decade)
Course	Episodic	Progressive
Smoking and other exposures	Uncommon	Common
Nasal symptoms, atopy	Common	Rare
Family history	Often	Uncommon
Triggers	Often identified	None
Wheeze	Prominent and almost universal	May or may not be present
Resting hyperinflation	Seen only during acute attacks	Common
Complications		Chronic respiratory failure or cor pulmonale in advanced disease

COPD: Chronic obstructive pulmonary disease

Table 32: Severity classification for chronic obstructive airway disease

Severity	Postbronchodilator FEV <sub>1</sub> (% predicted)	Dyspnea (mMRC grade)	Exacerbations in last 1 year	Complications*
Mild	≥80	<2	<2	No
Moderate	50-79	≥2	<2	No
Severe	<50	≥2	≥2	Yes

The category with the worst value should be used for severity classification, and spirometry may be excluded if a recent testing has not been performed. \*Complications include respiratory failure, cor pulmonale, and secondary polycythemia. FEV<sub>1</sub> - Forced expiratory volume in first second; mMRC - Modified Medical Research Council

Table 33: Level of current asthma control (over the preceding 4 weeks)

Components	Inadequately controlled (any one)	Adequately controlled (all should be present)
Day time symptoms or use of rescue medication	More than twice a week	Twice or less in a week
Night time symptoms/awakening	Any	None
Limitation of activities	Any	None
Pulmonary function (if available)	FEV <sub>1</sub> <80% of predicted or PEF <80% of personal best	FEV <sub>1</sub> >80% of predicted or PEF >80% of personal best

FEV1 - Forced expiratory volume in first second, PEF - Peak expiratory flow

summarized in Figure 19. A few important points need to be stressed. While it is desirable that spirometers should be available at all PHCs, the same might not be feasible (at least during the initial phases of program implementation). In such a scenario, health managers can consider pooling of resources for several neighboring PHCs. For example, if a spirometer is available at a secondary level center, then a mobile van can bring the equipment by

rotation to neighboring PHCs once in a week or fortnight, where patients awaiting pulmonary function test can be collectively evaluated. Second, patients presenting with cough of more than 2 weeks duration should undergo sputum examination to rule out tuberculosis. This activity will also integrate the program with the local tuberculosis control mechanisms. Finally, if there is some doubt in the diagnosis, or if some complication is suspected, then

patients should be immediately referred to secondary or tertiary centers for further evaluation.

Initial treatment and regular follow-up should be arranged for all patients at the primary care level itself, unless there is a need to refer them to a higher level. Inhaled medications should be preferred (1A). Even though these are more expensive than oral drugs, health managers should ensure that sufficient quantity is made available regularly for patient use. In the long term, these are likely to prove more cost-effective due to better disease and

symptom control, and lesser adverse effects. Treatment protocols for asthma and COPD are different, and initial therapy and its subsequent modulation need to be individualized for each patient [Figures 20 and 21].<sup>[65,66,69,70]</sup> It is important to verify that the patient is using his/her inhaler in a correct fashion and is compliant with prescribed treatment, before considering a step-up in therapy or referral to higher center.

The arrangement of logistics to implement the program at the primary care level may be a challenge in the initial stages, and health managers share a key responsibility for arranging finances to provide infrastructure and medications, as well as arrange horizontal integration into existing healthcare framework. A key requirement will be upgradation of diagnostic services and procurement of inhaled and other drugs that are so far not available at the primary care level. The minimum resources needed to make the program operational are enumerated in Table 35. Capacity-building measures need to be set up to improve the competencies of primary health workers in diagnosing CRDs and stratifying their severity based on clinical and spirometric criteria, providing support in managing disease exacerbations and health education.

The category with the worst value should be used for severity classification, and spirometry may be excluded if a recent testing has not been performed.

**Table 34: Preventive activities for patients and families**

Quit tobacco smoking
Ask family members who smoke to quit, and at least avoid smoking in presence of the patient, children, and pregnant women
Avoid trigger factors for asthma, if known
Avoid dusty and smoke-filled areas, both at home and at workplace
Improve ventilation in kitchen by keeping windows open or using a chimney to vent the smoke outside
If using solid fuels for cooking, etc., consider switching to LPG and/or electricity
Avoid occupations that involve agents capable of causing occupational asthma
Reduce dust as far as possible by using damp cloths to clean furniture, sprinkling the floor with water before sweeping, cleaning blades of fans regularly and minimizing soft toys in the sleeping area
It may help to eliminate cockroaches and other insects from house (when the patient is away)
Shake and expose mattresses, pillows, blankets, etc., to sunlight

LPG - Liquefied petroleum gas

**Table 35: Resources and medications required for management of asthma and chronic obstructive pulmonary disease at primary and secondary healthcare setting**

	Primary health Centre	Community Health Centre	District hospital
Essential	Oxygen cylinder with flowmeter Pulse oximeter Nebulizer Venturi facemask Valved spacer device	Oxygen cylinder with flowmeter Pulse oximeter Nebulizer Venturi facemask Spirometer and its consumables Chest radiography Valved spacer device	Oxygen cylinder with flowmeter and/or piped oxygen supply Pulse oximeter Nebulizer Venturi facemask Valved spacer device Spirometer and its consumables Chest radiography Arterial blood gases Noninvasive and invasive mechanical ventilation
Desirable	Spirometer and its consumables	Arterial blood gases Noninvasive and invasive mechanical ventilation	
Drugs	Metered dose inhaler and dry powder inhaler for Budesonide Formoterol plus Budesonide Tiotropium Levosalbutamol Levosalbutamol plus ipratropium nebulizing solution Prednisolone tablets Aminophylline tablets	Metered dose inhaler and dry powder inhaler for Budesonide Formoterol plus Budesonide Tiotropium Levosalbutamol Levosalbutamol plus ipratropium nebulizing solution Prednisolone tablets Aminophylline tablets	Metered dose inhaler and dry powder inhaler for Budesonide Formoterol plus Budesonide Tiotropium Levosalbutamol Levosalbutamol plus ipratropium nebulizing solution Prednisolone tablets Aminophylline tablets



## Chronic Kidney Diseases

Diabetes and hypertension are two widely prevalent NCDs that are major risk factors for development of CKD. The WHO in its global action plan for NCDs 2013–2020, though criticized for not recognizing kidney disease as major NCD, did stress upon that possible environmental and occupational hazards might be important in causing kidney disease in addition to diabetes and hypertension.<sup>[76]</sup> However, CKD, until recently overshadowed by diabetes and hypertension, is now being increasingly recognized as an important cause of mortality due to NCDs.

Among NCDs, the rise in burden of CKD has surpassed increases in other NCDs in the United States between 2002 and 2016.<sup>[77]</sup> The Global Burden of Disease 2015 study showed 32% increase in deaths attributable to kidney disease over the decade between 2005 and 2015.<sup>[78]</sup> Furthermore, 1.2 million deaths due to CVD could be attributed to low glomerular filtration rate (GFR).<sup>[78]</sup> Recent population-based studies from South Asia and other LMICs suggest a wide variation in the prevalence of CKD as standard and uniform definitions or methods have not been adopted in all.<sup>[79,80]</sup> Pooled data from cross-sectional studies in 12 LMICs showed prevalence of CKD as 14.3% and 36.1% in general and high-risk populations, respectively. It is likely that the estimates of prevalence of CKD are under-estimates in LMICs as sustained credible

mechanisms for screening and poor data management system.

### Operational definition of chronic kidney disease

CKD is defined as structural or functional abnormality in kidneys that persists for more than 3 months and has an implication for health. Low GFR and/or urine albumin or protein excretion are two functional parameters that are used to define CKD.

### Chronic kidney disease assessment and challenges

Urine albumin excretion can be semi-quantitatively assessed by urine dipstick testing which is cheap and easily available. GFR is indirectly estimated from estimating equations that use common demographic characteristics (e.g., age, sex, and race) and measurement of serum creatinine. The most commonly used estimating GFR (eGFR) equation is CKD-EPI. However, these equations are valid only for populations in which they have been validated because non-GFR determinants of circulating creatinine levels, e.g., diet and muscle mass, are different in people from different races and ethnicities. Unfortunately, populations from LMICs have had very poor representation in derivation and validation cohorts for eGFR equations, and therefore, it is not surprising to observe poor accuracy of eGFR equations in these settings. Studies from India and Pakistan have shown either poor accuracy or need of correction factors for eGFR equations for application in local populations.<sup>[81,82]</sup> Therefore, there is a need to validate

**Table 36: Suggestions for actions at primary and secondary levels of care (the listing is hierarchical with one level of care offering services over and above the ones offered at preceding level of care)**

Level of healthcare		Infrastructure		Recommended objectives/actions		
Level	Institution	Workforce	Services	Prevention	Diagnosis	Management
Primary	Subcenter	Multipurpose health worker	BP measurement Finger-prick glucose testing Urine protein/sugar excretion testing by dipstick	Lifestyle modification	Identification of subjects at risk: subjects with diabetes, hypertension and renal stone disease Identification of subjects with disease: Urine dipstick examination	Refer to PHC for treatment of diabetes, hypertension Refer to PHC for further evaluation
	PHC	Basic medical graduate doctor Nurse	Basic hematology and blood biochemistry measurements	Control of diabetes and hypertension	Identification of subjects with disease: Urine protein excretion measurement, urine microscopy, serum creatinine	Start treatment for hypertension and diabetes Start treatment directed at decreasing progression of kidney disease, management of complications due to kidney failure and refer
Secondary	Community health center	Medical specialist Lab technician	Complete hematology and biochemistry measurements Ultrasound	Control of kidney disease related complications	Identification of subjects with complications due to disease	Optimize treatment and refer when appropriate (rapid disease progression, atypical presentation, diagnosis in doubt)
	District hospital	Medical specialist Lab technician	Special investigations (e.g., ultrasound Doppler, CT scan etc.)	Control of vascular access and dialysis related complications	Identification of subjects with impending/anticipated need of renal replacement therapy in near future	Refer when appropriate (atypical course, for vascular access creation and transplantation) Dialysis when needed

PHC - Primary Health Center, CT - Computed tomography

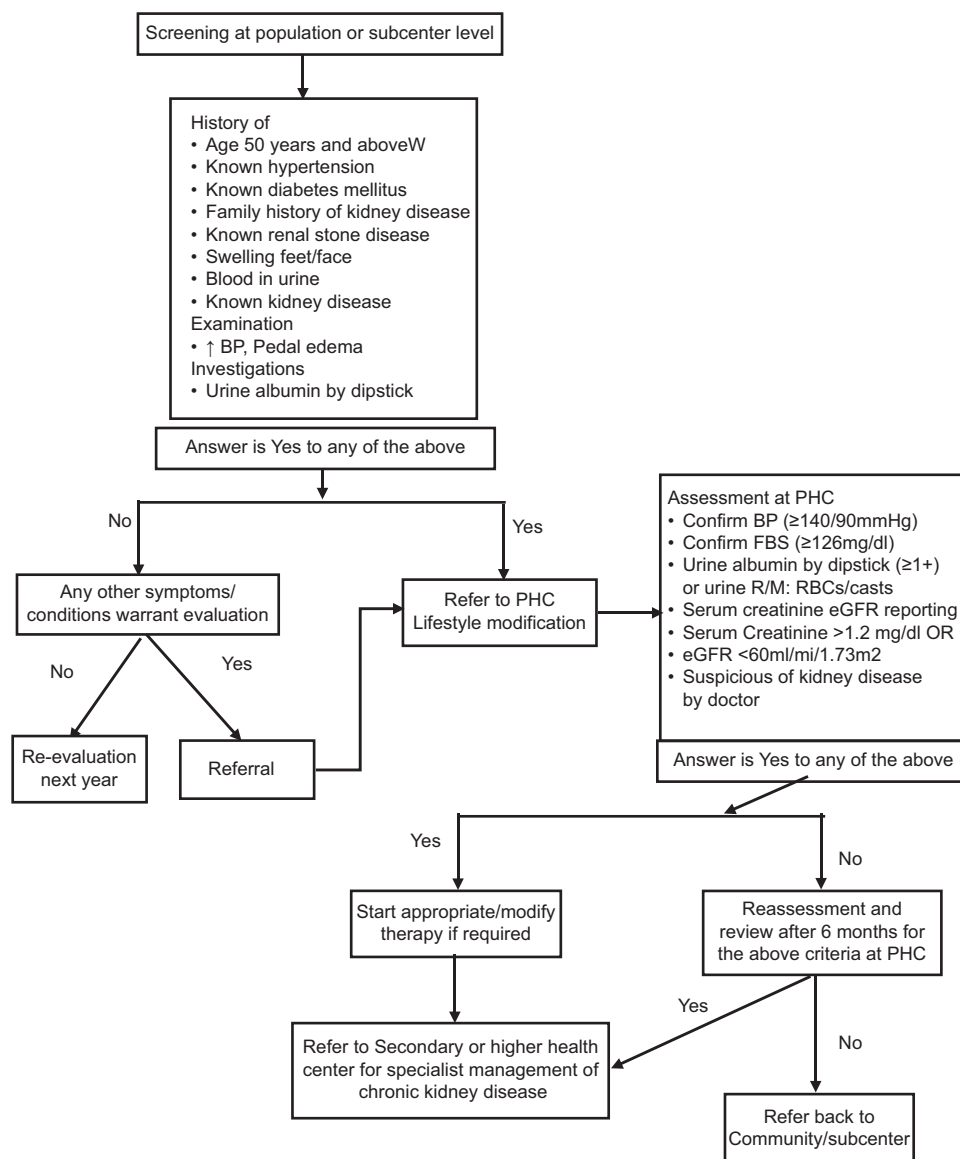


Figure 22: Screening and management of chronic kidney disease at primary healthcare

eGFR equations in different races or ethnic populations. Nevertheless, eGFR equations should be used to estimate GFR in clinical practice pending validation studies.

eGFR equations are based on serum creatinine measurements that should be standardized and traceable to isotope dilution mass spectrometry standards. Upgradation of existing laboratory infrastructure at primary and secondary levels of care to currently recommended standards would entail a lot of cost. However, these objectives can be met in a phased manner by ensuring adherence to minimum standards in newly set up laboratories and gradual upgradation of existing ones depending on resource availability. The use of nonstandardized serum creatinine values does not forbid

use of serum creatinine in eGFR equations as correction factors for the same have been suggested. However, these drawbacks should always be borne in mind while interpreting such data.

### Recommendations

The current recommendations for prevention, diagnosis, and management of CKD at primary and secondary healthcare levels have been designed to be simple, flexible, and practical in LMICs context. An attempt has been made to ensure flexibility so that these recommendations can be easily integrated with the existing NCD programs. The infrastructural limitations and expertise of trained workforce at various healthcare levels have been considered with the goal to achieve objectives listed in Table 36.

**Primary healthcare level**

Population can be screened to identify the high-risk population for CKD, i.e., diabetes, hypertension, and kidney stone disease through history, or questionnaire can be provided urine albumin excretion test by dipstick [Figure 22]. All patients who are identified at this level should be referred to higher center for evaluation and provided healthy lifestyle counseling [Table 37]. We suggest annual re-screening in people with negative screen preferably as part of integrated screening program for common NCDs. Figure 22 represents integrated algorithms for screening and management of kidney disease at primary healthcare.

At PHC level, all referred or high-risk patients should be screened for both low eGFR (by measurement of serum creatinine) and abnormal urine albumin or protein excretion. In case there is high clinical suspicion of kidney disease or the patient is found to have kidney disease, the patient should be referred to specialist doctor for evaluation. Patients who are negative for screening should be re-screened at 6 months at PHC and provided follow-up at community level.

**Secondary healthcare level**

These facilities are manned by specialist doctors and some facilities have additional provision for special diagnostic facilities and dialysis [Table 36]. The doctor would establish diagnosis of kidney disease, identify complications, judge imminent therapeutic needs, and refer the patient to a nephrologist for final assessment and management plan

**Table 37: Recommended specific interventions**

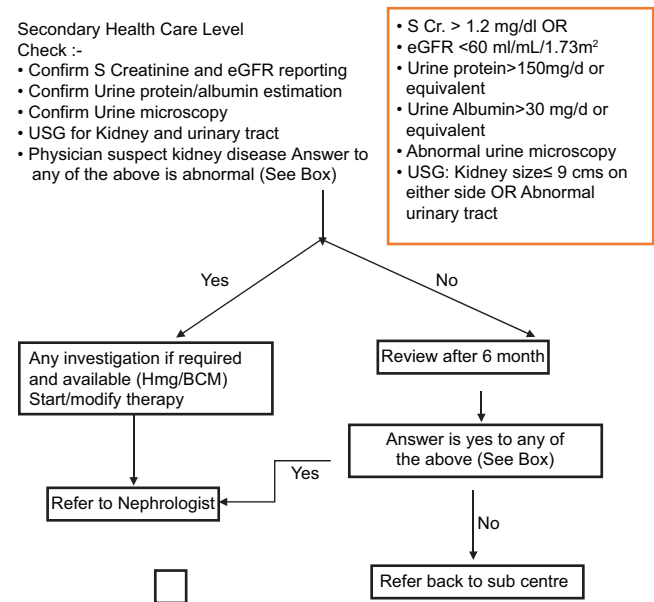
<b>Lifestyle modifications</b>
Cessation of smoking and alcohol intake
Restriction of dietary salt intake
Regular physical activity
Weight control in case of obesity
<b>Therapeutic interventions</b>
ACE# or ARBs for hypertension and/or proteinuria
Statins for hyperlipidemia
Treatment for elevated blood sugar levels in diabetes
Treatment for complications in CKD: Anemia, metabolic acidosis, hyperphosphatemia, Vitamin D deficiency
<b>Special considerations</b>
Timely referral to nephrologist (management of disease complications, vascular access creation and transplant)
Avoid NSAIDs, over the counter and alternative drug use
Drug dose modification in setting of low eGFR
Recognizing risk of drug induced hypoglycemia in diabetics with CKD
Community engagement for spreading awareness about kidney disease and its risk factors

ACE/ARB - Angiotensin Converting Enzyme inhibitors/Angiotensin Receptor Blockers, CKD - Chronic kidney disease, eGFR - Estimated glomerular filtration rate

[Figure 23]. Dialysis would be provided if there is an urgent need or requirement of long-term maintenance dialysis.

**Future course**

The proposed algorithms are expert suggestions that need to be tested for their efficacy and cost-effectiveness in different settings. Therefore, each algorithm itself becomes an important research question. It is likely that these would require some modifications due to variations in models of healthcare delivery in different regions. Still, these are important guides toward instituting initial mechanisms for addressing the increasing burden of CKD at primary and secondary levels of care. Simultaneously, there is need of scientific validation of eGFR equations in different populations, ascertaining significance of low normal GFR in otherwise normal individuals, and development of low-cost technologies for laboratory assessment of kidney diseases. A community-based long-term prospective cohort study should be established in LMIC scenario for better characterization of possible risk factors (environmental, occupational, etc.) for the



**Figure 23: Screening and management algorithm at secondary healthcare level**

**Table 38: Difference between nonalcoholic fatty liver and nonalcoholic steatohepatitis**

NAFL	NASH
It is a simple steatosis	It progresses to NASH-related cirrhosis and hepatocellular carcinoma
Hepatic steatosis without hepatic inflammation or fibrosis	Steatosis associated with the presence of inflammation (lobular inflammation) and features of hepatocyte injury such as ballooning of hepatocytes and Mallory hyaline with or without associated hepatic fibrosis

NAFL - Nonalcoholic fatty liver, NASH - Nonalcoholic steatohepatitis

development and progression of kidney disease. Finally, the success of community-based programs at primary and secondary levels of care also requires qualitative social science research to identify barriers during actual implementation of such programs and find solutions.

### Nonalcoholic Fatty Liver Disease (NAFLD) and Alcoholic Liver Disease

Nonalcoholic fatty liver disease (NAFLD) is the most common cause of an asymptomatic rise in transaminases, cryptogenic cirrhosis, and cryptogenic hepatocellular carcinoma. Patients with NAFLD are also at high risk for developing type 2 DM, CAD, CKD, and osteoporosis. Alcohol accounts for an estimated 3.3 million deaths (6% of all global deaths) and contributes as an etiologic factor in ~50% cases of cirrhosis. Even though LMICs represent a large population of the world, because of the resource constraints, the strategies to manage patients in these countries may be different than the high resource settings.

To address this gap, we herein describe a stepwise approach in managing patients with NAFLD and Alcoholic liver disease (ALD) at primary and secondary level healthcare settings for LMICs.

#### Nonalcoholic fatty liver disease

##### Definition of nonalcoholic fatty liver disease

NAFLD has been defined as the accumulation of fat in the liver in the absence of recent or ongoing intake of significant amount of alcohol and the exclusion of other secondary causes of hepatic steatosis. Even though it is best defined by histology, accumulation of fat in the liver (fatty liver) is usually diagnosed on ultrasound (abdomen). The severity of fatty liver on ultrasound is graded as mild, moderate, and severe based on the liver echogenicity, loss of echoes from walls of the intrahepatic portal venous radicles, and posterior beam attenuation with blurring of the diaphragm. Even though the ultrasound is a good modality to assess the presence and severity of fat in the liver, it may not be good modality to assess the overall severity of liver disease in patients with NAFLD.

#### Spectrum of nonalcoholic fatty liver disease

The differentiation between Nonalcoholic fatty liver (NAFL) and nonalcoholic steatohepatitis (NASH) is very important in determining the prognosis, risk of progression, and treatment stratification and for assessing the liver-related and cardiovascular morbidity and mortality, occurring more commonly in patients with NASH than in those with NAFL [Table 38].

Hepatic fibrosis can be diagnosed with the help of noninvasive parameters including transient elastography (FibroScan) or other forms of hepatic elastography if available.

Step-wise approach for evaluation of adult patients after detection of fatty liver on ultrasound or other imaging with or without symptoms [Figure 24]

- Step 1 – History of alcohol intake  
Significant alcohol intake as >20 g/day or >140 g/week for men and >10 g/day or >70 g/week for women (approximately 30 ml of whisky/spirit = 100 ml of wine = 240 ml of beer = 10 g of alcohol). Abstainer or insignificant intake will be categorized as nonalcoholic
- Step 2 – If nonalcoholic – assess for the presence or absence of metabolic syndrome  
Metabolic syndrome is a clinical syndrome that is usually defined by the presence of at least 3 of the following 5 components as per the WHO criteria.
  - Central obesity
    - Waist circumference  $\geq 90$  cm in males and  $\geq 80$  cm in females for Asians
    - Population-specific cutoffs for other populations.
  - Known DM or fasting plasma glucose of  $\geq 100$  mg/dl
  - Hypertension (BP  $\geq 130/85$  mmHg)
  - Low serum high-density lipoprotein (<40 mg/dl in males and <50 mg/dl in females)
  - High serum triglycerides ( $\geq 150$  mg/dl) or on treatment
- Step 3 – If metabolic syndrome or any of its components present [Figure 25]
  - Fatty liver likely to be NAFLD.

**Table 39: Spectrum of Alcoholic Liver Disease**

Alcoholic fatty liver disease Diagnosed in a patient with significant alcohol consumption with hepatic steatosis on ultrasound or any other imaging	Alcoholic Hepatitis Diagnosed in a patient with new onset of jaundice within 60 days of heavy consumption (>50g/day) of alcohol for a minimum of 6 months, a serum bilirubin >3 mg/dl, an elevated AST (50-400 U/L), an AST: ALT ratio >1.5, and no other obvious cause for hepatitis	Alcoholic cirrhosis compensated Ultrasound or any other imaging or Fibroscan evidence of cirrhosis with or without deranged LFT or coagulogram	Alcoholic cirrhosis decompensated Clinical features of portal hypertension including ascites, bleeding from GI tract or development of altered sensorium with evidence of deranged LFTs, coagulogram and ultrasound or other imaging evidence of cirrhosis
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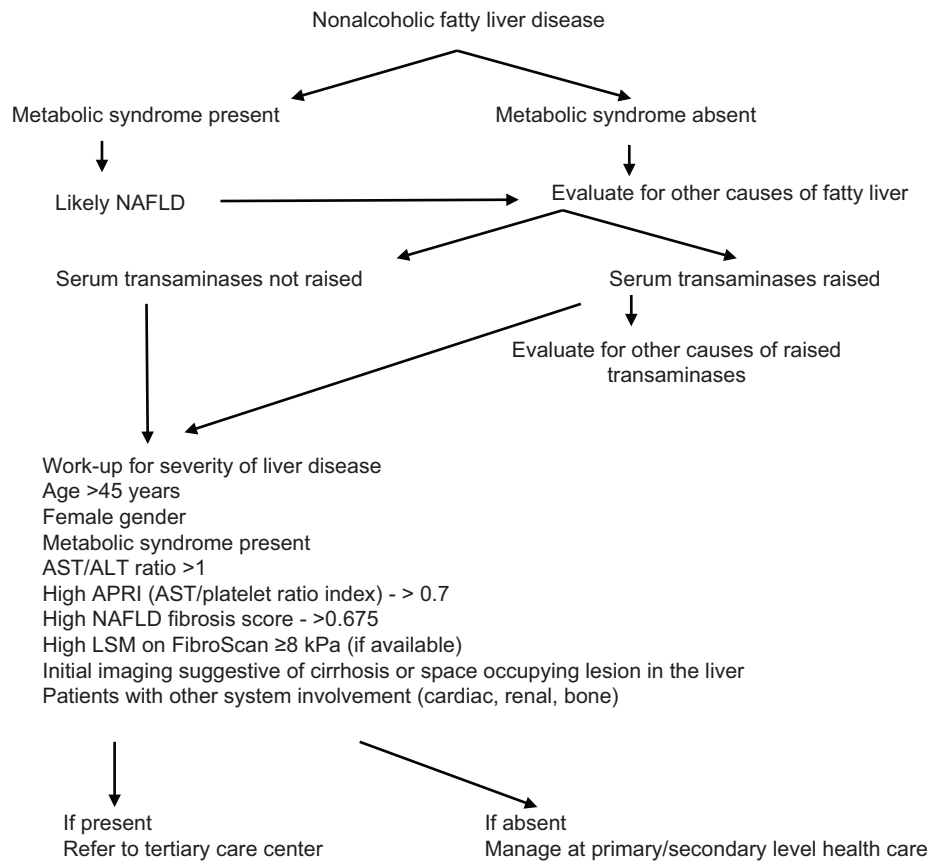


Figure 24: Algorithmic approach for the evaluation of patients with nonalcoholic fatty liver disease. NAFLD: Nonalcoholic fatty liver disease; AST: Aspartate aminotransferase; ALT: Alanine aminotransferase; APRI: AST/Platelet ratio index; LSM: Liver stiffness measurement

- Step 4 – If metabolic syndrome or any of its components absent
  - As it is less likely to be NAFLD, search for other causes of hepatic steatosis such as intake of drugs, namely corticosteroids, methotrexate, tamoxifen, and amiodarone, and hepatitis C infection. Other secondary causes of fatty liver such as Wilson’s disease, abetalipoproteinemia, lipodystrophy, and parenteral nutrition are uncommon and may require referral to a tertiary care center for further evaluation and confirmation.
- Step 5 – Assessment of liver function tests
  - Serum bilirubin is usually normal unless the patient has progressed on to cirrhosis or hepatocellular carcinoma (HCC)
  - ALT may be normal or elevated.
- Step 6 – Evaluate for other causes of raised transaminases if present
  - All patients with raised ALT (>1.5 times the normal) should be tested for hepatitis B surface antigen (HBsAg) and antibodies to hepatitis C virus (anti-HCV). Refer to a tertiary care center for

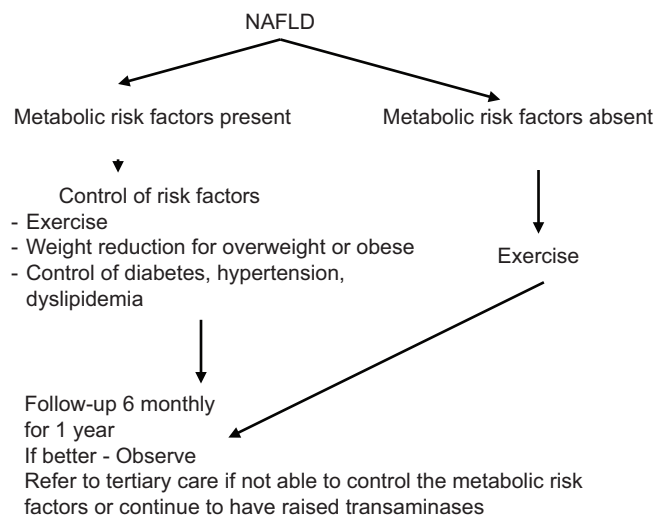


Figure 25: Algorithmic approach for the treatment of patients with nonalcoholic fatty liver disease

detailed work-up including autoimmune markers, celiac disease work-up, serum iron profile, and serum ceruloplasmin

- Raised ALT is insufficient to distinguish between NAFL and NASH.

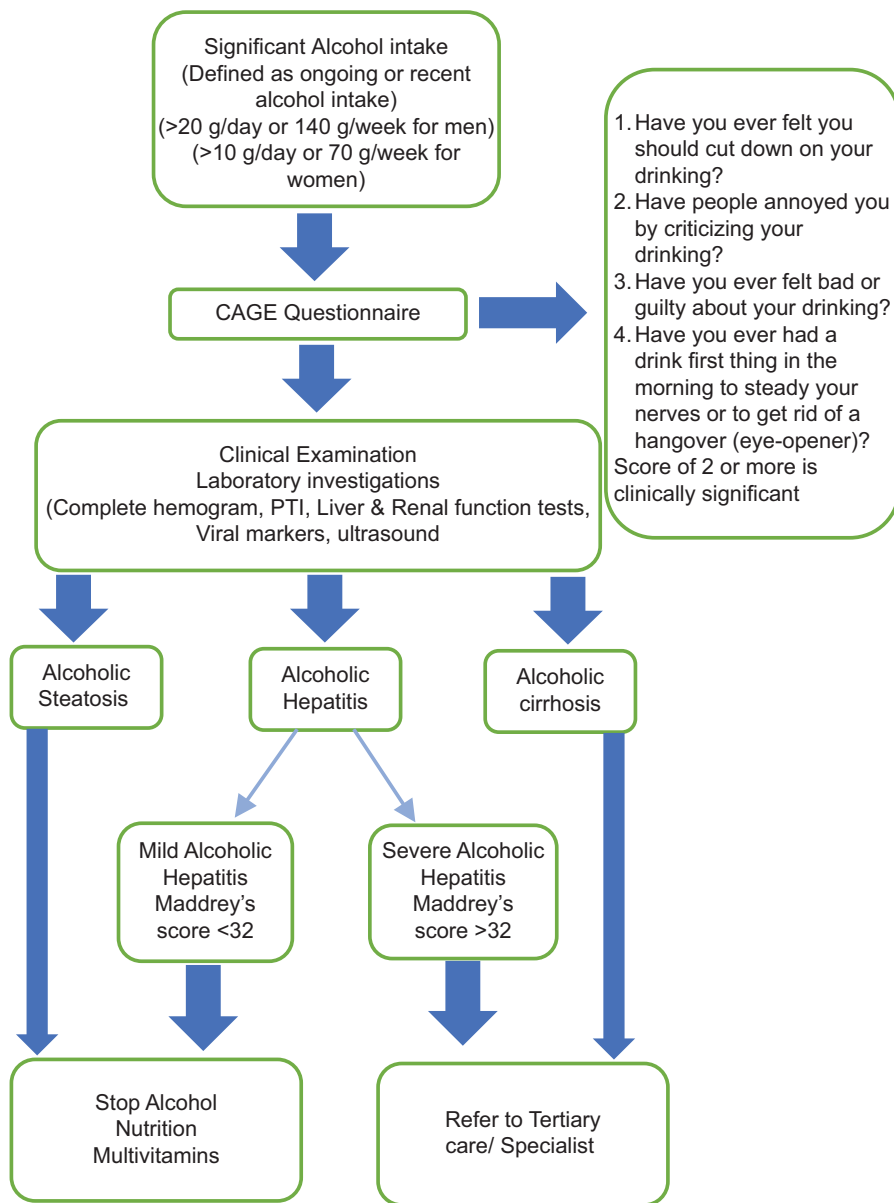


Figure 26: Algorithmic approach for the evaluation and treatment of patients with alcoholic liver disease

- Step 7 – Noninvasive assessment for the severity of liver disease (irrespective of ALT level)
    - AST/ALT ratio, AST to platelet ratio index (APRI), NAFLD fibrosis score (NFS) or by transient elastography (FibroScan) or other forms of hepatic elastography if available. Calculation of APRI and NFS is simple and can be done using free online calculators with age, BMI, diabetic status, and laboratory parameters such as AST, ALT, albumin, and platelets (<https://www.hepatitisc.uw.edu/page/clinical-calculators/apri>)
    - Significant fibrosis: AST/ALT ratio > 1, APRI > 0.7, NFS > 0.675, and liver stiffness measurement on  $\geq 8$  kPa on FibroScan (NAFLD Fibrosis Score: <http://www.naflscore.com/>)
  - Diagnosis of NASH-related cirrhosis liver and HCC may be suspected clinically or on imaging as per the clinical presentation of the patient.
  - Step 8 – Manage at primary or secondary level healthcare if less likely to have severe liver disease/ NASH/significant fibrosis/cirrhosis/HCC or Refer to tertiary care center otherwise.
- Footnotes - Workup and evaluation at primary (subcenter/ PHC) and secondary (CHC/district hospital) level healthcare may vary depending upon the availability of different

workforce (health worker/medical doctor/physician) and investigations required for the management.

#### **Treatment of noncirrhotic nonalcoholic fatty liver disease**

Since NAFLD is a lifestyle disease, weight loss and exercise and control of risk factors such as DM, hyperlipidemia, and hypertension form primary treatment. Pharmacological treatment is indicated only in selected situations. Vitamin E or pioglitazone can be given to biopsy-proven patients with NASH with or without DM. In addition, many new pharmacological agents are being evaluated in various phase III studies across the globe. Other pharmacological treatment is not recommended as liver-related complications in patients without NASH is low.

#### **Step-wise approach in the management of patients with nonalcoholic fatty liver disease at primary/secondary care**

The steps are explained in the Figure 25.

- Step 1 – Control of metabolic risk factors.
  - Control of overweight or obesity
    - Regular exercise and weight reduction for overweight and obesity. Overweight and obesity need to create a negative balance by consuming fewer calories (30% reduction in calorie intake recommended by restricting both carbohydrates and fats) and burning more calories by regular exercise. Regular exercise improves insulin sensitivity and is the only treatment for lean NAFLD. Slow and sustained weight reduction of 10% body weight for 6–8 months should be achieved. Severe hypocaloric diets are not recommended in NAFLD. Patients with NAFLD should avoid any amount of alcohol intake.
  - Control of DM/hypertension/dyslipidemia
    - There are no contraindications for the use of medications to control DM, hypertension, or dyslipidemia. Statins are also safe in patients with NAFLD having raised transaminases.
- Step 2 – Metabolic risk factors – absent
  - Regular Exercise.
- Step 3 – Follow-up
  - Six monthly follow-up for 1 year
  - Observation if parameters improving
  - Refer to tertiary care if not able to control the metabolic risk factors or continue to have raised transaminases.

#### **Alcoholic liver disease**

The spectrum of ALD [Table 39] varies from alcoholic steatosis (fatty liver), alcoholic hepatitis (AH, alcoholic

steatohepatitis) to alcoholic cirrhosis, and its complications including HCC). Multiple stages may be present simultaneously in a given individual.

#### **Alcoholic fatty liver disease**

Fatty liver develops in about 90% of individuals who drink more than 60 g/day of alcohol but may also occur in individuals who drink less. Simple, uncomplicated fatty liver is usually asymptomatic and self-limited and may be completely reversible with abstinence after ~ 4–6 weeks.

#### **Alcoholic hepatitis**

AH is diagnosed in a patient with new onset of jaundice within 60 days of heavy consumption (>50 g/day) of alcohol for a minimum of 6 months, a serum bilirubin >3 mg/dL, an elevated AST (50–400 U/L), an AST:ALT ratio >1.5, and no other obvious cause for hepatitis.

- Severe AH is identified by Maddrey's discriminant function score >32 ( $4.6 \times$  prolonged prothrombin time + serum bilirubin)

#### **Alcoholic cirrhosis**

- Compensated: Ultrasound or any other imaging or FibroScan evidence of cirrhosis with or without deranged liver function tests (LFTs) or coagulogram
- Decompensated: Clinical features of portal hypertension including ascites, bleeding from GI tract or development of altered sensorium with evidence of deranged LFTs, coagulogram, and ultrasound or other imaging evidence of cirrhosis.

#### **Step-wise approach for evaluation of adult patients with significant alcohol intake**

The steps are explained in the Figure 26. Identification and assessment of spectrum and the severity of disease are needed for appropriate management.

- Step 1 – History of alcohol intake
  - Significant alcohol intake as >20 g/day or >140 g/week for men and >10 g/day or >70 g/week for women
  - Heavy alcohol consumption: Consumption of >50 g/day of alcohol for a minimum of 6 months
  - Binge drinking: >5 drinks in males and >4 drinks in females, consumed over 2 h period.

\*(Approximately 30 ml of whiskey = 100 ml of wine = 240 ml of beer = 10 g of alcohol)

\*(Approximate 1 unit of alcohol = one ounce of spirit = 12-ounce beer = 4-ounce of wine)

- Step 2 – If significant alcohol intake is present – Assess for the presence or absence of alcohol dependence or abuse by using the CAGE questionnaire [Figure 26]
- Step 3 – If significant alcohol intake is present look for symptoms and signs of ALD
  - The initial symptoms are nonspecific and include pain abdomen, loss of appetite, fatigue, body aches, and sense of being unwell. Most patients do not develop symptoms until severe liver damage. The common symptoms are
    - Yellowing of the skin and eyes (jaundice)
    - Swelling of the legs (edema)
    - Distension of the abdomen due to fluid (ascites)
    - Bleeding in the gastrointestinal tract (blood in vomiting and or in stools)
    - Weight loss and muscle wasting and change in sleep pattern in advanced liver disease.
- Step 4 – Assessment of severity of liver disease irrespective of symptoms and signs
  - Serum bilirubin is usually normal unless a patient has progressed on to AH, cirrhosis, or HCC
  - ALT and AST may be normal or elevated even in the early stage of ALD
  - The platelet count is usually low in alcoholic cirrhosis, and coagulogram is deranged in advanced disease.
- Step 5 – Noninvasive assessment for the severity of liver disease in alcoholic steatosis (irrespective of elevation of transaminases)

Noninvasive assessment of hepatic fibrosis using AST/ALT ratio, APRI, or transient (FibroScan) or other forms of hepatic elastography in all alcoholic hepatic steatosis [See NAFLD section for details]. The liver stiffness can be fallaciously

high in patients with active alcohol abuse and should be repeated once the patient is abstinent for 3 months.

- Step 6 – Manage at primary or secondary level healthcare if alcoholic steatosis and mild alcoholic hepatitis present or refer to tertiary care center in case of severe liver disease/severe ASH/significant fibrosis/cirrhosis/HCC.

Footnotes: Work-up and evaluation at primary (subcenter/PHC) and secondary (CHC/district hospital) level healthcare may vary depending upon the availability of different workforce (health worker/medical doctor/physician) and investigations required for the management.

#### **Management of alcoholic liver disease**

Based on the initial evaluation, patients can be stratified into mild disease (alcoholic steatosis and mild AH) and advanced disease (severe AH and cirrhosis). Complete abstinence from alcohol consumption is the cornerstone in the management of every spectrum of ALD.

#### **Management of alcoholic steatosis and mild alcoholic hepatitis in primary and secondary level healthcare setting**

The management is explained in the Figure 26.

- Complete alcohol abstinence with use of pharmacological therapy and behavioral therapy with motivational interviewing techniques.
- 100 mg of thiamine daily and B complex vitamins should be given to all patients. Zinc and other trace elements may be replaced if available.
- Nutritional supplementation including high calorie (30–35 Kcal/kg/day) and high protein diet (1.2–1.5 g/kg/day) in mild AH
- Refer patients with advanced liver disease (severe AH and cirrhosis) to tertiary care facility for further management and follow-up.



## Mental Disorders

Mental disorders such as depression and substance use disorders, one of the groups of NCDs, are associated with development of NCDs and also improve the outcome of NCDs, namely cancers, hypertension, CADs, DM, and COPD.<sup>[83,84]</sup> Globally, one out of four is affected with mental or neurological disorders and the leading cause of disability. Depression the fourth leading in global burden of disease and is predicted to be second leading by 2020 globally.

Based on the burden and current healthcare delivery system for mental disorders, it is proposed to move from mental institution to community care through integration of mental healthcare with primary healthcare system. This guideline for common mental disorders (CMDs) will assist to build the capacity and implement the appropriate clinical and community care at primary and secondary healthcare facilities.

### Classification of mental disorders

Mental disorders are classified according to the International Classification of Diseases 10<sup>[85]</sup> and Diagnostic and Statistical Manual of Mental Disorders 5<sup>[86]</sup> [Table 40].

Validated and culturally accepted screening or diagnostic tools should be used for identification, assessment, management, and follow-up of patients with mental disorders [Table 41].

**Table 40: Classification of mental disorders**

Common mental disorders	Severe mental disorders
Depression, anxiety disorders, somatoform disorders, dissociative disorders, and substance use disorders	Psychotic disorders, bipolar affective disorder, obsessive-compulsive disorder, and some of the personality disorders

**Table 42: Signs and symptoms of stress**

Domain	Signs and symptoms
Physical	Dizziness, palpitations, aches and pains, grinding teeth, clenched jaws, excessive sweating, headache, indigestion, muscle tension, trouble in falling asleep, frequent respiratory tract infections, oral ulcers, feeling lethargy and tired
Psychological	Constant worry, forgetfulness, difficulty in making decisions, inability to concentrate, loss of sense of humor, difficulty in learning new things, anxiety, anger, feeling frustrated, frequent mood swings, irritability, feeling nervous and sad
Behavioral	Bossiness, compulsive eating/overeating, criticizing others, losing temper often, frequent job changes, impulsive actions, increased use of alcohol and tobacco, withdrawal from social situations, staying alone, coming late for work, frequent absenteeism, and getting into arguments with others

## General principles for assessment and management of mental disorders

The healthcare staffs involved in assessment and management of mental disorders should follow the following principles namely listening with interest, not being in hurry, accepting the beliefs of the patients about their symptoms and not contradicting the same directly, encouraging expression of emotions, being nonjudgmental, maintaining confidentiality, reassuring

**Table 41: Scales/tools used by healthcare staffs to screen for various mental disorders**

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Stress: PSS<sup>[87]</sup>  
 General screening questionnaires: General Health Questionnaire<sup>[88]</sup>, Self-Report Questionnaire<sup>[89]</sup>  
 Depression: Patient Health Questionnaire (2 items, 4 items, 9 items version)<sup>[90,91]</sup>  
 Anxiety: GAD-7<sup>[92]</sup>  
 Somatic symptoms: PHQ-15<sup>[93]</sup>, SSS-8<sup>[94]</sup>  
 Cognitive functions: Mini Mental Status Examination<sup>[95]</sup> or locally adopted version, clock drawing test<sup>[96]</sup>  
 Substance use disorders: ASSIST<sup>[97]</sup>, CAGE Questionnaire<sup>[98]</sup>  
 Childhood psychiatric disorder: Childhood psychopathology measurement schedule<sup>[99]</sup>  
 Screening for suicidality: Use item number 9 from the PHQ-9<sup>[91]</sup>

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PSS - Perceived stress scale, CAGE - Cut-annoyed-guilty- eye, ASSIST - Alcohol, Smoking and Substance Involvement Screening Test, PHQ-15 - Patient Health Questionnaire 15 items, SSS-8 - Somatic Symptoms Scale - 8 items, GAD-7 - Generalized Anxiety Disorder questionnaire

**Table 43: Strategies to prevent and manage stress**

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Prevention of stress: Practice more patience, control your responses  
 Set realistic goals  
 Establish priorities  
 Take time out: Spend few minutes each day alone to break routine (or socializing), set aside time each week for recreation, exercise regularly  
 Have faith (meditate, pray, worship). Practice Yoga on a regular basis  
 Think positively: Maintain a positive attitude as this gives more control  
 Have a sense of humor: laugh with others and at yourself  
 Communicate: Talk over your concerns/feeling with a friend, family member, or others  
 Learn to listen and consider suggestion with an open mind  
 Make decisions: Do not resist change if it is needed, make a choice and move on  
 Seek and get support: Discuss with a friend or family member  
 Relaxation Techniques: Prayer, meditation, visualization or imagery.  
 Progressive muscle relaxation, deep breathing  
 Take off your mind from the problem in hand  
 Assertive communication  
 Auto suggestion (giving positive suggestion to self)  
 Problem-solving  
 Believe in yourself  
 Do not try to be perfect  
 Plan ahead  
 Manage your time properly: Reduce the time robbing activities  
 Avoid procrastination  
 Avoid use of alcohol and tobacco use to deal with stress

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**Table 44: Presenting features of common mental disorders**

<b>Disorder</b>	<b>Features</b>
Depression	<p>Low or depressed mood, which is persistent</p> <p>Anxiety</p> <p>Multiple persistent physical symptoms for which no organic cause can be ascertained</p> <p>Weakness, fatigue, lethargy, low energy</p> <p>Sleep problems in the form of insomnia, difficulty in falling asleep, early morning awakening, intermittent awakening</p> <p>Loss of interest in activities that are normally pleasurable</p> <p>Hopelessness, voicing about death/death wish, suicidal ideation, act of self-harm</p>
Dementia	<p>Forgetfulness, which is much more than the day today forgetfulness and impairs the functioning (severe forgetfulness)</p> <p>Problems with orientation (with respect to time, place and person)</p> <p>Behavioral problems such as aggression, agitation, suspiciousness</p> <p>Problems related to mood: Apathy (appearing uninterested), irritability, sadness or emotional dyscontrol (easily upset, irritable or tearful)</p> <p>Inability to carry out usual work, domestic or social activities</p>
Substance use disorders	<p>History of regular substance use (alcohol, smoking, chewing tobacco, etc.)</p> <p>Having signs and symptoms suggestive of recent use (e.g., smell of alcohol/tobacco, slurring of speech, erratic behavior, physical evidence of organ damage)</p> <p>Evidence of withdrawal symptoms (anxiety, restlessness, craving, etc.)</p> <p>Impaired social functioning (i.e., problems at workplace, interpersonal problems at workplace and home)</p> <p>Evidence of organ damage (raised liver enzymes, jaundice, ascites, spider nevi, hepatic encephalopathy)</p> <p>Neurological symptoms such as problems with balance, walking, coordinated movements, and nystagmus</p> <p>Investigation findings: Macrocytic anemia, low platelet count, elevated MCV</p> <p>Evidence of IV drug use, Hepatitis-B and C infection, HIV</p>
Anxiety disorders	<p>Worries over minor matters, remaining tense, inability to relax</p> <p>Panic</p> <p>Fearfulness, uneasiness</p> <p>Sleep problems</p> <p>Cold skin, excessive sweating, numbness and tingling of hands and feet</p> <p>Shortness of breath, palpitations, dry mouth, muscle tension, dizziness</p>
Psychotic disorders	<p>Marked behavioral changes; social withdrawal, poor interaction</p> <p>Not taking responsibilities of usual activities related to work, education, home and social activities</p> <p>Agitation, aggression, alteration in activity level (either decreased or increased)</p> <p>Suspiciousness, delusions (fixed false beliefs not shared by others in the person's culture - which could have themes of being harmed)</p> <p>Hallucinations (hearing or seeing things which others cannot hear)</p> <p>Poor insight: Lack of realization about own mental state)</p>
Mania	<p>Irritability/cheerfulness</p> <p>Speaking excessively at a faster rate</p> <p>Increase in the energy and activity level</p> <p>Boasting, talking about big things</p> <p>Decreased sleep, increased appetite</p> <p>Inappropriate social behavior</p>
Somatoform disorders	<p>Frequent and multiple physical symptoms for which organic cause cannot be established: aches and pains, gastrointestinal symptoms, breathing difficulty, palpitation, sexual symptoms, etc.</p> <p>Cannot be reassured</p> <p>Frequent doctor shopping, multiple investigations</p>
Dissociative disorders	<p>Weakness, paralysis</p> <p>Loss of sensation or numbness</p> <p>Abnormal movements (such as tremor or unsteady gait)</p> <p>Blindness, Hearing loss, aphonia without any underlying organic cause</p> <p>Loss of personal identity</p>

MCV - Mean corpuscular volume

**Table 45: Basic ingredients of psychoeducation**

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Assess the basic knowledge and understanding of the patient about the illness
Tell about the problem in simple language
Explain the patient about the association of mental disorders with interpersonal problems and the need to share emotional symptoms with the doctor
Tell about the prevalence of mental disorders, and reassure that these disorders are common, which are experienced by many and can happen to anyone
Explain the patients and their caregivers that all the psychiatric disorders cannot be overcome by sheer will power and there is a need to seek regular treatment
Provide information about harmful effects of substances, need to stop using the same, including tobacco and alcohol use, wherever relevant
Encourage patients to bring about change in lifestyle and diet, such as exercising, maintaining regular schedule
Thoughts of self-harm and suicide are common among people with mental disorders; they should not act on the same, rather must report to the health workers and the physicians
Tell the patients that being depressed does not mean that they are weak and lazy
It is not important to tell the diagnosis to all the patients, but those who are interested in knowing about the diagnosis, etiology, treatment, and prognosis must be provided the required information
Etiological models held by the patient must be respected if this is not causing harm to the patient or the treatment, rather additional explanations may be provided
Tell the patients that their symptoms are treatable
Explain the patients receiving antidepressants about lag period of onset of action
Provide information about the available options, side effects, etc.
Discuss about the need of treatment and medication adherence
Provide information about the course and outcome of the problem
Impart knowledge about ways to deal with stress
Explain the importance of adequate sleep and regular sleep rhythm
Discuss about communication patterns, problem-solving skills, etc.
Promote adaptive coping to deal with persistent/residual symptoms
Inform about possibility of relapse, how to identify early signs of relapse

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**Table 46: General simple psychosocial interventions**

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Allowing the patients to ventilate and share their emotions
Reduce stress and enhance the ability to deal with stressful situations
Improve social support: Involve family members, promote interactions with friends and colleagues
Encourage the patient to share personal problems with family members caring for them or other key people in their social network
Promote functioning in daily routine life and integration with the community
Promote resumption of work
Breathing exercises for anxiety symptoms
Activity scheduling
Encouraging adherence to treatments and providing information about social and welfare organizations for disability benefits
Provide usual care for any coexisting physical health problems

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**Table 47: Simple psychosocial measures specific for patients with somatoform disorders/dissociative disorders/medically unexplained symptoms**

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Have a "caring" rather than a "curing" approach
Let the patients know that their symptoms do not appear to be caused by physical disease, but legitimize the existence of patient's symptoms
Provide a possible explanation for symptoms
Establish a goal of improved functioning
Explain and reassure the patient: The timing and degree of reassurance must be based on an adequacy of data and the trust and security of the relationship
A thorough physical examination at each visit helps
Refrain from use of medications, unless these are clearly indicated for the relief of comorbid affective and anxiety symptoms
Follow-up appointments at regular but relatively infrequent intervals
Try to develop a good therapeutic alliance: as the rapport and trust increase, the patient may be more willing to discuss his or her social world, family relationships, and the "stressors"
Cut down secondary gains

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the patients, expressing empathy, and recognizing their needs.

#### **Assessment and management of stress**

Stress, the predecessor for most of the mental disorders, is defined as person's total response to environment demands or pressure. The assessment of stress level should be part of routine health service delivery by CHWs which further guide to make culturally acceptable and sustainable interventions at individual, family, and community or workplace. The signs and symptoms of stress and management of stress are given in Tables 42 and 43, respectively.

#### **Early identification of mental disorders**

The health workers can deliver comprehensive, home-based services for identification of people with chronic mental disorders, CMDs, and substance abuse. They can also inform the primary care physicians about such patients and bringing the patients to the healthcare services at primary care, ensuring a regular follow-up with monitoring of compliance by periodic home visits along with planning of rehabilitation interventions. In addition, efforts can be attempted to promote awareness and address stigma, forming self-help groups in the families of mentally ill people to promoting the social and economic reintegration of those with mental disorders into the community.<sup>[100,101]</sup>

The presenting features of CMDs are summarized in Table 44.

**Table 48: Simple psychosocial measures specific for patients with dementia**

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Measures specific for patients with dementia

Reorientation: Caregivers need to be informed to reorient the patient from time to time. This can be done by keeping a big clock (with numbers) and calendar in the vision of the patient to keep a track of time

Patient should not be left alone

Encourage the family to maintain an identity card with the patient, which can help others to identify the patient, in case patient loses way

Encourage the family members to keep the patient socially connected

Family members must be informed about safety needs of the patient - need to be assisted by others or be made aware of certain sign boards/specific items to keep a track of commonly used roads and to find way back home

Encourage use of walking aids if required to avoid falls

Daily physical exercises (such as walking and stretching) as per the capability of the individual

Cognitive stimulation techniques - Staying active by reading newspapers, watching television, listening to music, playing games in mobile, solving puzzles, playing carom, chess, etc.

Using bright light in room in day time and dim-light in room at night

Educate caregivers regarding various behavioral and psychological signs and symptoms of dementia

Making a time table for various activities including timings for food and informing the patient repeatedly time and again to follow the same

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**Table 49: Simple psychosocial measures specific for patients with alcohol and tobacco use**

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Measures specific for patients with alcohol and tobacco use

Discussing with the patient in a nonjudgmental manner about his/her current problematic alcohol and tobacco use

Communicate confidently that it is possible to stop/reduce alcohol and tobacco use and ask the patients their viewpoints about substance abuse

Motivational interviewing (brief intervention): Encouraging the patient to reflect on their substance use pattern by building an atmosphere of trust while challenging their false beliefs (such as taking alcohol for getting a good sleep or to reduce stress, smoking tobacco for passing free time or for getting a good bowel movement); basic principles of motivational interviewing include expression of empathy, developing discrepancy between false beliefs and actions, working with resistance to treatment and supporting self-efficacy

Encourage the patient to take responsibility for their substance abuse and give choices whether to quit or not current pattern of substance use and ask specific reasons for continuing substances

Educate the patient regarding physical and psychological consequences of continuing in the current pattern of substance use

Discuss specific personal goals and if quitting substance can help in achieving the same

Support the patient by helping him to identify triggers (emotional and external factors) for use of alcohol and tobacco and suggest ways to modify the same

Engage patient in less risky behaviors (drinking cold drinks/juices in place of alcohol, chewing mouth-fresheners/cardamom/fennel seeds in place of tobacco)

Spending time with family and using distraction techniques (such as playing games, watching television, and chatting with friends/relatives) during the usual time of drinking/smoking

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### Detailed clinical assessment and investigation

All patients presented with one or the other presenting feature suggestive of CMD should undergo thorough clinical examination after detailed history and investigations to finalize the diagnosis and to check for presence of

comorbid conditions. The investigations include at least hemogram including bleeding time, clotting time, LFTs, renal function tests, serum electrolytes, blood sugar levels, and ECG. This is needed for control of primary CMD and also the comorbid condition and to avoid adverse effects/interactions when pharmacological management is needed.

### Formulating a treatment plan

Treatment setting and use of medications and psychological treatments are usually influenced by the severity of illness, available social support, presence or absence of comorbidity, and presence or absence of physical comorbidity. Patients with active suicidal ideations with or without plan should ideally be managed by the specialists. Accordingly, such patients must be referred to the nearest available mental health professionals.

Most of the patients with CMDs can be managed at the primary care level by the use of psychological interventions and pharmacological interventions.

### Psychological treatments

Psychological treatments form an important part of various psychiatric disorders, especially, in patients with mild-to-moderate depressive disorder, various anxiety disorders, and somatoform and dissociative disorders.

Psychological treatment in the form of psychoeducation must be considered as an integral part of management of any psychiatric disorder. Health workers at the primary care level can deliver the psychoeducation in collaboration with the primary care physicians [Table 45].<sup>[102,103]</sup>

Other simple measures that can be done at the primary care level by the healthcare workers and/or physicians are listed in Table 46. Certain general-specific [Table 46] and disorder-specific [Tables 47-50]<sup>[105-107]</sup> psychological interventions can be carried out by the healthcare workers or physicians in managing various psychiatric disorders.

### Pharmacological treatment for psychiatric disorders

Those patients who require use of psychotropic medications must be primarily managed by the physicians in the primary care and referred to the psychiatrist whenever required.

### Depression and anxiety disorders

The presenting feature, assessment, and management of depression are summarized in Figure 27.

- Among the selective serotonin reuptake inhibitors (SSRIs), the first-line treatment for depression

**Table 50: Commonly used psychotropic medications**

	<b>Starting dose (mg/day)</b>	<b>Usual adult therapeutic dose without medical comorbidity (mg/day)</b>	<b>Common side effects</b>	<b>Contraindications</b>	<b>Precautions</b>
<b>SSRIs</b>					
Antidepressants	10	20-60	Nausea, vomiting, insomnia, anxiety, behavioral activation, sexual dysfunction, hyponatremia in elderly		Avoid combination with warfarin; to be used cautiously in patients with bleeding abnormalities or in those on aspirin Monitor serum sodium levels in elderly with medical morbidity
Fluoxetine	20	20-60			
Paroxetine	50	50-300			
Fluvoxamin					
Sertraline	50	50-200			
Citalopram	20	20-60			
Escitalopram	10	10-30			
<b>TCAs</b>					
Amitriptyline	25	100-150 (maximum-300)	Sedation, orthostatic hypotension, dry mouth, weight gain, difficulty in micturition, sexual dysfunction, cardiac (QTc) ECG changes, risk of seizures	Avoid in known cases of cardiac illness, urinary retention, bipolar patients (induce switch), seizure disorder	Avoid in elderly, pregnancy and children
<b>Others</b>					
Bupropion	150	150-300	Risk of seizures	Avoid in known case of seizure disorder	
Duloxetine	20	30-80	May increase blood pressure, Mild anticholinergics effects, drowsiness, conduction abnormalities, GI distress	Avoid in cardiac illness	
<b>Antipsychotics</b>					
Risperidone	1	2-6	Sedation, dizziness, tachycardia, orthostatic hypotension, metabolic effects, EPS, elevated prolactin, sexual dysfunction	Cardiac disease	Drug interactions noted with carbamazepine and fluoxetine
Olanzapine	5	10-20	Sedation, metabolic side effects (weight gain, deranged lipids), EPS, prolactin elevation		
Haloperidol	1	5-20 (maximum-20)	Sedation, dizziness, dry mouth, blurred vision, orthostatic hypotension, urinary retention, constipation, EPS, ECG abnormalities (QTc prolongation)	Avoid in cardiac illness and in elderly	Risk of NMS Cautious use in kidney disease
Chlorpromazine	25-50	75-300 (maximum-1000)	Sedation, dizziness, dry mouth, blurred vision, orthostatic hypotension, syncope, urinary retention, constipation, EPS, ECG abnormalities (QTc prolongation), jaundice	Not to be used in patients with impaired consciousness, bone marrow depression, pheochromocytoma	Cautious use in patients with respiratory distress, glaucoma, cardiac illness, urinary retention
Trifluoperazine	2-5	15-25	Sedation, dizziness, dry mouth, blurred vision, orthostatic hypotension, urinary retention, EPS, ECG abnormalities (QTc prolongation), galactorrhea	Not to be used in patients with impaired consciousness	Cautious use in patients with cardiac illness, urinary retention, elderly
Fluphenazine (depot/long acting)	12.5 deep intramuscular injection in gluteal region	25-50 every 2-3 weekly deep intramuscular injection in gluteal region	Sedation, dizziness, dry mouth, blurred vision, orthostatic hypotension, syncope, urinary retention, constipation, EPS, ECG abnormalities (QTc prolongation), galactorrhea	Not to be used in patients with impaired consciousness and Parkinson's disease	Risk of NMS Cautious use - cardiac illness, kidney disease, liver disease, elderly
<b>Mood stabilizers</b>					
Lithium (use only if clinical and laboratory monitoring are available)	300	600-1200 (monitor serum lithium levels every 2-3 monthly) Target blood levels - 0.6-1.0 mmol/l	Sedation, cognitive problems, tremors, bradycardia, nausea, diarrhea, weight gain, acne, hair loss, ECG changes, hypothyroidism, diabetes insipidus	Severe kidney and cardiac disease	Dehydration can raise lithium levels Drug interactions with NSAIDs, ACEIs, thiazide diuretics
Sodium valproate	500	1000-2000 (maximum-60 mg/kg/day)	Sedation, headache, tremors, ataxia, nausea, weight gain, hair loss, impaired liver functions, rash, cardiac conduction delay	Suspected liver disease Pregnant females Females with PCOD	Drug interactions with aspirin and carbamazepine

Contd...

**Table 50: Contd...**

	Starting dose (mg/day)	Usual adult therapeutic dose without medical comorbidity (mg/day)	Common side effects	Contraindications	Precautions
<b>Cognitive enhancers</b>					
Memantine	5 mg	5-10 mg/day	Drug hypersensitivity Somnolence, dizziness, balance disorders, hypertension, dyspnea, constipation, elevated liver function test, headache	Renal impairment, hepatic impairment, drug hypersensitivity, neuroleptic malignant syndrome	Caution in hepatic and renal impairment
Donepezil	5 mg	5-20 mg/day	Diarrhea, nausea, vomiting, agitation, confusion, abnormal dreams, syncope, pruritus, muscle cramps, urinary incontinence	MI, CAD	Caution in cardiovascular and respiratory illnesses
<b>Benzodiazepines</b>					
Diazepam	2-2.5	2-40	Sedation, dizziness	Sleep apnea, bronchitis, COPD, myasthenia gravis	Caution in liver or kidney disease, drug allergies, alcohol use or other sedative-type drugs, elderly and intellectual disability
Lorazepam	1-2	2-16	Weakness, unsteadiness, feeling of depression	Avoid use in Pregnancy	Caution in hepatic impairment, mild-moderate if alcohol or drug abuse history, impaired respiratory function, sleep apnea, elderly or/and debilitated
Clonazepam	0.25-0.5	0.5-20	Loss of orientation		
Alprazolam	0.25-0.5	0.5-4	Headache, sleep disturbances, confusion Irritability, aggression Excitement, memory impairment		
<b>Other hypnotics</b>					
Zolpidem	5-10	5-12.5	Headache, drowsiness Lethargy Hypersensitivity Diarrhea, influenza-like syndrome, palpitations, constipation	Hypersensitivity to drug/class/component alcohol use, severe hepatic impairment	
<b>Anticholinergic agents</b>					
Trihexiphenidyl	1-2 mg	2 mg	Blurred vision, dry mouth, dry eyes, decreased urine production, decreased sweat production, constipation, memory impairment, delirium, confusion	Myasthenia gravis, hyperthyroidism, glaucoma, enlarged prostate, heart failure, hiatal hernia Severe constipation Down syndrome	Hypertension
Benztropine mesylate	0.5 mg	1-2 mg			

NMS - Neuroleptic malignant syndrome, PCOD - Polycystic ovary disease

and anxiety disorders, escitalopram and sertraline are among the most commonly prescribed agents and can also be used in patients with<sup>[108-111]</sup> hypertension, CAD, DM,<sup>[112]</sup> and various malignancies<sup>[113]</sup>

- Tricyclic antidepressants such as amitriptyline and imipramine can be used if SSRIs are not available with the cost of more side effects and drug interactions<sup>[114]</sup>
- Initiation of drugs: Start with lower doses; half recommended dose among patients with comorbid conditions and among elderly; one-fourth of the recommended dose for elderly with comorbid conditions.<sup>[115]</sup>
- It usually takes 2–4 weeks to observe any significant beneficial effects with antidepressants. Patients with improved clinical outcome must be continued on the same medications in the same dose for at least 9–12 months after first episode of depression. After completion of this treatment duration, the doses of medications can be tapered off slowly, with close monitoring for side effects.

- The doses of antidepressants for anxiety disorders are also same, except for patients with obsessive-compulsive disorder, who require higher doses.
- Benzodiazepines may be used along with antidepressants during the initial phase of treatment for short duration and in minimal doses.

#### Somatoform disorders

- Patients with somatoform disorders or those with medically unexplained symptoms can be managed with nonpharmacological measures such as psychosocial intervention [Table 47],<sup>[104,105]</sup> relaxation exercises, and activity scheduling.<sup>[116]</sup> However, some of the patients may require the use of antidepressants which include amitriptyline and duloxetine
- Avoid use of opioid analgesics in patients with somatoform disorders. The summary is given in the Figure 28.

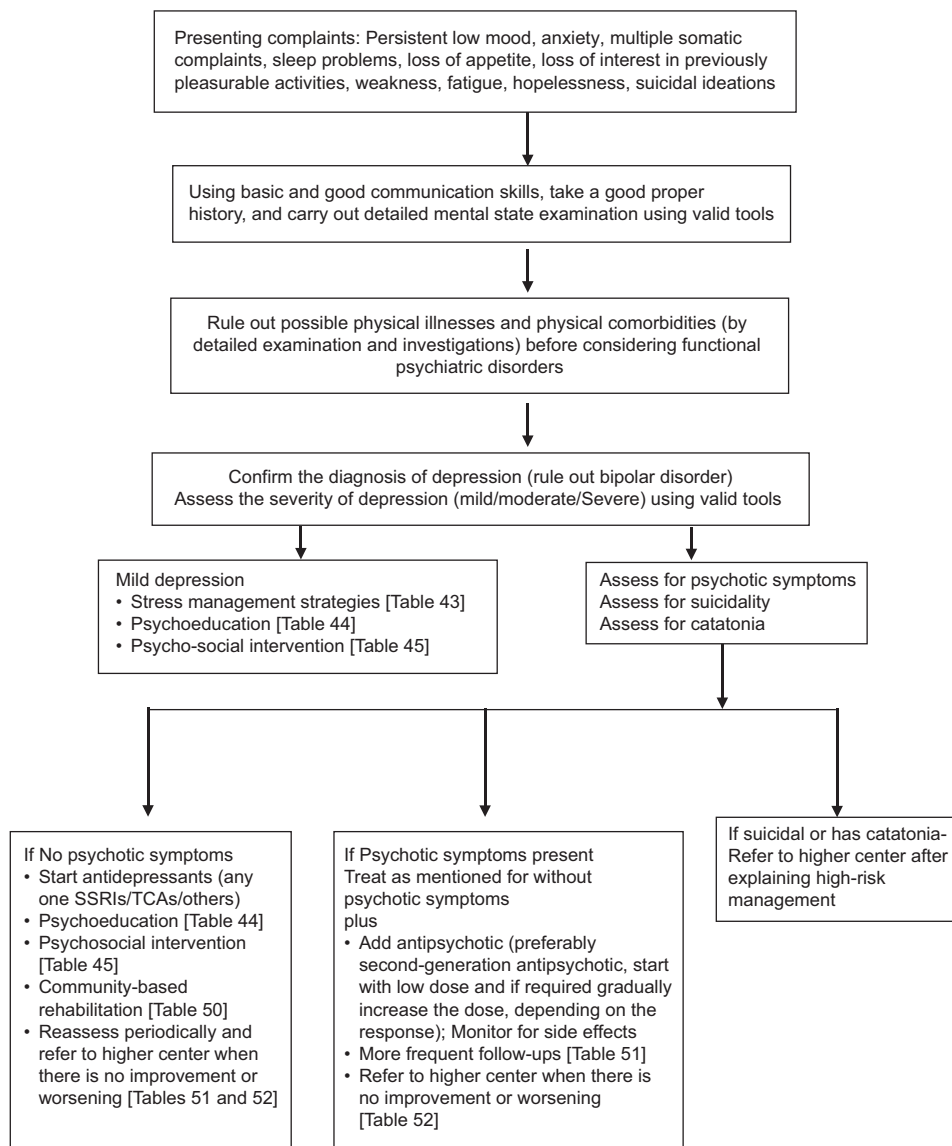


Figure 27: Assessment and management of depression at primary and secondary healthcare

Table 51: Basic community based rehabilitation which can be done at primary care level

- Creating awareness among the common public regarding mental disorders which can help in reducing the stigma
- Creating a positive attitude toward persons with mental illness to ensure equalization of opportunities for the mentally disabled persons in their own community
- Educating the patients with severe mental illness and their caregivers regarding available governmental schemes (disability benefits, pension benefits, income tax benefits, job reservations, etc.,) and guiding them to apply for the benefits
- Encourage formation of self-help groups for persons with mental health problems and/or family members, to enable mutual support and empowerment
- If self-help groups are already available (alcohol anonymous, narcotics anonymous), then help in facilitating inclusion of new persons with those specific problems
- Identifying skills (painting, stitching, carpentry, etc.) in persons with severe mental illness and promoting the same for earning livelihood as well as to improve self-esteem
- Providing emotional and practical support to caregivers of patients with mental illness
- Facilitating continued care with medical professionals
- Ensuring regular contact with those persons with mental illness having no social support, live on streets and/or face severe stigmatization
- Informing the employers of patients with mental illness to make necessary adjustments in the work environments (flexible working hours, quiet working area, etc.) wherever applicable

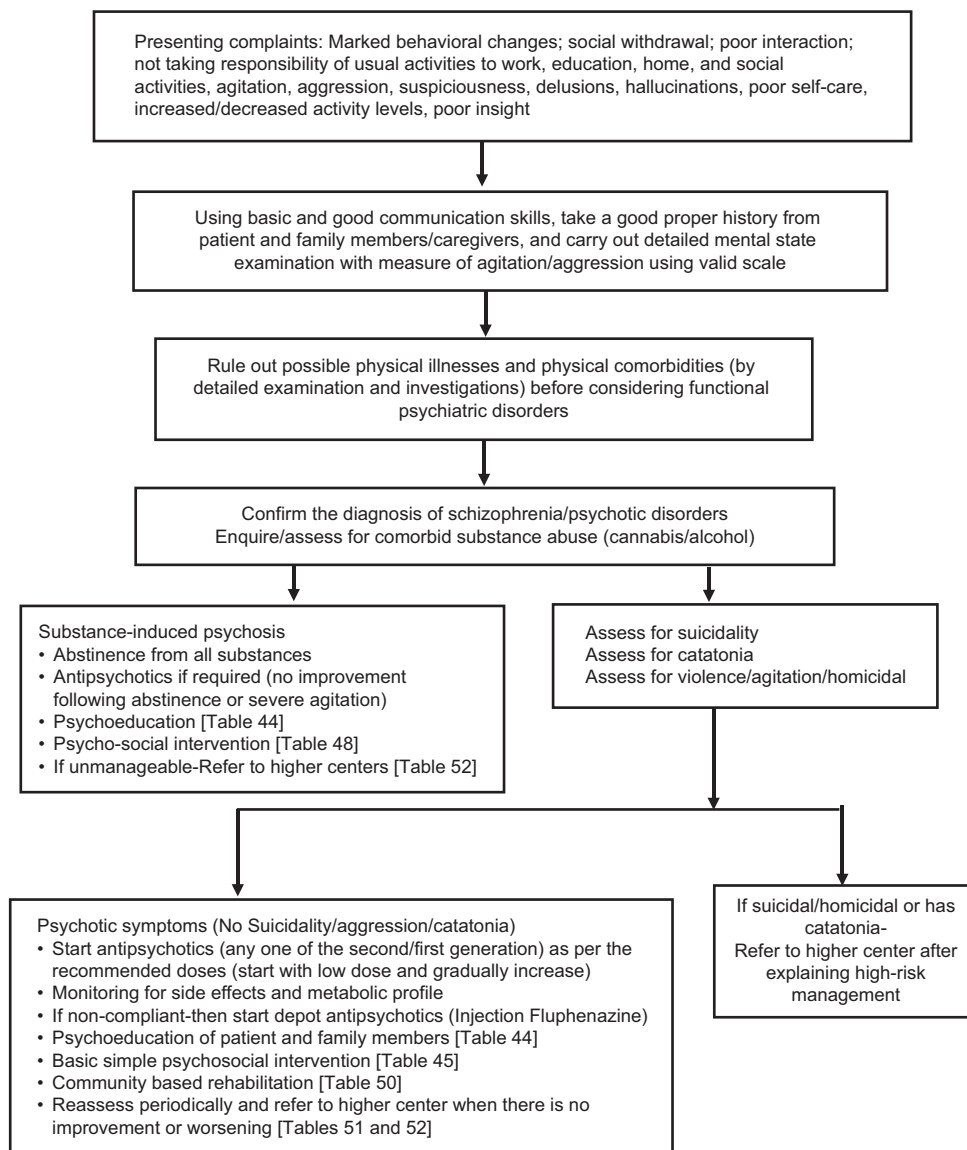


Figure 28: Assessment and management of psychosis at primary and secondary healthcare

Table 52: Things to do during the follow-up visits

- 
- Evaluate the response to treatment
  - Look for emergence of new psychological symptoms
  - Look for emergence of new physical health problems or worsening of physical health
  - Carry out a physical examination in patients with MUS, to reassure the patients that nothing is wrong
  - Check medication adherence and ensure adherence for future
  - Enquiry about self-care and psychosocial and occupational functioning
  - Evaluate and address the patient's and caregivers expectations from treatment
  - Evaluate and address the understanding of patient and their caregivers about the illness and treatment; correct misconceptions
  - Always inform the patient that they can come back to the clinic, if they feel the need to do so
  - Continue with psychoeducation
  - Carryout the psychosocial interventions as per the requirements
  - If there is a need, prepare the patient for psychiatric consultation
  - Plan rehabilitation with available resources
  - Evaluate and certify or facilitate assessment of disability as per the government norms
  - Liaise with social services to provide disability benefits
-



### Dissociative disorders

In general, psychotropics are not used for patients with dissociative disorders. However, these may be considered if the patient has comorbid anxiety or depression.

### Psychotic disorders

- The most commonly used antipsychotics include risperidone and olanzapine<sup>[117,118]</sup>
- Other agents which are commonly used include haloperidol, trifluoperazine, and chlorpromazine
- The basic principle of start from lower doses and gradually increase the dose must be followed. In patients with comorbid medical illnesses, the starting doses and the maximum doses to be used are usually lower than those recommended for those without medical illnesses.

### Bipolar disorder

Patients with bipolar disorder and current episode mania are usually managed by using mood stabilizers, antipsychotics, or both. Selection of mood stabilizers is usually based on current polarity, predominant lifelong polarity, availability of facilities for monitoring (for example, whether the facilities for monitoring serum lithium levels are available or not) and patient's preference. Lithium is usually preferred in patients with predominant depressive polarity and epilepsy. Valproate is not recommended for use in females during pregnancy and among females with polycystic ovarian disease. It is important to remember that while using valproate it is important to monitor the LFTs, hemogram, and serum levels. Other alternative mood stabilizers include carbamazepine and lamotrigine.

### Dementia

Cognitive enhancers are usually not very useful in patients with severe dementia. In patients with mild-to-moderate dementia, medications such as donepezil and memantine can be used to retard further cognitive deterioration.<sup>[119]</sup> Selection of these agents is often influenced by the type of comorbid illness [Table 53].<sup>[106]</sup>

### Alcohol

Patients with alcohol dependence presenting in withdrawal phase often require detoxification management [Figure 29]. Initial evaluation of patients presenting in alcohol withdrawal

state is to rule out delirium tremens. Patients who are not in delirium are usually managed with relatively lower doses of benzodiazepines, compared to those with delirium tremens. Selection of benzodiazepines is guided by level of hepatic impairment. Lorazepam and oxazepam are the preferred agents among those with impaired hepatic functions.<sup>[120]</sup> It is important to use thiamine in patients with alcohol withdrawal and avoid use of intravenous glucose before use of thiamine, as this may precipitate Wernicke's encephalopathy. Once patient is detoxified, pharmacoprophylaxis can be done using disulfiram, acamprosate, or naltrexone to prevent relapse.<sup>[121]</sup>

### Tobacco

Usually, psychological interventions are sufficient to manage patients with tobacco dependence. However, some of the patients who are heavy smokers may require use of nicotine substitution therapy.<sup>[120]</sup> This should ideally be done by a mental health professional along with use of psychosocial interventions. In patients with comorbid depression, bupropion [Table 50 for doses recommendations] may be the preferred agent, as this not only acts as an antidepressant but also reduces withdrawal associated with tobacco use.<sup>[122]</sup>

The details of commonly used psychotropic drugs including dose, indication, and side effects are summarized in Table 50. Further, the community-based rehabilitation, follow-up assessment, and time of referral to higher centers are given in Tables 51-53, respectively.<sup>[87,123-125]</sup>

## Conclusion

Mental disorders are highly prevalent in the community, and majority of these are CMDs. Mental disorders have been shown to be closely related to other NCDs. Patients with various mental disorders, often seek consultation from the primary care physician or the health workers at primary care. The health workers and physicians can play an important role in screening, prevention, and management of CMDs. Further, they can help in arranging for psychiatric consultation for the patients. Appropriate management of mental disorders at primary care can reduce the burden of mental disorders and also improve the outcome of other NCDs.

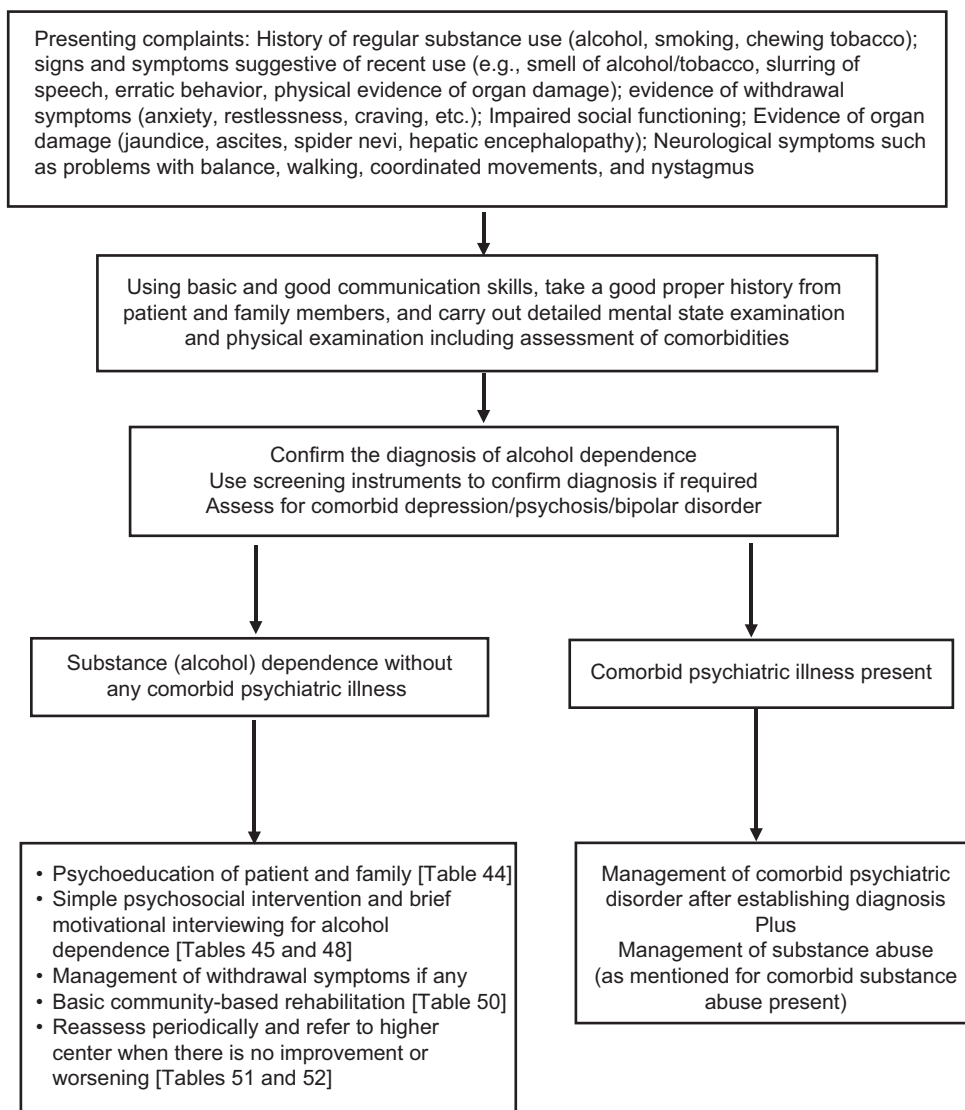


Figure 29: Assessment and management of alcohol dependence at primary and secondary healthcare

Table 53: Indications for referral to a psychiatrist

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Patient voicing suicidal ideations, have active suicidal plans or have made a suicide attempt
When diagnosis is not clear
Patients who may require inpatient care: violent and aggressive patients, patients with catatonia, patients refusing to eat or are severely nutritionally compromised
When patient has not responded to an adequate trial of an recommended agent
When special psychological treatments are warranted
When patient is not responding to psychoeducation or simple psychological interventions
When patient is experiencing frequent relapses
When the physician feels the need for a review of treatment by a specialist
Patients experiencing unmanageable side effects
Special population, i.e., children and adolescents with specific psychological needs, pregnant and postpartum females who do not respond to psychological interventions, elderly with multiple physical comorbidities

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## Monitoring and Implementation Framework of the Noncommunicable Diseases Guidelines

A monitoring and implementation framework is needed with predefined targets and indicators similar to the NCD global monitoring framework for effective uptake of the current guidelines. The framework will assist the policymakers and or program managers/implementers for uptake and roll out this guideline in their respective government. The framework developed based on systems approach [Table 54] which will be used for implementation and monitoring the progress of implementation of NCD guidelines.

The implementation framework has been built on a sample district with 1,000,000 (1 million) population which has one district hospital, two subdistrict hospitals, six CHCs, 30 PHCs (6 for each CHC), and 180 health subcenters (6 for each PHC). The framework

has been prepared based on the Indian Public Health Standards (IPHS) for primary (health subcenter and PHC) and secondary (CHC, subdistrict, and district hospital) healthcare settings of India. As per IPHS, the population covered by a health subcenter, PHC, and CHC is 5000, 30,000, and 150,000, respectively. The approximate number of population and patients screened, managed, referred, and followed up at primary and secondary healthcare settings is given in Table 55. For the calculated population/patients, needed human resources, and essential facilities or drugs needed, and budget involved in building the capacity of various level healthcare personnel for efficient implementation of guideline on prevention, surveillance, and management of NCDs in primary and secondary healthcare setting of a model district are given in Tables 56 and 57, respectively.

**Table 54: Framework for implementation of guideline on “Prevention, surveillance, and management of noncommunicable diseases in primary and secondary healthcare settings”**

Framework element	Target	Target verification
Input	National and subnational level political commitment and policy decision on prevention and control of NCDs at community level	NCD as one of the top agendas in National/subnational health policy Roll out of NCD program at community level
Process	Capacity-building and orientation of all healthcare personnel at primary and secondary healthcare setting on prevention, surveillance, and management of NCDs Strengthening the existing primary and secondary health systems to address the NCD	Availability of all essential drugs and services for prevention and management of NCDs Initiation of population-and facility-based screening of population/patient at community and health facilities
Output	All population/patients are screened for all important NCDs All patients diagnosed with NCDs had access for management including drug therapy and counseling All NCD patients received the essential medication for control of the disease	Proportion of population/patient screened, and found positive Proportion of NCD patients linked for care and received drugs and counseling Proportion of linked patients received essential medication
Outcome	Reduced premature mortality due to NCD Reduced prevalence of NCD risk factors like tobacco use, harmful use of alcohol, (high) salt consumption, physical inactivity	Mortality Prevalence of risk factors exposure (tobacco use, harmful use of alcohol, (high) salt consumption, physical inactivity)
Impact	Reduced burden of NCDs	Incidence or prevalence measurement

NCDs - Noncommunicable diseases

**Table 55: Calculation for assessing the population/patients screened, managed, and followed up for NCDs at primary and secondary healthcare setting of a model district**

Noncommunicable disease	Primary Healthcare setting					Secondary Healthcare Setting (SHC)				
	Population to be screened (a)	Burden (prevalence or Incidence) of disease (b)	Per Health Sub-centre (HSC)	Per Primary Health Centre (PHC)	Secondary Healthcare Setting (SHC)					
Diabetes	1850 (37% of population is > or equal to 30 years of age of the total 5000 population)	7.3 (1) Chandigarh, Jharkhand, and Maharashtra, sampled between Nov 17, 2008, and April 16, 2010; phase II included Andhra Pradesh, Bihar, Gujarat, Karnataka, and Punjab, sampled between Sept 24, 2012, and July 26, 2013; and the northeast phase included Assam, Mizoram, Arunachal Pradesh, Tripura, Manipur, and Meghalaya, with sampling done between Jan 5, 2012, and July 3, 2015. Capillary oral glucose tolerance tests were used to diagnose diabetes and prediabetes in accordance with WHO criteria. Our methods did not allow us to differentiate between type 1 and type 2 diabetes. The prevalence of diabetes in different states was assessed in relation to socioeconomic status (SES	Number with disease HSC (c=a*b) <sup>iv</sup>	Percentage of patients with complication (e)	Number of patients with complication (f=d*e)	Number without complication to be managed at PHC (g=d-f)	Number of patients to be managed/ day-PHC (h=g/4 *6)	Number of patients with complication to be managed at SHCs (i=f*30 PHCs)	Number of patients/ SHC (j=i/9)	Number of patients to be managed/ day/SHC (k=j/4 *7)
			135	33.3	270	540	23	8102	900	32
Hypertension	29.8 (2) Chandigarh, Jharkhand, and Maharashtra, sampled between Nov 17, 2008, and April 16, 2010; phase II included Andhra Pradesh, Bihar, Gujarat, Karnataka, and Punjab, sampled between Sept 24, 2012, and July 26, 2013; and the northeast phase included Assam, Mizoram, Arunachal Pradesh, Tripura, Manipur, and Meghalaya, with sampling done between Jan 5, 2012, and July 3, 2015. Capillary oral glucose tolerance tests were used to diagnose diabetes and prediabetes in accordance with WHO criteria. Our methods did not allow us to differentiate between type 1 and type 2 diabetes. The prevalence of diabetes in different states was assessed in relation to socioeconomic status (SES		551	33.3	1102	2205	92	33075	3675	131
COPD	3.49 (3)		65	33.3	129	258	11	3874	430	15
Asthma	2.05 (3)		38	33.3	76	152	6	2275	253	9
Stroke*	152 per lac (4)		3	100.0	17	0	0	506	56	2
Mental health disorder	10.6 (5)		196	50.0	588	588	25	17649	1961	70

Contd...

**Table 55: Contd...**

Noncommunicable disease	Primary Healthcare setting					Secondary Healthcare Setting (SHC)				
	Population to be screened (a)	Burden (prevalence or incidence) of disease (b)	Number with disease HSC (c=a*b) <sup>iv</sup>	Number with disease PHC (d=c*6)	Percentage of patients with complication (e)	Number of patients with complication (f=t*e)	Number without complication to be managed at PHC (g=d-f)	Number of patients to be managed/ day-PHC (h=g/4 *6)	Number of patients with complication to be managed at SHCs (i=f*30 PHCs)	Number of patients/SHC managed/ day/SHC (k=j/4 *7)
Chronic renal disease	9.53 (6) but data for morbidity and mortality of this disease are scarce or non-existent in many countries. We estimated the global, regional, and national burden of CKD, as well as the burden of cardiovascular disease and gout attributable to impaired kidney function, for the Global Burden of Diseases, Injuries, and Risk Factors Study 2017. We use the term CKD to refer to the morbidity and mortality that can be directly attributed to all stages of CKD, and we use the term impaired kidney function to refer to the additional risk of CKD from cardiovascular disease and gout. METHODS The main data sources we used were published literature, vital registration systems, end-stage kidney disease registries, and household surveys. Estimates of CKD burden were produced using a Cause of Death Ensemble model and a Bayesian meta-regression analytical tool, and included incidence, prevalence, years lived with disability, mortality, years of life lost, and disability-adjusted life-years (DALYs)	176	1058	100.0	1058	0	0	31732	3526	126
Cancer*	89.4 per lac (7)		2	10	100.0	10	0	298	33	1
Cardiovascular disease	9.4 (8)		173.9	1043	100.0	1043	0	31302	3478	124
Subtotal							156			511
Total (with 30% of patients with multiple NCDs)							109			358

\*Incidence; <sup>iv</sup>patient once diagnosed will be excluded from screening in the subsequent year, however, the community follow up will remain; Alcoholic liver disease and Non-alcoholic fatty liver disease were not included; All the diagnosed patients will have regular once monthly follow up

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**Table 56: The needed human resource and facilities for implementation of noncommunicable diseases guideline in a model district**

Type of healthcare facility	Human resource			Investigations, drugs and procedures	
	Number available	Number needed	Justification	Available	Needed
Health subcenter	2 (1 ANM and 1 Male health worker)	1 ANM/ male Health worker	Screening and follow up of patients need: Assuming that each worker screens 20 persons and follows 5 patients in a full working day, it needs 257 working days/ year excluding works related to prevention, surveillance and management of NCD among <30 years. With available total 516 working days, each HSC needs additional 102 working person-days over and above 155 working person-days spend by ANM/HW routinely (ANM/HW spends 70% of time in MCH services)	Blood sugar testing Blood pressure measurement Screening for oral, cervical and breast cancer Dipstick for urine protein and sugar Body mass index (height and weight), waist circumference	Screening for cancer cervix using VIA Clinical breast examination Hepatitis B vaccination Scales to screen mental health disorders
Primary health center	1 medical officer	3 medical officers	A medical officer can see 60 patients per day. To manage the 199 patients every day, the PHC needs at least 3-4 medical officers provided they do primarily NCD patient management	Routine urine, stool and blood tests (Hb%, platelets count, total RBC, WBC, BT/CT) Blood sugar Uristix for urine albumin and sugar VIA Drugs Oxygen, glyceryl trinitrate isosorbide mononitrate Isosorbide dinitrate, (sorbitrate), propranolol, atenolol, metoprolol, amlodipine, hydrochlorothiazide, Furosemide, captopril Enalapril maleate, methyl dopa, metformin Glibenclamide, insulin injection (soluble)	Investigations Serum creatinine, eGFR Pap smear Clinical breast examination ECG Pulmonary function test Equipment Nebulizer Drugs Budesonide, formoterol, tiotropium, aminophylline tablets levosalbutamol, formoterol with budesonide, levosalbutamol with ipratropium
Community health center	6	4	A specialist or general medical officer can see 60 patients per day. To manage the 640 patients every day, the SHC needs at least 3-4 medical officers provided they do primarily NCD patient management	Tests	Tests
Subdistrict hospital	>10	0		All hematology tests Blood sugar Liver function test Renal function test Lipid Profile Hb1Ac <sup>7</sup> , Glucose tolerance test <sup>7</sup> , ANA/RA factor <sup>7</sup> Complete Urine Analysis: albumin, sugar, bile salts and pigments, specific gravity, pH Stool analysis: Occult blood CSF analysis <sup>6</sup> Cytology: Aspirate/sputum <sup>6</sup> Serology: Rapid tests for HBsAg, HCV <sup>6</sup> ECG, Thyroid profile <sup>7</sup> Ophthalmoscopy/Retinoscopy Radiology: X-ray, Ultrasonography, Echocardiography <sup>7</sup> , CT scan <sup>7</sup> , Barium swallow <sup>7</sup> Mammography <sup>7</sup> TMT <sup>7</sup> , Holter <sup>7</sup> , Pulmonary function test	Urine protein quantification CKMB test Drugs Urokinase, tenecteplase, reteplase, alteplase Fluvoxamine, sertraline, citalopram, escitalopram, Bupropion, Duloxetine, Chlorpromazine, Memantine, Donepezil, Trihexyphenidyl, Benztropine mesylate, disulfiram, acamprosate, and naltrexone
District hospital	>10	0		Procedures All types of biopsy Bone marrow aspiration <sup>7</sup> Modified radical mastectomy <sup>7</sup> Hysterectomy <sup>7</sup>	

\*All the cases referred to tertiary care will be referred back and followed at secondary healthcare centers; <sup>7</sup>Available only at district hospital; <sup>6</sup>Not. TMT - Treadmill stress test, ECG - Electrocardiogram, NCD - Noncommunicable disease, HCV - Hepatitis C virus, CT - Computed tomography, WBC - White blood cell, RBC - Red blood cell

**Table 57: Capacity-building budgetary guidelines for orienting/training the health human resource at public health facilities for implementation of guideline on Prevention, surveillance and management of NCDs**

Healthcare personnel	Participants	Duration	n	Unit cost (INR)	Total cost (INR)	Assumption
Doctors	Specialists from DH (16) and CHCs (3×6)	2 days	2	78,700.00	157,400.00	Approximate size of each batch will be 25. DA at Rs. 400×25=10000; Honorarium at Rs. 500×25=12500; Resource person charges at Rs. 1000×2=2000; Food at 250×27=6750 and training kit including arrangements at 300×27=8100
	Medical Officers from DH (13) and CHCs (3×4)	2 days	1	78,700.00	78,700.00	
	Medical officers at PHCs (15)	2 days	1	78,700.00	78,700.00	
Paramedical staffs	DH (62), CHCs (3×16), and PHC (15×7)	1 day	8	24,550.00	196,400.00	Approximate size of each batch will be 25. DA at Rs. 400×25=10000, Honorarium at Rs. 300×25=7500; Resource person charges at Rs. 600×2=1200; Food at 250×27=6750 and training kit including arrangements at 300×27=8100
ANMs	DH (1), CHC (1), PHC (15), and HSC (180)	2 days	8	49,100.00	392,800.00	Approximate size of each batch will be 25. DA at Rs. 400×25=10000, Honorarium at Rs. 300×25=12500; Resource person charges at Rs. 600×2=1200; Food at 250×27=6750 and training kit including arrangements at 300×27=8100
ASHA	Villages (540)	2 days	22	42,100.00	92,6200.00	Approximate size of each batch will be 25. Travel cost at Rs. 50×25=1250, Honorarium at Rs. 150×25=3750; Resource person charges at Rs. 600×2=1200; Food at 250×27=6750 and training kit including arrangements at 300×27=8100
<b>Total</b>					<b>1,830,200.00</b>	

DH - District hospital, HSC - Health subcenter, CHC - Community health center, PHC - Primary health center

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## Expert list

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