Research & Reviews: Journal of Medical and Health Sciences

Health Care System Response to Cardiovascular Diseases, Trends from 2010-2018: Can Ethiopia Achieve 2025 Global Voluntary Targets for Non-Communicable Diseases from Cardiovascular Diseases Perspective? Explanatory Review of Available Literatures

Mende Mensa Sorato*, Majid Davari, Abbas Kebriaeezadeh

Department of Pharmacoeconomics and Pharmaceutical Administration, Tehran University of Medical Sciences, Iran

Research Article

*For Correspondence

Mende Mensa Sorato, Department of Pharmacoeconomics and Pharmaceutical Administration, Tehran University of Medical Sciences, Iran.Tel: +98-9056309138.

E-mail: mendemensa@gmail.com

ABSTRACT

Introduction: Cardiovascular diseases/CVDs are the 4th leading case of morbidity and mortality in Ethiopia. Globally nations have set nine voluntary targets that are attainable and can improve non-communicable disease/NCD related outcomes. This review was conducted to evaluate the health system response to CVD prevention and control from 2025 global NCD voluntary targets perspective and recommend the relevant stakeholders to act on un addressed areas.

Method: We have reviewed the all relevant literatures online, national and international guidelines; treatment protocols; conference proceedings from year 2010 to 2028 by using the following search terms 'Non-communicable diseases, Cardiovascular disease; global burden of diseases; prevalence of CVDs; cardiovascular diseases and associated factors; hypertension, best buys and healthcare system and CVDs, Primary care and CVDs and affordability and availability of medicines and chronic care and social determinants of CVDs.

Findings: Concerning mortality target which is a 25% relative reduction in risk of premature mortality from CVDs and diabetes, the Probability of dying from CVDs prematurely and death attributed by CVDs have increased by 15% and 80% from the baseline respectively. Both diabetes and obesity were increased in past 9 years. Only 11.5% of risk population were receiving any drug therapy and counseling to prevent heart attacks and strokes in 2016. The availability of essential drug was low, drugs were unaffordable and out of pocket payments were high.

Conclusion: Less than one third of the targets are on the way and promising to be achieved in the due date with current trend of healthcare. Therefore we recommend all stakeholders to give emphasis on: Improving best buys implementation; strengthening the primary care system; Improving access and affordability of essential drugs; Initiating community screening service to initiate drug therapy early and reduce morbidity and mortality from CVDs and Improving health taskforce number and capacity and financial risk protection.

BACKGROUND INTRODUCTION

Ethiopia

Ethiopia is one of the oldest civilizations in human history as evidenced by the oldest hominid discovered to date in Ethiopia is the 4.2 million year old Ardipithicus ramidus (Ardi). Poverty remains a challenge with Poverty head count ratio at < $ 1.90 a day: 23.4% in 2016, despite 7.5% average annual growth of gross domestic product per capita from 2009 to 2015 and Gross domestic product per capita: US $ 706.8 in 2016. Ethiopia has an estimated population of 112,078,730, which ranks 12th in the world and 2nd in East Africa after Nigeria. The majority of Ethiopian population is young, about 43.7% are below 15 years of age with median age of 18.8 years [1-3].

Non-communicable Disease Overview

Non-communicable diseases (NCDs) are the leading cause of death globally, and one of the major health challenges of the 21st century. In 2016, they were responsible for 71% of the 57 million deaths which occurred globally and CVDs accounted for 44% all NCD deaths. About 75% of adult deaths are premature (occurring in those aged 30-69 years). The global probability of dying from one of the four main NCDs in 2016 was 18%, with a slightly higher risk for males (22%) than for females (15%) [4].

According to World NCD monitor in 2017, NCD has contributed for 39% of all national deaths and risk of premature death from NCD was 19% [5]. According to NCD country profile report of WHO 2018, NCDs accounted for 39% of all deaths of this 16% are attributed by CVDs. Risk of premature death between 30-70 years due chronic illness is 18%. On average 14% (17% female and 10% males) of adults aged 18 years and above are Physical inactive. It is estimated that 57900 lives can be saved by 2025 by implementing all of the WHO "best buys" [6].

According to national risk factor surveys in Ethiopia and NCD global reports, Prevalence of raised blood pressure (SBP>140 and/or DBP>90 mmHg) among Ethiopian adult population is raising in alarming rate, 9.3% in 2011; 16.1% in 2015 and 24% in 2018. Six percent of study participants had raised blood glucose. Few individuals (6.3%) were overweight or obese, with a higher prevalence of overweight in urban residents [6-8].

WHO "best buys" are cost-effective interventions that are also high-impact and feasible for implementation even in resource-constrained settings for prevention and control NCDs. These best buys include: Tobacco control; (Reduce affordability of tobacco products by increasing tobacco excise taxes; Create by law completely smoke-free environments in all indoor workplaces, public places and public transport; Warn people of the dangers of tobacco and tobacco smoke through effective health warnings and mass media campaigns and Ban all forms of tobacco advertising). Harmful use of alcohol control: (Regulate commercial and public availability of alcohol; Restrict or ban alcohol advertising and promotions and Use pricing policies such as excise tax increases on alcoholic beverages). Diet and physical activity: (Reduce salt intake; Replace trans-fats with unsaturated fats; implement public awareness programs on diet and physical activity and Promote breastfeeding). Concerning Cardiovascular disease and diabetes: Drug therapy (including glycemic control for DM and control of hypertension using a total risk approach) and counseling individuals who have had a heart attack or stroke and to persons with high risk (≥ 30%) of a fatal and nonfatal cardiovascular event in the next 10 years and Aspirin for acute myocardial infarction [9,10].

Poor access to basic services in primary health care; lack of affordability of laboratory tests and medicines; inappropriate patterns of clinical practice; and poor adherence to treatment are preventing success in prevention of chronic disease deaths occurring in LMICs. For example in 2017 about 50% of health-care facilities had CVD guideline and provided cardiovascular risk stratification for high risk patients. The CVD guidelines were utilized by 74% of countries in European Region, 65% in the upper-middle-income countries and 28% in the African Region and 23% the low-income countries [11,12].

Ethiopian Healthcare System

The Ethiopian population is undergoing an epidemiological transition and now faces a triple burden of communicable diseases; Reproductive health threats and under nutrition, combined with emerging health concerns in the area of mental health, other non-communicable diseases and injuries [3]. The health care system is structured into three levels (primary, secondary and tertiary) healthcare. The health system is generally orientated to respond to acute episodes of illness, with healthcare providers tending to focus on the presenting health condition [3] **(Figure 1)**.
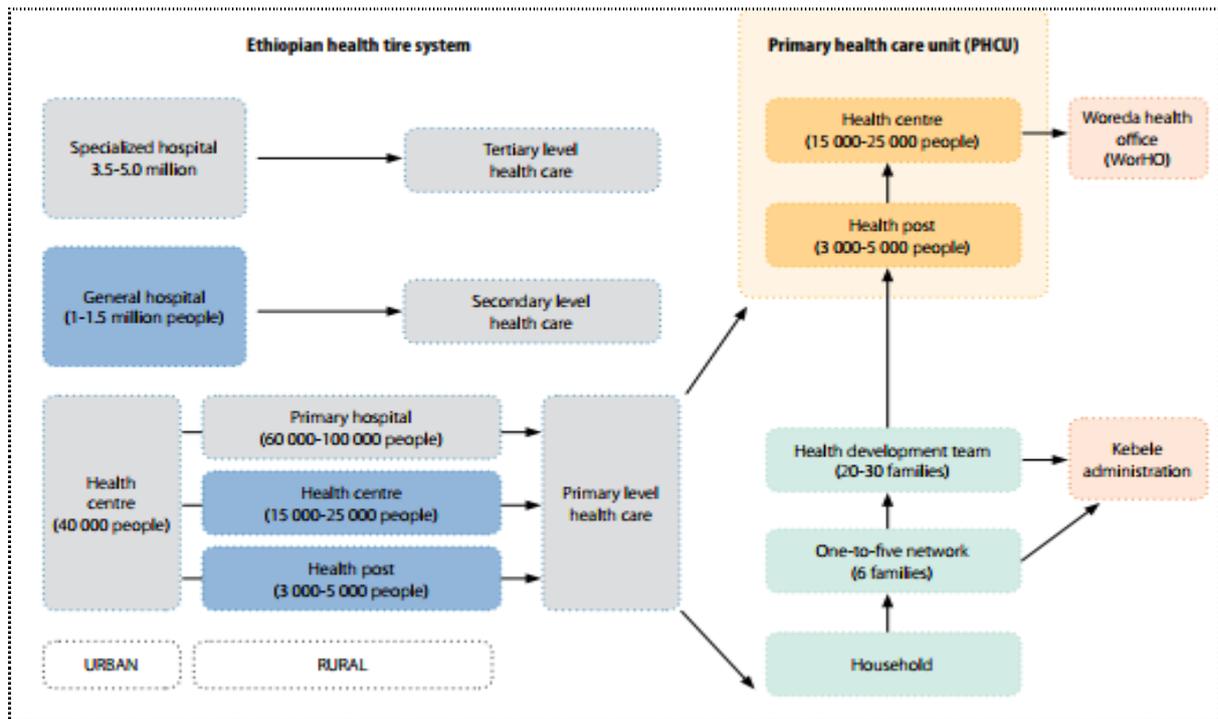
Figure 1. Ethiopian Health care system.

Source. Ethiopian Health Sector Transformation Plan, 2015.

Cardiovascular Disease Risk Factors Continuum

To prevent disease and injury, it is necessary to identify and deal with their route causes. Ischemic heart disease has many risk factors (i.e., distal, immediate and direct). There interaction is complex and usually non-linear. Distal factors are amplifiers for disease progress either due to their effect on intermediate risk factors, direct risk factors or their management system. Intermediate risk factors can impact disease progress through their effect on direct risks or they can directly lead to development of IHD. Therefore it is important to consider this complex chain of interaction when designing health service delivery for IHD control and management. Core players of the complex chain of events belong to; Socioeconomic factors, environmental and community conditions and individual behavior **(Figure 2)** [13,14].
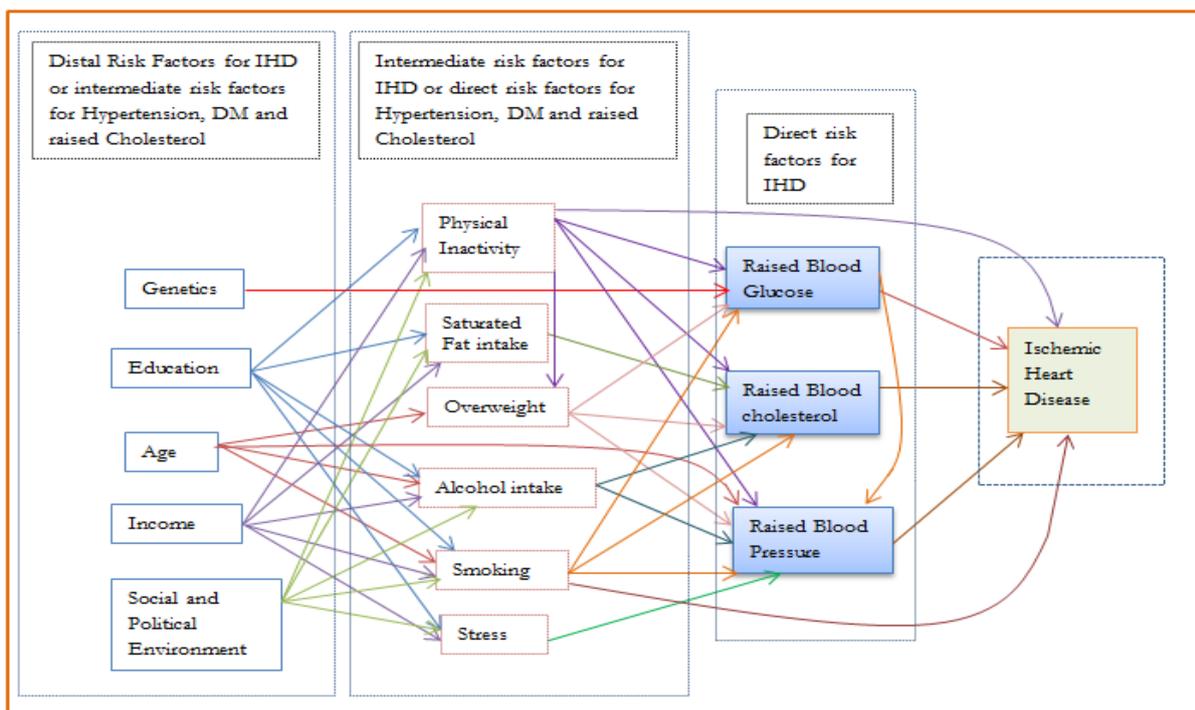
Figure 2. The causal relationship between Distal and immediate risk factors and ischemic heart disease. Arrows indicate some (but not all) of the pathways by which these causes interact Adapted from Commission on Social Determinants of Health-WHO 2008.

ETHIOPIA AND 2025 NON-COMMUNICABLE DISEASE VOLUNTARY TARGETS

Global Voluntary Targets for NCDs

Nine areas have been selected from the 25 indicators in the Global Monitoring Framework to be targets: one mortality target; six risk factor targets and two national systems targets. The targets are both attainable and significant, and when achieved will represent major accomplishments in CVD and risk factors reductions. The Targets have been set for 2025, with a baseline of 2010 data [15-21].

Health Care System Response Since 2010 to 2018

We have reviewed all available literatures and reported the trend CVD form 2010 to 2018 and Ethiopia is in line with NCD voluntary target of 2025 for very few indicators [21-35]. The details of global voluntary targets of NCD control in 2025 and Ethiopian health system response are presented **(Table 1)**.

Table 1. Table showing the past 9-year achievement of 2025 voluntary Global targets for control CVDs and Diabetes in Ethiopia from 2010-2018.

Framework indicator	Target	Indicator	Baseline (2010)	Recent (2018) & achievement
Premature mortality	A 25% relative reduction in risk of premature mortality from CVDs	Probability of dying between ages of 30 and 70 from CVDs	6.90%	7.9% (2018)
From CVDs		Proportion of death attributed by CVDs	9% (2012)	16% (2017)
Harmful use of alcohol	At least 10% relative reduction in the harmful use of alcohol	Total alcohol per capita (aged 15+ years) consumption a calendar year in liters of pure alcohol	4.2	3 (2016)
		Prevalence of alcohol consumption in age 15-59 years	49%	41%
		Prevalence of heavy episodic drinking among adolescents and adults	3%	12%
		Implementation status of Alcohol reduction measures	NA	Partial
Physical inactivity	A 10% relative reduction in prevalence of insufficient physical activity	Prevalence of insufficiently physically active persons aged 18+ years, defined as less than 60 minutes of moderate to vigorous intensity activity daily	17%	14%
Salt/sodium intake	A 30% relative reduction in mean population intake of salt	Mean population intake of salt (sodium chloride) per day in grams in persons aged 18+ years	<2.75 gm	6.0 gm
		Percentage of Unhealthy diet reduction measures achieved	NA	0% (2017)
Tobacco use	A 30% relative reduction in prevalence of current tobacco use	Prevalence of current tobacco use among adolescents Age-standardized prevalence of current tobacco use among persons aged 18+ years	4.5% (2012)	4%
		Implementation status of Tobacco demand reduction measures	None	Partial
Raised blood	A 25% relative reduction in the prevalence of raised BP	Age-standardized prevalence of raised blood pressure among persons aged 18+ years	24.40%	24 % (2016)
Pressure		Prevalence of raised total cholesterol among persons aged 18+ years	NA	5.60%
Diabetes and obesity	Halt the rise in diabetes and obesity	Prevalence of raised blood glucose/diabetes among persons aged 18+ years	3.10%	4%
		Age-standardized prevalence of overweight & obesity in persons aged 18+ years	4 % (2014)	6.30%
		Age-standardized prevalence of persons (aged 18+ years) consuming less than five total servings (400 grams) of fruit and vegetables per day	>98%	98%
Drug therapy to prevent heart attacks & strokes	At least 50% of eligible people receive drug therapy and counseling to prevent heart attacks and strokes	Proportion of population at high risk for CVD or with existing CVD (%)	NA	5 % (2016)
		Proportion of high risk persons receiving any drug therapy and counseling to prevent heart attacks and strokes (including glycemic control) (%)	NA	11.5% (2016)
		Proportion of health centers reported as offering CVD risk stratification	NA	<25% (2017)

Essential medicines and technologies	80% availability of the affordable basic technologies and essential medicines, including generics, required to treat major NCDs in both public and private facilities	Availability of quality essential CVDs disease medicines in both public and private facilities	NA	54.5% (2017)
To treat major CVDs and DM		Affordability of essential NCDs disease medicines, in both public and private facilities	NA	Not affordable
		Financial access to health services (out of pocket payment from total expenditure on health)	37%	33.80%
		Number of essential CVD medicines reported as "generally available"	NA	10% (2017)
		Number of essential NCD technologies reported as "generally available"	NA	50% (2017)
		Guidelines available for diabetes diagnosis and treatment	NA	16%
		Guidelines available for CVD diagnosis and management	NA	9%
		At least 1 trained staff CVD diagnosis and management	NA	7%
Additional		Health worker density and distribution (per 10,000); Target 22.8/10,000 population	2.7	4.93
		Prevalence of chat chewing in population 15-59 years.	18.70%	15.80%
		Assessment of 10 year CVD risk among adult patients (18 and older) with at least two CVD risk factors at primary healthcare level	None	None
		Geographic access to health services (Number of facilities in public and private sectors) with in 30 min walking distance	NA	47% (2016)
		CVD screening for population aged 35 and older at community level	None	None

Note: Raised blood glucose/Diabetes: Population aged 18 years and older who have measured fasting plasma glucose of ≥ 7.0 mmol/L (≥ 126 mg/dl) higher, or a history of diagnosis with diabetes, or use of insulin or oral hypoglycemic drugs.

Raised blood pressure/Hypertension: systolic blood pressure ≥ 140 mmHg or diastolic blood pressure ≥ 90 mmHg. Determined by taking three blood pressure measurements at different times and the average systolic and diastolic readings of the second and third measures.

Cardiovascular diseases/CVDs: are a group of disorders affecting the heart and blood vessels and include: Coronary Heart Disease; Heart Valve Disease; Cerebrovascular Disease; Peripheral Arterial Disease; Rheumatic Heart Disease; Congenital Heart Disease; Deep Vein Thrombosis and Pulmonary Embolism.

NA means No data is available or identified.

Mortality Target

This is the main target of the CVD control target is a 25% relative reduction in risk of premature mortality from cardiovascular diseases and diabetes at 2025 from the 2010 baseline status. Under this target we have reviewed two indicators in year 2010 and 2018. The first indicator Probability of dying between ages of 30 and 70 from CVDs was 6.9% and 7.9% respectively. This is taken from global estimate of CVD contribution to NCDs which is 44% [4]. The expected target for 2025 is 5.2% and to achieve this reduction the country should reduce probability of dying by 0.58% every 5 years (i.e., the country should have 5.75% at the end of 2018). However the probability of dying has increased approximately by 15% from the baseline. Similarly the second indicator Proportion of death attributed by CVDs was 9% and 16% respectively. The expected target for 2025 is 6.75% and to achieve this reduction the country should reduce Proportion of death attributed by NCDs by 0.75% every 5 years (i.e., the country should have 7.5% at the end of 2018). However the Proportion of death attributed by CVDs has increased approximately by 80% from the baseline in past 9 years [5,6].

Risk Factor Targets

The first risk factor target is at least 10% relative reduction in the harmful use of alcohol and under this target we have reviewed four targets in the baseline year and year 2018 [21]. The targets and their achievements were as follows: In our review we found that the total alcohol per capita (aged 15+ years old) consumption within a calendar year in liters of pure alcohol (4.2 Liter and 3 Liter respectively). The expected target for 2025 is 3.78 liter and to achieve this reduction the country should reduce total per capita alcohol consumption by 0.14% every 5 years (i.e., the country should have 3.92 Liters at the end of 2018). This indicates that country has achieved its 2025 target before its target year. The other indicator under harmful alcohol use reduction is reducing prevalence of alcohol consumption in age 15-59 years by 10% [7].

Based or review the prevalence of alcohol consumption in age 15-59 years was 49% and 41% in 2010 and 2018 respectively. The expected target for 2025 is 44.0% and to achieve this reduction the country should the reduce prevalence of alcohol consumption in age 15-59 years by 1.67% every 5 years (i.e., the country should have 45.7% at the end of 2018). This indicates that country has achieved its 2025 target before its target year. The third indicator is reducing prevalence of heavy

episodic drinking among adolescents and adults and it was 3% and 12% in 2010 and 2018 respectively. The prevalence of heavy episodic drinking among adolescents and adults has increased by more than four folds from the baseline in past 9 years. The indicator we included under harmful use of alcohol reduction is Implementation status of Alcohol reduction measures and there was no data concerning it in 2010 and under partial implementation in 2018 [6,7]. Studies indicated that Relationship between alcohol consumption and blood pressure is independent of age, obesity, cigarette smoking, social class and sodium excretion. In the British Regional Heart Study, about 10% of cases of hypertension (blood pressure ≥ 160/95 mmHg) could be attributed to moderate or heavy drinking [19,22]. Therefore it is important to further the achieved success to benefit more from further reduction and it is important address episodic and heavy drinking which is alarmingly high.

The second risk factor target is a 10% relative reduction in prevalence of insufficient physical activity. Our review revealed that Prevalence of insufficiently physically active persons aged 18+ years, defined as less than 60 minutes of moderate to vigorous intensity activity daily was 17% in 2010 and 14% in 2016. The expected target for 2025 is 15.3% and to achieve this reduction the country should the Prevalence of insufficient physical activity by 0.56% every 5 years (i.e., the country should have 15.8% at the end of 2018). This indicates that country has achieved its 2025 target before its target year [6,7]. Aerobic Physical activity for 90-150 minutes per week is believed to reduce BP in average of 5-8 mmHg for hypertensive individuals and 2-4 mmHg in normotensive patients. While dynamic resistance exercise for 90-150 minutes per week is believed to reduce BP in average of 4 mmHg for hypertensive individuals and 2 mmHg in normotensive patients [16,20]. The mechanisms by which physical activity lowers blood pressure are quite complex and not entirely clear. Overall, blood pressure is lowered by both reductions in sympathetic nervous system activity and in blood plasma volume. Suppression of the SNS is evident by lower levels of norepinephrine. Prostaglandin E levels are elevated in people who regularly exercise and these hormones block release of norepinephrine mediated by the sympathetic nervous system [19].

The third risk factor target is a 30% relative reduction in mean population intake of salt/sodium. We found that Age-standardized mean population intake of salt (sodium chloride) per day in grams in persons aged 18+ years was <2.75 gm in 2010 and 6.0 gm in 2016. The country has no unhealthy diet reduction measures or targets in place. The expected target for 2025 is 1.93 gm/person day and to achieve this reduction the country should reduce mean population intake of salt/sodium by 0.275 gm/person/day every 5 years (i.e., the country should have 2.2 gm/person/day at the end of 2018). However the mean population intake of salt/sodium has increased by more than two fold from the baseline in past 9 years [5-7,11]. Dietary Sodium reduction to optimal goal of <1500 mg/d and aiming for at least a 1000 mg/day reduction in most adults is believed to reduce BP in average of 5-6 mmHg for hypertensive individuals and 2-3 mmHg in normotensive patients. Increasing Dietary Potassium to optimal aiming for 3500–5000 mg/d, preferably by consumption of a diet rich in potassium is believed to reduce BP in average of 4-5 mmHg for hypertensive individuals and 2 mmHg in normotensive patients [16]. This could be one of important reasons why prevalence of hypertension is alarmingly increasing in the country. Therefore developing sodium salt reduction measures for national context or adopting available strategies like 'SHAKE' strategy important to reduce daily salt consumption.

The fourth risk factor target is a 30% relative reduction in prevalence of current tobacco use. We identified that age-standardized prevalence of current tobacco use among persons aged 18+ years (4.5% in 2012 and 4% in 2016). The expected target for 2025 is 3.15% and to achieve this reduction the country should the prevalence of current tobacco use among persons aged 18+ years by 0.45% every 5 years (i.e., the country should have 3.6% at the end of 2018). This indicates that country can achieve its 2025 target if extra effort is added to the sector. Implementation status of Tobacco demand reduction measures was none-existent in 2010 and partially implemented in 2018. Studies indicated that Smoking can increase systolic pressure by up to 20 mmHg [20].

The fifth risk factor is 25% relative reduction in the prevalence of raised blood pressure or contains the prevalence of raised blood pressure, according to national circumstances. The global report on Age-standardized prevalence of raised blood pressure among persons aged 18+ years showed that the prevalence was 24.4% in 2010 and 24% in 2016. While national reports indicated that it was 9.3% in 2009 and 16% in 2015. The expected target for 2025 is 18.4% based on global data and 6.9% based on national data to achieve this reduction the country should reduce prevalence of raised blood pressure by; 2.03% and 0.75% every 5 years based on global and national data respectively (i.e., the country should have 20.3% and 7.8% at the end of 2018 based on global and national data). This indicates that the prevalence of raised blood pressure has risen by more than 75% in past five years based on national data.

The 6th risk factor is target is halting the rise in diabetes and obesity. Our review revealed that Prevalence of raised blood glucose/diabetes among persons aged 18+ years (3.1% and 4% in 2016); Age-standardized prevalence of overweight & obesity in persons aged 18+ years (4% in 2012 and 6.3 in 2015); Age-standardized prevalence of persons (aged 18+ years) consuming less than five total servings (400 grams) of fruit and vegetables per day (greater than 98%).This indicates that both diabetes and obesity are in increasing trend and fruit and vegetable consumption is alarmingly low in past 9 years [7,8,24]. Obesity is linked to an increased risk of hypertension, many NCDs (such as diabetes, CHD, stroke, and cancers), and conditions including Obstructive

Sleep Apnea and osteoarthritis [19]. Therefore in individuals with overweight and obesity, weight loss is recommended to improve the ASCVD risk factor profile; Calculating BMI is recommended annually or more frequently to identify adults with overweight and obesity for weight loss considerations and it is reasonable to measure waist circumference to identify those at higher cardio-metabolic risk [16]. Consumption 5-8 servings of fruits and vegetables (one 1 serving is equivalent to 1 orange or apple or mango or banana or 3 tablespoons of cooked vegetables) and Consumption of whole grains, and low-fat dairy products, with reduced of saturated fat is believed to reduce BP in average of 11 mmHg for hypertensive individuals and 3 mmHg in normotensive patients [16]. However majority of the study population (73.6%) in Ethiopia reported not consuming fruit or vegetables at all [7].

National Systems Targets

The first national system target is at least 50% of eligible people receive drug therapy and counseling (including glycemic control) to prevent heart attacks and strokes. Proportion of population at high risk for CVD or with existing CVD data was not available for year 2010; 4.7% in 2015 and 5% in 2016. Proportion of high risk persons receiving any drug therapy and counseling to prevent heart attacks and strokes (including glycemic control) was 11.5% in 2016. Proportion of health centers reported as offering CVD risk stratification (NA in 2010 and <25% in 2016) [26,27]. This indicates that the country should improve drug therapy and counseling services with extra-efforts to achieve the 2025 target and if it continues with existing trend it is unlikely to be achieved. It also imperative to improve the health centers capacity to conduct CVD risk stratification because only 1.6% of the study population was found to be totally free of established CVD risk factors. Hence, 94.0% of the respondents had 1-2 risk factors; and 4.4% had 3-5 of the risk factors [7].

The second national system target is 80% availability of the affordable basic technologies and essential medicines, including generics, required to treat major CVDs in both public and private facilities. The available data from national pharmaceutical sector survey and affordability and pricing survey indicated that mean availability was 54.5% in 2016. Essential CVDs disease medicines, in both public and private facilities were not affordable [23]. Financial access to health services and OPP expense was 37% in 2010 and 33.8% in 2017 respectively. Number facilities reported essential CVDs medicines as generally available was 10%; Guidelines available CVD diagnosis and management was 9% [25-28].

Another important indicator included in this review is Health worker density and distribution (per 10,000 populations) (2.7 in 2010 and 4.93 in 2016. This is far below the global target recommended to effectively provide essential health services, meet the universal health coverage and health-related sustainable development goals/SDGs (i.e. 22.8/10,000) [29-31].

Another undermined risk factor is khat chewing which is increasingly popular in Ethiopia. Approximately 18.7% in 2008 and 15.8% in 2015 of youth consume khat one or more days per week [7,34]. While chewing khat, individuals concomitantly consume high levels of tea, sugary carbonated drinks and coffee. Moreover, khat chewing is often accompanied by cigarette smoking and use of cannabis (ganja or marijuana), with a strong statistical association between khat chewing and initiation of smoking. In most cases khat users end up using alcohol to avoid the after effects of the psychoactive content. The above facts illustrate the vicious cycle between khat chewing and CVD risk factors [34].

Ethiopia and Financial Capability to Implement Best Buys

Most premature NCD deaths can be prevented or delayed by implementing a set of so called "best buys" and other interventions to prevent and control these conditions, primarily cardiovascular and chronic respiratory diseases, cancer and diabetes. These measures were endorsed by the 70th World Health Assembly and are available to all countries and they are cost-effective [6].

Findings from 'best buys' scaling up study across all low- and middle-income countries showed that the estimated cost of approximately US $ 11.4 billion per year is required to implement. This amount is equivalent to an annual investment of less than US$1 per person (4% of current health budget) for low-income countries, US $ 1.50 per person (2% of current health budget) for LMCs, and US $ 3 per person (1% of current health budget) for upper middle-income countries. From a public health perspective, an annual per capita investment of US $ 1-3 would appear to be a low price to pay for significantly reducing the enormous burden of disease from major NCDs and their underlying risk factors in lower-income countries. However the impact on current health budget in LMICs is much larger than expected [9].

We have estimated that whether scale-up of best buys in Ethiopia would cost more than the global estimate. For these we have used the national prevalence of CVD and diabetes as contained to 2016 prevalence by hoping that the health sector will add extra effort to achieve 2025 voluntarily global targets. We have used the current Ethiopian birr to USD exchange rate of September 18/2019 (i.e., 1USD=29.40) for extrapolation of the total cost. The overall estimated total cost providing Comprehensive care for prevention and control of NCDs in Ethiopian Context in 2019/2020 is $ 20, 917, 371.712 USD ($ 1,975,880.99 + $ 9,120,162.315 + $ 9,821,328.407) or 614,970, 728.332 ETB. According the Cepheus Research Team the Ethiopian Parliament approved on July 8, 2019 a federal government budget of Birr 387 billion ETB. Out of this 12.8 billion ETB is allocated for Health sector [35-39]. The percentage of overall estimated cost for NCD prevention and control from the national budget is 4.804%. This indicates that the required expense is relatively higher than the WHO estimated best buy cost for low income countries which is 4% of the current healthcare budget **(Table 2)** [9].

Table 2. Costing of Non-Communicable Diseases Strategic Action Plan and implementation for the year 2014-2016 adapted from National framework for NCD disease control Ethiopia.

Detailed Summary of Strategies- National Systems Response Summary			
National Systems Response Summary	2014	2015	2016
Total Cost (USD)	$ 2,731,528.26	$ 2,116,895.39	$ 1,975,880.99
Total Cost (ETB)	ETB 51,899,037.00	ETB 42,337,907.75	ETB 41,493,500.70
Detailed Summary of Strategies- Health Promotion Summary			
Health Promotion Summary (USD)	$5,091,192.54	$5,988,721.39	$5,702,526.18
Total Cost (ETB)	96,732,658.20	119,774,427.80	119,753,049.68
Nationwide Campaign to Raise Awareness	ETB 63,102,380	ETB 62,883,370	ETB 62,861,230
Tobacco: Legislation, Policy Enforcement, Health Promotion	ETB 26,062,296	ETB 50,676,508	ETB 50,676,660
Promote Healthy Diet	ETB 723,433	ETB 2,575	ETB 2,727
Promote Physical Activity	ETB 723,433	ETB 2,575	ETB 2,727
Reduce Harmful Use of Alcohol	ETB 723,433	ETB 2,575 ETB 2,727	
Tackle Risks Related to Khat Consumption	ETB 723,433	ETB 2,575	ETB 2,727
NCD Awareness Raising Among Children	ETB 4,674,250	ETB 6,204,250	ETB 6,204,250
Detailed summary of Monitoring and Evaluation Summary			
Total Cost (USD)	$7,801,650.58	$9,088,133.93	$9,355,256.26
Total Cost (ETB)	148,231,361.08	181,762,678.66	196,460,381.38
Integrated Approach- Supportive Supervision	*ETB 34,069,674*	*ETB 34,173,706*	*ETB 59,140,246*
National targets and M&E framework	ETB 778,450	ETB 778,450	ETB 778,450
Vital Registration	ETB 709,975	-	-
Disease Registries	ETB 752,740	ETB 832,300	ETB 310,310
Non-communicable disease risk factor surveillance	ETB 28,500,000	ETB 57,000,000	ETB 38,000,000
Capacity Strengthening	ETB 11,782,590	ETB 11,782,590	ETB 11,782,590
Policies and Plans- Capacity Assessment of Regional Health Bureaus & Health Facilities	ETB 71,637,932	ETB 77,195,633	ETB 86,448,785
WHO Tool Outputs for CVD and Diabetes In USD			
WHO Outputs: CVD, Diabetes By cost category	2014	2015	2016
Primary care visits	417,127.5256	4813,85.9359	555,806.7986
Ancillary care visits	1,269,998.846	1,417,258.588	1,580,225.123
Drugs / medicines	4571,695.069	5,180,856.807	5873968.213
Lab & diagnostic tests	740,538.9002	908,206.4832	1,110,162.18
Sub Total	6,999,360.341	7,987,707.815	9,120,162.315
WHO Tool Outputs for Cancer; by cost category			
Primary care visits	152,161.9854	169,291.1656	187481.8178
Ancillary care visits	152,161.9854	169,291.1656	187481.8178
Drugs / medicines	0	0	0
Lab & diagnostic tests	7,213,510.225	8,025,549.553	8,887,909.854
Hospital-based procedures	453247.2	504270.1473	558,454.9172
Sub Total	7,971,081.395	8,868,402.032	9,821,328.407
ETB - USD Exchange Rate (ETB per USD)	19	20	21
ETB= Ethiopian Birr			

When we split the cost into three major areas:

1. Budget required for National Systems Response, Health Promotion and Monitoring and Evaluation;

2. Budget required to provide CVD and diabetes prevention and control service and

3. Budget required providing cancer prevention and controlling service. The total national health budget required for National Systems Response, Health Promotion and Monitoring and Evaluation) in 2019/2020 will be $ 1,975,880.99 * 29.4= 58,090,901.106 ETB (i.e. 0.45% of the current health budget). The total national health budget required to provide cancer prevention and control service in 2019 and 2020 will be $ 9,821,328.407* 29.4= 288,747,055.165.ETB. The percentage of this cost from the national budget is 2.25%. The total national health budget required to provide CVD and diabetes prevention and control service in 2019 and 2020 will be $ 9,120,162.315* 29=268,132,772.061.ETB. The percentage of this cost from the national budget is 2.09% [34].

DISCUSSION

In this explanatory review we have addressed the Ethiopian healthcare system response to cardiovascular disease prevention from 2025 global voluntary CVDs control targets perspective. The targets are both attainable and significant, for CVDs and risk factors reductions and evaluated based 2010 baseline data of each country [21]. We adapted the NCD target to the context of CVDs risk continuum [13,14]. We have reviewed all available literatures and reported the trend CVD form 2010 to 2018 in Ethiopia. Our review revealed that the country is in line with CVD voluntary targets for very few indicators [21-35].

Concerning mortality target which is a 25% relative reduction in risk of premature mortality from cardiovascular diseases, and diabetes at 2025, we have reviewed two indicators in year 2010 and 2018. We found that this target is probably the most challenging for the country achieve because both of its surrogate indicators are rising badly. For example Probability of dying between ages of 30 and 70 from CVDs was 6.9% and 7.9% respectively (i.e.,15% increase from the baseline). Similarly Proportion of death attributed by CVDs was 9% and 16% respectively. The Proportion of death attributed by NCDs has increased approximately by 80% from the baseline in past 9 years [5,6]. This is because the target requires successful achievement in all other indicators and most of them are not well addressed by the country healthcare system.

With regard to at least 10% relative reduction in the harmful use of alcohol, we have reviewed four surrogate targets in the baseline year and year 2018. In our review we found that the total alcohol per capita (aged 15+ years old) consumption within a calendar year in liters of pure alcohol has decreased from 4.2 Liter to 3 Liters. The prevalence of alcohol consumption in age 15-59 years has decreased from 49% to 41%. This indicates that country has achieved these surrogate targets before the target year. However heavy, episodic drinking among adolescents and adults has increased from 3% 2010 to 12% in 2018 [5-7]. This could be due to increasing alcohol related investment and weak implementation of alcohol reduction policy and laws which are under development.

Concerning the physical inactivity reduction our review showed that the Prevalence of insufficiently physically active persons aged 18+ years was 17% in 2010 and 14% in 2016. This indicates that country has achieved its 2025 target before its target year. This is mainly because of the socioeconomic status of the population where about 80% are farmers and they participate in work related activities [5-7,34]. There is no clear policy concerning physical activity and there is no favorable environment for adult physical activity in the country. This needs further attention due to urbanization and aging population.

Concerning a 30% relative reduction in mean population intake of salt/sodium, we found that mean population intake of salt (sodium chloride) per day in grams in persons aged 18+ years was <2.75 gm in 2010 and 6.0 gm in 2016. This is above WHO recommendation which is below 2 gm/person/day. This area requires implementation salt reduction measures like SHAKE strategy. Technical Package for Salt reduction has been developed by WHO known as 'SHAKE' is acronym for action to reduce salt consumption: Surveillance: measure and monitor salt use; Harness industry: promote the reformulation of foods and meals to contain less salt; Adopt standards for labeling and marketing: Implement standards for effective and accurate labeling and marketing of food; Knowledge: educate and communicate to empower individuals to eat less salt and Environment: support settings to promote healthy eating [16].

With regard to a 30% relative reduction in prevalence of current tobacco use, age-standardized prevalence of current tobacco use among persons aged 18+ years (4.5% in 2012 and 4% in 2016). The expected target for 2025 is 3.15% and to achieve this reduction the country should the prevalence of current tobacco use among persons aged 18+ years by 0.45% every 5 years (i.e. the country should have 3.6% at the end of 2018) [5-7]. This indicates that country can achieve its 2025 target if extra effort is added to the sector. Strengthening tobacco use control laws implementation which is partially implemented currently will help the journey towards this goal.

Raised blood pressure control target is a 25% relative reduction in the prevalence of raised blood pressure or contains the prevalence of raised blood pressure. The global report on Age-standardized prevalence of raised blood pressure among persons aged 18+ years showed that the prevalence was 24.4% in 2010 and 24% in 2016 and national reports indicated that it was 9.3% in 2009 and 16% in 2015 [5-7]. This indicates that the prevalence of raised blood pressure has risen by more than 75% in past five years based on national data. The reduction achieved based on global data too is out-off track if the country is marching to achieve its 2025 target. It needs the dynamic thinking and re-works on health system particularly concerning NCD control and

management including improving Community awareness about salt restriction, consumption of fruits and vegetables, alcohol use reduction, increasing availability and affordability of essential drugs for CVDs and providing counseling and drug therapy to all risk patients to prevent heart attack and stroke.

The other global factor target is halting the rise in diabetes and obesity. Our review revealed that Prevalence of raised blood glucose among persons aged 18+ years (3.1% and 4% in 2016); Age-standardized prevalence of overweight & obesity in persons aged 18+ years (4% in 2012 and 6.3 in 2015); Age-standardized prevalence of persons (aged 18+ years) consuming less than five total servings (400 gms) of fruit and vegetables per day (greater than 98%). This indicates that both diabetes and obesity are in increasing trend and fruit and vegetable consumption is alarmingly low in past 9 years. Therefore it is important increase community awareness about importance of fruits and vegetable consumption. One could wonder why the agricultural community is not consuming fruits and vegetables [7]. Research indicated Consumption 5-8 servings of fruits and vegetables (one 1 serving is equivalent to 1 orange or apple or mango or banana or 3 tablespoons of cooked vegetables) and Consumption of whole grains, and low-fat dairy products, with reduced of saturated fat is believed to reduce BP in average of 11 mmHg for hypertensive individuals and 3 mmHg in normotensive patients [40,41]. Therefore it is important for the country to address community awareness about health diets important for prevention and control of CVDs and other NCDs as we are living in 21st century where 'nutrition is considered as health care and medicine as sick care'.

There two National systems targets agreed to be achieved by year 2025. The first is provision of drug therapy and counseling to prevent heart attacks and stroke for at least 50% of eligible population. We found that only 11.5% of risk population were receiving any drug therapy and counseling to prevent heart attacks and strokes in 2016. Proportion of health centers offering CVD risk stratification was below 25% in 2016 [23,25-27]. This indicates that the country should improve drug therapy and counseling services with extra-efforts to achieve the 2025 target and if it continues with existing trend it is unlikely to be achieved. It also imperative to improve the health centers capacity to conduct CVD risk stratification because only 1.6% of the study population was found to be totally free of established CVD risk factors. Hence, 94.0% of the respondents had 1-2 risk factors; and 4.4% had 3-5 of the risk factors [7].

The second national system target is 80% availability of affordable and quality essential drugs for treatment of NCDs in both public and private facilities. The available data from national pharmaceutical sector survey and affordability and pricing survey indicated that mean availability was 54.5% in 2016. Essential NCDs disease medicines, in both public and private facilities were not affordable. Financial access to health services and OPP expense was 37% in 2007/08 and 33.8% in 2017 respectively. Number of essential NCD medicines reported as "generally available" was 10%. It is important consider this target because increased out of pocket expense could inhibit access, especially for the poor, and because of "the risk of impoverishment or destitution. It is recommended to decrease OPP to 15-20% of total health expenditure to make financial limitation to healthcare access. The WHO report also revealed that if households are spending more than 40% of their disposable income, they could become impoverished. Given the poverty level of nearly one-quarter of the population in Ethiopia, it is likely that households who decide to use health services could easily slip into poverty. Thus the government should improve coverage of community health insurance schemes which is under pilot in some regions. It should also start social health insurance for the formal sectors [40,41].

The pharmaceutical pricing study indicated that the wholesaler was charging mark-ups of 5-10% for imported products, and 10% for local products. While the mark-up at retail outlets is, 18-186% for imported medicines and 4-30% for locally produced drugs. In Ethiopia, value-added tax (VAT) or goods and services tax (GST) is not applied to medicines, but a customs duty of 5% is applied to imported pharmaceutical ingredients and medicines (Finished product) [25]. Therefore it is important to regulate the price of pharmaceuticals and remove these import duties to access and affordability medicines.

Another important indicator included in this review is Health worker density and distribution (per 10, 000 population) (2.7 in 2010 and 4.93 in 2016. This is remains 4.6 times than the required global target recommended to effectively provide essential health services, meet the universal health coverage and health-related SDGs (i.e., 22.8/10,000). This along with low level of trained staffs is posing another challenge to the system-wide NCD care the health service. In addition to this poor access to healthcare, low patient attendance, illiteracy and cultural beliefs continue to threaten the widespread scale-up of NCD care in Ethiopia [3,15,28-31,37].

Generally the healthcare service delivery system is ill-equipped for provision of CVD prevention and control services in Ethiopia as evidenced by availability and Readiness survey which indicated that the general service readiness index was 54%, implying that 54% of all health facilities, excluding health posts are ready to provide the general health services [26]. Concerning readiness and availability of CVD care, the availability of diagnosis and/or management of CVD service was 41%. Only 9% of facilities had Guidelines for CVD diagnosis and management; the percentage of at least 1 trained staff for CVD diagnosis and management was 7%. Availability of drugs were also low; Aspirin (53%); Hydrochlorothiazide tablet (37%); ACE inhibitors (25%); Calcium channel blockers (20%); Metformin (19%) and Beta blockers (15%). The Percent of facilities with all of these items needed to provide CVD care was (1%). Similarly readiness and availability of Diabetes care, the availability of diagnosis and/or management of diabetes was 22%. The availability of trained staff for diabetes diagnosis and treatment was 10%. However, only few health facilities had guidelines (16%), the availability of injectable insulin, and Gliclazide tablet or glipizide tablet in stock (only 185 and 4% respectively) on the day of the assessment [25-27].

Findings from 'best buys' scaling up study across all low and middle-income countries showed that the estimated cost of approximately US $ 11.4 billion per year is required to implement . This amount is equivalent to an annual investment of less than

US $ 1 per person (4%) of current health budget) for low-income countries. The percentage of estimated comprehensive NCD prevention and control cost for implementation best buys from the national budget for 2019/2020 is 4.8% [34]. This is relatively higher than the WHO estimated best buy cost for low income countries which is 4% of the current healthcare budget [9]. However implementing these will be too less costly when compared with NCDs associated morbidity and mortality [36]. It is estimated that 57 900 lives can be saved by 2025 by implementing all of the WHO "best buys". Therefore it is important to address these interventions which are already accepted and published in national NCD strategic plan of the country.

There is no community screening service for CVDs and this is potential player of unmet premature mortality target because patients with NCDs may come to hospitals late, either with acute and/or chronic complications, where management is expensive and protracted [27,38]. Therefore initiating community screening service and capacitating primary healthcare task force to provide comprehensive CVD care will have significant impact on CVD related outcomes. Overall, the combined population-wide and individual interventions will save many lives and reduce suffering from NCDs in the country.

CONCLUSION

We have reviewed all relevant documents concerning Ethiopia journey to achieve 2025 global voluntary targets of CVD and diabetes control. Less than one third of the targets are on the way and promising to be achieved in the due date with current trend of health of care delivery. Some of targets on the normal track include; tobacco control, weight control, physical activity and alcohol control. While; reducing of premature mortality from CVDs which is the central goal of all targets is unlikely to be achieved in the due date. Therefore it is important for the country health system to re-emphasize on CVD care to address all relevant targets not addressed yet (nutrition and salt intake; community level screening; assessing cardiovascular risk score of high risk individuals and counseling services to prevent risk of stroke) and addressed and with unsatisfactory outcomes (prevention of premature mortality from CVDs, blood pressure, availability and affordability of drugs and basic technologies and drug therapy to prevent stroke and cardiovascular events).

It is also important for the country to address issues of chat use which plays role in associated alcohol and cigarette use.

Working on community awareness and behavior change education may benefit more concerning consumption of vegetables and fruits which is alarmingly low. This calls the health system for focusing on community level care that can be achieved by using available taskforces like health extension workers in the frontline of health service in the community. Addressing health work force gaps is also important because they are the main pillars for healthcare outcomes.

RECOMMENDATIONS

Based on our findings we recommend the stakeholders of the healthcare system of the country to:

1. Wok on best buys to control CVDs and other NCDs to improve the CVD related outcomes since both premature mortality and mortality attributed due to NCDs are increasing;

2. Strengthen the primary care system since the percentage of health centers offering CVD risk stratification service were low and availability of guidelines were not addressed;

3. Improve access and affordability of essential drugs for management of CVDs since the availability is below target and drugs are not affordable for the majority of the population;

4. Design alternative strategies that can further reduce the cost of drugs used for management of NCDs in collaboration Ministry of health and pharmaceutical fund and supply agency (strategies may include decreasing or avoiding price mark-ups for these products, removing import duties etc.);

5. Initiate community screening service because it help to initiate drug therapy early and which can prevent and/delay the development of CVDs and associated complications;

6. Improve health taskforce number and capacity since it is far below the required number to provide the general health care to the population.

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