Original article

Non-communicable Diseases in Ethiopia: Disease burden, gaps in health care delivery and strategic directions

Fassil Shiferaw[1*], Mekitew Letebo[2], Awoke Misganaw[3], Yeweyenhareg Feleke[4], Terefe Gelibo[5] , Theodros Getachew[5], Atkure Defar[5], Abebayehu Assefa[1], Abebe Bekele[5], Kassahun Amenu[5], Habtamu Teklie[5], Tefera Tadele[5], Girum Taye[5,] Misrak Getnet[5], Geremew Gonfa[5], Alemayehu Bekele[6], Tedla Kebede[4], Dejuma Yadeta[4], Mussie GebreMichael[7], Feyissa Challa[5], Yabestse Girma[5], Kissi Mudie[5], Mulugeta Guta[5] Yewondwossen Tadesse[4]

Abstract

Introduction: In Ethiopia, non-communicable diseases (NCDs) cause 42% of deaths, of which 27% are premature deaths before 70 years of age. The Disability Adjusted Life Years (DALYs) increased from below 20% in 1990 to 69% in 2015. With no action, Ethiopia will be the first among the most populous nations in Africa to experience dramatic burden of premature deaths and disability from NCDs by 2040. However, the national response to NCDs remains fragmented with the total health spending per capita for NCDs still insignificant.

The focus of this paper is highlighting the burden of NCDs in Ethiopia and analyzing one of the two major WHO-recommended policy issues; the status of integrated management of NCDs, in Ethiopia. NCDs are complex conditions influenced by a range of individual, social and economic factors, including our perceptions and behavior. Also, NCDs tend to be easily overlooked by individuals and policy makers due to their silent nature. Thus, effectively addressing NCDs requires a fresher look into a range of health system issues, including how health services are organized and delivered.

Methods: A mixed method approach with quantitative and qualitative data was used. Quantitative data was obtained through analysis of the global burden of diseases study, WHO-STEPs survey, Ethiopian SARA study and the national essential NCD drug survey. This was supplemented by qualitative data through review of a range of documents, including the national NCD policies and strategies and global and regional commitments.

Results and discussion: In 2015, NCDs were the leading causes of age-standardized death rate (causing 711 deaths per 100,000 people (95% UI: 468.8–1036.2) and DALYs. The national estimates of the prevalence of NCD metabolic risk factors showed high rates of raised blood pressure (16%), hyperglycemia (5.9%), hypercholesterolemia (5.6%), overweight (5.2%) and Obesity (1.2%). Prevalence of 3-5 risk factors constituting a metabolic syndrome was 4.4%. Data availability on NCD morbidity and mortality is limited. While there are encouraging actions on NCDs in terms of political commitment, lot of gaps as shown by limited availability of resources for NCDs, NCD prevention and treatment services at the primary health care (PHC) level. Shortage of essential NCD drugs and diagnostic facilities and lack of treatment guidelines are major challenges. There is a need to re-orient the national health system to ensure recognition of the NCD burden and sustain political commitment, allocate sufficient funding and improve organization and delivery of NCD services at PHC level. [*Ethiop. J. Health Dev.* 2018;32 (3):170-180]

Key words: Non-communicable diseases, health-system re-orientation, NCD burden, metabolic risk factors, Service delivery, Primary Health Care

Introduction

Globally, NCDs are responsible for two-thirds of the 38 million deaths occurring each year. Of these, 42% are premature deaths happening before 70 years of age, and 80% of the deaths happen in in low and middle income countries (1). For instance, NCDs are common causes of mortality in Sub-Saharan Africa (SSA), accounting for over 50% of all reported adult mortality in countries such as Mauritius, Namibia, and Seychelles. Furthermore, the burden of NCDs in SSA is expected to increase by 27% in the next ten years (2).

NCDs comprise a large number of conditions, although the four major diseases namely cardiovascular diseases, cancer, diabetes and chronic obstructive lung diseases cause 82% of all NCD deaths and get the most global attention. The public health importance of these four conditions is further enhanced due to the sharing of four major risk factors: tobacco use, unhealthy diets, harmful use of alcohol, and physical inactivity (3).

In Ethiopia, NCD deaths are estimated at around 42%. Among these, 27% are premature deaths occurring before 70 years of age. Disability Adjusted Life Years (DALYs) due to NCDs in the country have increased from 20% in 1990 to 69% in 2015, which is more than double that of communicable maternal, neonatal & nutritional problems combined (4, 5). Despite the increase in the DALYs lost and deaths from NCDs, the

[1]World Health Organization, Corresponding Author*, Cell phone: +251911211301, E-mail: et_fassil@hotmail.com, shiferawf@who.int, Addis Ababa, Ethiopia;
[2]Clinton Health Access Initiative, Addis Ababa, Ethiopia;
[3]Institute for Health Metrics and Evaluation (IHME), Addis Ababa, Ethiopia;
[4]Addis Ababa University, Health Sciences College, Addis Ababa, Ethiopia;
[5]Ethiopian Public Health Institute;
[6]Ethiopian Public Health Association;
[7]Federal Ministry of Health

total health spending per capita for NCDs is negligible (5).

In recent years, there is increasing recognition of NCDs as a global challenge with a range of commitments made, including the flagship UN high-level meeting conducted in 2011 recognizing the diseases as societal and economic threats that need to be high on development agenda (6). There are also regional commitments, such as the Brazzaville (7) and Lawanda declarations in the African continent (8). The World Health Organization (WHO) developed an action plan to help translate these commitments into action. This global action plan for prevention and control of NCDs for 2013-2020 emphasizes addressing population-based risk factors and the integrated management of NCDs at the primary healthcare level (9). As member state of the WHO, Ethiopia adopted the global strategy and developed the national NCD strategy for 2014-2016 (10), which is currently being updated

The focus of this paper is highlighting the burden of NCDs in Ethiopia and analyzing one of the two major WHO-recommended policy issues; the status of integrated management of NCDs, in Ethiopia. NCDs are complex conditions influenced by a range of individual, social and economic factors, including our perceptions and behavior. Thus, due to the silent nature of the diseases, NCDs tend to be easily overlooked by individuals and policy makers. Therefore, effectively addressing NCDs requires a fresher look into how health services are organized and delivered since business as usual is unlikely to bring results. Hence countries need to reorient health care delivery system towards health equity, community engagement and practical application of the WHO's best-buy strategies for NCD response, which has a cost implication of only 170 million USD versus 7 trillion that could be incurred due to inaction over a five-years period.

Methodology

This mixed-method review study (11) explores the NCD burden and the status of health care delivery for NCDs in Ethiopia using qualitative and quantitative data. Data sources (see Table 1).

The study used three quantitative data sources: the global burden of diseases study data from Institute for Health Metrics and Evaluation (IHME) and the Ethiopian WHO-STEPs survey of 2015 and Service availability and readiness Assessment (SARA) survey of 2016. Qualitative data was collected from national policy, strategic guidelines, and global commitment documents.

Data Analysis: The research team generated the national trends in NCD burden for both sexes, and produced age standardized cause-specific DALYs and deaths for 1990 and 2015 from the global burden of diseases study data. Analysis of WHO's STEPs survey provided the prevalence of NCD metabolic risk factors disaggregated by geographic region to examine policy implications and strategic priorities. The SARA study helped to measure NCD service availability and readiness of the health system to respond to NCDs using a core set of indicators on key inputs and outputs of the health system.

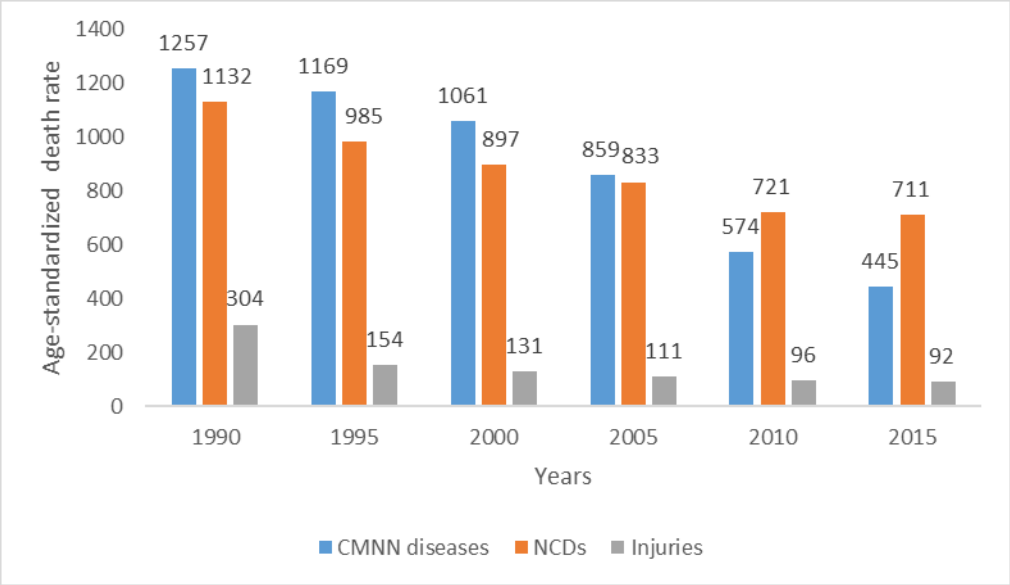
The qualitative data was thematically analyzed using WHO's indicator checklist tool used for progress monitoring on NCD response. The tool provides ten indicators which WHO intends to assess progress of member states (10). Findings exhibit in a graphic form and text narrative. Results are discussed under four themes: the burden of NCDs in Ethiopia, prevalence of metabolic risk factors, availability of evidence on NCD burden and risk factors, and the readiness and gaps in the health care delivery system.

Table 1: **Quantitative and Qualitative Data Sources**

Topic of interest	**Data source**
Evidence on NCD burden & metabolic risk factors in Ethiopia	
National NCDs morbidity & mortality data	• Data visualization by Institute of Health Metrics and Evaluation (IHME), University of Washington (http://vizhub.healthdata.org/gbd-compare/)
National NCD metabolic risk factors	• Ethiopian NCD STEPs survey, 2015. Preliminary data.
National NCD strategy and target setting	
National NCD strategy	• National Strategic Action Plan for Prevention & Control of NCDs in Ethiopia (2014-2016)
National NCD target setting	• Health Sector Transformation Plan (HSTP) 2016-2020.
Health sector service availability and readiness	
Health sector readiness for NCDs response.	• Ethiopian Services Availability and Readiness Assessment (SARA), Summary report, FMOH, EPHI, WHO, June 2016. • NCD drug availability & pricing survey, 2017 (unpublished data, FMOH).
National NCD response progress	
Progress made by the country on NCD response against a global set of indicators.	• WHO Tool: Non-communicable diseases progress monitor 2017, WHO.

Results

Burden of Non-Communicable Diseases in Ethiopia: The global burden of disease (GBD) study typically measures disease burden using age-standardized death rates and disability-adjusted life years (DALYs). Based on the GBD data for 1990 and 2015, relative contribution of non-communicable diseases for mortality and DALYs increased between 1990 and 2015. In 2015, NCDs were the leading cause of the age-standardized death rate accounting for 711 deaths per 100,000 people (95% UI: 468.8–1036.2) (Figure 1). In the same year, NCDs were the leading causes of age-standardized DALYs (Figure 2).



Data source: Institute for Health Metrics and Evaluation (IHME)

Figure 1: **Levels and trends of age-standardized death rate per 100,000 by major causes for both sex and all age groups in Ethiopia, 1990-2015**

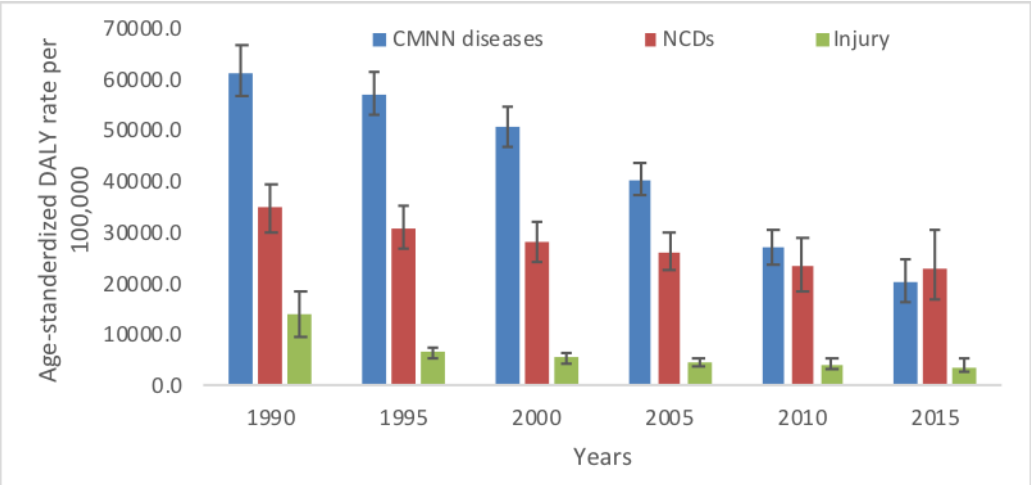


Figure 2: **Levels and trends of age-standardized DALYs per 100,000 peoples by major causes for both sex and all age groups with 95% UI in Ethiopia, 1990-2015**

Ranks of specific diseases with their age-standardized DALY rate and percentage changes between 1990 and 2015 are shown in Figure 3. According to GBD data, the top twenty leading causes of age-standardized DALYs accounted for 59% of the total DALYs in Ethiopia. In 2015, cardiovascular diseases, cancer, diabetes, and mental and substance use disorders accounted for 30% of the total disease burden in the country as measured in age-standardized DALY rates. Cardiovascular diseases, including ischemic heart disease, stroke, and hypertensive heart disease, were Ethiopia's second leading cause of premature death and disability (6,458 age-standardized DALYs per 100,000). Cancer was the sixth leading cause of premature death and disability in 2015 (causing 3,192 age-standardized DALYs per 100,000). Cervical, liver, breast cancer, and esophageal cancer are some of the leading cancers. Mental and substance use disorders, including major depression, were the seventh leading cause of premature death and disability (2,224 DALYs per 100,000). In 2015, diabetes was the ninth leading cause of premature death and disability (causing 1,106 DALYs per 100,000) (Figure 3). Between 1990 and 2015, there was shifting in ranks of disease types as certain non-communicable diseases joined the top 20 causes, replacing most CMNN causes (Figure 3). Other

global burden of diseases projected studies also showed that Ethiopia is the first among the most populous nations in Africa expected to see dramatic increases in the burden of premature death and disability from non-communicable diseases by 2040 (5).

Age-standerdized DALYs per 100000

Rank,1990	Disorder,1990	DALYs per 100,000
1	Diarrheal diseases	10794.7(7266.2-13746.1)
2	Lower respiratory infections	8683.6(5702-10942.6)
3	Tuberculosis	7642.2(5246.6-10078.8)
4	Measles	6726.2(385.6-22681.4)
5	Collective violence and legal intervention	6493(2672.1-11093.2)
6	Cerebrovascular disease	4087.3(3396.7-4848.7)
7	Ischemic heart disease	4065.3(3414.8-4827.6)
8	Protein-energy malnutrition	3196.8(1296.1-5798.5)
9	Malaria	3014.5(1244.5-5810.1)
10	Meningitis	2852.7(1677.5-4256)
11	Neonatal encephalopathy	1973.4(1120-2977.6)
12	Neonatal preterm	1868.7(1014.1-2681)
13	Other cardiovascular diseases	1659.6(1350.6-2015.7)
14	Road injuries	1609.8(1170-2062.4)
15	HIV/AIDS	1591.8(862.1-2711.2)
16	Diabetes mellitus	1414.7(1160.2-1687.8)
17	Congenital birth defects	1413.7(827.1-2177.7)
18	Iron-deficiency anemia	1408(1030-1869.3)
19	Maternal hemorrhage	1336.4(943.3-1827.9)
20	Other neonatal disorders	1317.6(485.2-2696.1)
21	Sense organ diseases	1245.9(880.1-1695.4)
22	Asthma	1196.5(791.5-1618.1)
23	Neonatal sepsis	1183.7(512.6-2317.3)
24	STI excluding HIV	1161.6(550.2-1992.1)
25	Depressive disorders	1080.5(743.2-1451.3)
26	Low back and neck pain	1057.4(757.6-1417.7)
27	Hypertensive heart disease	1048.4(744.8-1440.1)
28	Chronic obstructive pulmonary disease	883.3(575.4-1253.2)
29	Skin and subcutaneous diseases	870.3(626.4-1214.2)
30	Falls	846.2(655.8-1063.8)

Rank,2015	Disorder, 2015	DALYs per 100,000	1990 - 2015, DALYs % change
1	Lower respiratory infections	2998(2173.7-4029)	-65%
2	Diarrheal diseases	2592.5(1850.7-3495.1)	-76%
3	Tuberculosis	2562.9(1466.1-4220.7)	-66%
4	Ischemic heart disease	2535.7(1603.7-3843.2)	-38%
5	Cerebrovascular disease	2159.9(1369.7-3216.3)	-47%
6	HIV/AIDS	1850.6(1419.7-2247.1)	16%
7	Sense organ diseases	1273(901.9-1728.2)	2%
8	Congenital birth defects	1112(580.8-1490.5)	-21%
9	Diabetes mellitus	1105.7(781.8-1516.3)	-22%
10	Low back and neck pain	1094.7(779.8-1480.7)	4%
11	Depressive disorders	1056.1(729.1-1434.6)	-2%
12	Neonatal encephalopathy	1030.7(612.1-1512.2)	-48%
13	Meningitis	985.1(686.1-1381.7)	-65%
14	Other cardiovascular and circulatory diseases	818.7(546.1-1215.9)	-51%
15	Skin diseases	817(575.5-1159.9)	-6%
16	Road injuries	783.3(498.3-1260.2)	-51%
17	Neonatal preterm	771.1(445.5-1150.3)	-59%
18	Neonatal sepsis	749.4(352.9-1306.5)	-37%
19	STI excluding HIV	739.9(410.8-1212)	-36%
20	Protein-energy malnutrition	676.2(381.3-1143.5)	-79%
21	Other neonatal disorders	626.6(238.2-1250.5)	-52%
22	Other neoplasms	621.3(307.3-1157)	-18%
23	Iron-deficiency anemia	588.9(402.3-811.1)	-58%
24	Hypertensive heart disease	575.3(305.5-1154.6)	-45%
25	Falls	545.8(407.3-726.4)	-35%
26	Asthma	539.8(370-762.6)	-55%
27	Chronic obstructive pulmonary disease	508.9(335.8-766.7)	-42%
28	Measles	429.2(14.5-2168.2)	-94%
31	Maternal hemorrhage	390.3(160.1-882.7)	-71%
86	Collective violence and legal intervention	101.1(63.4-152.3)	-98%
59	Malaria	154.4(103.2-226.2)	-95%

	CMNN disease
	Non-communicable diseases
	Injuries

Figure 3: **Ranks of causes of age-standardized DALYs per 100,000 for both sex and all age groups between 1990 and 2015 in Ethiopia (Data source: Institute for Health Metrics and Evaluation)**

Prevalence of metabolic risk factors in Ethiopia: Metabolic risk factors such as raised blood pressure, hyperglycaemia, hypercholesterolemia, obesity, and intermediate risk factors such as older age, sex, and family history are indicators of the forthcoming NCD burden in a country. Figures 4-8 depict the prevalence of these risk factors in Ethiopia based on the 2015 NCD STEPs survey result.

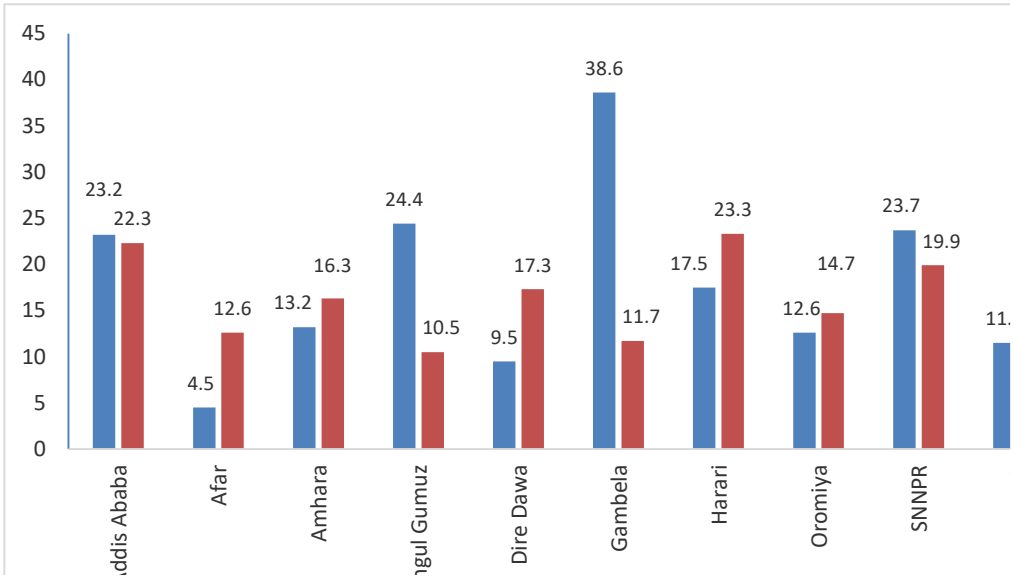


Figure 4: **Blood pressure measurements greater than or equal to 140/90 mmHg excluding those on medication by region**

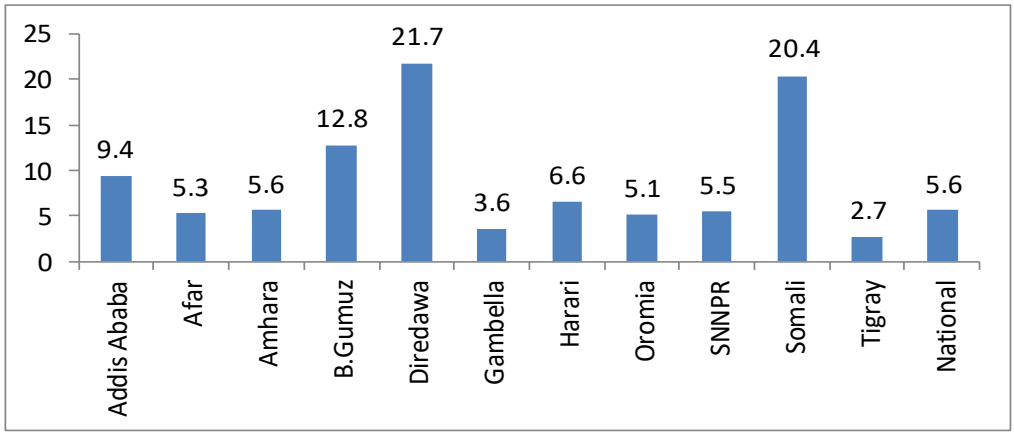


Figure 5: **Total cholesterol greater than or equal to 190mg/dl or on medication by regions**

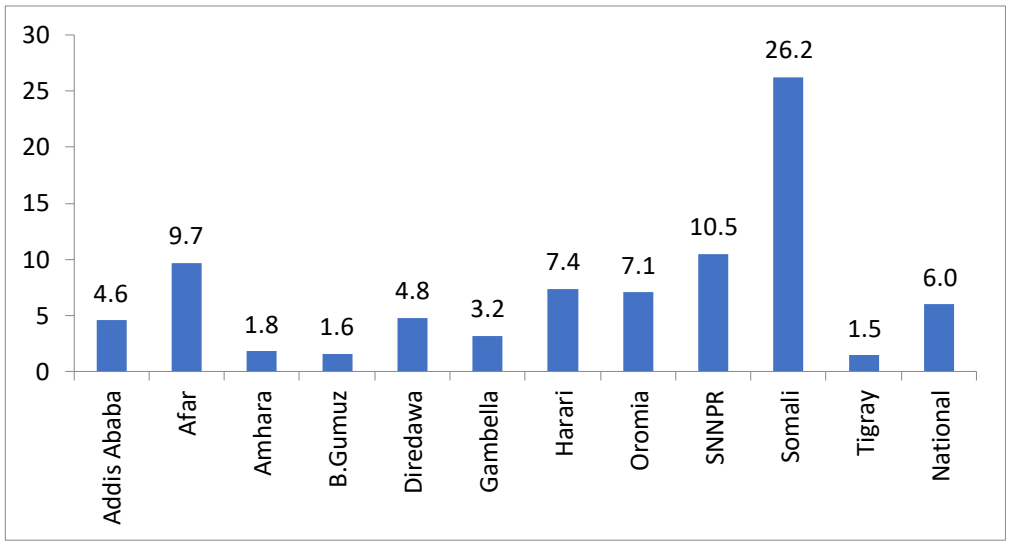


Figure 6: **Blood Glucose greater or equal to 110mg/dl or on medication by region**

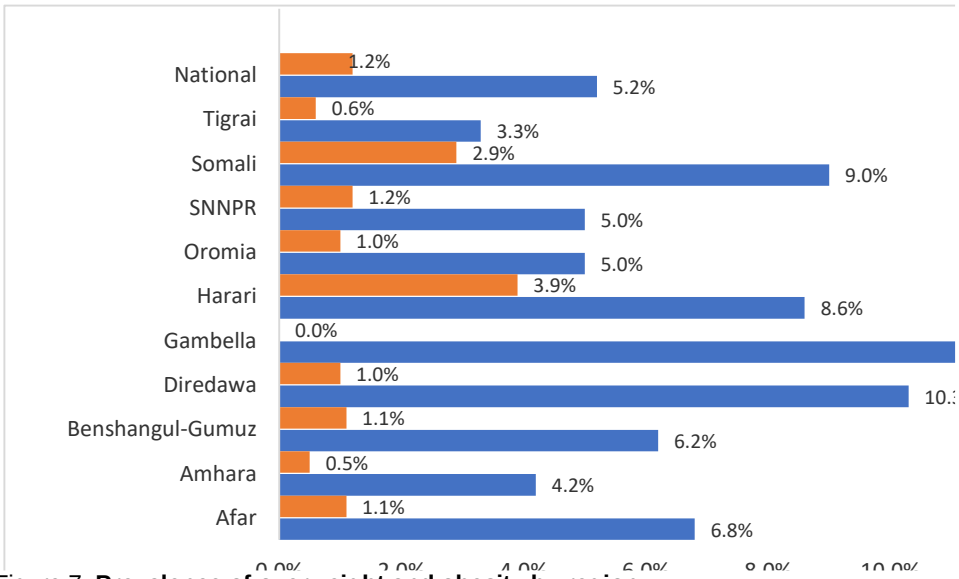


Figure 7: **Prevalence of overweight and obesity by region**

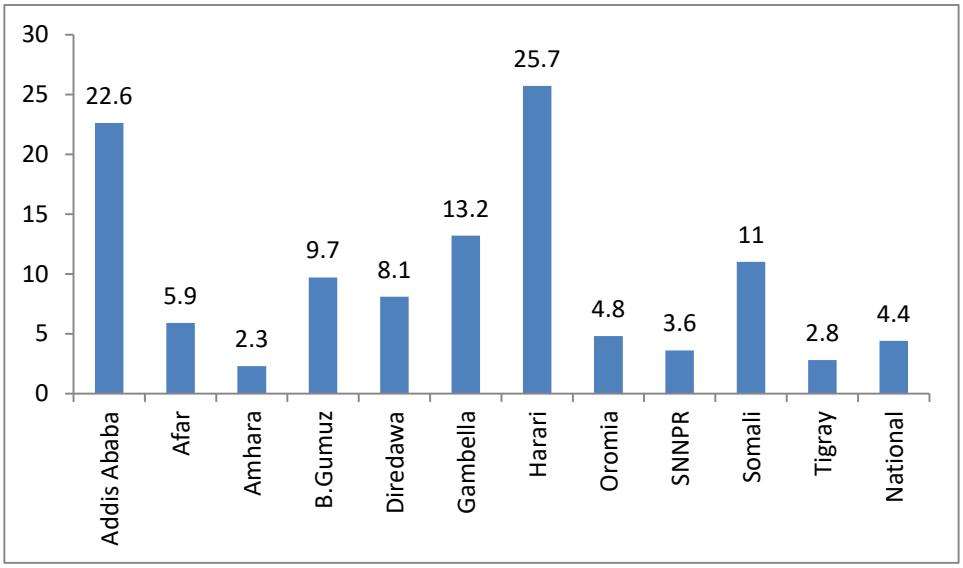


Figure 8: **Prevalence of metabolic syndrome (having three to five risk factors for NCDs) by region**

Evidence gap on NCDs burden and risk factors: Ethiopia conducted a comprehensive national NCD risk factors survey for the first time in 2015. The survey involved 10,000 people between 15-59 years of age, and employed the WHO STEPS survey tool. In 2009, there was a sentinel survey conducted at district level using the same WHO tool. The country established a national birth and death registry agency recently. However, NCD morbidity and mortality reports in Ethiopia are based on facility-based morbidity and mortality data. Currently, Ethiopia has only one cancer registry canter, established in central referral hospital that provides chemotherapy to most patients and is the only radiotherapy centre in the country. See Table 2 for summary on the country's progress on evidence generation.

Table 2: **Country progress on evidence generation on NCDs**

Standard NCD response indicators	*Progress made by the country*
WHO NCD STEPs survey recommended every three to five years.	The 2009, district level (Gilgel-Gibe) WHO Steps survey. The national community-based NCD STEPs survey conducted at the end of 2015.
A functioning system for generating reliable cause-specific mortality data on a routine basis.	Addis Ababa Cancer registry established, but no regional cancer registry centres. Facility based cause specific registry available but data collection system not standardized. National birth & death registry agency established.

Health care delivery system readiness and gaps in addressing NCDs

Chronic care service at primary healthcare level: Chronic care services at the primary health care level were assessed using WHO package of Essential NCD interventions (WHO-PEN) strategy. WHO-PEN is an innovative and action-oriented set of cost-effective interventions delivered to an acceptable quality of care, even in resource-poor settings at a cost of as low as 1dollar/person/year (11). As part of the NCD response, the Federal Ministry of Health of Ethiopia adopted the WHO-PEN strategy. Ethiopia's progress in delivering chronic case services using the WHO-PEN tool is depicted in Table 3.

Table 3: **Implementation of WHO-Package of Essential NCD interventions (WHO-PEN)**

Evidence based National guidelines/protocols/standards for the management of major NCDs through a primary care approach, recognized/approved by government or competent authorities.	
Standard progress indicators	***Country status***
National NCD strategic action plan	Strategic action plan available and addressed PHC on priority three as: *"strengthen and reorient health systems to address prevention & control of non-communicable diseases through people-cantered primary care & universal health coverage".*
WHO-Package of Essential NCD interventions (WHO-PEN) adoption.	WHO-PEN interventions guideline adopted by FMOH, as chronic care management at primary health care level. National palliative care strategy developed.
Provision of drug therapy, including glycaemic control, and counselling for eligible persons of high risk to prevent heart attacks and strokes, with emphasis at the primary health care level.	
Standard progress indicators	***Country status***
WHO-PEN strategy implementation	The strategy piloted on 12 district hospitals and 36 primary health care facilities after two rounds of training on hypertension & Diabetes. Chronic care registry developed for facility based regular monitoring of hypertention, cardiovascular diseases & diabetes.

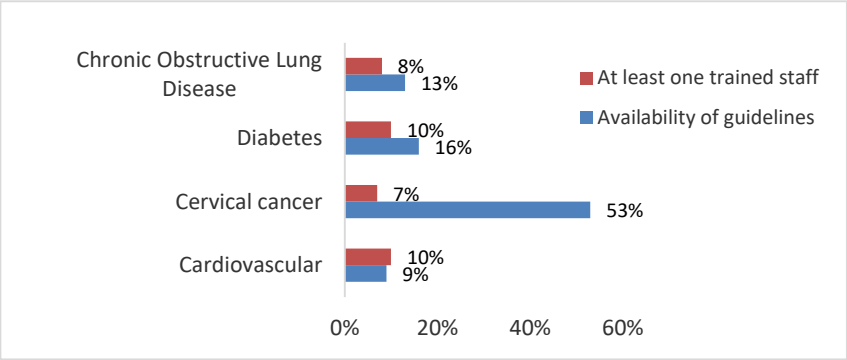


Figure 9: **Availability of guideline and trained staff (data source: Ethiopia SARA survey, 2016)**

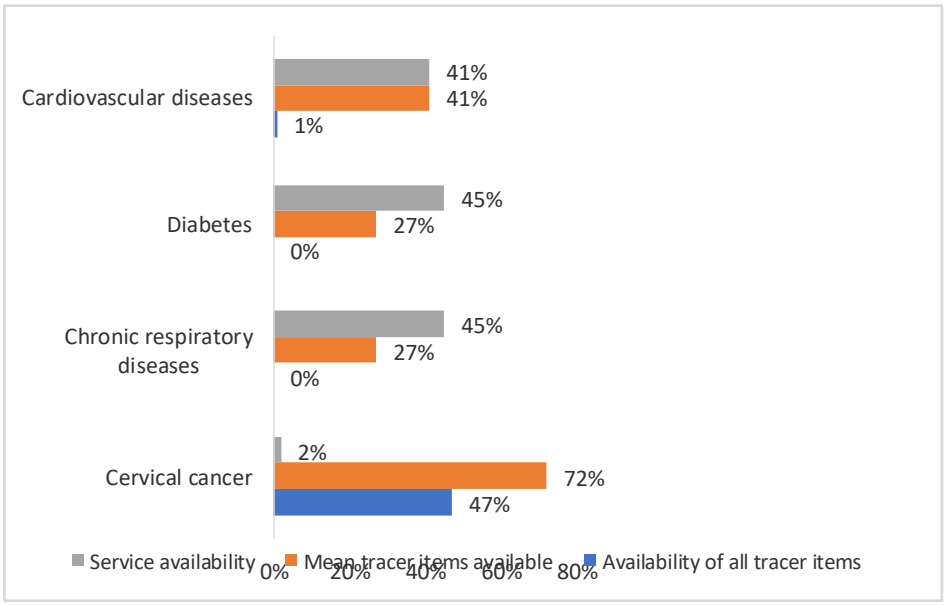


Figure 10: **NCDs service availability & readiness in Ethiopia (data source: Ethiopia SARA survey,2016)**

Essential CVD drugs	**Availability**	**Pricing (US$)**
Aspirin	23.08%	$0.013/tab
Clopidogrel	Not registered	
Thiazide diuretics (HCT)	46.15%	$0.024/tab
Calcium channel blockers (Nifedipine)	65.38%	$0.026/tab
ACE inhibitors (Enalapril)	46.15%	$0.026-$0.029/tab
Beta blockers (Atenolol)	19.23%	$0.015 (50 mg tab)
Isosorbide dinitrate	Registered but not available	
Statins	Not available	
Essential diabetic drugs		
Glibenclamide	46.15%	$0.0017/tab
Metformin	38.46%	$0.026/tab
Human insulin short/rapid acting	7.69%	$0.22/vial
Human insulin intermediate acting	11.54%	$0.026/vial
NB: Warfarin, Chlorthalidone, Amlodipine, Captopril, Ramipril, Bisoprolol, Carvedilol, Metoprolol, Simvastatin and Atorvastatin were not available.		

Figure11: **NCDs drug availability and pricing at primary health care in Ethiopia (data source: NCD drug Availability & pricing survey, FMOH, WHO, September 2017)**

Discussion

Non-communicable diseases are on the rise in Ethiopia, and there are two possible explanations for the current burden. The first possibility is that the burden from NCDs has truly increased and become highly prevalent in the urban settings due to behavioral and life style changes and increased urbanization. The second possibility is that NCDs were existing problems and became more visible following a higher reduction in communicable, maternal, neonatal and nutritional diseases and increased population size and/or aging. These findings support the possibilities of: increased absolute number of DALYs due to NCDs and decreased DALYs due to Maternal, Neonatal and Nutritional (CMNN) diseases and decreased age-standardized DALYs after controlling for population growth and aging during the last 25 years. Age-standardized DALYs due to non-communicable diseases have declined slowly compared to CMNN problems, supporting the argument that NCDs were not amongst the national priorities. National strategies and action plans on NCDs were not in place until 2010 and the national response to NCDs remains fragmented.

The evidence on metabolic risk factors from the 2015 WHO-STEPs survey shows that raised blood pressure, high cholesterol, high blood glucose, and metabolic syndrome affect a significant proportion of the population with marked regional variation in prevalence. Reduction of mortality and morbidity from NCDs requires successful effort to address these risk factors. For instance, increased blood pressure, the prevalence of which in Ethiopia is between 4.5 to 38.6% with national average at 16%, is a major global risk factor for cardiovascular and chronic kidney diseases (13). Without urgent and effective response,

high blood pressure is likely to contribute to increased burden of NCDs in the coming years.

Data availability on NCDs remains low in Ethiopia, making accurate estimation of the morbidity and mortality of NCDs difficult. The lack of strengthened NCD cause-specific monitoring system in Ethiopia has been reported previously (15) with little progress to date. Furthermore, with 40% of the urban population using private health facilities (16) where the monitoring system is not well regulated and not integrated to the national health management information system (HMIS), capturing the full burden of NCDs based on facility-level data alone is challenging. One of the recommendations of the global action plan on NCDs is monitoring the trends and determinants of NCDs and evaluation of progress in prevention and control using a range of data sources and approaches. These includes vital registration systems, national cancer registries, integrated surveillance of NCDs within the national HMIS, periodic risk factor surveillance, such as adopting the WHO STEPs, and establishing strong technical and institutional capacities for NCD surveillance (17). Data from these sources would be vital for setting baselines and target setting on behavioural and metabolic risk factors at national and regional level. In addition, studies recommend the use of a sentinel surveillance approach with strong electronic medical record systems and data quality assurance procedures for effective surveillance of NCDs (18). However, the rates of computer and network possession at health facilities in Ethiopia is only 2% according to WHO-SARA survey of 2016. While encouraging efforts were done in evidence generation for NCDs in the last few years, such as the conduct of WHO STEPs survey in 2015 and SARA survey in 2016 and establishment of the Addis Ababa cancer registry, a lot remains to be done to ensure NCD burden and risk factors are effectively captures.

Even though Ethiopia made marked progress in achieving some of the health-related MDGs through expansion of primary health care (PHC) and the innovative health extension program (HEP) at community level (19) the progress it made in terms of providing integrated services for NCDs at PHC-level is minimal. Our analysis shows that the health system is still primarily oriented towards handling acute and communicable health conditions and maternal and child health issues as with other developing countries. The resources allocated and service availability for NCDs remains low (20). According to the WHO-STEPs survey, 97% of hypertensive patients in Ethiopia do not receive appropriate preventive care or treatment, with only 2.8% receiving treatment and 1.5% having their hypertension controlled. Primary health care is the only level for creating an opportunity for mutually reinforcing preventive and therapeutic interventions for NCDs due to its proximity and affordability to the communities. Thus, the Ethiopian health system needs reorientation to address NCD service gaps effectively and in an integrated manner.

Overall, Ethiopia has made strides towards adopting global initiatives to expand services for NCDs. For example, the NCD global action plan emphasizes the need for health system strengthening for the prevention and control of NCDs and addressing the underlying social determinants. This requires people-centred PHC and universal health coverage (17). In line with this, the government of Ethiopia has adopted a people-cantered PHC with aim to achieve universal health coverage by setting targets for the prevention and control of hypertension and diabetes in its Health Sector Transformation Plan (HSTP 2016-2020). These targets are congruent with the global targets. The country also adopted almost all of the nine global voluntary targets set by the 2013 World Health assembly which has the overarching aim to achieve a 25% reduction of premature death from the four major NCDs by 2025 (9,10).

However, there are several gaps in the planning, organization and delivery of health services for NCDs. First, health care delivery without sustainable financial mechanism cannot ensure universal health coverage. The current out-of-pocket expenditure in Ethiopia is 33.8 %, which is detrimental to health seeking behaviour, especially for NCDs given the silent nature and slow progress of the diseases. Although the Ethiopian government embarked on established community health insurance system with the aim to improve access and utilization of healthcare, the rate of client enrolment remains low and requires strong financial capacity to support NCD services (21). Despite the huge progress made, the current health workforce in Ethiopia (4.93/10,000) remains short of the 22.8/10,000 target recommended to effectively provide essential health services, meet the universal health coverage and health-related SDGs (22, 23). Thus, meeting the health workforce ratio is vital to ensure comprehensive NCD preventive and treatment services at the PHC level in Ethiopia. In addition to efforts to "flood" student's enrolment in to health sciences, task-shifting efforts are underway to improve NCD services provision. Besides, deployment of health extension workers that link the community to PHC (24), there is a lack of simplified evidence-based treatment guidelines and job aids targeting NCDs and health workers trained on NCD services (Figure 9). The high turn-over of health workers in rural areas is also a major challenge to provision of quality NCD services (25). Studies showed that task-shifting strategy works for non-communicable diseases scenario in sub-Saharan African setting (26), although specific training, such as cardiovascular risk assessment need to be provided.

According to SARA 2016, the general service readiness index was 54 percent, implying that 54 percent of all health facilities, excluding health posts are ready to provide the general health services. Even when service availability is improved, such as for cervical cancer screening using VIA through the efforts of the FMOH and the high-level political commitment led by the former First Lady,uptake remains disproportionately low due to lack of skilled

manpower, high turn-over rate (27), and low health care seeking behaviour.

The study revealed that availability of essential NCD drugs is far below the recommended global target of 80% at primary health care level to address the NCD epidemic (Figure 11). In addition, the low availability of diagnostic facilities for NCD, such as tests for blood glucose (24%) and the overall mean diagnostic capacity of 39% are also huge gaps (27).

Conclusions and recommendations:

Ethiopia is in both demographic and epidemiologic shift with the burden of NCDs is steadily increasing. Despite the encouraging efforts, however, the gaps in evidence generation on morbidity and mortality of NCDs and the planning, organization and delivery of preventive and curative services for NCDs, especially at primary health care level, remains unsatisfactory. Therefore, a range of policy and strategic measures that involve reforming and re-orienting the health system should be taken to effectively respond to the NCD epidemic in Ethiopia. The following are key considerations for action in the coming years:

1. The NCD burden in Ethiopia should be brought to the attention of policy makers through appropriate investment case to ensure NCDs compete with existing disease prevention and control priorities.
2. The high political commitment and coordination seen on national cancer control which resulted in significant improvements in the screening and treatment of cervical cancer and expansion of cancer infrastructure should be enhanced to address other NCDs and bring non-health sectors on board for the national NCD response.
3. There needs to be more evidence on NCDs to support target setting and monitoring progress on NCD response. This requires strengthening the national HMIS, conducting periodic risk factor assessments and scaling up cancer registry to national level. Improving data management capacity through e-HMIS and/or the use of open-source platforms such as the DHIS-2 would be critical.
4. Innovative and sustainable financial mechanisms advocated by the WHO and civic societies to support the NCD service delivery through "sin taxes" such as increase in tobacco taxation and other financial levies need to be adopted. Given the huge epidemiologic overlap between NCDs and communicable diseases, it would be vital to integrate NCD prevention and treatment services for to those of other diseases for efficiency gains through resource sharing
5. The efforts to increase health workforce should be strengthened. To ensure the task-shifting approach has the desired impact, the country needs to develop simplified evidence-based protocols and treatment algorithms, supplementary job aids and training curricula for treatment of NCDs by mid-level professionals.
6. Ensuring essential NCD drugs are available at the primary healthcare level through review of pharmaceutical policy for bottlenecks, strengthening supply chain systems, local manufacturing of generic NCD drugs and diagnostic facilities are critical.
7. Community engagement should be enhanced for NCD response for better understanding of their health problems and improved health care seeking behavior (35).

Acknowledgments:

The Authors would like to thank International health metrics for providing us the 1990-2015 Ethiopian NCD burden analysis. Ethiopian Public Health Institute (EPHI), and Federal Ministry of Health (FMOH) for conducting WHO-STEPs survey and Service availability and readiness (SARA) survey which is used as an input for this NCD health care delivery policy, strategy and gaps analysis.

Author's contribution:

FS & YF designed the study methodology; the national task-force members TG, ThG, AD, AA, AB, KA, HT, TT, GT MG, GG, AlB, TK, DY, MuG, FC, YG, KiM, Mul G, YT. Commented the study methodology; FS wrote the paper: AM, wrote disease burden section: ML & MK critically reviewed the document.

Funding: No funding for writing this policy manuscript.

Competing interests:

All authors declare they have no competing interests. The authors are solely responsible for the views expressed in this article, and they do not necessarily represent the views, decisions, or policies of their institutions.

Consent for publication: Not applicable because the manuscript does not include details, images, or videos relating to individual participants.

Ethics approval; Ethical approval got from the ethical committee of Ethiopian public health institution.

References

1. WHO. Global status report on noncommunicable diseases, 2010.
2. WHO. African Regional Health Report, 2014.
3. WHO. Global status report on noncommunicable diseases, 2014.
4. Misganaw A, Haregu TN, Deribe K, Tessema GA, Deribew A, Melaku YA, et al. National mortality burden due to communicable, non-communicable, and other diseases in Ethiopia, 1990–2015: findings from the Global Burden of Disease Study 2015. Popul Health Metr. London: BioMed Central; 2017 Jul;15:29.
5. Bollyky BTJ, Templin T, Cohen M, Dieleman JL. Lower-Income Countries That Face The Most Rapid Shift In Noncommunicable Disease Burden Are Also The Least Prepared. 2017;11(11):1866–75.
6. United Nations. 2011 High Level Meeting on the Prevention and Control of Non-communicable Diseases. In: High Level Meeting [Internet]. New York: United Nations; 2011. Available from:

http://www.un.org/en/ga/ncdmeeting2011/
7. African Health Ministers. THE BRAZZAVILLE DECLARATION ON NONCOMMUNICABLE DISEASES PREVENTION AND CONTROL IN THE WHO AFRICAN REGION. In: Uniting against NCDs;the time to act now. WHO; 2011.
8. African Health Ministers. The Luwanda devleration on Universal Health coverage in Africa. In: UNIVERSAL HEALTH COVERAGE IN AFRICA: FROM CONCEPT TO ACTION. WHO; 2014.
9. WHA 66.10. Follow-up to the Political Declaration of the High-level Meeting of the General Assembly on the Prevention and Control of Non-communicable Diseases. In: Sixty-Six World Health assembly [Internet]. WHO; 2013. Available from: http://apps.who.int/gb/ebwha/pdf_files/WHA66/A66_R10-en.pdf
10. FMOH. National strategic action plan for the prevention and control of NCDs in Ethiopia, 2014 – 2016. 2014;
11. John W. Creswell. Research design : qualitative, quantitative, and mixed methods approaches. 4th ed. Knight V, editor. SAGE Publications, Inc.; 2014. 42-53 p.
12. WHO. Package of essential noncommunicable disease interventions for primary health care in low-resource settings. Geneva; 2010.
13. Global Burden of Metabolic Risk Factors for Chronic Diseases, Collaboration. Cardiovascular disease, chronic kidney disease, and diabetes mortality burden of cardiometabolic risk factors from 1980 to 2010: a comparative risk assessment. Lancet diabetes endocrinol. 2014;2:634–47.
14. WHO. Global NCD target reduce high blood pressure. 2016.
15. Letebo M, Shiferaw F. Adapting HIV patient and program monitoring tools for chronic non-communicable diseases in Ethiopia. Global Health. 2016;12(1).
16. Ethiopia FM of H. Ethiopia's Fifth National Health Accounts 2010/2011. Addis Ababa;
17. Organization WH. Global action plan for the prevention and control of noncommunicable diseases 2013-2020. World Heal Organ. 2013;102.
18. Kroll M, Phalkey RK, Kraas F. Challenges to the surveillance of non-communicable diseases--a review of selected approaches. BMC Public Health. England; 2015 Dec;15:1243.
19. Mebratie AD, Sparrow R, Yilma Z, Alemu G, Bedi AS. Enrollment in Ethiopia ' s Community-Based Health Insurance Scheme. WORLD Dev. Elsevier Ltd; 2015;74:58–76.
20. Reidpath DD, Allotey P. The burden is great and the money little: Changing chronic disease management in low- and middle-income countries. J Glob Health. Scotland; 2012 Dec;2(2):20301.
21. Workie, Netsanet W;Ramana GN. The Health Extension Program in Ethiopia [Internet]. Washington DC; Available from: https://openknowledge.worldbank.org/handle/10986/13280 License: CC BY 3.0 IGO
22. Campbell J, Dussault G, Buchan J, Pozo-Martin F, Guerra Arias M, Leone C, et al. A universal truth: No health without a workforce. Forum Rep Third Glob Forum Hum Resour Heal Glob Heal Work Alliance World Heal Organ [Internet]. 2013;104. Available from: http://www.who.int/workforcealliance/knowledge/resources/GHWA-a_universal_truth_report.pdf?ua=1
23. Pozo-Martin F, Nove A, Lopes SC, Campbell J, Buchan J, Dussault G, et al. Health workforce metrics pre- and post-2015: A stimulus to public policy and planning. Hum Resour Health. 2017;15(1).
24. Abebe Alebachew; Catriona Waddington. Improving health system efficency,Human resource for health reforms,Ethiopia. 2015.
25. Gesesew HA, Tebeje B, Alemseged F, Beyene W. Health Workforce Acquisition, Retention and Turnover in Southwest Ethiopian Health Institutions. Ethiop J Health Sci. Jimma, Ethiopia: Research and Publications Office of Jimma University; 2016 Jul;26(4):331–40.
26. Lekoubou A, Awah P FL, Sobngwi E KA. Hypertension, diabetes mellitus, and task shifting in their management in sub- Saharan Africa. Int J Env Res Public Heal. 2010;7(2):353–63.
27. EPHI, FOMH Ethiopia W. Services Availability and Readiness Assessment Summary Report Ethiopia Service Availability and Readiness Assessment 2016 Summary Report. 2016;1–123.