

CAPACITY AND READINESS TO PREVENT AND MANAGE NON-COMMUNICABLE DISEASES: A SURVEY OF PRIMARY HEALTH FACILITIES IN MAIDUGURI, NIGERIA.

Paul Otor Onah* and Abubakar Mohammed

Department of Clinical Pharmacy and Pharmacy Administration, University of Maiduguri, Borno State, Nigeria.

*Corresponding Author's E-mail: onahpaul@unimaid.edu.ngDOI: [njcpt.com.ng/101.1.2.40](https://doi.org/10.1.2.40)**Abstract**

Background: Non-communicable diseases (NCDs) and associated complications are on the rise in many low- and middle-income countries where they are becoming major contributors to rising morbidity and mortality. Since the launch of Nigeria's NCD strategic control plan, there have been few studies aimed at determining the level of progress made in the implementation of the policy. This study aimed to assess the capacity and readiness of primary healthcare facilities (PHCs) to prevent and manage NCDs.

Methods: This was a cross-sectional survey study of twenty primary healthcare facilities in four local government areas of Borno State (Konduga, Jere, Maiduguri, Mafa). The facilities were visited, and data was obtained from personnel interviews, and direct observation of equipment and services provided using the WHO-SARA tool. Oral interviews were carried out with the most senior administrative staff (Medical officer/nurse) who provided details of personnel, equipment, and services before physical verification. The data was entered into SPSS version 21 for descriptive statistics and results were expressed using descriptive statistics.

Results: The findings showed that 5.7% of all consultations were related to NCDs of which cardiovascular diseases accounted for 57.1% while diabetes mellitus (29.5%) and asthma (13.4 %) were the most encountered. The capacity and readiness to provide NCD management services was generally poor. Capacity and readiness scores include equipment (64.6%), services (42.8%), laboratory tests (49.2%), referral of patients (47.7%) and medicine availability (33.9%). Human resources largely included community health workers (100%) and nurses (80%). Physicians and pharmacists were only found in 30% of facilities surveyed. The overall readiness scores found in this study (39.9%) is very low indicating a clear inability to provide quality NCD management services.

Conclusion: The capacity of facilities in terms of human resources, equipment, laboratory services and referrals was generally low. The same was observed with readiness to manage cardiovascular diseases, diabetes mellitus and asthma. This is a reminder that the primary healthcare facilities are currently ill-prepared to control and manage the emerging NCD pandemic.

Keywords: Capacity, Readiness, Non-communicable diseases, Primary healthcare, Preparedness

Introduction

Non-communicable diseases (NCDs) are rapidly becoming a major cause of preventable morbidity and mortality among the adult population in developing countries. Recent projections indicate that NCDs are directly responsible for over 41 million deaths annually ^[1] of which 77% is estimated to occur in developing countries ^[1,2]. The major NCDs responsible for most of the mortality include cardiovascular diseases (CVD), chronic respiratory diseases (CRD), diabetes mellitus (DM) and cancers ^[3]. If current rates continue, NCDs will be the most important cause of all mortality globally among the adult population by the year 2030 ^[1,4]. In a recent report, the World Health Organization estimated that up to 75% of all premature deaths occurring among 30 – 69-year-olds in developing countries were related to one or more of these four NCDs ^[1,5,6].

In Nigeria, there are increasing reports of rising cases of NCDs particularly among urban dwellers, although less frequently reported among rural residents ^[7-9]. This disparity in prevalence is related to a lack of data from rural health facilities, absence of epidemiological surveys and little focus on early detection of NCDs. The economic impact of NCD management global economy is projected to rise to

\$47 trillion over the next decade, which is equivalent to 75% of the gross domestic product of twenty years if there is no reversal of the current trend [10].

The effect of the lifelong cost of treatment on household income is huge and capable of driving the most economically vulnerable segment of the population into poverty.

Over the last decade, WHO and the UN General Assembly have initiated global intervention policies aimed at containing the rising epidemic of NCDs. Some of the policies were contained in policy declarations and resolutions outlining steps to be taken, human resource development and country specific implementation strategies [11,12]. These resolutions along with political commitment by heads of governments led to the endorsement of the WHO global action plan for the prevention and control of NCDs 2013 – 2020. The follow-up action plan provides member countries with a clear list of policy options which if implemented will contribute to a significant reduction of NCDs and the achievement of global targets by 2025. The global control targets include a 25% reduction target in premature deaths, a 10 – 30% reduction in risk factors related to the use of alcohol, and salt, reduction of blood pressure, obesity etc. The targets also included 50% of eligible patients being on drug therapy and 80% availability of NCD medicines in both public and private health facilities [13].

In Nigeria, the national strategic action plan on NCD prevention first published in 2015 was largely in alignment with WHO global strategic action plan 2013 – 2020. The policy document not only identified primary healthcare system as central to implementation strategy, it also envisaged integration of all public health activities that impact on social determinants of NCDs such as promotion of healthy lifestyles and management of cases [14,15]. The follow-up 2020 – 2030 roadmap for the WHO global action plan mandates governments to mainstream its NCD control policies and implementation strategies into the primary healthcare system from where good treatment outcomes have been well documented [16-19].

The primary healthcare system being the first point of healthcare services for the majority of the population is expected to make NCD prevention accessible and cheaper if well-funded and administered [20-22]. In order to achieve global targets, significant improvements in capacity and readiness are needed in the primary healthcare system. There is a need for government investment in manpower development, availability of skilled personnel, basic technologies, diagnostics, equipment, essential drugs, and a sustainable healthcare financing system [23,24].

Over the last few decades, there have been mixed performance reports on NCD prevention and management from several primary healthcare systems in developing countries [25-27]. Literature evidence from southeast Asia [28-31] and sub-Saharan Africa [32-34] have generally reported suboptimal capacity and poor readiness. However, evidence from Nigeria is rather scanty [35,36].

The primary healthcare system in Nigeria is still bedevilled by poor funding and systemic lack of capacity in all aspects of service delivery and questions remain regarding the progress that have been made since the rollout of the NCD control policy [37-39]. This lack of information on the implementation of the national action plan as well as the lack of capacity and readiness is widespread in developing countries [40,41]. The major aim of this study is therefore to assess the capacity and readiness of primary healthcare facilities to prevent and manage NCDs.

Methods

Setting

The city of Maiduguri is a major metropolitan city in Borno State Northeast Nigeria, which is home to millions of internally displaced persons arising from the decade-old Boko Haram insurgency. The city consists of four local area councils (Jere, Mafa, Konduga and Maiduguri municipal area council) and it remains the hub of humanitarian operations in the region. The state primary healthcare development agency is generally responsible for managing primary healthcare facilities including those located in internally displaced persons camps.

Study design

This was a cross-sectional descriptive study using the WHO-SARA tool ^[23] to assess the capacity and readiness of primary healthcare facilities to prevent and manage NCDs. The tool consists of seven domains into which data is collected on human resources, equipment, services, diagnostics, information management and availability of NCD medicines.

Sample size/Sampling

A total of twenty-two primary healthcare facilities located within the study area were used for the study. The other two found were excluded based on the absence of $\geq 50\%$ service availability and poor record quality.

Selection of medicines

The list of seventeen tracer NCD medicines was drawn up following a review of the approved medicines list for use in the primary healthcare system and national standard treatment guidelines. Cancer medicines were excluded because the disease is not managed at this level of the country's healthcare system.

Data collection

A pair of trained research assistants visited selected primary healthcare facilities and collected data between June and November 2022. There were also interviews with administrative heads and/or the most senior staff who provided information on personnel and their qualifications, services provided, attendance and referral records, medicine availability etc. The information obtained from interviews on equipment, medicines, laboratory supplies, information management systems and availability of health education materials were verified through direct observation.

Variables of service and readiness

The capacity to provide services was calculated as a percentage of primary healthcare facilities that have the required equipment, diagnostics, and other applicable services. Readiness was calculated based on the availability of selected tracer items from each service domain related to each type of NCD (equipment, diagnostics, essential medicines etc.). The facilities that did not have the tracer items were considered not to be ready to provide the specific service. Availability score was calculated for each service domain based on tracer items, and service-specific readiness was calculated as an overall composite score based on availability score across all service domains and expressed as a percentage. A capacity and readiness score of $\geq 80\%$ was considered "satisfactory" as having the capacity and readiness.

Data analysis

The data was cleaned and entered into SPSS version 21 and analysed using descriptive statistics and results were expressed as frequencies and percentages.

Ethical issues

The study received approval from the health research ethics committee of the Borno State Ministry of Health (*SHREC/049/2021*)

Results

The composition of medical staff showed that most of the facilities had nurses (80%), midwives (85%), community health extension workers (100%) and laboratory technologists (75%). Physicians and pharmacists were found only in 30% of surveyed facilities. The capacity score of 62.1% was recorded for this domain (**Table 1**).

Table 1: Human resources

Category of staff	PHCs where available	PHCs Not available
--------------------------	-----------------------------	---------------------------

	Number (%)	Number (%)
Physicians	6 (30)	14(70)
Pharmacists	6(30)	14(70)
Nurses	16(80)	4(20)
Midwives	17(85)	3(15)
Community health workers	20(100)	
Pharmacy technicians	7(35)	13(65)
Laboratory technologists	15(75)	5(25)
Score	62.1%	37.9%

There was availability of functional basic equipment was highly variable and ranged from 100% for sphygmomanometers, stethoscopes, thermometers, weighing scales and measuring tape to 15% oxygen cylinders, nebulizers (10%) and spacers for inhalers (5%). The capacity score for this domain was 64.5% (Table 2)

Table 2: Functional equipment

Description of equipment	Available and functional	Unavailable/malfunctioning
	Number (%)	Number (%)
Oxygen cylinders	3 (15)	17 (85)
Blood pressure apparatus	20 (100)	
Weighing scale	20 (100)	
Measuring tape	20 (100)	
Nebulizers	2 (10)	18 (90)
Stadiometer	14 (70)	6 (30)
Peak flow meter		20 (100)
Stethoscope	20 (100)	
Thermometer	20 (100)	
Health educational materials	20 (100)	
Spacers for inhaler	1 (5)	19 (95)
Glucometer	15 (75)	5 (25)
Score	64.6%	35.4%

Medicine administration services were available in all the facilities (100%) except for oxygen administration (25%), cardiopulmonary resuscitation (30%), examination for neuropathy (25%) and visual acuity tests (5%). There was a total absence of peak flow test and ophthalmoscopy in all the facilities surveyed. The overall capacity score of 42.8% was calculated for this domain (Table 3)

Table 3: Infrastructure/services

Description of service	Available	Not available
	Number (%)	Number (%)
Administration of oxygen (via mask or tube)	5 (25)	15 (75)
Administration of IV fluids/drips	20 (100)	na
Intravenous injection (IV)	20 (100)	na
Intramuscular injection (IM)	20 (100)	na
Cardiopulmonary resuscitation	6 (30)	14 (70)
Visual acuity test	1 (5)	1 (5)
Examination for neuropathy with a hammer or turning fork	5 (25)	15 (75)
Peak flow test	na	20 (100)
Ophthalmoscopy	na	20 (100)
Score	42.8%	47.2%

Key: na – not available

Diagnostic test services were satisfactorily available for blood glucose test (80%) and urine albumin test (75%) in all the facilities surveyed. However, tests for serum creatinine (10%), blood cholesterol (20%) and urine ketone bodies (30%) were the least available. The overall capacity of 49.2% was the average score for this domain (**Table 4**)

Table 4: Diagnostics

Laboratory tests	Available Number (%)	Not available Number (%)
Urine albumin/protein test	15 (75)	5 (25)
Urine glucose test	16 (80)	4 (20)
Urine ketone bodies	6 (30)	14 (70)
Blood glucose	16 (80)	4 (20)
Blood cholesterol	4 (20)	16 (80)
Serum creatinine	2 (10)	18 (90)
Average score	49.2%	50.8%

The majority of patients accessed facilities based on appointments and walk-ins (75%) and in only 60% were medical records used during consultations. While there is a manual patient register in all the facilities, only 60% of records were available for use during patient visits and only 20% were up to date. There was satisfactory availability of health education materials for risk behaviour counselling (100%), self-management of diabetes mellitus (100%), although education on self-administration of insulin (5%) was very poor. The overall score for this domain was 70% (**Table 5**).

Table 5: Medical information system/Patient records

Patient access to the facility	Walk-in only (%) 5 (25)	Appointment only (%) na	Combination of both (%) 15 (75)
Record of visits kept	Records kept for all visits 14 (70)	Records kept for certain visits 6 (30)	No records kept na
How are records kept?	Patient files na	Registry system 20 (100)	na
Records consulted	Records consulted all the time 12 (60)	Consulted when necessary 8 (40)	Not consulted na
Stock card	Yes, not routinely used na	Routinely used and up-to-date 20 (100)	Not used at all na
Medicines	na	20 (100)	na
Consumables	2 (10)	18 (90)	na
Risk behavioural counselling	Yes 20 (100)	na na	Don't know na
Self-management in diabetes	Yes 20 (100)	na	na
Self-administration of insulin education	1 (5)	16 (80)	3 (15)

Key: *na = not available*

There was a written procedure for patient referral (100%), however, the lack of ambulance services in more than half of the facilities presented challenges. While patients were successfully referred to secondary and tertiary health facilities in half of all cases of NCD emergencies, only a third of them were returned to the facility for continuation of care. The performance score was 47.7% for this domain (Table 6).

Table 6: Patient referrals

Item	YES	NO
	Number (%)	Number (%)
Ability to refer patients during emergencies	20 (100)	na
Is there a need to refer patients for NCDs	20 (100)	na
Ambulance available in the facility	8 (40)	12 (60)
Ambulances are used to transfer patients in emergencies	8 (40)	12 (60)
Ambulance is the most used mode of transportation	7 (35)	14 (70)
Is there an arrangement to refer patients for specialist care	2 (10)	18 (90)
Are patients sent back to the facility from a referral hospital?	8 (40)	12 (60)
Are referrals made only for additional tests	3 (15)	17 (85)
Patients in emergencies are easily referred within minutes of arrival	10 (50)	10 (50)
Average score	47.7%	52.3%

Key: *na – not available*

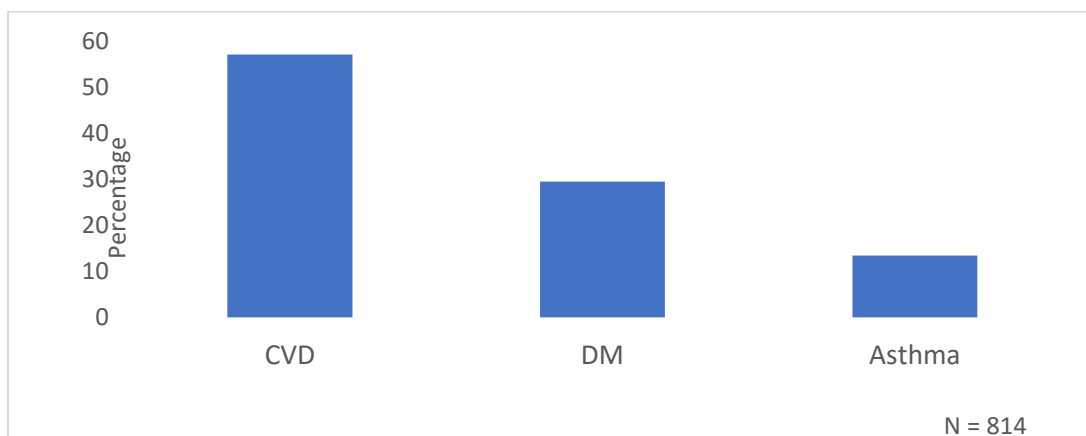
The results of NCD medicine availability showed that only 33.9% were always available and another 21.1% were sometimes available in their inventory. The capacity to provide NCD medicines was only 33.9% (Table 7).

Table 7: Availability of selected NCD drugs

Name of drug	Always available	Sometimes available	Not available at all
	N (%)	N (%)	N (%)
Aspirin 75mg	6 (30)	3 (15)	11 (55)
Atenolol	7 (35)	7 (35)	6 (30)
Amiloride +Triamterene	3(15)	11 (55)	6 (30)
Amlodipine	16 (80)	2 (10)	2 (10)
Aminophylline	1 (5)	4 (20)	15 (75)
Bendrofluorothiazide	3 (15)	3 (15)	14 (70)
Glibenclamide	3 (15)	3 (15)	14 (70)
Hydrocortisone Inj	14 (70)	4 (20)	2 (10)
Lisinopril	5(25)	7 (35)	8 (40)
Insulin (soluble)	1 (5)	na	19 (95)
Metformin	8 (40)	6 (30)	6 (30)
Methyldopa	15 (75)	1 (5)	4 (20)
Nifedipine	11 (55)	5 (25)	4 (20)
Prednisolone	14 (70)	4(20)	2 (10)
Simvastatin	1 (5)	1 (5)	18 (90)
Salbutamol inhaler	7 (35)	5 (25)	8 (40)
Salbutamol tablets	5 (25)	8 (40)	7 (35)
Salbutamol injection	2 (10)	2 (10)	16 (80)
Average score	33.9%	21.1%	45%

A total of 14,197 recorded patient visits were made within the study period out of which 814 (5.7%) were for cases of one or more NCDs. A further breakdown showed that cardiovascular diseases

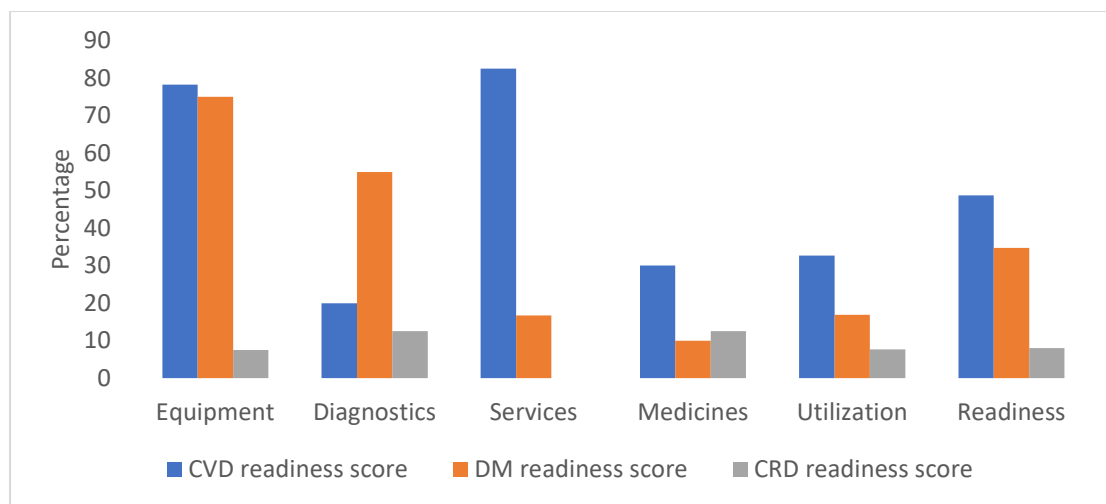
accounted for most of the cases (57.1%), followed by diabetes mellitus (29.5%) and chronic respiratory diseases (13.4%) (**Figure 1**)



Key: CVD- cardiovascular diseases, DM – diabetes mellitus

Figure 1: Prevalence of NCDs

The readiness score was higher for functional equipment for cardiovascular diseases (78.3%), and diabetes mellitus (75%) compared to chronic respiratory diseases (7.5%). The readiness score for diabetes mellitus tests was moderate (55%) but high for cardiovascular diseases (82.5%). The readiness score was low for cardiovascular diseases (48.7%), diabetes mellitus (34.7%) and chronic respiratory diseases (8%). The overall readiness score of 39.9% was low indicating a clear gap in NCD prevention and management. (**Figure 2**).



Key: CVD – cardiovascular diseases, DM – diabetes mellitus, CRD – chronic respiratory diseases

Figure 2: Readiness to provide disease-specific services

The overall capacity to manage NCDs was low to moderate across the service domains. While the score for equipment was moderate (64.5%) and human resources (62.1%) other domains had low scores ($\leq 50\%$) (**Figure 3**).

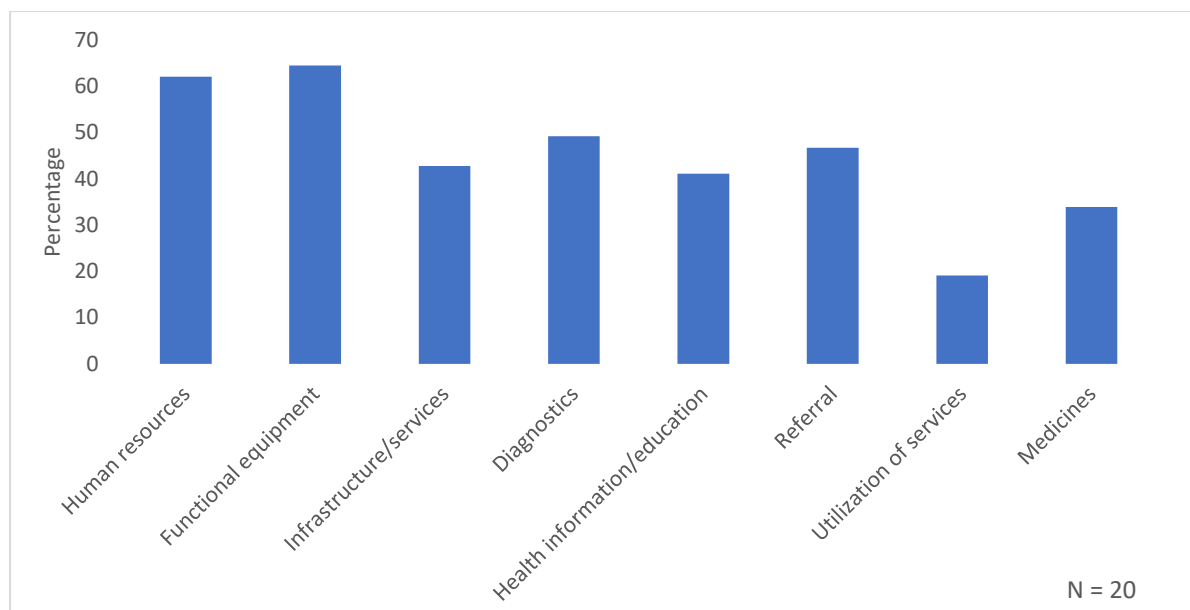


Figure 3: Capacity to provide NCD services

Discussion

The rising burden of NCDs in the country and the role of the primary healthcare system in the country outlined by the national strategic policy document appear to be making very little progress in achieving global control targets long after the launch of the programme. The low capacity and readiness observed in this study have been reported in similar studies in Nigeria and other developing countries [42,43]. The lack of capacity affected all service domains like previous studies [44,45], although a higher level of capacity has been reported for cardiovascular disease prevention [46,47]. Several other studies have also reported mixed results ranging from low to moderate capacity and readiness [30,47,48]. For instance, studies from some East African countries [29,49,50] and Southeast Asia [51-53] have generally reported lower levels of NCD service readiness compared to the findings of this study.

The most common reason(s) for lack of capacity and readiness have been reported to include lack of equipment [54,55], poor self-management education [46], poorly qualified and unskilled personnel [56], lack of functional referral system [23,32], non-adherence to standard treatment guidelines [33,45], absence of basic diagnostic and screening services [51], absence of health education materials [51] and low budgetary allocation to primary healthcare facilities [56] to mention a few. The lack of skilled and adequately trained personnel with requisite knowledge, experience, and competence to manage NCDs has similarly been reported in previous studies [44,57]. There have been acknowledgement that availability of highly skilled health workers tend to improve the quality of NCD management services [32]. While the widespread use of nurses, midwives, and community health workers at this level of healthcare has been well reported [58], the near absence of physicians and pharmacists at the primary healthcare level [54,55] remains a critical setback for the achievement of NCD control targets and quality of service delivery [59].

The paper-based patient registry and medical information system coupled with the lack of its use during follow-up visits is not a new phenomenon at this level of the healthcare system [23,46]. This poor use of medical information in subsequent consultations makes it difficult to carry out any evidence-based management of NCDs. The medical record is a key component of patient information required for continuation of care, monitoring of clinical outcomes, modification of therapy, prevention of complications and making referral decisions to higher levels of healthcare.

The availability of functional equipment was comparable to some previous studies [37,60], although mixed results have been reported [51,61,62]. This may partly be because most of the basic equipment was already provided for maternal/child health services [63,64]. For instance, equipment needed for the management of asthma and ophthalmology were largely unavailable [63,65] as they were not part of the items required for routine maternal and childcare.

Diagnostic services are critical to NCD detection, assessment, and monitoring of treatment outcomes, so poor capacity found in this study can significantly limit access to quality of care [66,46,56]. The rising cases of NCDs such as hypertension, diabetes, and asthma [67,68] and the lack of readiness [67,69] has been known to negatively affect service utilization [30,36,48].

Medicine availability is central to positive clinical outcomes, so nonavailability not only reduces the quality of service [54,70] but also forces patients to purchase them from unregulated sources thereby increasing the risk of exposure to fake and adulterated drugs. The challenge of low medicine availability remains a chronic public health challenge in most developing countries [38,18,55]. While some studies have in contrast reported higher availability of medicines [45,71,72], evidence from Nigeria showed a consistent pattern of poor medicine availability in both private and public sectors of the country's healthcare system.

The low capacity and readiness found in this study are generally consistent with previous studies from developing countries [32,73,74]. The inadequacies and unpreparedness of the primary healthcare system will make it increasingly difficult to achieve global NCD control targets in the country. The current practice of only deploying basic-level health workers to primary healthcare facilities needs to be revised to include higher cadres of healthcare professionals if any meaningful impact can be made in stemming the scourge of NCDs among the most vulnerable segment of the population. The role of pharmacists in medication management, monitoring of therapy, and pharmaceutical care services including identification and resolving drug therapy problems are too critical to be ignored.

Conclusion

The capacity and readiness were generally low across all service domains. The shortage of skilled staff and poor availability of medicines and functional equipment highlights some of the systemic challenges that remain endemic at the third tier of the nation's healthcare system. There is a need for reforms that emphasise manpower development, training, and sustainable healthcare financing if NCD prevention and management targets are to be achieved.

Conflict of interest

The authors declare no conflict of interest.

References

1. World Health Organization. Non-communicable diseases: key facts: WHO, 2018. <https://www.who.int/news-room/fact-sheets/detail/non-communicable-diseases> [Accessed 8th June 2023]
2. Marrero SL, Bloom DE, Adashi EY. Non-communicable diseases: a global health crisis in a new world order. *Journal of American Medical Association.*, 2012; 307(19): 2037–2038.
3. Bennett JE, Stevens GA, Mathers CD, Ruth B, Rehm J, Kruk ME, Riley LM, Dain K, Kengne AP, Chalkidou K, Beagley J, Kishore SP, Chen W, Saxena S, Bettcher DW, Grove JT, Beaglehole R, Ezzati M. 2018. NCD Countdown 2030: worldwide trends in non-communicable disease mortality and progress towards Sustainable Development Goal target 3.4. *The Lancet.*, 392(10152): 1072–1088.
4. World Health Organization. Non-communicable diseases: Fact sheet. 2022. <https://www.who.int/news-room/fact-sheets/detail/non-communicable-diseases>. [Accessed 10th June 2023].
5. Omar SM, Musa IR, Osman OE, Adam I. Prevalence and associated factors of hypertension among adults in Gadarif in eastern Sudan: a community-based study. *BMC Public Health.*, 2020; 20(1): 4–9.
6. Russell S, Sturua L, Li C, Morgan J, Topuridze M, Blanton C, Hagan L and Salyer SJ. The burden of non-communicable diseases and their related risk factors in the country of Georgia, 2015. *BMC Public Health.*, 2019; 19(Suppl 3): 1–9.
7. Ekpenyong CE, Udokang NE, Akpan EE, Samson TK. Double Burden, Non-Communicable Diseases and Risk Factors Evaluation in Sub-Saharan Africa: The Nigerian Experience. *European Journal of Sustainable Development.*, 2012; 1(2): 249–270.

8. Tagurum YO, Okoh OE, Inalegwu E, Ozoilo JU, Banwat ME, Zoakah AI. Non-communicable diseases: Prevalence and risk factors among adults in a rural community in Plateau State, Nigeria. *International Journal of Biomedical Research.*, 2015; 6(04): 228–34.
9. Ogah OS, MOO, Onyeonoro UU, Chukwuonye II, Ukegbu AU, Akhimien MO, Okpechi IG. Cardiovascular risk factors and non-communicable diseases in Abia state, Nigeria: report of a community-based survey. *International Journal of Medical and Biomedical Research.*, 2013; 2(1): 57–68.
10. Karashima N. Outcome document of the high-level meeting of the General Assembly on the comprehensive review and assessment of the progress achieved in the prevention and control of non-communicable diseases. *Trends in the Sciences.*, 2014; 7(8): 44–45
11. World Health Organization. Global action plan for the prevention and control of non-communicable diseases 2013–2020, 2013. <https://www.who.int/publications/i/item/9789241506236> [Accessed 8th June 2023]
12. Assembly UG. High-level meeting on prevention and control of non-communicable diseases: political Declaration of the high-level meeting of the general assembly on the prevention and control of non-communicable diseases. Document A/66/L. 1. New York, NY: United Nations General Assembly, 2016. [Accessed 9th June 2023]
13. Bennett JE, Kontis V, Mathers CD, Guillot M, Rehm J, Chalkidou K, Kengne AP, Carrillo-Larco RM, Bawah AA, Dain K, Varghese C, Riley LM, Bonita R, Kruk ME, Beaglehole R, Ezzati M. NCD Countdown 2030: pathways to achieving sustainable development goal target 3.4. *Lancet.*, 2020(10255); 918–934.
14. Dodd R, Palagyi A, Jan S, Abdel-All M, Nambiar D, Madhira P, Balane C, Tian M, Joshi R, Abimbola S, Peiris D. Organization of primary health care systems in low- and middle-income countries: review of evidence on what works and why in the Asia-Pacific region. *BMJ Global Health.*, 2019; 4(Suppl 8):e001487.
15. Rohde J, Cousens S, Chopra M, [Tangcharoensathien V](#), [Black R](#), [Bhutta ZA](#), [Lawn JE](#). 30 years after Alma-Ata: has primary health care worked in countries? *Lancet.*, 2008; 372 (99642): 950–961.
16. Maher D, Harries AD, Zachariah R, Enarson D. A global framework for action to improve the primary care response to chronic non-communicable diseases: a solution to a neglected problem. *BMC Public Health.*, 2009; 9: 355.
17. Moucheraud C. Service Readiness For Non-communicable Diseases Was Low In Five Countries In 2013–15. *Health Affairs.*, 2018; 37(8): 1321–1330
18. Elias MA, Pati MK, Aivalli P, Srinath B, Munegowda C, Shroff ZC, Bigdeli M, Srinivas P. Preparedness for delivering non-communicable disease services in primary care: access to medicines for diabetes and hypertension in a district in south India. *BMJ Global Health.*, 2018; 2(Suppl 3): e000519.
19. Guariguata L, Whiting DR, Hambleton I, Beagley J, Linnenkamp U, Shaw JE. Global estimates of diabetes prevalence for 2013 and projections for 2035. *Diabetes Research and Clinical Practice.*, 2014; 103(2): 137–149.
20. Beaglehole R, Epping-Jordan J, Patel V, [Chopra M](#), [Ebrahim S](#), [Kidd M](#), [Haines A](#). Improving the prevention and management of chronic disease in low-income And middle-income countries: a priority for primary health care. *Lancet.*, 2008; 372(9642): 940–949.
21. Dineen-Griffin S, Garcia-Cardenas V, Williams K, Benrimoj SI. Helping patients help themselves: a systematic review of self-management support strategies in primary health care practice. *Plos One.*, 2019; 14(8):e0220116.
22. Federal Ministry of Health. National Strategic Plan of Action on Prevention and Control of Non-Communicable Diseases. Abuja, Nigeria Non-Communicable Disease Division, Federal Ministry of Health, 2015. <https://www.medbox.org/document/nigeria-national-strategic-plan-of-actionon-prevention-and-control-of-non-communicable-diseases> [Accessed 10th July2023]
23. Mendis S, Al Bashir I, Dissanayake L, Varghese C, Fadhil I, Marhe E, [Sambo B](#), [Mehta F](#), [Elsayad H](#), [Sow I](#), [Algoe M](#), [Tennakoon H](#), [Truong LD](#), [Lan LHT](#), [Huiuinato D](#), [Hewageegana N](#), [Fahal NAW](#), [Mebrhatu G](#), [Tshering G](#), [Chestnov O](#). Gaps in capacity in primary care in low-resource settings for implementation of essential non-communicable disease interventions. *International Journal of Hypertension.*, 2012; 2012: Article ID 584041.

24. World Health Organization. Global action plan for the prevention and control of non-communicable diseases 2013–2020. Geneva: WHO; c 2013. http://apps.who.int/iris/bitstream/handle/10665/94384/9789241506236_eng.pdf [Accessed 5th July 2023]
25. Juma K, Juma PA, Mohamed SF, Owuor J, Wanyoike A, Mulabi D, Odinya G, Njeru M, Yonga G. First Africa non-communicable disease research conference 2017: sharing evidence and identifying research priorities. *Journal of Global Health.*, 2019; 8(2): 020301.
26. McKee M, Haines A, Ebrahim S, Lamptey P, Barreto ML, Matheson D, Walls HL, Foliaki S, Miranda JJ, Chimeddamba O, Garcia-Marcos L, Vineis P, Pearce N. Towards a comprehensive global approach to prevention and control of NCDs. *Global Health.*, 2014; 10: 74.
27. Kengne AP, Mayosi BM. Readiness of the primary care system for non-communicable diseases in sub-Saharan Africa. *Lancet Global Health.*, 2014; 2(5): e247–248.
28. Ghimire U, Shrestha N, Adhikari B, Mehata S, Pokharel Y, Mishra SR. Health system's readiness to provide cardiovascular, diabetes and chronic respiratory disease related services in Nepal: analysis using 2015 health facility survey. *BMC Public Health.*, 2020; 20: 1163.
29. Elias MA, Pati MK, Aivalli P, Srinath B, Munegowda C, Shroff ZC, Bigdeli M, Srinivas PN. Preparedness for delivering non-communicable disease services in primary care: access to medicines for diabetes and hypertension in a district in South India. *BMJ Global Health.*, 2017; 2(3): e000519.
30. Islam MR, Laskar SP, Macer D. A study on service availability and readiness assessment of non-communicable diseases using the WHO tool for Gazipur district in Bangladesh. *Bangladesh Journal of Bioethics.*, 2016; 7(2):1–13.
31. Panda R, Mahapatra S, Persai D. Health system preparedness in non-communicable diseases: findings from two states Odisha and Kerala in India. *Journal of Family Medicine and Primary Care.*, 2018; 7(3):565–570.
32. Katende D, Mutungi G, Baisley K, Biraro S, Ikoona E, Peck R, Smeeth L, Hayes R, Munderi P, Grosskurth H. Readiness of Ugandan health services for the management of outpatients with chronic diseases. *Tropical Medical International Health.*, 2015; 20(10):1385–1395.
33. Musinguzi G, Bastiaens H, Wanyenze RK, Mukose A, Van geertruyden JP, Nuwaha F. Capacity of health facilities to manage hypertension in Mukono and Buikwe districts in Uganda: challenges and recommendations. *Plos One.*, 2015; 10(11):e0142312.
34. Mutale W, Bosomprah S, Shankalala P, Mweemba O, Chilengi R, Kapambwe S, Chishimba C, Mukanu M, Chibutu D, Heimbürger D. Assessing capacity and readiness to manage NCDs in primary care setting: gaps and opportunities based on adapted WHO PEN tool in Zambia. *Plos One.*, 2018; 13(8): e0200994.
35. Adeyi O, Smith O, Robles S. Public Policy and the Challenge of Chronic Non-communicable Diseases. Washington, DC: World Bank; 2007. <https://doi.org/10.1596/978-0-8213-7044-5>
36. Armstrong-Hough M, Kishore SP, Byakika S, Mutungi G, Nunez- Smith M, Schwartz JJ. Disparities in availability of essential medicines to treat non-communicable diseases in Uganda: a Poisson analysis using the service availability and readiness assessment. *Plos One.*, 2018; 13(2): e0192332.
37. Tesema AG, Abimbola S, Mulugeta A, Ajisegiri WS, Narasimhan P, Joshi R, Peiris D. Health system capacity and readiness for delivery of integrated non-communicable disease services in primary health care: A qualitative analysis of the Ethiopian experience. *Plus Global Public Health.*, 2021; 1(10): e0000026.
38. Akinwumi AF, Esimai OA, Arije O, Ojo TO, Esan OT. Preparedness of primary health care facilities on implementation of essential non-communicable disease interventions in Osun State South-West Nigeria: a rural–urban comparative study. *BMC Health Services Research.*, 2023; 23: 154.
39. Oyekale ASO. Assessment of primary health care facilities' service readiness in Nigeria. *BMC Health Services Research.*, 2017; 17: 172.
40. Kabir A, Karim MN, Billah B. Primary healthcare system readiness to prevent and manage non-communicable diseases in Bangladesh: a mixed-method study protocol. *BMJ Open.*, 2021; 11:e051961.

41. Albelbeisi AH, Albelbeisi A, El Bilbeisi AH, Taleb M, Takian A, Akbari-Sari A. Public sector capacity to prevent and control of non-communicable diseases in twelve low- and middle-income countries based on WHO-PEN standards: a systematic review. *Health Service Insights.*, 2021; 14:117863292098623.
42. Paromita P, Chowdhury HA, Mayaboti CA, Rakhshanda S, Rahman AKMF, Karim MR, Mashreky SR, Hotchkiss D. Assessing service availability and readiness to manage Chronic Respiratory Diseases (CRDs) in Bangladesh. *Plos One.*, 2021; 16(3): 1–10.
43. Rogers HE, Akiteng AR, Mutungi G, Ettinger AS, Schwartz JI. The capacity of Ugandan public sector health facilities to prevent and control non-communicable diseases: an assessment based upon WHO-PEN standards. *BMC Health Services Research.* 2018; 18(1):1–13.
44. Van Minh H, Do YK, Bautista MAC, Anh TT. Describing the primary care system's capacity for the prevention and management of non-communicable diseases in rural Vietnam. *International Journal of Health Planning Management.*, 2014; 29(2): e159-173.
45. Peck R, Mghamba J, Vanobberghen F, Kavishe B, Rugarabamu V, Smeeth L, Hayes R, Grosskurth H, Kapiga S. Preparedness of Tanzanian health facilities for outpatient primary care of hypertension and diabetes: a cross-sectional survey. *Lancet Global Health.*, 2014; 2(5): e285–e292.
46. Adinan J, Manongi R, Temu GA, Kapologwe N, Marandu A, Wajanga B, Dika H, Maongezi S, Laizer S, Manyuti R, Nassir RA, Renju J, Todd J. Preparedness of health facilities in managing hypertension & diabetes mellitus in Kilimanjaro, Tanzania: a cross-sectional study. *BMC Health Services Research.*, 2019; 19:537.
47. Mulugeta TK, Kassa DH. Readiness of the primary health care units and associated factors for the management of hypertension and type II diabetes mellitus in Sidama, Ethiopia. *Peer Journal.*, 2022; 10: e13797
48. Biswas T, Haider MM, Das Gupta R, Uddin J. Assessing the readiness of health facilities for diabetes and cardiovascular services in Bangladesh: a cross-sectional survey. *BMJ Open.*, 2018; 8:e022817.
49. Bintabara D, Mpondo BCT. Preparedness of lower-level health facilities and the associated factors for the outpatient primary care of hypertension: evidence from Tanzanian national survey. *Plos One.*, 2018; 13:e0192942.
50. Duong DB, Minh HV, Ngo LH, Ellner AL. Readiness, availability and utilization of rural Vietnamese health facilities for community-based primary care of non-communicable diseases: a Cross-Sectional survey of 3 provinces in northern Vietnam. *International Journal of Health Policy and Management.*, 2019; 8:150–157.
51. Thi Thuy Nga N, Thi My Anh B, Nguyen Ngoc NN, Diem DM, Kien VD, Phuong TB, Anh TQ, Minh HV. Capacity of commune health stations in Chi Linh district, HAI Duong Province, for prevention and control of non-communicable diseases. *Asia Pacific Journal of Public Health.*, 2017; 29: 94–101.
52. Wood R, Viljoen V, Van Der Merwe L, Mash R. Quality of care for patients with non-communicable diseases in the Dedza District, Malawi. *African Journal of Primary Health Care and Family Medicine.*, 2015; 7(1):1–8.
53. Mannava P, Abdullah A, James C, Dodd R, Annear PL. Health systems and non-communicable diseases in the Asia-Pacific region: a review of the published literature. *Asia Pacific Journal of Public Health.*, 2015; 27(2): 1–19.
54. Nyarko KM, Ameme DK, Ocansey D, Commeh E, Markwei MT, Ohene SA. Capacity assessment of selected health care facilities for the pilot implementation of the package for essential non-communicable diseases (pen) intervention in Ghana. *Pan African Medical Journal.*, 2016; 25(suppl 1):16.
55. Pakhare A, Kumar S, Goyal S, Joshi R. Assessment of primary care facilities for cardiovascular disease preparedness in Madhya Pradesh, India. *BMC Health Services Research.*, 2015; 15: 408.
56. Kien VD, Van Minh H, Giang KB, Ng N, Nguyen V, Tuan LT, Eriksson M. Views by health professionals on the responsiveness of commune health stations regarding non-communicable diseases in urban Hanoi, Vietnam: a qualitative study. *BMC Health Services Research.*, 2018; 18: 392.

57. Aekplakorn W, Suriyawongpaisal P, Sirirassamee B. Assessment of capacity for cardiovascular disease control and prevention in Thailand: a qualitative study. *Southeast Asian Journal of Tropical Medicine & Public Health.*, 2005; 36:741–747.
58. Meiqari L, Nguyen T-P-L, Essink D, Wright P, Scheele F. Strengthening the human and physical infrastructure of primary healthcare settings to deliver hypertension care in Vietnam: a mixed-methods comparison of two provinces. *Health Policy and Planning.*, 2020; 35: 918–930.
59. Kabir A, Karim MN, Islam RM, Romero L, Billah B. Health system readiness for non-communicable diseases at the primary care level: a systematic review. *BMJ Open.*, 2022; 12: e060387.
60. Isadru VR, Nanyonga RC, Alege JB. 2021. Health facilities' readiness to manage hypertension and diabetes cases at primary health facilities in Bidibidi refugee settlement, Yumbe District, Uganda. *Journal of Tropical Medicine.*, 2021; 1: 1–10.
61. Rashid S, Mahmood H, Asma Iftikhar A, Komal N, Butt Z, Mumtaz H and Shellah D. Availability and readiness of primary healthcare facilities for the management of non-communicable diseases in different districts of Punjab, Pakistan. *Frontiers Public Health.*, 2023; 11: 1037946.
62. Leslie HH, Spiegelman D, Zhou X, Kruk ME. Service readiness of health facilities in Bangladesh, Haiti, Kenya, Malawi, Namibia, Nepal, Rwanda, Senegal, Uganda, and the United Republic of Tanzania. *Bulletin of World Health Organization.*, 2017; 95(11):738–748.
63. Bintabara D, Ngajilo D. Readiness of health facilities for the outpatient management of non-communicable diseases in a low-resource setting: an example from a facility-based cross-sectional survey in Tanzania. *BMJ Open.*, 2020; 10(11):1–12.
64. Jacobs B, Hill P, Bigdeli M, Men C. Managing non-communicable diseases at the health district level in Cambodia: a systems analysis and suggestions for improvement. *BMC Health Services Research.*, 2016; 16(1): 1–12.
65. Legese N, Tadiwos Y. Epidemiology of hypertension in Ethiopia: a systematic review. *Integrated Blood Pressure Control.*, 2020; 13:135–143.
66. Agunga PW. County health leadership and readiness for non-communicable disease services. *Dissertation Abstracts International. Walden Dissertations and Doctoral Studies.* 5298. 2018. <https://scholarworks.waldenu.edu/dissertations/5298> [Accessed 5th July 2023].
67. Ammoun R, Wami WM, Otieno O, Schultsz C, Kyobutungi C, Asiki G. Readiness of health facilities to deliver non-communicable diseases services in Kenya: a national cross-sectional survey. *BMC Health Services Research.*, 2022; 22: 985.
68. Gamra H, Maatoug J, Fourie JM, Scholtz W, Scarlatescu O, Nel G, Ghannem H. PASCAR and WHF Cardiovascular Diseases Scorecard project. *Cardiovascular Journal of Africa.*, 2020; 31(5):267–273.
69. World Health Organization. *Global Action Plan for the Prevention and Control of NCDs 2013–2020.* Geneva: World Health Organization; 2013.
70. Ashigbie PG, Rockers PC, Laing RO, Cabral HJ, Onyango MA, Buleti JPL, Wirtz VJ. Availability and prices of medicines for non-communicable diseases at health facilities and retail drug outlets in Kenya: a cross-sectional survey in eight counties. *BMJ Open.*, 2020; 10: e035132.
71. Abhijit P, Sanjeev K, Swati G, Rajnish J. Assessment of primary care facilities for cardiovascular disease preparedness in Madhya Pradesh, India. *BMC Health Services Research.*, 2015; 15: 408.
72. Tanzania Ministry of Health and Social Welfare. *Tanzania - Service Availability and Readiness Assessment (SARA) 2012.* Ifakara Health Institute, Dar es Salaam; 2013. https://afahobckpstorageaccount.blob.core.windows.net/afahobckpcontainer/production/files/SARA_Full_final_report.pdf [Accessed 12th July 2023].
73. Kapongo RY, Lulebo AM, Mafuta EM, Mutombo PB, Dimbelolo JCM, Bieleli IE. Assessment of health service delivery capacities, health providers' knowledge and practices related to type 2 diabetes care in Kinshasa primary healthcare network facilities, Democratic Republic of the Congo. *BMC Health Services Research.*, 2015; 15(1): 9.
74. Khandelwal V. Global Intervention for Prevention and Control of Non-Communicable Diseases. *International Journal of Medical Sciences and Public Health.*, 2013; 2(4): 1.