

Research

Primary healthcare system insights for cardiovascular diseases health services delivery

Christopher Khayeka-Wandabwa^{1,2}  · Caroline Wainaina² · Shuai Shao^{2,3,4} · Tilahun Nigatu Haregu⁴ · Shukri F. Mohamed² · Lijing L. Yan^{3,5}

Received: 5 January 2025 / Accepted: 16 May 2025

Published online: 29 September 2025

© The Author(s) 2025 

Abstract

In developing nations, primary healthcare (PHC) is the first crucial level of contact for patients including emergencies. We examined the capacity of PHC for cardiovascular diseases (CVDs) prevention and management in Kenya from health workforce experiences in order to inform strategies for strengthening their capability and associated implications for measures of accessibility. The study was conducted in urban and rural settings of Nairobi and Machakos counties, Kenya. The cross-sectional study adopted purposive sampling applying mixed methods approach through health facility survey and key informant interviews. Despite the rural–urban populations variations, a higher proportion of rural facilities (81.2%) offered monthly CVD outpatient services than the urban counterparts (46.2%). More CVD home visits were predominantly conducted by rural PHC facilities at 17.6% versus 6.6% for urban. Unpredictable early access to diagnostic testing and medication occasioning missed opportunities and unwarranted referrals was a critical concern. Most facilities stocked anti-arrhythmia, a diuretic antihypertensive and anti-thrombolytic for essential CVDs related medications. Healthcare providers were emphatic on the need for continuous medical education opportunities for up-to-date evidence-based clinical decisions support competence. Moreover, the health workers advocated for increased outpatient financing for CVDs due to costly out of pocket financing limiting early treatment uptake. Efforts to streamline and upscale CVD resources mainly supply and health labour force at PHC will go a long way in alienating unnecessary referrals and patients' attrition in the continuum of care. More efficient and continuous medical education particularly in the rural and urban poor settings with emphasis on the evolving CVDs burden is desirable. Electronic health record system is a timely endeavor for enhanced patients' systematic referral and tracking considering that CVDs are lifelong conditions.

Keywords Primary healthcare · Health system · Cardiovascular diseases · Electronic health record system · Essential medicines · Kenya

✉ Christopher Khayeka-Wandabwa, khayekachris@yahoo.com; christopher.wandabwa@wur.nl; ✉ Caroline Wainaina, cwainaina@aphrc.org; Shuai Shao, shuaishao@gmail.com; Tilahun Nigatu Haregu, haregu.t@unimelb.edu.au; Shukri F. Mohamed, smohamed@aphrc.org; Lijing L. Yan, lijing.yan@duke.edu | ¹Laboratory of Genetics, Wageningen University and Research, 6700 HB Wageningen, The Netherlands. ²African Population and Health Research Center, P.O Box 10787-00100, Nairobi, Kenya. ³Global Health Research Center, Duke Kunshan University, Jiangsu, China. ⁴Nossal Institute for Global Health, University of Melbourne, Melbourne, Australia. ⁵Global Health Institute, Duke University, Durham, NC, USA.



1 Introduction

Among the noncommunicable diseases (NCDs), cardiovascular disease (CVD) which is a collective term for diseases of the heart and blood vessels, is considered a major cause of morbidity and mortality globally [1]. Moreover, CVDs have demonstrated a high impact in the context of widening inequity in health outcomes between rural–urban settings as well as the rich and poor [1]. In 2017, Kenya recorded a total of 17,856,955 disability-adjusted life years (DALY) attributable to all causes, of which 36% were due to NCDs [2]. With earlier findings showing CVDs alone accounted for more than 12% of total deaths and 5% of total Disability-Adjusted Life Year (DALYs) in 2016 with a steady increase over the past decade [3, 4]. Strengthening Primary health care (PHC) has been identified as a key strategy for effective NCD prevention and control [5]. In 2010, the World Health Organization (WHO) published its “WHO Package of Essential Noncommunicable (PEN) disease interventions for primary care in low-resource settings” (WHO PEN) [6] to provide a prioritized set of very cost-effective interventions (“best buys”) that are also high-impact and feasible for implementation even in resource-constrained settings. An evaluation study done on the implementation of PEN, demonstrated that large gaps exist in the capacity of PHC facilities to manage NCDs in eight LMICs [7].

Management of CVDs in Kenya has improved over the years, considering there is now a Non communicable disease unit within the Ministry of Health, which has been mandated with formulation and implementation of policies on NCD prevention and management. Though the unit is still in its infancy, it has given the fight against NCDs a boost and brought the fight into the limelight [5]. Despite the efforts, the health system in Kenya needs to be strengthened to respond to effective NCDs management and by extension CVDs. Screening and detection of CVDs risk factors is still inadequate, thus low self-awareness of CVDs risk factors such as hypertension and diabetes [8]. Other than the NCDs management strengthening desired, it is common knowledge that in Kenya as well as other Sub-Saharan African countries, it is only physicians that are licensed to manage CVDs [9]. The few physicians available are already overwhelmed by the high work burden arising from inpatients and outpatients of both communicable and non-communicable diseases [9].

Approximately 80% of CVD-related deaths occur in low- and middle-income countries (LMICs), disproportionately affecting the poor and vulnerable households [3, 4]. In a quest to tackle the burden, under Sustainable Development Goal (SDG) 3.4, United Nations member states have pledged to reduce premature NCD deaths by a third by the year 2030 [10]. To attain these goals, different international agencies like the WHO 2013–2020 Global Action Plan and the World Heart Federations “25 by 25” initiative are focused towards accessible and affordable essential medications and health services in at least 80% of healthcare institutions across all sectors [11, 12]. Essential medicines are minimum medicine needs that satisfy the priority healthcare requirements of the majority of the population [13]. Therefore, there is a need to understand the capacity of CVD prevention and management among PHC facilities in Kenya, which will in turn inform suitable strategies for delivering essential PHC services for the prevention and control of CVDs besides tackling emergencies which are a common phenomenon in CVDs continuum of care [1, 14]. In the presented findings, we assessed the capacity of PHCs, in delivering CVD management and prevention in two settings (urban and rural areas) in Kenya. This aimed to provide empirical basis for strategies to inform strengthening PHC capacity and associated implications for measures of accessibility processes and norms which promote health equity [1, 15–17] alongside invigorating further comprehensive and transformative policy change research focus.

2 Methodology

2.1 Study design and setting

A mixed methods approach was employed in the exploratory cross-sectional study that was part of a larger study implemented in four countries including China, Vietnam and Nepal by following the same protocol [17]. In Kenya, the study was conducted in 5 primary health facilities in each of the two counties; Nairobi county (Mathare North, Babadogo, Lunga Lunga, Korogocho and Kariobangi health centres) and Machakos county (Wamunyu, Masii, Muthetheni, Mitaboni and Mwala RDHC) for urban and rural settings respectively with a focus in resource-limited settings which were purposively selected through convenient sampling as previously described [17]. The two settings have notable differences in demographic characteristics of the populations. The facilities in urban setting

of Nairobi serve a larger population than their rural counterparts. The population in the urban setting is majorly low socioeconomic status; with most of the population being between 15 and 49 years, working in both formal and informal sectors [23]. According to a report on Machakos County [24, 25], the population was between 15 and 59 years of age, a population that can effectively work with main source of livelihood being self-employment majorly in the area of Agriculture [24].

The healthcare sector in Kenya is divided into 6 levels as illustrated in Fig. 1 and this study focused on the first level, primary healthcare. The primary healthcare system is staffed by at least midwives or nurses, clinical officers (physician assistants), and occasionally by doctors [18]. The staff provides a wider range of services, such as basic curative and preventive services for adults and children, as well as reproductive health services. They also provide minor surgical services such as incision and drainage. They augment their service coverage with outreach services, and refer severe and complicated conditions to the appropriate level, such as the district hospital [18].

2.2 Participant recruitment and data collection

Survey was conducted using a facility assessment questionnaire which was designed and modified based on WHO PEN rapid assessment tool [3, 4, 17, 20] while additional key informant interviews were conducted with the facility in charge (FIC) healthcare providers and/or representative from each of the ten facilities sampled as earlier detailed [17]. Briefly, for the ten health care providers (one per facility) for the facility assessment questionnaire study eligibility was based on (1) status as a current clinical health care provider at PHC and can provide reliable information to interviewers, and (2) voluntary agreement and written informed consent. The facilities in charge and/or representative for the key



Fig. 1 Levels of healthcare provision in Kenya (adapted from SafeCare.org). Community health service (level 1)/health shop/nurse driven clinic. Primary care services consist of dispensaries/basic health center (level 2), primary health center and nursing homes both public and private facilities (level 3). The primary referral (level 4) services include district/county referral hospitals, while level 5 and 6 facilities are secondary referral/referral and tertiary/national referral hospitals respectively [19]

informant interviews were selected based on further consideration of having worked at least one year in the facility with good understanding of the facility capacity and CVD related services provided by the facility. Facility in-charge and/or representative were involved in the in-depth interviews with the aim of the qualitative interviews being to further identify gaps, barriers, enabling and reinforcing factors in delivery of CVD management and control at the primary healthcare level. Data collection was conducted between July and February 2017. Data was captured electronically on the Open Data Kit (ODK) platform using tablets.

2.3 Data analysis

Descriptive statistics was used to highlight the basic conditions and capacity of the primary healthcare facilities regarding CVD management and control: We report availability as the proportions of surveyed facilities where a given medicine/diagnostic test was found during the survey. Alongside reporting various access barriers (such as travel time to health/medicine facility, public–private health sector mix and cadre of health practitioners present) among surveyed facilities. For the key informant interviews data analysis, the interviewers tape-recorded all the interviews. Recording the interviews is deemed an effective method for capturing the interview data. The recording of the interviews enables the researcher to focus on the interview content and the verbal prompts that emerge and in so doing, facilitating the “verbatim transcript” generation by the transcriptionist [21]. All the records were transcribed verbatim by an independent transcriber. Where the records were in Kiswahili, these were translated to English. Coded accordingly using Nvivo software with WHO’s six building blocks for human health systems as the main themes [22, 23]. Categories, which are the aggregate individual codes that are related conceptually or analytically, were then developed, and the researchers produced themes from the data. The authors developed themes by bringing together related categories and recognizing the set categories’ similarities, differences and relationships. All authors reviewed themes and resolved discrepancies through further discussions to obtain a consensus.

3 Results

The health facilities sampled offered mainly general outpatient services with an average patient load of 2,400 per month. Despite the rural–urban populations variations served by the respective facilities in the study settings (Table 1), urban PHCs recorded an average of 2,772 patients per month, slightly higher than rural health facilities with 2,031 patients per month. Moreover, it is worth noting, a higher proportion of rural PHC facilities (81.2%) reported offering monthly CVD outpatient services as compared to 46.2% in urban areas. Equally, more CVD home visits were conducted by rural health facilities as compared to the urban counterparts (17.6% versus 6.6%).

Table 1 Characteristics of the rural vs urban facilities in Machakos and Nairobi counties respectively

General information	Urban	Rural	Cumulative average
Average population served per setting	82,992	48,774	65,883
Average number of Mission facilities serving the same area covered by surveyed PHC facilities	0.8	1.0	~ 1
Average number of private facilities serving the same area covered by surveyed PHC facilities	0.8	3.4	~ 2
Average number of all the other facilities serving the same area covered by surveyed PHC facilities	1.6	11.8	~ 6
Estimated average monthly CVD patients per facility			
Total out-patients	2772	2031	2401.5
Total in-patients	1	36	18.5
Total home visits	76.6	32	54.3
CVD outpatients	46.2	81.2	63.7
CVD home visits	6.6	17.6	12.1
CVD referrals for emergencies	3.3	3.6	3.5
Approximate average distance between the referral hospital and the health facilities in kilometer	30	30.4	30.2
Facilities using ambulance for referrals	2 (40%)	5 (100%)	7 (70%)

The capacity of the PHC facilities to deliver CVD services was assessed using the WHO's six building blocks for human health systems as the main themes [22, 23].

3.1 Human resources

Generally, there was inadequate staffing at the PHC facilities with human resource findings showing majority of the staff in the facilities were nurses and clinical officers as well as laboratory technicians, community health volunteers (CHVs) and midwives (Table 2).

Only a quarter of the health facilities, predominantly from the urban setting, reported that their staff had been trained on CVD management. The few staff available took alternate roles to fill in any gaps as reflected in the interview with facility in charge (FIC) health provider:

There are also 2 or 3 nurses who have also been trained in pharmacy ...because once the clinical officer sees the patients and gives them the education in the room, they give the health education one on one and the patient is sent to the pharmacy then the nurse now gives the drugs and explains about the drugs. (FIC, Nairobi based facility)

Probing the facilities health providers further to assess their skills in CVD management revealed that most of the health facilities in both settings did not have enough staff capacity qualified in managing CVD conditions per the Kenyan health sector human resource requirement:

We also don't have the physician; we don't have the expert that is required to manage these patients. We might have an essential drug like adrenaline but as a clinical officer I cannot administer this adrenaline. So I have the drug, I have the patient but I will have to refer this patient to a specialist. (FIC, Machakos based facility)

We do not have enough workforce because some of the baseline tests that you want to do for those patients we do not have, or some technicians are not skilled to do it (test), so we refer to other health facilities. (FIC, Nairobi based facility)

3.2 Health service delivery

Screening of CVDs: Health facilities reported conducting basic screening including blood pressure measurements, blood sugar, weight and height. The patients were also offered health education either on face-to-face basis or with other patients in the outpatient section of the health facility.

For the patients who either are having the CVD diseases and are at a risk of having complications, we have a clinic where we do follow up and continuous monitoring of their conditions and there is screening of the complications which are setting in. (FIC, Machakos based facility)

Table 2 Urban–rural facilities and the proportion of type of healthcare providers

Staff*	Urban facilities (n = 5)	Rural facilities (n = 5)	Total (n = 10)
Doctor	0 (0%)	3 (60%)	3 (30%)
Clinical officer	5 (100%)	5 (100%)	10 (100%)
Laboratory technicians	5 (100%)	4 (80%)	9 (90%)
Pharmacists	1 (20%)	5 (100%)	6 (100%)
Nurses	5 (100%)	5 (100%)	0 (0%)
Midwives	4 (80%)	3 (60%)	7 (70%)
CHV with honorarium	5 (100%)	1 (20%)	6 (60%)
CHV with no honorarium	1 (20%)	3 (60%)	4 (40%)
CHV with honorarium- CVD trained	1 (20%)	0 (0%)	1 (10%)
Administrative staff	2 (40%)	2 (40%)	4 (40%)

*Though it was not within the range of this study, we note, Kenya has health work policy guidelines of workload Indicator of Staffing Needs (WISN) approach where the WISN method is based on deriving staffing needs based on the work actually undertaken by staff [24]. It is facility based, aimed at capturing the effort (i.e. time) from specific health staff to carry out particular activities [24]

Some of the challenges encountered by facilities in availing this service to patients were: lack of skilled healthcare staff, lack of equipment for example glucose strips, calibrated weighing machines, adequate blood pressure machines, lack of electrocardiogram (ECG) and electroencephalogram (EEG) for specialized CVD screening and diagnosis. This became a basis for referrals to other health facilities.

Yes as we are a referral hospital. We are getting referrals from health centres and private hospitals...so they expect us to have...a working lab as they refer patients to us...the challenge is lack of equipped lab. Our lab is not equipped, it can't handle these (CVD) patients...so we end up referring them. (FIC, Machakos based facility)

Weighing machines and stethoscopes were available for screening in all the facilities. The blood pressure machines, glucometers and the automatic and mercury blood pressure machines were used by more than half of the facilities in the two settings. There was however variation in terms of availability of the various equipment in urban and rural PHCs. For example, glucometers were available in all urban PHCs but only 3 out of the 5 in rural PHCs. Rural facilities had more automatic digital blood pressure monitors than mercury BP machines compared to urban PHCs (4 facilities vs 3 facilities). ECG machines were non-existent in all PHCs; The facility in-charges of the health facilities (FICs) indicated that its availability would improve the screening of complications arising from the CVDs.

We don't have, like ECG machines; we would wish to get such. So that they can help in tests... and we need like ECG machine and echo for easier management of CVDs. (FIC, Machakos based facility)

Referral services: Other than the need for higher level attention, the health facilities also relied on referral services due to lack of or inadequate skilled healthcare staff and emergency care resources. Of the two settings, all the rural facilities indicated having challenges in transportation of patients. This included distance between the health facility and referral center, listed as an average of 30 km (as also shown in Table 1) and compounded by poor road network in rural setting. This became a challenge especially in emergency cases, as the available ambulance services were not equipped for sustaining an emergency patient; the rough terrain made accessibility quite difficult. Lack of appropriate alternative transport for referrals hindered successful referrals.

We have an ambulance though it is not that equipped. In case of an emergency and the distance is quite long from this facility to the higher facility. We have an ambulance that is not equipped, we have a driver yes, we have the emergency staff to accompany this patient but the ambulance is not equipped. There is no oxygen cylinder, there is no aspirator. It is just not equipped. (FIC, Machakos based facility)

Population based services: This approach involved health promotion initiatives done either at the facility or in the communities or in both places. The health promotion activities conducted by staff were limited to health facilities due to lack of funds to conduct community outreach services, lack of transport to communities and patients' homes and bad weather and rough terrain. The FICs recommended the need for more resources and planning for effective implementation of population-based approaches.

We are not much involved in the prevention of these conditions as generally we treat them in our facility. We just sit there, wait for the patient to come, we treat them and then we give them a follow up...but for the population out there we do not reach them. It is a challenge to do these outreaches as we need a structure set aside for these outreaches we need funds and even facilitation and vehicles to go do these outreaches to reach the community. (FIC, Machakos based facility)

Community health volunteers (CHVs) conducted an average of 54 home/community visits per month, but this was higher in rural facilities compared to urban (17.6 vs. 6.6% as already shown in Table 1). During patient visits to the clinics there was a remarkable attempt by nearly all health facilities to offer health promotion services. It entailed counselling and education services on hypertension, its management as well as counselling and education on all behavioral risk factors for CVD (smoking, diet, alcohol and physical activity).

3.3 Access to medication

Access to the basic medicines for CVD management was sporadic with frequent shortages and delayed supplies. For example, the medicines that were accessible and present in most health facilities were anti-arrhythmia, a diuretic antihypertensive and anti-thrombolytic (Table 3). Only a quarter of the facilities reported having a beta-blocker

Table 3 Essential medicine for CVD management

Type of medicine available	Nairobi	Machakos	Total
Facility has beta-blocker hypertensive always	1 (20%)	0 (0%)	1 (10%)
Facility has anti-angina medication always	0 (0%)	0 (0%)	0 (%)
Facility has anti-arrhythmia medication always	4 (80%)	3 (60%)	7 (70%)
Facility has calcium channel blocker antihypertensive always	2 (40%)	0 (0%)	2 (20%)
Facility has angiotensin inhibitor antihypertensive always	3 (60%)	1 (20%)	4 (40%)
Facility has maternal antihypertensive always	0 (0%)	1 (20%)	1 (10%)
Facility has a diuretic antihypertensive always	3 (60%)	3 (60%)	6 (60%)
Facility has anti thrombolytic (Aspirin) always	3 (60%)	3 (60%)	6 (60%)
Facility has Epinephrine (for cardiac arrest)	0 (0%)	3 (60%)	3 (30%)
Facility has spironolactone (for heart failure)	0 (0%)	0 (0%)	0 (0%)
Facility has antidiabetic always	4 (80%)	0 (0%)	4 (40%)
Facility has cholesterol lowering drug	0 (0%)	0 (0%)	0 (0%)

anti-hypertensive in stock in a sustainable way. Interestingly, epinephrine was more available in the rural setting than in the urban PHC facilities.

In instances when medicines were not available and in emergency cases, the health facility staff referred patients to other health facilities and the patients had no choice but to buy the drugs from pharmacies or default treatment.

We are supposed to make orders for drugs quarterly but you find we can go for even 3 months without being supplied with the medicine. Once it happens like that, patients will be told to go and buy over the counter. (FIC, Nairobi based facility)

3.4 Health care financing

Seven facilities were fully funded by the national government and the FICs indicated that with the devolved system, the budget for funding healthcare had now been taken up by the County governments. Though the shift of activities was the case, the FICs mentioned that there were challenges in adequate provision of skilled workforce, sufficient essential medication and equipment.

But we really don't support them financially it is out of pocket. We treat them and we refer them for investigations... we cannot do in our facility and even if we do in our facility we do not have a system set aside to assist them... they are from poor backgrounds so you can see a patient is prescribed for drugs for three months but she can only afford to buy for one week so we just dispense this for one week then they go. They stay at home until the day they get more funds to purchase more drugs that is when they come to pick their next refill of drugs. (Machakos based facility)

The National Health Insurance Fund (NHIF), a government insurance scheme was preferred for admissions in hospitals rather than in outpatient services that are free in government health centers. The FICs mentioned that the NHIF was also used more when the patients were referred to other facilities.

Although some of them have(NHIF),they know it (health services) is free, so they can still get the services free but when they need the admission they go to bigger hospitals with the NHIF card. (Nairobi based facility)

3.5 Health information system

All the Facility in charges (FICs) in both settings indicated that the system used for keeping records was paper-based and majorly marred by challenges of space. Majority of the facilities indicated having either a desktop or a laptop. The Facility in charges recognized the benefit of an electronic health information system (HIS) including ease of following up patients and safer patient medical data storage. They however indicated a lack of skilled medical records staff to enable smooth transition from paper to computer-based records. The following quote illustrates the perception of the facility in charge on the HIS;

I have seen it in DHIS where we enter in patient data it is quite easy to retrieve data and also easy to put it into record but in paper work we see that at times we have registers the next minute we do not have the registers so it is not easy to keep that data and also retrieving data is quite hard. (Machakos based facility)

Feasibility of Mhealth in health facilities: The FICs indicated that the innovation would be good in following up and tracing patients. The perceived challenges included; lack of phones and computer and connectivity as well as qualified staff to implement the innovative idea. In terms of internet connectivity, only two facilities in the urban setting had Wi-Fi connectivity, none of the rural facilities had either cable or Wi-Fi connectivity.

what I know is that most people nowadays have mobile phones, so, I think if it (Mhealth) was implemented it would help, so that the patients are given reminders on how and when to take their medication, their return dates something like that, there are some patients who are injecting themselves at home, they can also be reminded or maybe somebody can find out how they are or how they are doing. (Nairobi based facility)

3.6 Leadership and governance

This block captured the policy functions or roles and the impact on the facilities' capability to manage CVD conditions. The policy guidelines for CVD management were not available and or accessible to the FICs, hence the mostly used were the general clinical guidelines.

Yeah we have general guideline, a general guideline which covers all the diseases. That is the clinical treatment guideline. But a guideline specifically for cardiovascular diseases, no we don't have. (FIC, Machakos)
We have one for diabetes and we also have one like for hypertension...the problem is accessibility, when you need it you cannot access it. (FIC, Nairobi based facility)

4 Discussion

The presented findings reinforce the fact that in terms of healthcare provision at PHC, there are not enough trained staff and health service provision resources especially in the rural areas [2, 25, 26]. About 61% of the residents had to cover a substantial distance (of ~ 5 km) to the nearest facility and the doctor to patient ratio being 1:60,000 as evidenced by the survey insights. Though still below the required threshold, clinical officers and nurses were more in each of the facilities surveyed compared to medical doctors. Notably, these medical specialists pointed to inadequate or lack of CVD management skills as a systemic challenge they face despite their willingness to attend to CVD-related patients even with the high workload and task shifting they confront daily. This lack of or inadequate skills negatively impacts health services provision, management, and quality assurance of CVD patients hence undue referrals. Going by the findings, it is apparent, despite policy efforts targeting PHC in Kenya [5], CVD training has not been actively incorporated for staff at the primary care level. As such, much attention is needed in this cadre of staff and level of the healthcare system to ensure the medical experts at this level gain from continuous medical education with an integrated focus on CVDs.

Notable in the human resource capacity findings presented, there were no medical doctors in any of the facilities sampled in the urban setting whereas three facilities in the rural setting had one doctor each. The phenomenon varies from proven findings of uneven distribution of health workers between urban and rural areas as a well-established concern known to affect access to care in Kenya and other developing countries [16, 27]. Per the Kenya National Health Accounts (KNHA), with little incentive provided to medical doctors working in the Kenya public system, well-qualified health workers rarely choose to work in rural health facilities when they can enjoy a higher standard of living and additional employment opportunities by remaining in the urban hubs [28]. This shift observed in our study, would possibly be explained by a sustained focus on and attention to PHC in the public health sector achieved through increased staffing, provision of essential commodities, elimination of cash payments, and introduction of free maternal services in the spirit of devolution under the 2010 constitution dispensation [15, 29].

Studies have shown that one hindrance to CVD management is the lack of essential medicine for CVDs [12, 30–32]. Essential medicine that should be readily available and affordable was reported in our study as not just insufficient but lacking hence leading to referrals of patients for further care complicated by distant health referral centers and unreliable ambulance systems. Lack of essential medication was also directly associated with the financing component as all the health facilities depended on government funding whose priorities seem to have drifted from CVD

management at PHC [5]. Apart from unavailability, unaffordability of the drugs led to poor adherence to medication among CVD patients. To counter the challenge of stocking drugs, a study conducted in western Kenya implemented a promising revolving pharmacy fund that supplements medication accessibility once the government drugs are out of stock [31] thus, good practices can be learned and adopted from the same.

A report by the ministry of health in Kenya points to limited information on various diseases as well as incomplete patient registrations in the current health management information system (HMIS) in public health facilities [33]. Data quality and incompleteness of the health records and poor linkage to the County HMIS has impacted the use of health information in evidence generation to inform policy [34]. The FICs from both rural and urban health facilities pointed to the need for staffs that are skilled in electronic health records systems (EHRs). It was also apparent that both the rural and urban healthcare providers had a strong preference for EHRs. The utility of EHRs has been deemed as crucial to effective healthcare systems as depicted in the implementation of EHRs in three east African countries. In the three nations, healthcare systems strongly benefitted from timely data which led to improved effectiveness and efficiency of healthcare services provision [35].

At the PHC, the majority of FICs were of the view that there were no available guidelines specifically tailored to address CVDs. Apart from the formulation of guidelines, implementing policies that guarantee access to medication and equipping of the PHCs is a mandate of the unit of non-communicable diseases (NCDs) in the Ministry of Health [5, 9]. Studies have also shown barriers at health system (including policies governing the prevention and control), health-care provider and patient level limiting optimal primary prevention of CVDs and NCDs at large [36, 37]. It is recommended that primary prevention measures are prioritized as a key strategy in NCD prevention and management [36–38] and these sentiments are reflected in our reported findings.

The study had some limitations, the findings from the study cannot be generalized to other settings due to the small number of sampled facilities. It is thus necessary for a wider and robust population-based survey to be considered to generate evidence that can be generalized to other settings. Nevertheless, the exploratory findings provide a much-needed basis for further research alongside informing strategies for strengthening PHC capacity and associated implications for measures of accessibility processes and norms that promote health equity for all Kenyans [15, 16] with a focus on CVDs.

5 Conclusion

Of note, more efficient in-service continuous medical education with an emphasis on the evolving CVDs burden trends at PHC level of healthcare service providers is necessary. A sustainable model of accessibility and availability to safeguard steady provision of supplies for diagnosis and treatment of patients with CVDs at PHCs to promote retention and steady treatment plans for patients is needed. Both rural and urban health care providers emphasized the need to evolve to electronic health record system (EHR). It was evident, with correct infrastructure in place, transitioning to EHR is a timely venture with goodwill from both rural and urban settings for enhanced tracking of patients' records, medical history, ease counter referrals and follow up.

Acknowledgements We thank Duke Kunshan University Education Development Foundation (Donor: Tingting Gu). We also recognize the Duke Kunshan University Master Student Fieldwork Fund for supporting SS. We further acknowledge the invaluable contributions of all the study participants as well as the dedicated work of all members of the research team who conceptualized and conducted the FAITH study in Kenya.

Authors' contributions CKW, CW, SHM and SS drafted the manuscript. SS, SFM, CKW and TH, coordinated the study. CKW, TH, SS and CW participated in data collection. SS, LLY, TH and CKW designed the study, obtained funding and provided overall guidance. CW, SS and CKW conducted data analysis and interpreted the results. All authors provided substantial reviews and comments. All authors read and approved the final manuscript.

Funding Not applicable.

Availability of data The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request. Deidentified participant data are available upon reasonable request from African Population and Health Research Center, PO Box 10787-00100, APHRC Campus, Kitisuru, Nairobi, Kenya. Email: info@aphrc.org. Telephone: +254 (20) 400 1000, 266 2244, or 266 2255. Mobile: +254 722 205 933, 733 410 102. Fax: +254 (20) 400 1101.

Declarations

Ethics approval and consent to participate and publish Ethical approval for this study was provided by the Ethics and Scientific Review Committee of AMREF-Health Africa in Kenya (REF: AMREF-ESRC P239/2016). A written informed consent was obtained from study participants before data collection. Before initiating the data collecting process, the enumerators explained the study objectives to the respondents, subsequently gathering data exclusively from those who consented to participate. All methods were performed in accordance with the relevant guidelines and regulations.

Competing interests The authors declare no competing interests.

Open Access This article is licensed under a Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International License, which permits any non-commercial use, sharing, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if you modified the licensed material. You do not have permission under this licence to share adapted material derived from this article or parts of it. The images or other third party material in this article are included in the article's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit <http://creativecommons.org/licenses/by-nc-nd/4.0/>.

References

1. Thompson SC, Nedkoff L, Katzenellenbogen J, Hussain MA, Sanfilippo F. Challenges in managing acute cardiovascular diseases and follow up care in rural areas: a narrative review. *Int J Environ Res Public Health*. 2019;16(24):5126.
2. Okoroafor SC, Kwesiga B, Ogato J, Gura Z, Gondi J, Jumba N, Ogumbo T, Monyoncho M, Wamae A, Wanyee M. Investing in the health workforce in Kenya: trends in size, composition and distribution from a descriptive health labour market analysis. *BMJ Glob Health*. 2022;7(Suppl 1): e009748.
3. Health Mo. Kenya STEPwise Survey For Non-Communicable Diseases Risk Factors 2015 Report. 2015.
4. Wamai RG, Kengne AP, Levitt N. Non-communicable diseases surveillance: overview of magnitude and determinants in Kenya from STEPwise approach survey of 2015. *BioMed Central*; 2018.
5. Asiki G, Shao S, Wainana C, Khayeka-Wandabwa C, Haregu TN, Juma PA, Mohammed S, Wambui D, Gong E, Yan LL. Policy environment for prevention, control and management of cardiovascular diseases in primary health care in Kenya. *BMC Health Serv Res*. 2018;18(1):344.
6. Zhang XH, Lisheng L, Campbell NR, Niebylski ML, Nilsson P, Lackland DT, League WH. Implementation of World Health Organization Package of Essential Noncommunicable Disease Interventions (WHO PEN) for primary health care in low-resource settings: a policy statement from the world hypertension league. *J Clin Hypertension*. 2016;18(1):5–6.
7. Mendis S, Al Bashir I, Dissanayake L, Varghese C, Fadhill I, Marhe E, Sambo B, Mehta F, Elsayad H, Sow I. Gaps in capacity in primary care in low-resource settings for implementation of essential noncommunicable disease interventions. *Int J Hypertension*. 2012;2012.
8. Ataklte F, Erqou S, Kaptoge S, Taye B, Echouffo-Tcheugui JB, Kengne AP. Burden of undiagnosed hypertension in sub-saharan Africa: a systematic review and meta-analysis. *Hypertension*. 2015;65(2):291–8.
9. List KEM: Ministry of Medical Services, Ministry of Public Health and Sanitation; 2014.
10. Howden-Chapman P, Siri J, Chisholm E, Chapman R, Doll CN, Capon A. SDG 3: ensure healthy lives and promote wellbeing for all at all ages. In: *A guide to SDG interactions: from science to implementation*. Paris, France: International Council for Science; 2017:81–126.
11. Yusuf S, Wood D, Ralston J, Reddy KS. The World Heart Federation's vision for worldwide cardiovascular disease prevention. *The Lancet*. 2015;386(9991):399–402.
12. Sharma A, Kaplan WA, Satheesh G, Poudyal IP, Gyawali P, Neupane D, Bhandari PM, Malla M, Sapkota S, Mishra SR. Health system capacity and access barriers to diagnosis and treatment of CVD and diabetes in Nepal. *Glob Heart*. 2021;16(1):38.
13. Purgato M, Barbui C. What is the WHO essential medicines list? *Epidemiol Psychiatr Sci*. 2012;21(4):343–5.
14. Organization WH. Primary health care and health emergencies. World Health Organization; 2018.
15. McCollum R, Theobald S, Otiso L, Martineau T, Karuga R, Barasa E, Molyneux S, Taegtmeier M. Priority setting for health in the context of devolution in Kenya: implications for health equity and community-based primary care. *Health Policy Plan*. 2018;33(6):729–42.
16. Ngugi AK, Agoi F, Mahoney MR, Lakhani A, Nderitu E, Armstrong R, Macfarlane S. Utilization of health services in a resource-limited rural area in Kenya: prevalence and associated household-level factors. *PLoS ONE*. 2017;12(2): e0172728.
17. Gong E, Lu H, Shao S, Tao X, Peoples N, Kohrt BA, Xiong S, Kyobutungi C, Haregu TN, Khayeka-Wandabwa C. Feasibility assessment of invigorating grassroots primary healthcare for prevention and management of cardiometabolic diseases in resource-limited settings in China, Kenya, Nepal, Vietnam (the FAITH study): rationale and design. *Glob Health Res Policy*. 2019;4(1):1–9.
18. Muga R, Kizito P, Mbayah M, Gakuru T. Overview of the health system in Kenya. *Kenya Service Provision Assess Survey*. 2004;2005:13–26.
19. Kenya MoH. Kenya health service delivery indicator survey 2018 report. The World Bank, 1818 H Street NW, Washington, DC 20433, USA; May 2019.
20. WHO W. WHO package of essential noncommunicable (PEN) disease interventions for primary health care. Geneva, Switzerland: World Health Organisation; 2020.
21. Jamshed S. Qualitative research method-interviewing and observation. *J Basic Clin Pharm*. 2014;5(4):87.
22. Organization WH. Monitoring the building blocks of health systems: a handbook of indicators and their measurement strategies. World Health Organization; 2010.
23. Ferrinho P, Daniel-Ribeiro CT, Ferrinho R, Fronteira I. Building-blocks to develop one health systems. *One Health*. 2023;17: 100624.

24. Health Mo. Human resources for health norms and standards guidelines for the health sector; 2014.
25. Wiesmann UM, Kiteme B, Mwangi Z. Socio-economic atlas of Kenya: depicting the national population census by county and sub-location. Kenya National Bureau of Statistics, Centre for Training and Integrated; 2014.
26. Statistics KNBo. The 2009 Kenya population and housing census, vol. 1. Kenya National Bureau of Statistics; 2010.
27. Strasser R, Kam SM, Regalado SM. Rural health care access and policy in developing countries. *Annu Rev Public Health*. 2016;37:395–412.
28. Turin DR. Health care utilization in the Kenyan health system: challenges and opportunities. *Inquiries J*. 2010;2(09).
29. Mohamoud G, Mash B, Merali M, Orwa J, Mahoney M. Perceptions regarding the scope of practice of family doctors amongst patients in primary care settings in Nairobi. *Afr J Primary Health Care Family Med*. 2018;10(1):1–7.
30. Kibirige D, Atuhe D, Kampiire L, Kiggundu DS, Donggo P, Nabbaale J, Mwebaze RM, Kalyesubula R, Lumu W. Access to medicines and diagnostic tests integral in the management of diabetes mellitus and cardiovascular diseases in Uganda: insights from the ACCODAD study. *Int J Equity Health*. 2017;16(1):154.
31. Binanay CA, Akwanalo CO, Aruasa W, Barasa FA, Corey GR, Crowe S, Esamai F, Einterz R, Foster MC, Gardner A. Building sustainable capacity for cardiovascular care at a public hospital in Western Kenya. *J Am Coll Cardiol*. 2015;66(22):2550–60.
32. 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 Glob Health*. 2014;2(5):e285–92.
33. Kenya MoH. Kenya health policy 2014–2030. Government of Kenya Nairobi; 2014.
34. Kihuba E, Gathara D, Mwinga S, Mulaku M, Kosgei R, Mogoa W, Nyamai R, English M. Assessing the ability of health information systems in hospitals to support evidence-informed decisions in Kenya. *Glob Health Action*. 2014;7(1):24859.
35. Tierney WM, Achieng M, Baker E, Bell A, Biondich PG, Braitstein P, Kayiwa D, Kimaiyo SN, Mamlin BW, McKown B. Experience implementing electronic health records in three East African countries. *MedInfo*. 2010;2010:371–5.
36. Schwalm J-D, McKee M, Huffman MD, Yusuf S. Resource effective strategies to prevent and treat cardiovascular disease. *Circulation*. 2016;133(8):742–55.
37. Lahariya C, Sundararaman T, Ved RR, Adithyan G, De Graeve H, Jhalani M, Bekedam H. What makes primary healthcare facilities functional, and increases the utilization? Learnings from 12 case studies. *J Family Med Primary Care*. 2020;9(2):539–46.
38. Darukaradhy TB, Krishnamurthy J. Modifying non-communicable disease behaviours through effective health communication and behaviour change: a systematic review. *Preventive Med Res Rev*. 2025;2(1):24–39.

Publisher's Note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.