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Assessing the capacity of primary healthcare facilities and healthcare workers in managing diabetes and hypertension in Kisumu county, Kenya

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Abstract

Background The burden of non-communicable diseases (NCDs) like hypertension and diabetes is rapidly increasing in sub-Saharan Africa, with cardiovascular conditions contributing to about 40% of all NCD-related morbidity. The increase poses considerable challenges, including governance, prevention of risk factors, monitoring, surveillance, and evaluation of health systems. In Kenya, NCD-related mortality is approximately 600 per 100,000 for males and 500 per 100,000 for females, with Kisumu County reporting approximately 1,118 per 100,000 populations annually, compounded by a high HIV burden. Primary healthcare (PHC) provides essential care that could ensure proactive, patient-centered, community-based, and sustainable care to prevent and manage NCDs, yet its implementation remains weak with large regional and subnational differences.

Methods This mixed-methods study was conducted between October 2023 and September 2024 in Kisumu County, Kenya, and included a facility assessment survey, PHC worker surveys, and focus group discussions (FGDs) with 20 patients living with DM and/or HTN. Ten facilities out of 29, classified as level 2 to 4 under the Kenya Essential Package for Health (KEPH), were purposively selected for the study. The evaluation assessed service availability and performance in NCD care using the World Health Organization (WHO) Service Availability and Readiness Assessment (SARA) toolkit. Key aspects included essential drugs, guidelines, equipment, patient follow-up, counseling systems, support supervision, and the training, knowledge, perceptions, and practices of PHC workers.

Results While most facilities conducted routine DM and HTN screenings, only 20% of them had visible national guidelines, indicating a significant policy-implementation gap. Over 80% of PHC workers had not received post-basic training in DM and HTN management, and only 50% were proficient, with an average knowledge score of 2.2 out of 4. Nearly 80% [95% CI: 49.0%, 94.3%] of facilities referred patients to higher-level facilities due to inadequate clinical capacity or a lack of essential medicines. Patient follow-up and counseling on self-care and lifestyle changes were

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rated poorly, averaging 2.9 [95% CI: 1.4, 4.4] out of 6. A qualitative study through FGDs revealed frequent medication shortages, a lack of basic equipment, and insufficient patient information on self-care, diet, and exercise.

Conclusions and recommendations Significant gaps exist in the organizational and workforce capacity of PHC facilities in Kisumu County, Kenya. Addressing these modifiable issues requires targeted strategies and investments to scale up effective interventions. Priority areas include expanding training programs for PHC workers in NCD management, particularly diabetes and hypertension, tailored to local and linguistic contexts, improving infrastructure to support individualized counselling and follow-up, and strengthening the integration of community health promoters (CHPs) to bridge communication gaps and improve continuity of care. This could proffer far-reaching implications for health outcomes and overall health system efficiency.

Keywords Mixed methods, Health system, Referrals, Guidelines, Communication gaps, Patient follow-up

Background

Non-communicable diseases (NCDs), particularly diabetes mellitus (DM) and hypertension (HTN), are rising significantly in low- and middle-income countries (LMICs) like Kenya [1, 2]. These conditions contribute to approximately 15 million premature deaths globally among individuals aged 30–69 years [3, 4], of which 85–90% occur in LMICs [5, 6]. While trends of NCD incidence and mortality are declining in high-income countries (HICs), new cases and NCD mortality are disproportionately higher in the LMICs. Africa, in particular, faces a rapidly increasing burden of NCDs, with projections indicating a significant increase in NCD-related deaths. We expect NCDs to pose a greater global challenge by 2030 than communicable, maternal, neonatal, and nutritional diseases (CMNNDs) combined [7, 8].

In Kenya, NCDs account for over half of inpatient hospital admissions and 39% of all deaths annually [9, 10]. According to the International Diabetes Federation (IDF) (2021), approximately 15,284 adults aged 20 to 79 years were linked to diabetes in Kenya [11, 12]. In Kisumu County, Kenya, the mortality rate is 1,118 per 100,000 populations, significantly exceeding both the national average of 659 deaths per 100,000 and the average observed in other LMICs at 547 per 100,000. In addition to the high burden of HIV in this region, a considerable 48% of all deaths are attributed to NCDs as compared to 58.1% (50%–88%) as reported in other LMICs [13, 14] with intrinsic variation between countries, highlighting the urgent need for effective NCD prevention strategies, considering the uncertainty and variability in these estimates. The concurrent burden of communicable diseases in the region exacerbates this issue. These chronic conditions result in high morbidity, mortality, and treatment costs, primarily due to complications, which points to the need for effective NCD prevention and management interventions. Although effective interventions exist for NCDs, they are not widely implemented satisfactorily, with large subnational differences [15]. Appropriate mechanisms are required to support implementation of policy and programs, including health

system strengthening and advocacy, community participation, and inter-sectoral and interdisciplinary collaboration [15]. Delivery of essential services through the PHC approach could ensure proactive, patient-centered, community-based, and sustainable essential care to prevent and manage NCDs [16]. Evidence suggests that the implementation of effective PHC can substantially reduce the morbidity and mortality rates associated with NCDs [17], for instance, by enhancing the early detection and management of conditions like HTN and DM, resulting in improved health outcomes.

The implementation of a PHC approach in LMICs to improve NCD coverage faces significant barriers [18], including unreliable medical supply chains, inadequate health financing, and weak health information systems [19–21]. Suboptimal clinical guidelines and a lack of implementation strategies, such as technical support and supervision for PHC workers, exacerbate inequities in access and care quality [23, 25–29, 31–33]. Shortages of essential medical supplies and equipment, like blood pressure machines and glucometers, hinder PHC workers from delivering quality care [22], leading to suboptimal diagnosis and treatment of NCDs [23–27]. Human resource limitations, including inadequate training and insufficient competencies among PHC workers, further restrict effective PHC implementation [27–32]. Additionally, PHC facilities often lack the means for organizing referrals, conducting laboratory tests, and ensuring proper patient follow-up [28, 33–35], with evidence indicating that about 71.4% of facilities refer patients to higher-level facilities immediately after DM diagnosis [36].

Patient experiences and perceptions highlight unmet needs and barriers to accessing care, especially in rural settings where individuals at an increased risk of or living with NCDs may be unaware, undiagnosed, or lack access to treatment and support interventions [37]. These issues call for strengthening support for the implementation of policies and programs targeting priority NCDs, such as hypertension and diabetes [38]. The improvement interventions could focus on patient scheduling to reduce

time and cost burden and increase compliance [39] and advocacy to enhance community engagement, participation, and experience in prevention and quality care [19].

The Kenya Ministry of Health embarked on policy reforms following the 2011 UN declaration on mitigation for NCDs by developing and distributing the national strategic plan, currently in its second edition, and the national clinical guidelines for DM and HTN management in 2024 to strengthen PHC [40]. The reported implementation gaps, especially for hypertension and diabetes, highlight the need for context-specific evidence on the implementation of effective interventions to inform priority setting. As a priority, Kenya adopted the WHO Package of Essential Non-Communicable Disease Interventions (WHO PEN) for low-resource settings [41, 42]. Both frameworks emphasize a chronic care approach due to their public health impact. However, implementation remains challenging, especially in rural areas like Kisumu County, due to limited input of local evidence in the guidelines as well as systems and resource constraints, including a shortage of experienced frontline health workers [43], competing priorities with communicable diseases, and inadequate infrastructure.

The current study reports an evaluation of the capacity of PHC facilities in Kisumu County, Kenya, to provide quality care for the prevention and management of HTN and DM and the mechanisms for implementing strategic guidelines for hypertension and diabetes management. Specifically, it (1) determined the current status of structural elements in PHC settings, which facilitate the delivery of quality care for the prevention and management of HTN and DM; (2) assessed the care processes provided by PHC workers in managing DM and HTN; and (3) explored experiences and perceptions of patients regarding the care they receive for these conditions in PHC settings. The study objectives are of high public health relevance as the findings reveal core stakeholder perspectives across the care continuum, priority training, and advocacy intervention points. These findings will be valuable in informing strategic improvement interventions to enhance service quality, efficiency, and effectiveness.

Methods

Study setting

This study was conducted in Kisumu County, one of Kenya's 47 counties, from October 2023 to September 2024. The county is located on the shores of Lake Victoria, in western Kenya, and comprises seven sub-counties. The county's approximately 1.2 million people are served by about 70 PHC facilities (levels 2, 3, and 4), which include dispensaries, health centers, and sub-county hospitals. Nursing officers are the key clinical staff at the majority of the dispensaries (level 2), with clinical officers being the lead clinicians at the health centers (level

3) and medical officers at the sub-county hospitals (level 4). All services are integrated and, where staff establishment allows, are provided through an interdisciplinary approach, integrating the roles of nutritionists, public health officers, occupational therapists, and physiotherapists. These facilities provide various levels of NCD care services for DM and HTN based on a tiered approach as defined in the Kenya Essential Package of Health (KEPH) guideline. Case referral is based on the Kenya Health Sector Referral Implementation Guidelines (KHSRIGs) within the context of Primary Care Networks (PCNs). The PCNs operate on a hub-and-spoke model, where the hub (a higher-level health facility) provides advanced care and supports the surrounding spoke facilities (lower-level health facilities). The purpose is to enhance cross-level integration of healthcare delivery and coordination of multidisciplinary health teams within the county, thereby ensuring continuity and efficiency of care through case referrals and counter-referrals. We purposively selected the Seme sub-county for the current study due to its organizational and logistical capacities.

Research design

This study adopted a cross-sectional design with a parallel mixed-methods approach to assess the capacity of PHC facilities in Kisumu County to deliver high-quality care for the prevention and management of HTN and DM. We employed a structured questionnaire to obtain quantitative data and conducted FGDs to gain qualitative insights into HPC services.

Study population and sampling strategy

The study population comprised of PHC workers and patients from PHC facilities in Seme sub-county. To ensure our research to be in line with local health policies, we consulted county and sub-county representatives from the Department of Health, incorporating stakeholder feedback, for instance to select study facilities. The study sites primarily consisted of public PHC facilities, with a small number of private facilities (level 3) included to gather some insights from the private sector; however, we did not intend to make strong claims about the differences between public and private sectors because of the underrepresentation of the private facilities.

Sample selection

The selection of samples was conducted in three stages:

Stage 1: County and sub-county selection

County and Sub-county Selection One county was purposively selected where the prevalence of NCDs is notably high at 22% [44] compared to other counties to represent the broader region in which one sub-county was also purposively selected. This study was nested within a larger

study targeting six counties in Kenya under the School of Health Sciences of Jaramogi Oginga Odinga University of Science and Technology (JOOUST). The parent study is a sub-project in the institutional capacity building project titled: '*Strengthening Jaramogi Oginga Odinga University of Science and Technology Capacity in Natural Resource Management, Food Security and Health*' (Study number 001). Clinical trial number: not applicable.

Stage 2: facility selection

Facility selection We purposively selected ten out of 29 PHC facilities classified as level 2 to 4 facilities according to Kenya Essential Package for Health (KEPH). These facilities included health centers, maternity homes, and sub-county hospitals, providing relatively complex PHC services (e.g., maternity care, minor surgeries, and specialized consultations).

Stage 3: PHC workers and patients selection

PHC Workers and Patients Selection PHC workers and patients selection Purposive sampling for both qualitative and quantitative data collection was conducted per facility, with the following target numbers for each facility level considered.

Level 2: One PHC worker (either a nurse or clinical officer) per facility. No focus group discussions (FGDs) were conducted at this level due to a low caseload of patients.

Level 3: Two PHC workers and 1–2 patients per facility.

Level 4: Five PHC workers and 1–2 patients per facility.

The facility in-charges expressed a willingness to participate through informed consent, and the county and sub-county team deemed the selection appropriate, ensuring alignment with the study's objectives. For quantitative data collection, a total 24 PHC workers were selected from the 10 PHC facilities, representing 25% of the total workforce (i.e., 96 PHC workers in 29 facilities). This sampling facilitates targeted conversations within PHC settings and ensures a varied representation of perspectives across different cadres. The PHC workers included clinical officers, nurses, and nutritionists, who provided informed consent and actively worked in the selected facilities. The distribution of PHC workers observed reflects broader trends in the Kenyan health system, with data from July 2024 indicating that there were two medical officers, 33 clinical officers, 57 nursing officers, and four nutritionists working across various facilities in Seme sub-county.

Additionally, we collected extensive qualitative data from 20 patients about their experiences with hypertension and diabetes mellitus and care received in the selected settings. They were selected through purposive

sampling from level 3 and 4 facilities based on specific criteria: aged 18 years or above, capable of providing informed consent, and had been living with DM and/or HTN for at least six months. We specifically targeted individuals attending routine care at the clinic, defined as having at least two visits in the past six months, to facilitate comprehensive discussions about their ongoing experiences with care received at the facilities. Two FGDs were conducted, each comprising about 9 and 11 patients respectively. For additional details, see Fig. 1.

Measurements and data collection

We collected data at the health system, patient, and PHC worker level using standard survey procedures and tools adapted from the WHO PEN framework [45], the World Health Organization (WHO) Service Availability and Readiness Assessment (SARA) toolkit [46], and the WHO Innovative Care for Chronic Conditions (ICCC) Framework [47–49]. Table 1 provides a comprehensive overview of the variables, instruments, and data collection methodologies for specific research questions.

For Research Question (RQ) 1, the outcome measurements assessed included the availability of essential drugs for managing DM and HTN, basic medical equipment (e.g., blood pressure monitors, glucometers), guidelines and diagnostic algorithms, information, education, and communication (IEC) materials for community outreach, structures for patient follow-up and counseling, availability of trained PHC workers on DM and HTN management, and regular support supervision received by the PHC facility. For RQ2, the outcomes included the knowledge of PHC workers, their perceptions, practices related to healthy counseling and education, training received, and support systems such as mentorship, while for RQ3, the outcomes were patient satisfaction, perceived barriers and facilitators to accessing care, and self-care practices related to DM and HTN management. Incorporating user experience as a metric for the quality of care [19, 50] is advisable, as it aligns well with the principles of patient-centered care (PCC).

Supplementary file 1 details the process used to calculate each indicator score for PHC workers managing DM and HTN in terms of care processes. This method is derived from the organization Room to Read [51], which implements literacy programs and gender equality and employs a similar approach to calculate teachers' knowledge, perception, and practice scores, and it is validated extensively in similar sub-Saharan African settings. Therefore, adapting this instrument can assist in evaluating PHC workers' knowledge, perceptions, and practices in managing DM and HTN, ensuring its relevance in the health facility context and contributing to improved patient care outcomes.

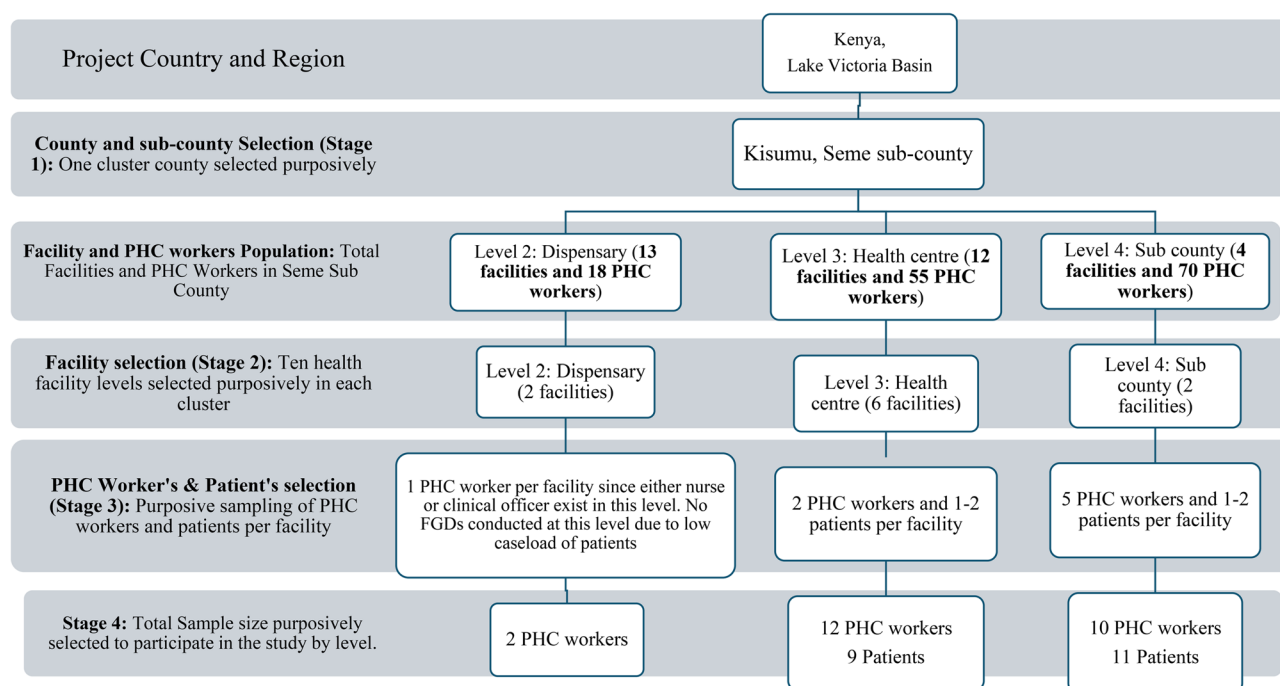


Fig. 1 Flowchart depicting the general sampling strategy for the mixed-methods study conducted in Kisumu County, Kenya, between 2023 and 2024.

We utilized the mobile application Kobo Collect to program and gather quantitative data, which quickened the data entry process and enhanced the efficiency of quality checks. Data collection was conducted through structured one-on-one interviews, ensuring comprehensive assessments. We also held two FGDs in quiet environments, each lasting between 1 and 1.5 h, in both local languages and Swahili, to capture patients' emerging experiences while seeking NCD-related care services at PHC settings. We digitally recorded all interviews and manually transcribed them.

Data analysis

Quantitative analysis

Quantitative data cleaning and analysis was conducted using STATA version 17. To address RQ1 and RQ2, means and standard deviations (SD) were reported for continuous variables, absolute and relative frequencies (expressed as percentages) for categorical variables. In addition, we estimated means and proportions by constructing asymptotic 95% confidence intervals (CIs) for the population means, and 95% Wilson-score CIs for population proportions. These results are presented using tables and charts.

Qualitative analysis

For RQ3, we conducted qualitative analysis employing both inductive and deductive coding methodologies. For the inductive coding, we identified themes from the data without preconceived categories. This was followed by

deductive coding, where we applied the thematic analysis framework proposed by Braun and Clarke (2006) due to its flexibility to categorize the data consisting of six key phases. Particularly, these phases guided the authors to analyze qualitative data and include (1) familiarizing with the data; (2) coding initial themes; (3) grouping related codes; (4) reviewing themes; (5) defining and naming themes; and (6) finally presenting their significance to the research questions in a structured format [55]. This coding process was conducted independently by a minimum of two members of the research team using Dedoose qualitative analysis software. We selected a sample of 10% of the transcripts to develop a common codebook, ensuring the reliability of code applications between coders through inter-coder reliability testing in Dedoose.

After finalizing the codebook, all transcripts were recoded by the first author (OJO). The coded transcripts were subsequently exported to Excel for analysis, allowing us to identify emerging themes. This triangulation of data sources was essential in exploring how PHC workers manage DM and HTN in terms of care processes.

Results

To provide a solid statistical foundation, we presented quantitative information on structural elements in PHC for HTN and DM care and care processes by PHC workers for HTN and DM management. Numerical data reveals the prevalence of structural elements such as medication availability and patient referral rates, as well as care processes by PHC workers, including their

Table 1 Variable definition and measurements

Research Question (RQ)	Concepts/Key information required	Instrument and process of data collection	Reference or name of instrument
1) What are the current structural elements in PHC settings that facilitate the delivery of quality care for the prevention and management of DM and HTN?	Availability of essential drugs for managing DM and HTN:	- A structured observation checklist to assess the availability of essential drugs for DM and HTN. Each drug available was assigned 1, else 0 and a composite score is derived by summing these scores.	Kenya Essential Medicines List 2023 and other sources from Isadru et al., 2021 [52], 22nd WHO model list of essential medicines 2021 [53], WHO ICCF Framework [47–49], and WHO SARA tool [46].
	Availability of basic medical equipment (e.g., blood pressure monitors, glucometers) and diagnostic parameters	- Structured observation checklist followed with a guided interview with the in-charges on equipment use including: availability and functionality of sphygmomanometer, stethoscope, weighing scale, glucometer, and glucometer stripes. Each equipment availability and functionality was assigned 1, else 0 and a composite score is derived by summing these scores.	List of basic equipment and diagnostic parameters from Isadru et al., 2021 [52], WHO ICCF Framework [47–49], and WHO SARA tool [46].
	Availability of guidelines and diagnostic algorithms for care of DM and HTN	Structured observation checklist and interviews with facility in charges. Each guideline, diagnostic algorithms, and IEC materials availability was assigned 1, else 0 and a composite score is derived by summing these scores.	Availability of DM and HTN guidelines and diagnostics assessed as per Isadru et al., 2021 [52] and WHO SARA tool [46].
	IEC materials for community outreaches		Isadru et al., 2021 [52] and WHO SARA tool [46].
	Availability of structures and process for patient follow-up and counselling	Guided interview with the facility in-charges using a checklist in a binary format (Yes/No) with items on who, what and how of counselling, and tracing and a composite score is derived by summing these scores.	Self-developed based on general management information from literatures and DM and HTN guidelines.
	PHC facility has trained PHC workers on DM and HTN management, received quarterly or annual supervisory support visits from CHMT and/or S/CHMT	Guided interview with the facility in-charges using a checklist in a binary format (Yes/No): trained workers on HTN and diabetes management in the last 2 years (2023 and 2024), facility received regular or quarterly support supervision visit from the higher level (county and/or sub county health management team). A composite score is derived by summing these scores.	Isadru et al., 2021 [52] and WHO SARA tool [46].

Table 1 (continued)

Research Question (RQ)	Concepts/Key information required	Instrument and process of data collection	Reference or name of instrument
2) How do PHC workers manage DM and HTN in terms of care processes?	Knowledge of PHC workers	PHC worker's knowledge assessment survey and in the knowledge test, PHC workers received 1 point for each correct mention. The total scores were summed to create a composite indicator score, which is measured on a 4-point scale. This means that the maximum possible score is 4 out of 4, see Supplementary file 1, part A.	Self-developed based on general management information from literatures and DM and HTN guidelines.
	Perception	PHC workers survey to gauge their level of (dis)agreement with statements on DM and HTN management, to understand to their perceptions of effective practices in managing these conditions. This definition differs from knowledge, which refers to factual understanding or awareness of medical concepts and guidelines. For example, while a respondent may agree that patient education is critical (indicating a perception), their actual knowledge about specific lifestyle changes or medical adherence may vary. The indicators tested assess both the recognition of important management strategies and the underlying beliefs that influence patient care practices. For additional details, see Table 7, indicator 4 in the Supplementary file 1.	Self-developed based on general management information from literatures and DM and HTN guidelines.
	Practices by PHC workers on healthy counselling and education	Checklist with activities to manage DM and HTN, can be listed. For every item mentioned, PHC workers score 1 and these scores were summed up to get a composite 6-point indicator score on practices with higher scores reflecting a broader engagement in effective management practices based on their reported activities related to DM and HTN management. This concept covers the actual activities and methods employed by PHC workers in managing DM and HTN, including counselling techniques and the ability to adjust these based on patient feedback, see Supplementary file 1, part B.	Adapted from the information in the HEARTS Technical Package for Cardiovascular Disease Management in Primary Health Care [54].
	PHC worker's training	The survey form for PHC workers uses a binary format (Yes/No) to determine whether they have attended any training on NCDs in the years 2023 or 2024. If they answered "Yes," they were prompted to specify the trainings they attended to provide a clear picture of the training attendance and the collection of detailed information on specific training. The training attended by PHC workers was evaluated in two aspects. First, the extent of coverage regarding the methods and strategies to teach patients about the management and prevention of DM and HTN during the training.	Isadru et al., 2021 [52]
3) What are the experiences and perceptions of patients regarding the care they receive for DM and HTN in PHC settings?	PHC worker's support system e.g. mentorship	Checklist: regular technical support visits from NCD Coordinator (Yes/No?). The assessment also required active recall of examples of mentorship provided. (Table 11 in the Supplementary file 1). A composite score is derived by summing these scores.	Isadru et al., 2021[52]
	Patient satisfaction	FGD combining both explicit/overt (direct responses) and latent (non-verbal, underlying emotions) meanings to ensure a comprehensive understanding of the respondent's perspectives and contextual relevancy, providing more nuanced details of the topic from the collected data.	Self-developed based on general management information from literatures and DM and HTN guidelines.
	Perceived barriers and facilitators to access care	More details in Supplementary file 2.	

knowledge, perceptions, and practices, which are crucial for understanding NCD care. These quantitative insights are supplemented by integrating qualitative findings on patients' experiences with NCD care, such as patient counseling, treatment barriers, and subjective experiences, to avoid repetition of the findings. Qualitative data adds context and depth to quantitative results, uncovering PHC system barriers and facilitators. In this section, we have combined these findings to demonstrate how both quantitative and qualitative data inform our understanding of NCD care.

PHC workers' characteristics

The study revealed that 58% of PHC workers were female, with a mean age across all PHC workers of 36.3 years (SD: 4.7). The findings further indicate that among the professional cadre, 42% were clinical officers, 50% were registered nurses, and 8% were nutritionists. See Table 2 for additional details.

The qualitative analysis identified five key themes regarding patients' experiences and perceptions of NCD care in PHC settings. Themes identified were inadequate counseling and follow-up, patients feeling that dietary and exercise advice was not useful, a desire for practical

Table 2 PHC worker's characteristics

Variable	N (%) or Mean (SD)
Number of PHC workers interviewed	24 (100%)
Gender	
Male	10 (42%)
Female	14 (58%)
Age (in years)	36.3 (4.7)
Marital status	
Married	20 (83%)
Single	3 (13%)
Widowed	1 (4%)
Highest level of education completed	
Diploma	19 (79%)
Bachelors	5 (21%)
Professional cadre	
Clinical officer	10 (42%)
Registered Nurse	12 (50%)
Nutritionist	2 (8%)
Contract type	
Permanent and pensionable	8 (33%)
Short term contract	16 (67%)
PHC worker worked in other facilities before current one	20 (83%)
Years of experience in current PHC facility (in years)	2.8 (3.2)
Years of experience working in PHC before (in years) ^a	7.6 (4.4)

^aIn this indicator, out of 24 PHC workers surveyed, only 20 had prior experience working in PHC facilities, while 4 were new to the role. The missing data regarding the experience of the 4 PHC workers does not necessitate advanced missing data techniques due to the descriptive nature of our analyses. We focused on summarizing the characteristics of the PHC workers and their experiences, which provides valuable insights into the workforce dynamics within the current facility

demonstrations that fit their daily lives, inadequate counseling time, inconsistent counseling practices, a focus on medication availability, a lack of practical demonstration during counseling, limited staff, inadequate training, communication issues, time constraints, inadequate access to recommended healthy diets, inconsistent exercise, and inadequate reference materials. In the deductive phase, we organized themes and related themes identified in literature and theoretical frameworks related to patient care such as principles of patient-centered care and medical adherence. This led to new themes such as barriers to patient adherence, insufficient equipment and screening practices, limited access to essential medications, lack of awareness, delayed diagnosis, lack of drugs, patient trust issues, discouragement, and frustration. Through this dual approach in our analysis, we were able to elicit explicit spontaneous patient experiences and more latent meanings, such as underlying attitudes and contextual elements affecting patients' experiences. The section integrates details of these qualitative findings alongside the quantitative results.

Table 3 Availability of essential drugs and equipment for hypertension (HTN) and diabetes mellitus (DM)

Item	N (%)	Wilson-score [95% confidence interval]
Availability of essential drugs for managing HTN	1 (10%)	1.8%, 4.0%
Availability of essential drugs for managing DM	2 (20%)	5.7%, 51.0%
Facility has access to written guidelines of care, and diagnostic and treatment algorithms for NCD care	6 (60%)	31.3%, 83.2%
Facility has necessary supplies	2 (20%)	5.7%, 51.0%
PHC facility has the following equipment for NCD care		
Blood pressure monitors	10 (100%)	72.2%, 100.0%
Sphygmomanometer- manual (cuff for different arm sizes)	2 (20%)	5.7%, 51.0%
Height Measuring Tape	10 (100%)	72.2%, 100.0%
Stethoscope	10 (100%)	72.2%, 100.0%
Glucometers	10 (100%)	72.2%, 100.0%
Urine test strips (for glucose and ketones)	9 (90%)	59.6%, 98.2%
Lancets and test strips	6 (60%)	31.3%, 83.2%
Tape measure	1 (10%)	1.8%, 4.0%

Total number of facilities were 10

Structural elements in PHC for HTN and DM care

Essential drugs and basic medical equipment availability

The findings in Table 3 reveal that the majority of PHC facilities are without essential medications for treating HTN ($N=9$ out of a total of 10 health facilities included in the study) and DM ($N=8$). Specifically, 90% [95% CI: 59.6%, 98.2%] of the facilities lack key hypertension drugs such as losartan, enalapril, and nifedipine. Furthermore, 80% [95% CI: 49.0%, 94.3%] of the facilities do not have critical diabetes medications like insulin, metformin, and empagliflozin. Most PHC facilities have essential equipment for NCD care; however, the availability of specific items such as lancets and test strips (60% [95% CI: 31.3%, 83.2%]), sphygmomanometers (20% [95% CI: 5.7%, 51.0%]), and tape measures (10% [95% CI: 1.8%, 4.0%]) is insufficient. None of the facilities had HbA1c testing devices, foot care tools, or retinal screening equipment, all required by national guidelines. Only 60% of the facilities have access to written care guidelines and management algorithms. Similarly, 80% [95% CI: 49.0%, 94.3%] of the facilities did not have essential materials for counselling and education (Fig. 2 in Supplementary file 1). Respondents in the patient FGD confirm that they experienced the lack of screening equipment and medications as a barrier to diagnosis and management. This

contributed to their dissatisfaction with care and trust in the services and made adherence to treatment more difficult.

Patient follow-up and counselling

Patient follow-up and counselling on self-care and lifestyle modifications were poorly rated, with an average score of 2.9 [95% CI: 1.4, 4.4] out of 6 (Table 4). Many patients expressed that the dietary and exercise advice provided was not useful, highlighting a desire for practical demonstrations tailored to their daily lives. Additionally, issues such as insufficient counseling time and inconsistent practices among staff were noted, contributing to overall dissatisfaction with the care received.

Care processes by PHC workers for HTN and DM management

PHC worker's knowledge, perception and practices

Overall, 50% of PHC workers showed proficiency in managing NCDs like DM and HTN with a mean knowledge score of 2.2 (95% CI: 1.8–2.6) out of a total score of 4 (Table 5). Only 46% [95% CI: 27.9–64.9%] of PHC workers could identify over half the components of NCD management out of nineteen, such as healthy diets and timely screenings. Additionally, 21% [95% CI: 9.2%, 40.5%] could mention more than half out of nine of the essential characteristics for effectively managing DM and HTN as outlined in Supplementary file 1, Table 7 under the third indicator.

The perception of PHC workers towards NCD management is largely positive, with 92% [95% CI: 74.2%, 97.7%] of PHC workers responding favorably to statements related to key aspects such as prevention, patient education, and the importance of routine monitoring. For

example, PHC workers stressed the importance of teaching patients about healthy lifestyles to effectively manage and prevent diabetes and high blood pressure. They also stressed how important it is to start helping newly diagnosed patients right away and how essential it is to keep learning as a professional. For additional details, see Table 7, Indicator 4 of Supplementary file 1.

The results indicate that only 50% of PHC workers engaged in practices related to managing and preventing DM and HTN, as evidenced by a practice score of 3.0 [95% CI: 2.6, 3.5] out of a total score of 6 (see Table 5).

The majority of PHC facilities, 80% [95% CI: 49.0%, 94.3%], were referring patients to the higher-level facilities for further care related to HTN or DM. The main reasons for referral were poor control of the condition despite treatment (50% [95% CI: 23.7%, 76.3%]), severe complications such as stroke, heart attack, or kidney failure (30% [95% CI: 10.8%, 60.3%]), and a lack of diagnostic equipment at the facility (20% [95% CI: 5.7%, 51.0%]) (Table 12 in the Supplementary file 1).

When asked for their needs in relation to follow-up, FGD participants felt that they did not receive reminders to attend to their scheduled routine hospital clinic days. As a result, they often missed counseling services, which they deemed essential for managing their conditions. Participants indicated a lack of uniform health information with no standardized package of care during patient education and counseling sessions within PHC settings (Table 6). Furthermore, participants indicated that they were not receiving consistent practical counseling on dietary and exercise plans for managing DM and HTN. Some PHC workers were providing differing advice on different clinic visits, leading to confusion. They expressed a need for practical illustrations and education that can apply to their mundane daily lives. This phenomenon highlights a disconnect between the counseling provided and their real-life experiences and felt needs (Table 6).

PHC worker's support and training

Over 80% of PHC workers who completed basic training have not received further training on managing and preventing NCDs. This finding is reflected by a training score of 1 [95% CI: 0.2, 1.8] out of a total score of 6 (see Table 10 for specific components thereof). In 2023–2024, only 21% [95% CI: 9.2%, 40.5%] were trained on DM or HTN management, and just 17% [95% CI: 6.7%, 35.9%] on both (Table 11 in the Supplementary file 1). Out of those who received training, about half of them believed the training covered these topics to a great or very great extent. Secondly, in terms of ease of understanding, 67% [95% CI: 30.0%, 90.3%] of the PHC workers found it easy or effortless to understand these topics. Additionally, in a test example, only one-third could list over half of the

Table 4 Patient counselling and follow-up

Item	N (%) or Mean (SD)	Wilson-score [95% confidence interval]
Patient counselling and follow-up score (out of a total score of 6)	2.9 (2.1)	1.4, 4.4
Availability of staff assigned for patient counselling	2 (20%)	5.7%, 51.0%
Availability of patient counselling tools/materials	3 (30%)	10.8%, 60.3%
Availability of a framework for conducting group counselling and individual counselling for patients	5 (50%)	23.7%, 76.3%
Availability of a system for tracking initial defaulters	3 (30%)	10.8%, 60.3%
Availability of a functional system for patient reminder and follow-up?	3 (30%)	10.8%, 60.3%
Availability of a trained staff in DM and/or HTN diagnosis and treatment in the facility	7 (70%)	31.3%, 83.2%
Total number of facilities were 10		

Table 5 PHC worker's knowledge, perception and practices

	N (%) or Mean (SD)	Wilson-score [95% confidence interval]
PHC worker's knowledge score on NCDs management, focusing on DM and HTN (out of a total score of 4)	2.2 (1.0)	1.8, 2.6
Knowledge (NCD Management): Mentioned 50%+ of the listed different components of NCD management.	11 (46%)	27.9%, 64.9%
Knowledge (Trainings): Knew when PHC workers should acquire the knowledge, skills and abilities to manage DM and HTN.	14 (58%)	38.8%, 75.5%
Knowledge (NCD provider): Mentioned 50%+ of the listed characteristics of skilled PHC workers to effectively manage DM and HTN.	5 (21%)	9.2%, 40.5%
Perception: Gave favorable response on 50%+ of the statements on DM and HTN management	22 (92%)	74.2%, 97.7%
PHC worker's practices score on management and prevention of DM and HTN (out of a total score of 6)	3.0 (1.1)	2.6, 3.5
Practice: Mentioned 50%+ of the listed practices used to manage DM and HTN among patients diagnosed with these conditions.	8 (33%)	18.0%, 53.3%
Practice (teaching): Mentioned 50%+ of the listed methods used to teach patients to manage DM and HTN.	4 (17%)	6.7%, 35.9%
Practice (assessment): Mentioned 50%+ of the listed assessment processes of understanding patients during self-management education.	7 (29%)	14.9%, 49.2%
Practice (assessment frequency): Provide patient education, including counselling services, to patients living with DM and/or HTN at every consultation during clinic schedules.	18 (75%)	55.1%, 88.0%
Practice (adaptation): Ability to adjust patient education and counselling strategies based on assessments and patient feedback.	23 (96%)	79.8%, 99.3%
Practice (examples of adaptation): Mentioned 50%+ of the listed patient education and counselling strategies.	12 (50%)	31.4%, 68.6%

Total number of PHC workers interviewed were 24

tools they use for patient self-management, such as self-care illustrations, follow-up calls or messages, home care visits, and peer mentoring support systems.

The majority of PHC workers, 75% [95% CI: 55.1%, 88.0%], reported receiving regular technical support visits from county or sub-county NCD coordinators, but only a third confirmed these occurred quarterly. During these visits, 67% [95% CI: 46.7%, 82.0%] received mentorship for DM and HTN management. 13% [95% CI: 4.3%, 31.0%] could identify examples of mentorship provided, including Patient Data Documentation, Community Outreach Programs, Drug Management, and On-the-Job Training.

Regarding the qualitative findings on the patient's experiences and perceptions of NCD care, Table 6 provides illustrative quotes from each theme, illustrating both spontaneous and latent insights obtained from the participants' responses.

Discussion

This study aimed to evaluate the capacity of the PHC system in Kisumu County to provide quality care for the prevention and management of HTN and DM, and it found crucial gaps. We found that 80% of patients are referred for further care due to poor control or complications, underscoring a critical gap in the ability of PHC facilities to manage these conditions at the primary care level. Although these findings are specific to Kisumu, they provide valuable insights that could impact the wider devolved county PHC system nationwide in Kenya.

First, the findings highlight significant gaps in the availability of essential medicines and health products, including IEC materials, which are critical for effective self-management. Patient experiences corroborate these findings, which negatively impacted their adherence to treatment and understanding of their conditions. Findings also highlight a gap in follow-up systems, such as reminders for follow-up appointments. This situation is similar to that in western Kenya [56, 57] and other LMICs in the African continent, such as Nigeria, Benin, Eritrea, and Sudan [58, 59]. Addressing these broader issues is crucial for improving overall PHC delivery. Recommendations include strengthening supply chains for essential medicines, improving patient education materials, and implementing effective tracking systems, especially in rural areas that are less populated and face many barriers related to and access.

Second, the capacity of PHC workers is critically inadequate, both in terms of numbers and quality. Inadequate numbers lead to heavy workloads for PHC workers, as illustrated by high patient-to-provider (nurse) ratios of 1:1250, despite the WHO recommendation of 1:120 [60]. Time constraints during consultations hinder meaningful interactions, and unclear dietary and exercise advice further complicate patient management. Patients reported that nurses have to attend to many individuals simultaneously, compromising the opportunity for personalized counseling. Moreover, the quality of counseling requires better contextualization. Many PHC workers are not fluent in the local dialect (Luo), which exacerbates communication challenges and hinders effective care delivery. This gap leads to misunderstandings and insufficient patient education, with patients expressing a pervasive sense of ineffective counseling and self-management support. In Kenya, PHC facilities are linked to communities through community health strategy. However, the role of community health promoters (CHPs)—formerly referred

Table 6 Patient's experiences and perceptions of NCD care

Barriers	Sample quotes
Major themes: Inadequate counselling	<i>"One of the challenges in this facility is inadequate counseling. Nowadays, once the provider asks if you're feeling better and you confirm yes, the next question is whether you have your medication. If not, you're referred to the pharmacy, but often the drugs aren't available there either."</i> [Female, 37 years, HTN patient, Level 4]
Sub-themes: • Inadequate counselling time • Inconsistent counselling practices • Medication availability focus • Lack of practical demonstration during counselling	<i>"Since I started attending clinics at this facility, I have found the services to be better than at my previous one especially the way the nurse regularly counsels me on what to eat and what to avoid. However, the biggest challenge is the lack of medication and in most cases I have to buy them from nearby shops but very expensive, facility should stock these drugs."</i> [Male, 48 years, HTN patient, Level 3] <i>"I believe this facility's providers lack counseling time due to the high number of clients and limited number of providers. Therefore, they typically only inquire about my experiences and medication levels. In fact, when I first received the diagnosis, the only advice I received was on what to eat and what not to eat, and that is the only counseling I ever received."</i> [Female, 48 years, HTN patient, Level 4]
Major themes: Language Barriers, Capacity Constraints, and Time Pressure	<i>"I think the main challenge is the lack of adequate providers. For example, here, there's only one nurse who doesn't speak our language [Luo dialect], so trying to explain in Swahili isn't very clear. In fact, the nurse isn't even sure how to teach us about preventing these conditions and wants to serve many clients in the morning, so she can't spend enough time with us."</i> [Female DM Patient, 63 years, Level 2]
Sub-themes: • Limited staff • Inadequate training • Time constraints • Communication issues	
Major themes: Lack of practical and individual guidance on diet and physical exercise	<i>"I wish the facility could demonstrate what healthy eating means and, if possible, teach us through practical examples. When we come here, it would be helpful to see specific foods. For instance, I am told to eat fruits, but here in Seme, you can't even find fruits. So, where am I supposed to get them?"</i> [Female patient living with HTN, 46 years, Level 4 facility]. <i>"Given my age [elderly], nurses typically advise me to exercise as part of managing my condition. . . ., providers advise me to engage in home physical activities like grazing animals or gardening instead of prescribing a specific amount and frequency of exercise. Nowadays, I leave these responsibilities to my grandchildren. It would be helpful to know what specific exercises are suitable for the elderly."</i> [Male patient living with HTN, 68 years, Level 3 facility].
Sub-themes: • Inadequate access to recommended healthy diets • Inconsistent exercise • Inadequate reference materials	
Major themes: Lack of screening for all patients who walk into the facility	<i>"I learned about my hypertension status during a general check-up at the facility. After screening, my blood pressure was found to be too high, and that's how I was put on medication. I believe it would be beneficial if all facilities screened everyone who walks in."</i> [Male, 54 years, Level 3]
Sub-themes: • Inadequate access to screening services • Lack of awareness • Delayed diagnosis	<i>"The first facility I visited did not have the necessary equipment for blood pressure screening, so they referred me to this facility. It was through this process that I discovered my condition and received medication."</i> [Female, 42 years, Level 4]
Major themes: Frustration over Lack of essential drugs	<i>"Sometimes, it's very discouraging to keep coming to the hospital when there are no drugs available instead you are being told to buy from private outside pharmacies which are very expensive. Why do they open every day if clients can't be treated and given medication? I'd rather stay at home because going to the hospital makes no difference if I can't get the drugs I need."</i> [Male participant, 55 years, Level 4]
Sub-themes: • Lack of drugs • Trust issues • Patient Discouragement • Patient frustration	

to as community health workers or volunteers in bridging communication gaps was not emphasized by interviewed PHC workers. While some acknowledged that CHPs occasionally support patient follow-up and health education activities, their involvement in facilitating communication between PHC facilities and communities appears limited and underutilized. In addition, primary care staff receive minimal training to enhance their capacity for NCD management. For instance, only 22% of PHC workers in sub-Saharan Africa reported receiving hypertension training in the past year [59, 61]. Our findings illustrate the need for comprehensive training of PHC workers, tailored to the cultural and linguistic contexts of the populations they serve, alongside stronger

integration of community health structures to improve communication and continuity of care.

Third, findings revealed that over two-thirds of PHC workers are employed on short-term contracts. This potentially contributes to a high attrition rate among PHC workers, as indeed indicated in another Kenyan study on motivation of health workers [62, 63]. Such instability raises significant concerns about the sustainability of the devolved health sector in Kenya and potentially in other regions facing similar challenges. Many county governments struggle to provide permanent positions for health workers, leading to a workforce that is frequently in flux as employees seek more stable opportunities elsewhere. This trend not only affects the

continuity of care for patients but also undermines the overall effectiveness of health systems. Addressing the employment conditions of PHC workers is crucial for fostering a stable workforce and ensuring the delivery of quality health services.

Fourth, we also found that there are technical support visits from NCD coordinators, but their consistency and reliability seem lacking. For instance, the absence of a standard checklist for these visits may lead to variability in information, support and mentorship. Indeed, PHC workers overwhelmingly expressed their need for more support and mentoring [64]. Evidence indicates that nurses receiving mentorship can adhere to NCDs treatment protocol [65], suggesting the need to further investigation of this in the Kisumu context.

Strengths and limitations

The study employed a mixed-methods approach with triangulation to achieve a comprehensive understanding of the objectives. It applied internationally validated frameworks—WHO Health System PEN, WHO ICC, WHO SARA, and the HEARTS Technical Package—alongside locally tailored tools, enhancing the validity of the findings. Additionally, the surveys were conducted in collaboration with county and sub-county health management teams, leveraging their goodwill and mutual understanding of institutional challenges and strengths. Facility in-charges and the researchers jointly reviewed the health facility reports and the status of equipment such as glucometers, weighing scales, sphygmomanometers, and medications available. These results provided more ownership of data, a common realization of situation analysis, and increasing urgency for health authorities to take action. This approach could enhance buy-in and readiness to implement recommended changes while fostering a stronger alignment between policy makers and health facility management.

This study has some limitations. The survey evaluation data collected were not representative of the Kenyan primary healthcare system. The focus here was rather at the sub-county level with surveys conducted in specific rural areas, which may have led to an overestimation of the capacity of PHC facilities in these regions. Due to the purposive selection of the facilities, PHC workers, and patients, we cannot generalize the findings to other PHC settings or populations. Also, the wide confidence intervals reflect the variability in equipment availability across facilities and suggest a need for caution in interpreting these estimates. Furthermore, our findings may be limited by selection bias of participants and response bias. The study may have limited the perspectives by focusing on only three categories of healthcare workers: clinical officers, nursing officers, and nutritionists. We did not interview any doctors, health records officers,

pharmacists, or public health officials, as they were not present in our facilities. Moreover, participants may have altered their responses based on perceived expectations from the research team and county representatives during data collection. This response bias could potentially skew the results toward more favorable perceptions by both staff and patient respondents. To mitigate these and ensure consistency in observations and measurements, the study recruited experienced researchers, all of whom were trained in interview techniques and the use of the study tools. Real-time feedback and debriefings were provided daily to validate some of the observer's findings. The inclusion of patient perspectives is considered a strength.

Despite these limitations, our findings have generated locally relevant evidence that can inform local action in PHC for NCDs.

Conclusion

The evaluation of PHC facilities in Kisumu County reveals critical structural deficiencies that significantly impede the delivery of high-quality care for hypertension and diabetes management, as well as patient satisfaction. This emphasizes how important it is to strengthen both the structural and procedural aspects of care. Key areas for investment include expanding training programs focused on NCD management, particularly diabetes and hypertension tailored to local cultural and linguistic contexts, and improving infrastructure to support individualized counseling and follow-up. Additionally, integrating community health promoters into facility-level care processes is critical for bridging communication gaps and enhancing continuity of care. These findings provide a roadmap for targeted interventions aimed at improving the quality of care in Kisumu County and similar rural settings.

Supplementary Information

The online version contains supplementary material available at <https://doi.org/10.1186/s12913-025-13390-5>.

Supplementary Material 1.

Acknowledgements

We extend our heartfelt gratitude to all the participants who participated in this study. This includes patients living with diabetes and/or hypertension, county and sub-county health management teams, facility in-charges, PHC workers, and the PhD and master's students who assisted with data collection.

Authors' contributions

OJO conceptualized the study, conducted the desk review research, developed and programmed the data collection tools, analyzed the data, and wrote the manuscript. DO, EM, JO, SA, JB, and JvO contributed to the study's conception and reviewed the manuscript. OJO, EM, and DO were involved in data collection with JO with relevant qualifications and prior experience in qualitative research methodology led the focus groups. OJO conducted data cleaning and analysis. DO, JB, SA, and JvO provided technical guidance and critical suggestions for the manuscript. All authors read and approved the final

submission. OJO holds full responsibility for the study, including data access and publication decisions.

Funding

A PhD scholarship from the VLIR-UOS supported the research and the primary author (OJO), fostering partnerships between Flemish universities in Flanders, Antwerp, Belgium, and a partner university, Jaramogi Oginga Odinga University of Science and Technology (JOUST), in Kenya. However, funders did not contribute to the design of this study, data collection, analysis, interpretation, or writing of the manuscript.

Data availability

Data is accessible and available upon reasonable request to the corresponding author (OJO) to ensure that use is in line with the terms of ethics approvals and principl.

Declarations

Ethics approval and consent to participate

The study protocol was reviewed and approved by the Jaramogi Oginga Odinga University of Science and Technology (JOUST) and the National Commission for Science, Technology and Innovation (NACOSTI), with approval license numbers ERC/5/24–06 and NACOSTI/P/23/25192, respectively. Additional approvals were obtained from the county government of Kisumu, and individual informed consent was signed by each PHC worker and FGD participant before data collection began. During the informed consent process, interviewers emphasized the voluntary nature of the study, ensuring participants understood the risks and benefits and were willing to participate. We confirm that all methods were carried out in accordance with relevant guidelines and standards, including the Declaration of Helsinki, adhering to the approved protocol.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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Received: 25 May 2025 / Accepted: 18 August 2025

Published online: 30 September 2025

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