

Determinants of Self-Reported Proficiency in Cardiometabolic Disease Prevention, Management, and Control Among Faculty and Clinical Mentors in Kenya: A National Cross-Sectional Study

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Abstract

Background

Cardiometabolic diseases (CMDs) encompass a cluster of interrelated conditions, including obesity, diabetes, and cardiovascular diseases (CVDs) such as ischemic heart disease and heart failure. These conditions represent a major and growing global public health crisis particularly in low- and middle-income countries (LMICs). Addressing CMDs therefore requires dual focus on the proficiency of both the trainers and the practitioners on prevention, management and control. The study aimed at determining the gaps and determinants associated with self-reported proficiency scores in the prevention, management, and control of cardiometabolic diseases among faculty and clinical mentors.

Methods

This was a cross-sectional study design conducted across 32 counties in Kenya spanning public and faith-based institutions. A total of 220 faculty and clinical mentors both in training institutions and health facilities. The participants included both male and female and must have worked for at least one year. The primary outcome was the self-reported competency scores in cardiometabolic disease (prevention, management and control) among faculty and clinical mentors. The secondary outcome was to determine competency vis a vis the independent variables among them the study population, age, years of experience, cadre and education level.

Results

Participants reported comparatively higher self-perceived proficiency in diabetes and obesity, whereas lower proficiency was observed in dyslipidemia and Metabolic Associated Steatotic Liver Disease (MASLD). Increased proficiency scores were significantly associated with higher educational attainment, years of experience, nursing profession, and being a clinical mentor.

Conclusions.

This study demonstrates a self-reported “competency gradient” among educators responsible for training Kenya’s future healthcare workforce. Participants reported lower proficiency in dyslipidemia and MASLD, while those with higher educational attainment, nurses, and clinical mentors indicated higher proficiency scores. These findings highlight the need to develop targeted opportunities for curriculum enhancement and ongoing professional development.

Background

Cardiometabolic diseases (CMDs) encompass a cluster of interrelated conditions, including obesity, diabetes, and cardiovascular diseases (CVDs) such as ischemic heart disease and heart failure. [1] These conditions represent a major and growing global public health crisis particularly in low- and middle-income countries (LMICs). According to the World Health Organization (WHO), approximately 1.4 billion adults aged 30–79 years were living with hypertension in 2024, with nearly two-thirds residing in LMICs.[2] Furthermore, the International Diabetes Federation (IDF)[3] estimated that diabetes accounted for 3.4 million deaths globally in 2024. In Sub-Saharan Africa (SSA), the prevalence of type 2 diabetes is estimated at 4 – 5% among adults, though this figure is likely to be underestimated due to a substantial proportion of undiagnosed cases. [4] The rising burden of CMDs is driven by a complex interplay of behavioral, metabolic, and environmental risk factors. Modifiable behaviors such as tobacco use, physical inactivity, unhealthy diets, and harmful alcohol consumption significantly increase the risk of developing these conditions. [5]

Addressing CMDs therefore requires dual focus on the proficiency of both the trainers and the practitioners on prevention, management and control.

In Kenya, this burden is further compounded by a health system often described as fragmented and under-resourced, [6] underscoring the urgent need to equip healthcare providers with the competencies required to effectively prevent, manage, and control CMDs. [7]

At the policy level, Kenya’s Human Resources for Health (HRH) Strategic Plan (2019–2023) emphasizes the importance of strengthening workforce capacity for non-communicable disease (NCD) prevention and control. Key priorities include identifying required competencies, enhancing knowledge and skills among health workers, integrating NCD content into training programs, and addressing gaps in pre-service education at both undergraduate and postgraduate levels.[8] While pre-service training is critical for ensuring readiness for practice, [9] evidence suggests that mid-level healthcare workers often lack adequate competencies, highlighting gaps in both pre-service and in-service training. [10] Targeted interventions such as interactive workshops, have shown that promise in improving healthcare worker performance. [11]

Trainers’ competency influences teaching quality, innovation, general success, and effectiveness. [12] and is vital for trainees’ development. [13]

Considerable attention has been given to strengthening the competencies of frontline healthcare workers, but the capacity of those training the next generation remains under-examined. Faculty in medical training institutions and clinical mentors who supervise students during internships play a pivotal role in shaping the future health professionals; however, concerns suggest that educators may not always possess necessary competencies. [14] Deficiencies at this level may have significant downstream effects on healthcare delivery, contributing to a persistent mismatch between theory and clinical practice.[15] Inadequate competencies among trainers due to limited pedagogical support or weak assessment literacy, classroom practice may default to “safe” routines of lecture and drilling, even when curriculum frameworks advocate otherwise.[16]

Despite the recognized importance of these roles, there is limited empirical evidence assessing the competencies of faculty and clinical mentors in CMD prevention and management in high burden, low-resource settings. This study sought to identify the gaps and determine the factors influencing self-reported proficiency scores by conducting a cross-sectional assessment of 220 faculty and clinical mentors across 32 counties in Kenya.

Methods

Study design

This study employed a cross-sectional study design to assess the competencies of the academic faculty and clinical mentors in the prevention, management and control of CMDs and the factors that may influence them. Data collection was conducted between November and December 2024.

Participants involvement

The participants were not involved in setting research questions or the outcome measures, but were central to dissemination of the information, which helped in appreciating their level of competencies.

Study Setting and Population

The study was conducted across 74 medical training colleges (MTCs) in Kenya (63 State Corporation and 11 faith-based institutions) and 40 Level 5 and 4 health facilities (32 public facilities and 8 faith-based institutions). Publicly sponsored MTCs are the Kenya Medical Training Colleges (KMTCs). Established in 1927, the KMTC is a public middle-level college mandated to train multidisciplinary health professionals at the certificate, diploma, and higher diploma levels in various healthcare disciplines. It is the largest government MTC in Africa. As of November 2025, there were 90 KMTC campuses across the country, with a student population of 60,000. [17] Faith based medical and educational institutions included those affiliated with the Kenya Conference of Catholic Bishops (KCCB) and Christian Health Association Kenya (CHAK).

The study population included academic faculty and clinical mentors. For this analysis, the focus was narrowed to two primary cadres - clinical officers and nurses as these professionals are centrally responsible for the joint clinical management of CMDs in the Kenyan health system.

Theoretical Framework

This study is grounded by Competency-Based Medical Education (CBME) framework [18] and supplemented by Donabedian Model [19] of care quality. Together, these frameworks allow for dual focuses on the specific skills required for CMD management and systematic factors that influence their distribution across the Kenya healthcare workforce.

Competency Based Medical Education (CBME)

The aim of CBME is to produce competent clinical healthcare workers able to meet the evolving healthcare needs of the population they serve and improve the quality of healthcare delivery, patient safety and overall healthcare system performance.[20] CBME shifts the focus from time-based training to the measurable attainment of specific clinical skills and knowledge. Within the context of CMDs, these competencies include the ability to effectively undertake disease prevention, clinical management, and control.

In this study, competency is conceptualized as a habitual and judicious use of knowledge, technical skills and clinical reasoning [21] required to address CMDs across the continuum of care. We operationalized this across three core domains -prevention, management, and control. By evaluating this, the study identified whether the “trainers of trainers (TOT)” – faculty and clinical mentors possess the required abilities to produce a workforce capable of tackling Kenya’s surging CMD crisis. Specifically, the framework helps in explaining why proficiency in established areas (diabetes/obesity) may coexist with critical deficits in emerging clinical areas (dyslipidemia/MASLD).

The Donabedian Model: A Systems Perspective

To interpret these competencies within the broader healthcare landscape, the study utilizes the Donabedian Model[22] which categorizes health services into structure, process, and outcome embedded within the health and training systems.

- Structure: Includes the foundational attributes of the trainers, such as level of education and professional cadre
- Process: refers to the roles performed by the participants, specifically academic instruction (faculty) and clinical mentorship that shape the context within which competencies are developed and applied.
- Outcome: In this context, competency scores serve as a proxy for the quality of training provided.

While the study focuses on describing the distribution of competency gaps rather than establishing strict causality, the Donabedian lens allows us to treat demographic and professional characteristics as stratification variables. This reveals how structural factors—like the level of education—directly correlate with competency outcomes.

Synthesis and Application

By integrating CBME with a systems-oriented perspective, this study provides a robust framework for identifying and interpreting competency gaps in CMD care. It positions the identified gaps not merely as individual failings, but as systemic indicators of where the “Structure” (training curricula and faculty development) must be reinforced to improve the “Outcome” (CMD care quality). This integrated approach provided a robust foundation for developing evidence-based interventions to strengthen the health workforce across all 32 assessment counties.

Sampling and Recruitment

A multistage sampling approach was utilized. To ensure regional representation, MTCs were clustered into six hubs (Counties in parenthesis): *Nairobi* (Nairobi, Nyeri, Murang’a, Kirinyaga, Nyandarua), *Mombasa* (Mombasa, Kilifi, & Kwale), *Embu* (Embu, Meru, Tharaka Nithi, Kitui, Makueni & Garisa,), *Kisumu* (Kisumu, Siaya, Kakamega, Vihiga, Busia, Bungoma, Homa Bay, Migori, & Kisii), *Uasin Gishu* (Eldoret, Trans Nzoia, & Nandi, Turkana & West Pokot), and *Nakuru* (Nakuru, Kericho, Bomet, & Narok). While the study initially aimed to cover all 47 counties, logistical constraints limited the final scope to 32 counties (68% coverage). County selection was based on CMD prevalence, regional balance, rural -urban reach and existing infrastructure.

Sampling was performed at three stages:

1. Institutional level: After categorizing the 125 MTCs into six clusters corresponding to the six hubs, systematic sampling was employed to select the MTCs to be visited from the six clusters.
2. Departmental level: Within each sampled MTCs, teaching faculty from the six departments (Clinical Medicine and Surgery, Medical Laboratory Sciences, Nursing, Pharmacy, Health Promotion and Community Health, and Nutrition and Dietetics) were purposively selected.
3. Individual level: A sampling frame of all faculty members within the selected departments was generated and participants were randomly selected and invited to participate in the study.

Sample size determination

The sample size was determined based on the number of institutions and their ownership type. A total of 63 faculty members from KMTC and four from each faith-based MTC were targeted, while three clinical mentors from both public and faith-based hospitals were also recruited, resulting in a total of 207 participants as shown in Table 1. An additional 10% was included to account for non-response, bringing the final target sample size to 228 participants

Table 1 Sample size of the participants			
Institution	n	Faculty	Clinical mentor
KMTC	63	63	
Faith based MTCs	11	44	
Public hospitals	32		76
Faith based hospitals	8		24

Data collection tool

The data collection tool was collaboratively developed by independent curriculum experts together with regulators from nursing council of Kenya and Clinical officers of Kenya. The tool was later pre-tested in Machakos County among faculty at Kenya Medical Training College (KMTC) and clinical mentors at Machakos Level Five Hospital.

Data Collection Instrument

Self-reported competency was assessed using a survey questionnaire. Participants rated their performance across various skills related to the prevention, management and control of CMDs using a 5-point Likert-type 0 (Novice), 1 (Advanced Beginner), 2 (Competent), 3 (Proficient), and 4 (Expert).

Participants whose mean proficiency was between 0–1 were defined as having low proficiency, 2 had relatively moderate proficiency while 3–4 were defined as having relatively higher proficiency.

The proficiency scale demonstrated excellent internal consistency reliability with a Cronbach’s alpha coefficient of 0.99, indicating strong coherence among the prevention, management, and control competency items across disease domains.

The tool assessed competencies across six major disease domains:

- Cardiovascular diseases: Including hypertension, heart failure, and coronary artery disease.
- Obesity: Categorized by risk and BMI classes (I, II, and III).
- Metabolic Associated Steatotic Liver Disease (MASLD)
- Renal diseases: Including chronic kidney disease and acute kidney injury.
- Diabetes: Including Type 1 diabetes (T1D), Type 2 diabetes (T2D), and gestational diabetes.
- Dyslipidemia: Including hyperlipidemia and hypoalipalipoproteinemia.

Statistical Analysis

Data was analyzed using STATA[23] and R. Descriptive statistics, including frequencies and proportions, summarized socio-demographic characteristics such as sex, cadre, education level, and age. Continuous variables including age and years of experience were expressed as means $\pm$ standard deviations (SD). Because competency scores were derived from ordinal data and exhibited non-normal distributions, non-parametric tests were employed. The Mann–Whitney U test was used to identify significant disparities in competency scores across independent groups, specifically: *study population* (faculty vs. clinical mentors); *education level* (bachelor's degree and above vs. below bachelor's level); *age group*: Younger (23–39 years) vs. older (40–65 years); and cadre (Clinical Medicine vs. Nursing).

The Kruskal Wallis test was also conducted between years of experience (< 10 years, 10–20 years and > 20 years) and proficiency scores. We conducted pairwise comparisons using the Dunn–Bonferroni method when significant differences were observed between years of experience and proficiency scores.

Further, multivariable ordinal logistic regression analyses adjusting for disease category, study population, department, education level, age group, and years of experience was conducted. A two-sided *p*-value of < 0.05 was considered statistically significant.

Results

Participant Characteristics

A total of 220 (96% response rate) clinical mentors (38.2%) and faculty (61.8%), both from the public and faith-based institutions were interviewed. Slightly more than half (52.3%) were female, 52.7% were below 40 years of age and 76.4% had attained a bachelor's degree and above. The majority (62.3%) of the respondents were from nursing department with mean years of experience being 13.8 years as shown in Table 2.

Table 2
Sociodemographic Characteristics

Variables	n (%)
Study Population	
Clinical Mentor	84(38.18)
Faculty	136(61.82)
Mean Age (Years)	39.58
Sex	
Male	105(47.73)
Female	115(52.27)
Age group	
< 40 years	116(52.73)
> 40 years	104(47.27)
Hub	
Mombasa	11(5.00)
Eldoret	17(7.73)
Nakuru	28(12.73)
Nairobi	43(19.54)
Embu	57(25.91)
Kisumu	64(29.09)
Education level	
Less than a bachelor	52(23.64)
Bachelor and above	168(76.36)
Cadre	
Clinical medicine	83(37.73)
Nursing	137(62.27)
Mean years of experience	13.8
Years of experience	
< 10 years	90(40.91)
10–20 years	80(36.36)
> 20 years	50(22.73)

Competency Levels Across CMD Domains

The level of competency in the prevention, management, and control of cardiometabolic diseases varied across disease domains.

Overall, higher mean scores were reported for diabetes, followed by obesity and cardiovascular diseases. On the other hand, mean prevention, management and control of MASLD and dyslipidemia was lower than 2.4. Statistical difference ($p < 0.05$) was reported in prevention, management and control in CVD and renal diseases as shown in Table 3.

Table 3
Self-Reported Performance Levels of Prevention, Management and Control Skills for Cardiometabolic Diseases
Among Faculty and Clinical Mentors

Disease	Prevention mean (sd)	Management mean (sd)	Control mean (sd)	P_Value
Cardiovascular Diseases	2.69 ± 0.97	2.58 ± 0.93	2.60 ± 0.96	< 0.05*
Hypertension	3.05 ± 0.74	2.98 ± 0.72	3.01 ± 0.76	
Heart failure	2.91 ± 0.91	2.8 ± 0.88	2.78 ± 0.9	
Cerebrovascular Disease	2.8 ± 0.95	2.68 ± 0.91	2.7 ± 0.95	
Venous Thromboembolism	2.76 ± 0.95	2.66 ± 0.96	2.67 ± 0.95	
Coronary artery diseases	2.63 ± 0.93	2.56 ± 0.91	2.58 ± 0.94	
Congenital heart diseases	2.55 ± 1.1	2.41 ± 1.03	2.4 ± 1.06	
Peripheral arterial disease	2.55 ± 1.01	2.4 ± 0.96	2.43 ± 0.98	
Rheumatic heart disease	2.61 ± 0.93	2.57 ± 0.88	2.59 ± 0.92	
Arrhythmia	2.43 ± 1.02	2.3 ± 0.97	2.36 ± 1.01	
Pericarditis	2.48 ± 1.01	2.37 ± 0.96	2.39 ± 0.98	
Aortic diseases	2.35 ± 1.00	2.21 ± 0.95	2.23 ± 0.96	
Obesity	2.90 ± 0.99	2.82 ± 0.98	2.82 ± 0.98	0.783
Low Medium and high risk	3.08 ± 0.89	2.99 ± 0.89	3.01 ± 0.89	
Class I: BMI of 30–35	2.94 ± 0.99	2.86 ± 0.97	2.87 ± 0.98	
Class 2: BMI of 35–40	2.82 ± 1.00	2.77 ± 0.99	2.78 ± 1.01	
Class 3: BMI of 40 or higher	2.75 ± 1.06	2.66 ± 1.04	2.68 ± 1.04	
Metabolic Associated Steatotic Liver Disease (MASLD)	2.34 ± 1.11	2.27 ± 1.08	2.25 ± 1.07	0.373
NAFLD	2.43 ± 1.05	2.35 ± 1.03	2.32 ± 1.02	
NASHD	2.25 ± 1.15	2.19 ± 1.12	2.19 ± 1.12	
Renal disease	2.67 ± 1.07	2.55 ± 1.04	2.56 ± 1.06	< 0.05*
Glomerulonephritis	2.9 ± 0.94	2.82 ± 0.93	2.8 ± 0.94	
Kidney stone	2.81 ± 0.99	2.67 ± 0.96	2.71 ± 0.98	
Analgesic nephropathy	2.44 ± 1.12	2.32 ± 1.08	2.32 ± 1.09	
Chronic kidney disease	2.96 ± 0.95	2.85 ± 0.96	2.85 ± 0.97	
prerenal disease	2.85 ± 0.97	2.72 ± 0.93	2.74 ± 0.99	
Lupus nephritis	2.11 ± 1.12	2 ± 1.07	2.02 ± 1.08	
Polycystic kidney disease	2.46 ± 1.07	2.33 ± 1.03	2.34 ± 1.04	
Acute Kidney Injury (AKI)	3.05 ± 0.94	2.94 ± 0.95	2.94 ± 0.97	
Diabetes	3.06 ± 0.96	3.04 ± 0.95	3.03 ± 0.96	0.783
Type 1 Diabetes (T1D)	3.21 ± 0.86	3.26 ± 0.78	3.22 ± 0.82	
Type 2 Diabetes (T2D)	3.3 ± 0.75	3.28 ± 0.75	3.26 ± 0.77	
Genetic Drug Induced	2.68 ± 1.11	2.62 ± 1.09	2.63 ± 1.11	
Gestational	3.06 ± 0.97	3.04 ± 0.94	3.03 ± 0.95	
Dyslipidemia	2.22 ± 1.20	2.15 ± 1.15	2.15 ± 1.15	0.605
Hyperlipidemia	2.45 ± 1.11	2.35 ± 1.07	2.36 ± 1.08	
Hypoalphalipoproteinemia	1.99 ± 1.25	1.96 ± 1.21	1.94 ± 1.19	

The Mann–Whitney U test revealed that professional role (academic faculty vs. clinical mentor) did not significantly influence competency scores ($p < .05$). This indicates a uniform distribution of knowledge gaps across both teaching and clinical supervision roles. Significant differences were observed by

education level, with participants holding a bachelor's degree or higher demonstrating higher mean scores across prevention, management, and control compared to those with lower educational attainment (all $p < 0.05$).

Age was also significantly associated with cardiovascular disease competencies. Participants aged 23–39 years had higher mean scores in prevention (2.76 ± 0.90 vs 2.61 ± 1.04 , $p < 0.05$) and management (2.66 ± 0.89 vs 2.51 ± 0.98 , $p < 0.05$) compared to those aged 40–65 years. However, no significant age-related difference was observed for control ($p = 0.07$). Additionally, no significant differences were observed by department ($p > 0.05$).

Education level was significantly associated with diabetes-related competencies. Participants with a bachelor's degree or higher reported higher mean scores across prevention, management, and control (all $p < 0.05$). There were, however, no statistically significant differences observed across study population, department, or age groups (all $p > 0.05$).

There were no statistically significant differences in dyslipidemia-related competencies across study population, department, education level, or age groups (all $p > 0.05$). Similarly, no statistically significant differences were observed across all socio-demographic characteristics for MASLD-related competencies (all $p > 0.05$).

Significant differences were observed by department, with participants from nursing demonstrating higher mean scores than those from clinical medicine across prevention ($p = 0.01$), management ($p = 0.001$), and control ($p < 0.05$). Education level was also associated with obesity control, with higher scores observed among participants with a bachelor's degree or higher ($p < 0.05$). No significant differences were observed by study population or age ($p > 0.05$). Competency scores for renal diseases were significantly associated with both education level and age. Participants with a bachelor's degree or higher reported higher mean scores across prevention, management, and control (all $p < 0.05$). Similarly, younger participants (23–39 years) had significantly higher scores compared to those aged 40–65 years across all domains: prevention ($p < 0.05$), management ($p < 0.05$), and control ($p < 0.05$). No significant differences were observed by study population or department ($p > 0.05$ as shown in Table 4).

Table 4

Association Between Self-Reported Performance Levels of Cardiometabolic Disease Skills and Selected Sociodemographic Characteristics Among Faculty at Clinical Mentors

Disease	Action	Study Population			Department			Education Level			Age		
		Clinical mentor	Faculty	P	Clinical medicine	Nursing	p	Bachelor & above	Less than a bachelor	P	23–39 years	40–65 years	P
		Mean ± SD	Mean ± SD		Mean ± SD	Mean ± SD		Mean ± SD	Mean ± SD		Mean ± SD	Mean ± SD	
Cardiovascular diseases	Prevention	2.65 ± 0.99	2.67 ± 0.93	0.88	2.69 ± 0.93	2.69 ± 0.97	0.92	2.74 ± 0.93	2.52 ± 1.07	< 0.05*	2.76 ± 0.90	2.61 ± 1.04	< 0.05*
Cardiovascular diseases	Management	2.52 ± 0.96	2.59 ± 0.90	0.36	2.57 ± 0.90	2.59 ± 0.93	0.63	2.64 ± 0.89	2.40 ± 1.04	< 0.05*	2.66 ± 0.89	2.51 ± 0.98	< 0.05*
Cardiovascular diseases	Control	2.58 ± 0.99	2.59 ± 0.92	0.87	2.58 ± 0.92	2.61 ± 0.97	0.52	2.66 ± 0.92	2.39 ± 1.05	< 0.05*	2.65 ± 0.90	2.54 ± 1.02	< 0.05*
Diabetes	Prevention	3.03 ± 1.00	3.07 ± 0.93	0.89	3.03 ± 0.87	3.08 ± 1.00	0.11	3.12 ± 0.93	2.87 ± 1.01	< 0.05*	3.06 ± 0.90	3.06 ± 1.01	0.42
Diabetes	Management	3.02 ± 0.99	3.06 ± 0.90	0.89	3.01 ± 0.87	3.07 ± 0.97	0.11	3.11 ± 0.9	2.85 ± 1.02	< 0.05*	3.06 ± 0.88	3.03 ± 1.00	0.99
Diabetes	Control	3.03 ± 0.99	3.04 ± 0.93	0.75	3.00 ± 0.90	3.06 ± 0.99	0.12	3.10 ± 0.92	2.39 ± 1.02	< 0.05*	3.04 ± 0.89	3.02 ± 1.02	0.69
Dyslipidemia	Prevention	2.24 ± 1.25	2.21 ± 1.17	0.58	2.28 ± 1.19	2.19 ± 1.21	0.44	2.27 ± 1.14	2.07 ± 1.38	0.25	2.29 ± 2.14	2.14 ± 1.30	0.26
Dyslipidemia	Management	2.19 ± 1.19	2.13 ± 1.13	0.39	2.24 ± 1.16	2.10 ± 1.15	0.24	2.21 ± 1.10	1.97 ± 1.31	0.13	2.22 ± 1.08	2.07 ± 1.23	0.21
Dyslipidemia	Control	2.18 ± 1.20	2.13 ± 1.13	0.45	2.22 ± 1.18	2.11 ± 1.14	0.29	2.21 ± 1.10	1.95 ± 1.29	0.095	2.22 ± 1.06	2.06 ± 1.24	0.21
MASLD	Prevention	2.42 ± 1.12	2.30 ± 1.09	0.14	2.40 ± 1.03	2.31 ± 1.15	0.49	2.37 ± 1.09	2.25 ± 1.15	0.45	2.32 ± 1.07	2.36 ± 1.15	0.60
MASLD	Management	2.36 ± 1.09	2.22 ± 1.07	0.08	2.31 ± 1.02	2.25 ± 1.11	0.61	2.41 ± 1.07	2.13 ± 1.11	0.20	2.28 ± 1.05	2.26 ± 1.11	0.91
MASLD	Control	2.34 ± 1.09	2.20 ± 1.06	0.08	2.30 ± 1.02	2.22 ± 1.10	0.55	2.29 ± 1.07	2.15 ± 1.10	0.43	2.24 ± 1.02	2.27 ± 1.12	0.70
Obesity	Prevention	2.95 ± 1.02	2.86 ± 0.97	0.11	2.80 ± 1.00	2.95 ± 0.98	< 0.05*	2.95 ± 0.93	2.72 ± 1.15	0.40	2.95 ± 0.91	2.84 ± 1.07	0.43
Obesity	Management	2.85 ± 0.99	2.80 ± 0.97	0.34	2.70 ± 0.96	2.89 ± 0.99	< 0.05*	2.87 ± 0.92	2.65 ± 1.12	0.43	2.87 ± 0.91	2.77 ± 1.05	0.36
Obesity	Control	2.86 ± 1.02	2.82 ± 0.97	0.39	2.70 ± 0.97	2.91 ± 0.99	< 0.05*	2.90 ± 0.94	2.63 ± 1.12	< 0.05*	2.88 ± 0.91	2.78 ± 1.06	– .41
Renal diseases	Prevention	2.74 ± 1.15	2.79 ± 1.03	0.43	2.75 ± 1.06	2.79 ± 1.09	0.31	2.73 ± 1.03	2.47 ± 1.15	< 0.05*	2.84 ± 1.03	2.69 ± 1.10	< 0.05*
Renal diseases	Management	2.63 ± 1.12	2.68 ± 0.99	0.37	2.63 ± 1.04	2.68 ± 1.05	0.29	2.62 ± 1.00	2.32 ± 1.13	< 0.05*	2.74 ± 1.02	2.57 ± 1.08	< 0.05*
Renal diseases	Control	2.62 ± 1.15	2.70 ± 1.00	0.29	2.62 ± 1.05	2.70 ± 1.07	0.09	2.64 ± 1.02	2.28 ± 1.14	< 0.05*	2.74 ± 1.03	2.58 ± 1.10	< 0.05*

A Kruskal Wallis test was conducted and a statistically significant difference in proficiency scores across years-of-experience categories ($\chi^2 = 43.48$, $df = 2$, $p < 0.001$) was observed.

Proficiency scores differed significantly between respondents with less than 10 years and those with 10–20 and 21–42 years of experience. However, no statistical difference was observed between proficiency and participants with less than 10 years and those with 21–42 years as shown in Table 5.

Table 5
Post hoc pairwise Wilcoxon comparisons between years of experience and proficiency score

Comparison	P value	Interpretation
< 10 years vs 10–20 years	< 0.05	Significant difference
< 10 years vs 21–42 years	0.35	No significant difference
10–20 years vs 21–42 years	< 0.05	Significant difference

Multivariable Ordinal Regression of factors influencing proficient scores

The ordinal logistic regression model was developed to determine the factors associated with self-proficient scores with cardiovascular diseases used as the reference category.

Respondents had significantly higher odds of reporting higher proficiency scores for diabetes, obesity and renal diseases compared to CVDs (AOR = 2.46, 95% CI: 2.26–2.68, $p < 0.05$, AOR = 1.60, 95% CI: 1.46–1.74, $p < 0.05$ & AOR = 1.07, 95% CI: 1.00–1.15, $p < 0.05$).

In contrast, significantly lower proficiency scores were observed for dyslipidemia (AOR = 0.61, 95% CI: 0.54–0.68, $p < 0.05$) and MASLD (AOR = 0.65, 95% CI: 0.58–0.73, $p < 0.05$) compared to CVD.

Additionally, respondents with less than a bachelor's degree had significantly lower odds of lower proficiency scores (AOR = 0.67, 95% CI: 0.63–0.72, $p < 0.05$) compared to those with bachelor's degree and above.

The respondents from nursing departments had significantly higher odds of higher proficiency (AOR = 1.14, 95% CI: 1.07–1.20, $p < 0.05$) in comparison to clinical medicine department

On the other hand, clinical mentors/preceptors had significantly higher odds of higher proficiency scores (AOR = 1.27, 95% CI: 1.19–1.34, $p < 0.05$) compared to faculty.

Respondents aged 40–65 years did not significantly differ in proficiency scores (AOR = 0.97, 95% CI: 0.92–1.02, $p = 0.26$) compared to respondents aged 21–39 years. The respondents with 10–20 years of experience had significantly lower odds high proficiency scores (AOR = 0.83, 95% CI: 0.83–0.90, $p < 0.05$) compared to participants with less than 10 years of experience as shown in Table 6

Table 6
Adjusted Ordinal Logistic Regression of Factors Associated with Self-reported Proficient scores

Variable	Category	Adjusted OR	95% CI	p-value
Disease	Cardiovascular diseases (Ref)			
	Diabetes	2.46	2.26–2.68	$P < 0.05^*$
	Dyslipidemia	0.61	0.54–0.68	$P < 0.05^*$
	MASLD	0.65	0.58–0.73	$P < 0.05^*$
	Obesity	1.60	1.46–1.74	$P < 0.05^*$
	Renal diseases	1.07	1.00–1.15	0.05
Education level	Bachelor & above (Ref)			
	Less than bachelor	0.67	0.63–0.72	$P < 0.05^*$
Age group	21–39 years (Ref)			
	40–65 years	0.97	0.92–1.02	.0.26
Department	Clinical medicine (Ref)			
	Nursing	1.14	1.07–1.20	$P < 0.05^*$
Study population	Faculty (Ref)			-
	Clinical mentor	1.27	1.19–1.34	$P < 0.05^*$
Years of experience	< 10 years (Ref)			
	10–20 years	0.83	0.83–0.90	$< 0.05^*$
	21–42 years	0.95	0.95–1.06	0.34

Discussion

To the best of our knowledge, this study represents a pioneering effort in Kenya to comprehensively assess CMD prevention, management and control competencies among faculty and clinical mentors. Our findings reveal a relative competency gradient across disease domains. While proficiency is relatively high in diabetes and obesity, there seems to be relatively low proficiency in dyslipidemia and MASLD.

The prioritization gap: why diabetes and obesity lead

The relatively higher self-reported competency scores observed in diabetes and obesity likely reflect their entrenchment in the global and national priorities within training curricula and clinical practice. As noted by [24] in a scoping review of noncommunicable disease programs evaluation, most NCD program evaluations focus heavily on diabetes and hypertension, often at the expense of other conditions revealing critical disease-focus gaps. In Kenya, the Primary Care Network (PCN) Guideline in 2021 [25] and the 2024 the National Clinical Guidelines for mapping DM and hypertension (HTN) [26] [27] have provided structured frameworks that increase educator familiarity and confidence. This "policy-to-proficiency" pipeline demonstrates that when the Ministry of Health prioritizes a condition through guidelines and continuous professional development (CPD), trainer competency follows.

The “silent” epidemics: dyslipidemia and MASLD

In contrast, perceived lower scores in dyslipidemia and MASLD highlight a critical mismatch between disease burden and educational emphasis. Despite their role as primary drivers of cardiometabolic disease mortality, these two conditions remain underemphasized in training curricula and clinical practice. The barriers identified by [28] including insufficient curriculum room (time), lack of access to trained specialists or faculty expertise, limited faculty interest - are likely mirrored in the Kenyan context. This gap highlights the need to strengthen emerging and often underrepresented conditions within both pre-service and in-service training programs. The profound gap in MASLD competency is particularly concerning given its rising prevalence; without targeted upskilling, it will remain an invisible driver of liver and metabolic morbidity in the region.

Sociodemographic drivers of competency

Our study identified higher education as a significant driver to self-reported CMD proficiency as higher education attainment was independently associated with better self-reported CMD proficiency. This could be due to advanced professional training and continuing professional development opportunities. In addition, those with higher educational levels could have heard broader theoretical grounding. The superior performance of participants with a bachelor's degree or higher aligns with findings that advanced formal education enhances clinical reasoning skills and exposure to complex conditions. [29] It also underscores the importance of strengthening training pathways and ensuring that lower-cadre health workers receive adequate support through targeted in-service training and capacity-building initiatives. However, our findings contrast with some studies [30] [31] that found no disparity across cadres, suggesting that in the Kenyan context, the depth of pre-service training remains a primary determinant of professional readiness.

The years of experience in our study showed that respondents with 10–20 years of experience reportedly had lower odds of higher proficiency than those with < 10 years of experience. This could be because of reduced exposure to updated CMD guidelines or fewer refresher training while newer graduates may have more updated CMD training. However, the findings diverge from studies by [32–34]

Departmental differences, particularly the higher competency scores observed among nurses may be explained by the nature of nursing roles including providing frontline chronic disease care, greater patient interaction and involvement in counselling, follow-up, continuity care and screening programs.[29] [35] These responsibilities align closely with prevention and management, potentially resulting in greater familiarity and skill in this area compared to other cadres.

Notably, significant differences in proficiency scores observed between faculty and clinical mentors could be because the clinical mentors have more recent practical exposure, they engage frequently with patients whereas the faculty are more classroom oriented and are less involved in routine CMD management. This therefore calls for the need for a stronger integration between academic teaching and current clinical practice.

Our findings showed that age was not associated with proficiency similar to a studied by[33,34] but aligns to a study by.[34] Our findings suggest that age itself is not protective, and competency development requires ongoing professional engagement.

Systemic implications and recommendations

In line with the above findings, we hereby highlight systemic implications and possible recommendations;

- 1. Curriculum modernization: from peripheral to core integration:** Current medical and nursing curricula in Kenya often treat dyslipidemia and MASLD as secondary complications of diabetes rather than distinct, primary drivers of cardiometabolic risk. Curriculum modernization must move these topics from elective or peripheral modules into the core “gold standard” training for all clinical cadres. This involves shifting from a siloed, disease-specific teaching model to an integrated metabolic-health framework. By embedding advanced lipidology and hepatic steatosis diagnostics into pre-service training, institutions can ensure that the next generation of providers views MASLD not as an incidental finding, but as a critical clinical marker requiring early intervention.
- 2. Targeted continuous professional development (CPD) programs: inclusivity in skill distribution:** CPD must be specifically engineered to reach older, experienced mentors and lower-cadre health workers. For older mentors, who possess vast clinical wisdom but may lack familiarity with the latest evidence-based guidelines, “reverse mentorship” programs or intensive refresher workshops on MASLD staging and modern statin therapies are essential. Simultaneously, for lower-cadre mentors, training must be demystified through decentralized, mobile-learning platforms and peer-to-peer mentorship. This ensures that expert-level competency is not concentrated at the top of the educational hierarchy but is equitably distributed across the entire training ecosystem.
- 3. Policy expansion: scaling the “diabetes-hypertension” success model:** There is need to build upon the success of diabetes and hypertension guidelines to create similar national frameworks for broader metabolic health. Specifically, the Ministry of Health should build upon the robust infrastructure of the 2021 PCN and the 2024 National Clinical Guidelines for diabetes and hypertension to catalyze a broader policy expansion. There is an urgent need for a unified National Cardiometabolic Health Framework that provides standardized diagnostic algorithms and treatment protocols for dyslipidemia and fatty liver disease. By elevating these “silent” conditions to the same level of policy surveillance and resource allocation as hypertension, the health system can mandate their inclusion in institutional audits and performance contracts. This top-down policy pressure will necessitate that training institutions prioritize these competencies to meet national health targets.

This study has several notable strengths. First, its upstream” focus. By assessing trainers, we provide valuable insights into the root of workforce capacity. Second, the inclusion of 32 counties provides a robust, nationally representative snapshot of the Kenyan training landscape. Third, the inclusion of multiple cardiometabolic disease domains and sub-domains allowed for a comprehensive assessment of competencies, enabling identification of both strong and weak areas across prevention, management, and control. Finally, the analysis incorporated multiple socio-demographic factors, providing a nuanced understanding of variations in competency across different groups.

Despite these strengths, some limitations should be considered when interpreting the findings. First, the reliance on self-reported measures of competency may result in overestimation of skills due to social desirability bias. Future research should utilize Objective Structured Clinical Examinations (OSCEs) or direct observation to validate these findings against actual clinical performance. Second, the cross-sectional study design limits the ability to establish causal relationships between socio-demographic factors and competency levels. The associations observed should therefore be interpreted as indicative rather than causal. Future studies incorporating objective assessments, such as direct observation or practical evaluations should be conducted to provide a more robust measure of competency.

Conclusion

This study demonstrates a self-reported “competency gradient” among educators responsible for training Kenya’s future healthcare workforce. Participants reported lower proficiency in dyslipidemia and MASLD, while those with higher educational attainment, nurses, and clinical mentors indicated higher proficiency scores. These findings highlight the need to develop targeted opportunities for curriculum enhancement and ongoing professional development.

Declarations

Ethics approval and consent to participate

Ethical approval for the study was obtained from Amref Health Africa Ethics Scientific and Research Committee (ESRC) (ref. no. ESRC P1726/2024). The ethics committee was chosen since it’s one of the top institutions accredited to review research work in Kenya in addition to it’s short review timelines. Participants were informed by the participant information sheet, and informed consent was obtained from all participants before participating in this study. In addition, the participants were asked to voluntarily participate, and the confidentiality of their responses were carried out in accordance with the Declarations of Helsinki.

Consent for publication

Not applicable

Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Competing interests

The author(s) declare(s) that they have no competing interests

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Authors' contributions

JO and HW conceptualized the study. JO, HW, BO and SO collected and collated the data. HW, SO, BO and CK supervised the research protocol development. MM and PA and SO contributed to the data analysis. JO and HW wrote the first draft of the manuscript. All authors critically reviewed the manuscript.

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