

Influence of training resources on non-physician anaesthetists trained at Kenya Medical Training Colleges in western Kenya

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ABSTRACT

The severe shortage of health workers in sub-Saharan Africa is projected to worsen beyond 2030 due to rapid population growth, limiting access to safe, timely, and affordable surgical care. Anaesthesia services are particularly affected, with only about two anaesthesiologists per 100,000 people, leading to surgical delays and restricted access. This study assessed the influence of training resources on non-physician anaesthetists trained at Kenya Medical Training colleges in western Kenya. The study utilized the theory of labour shortage. The study utilized a descriptive survey design where stratified random sampling was used to classify Kenya Medical Training College (KMTTC) and three campuses. Purposive sampling was used to select the samples with the required information. Proportionate sampling was employed to select a sample size within the samples that would reflect the numerical strength of the samples selected, and finally, a simple random sampling technique was used to accord each member a chance of being selected, and each choice would be independent of any other choice. The target population for the study was 200 students, 25 hospital administrators, and 25 lecturers. The study used the Yamane method to arrive at a sample size of 143 students, 24 hospital administrators, and 28 lecturers. Correspondingly, a pilot study was carried out, and feedback obtained was used to correct research instruments that were afterwards used to collect data in the field. Data was collected through validated questionnaires for students and interviews from lecturers. Descriptive and inferential analysis was utilized to analyze data both qualitatively and quantitatively. The results show that lecturing was the most common delivery method (100%), followed by skills labs (97%) and self-directed learning (92%). All respondents had been trained in the core Non-Physician Anaesthesia Providers (NPAP) curriculum content, which was considered highly relevant to their roles; 97% reported comprehensive topic coverage, and 83% found the depth adequate for practice. Respondents who rated training methods as highly effective had an 88% reduction in the odds of low employability and were three times more likely to report high job satisfaction. Consistent use of multiple delivery methods was associated with a 95% lower likelihood of low employability. Readily available expert guidance reduced the odds of low employability by a factor of 13. Conversely, unaffordable training costs doubled the likelihood of low employability, while exposure to out-dated or irrelevant resources tripled it. The findings of this study will provide evidence-based insights that can guide the enhancement of training programs, promote competency development, and improve the overall quality of anaesthesia services across the region. The study recommends that KMTTCs should invest in establishing and maintaining well-equipped simulation laboratories across all campuses offering anaesthesia training.

Keywords: Anaesthetist, Employability, Learning, Non-Physician, Satisfaction, Simulation-Based Education, Training Resources

I. INTRODUCTION

Anesthesia is an important part of surgical treatment, and therefore anesthesia training must adhere to high quality standards to guarantee patient safety (Gelb et al., 2019). Training programs involve organized activities for increasing the technical skills of employees to enable them to do jobs efficiently (Ozkeser, 2019). Moreover, training creates opportunities for students and/or employees to gain work familiarity making them efficient once deployed (Ozkeser, 2019). This study will investigate the educational experiences of non-physician anesthesia students revealing the advantages and challenges of the training programs at higher learning institutions. Non physician anesthesia student training is an indispensable part of medical education. The increasing variety of healthcare treatments around the globe has prompted the rise in demand for surgeries. The World Health Organization (WHO) reported in 2015 that 2.8 million surgery procedures were conducted worldwide each year, with 5.7 million extra operations required to address the planet's fundamental surgical requirements (David et al., 2018).

Globally, the scarcity of well-trained Anaesthesiologists has been a serious healthcare concern for the developed and developing nations. The WHO has claimed that this scarcity has resulted in a significant gap in surgical

and anaesthetic care in developing nations (Biccard & Green-Thompson, 2018). These nations have high budget deficits that limit the resources available for education particularly medical training. The ratio is estimated to be one anesthesiologist for 100,000 patients in contrast to one anesthesiologist for 25,000 persons in developed nations (Biccard & Green-Thompson, 2018). This scenario calls for effective training methods to maximize efficiency in healthcare service delivery despite the harsh realities. An evolving medical technological environment, scarcity of qualified trainers and resource inadequacies remain top challenges of anaesthesia education globally (Bul  on et al., 2021). The fast advancement of healthcare technology calls for regular curriculum reviews and modifications (Bul  on et al., 2021). Varying training standards across the globe has limited the effectiveness of Anaesthesiologists labour mobility further deepening the gap in healthcare (Morris et al., 2018). This is since training standards employed in one region may be particularly suited for that region's unique circumstances (Bul  on et al., 2021). Moreover, this reflects the resource gaps in the global society that impact clinical exposure levels affecting differences in anaesthetics care around the world. In many developing nations, there is a scarcity of trained anaesthesia lecturers (Morris et al., 2018). As a result, anaesthesia practitioners may lack the necessary training to deliver safe anaesthesia care.

The African continent is severely understaffed with regards to aesthetic care. It is estimated that there are about 2 anaesthesiologist's for 100,000 people in Africa, resulting into high delays for surgeries and limited access to secure surgical care for maternal and paediatric care (Morris et al., 2018). The standard of anaesthesia training in the continent is a serious issue reflected in the high rate of anaesthesia-related fatalities. Notably, it is believed that improved training might save 1 in 150 fatalities connected to anaesthesia (World Health Organization [WHO], 2019). High population growth in Africa further increases the demand for aesthetic care. This reality has stretched the medical capacities of many countries in the content. The training of non-physician anaesthesia students in Africa has specific challenges that influence the state of medical training on the region. Inadequate resources have seen a restriction on the access to simulation centers and contemporary medical technology undermining training curriculum (Gray et al., 2022). The growing demand for healthcare reaffirms the significance of examining the factors that influence the training of post-basic anaesthesia students in African universities and colleges. Furthermore, concerns such as regional differences in educational standards and the need for specialized measures to address distinct cultural and environmental factors highlight the importance of a localized research. Patient safety in Kenya is seriously threatened by a scarcity of anaesthesia practitioners and inadequate anaesthesia training (Lilaonitkul et al., 2020). Resource constraints are a serious barrier, with insufficient access to cutting-edge technology and simulation facilities impeding practical training (Lilaonitkul et al., 2020). Moreover, insufficient training facilities have seen the healthcare sector in the country fail to meet the demand for aesthetic care. A scarcity of experienced anaesthesia trainers who are further strained by massive workloads is a serious concern for the training program (Lilaonitkul et al., 2020).

1.1 Statement of the Problem

The provision of safe anaesthesia services in Kenya remains a major challenge due to the limited number of qualified physician anaesthetists. To bridge this gap, Kenya Medical Training Colleges (KMTCS) have established training programs for non-physician anaesthetists (NPAs) to support surgical and emergency care, particularly in county and sub-county hospitals (Ministry of Health [MOH], 2023). The success of these training programs depends largely on the adequacy and quality of training resources, including instructional materials, simulation laboratories, clinical equipment, and access to experienced faculty and clinical mentors (World Health Organization [WHO], 2020). Despite the critical role of NPAs in improving access to anaesthesia services, there have been persistent concerns regarding the adequacy of training resources in KMTCS, especially in Western Kenya (KMTCS Annual Report, 2022). Some training campuses continue to face shortages of essential teaching aids, limited exposure to modern anaesthetic equipment, inadequate simulation laboratories, and insufficient opportunities for hands-on clinical experience. These deficiencies may hinder the acquisition of essential competencies, technical skills, and professional confidence among trainees (Zhao et al., 2022). Consequently, the quality of anaesthesia care provided by graduates may be compromised, posing potential risks to patient safety and overall healthcare outcomes (Mutua & Nyoni, 2022). There is limited empirical evidence assessing how the availability and utilization of training resources affect the quality of training outcomes among non-physician anaesthetist trainees in KMTCS (MOH, 2023; WHO, 2022). Without such evidence, it becomes difficult for policymakers and educational administrators to make informed decisions regarding investment in training infrastructure, curriculum improvement, and resource allocation. Therefore, this study seeks to investigate the influence of training resources on non-physician anaesthetists trained at Kenya Medical Training colleges in western Kenya.

1.2 Research Objectives

To assess the influence of training resources on NPAs trained at KMTCS in Western Kenya on employability.

1.3 Research Question

What training resources influence employability of non-physician anaesthetists trained at KMTCs in Western Kenya?

II. LITERATURE REVIEW

2.1 Theoretical Review

2.1.1 The Theory of Labour Shortage

The Theory of Labour Shortage, as proposed by Veneri (1999), provides a framework for understanding the imbalance between the demand for and supply of skilled labor within specific occupational groups or sectors. According to Veneri, labor shortages arise not merely from an absolute lack of workers, but from a mismatch between the skills possessed by the workforce and those demanded by employers. This concept shifts the focus from quantity to quality, emphasizing the importance of aligning training and education systems with the evolving requirements of the labor market. Veneri (1999) argued that persistent labor shortages often occur when training institutions and labor policies fail to adapt to technological changes, demographic shifts, or economic restructuring. For instance, industries experiencing rapid innovation tend to demand new competencies that traditional training systems may not provide. Consequently, even in the presence of high unemployment, employers report difficulties filling vacancies a phenomenon termed structural labor shortage. This theoretical view highlights that shortages are frequently skill-specific rather than universal, reflecting inefficiencies in workforce development and human capital planning. The theory also draws attention to the time lag between education and employment outcomes.

Veneri observed that educational institutions operate on relatively long cycles of curriculum revision and program delivery, whereas labor market demands can change quickly. This lag creates a temporary disequilibrium where the skills of graduates do not match current employer expectations. Thus, labor shortages can be mitigated by improving feedback mechanisms between employers, training providers, and policymakers to ensure continuous alignment of curricula with market needs. Subsequent studies have expanded on Veneri's framework to examine sectoral and regional variations in labor shortages. For example, research by Barnow et al. (2000) and Cappelli (2015) supports Veneri's argument that shortages often reflect institutional rigidities and information asymmetries, rather than a true scarcity of workers. Similarly, in the healthcare and education sectors, scholars have noted that shortages often stem from limited training resources, poor working conditions, and inadequate retention strategies rather than insufficient labor supply (Zurn & Dumont, 2008; Maré et al., 2019). These findings reinforce Veneri's view that policy interventions must target both training adequacy and labor market incentives. In recent years, the theory has gained renewed relevance amid global technological transformation and post-pandemic workforce disruptions. Studies applying Veneri's model to contemporary labor markets emphasize that addressing shortages requires not only expanding training capacity but also enhancing employability skills, promoting lifelong learning, and ensuring flexibility in occupational mobility (World Economic Forum, 2020; ILO, 2022). The persistence of skill mismatches across sectors such as healthcare, information technology, and technical trades suggests that the core insights of Veneri's theory remain central to current debates on workforce development and education policy. The Theory of Labour Shortage is especially useful in this research for creating the conceptual framework. This theory tackles the widespread problem of a labour shortage in the healthcare industry, which is a problem that is continuously seen around the world.

2.2. Empirical Review

According to human capital hub training effectiveness refers to the impact that a training intervention has as measured by the achievement of the goals set before the training intervention. Training effectiveness largely depends on how the training is designed, delivered and implemented (Kreismann & Talaular, 2020).

The other key facet of training and its effectiveness depends on the transfer of what has been learnt to the job. This specifically speaks to whether the individual who has attended the training is doing the job better after the training and whether the trainee has more knowledge after the training than before (Kreismann & Talaular, 2020).

The training delivery models should be flexible to meet various learning preferences and achieve comprehensive positive outcomes efficiently. In NPA training, traditional lecture-based methodologies give an understanding of information and theoretical ideas. The addition of lectures with simulated scenarios, hands-on practice, and interactive case studies, on the other hand, can accommodate to different learning styles and promote engaged learning (Bajwa et al., 2022). Widening instruction techniques in NPA training has regularly been shown in studies to be beneficial. Research conducted at KMTC in Eldoret, Kenya examined the efficacy of conventional lecture-based instruction with an integrated method that involved simulation and personal practice (Tibi et al., 2022). The results demonstrated that the integrated method greatly increased student academic performance, demonstrating the need of mixing varied training modalities to boost participation and educational outcomes (Tibi et al., 2022).

The academic programme is a primary factor that can impact effectiveness of medical training particularly on non-physician anaesthetists. An effective curriculum should provide a clear and thorough framework for information acquisition and skill development, influencing the entire training experience and, ultimately, NPA performance. This includes well defined objectives, logical material arrangement, and suitable difficulty attention (Schleiff et al., 2021). This approach guarantees that NPA students are introduced to fundamental principles and abilities before progressing to more complicated concepts and expertise (Schleiff et al., 2021). It also encourages the progressive development of competence, allowing the students to get a thorough grasp of anaesthesia concepts and techniques before utilizing them in clinical practice.

The term resources refer not only to teaching methods and materials but also the time available for instruction and the knowledge and skills of teachers acquired through training and experience (Kibwana et al. 2018),). Teaching and learning Resources (TLR) comprises basically three components: material resources, physical facilities and human resources (Mutua & Nyoni, 2022). Studies done in the past about availability of TLR in education reveal that TLR are not always available in schools. This inadequacy of TLR has been of serious concern to educators (Kibwana et al. 2018),). Learning is a complex activity that involves interplay of students' motivation, physical facilities, teaching resources, and skills of teaching and curriculum demands (Thuranira et al., 2022). Availability of TLR therefore enhances the effectiveness of schools as they are the basic resources that bring about good academic performance in the students (Thuranira et al., 2022). The necessary resources that should be available for teaching and learning include material resources, human resource such as teachers and support staff and, physical facilities such as laboratories, libraries and classrooms.

Practical sessions allow a real-life situation for NPA students to practice their expertise and test their capabilities. These sessions help students to build confidence, fine-tune their skills, and handle possible issues before they meet them in actual medical circumstances (Svelling et al., 2021). Research has proven that these sessions are fundamental in the professional development of NPA practitioners. For instance, a study investigated the efficacy of practical sessions during training for a NPA program in KMTC Kisumu, Kenya (Umutesi et al., 2019). The results revealed that students engaged in practical sessions honed actual expertise skills more proficiently than those exposed only to classroom learning (Umutesi et al., 2019).

This study looks at the influence of training delivery techniques on non-physician anaesthetists (NPAs). Classical lecture-based techniques are crucial for theoretical comprehension, recognizing the requirement for flexibility to suit varied learning preferences. Studies, on the other hand, constantly argue for a hybrid strategy that includes simulated scenarios, personal practice, and interactive case studies. The study intends to provide insights on improving training approaches for NPAs worldwide

Research has repeatedly shown that well-structured curricula have a beneficial effect on NPA training results. For instance, one study examined the efficacy of a competency-based curriculum at KMTC in Kisumu, Kenya (Umutesi et al., 2019). The efficacy of a competency-based curriculum at KMTC in Kisumu, Kenya, was examined in research. Comparing the results to the prior curriculum, the results showed significantly higher levels of student information retention, clinical skill competency, and self-reported confidence (Umutesi et al., 2019). This study emphasizes how crucial a systematic approach is to maximizing the results of NPA training.

Content structuring within a programme is critical for optimal learning. A well-structured curriculum begins with fundamental principles and subsequently builds on with more complicated subjects. This method guarantees that students understand the fundamentals before going into more complex parts of anaesthesia treatment (Livingston et al., 2022). Additionally, the difficulty gradient within a curriculum is critical in molding NPA training (Nevenglosky et al., 2019). A progressive escalation in the perceived degree of difficulty helps students to gain competency at every level before progressing to increasingly difficult assignments (Nevenglosky et al., 2019). This gradual approach builds confidence while reducing the danger of overloading students with complicated topics before they are ready for them.

III. METHODOLOGY

The study was conducted at selected KMTC campuses located in Western Kenya. This region comprises of thirteen counties that include Kisumu, Homabay, Nyamira, Migori, Kisii, Siaya, Vihiga, Kericho, Busia, Eldoret, Bomet, Bungoma and Kakamega. The study employed mixed method research, that is; a combination of descriptive research and correlational research approaches being used simultaneously. Descriptive survey design was used in making careful in-depth observations of a subject or phenomenon of interest. The study target population was 255 consisting of lecturers/clinical instructors, campus/hospital administrators and qualified NPAP graduates in the various counties in Kenya who completed their training between 2020-2023 at campuses in Kisumu, Kisii or Eldoret. The inclusion criteria were the lecturers/instructors and NPAP graduates in the various counties in Kenya who completed their training between the year 2020-2023 while the exclusion criteria were NPAP graduates in the various counties in Kenya who completed their training before 2020 and after 2023. Purposive sampling was used to select the samples

with the required information. Proportionate sampling was employed to select a sample size within the samples that would reflect the numerical strength of the samples selected and finally simple random sampling technique was used to accord each member a chance of being selected and each choice would be independent of any other choice. In determining the study sample, the researcher was guided by Yamane's formula (Umar & Wachiko, 2021).). On the basis of the formula, the researcher arrived at a sample size of 143 NPA providers, 28 lecturers/instructors and 24 hospital administrators.

Data collection tools involved the use validated questionnaires, for NPA providers and interviews for lecturers/instructors and hospital administrators. The researcher incorporated triangulation in the data collection process in order to enhance verification and validation of the collected data. Triangulation is the use of multiple data collection techniques. This multi-faceted approach of data collection gave the researcher an opportunity to corroborate the collected data thus improving on the reliability of the study findings. The data collection instruments were subjected to a validation process. This process included seeking expert opinions from the study supervisors on the appropriateness of items included in the questionnaires. Feedback given by these experts helped in the improvement of the data collection instruments. A pilot study was conducted at Kakamega County Referral hospital capturing NPAs working in the hospital. Cronbach's alpha was used to analyze the reliability measures of the study instruments. Students' questionnaire had a reliability value of 0.783 showing that these instruments were reliable as indicated by Orodho (2014). To avoid plagiarism, all sources cited in the study were acknowledged.

Ethical considerations were also taken into account during data collection process. Permission to conduct the study in the region was sought from Ethics and Research Committee of MMUST and KMTC involved. During the data collection procession, the respondents were assured of the confidentiality of their identities. To ensure this was done, participants were requested not to write their names anywhere on the research instruments. This was necessary because it constituted an explicit willingness of the participants to voluntarily participate in the study. Data was analysed in line with the study objective with the aid of the Statistical Package for Social Sciences (SPSS) Version 27 computer software.

IV. FINDINGS & DISCUSSION

4.1 Response Rate

A total of 143 monkey questionnaires were issued to NPAs and 52 interviews was conducted to hospital administrators and lecturers. A total of 143 (100%) questionnaires were filed and returned back from NPAs. Of these 3 (2%) of the questionnaires returned from NPAs were dropped out of the tally for having significant gaps in response for variable items. Therefore 140 (98%) questionnaires from NPAs were used in the study for analysis. According to Saunders *et al.* (2006) argument that 30 to 50% response rate is acceptably sufficient for statistical generalization.

4.2 Demographic Distribution

From the results in Table 1, the majority 69.3% of NPAs are male while female anaesthetists account for only 30.7%. This gender disparity may reflect the broader trend in Kenya where male dominance persists in technical and high-risk clinical fields, including anaesthesia. According to Spence (1973) gender disparity in technical and clinical cadres are well documented in many health systems. Explanations include social norms, differential access to training opportunities, and perceived occupational risks or working conditions that dissuade women from entering certain specialties (see gender and health workforce reviews). From a human-capital and signalling perspective, gender differences may reflect historical pipelines into clinical officer and technical programs. The results also show that 55% are aged between 31–40 years, followed by 21–30 years at 29.3%. This age pattern shows that the NPA workforce is relatively young and mid-career, reflecting KMTC's success in training anaesthetists who are quickly absorbed into the labor market. According Asamani *et al.* (2025), a relatively young to mid-career demographic is consistent with labour market literature suggesting that young professionals often adopt these roles first, while mid-career individuals balance experience and readiness. Also, Kenya's health labour market is seeing growing numbers of health workers entering practice in their 20s–30s due to expanded training capacity.

The analysis also shows that 75% of NPAs hold a Higher Diploma, the standard qualification offered by KMTC for anaesthesia training. Only 20% possess Bachelor's academic qualifications. From the results, all respondents were qualified to train at Kenya medical training college and therefore in a position to provide reliable information about the study at hand. On the other hand, the results shows that 67.2% NPAs graduated between 2020 and 2021 corresponding to a period of heightened healthcare demand due to COVID-19. The high number of 2020–2021 graduates reflects increased recruitment and training efforts during the pandemic to strengthen critical care capacity. The decreasing trend from 2022–2023 at 24.3% and 8.6% respectively may be attributed to reduced training intake or delayed enrollment cycles after the pandemic.

Furthermore, results shows that majority of NPAs at 69.3% are employed in the private sector, while only 30.7% work in public institutions. This skew distribution suggests that private healthcare facilities and mission hospitals are the leading employers of KMTC-trained NPAs while the lower absorption in the public sector may reflect limited recruitment positions, budget constraints, or slow bureaucratic processes in county health systems. On the number of years before employment, the results shows that a significant majority 65% secured employment within 2–5 years of completing training, while a smaller group 25.7% were absorbed in less than 2 years. Only 9.3% took over 5 years to get employment. This distribution indicates moderate employability of KMTC-trained NPAs—most graduates eventually find work but often after a lag period, possibly due to limited job openings or regional mismatches. The delay also suggests the need for structured internship programs or partnerships within the healthcare institutions to facilitate smoother transition from training to practice. Early employment of within 2 years was likely facilitated by the COVID-19 pandemic's surge in demand for anaesthetic care professionals.

Table 1
Demographic Characteristics of Non-Physician Anaesthetists

Responses		Frequency	Percent
Gender	Male	97	69.3
	Female	43	30.7
	Total	140	100.0
Age	21-30	41	29.3
	31-40	77	55.0
	41-50	22	15.7
	Total	140	100.0
Education	Diploma	7	5.0
	Higher Diploma	105	75.0
	Bachelors	25	17.9
	Masters	3	2.1
	Total	140	100.0
Year of completion of NPA	2020	53	37.9
	2021	41	29.3
	2022	34	24.3
	2023	12	8.6
	Total	140	100.0
Currently employed	Public sector	43	30.7
	Private sector	97	69.3
	Total	140	100.0
Number of years before employment	Less than 2 years	36	25.7
	2-5 years	91	65.0
	more than 5 years	13	9.3
	Total	140	100.0

4.3 Analysis of Likert Scale

4.3.1 Likert Scale on Training Resources

The results in Table 2 examined the influence of training resources on the quality of training of non-physician anaesthetists (NPAs) in Kenya Medical Training Colleges (KMTCs) in Western Kenya. The findings revealed a composite mean score of 2.81 (SD = 1.179), suggesting that while some respondents agreed that training resources were adequate; there was notable variability across the campuses. Specifically, the study showed that textbooks were moderately available (M = 2.29), training was perceived as less affordable (M = 3.65), clinical equipment was often insufficient (M = 3.30), simulation labs were somewhat adequate (M = 2.18), access to expert guidance was inconsistent (M = 3.01), and training resources were fairly up to date (M = 2.43). The uneven access to teaching materials such as textbooks mirrors findings by Kibwana et al. (2018) and Edgcombe et al (2019), who observed that limited availability of learning resources in Kenyan health training institutions leads to disparities in learning experiences and competencies among students. According to the World Health Organization (2022), the standardization of learning materials across campuses is critical in achieving competency-based education and improving healthcare outcomes. Affordability challenges reported by the respondents align with studies by Johnston et al, (2020) and WHO (2020), which found that financial constraints limit enrolment and continuity in health workforce training programs. Cost barriers have been linked to student attrition, limited access to clinical placements, and

reduced motivation among trainees. Hence, the findings highlight the need for KMTCs and the Ministry of Health to enhance bursaries, scholarships, and subsidy mechanisms to support trainee retention and equity. The inadequacy of clinical equipment noted in this study corroborates observations by Kibwana et al. (2018), who emphasized that limited access to anaesthesia machines and monitoring equipment impedes hands-on practice and skill acquisition.

Similarly, Mwasi and Orwa (2023) noted that practical deficiencies compromise clinical competence and confidence of graduates, which may eventually affect patient safety and quality of care. Although respondents rated simulation labs relatively positively ($M = 2.18$), the variability suggests unequal access and use across campuses. This finding is consistent with global literature indicating that simulation-based education (SBE) enhances skill acquisition and performance among anaesthesia trainees, particularly in low-resource settings (Robinson et al., 2024; WHO, 2022). However, the sustainability of SBE depends on faculty training, technical support, and regular curriculum integration. The near-neutral responses regarding access to expert guidance ($M = 3.01$) indicate inconsistent mentorship and supervision. Evidence from Kim et al (2024), and WHO (2020) demonstrates that structured mentorship and clinical supervision are critical components of effective training, facilitating the transfer of simulation gains to real-world practice. Strengthening mentorship frameworks and continuous professional development for clinical instructors is therefore essential. Overall, the composite mean (2.81) reflects partial adequacy of training resources, implying significant heterogeneity among KMTC campuses. These results echo WHO (2022) and KMTC (2022) findings that disparities in resources contribute to unequal competency outcomes. Ensuring equitable distribution of training infrastructure and materials is thus imperative for producing competent NPAs capable of delivering safe anaesthesia care nationwide. The findings of this study emphasize the need for a multi-level strategy encompassing investment in essential equipment, enhancement of simulation-based training, provision of financial support, and strengthening of mentorship frameworks. These interventions align with Kenya's Health Workforce Strategic Plan (MOH, 2023), which underscores competency-based education and equitable access to training resources as cornerstones for healthcare quality improvement.

Table 2
Likert Scale on Training Resources

Methods	SA	A	N	D	SD	Mean	Std
Textbooks are available and adequate in terms of copies	44 31.4%	53 37.9%	1 0.7%	42 30%	-	2.29	1.202
The cost of training is adequately affordable	5 3.6%	29 20.7%	3 2.1%	76 54.3%	27 19.3%	3.65	1.118
Clinical equipment are readily accessible and sufficient	20 14.3%	27 19.3%	3 2.1%	71 50.7%	19 13.6%	3.30	1.318
Simulation labs adequately support training needs	36 25.7%	76 54.3%	2 1.4%	19 13.6%	7 5.0%	2.18	1.114
Access to expert guidance readily available and sufficient	17 12.1%	41 29.3%	5 3.6%	77 55%	-	3.01	1.157
Training resources, such as textbooks, clinical equipment, and simulation labs are up-to-date and relevant to the needs of non-physician anaesthetists	21 15%	82 58.6%	5 3.6%	20 14.3%	12 8.6%	2.43	1.164
Composite Mean and Std						2.81	1.179

4.3.2 Likert Scale on Job Satisfaction

Table 3 presents the responses on job satisfaction among non-physician anaesthetists trained at Kenya Medical Training Colleges (KMTCs) in Western Kenya. The composite mean score was 2.96 ($SD = 1.071$), suggesting that respondents were generally neutral but leaned slightly toward agreement that they were satisfied with their jobs. The highest mean was recorded for 'The workplace offers a very supportive environment for non-physician anaesthetists' ($M = 3.57$, $SD = 0.907$), indicating disagreement that their workplace environments are supportive. Similarly, the statement 'There is high recognition and appreciation for non-physician anaesthetists in the workplace' also had a relatively high mean ($M = 3.29$, $SD = 1.055$), reflecting dissatisfaction regarding recognition. On the other hand, respondents moderately agreed that 'There are many opportunities for professional development' ($M = 2.39$, $SD = 1.057$) and 'My salary highly influences my job satisfaction levels' ($M = 2.61$, $SD = 1.210$). The statement 'The work-life balance as a non-physician anaesthetist is very satisfying' yielded a mean of 2.71 ($SD = 1.196$), suggesting modest satisfaction, while 'I am highly satisfied with my current job' recorded $M = 2.69$ ($SD = 1.046$). Overall, the results indicate that although non-physician anaesthetists experience moderate satisfaction with certain aspects of their work, there are persistent concerns related to recognition, remuneration, and workplace support.

The findings of this study indicate that job satisfaction among non-physician anaesthetists remains moderate, characterized by mixed perceptions across dimensions such as remuneration, work-life balance, and professional

recognition. This aligns with recent studies showing that health professionals in resource-constrained environments often experience only moderate levels of job satisfaction (Johnston et al., 2020). The moderate satisfaction regarding salary reflects on-going disparities in remuneration across the Kenyan health sector. According to the Ministry of Health (MOH, 2023), non-physician cadres such as anaesthetists frequently report pay inequities compared to other specialized health professionals. Similar findings by Edgcombe et al (2019) and Kibwana et al. (2018) highlight that financial incentives and compensation remain critical determinants of motivation and retention among anaesthesia providers. Regarding work-life balance, respondents indicated only modest satisfaction. This is consistent with studies showing that anaesthesia work schedules, often characterized by long hours and emergency call duties, reduce personal time and increase stress levels (Abdiwahab, (2024); WHO, 2022). Enhancing staffing levels and workload distribution has been recommended as a strategy to improve job satisfaction and reduce burnout among anaesthesia personnel. In terms of professional development opportunities, the relatively low mean (2.39) suggests that KMTC graduates perceive a fair number of growth opportunities within their field. This is encouraging and resonates with reports by the Kenya Medical Training College (2022), which identified increasing postgraduate and continuous professional development (CPD) opportunities as a strength of its programs. However, the literature cautions that without adequate mentorship and structured career progression, CPD alone may not translate into long-term retention (Kim et al., 2024). Conversely, recognition and appreciation recorded one of the least favourable responses, with a mean of 3.29. This mirrors findings by Mwasi and Orwa (2023), who found that lack of institutional recognition, contributes to professional dissatisfaction and attrition among non-physician clinicians. Recognition, as emphasized by Herzberg's two-factor theory, is a major motivator influencing job commitment and performance. Finally, the unsupportive workplace environment ($M = 3.57$) underscores systemic challenges such as inadequate equipment, high workload, and limited administrative backing. These conditions, as noted by Kibwana et al. (2018) and WHO (2022), can diminish morale, compromise service delivery, and hinder staff retention in public health institutions. Overall, the composite mean of 2.96 reveals a need for targeted interventions to enhance job satisfaction among non-physician anaesthetists. Strategies such as fair remuneration, improved working conditions, recognition mechanisms, and supportive supervision frameworks are essential to strengthen motivation, performance, and workforce stability.

Table 3*Likert Scale on Job Satisfaction*

Job satisfaction	SA	A	N	D	SD	Mean	Std
I am highly satisfied with your current job as a non-physician anaesthetist?	9 6.4%	78 55.7%	1 0.7%	52 37.1%	-	2.69	1.046
My salary highly influence my job satisfaction levels as a non-physician anaesthetist	23 16.4%	63 45%	8 5.7%	38 27.1%	8 5.7%	2.61	1.210
The work-life balance as a non-physician anaesthetist very satisfying	17 12.1%	65 46.4%	10 7.1%	38 27.1%	10 7.1%	2.71	1.196
There are many opportunities for professional development in the non-physician anaesthetist sector	24 17.1%	74 52.9%	5 3.6%	37 26.4%	-	2.39	1.057
There is high recognition and appreciation for non-physician anaesthetists in the workplace	8 5.7%	37 26.4%	4 2.9%	89 63.6%	2 1.4%	3.29	1.055
Workplace offers a very supportive environment for non-physician anaesthetists?	7 5%	19 13.6%	1 0.7%	113 80.7%	-	3.57	0.907
Composite Mean and Std						2.96	1.071

To answer the research question on what training resources influence employability of non-physician anaesthetists trained at KMTCs in Western Kenya? The researcher carried out chi-square analysis to determine the associations' between training resources and employability of non-physician anaesthesia and the one that influences the most. The Chi-square analysis in Table 4 revealed that two training resources i.e. simulation laboratories ($p = 0.011$) and access to expert guidance ($p = 0.023$) had statistically significant associations with employability of non-physician anaesthetists. The other factors, including textbooks, affordability of training, and adequacy of clinical equipment, did not show significant relationships ($p > 0.05$). These findings suggest that practical, skill-based training environments and mentorship or expert guidance are stronger predictors of employability outcomes than the mere availability of theoretical learning materials or affordability of training programs.

The results highlight the critical role of experiential learning components namely simulation-based training and expert mentorship in improving the employability of non-physician anaesthetists. The significant influence of simulation laboratories aligns with research indicating that simulation-based education (SBE) enhances clinical competence, confidence, and readiness for professional practice, especially in low- and middle-income country (LMIC) contexts (Robinson et al., 2024; WHO, 2022). Simulation enables trainees to practice high-risk, low-

frequency procedures safely, thereby bridging the gap between classroom learning and clinical realities (Zhao et al., 2022). Similarly, the significant association between access to expert guidance and employability underscores the value of mentorship and clinical supervision in professional skill development. According to Kim et al (2024), structured mentorship facilitates clinical reasoning, improves decision-making, and fosters professional identity formation among healthcare trainees. In the anaesthesia field, guidance from experienced practitioners is particularly vital given the technical and ethical demands of patient management (Kibwana et al., 2022). Conversely, the non-significant associations for textbook availability ($p = 0.769$) and affordability of training ($p = 0.858$) suggest that while these factors contribute to general learning conditions, they may not directly influence employability outcomes. This finding supports earlier studies indicating that employability in health professions is more strongly shaped by practical skill acquisition and clinical exposure than by traditional classroom resources (Ranabhat et al., 2024). Although clinical equipment availability did not reach statistical significance ($p = 0.370$), the descriptive data and prior research (Kibwana et al., 2018; WHO, 2020) indicate that inadequate equipment can still hinder the quality of practical training and preparedness for employment. Therefore, while equipment adequacy may not have shown a strong statistical relationship in this dataset, it remains a critical component of quality training infrastructure. Overall, these findings confirm that hands-on training environments and sustained mentorship are key determinants of employability for non-physician anaesthetists. Institutions should therefore invest in simulation-based education, ensure continuous access to skilled instructors, and strengthen partnerships with clinical training hospitals to enhance competency-based training outcomes.

Table 4*Chi-Square Analysis on Training Resources*

Resources	Chi-square value	df	p-value
Textbooks are available and adequate in terms of copies	1.135	4	0.769
The cost of training is adequately affordable	1.320	4	0.858
Clinical equipment are readily accessible and sufficient	4.275	4	0.370
Simulation labs adequately support training needs	2.137	4	0.011
Access to expert guidance readily available and sufficient	2.806	4	0.023
Training resources, such as textbooks, clinical equipment, and simulation labs are up-to-date and relevant to the needs of non-physician anaesthetists	3.113	4	0.539

V. CONCLUSION & RECOMMENDATIONS

5.1 Conclusion

The study aimed to assess the influence of training resources on the employability of non-physician anaesthetists (NPAs) trained at Kenya Medical Training Colleges (KMTCS) in Western Kenya. The findings revealed that while several training resources contribute to the overall learning environment, simulation laboratories and access to expert guidance had a statistically significant influence on employability outcomes. This underscores the importance of practical, hands-on learning experiences and mentorship in preparing NPAs for the dynamic and demanding nature of anaesthesia practice. The results further showed that although textbooks, affordability of training, and adequacy of clinical equipment were viewed as important components of the training process, they did not directly predict employability. This suggests that theoretical knowledge and resource availability alone are insufficient to produce work-ready graduates. Instead, the acquisition of clinical competence through simulation-based learning, continuous mentorship, and exposure to real-world clinical environments, are the most critical determinants of employability. Overall, the study concludes that effective training of non-physician anaesthetists requires a competency-based approach supported by adequate infrastructure, mentorship, and simulation facilities. Strengthening these components will enhance the employability, confidence, and professional readiness of graduates, thereby contributing to improved anaesthesia service delivery in Kenya's healthcare system.

5.2 Recommendation

Based on the findings and conclusions of the study, the following recommendations are made: KMTCS should invest in establishing and maintaining well-equipped simulation laboratories across all campuses offering anaesthesia training. Simulation-based education should be integrated throughout the curriculum to improve clinical reasoning, technical proficiency, and decision-making and regular mentorship programs and clinical supervision frameworks should be institutionalized. Partnerships with experienced anaesthetists and teaching hospitals should be reinforced to ensure continuous guidance and skill transfer to trainees.

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