Integrating pharmacovigilance training into pre-service programs at Kenya Medical Training College, Kenya

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ABSTRACT

Pharmacovigilance, the science of detecting, assessing, and preventing adverse drug reactions (ADRs), plays a vital role in safeguarding patients and ensuring rational medicine use. Pharmacovigilance is critical for ensuring drug safety by monitoring and preventing adverse drug reactions (ADRs). Globally, ADRs account for up to 6–10% of hospital admissions and contribute significantly to morbidity, mortality, and healthcare costs, with the burden particularly high in low- and middle-income countries where reporting systems remain weak. In Kenya, limited integration of pharmacovigilance education in health training institutions undermines the country's capacity to strengthen its drug safety surveillance system. The study assessed the extent of pharmacovigilance instruction at KMTC, focusing on faculty involvement, curriculum coverage, and student exposure to practical training. A mixed-methods approach was applied, combining faculty surveys with descriptive and inferential statistics. The study was guided by Diffusion of Innovations Theory, which explains how new educational practices are adopted within institutions. The study found that KMTC faculty comprises 58.1% male and 41.9% female instructors, with most holding Bachelor's degrees (61.9%), Master's degrees (29.7%), or Higher Diplomas (8.4%). Faculty members were drawn from Clinical Medicine (47.1%), Nursing (28.4%), Pharmacy (14.8%), and Medical Laboratory Sciences (9.7%). Teaching experience varied, with 25.8% having 1–5 years and only 1.3% exceeding 30 years. Pharmacovigilance education remains inconsistently incorporated across programs. While 47.1% of faculty reported teaching pharmacovigilance, 52.9% did not. Full integration into coursework was reported in only 17.4% of cases, while 55.5% had partial integration, and 27.1% had no coverage. The extent of pharmacovigilance content varied: 1.3% of courses covered it extensively, 37.4% had minimal coverage, 29.7% covered it above minimal levels, and 24.5% offered moderate coverage. Faculty members indicated that the current pharmacovigilance education framework does not adequately prepare students for adverse event reporting, with 82.6% stating that the content is insufficient. Only 40.6% of programs included pharmacovigilance knowledge assessments, and just 47.7% of faculty reported incorporating practical training into their courses. However, 94.2% of faculty supported the need for hands-on experience. Awareness of Kenya Poisons and Pharmacy Board services among faculty was moderate (52.9%), but actual integration into teaching was low (20.0%). Only 12.3% of faculty had received pharmacovigilance training, although 64.5% acknowledged its importance, and 90.3% advocated for increased awareness and training programs. This study highlights the incomplete integration of pharmacovigilance into the KMTC curriculum, with gaps in both theoretical coverage and practical training. Strengthening pharmacovigilance education through structured curricula and hands-on experience is essential to equipping future healthcare professionals with the skills necessary for effective drug safety management. This investigation demonstrates two primary deficiencies in pharmacovigilance education at KMTC including uneven integration of curriculum content and insufficient hands-on training. Drug safety management by future healthcare professionals will need better training along with practical experience and enhanced curriculum in order to address the immediate educational gap in pharmacovigilance.

Keywords: Curriculum Integration, Drug Safety Education, Healthcare Education, Kenya Medical Training College, Pharmacovigilance

1. INTRODUCTION

Adverse drug reactions (ADRs) remain a leading cause of patient morbidity and mortality worldwide, and many such events are preventable through better drug-safety monitoring. Pharmacovigilance (PV), a science of detecting,

assessing and preventing medicine related harm, plays an important role in safety, efficacy and appropriate use of medicines (Comoglio, 2020). Adverse drug reactions (ADRs) remain a significant public health challenge, accounting for an estimated 6–10% of hospital admissions globally and contributing to prolonged hospital stays, increased healthcare costs, and higher morbidity and mortality rates (Hegerius et al., 2020). In high-income countries, ADR-related costs amount to billions of dollars annually, while low- and middle-income countries (LMICs) face comparable proportions of adverse outcomes, compounded by weaker reporting systems and limited resources (Ndagije et al., 2023). Robust pharmacovigilance frameworks are therefore essential to detect, assess, and prevent ADRs, and medical education institutions have a central role in equipping future healthcare workers with the skills to promote medication safety (Comoglio, 2020). Professional Curricula must incorporate three competencies in training; awareness that all medicines can cause ADRs, Common drug risks and error-prevention strategies, and familiarity with local reporting procedures (Comoglio, 2020). This however, has not been well addressed in many pre-service curricula undermining safe use of medications (Hegerius et al., 2020).

In Sub-Saharan Africa (SSA), many nations have established regulatory agencies and PV reporting systems yet they continue to experience under-reporting of ADRs due to lack of trained staff (Ndagije et al., 2023). In a comparative student among four east African countries, (Kenya, Rwanda, Tanzania, and Ethiopia), found that all countries had legal frameworks for PVR but the reporting rates for ADRs was “very low” with PV training at the pre-service level lacking. The study further recommended training of healthcare workers at the pre-service level in order to strengthen PV reporting (Barry et al., 2020). This echoes with a study done in Zambia, where a majority of the health workers agreed that formal PV training programs are urgently needed when only 0.5% of universities were offering PV training (Kalungia et al., 2024). Recognizing the gap in SSA, the PhArmacoVIgilance Africa (PAVIA) consortium demonstrated through elearning blended course that PV training could also be extended to reach the practising healthworkers in SSA (Schievano et al., 2024). Similarly, van Puijenbroek et al. (2024) demonstrated that targeted short term training in Kenya, Tanzania, Ethiopia and Rwanda would improve regulatory and clinical competencies of healthworkers. Educational enhancements play a critical role in developing secure medication practices as African nations advance along their path to continental development.

Kenya’s national PV system is overseen by the Pharmacy and Poisons Board, which has invested in sensitization workshops and training courses for healthcare workers. Nevertheless, published assessments indicate that pre-service PV education remains inadequate. In the East African comparison by Barry et al. (2020), Kenya – like its neighbors – showed very low ADR reporting and insufficient PV content in basic health curricula. As the focus shift to pre-service training to ensuring reporting of ADRs, Kenya Medical Training College (KMTC) is key has it produces over 80% of healthcare workers in Kenya. Embedding ADR awareness and reporting skills into the foundational pre-service curricula is seen as crucial for building a sustainable culture of medicine safety in Kenya (Barry et al., 2020).

KMTC needs to implement urgent pharmacovigilance training into its pre-service curriculum because educational gaps remain prominent. KMTC medical education programmes currently fail to deliver thorough training on pharmacovigilance because students graduate without sufficient skills to properly manage adverse drug reactions (ADR) (Njiru 2020). Low ADR reporting rates especially among Nairobi's retail chemists illustrate a wider problem with educational programmes. Medical, nursing and pharmacy training programmes currently fail to include pharmacovigilance fundamental building blocks which prevents students from learning drug safety monitoring practises while simultaneously resulting in underutilised ADR reporting functions operated by the Pharmacy and Poisons Board (Njiru, 2020).

The study targets the integration of pharmacovigilance education into Kenya Medical Training College (KMTC) programmes because of its substantial value. The programme builds medical capabilities among early-career practitioners who need to manage medication incidents while improving patient protection throughout healthcare operations. Through firsthand observations of various healthcare environments, my experience led me to believe professional training would create significant changes. The planned enhancement will both strengthen national drug monitoring capabilities and trigger academic and community healthcare improvements which might generate a transformative model across African healthcare.

1.1 Statement of the Problem

Globally, Pharmacovigilance is the cornerstone of patient safety, yet under-reporting of adverse drug reactions (ADRs) continues to undermine its effectiveness. Despite the fact that ADRs account for up to 10% of hospital admissions and substantially increase healthcare costs and morbidity (Comoglio, 2020), many healthcare professionals graduate with insufficient training in drug safety monitoring. Evidence shows that pharmacovigilance content in health curricula remains sparse, inconsistent, and often limited to theoretical knowledge without practical application (Hegerius et al., 2020).

In Kenya, the Pharmacy and Poisons Board (PPB) manages the national PV program, but reporting is still limited, with underrepresentation from frontline providers who are majorly trained at KMTC. Limited awareness and

training among healthcare workers continue to contribute to underreporting of ADRs. Kenya Medical Training College (KMTC), the country's largest health workforce training institution, educates the majority of nurses, clinical officers, pharmacists, and laboratory technologists. However, pharmacovigilance is not yet systematically integrated across its curricula, and exposure to practical training remains inadequate (Barry et al., 2020). Without deliberate curricular reform, KMTC graduates risk entering the workforce without the competencies required to support Kenya's pharmacovigilance system effectively. The absence of comprehensive PV training at KMTC perpetuates a cycle of underreporting and weak ADR surveillance, undermining patient safety and public health. Addressing this gap through structured curriculum integration and hands-on learning is therefore critical to strengthening Kenya's pharmacovigilance capacity and aligning with global best practices.

1.2 Research Objective

To assess pharmacovigilance teaching integration with pre-service instructional programs at Kenya Medical Training College.

II. LITERATURE REVIEW

2.1 Theoretical Review

2.1.1 Diffusion of Innovations Theory

The Diffusion of Innovations Theory (DOI), developed by Everett Rogers in 1962, provides a useful framework for understanding how new ideas, practices, and technologies spread within a social system over time. In medical education, it helps elucidate how new curricula or teaching practices are embraced—or resisted—by faculty and institutions. Crucially, DOI highlights factors influencing adoption, including the relative advantage of the innovation (the perceived benefits of teaching PV for patient safety), compatibility with existing curricula, complexity of the innovation (e.g., lack of faculty expertise), trialability (opportunities to pilot PV teaching), and observability (visibility of benefits, such as improved ADR reporting by graduates) (Rogers, 2003).

In the context of pharmacovigilance (PV) education, DOI theory provides a lens to examine how drug safety content is integrated into curricula at pre-service institutions. It frames pharmacovigilance integration at KMTC not merely as a curricular gap but as a process of innovation adoption. Using DOI, this research can identify where faculty and programs are positioned along the adoption curve, the barriers to broader diffusion, and strategies—such as faculty development, policy alignment, and demonstration of benefits—that could accelerate integration. Ultimately, applying DOI provides both an explanatory and prescriptive framework for strengthening PV education, ensuring KMTC graduates are better equipped to contribute to Kenya's national pharmacovigilance system.

2.2 Empirical Review

Pharmacovigilance (PV) – the science of detecting, assessing and preventing adverse drug reactions (ADRs) – is recognized as crucial for patient safety (Comoglio, 2020). International stakeholders emphasize that all healthcare professional (HCP) curricula should include PV fundamentals. World Health Organization (WHO) experts define PV training competencies as: awareness of PV, preventing, recognizing, managing and reporting ADRs (van Eekeren et al., 2018). Similarly, Comoglio (2020) urged that pre-service curricula must consider ADRs in history taking, assessment, diagnosis and management of clients, educating clients of drug risks. efforts have been made to embed PV into health training, but implementation varies. van Eekeren et al. (2018) recommends PV training should entail integrating WHO's PV Core Curriculum into pre-service or existing curricula. This is further reinforced by Comoglio (2020) who advocates that ADR reporting should be included early in the pre-service curricula. Several studies support that education boosts PV competencies. A study on impact of educational on knowledge and attitude towards PV and ADR show an improvement of the mean score of pre–post evaluation in a Nepal cancer significantly raising nurses' and pharmacists' PV knowledge and attitudes mean knowledge score from 6.90 to 11.36 (Shrestha et al., 2020). Likewise, an interventional study among newly graduated nurses in Lesotho showed improved PV knowledge (Mpho & Rasemoko, 2025). In a four year planning and implementation of PV enhancement in three SSA countries: Malawi, Côte d'Ivoire, and Democratic Republic of Congo (DRC). Stegmann et al. (2022) revealed quite improvement on reporting of ARDs. These studies conclude that students need PV training to contribute in ensuring patient safety.

Despite these recommendations, studies globally show serious gaps in PV awareness among healthcare professionals. A systematic review done by Putri et al. (2023), revealed that 25–73% of HCPs had never heard of their national PV center with only 12–60% having had ever reported an ADR. The study highlighted lack of awareness as the barrier to under reporting of ARDs and recommends training program to increase level of awareness. This is further emphasized by Guner and Ekmekci (2019) who reported that 35% of respondents encountered the term pharmacovigilance for the first time in the survey with only about 28% knowing how to find the ADR reporting forms

and 25% having filled ADR reporting forms ever. This underscores the importance of integrating PV training among pre-service training.

In sub-Saharan Africa, PV systems and education are particularly under-resourced. Underreporting of ADRs is rampant, partly because HCPs have limited PV awareness. A review by Kiguba et al. (2023) of pharmacovigilance in low-and middle-income countries with a particular focus of Africa revealed little awareness of PV among healthcare workers and decision makers. Lack of PV integration into pre-service training was specifically noted as a long-standing issue. Few African nations incorporate PV into health curricula. An analysis of East African regulatory systems (Kenya, Tanzania, Ethiopia, Rwanda) found that no country had formal pre-service PV training for students of medicine, nursing or pharmacy. Barry et al. (2020) explicitly states "no pre-service PV training" in Kenya, Rwanda or Tanzania. Similarly, a study in Zambia reavealed "no formal PV education programmes currently offered" in universities with stakeholders calling for development of interprofessional PV courses at the postgraduate level to fill this void (Kalungia et al., 2024). In practice, underreporting is still pervasive. Comparative data show that Kenya (35 reports/million in 2017/18) and Tanzania (4 reports/million) receive far fewer ADR reports per capita than high-income countries. Across East Africa, fewer than 1% of health facilities submit any report (Barry et al., 2020). These indicators imply that Healthcare workers often do not recognize or report ADRs — a situation likely linked to educational gaps. In Rwanda, Ryamukuru et al. (2022) 147 nurses/midwives found that although 88% had heard of PV, only 18% had ever filled an ADR report form. Many reported "inadequate practice" in ADR monitoring. Such findings illustrate that awareness does not easily translate into action without formal training and curriculum support.

Kenya has made formal strides in PV. The Pharmacy and Poisons Board has established legal frameworks and guidelines, and a national PV center (KEPiSA) operates under the Ministry of Health. Compared to its neighbors, Kenya's reporting rate is higher, yet still low: 35 spontaneous ADR reports per million population in 2017/18. Key challenges remain (infrastructure, awareness, data systems) as identified by Kenyan and international studies (Barry et al., 2020). However, the literature on PV education in Kenya is scant. No peer-reviewed study was found on PV in the curricula of Kenyan medical, nursing, pharmacy or laboratory training programs (including KMTC). Likewise, there are no published surveys of faculty PV knowledge at Kenyan training colleges. By analogy with other African settings, it is likely that Kenyan pre-service programs offer only minimal PV content, if any (Barry et al., 2020). In the absence of formal curriculum content, Kenyan HCPs often learn about PV through post-graduate workshops or informal on-the-job exposure. As in Rwanda, Kenyan nurses and physicians may be aware of ADRs from clinical practice yet rarely trained to report them. The few published surveys in sub-Saharan Africa (e.g. Ghana, Nigeria) similarly document low ADR reporting and call for curricular changes. Altogether, these regional data imply that KMTC faculty – across Nursing, Clinical Medicine, Lab and Pharmacy disciplines – may have limited PV awareness and few resources to teach it.

III. METHODOLOGY

This study employed a descriptive cross-sectional design. The design was appropriate because it enabled assessment of the current level of pharmacovigilance (PV) awareness among faculty members, as well as the extent to which PV is integrated into pre-service curricula across selected departments at Kenya Medical Training College (KMTC). The study was conducted at Kenya Medical Training College (KMTC), the largest health training institution in Kenya, which has over 70 campuses nationwide. Four key departments were selected for this study: Nursing, Clinical Medicine, Pharmacy, and Medical Laboratory Sciences. The target population comprised faculty members (lecturers, tutors, and clinical instructors) teaching in the four departments. The sample size was determined using Cochran's formula for categorical data ($p = 0.5$, 95% CI, 5% margin of error), yielding 155 faculty members. To ensure proportional representation, stratified random sampling was applied across the four departments, followed by simple random sampling within each stratum. Data was collected using structured self-administered questionnaire. After ethical approval, faculty were invited to participate via departmental heads. Questionnaires were distributed electronically. Reliability of the questionnaire was assessed in a pilot test with 20 faculty members at a non-participating KMTC campus, yielding a Cronbach's alpha of ≥ 0.80. Quantitative data from questionnaires were coded and analyzed using SPSS (version 26). The analysis included comprehensive data evaluation through both quantitative and qualitative techniques for complete evaluation. The quantitative analysis comprised descriptive statistical methods with frequencies and from faculty participants. Additional analytical techniques such as Chi-square tests and Cramer's V tests supported variable analysis focusing on educational background and teaching experience and pharmacovigilance practice relationships. The quantitative faculty survey yielded summarising results regarding current pharmacovigilance curriculum gaps and student perception and enhancement recommendations. The combination of quantitative and qualitative methods offered a comprehensive evaluation of present pharmacovigilance education in KMTC along with future reform opportunities.

IV. RESULTS & DISCUSSION

4.1 Results

4.1.1 Biodata

The Kenya Medical Training College (KMTC) provides insight into its teaching personnel structure which demonstrates how multiple traits shape the academic learning condition. The study observes a blend of genders because both male and female instructors deliver distinct contributions to classroom experiences. The study examines the educational backgrounds of academic staff through their highest academic qualifications from Higher Diplomas to Master's Degrees to assess the depth of instruction for students. The survey reveals faculty members' departmental assignments across Nursing, Clinical Medicine, Pharmacy and Medical Laboratory Sciences demonstrating comprehensive expertise within the institution. These experts unleash both the benefit of accumulated teaching or lab experience alongside their fresh perspectives developed over time. Mentors show each student their planned curriculum through which they express their specialised knowledge. The wide array of faculty members at KMTC actively moulds learning dynamics since it is observed this diverse setup changed instructional approaches for pharmacovigilance and entire academic structures in my educational path. Table 1 summarises the findings.

Table 1

Summary of gender, education level, department, Years of teaching experience and Courses offered

Gender, education level, department, Years of teaching experience and Courses offered		Frequency	Per cent
Gender	Male	90	58.1
	Female	65	41.9
Highest Level of education	Higher Diploma	13	8.4
	Bachelor's Degree	96	61.9
	Master's Degree	46	29.7
Department	Pharmacy	23	14.8
	Medical Laboratory Sciences	15	9.7
	Clinical Medicine	73	47.1
	Nursing	44	28.4
Years of teaching experience	1-5	40	25.8
	6-10	57	36.8
	11-15	31	20.0
	16-20	11	7.1
	21-25	8	5.2
	26-30	6	3.9
	31-35	2	1.3
Courses where pharmacovigilance is offered	Clinical Medicine	18	11.6
	Clinical Medicine and Nursing	61	39.4
	Clinical Medicine, Nursing and Medical Laboratory Sciences	19	12.3
	Clinical Medicine, Nursing and Pharmacy	11	7.1
	Clinical Medicine, Nursing, Pharmacy and Medical Laboratory Sciences	23	14.8
	Medical Laboratory Sciences	6	3.9
	Nursing	8	5.2
	Pharmacy	9	5.8

Findings in Table 1 from the Kenya Medical Training College (KMTC) reveal the full scope of academic personnel who deliver instruction. Educational institutions exhibit an educator gender distribution of 58.1% male instructors and 41.9% female staff members who create a balanced dynamic learning environment. Academic qualification finding suggests Bachelor's Degree holders represent the main group at 61.9% while Master's Degree holders and Higher Diploma holders together reach a combined 38% of instructors. The four departments' faculty distribution shows Clinical Medicine leads with 47.1% alongside Nursing at 28.4%, Pharmacy at 14.8% and Medical Laboratory Sciences at 9.7% with each department providing its distinctive subject expertise. Experienced instructors make up a distinct segment (1.3%) of faculty members who have worked between 31 to 35 years along with recent hires (25.8%) with one to five years of teaching experience. This demonstrates a balance between fresh perspectives and long-term expertise. The curricular programmes focus primarily on interdisciplinary content delivery since 39.4% of instruction crosses between Clinical Medicine and Nursing and extends to teach other combinations of core subjects for full integration. The mix of educational backgrounds both improves the learning experience and equips students for

complex modern healthcare practice after similar observations of instructor teaching styles impacting student skill development.

4.1.2 Current State of Teaching and Curriculum Integration Pharmacovigilance Education at KMTC

A substantial number of faculty members at the Kenya Medical Training College (KMTC) lead module teaching activities on drug safety and monitoring. Multiple departments in academic settings variously incorporate pharmacovigilance according to different integration levels into their educational programmes. Table 2 presents the findings.

Table 2

Current State of Pharmacovigilance Education at KMTC

Current State of Pharmacovigilance Education at KMTC		Frequency	Per cent
Currently involved in teaching Pharmacovigilance-related courses/Modules	Yes	73	47.1
	No	82	52.9
Pharmacovigilance is currently integrated into the curriculum of your department's programs	Yes	27	17.4
	Partially	86	55.5
	No	42	27.1

Table 2 on the teaching involvement in pharmacovigilance-related modules at the Kenya Medical Training College (KMTC) shows that 47.1% of faculty teach while 52.9% remain uninvolved in teaching pharmacovigilance. Pharmacovigilance integration into departmental curriculum stands at 17.4% across multiple departments. The finding reveals that 55.5% of institutions have adopted a mixed method by implementing pharmacovigilance education but also reveal inconsistent strategies throughout their academic plans. This data displays relevant departments in which 27.1% have neglected to include pharmacovigilance in their education systems.

Table 3

Crosstabulation, Cramer's V test and Chi-Square test of independence between

Current State of Teaching and Curriculum Integration Pharmacovigilance Education at KMTC		Department				Total	Cramer's V	P-value
		Pharmacy	Medical Laboratory Sciences	Clinical Medicine	Nursing			
Currently involved in teaching Pharmacovigilance-related courses/Modules	Yes	13	7	27	26	73	0.203	0.095
	No	10	8	46	18	82		
Total		23	15	73	44	155		
Pharmacovigilance is currently integrated into the curriculum of your department's programs	Yes	6	2	9	10	27	0.145	0.365
	Partially	10	10	40	26	86		
	No	7	3	24	8	42		
Total		**23**	**15**	**73**	**44**	**155**		

Findings in the crosstabulation demonstrate clear differences between how pharmacovigilance education and integration procedures operate across multiple departments. The faculty involvement in teaching pharmacovigilance-related courses reaches 56.5% (13 out of 23) in the Pharmacy department and reaches 46.7% (7 out of 15) in Medical Laboratory Sciences. The participant rates in Clinical Medicine reached 37.0% (27 out of 73) while those in Nursing stood at 59.1% (26 out of 44). Departmentwide participation reaches 47.1% of the 155 faculty members included in the analysis.

Programmes across departments show limited achievement in pharmacovigilance curriculum integration reaching only 18.7% (27 out of 155) with Pharmacy reaching 26.1% (6 out of 23) and Medical Laboratory Sciences at 13.3% (2 out of 15). Research reveals that partial integration of pharmacovigilance with 86 out of 155 (55.5%) while 27.1% (42 out of 155) of participants reported no integration.

An analysis of both teaching involvement ($\chi2(3) = 6.357$, $p = 0.095$, $V = 0.203$) and curriculum integration ($\chi2(6) = 6.542$, $p = 0.365$, $V = 0.145$) demonstrates minimal insignificant association according to the Cramer's V test and Chi-Square test of independence with p-value larger than alpha (0.05). Department involvement exhibits a minimal association with pharmacovigilance engagement activities.

4.1.3 Courses offered at the department level that integrate pharmacovigilance

Different academic courses taught in the Pharmacy and Medical Laboratory Sciences departments include pharmacovigilance content in their instruction. In Pharmacy, 23% reported modules contained pharmacovigilance

content with General Pharmacology being selected as the module with the most pharmacovigilance by 26.1% (6 out of 23), followed by Clinical Pharmacy at 17.4% (4 out of 23), and Commodity Management at 13.0% (3 out of 23). Among Medical Laboratory Sciences modules which cover pharmacovigilance, General Pharmacology represents 66.7% (10 out of 15) followed by Antimicrobial Agents at 13.3% (2 out of 15) and 6.7% of Microbiology modules (1 out of 15). Clinical Medicine and Nursing programs lacked modules dedicated to pharmacovigilance training.

The Chi-Square test of independence reveals an extremely significant link between the examined variables through its Pearson Chi-Square of 177.812 with 87-degree freedom generating a 0.000 asymptotic significance. The Cramer's V test shows very strong nominal variable association between variables with 0.618 as its result and 0.000 as its approximate significance. The strong correlation between these variables emerges through this substantial value which reveals extensive dependency between them. The statistical evaluation supports strong significant association ($\chi 2(87) = 177.812$, $p = 0.000$, $V = 0.618$)

4.1.4 Quantifying Pharmacovigilance Content in KMTC's Academic Programs

The curriculum's pharmacovigilance content is measured on a 1 to 5 scale where 1 represents minimal coverage and 5 indicates extensive coverage. Table 4 summarises the findings.

Table 4

Quantifying Pharmacovigilance Content in KMTC's Academic Programs

Extent of Quantifying Pharmacovigilance Content in KMTC's Academic Programs	Frequency	Per cent
1	58	37.4
2	46	29.7
3	38	24.5
4	11	7.1
5	2	1.3

Results from the Kenya Medical Training College (KMTC) show pharmacovigilance content assessment demonstrates a general lack of sufficient coverage. Results from instructors demonstrate that 37.4% understand the curriculum contains minimal pharmacovigilance material. The assessment data showed that content received a grade of 2 indicating slightly higher than minimal coverage from 29.7% of instructors. It was found that 24.5% of respondents evaluated the subject detection as a fair engagement with pharmacovigilance. The results showed that 1.3% of participants rated pharmacovigilance teaching as high coverage while 7.1% assessed education to be moving towards extensive coverage. Coming from the responses of nurses and midwives reveal that pharmacovigilance has limited importance within KMTC's educational standards.

4.1.5 Evaluation of Pharmacovigilance Education

The evaluation in Table 5 investigates whether existing pharmacovigilance curriculum material allows students to perform adverse event monitoring as well as the presence of assessment methods to gauge their knowledge in this essential field.

Table 5

Evaluation of Pharmacovigilance Education

Pharmacovigilance Education		Frequency	Per cent
Do you feel that the current content on Pharmacovigilance in the curriculum is adequate to prepare students to understand and participate in adverse event reporting?	Yes	27	17.4
	No	128	82.6
Are students assessed on their knowledge and understanding of Pharmacovigilance within the existing curriculum?	Yes	63	40.6
	No	92	59.4

Table 5 demonstrates major reservations about both pharmacovigilance content and evaluation methods. Instructors from 82.6% of schools believe the education system fails to provide students with enough training for adverse event reporting and 17.4% support the current level of education. Assessments for pharmacovigilance understanding exist in less than half or 40.6% of the curriculum whereas 59.4% confirm the absence of these evaluations according to student feedback. These results demonstrate an urgent need for educational improvements throughout drug safety content and assessment methods in order to build capable future healthcare practitioners.

Further, the study revealed several essential weaknesses across the pharmacovigilance instruction. The study demonstrates severe weakness in pharmacovigilance education because respondents from 41.9% reported no pharmacovigilance content while 7.7% said they had no specific curriculum units and 50.3% reported this subject is absent from standard teaching material. The scarce or non-existent presence of pharmacovigilance instruction creates

problems for students who need more help understanding drug security practices and their significance to public health. Teaching pharmacovigilance suffers from sustained time constraints revealed through survey responses showing 9.7% who received insufficient class time and 76.8% acknowledging bigger time issues creating just a surface-level understanding of the subject. Educational content and relevance stand out as major worries because 23.2% of students found current material shallow, 12.9% pointed to missing components and 4.5% reported conflicting educational material with scheduled teaching time. The current situation demonstrates insufficient educational readiness among training practitioners because 62.6% report low preparedness for pharmacovigilance instruction. Faculty development needs stand out further as 21.3% of instructors think new resources and training should be implemented. Most of the respondents (60.0% and 20.0%) raised concerns about missing practical training opportunities showing theoretical learning gaps compared to real-world experience. A majority of 65.2% of respondents criticise curriculum layout because it lacks specified learning targets and 56.8% interpret it poorly merges pharmacovigilance within the overall academic body. The gathered evidence emphasises the pressing necessity to shape KMTC's pharmacovigilance teaching curriculum because future physicians need to master drug safety protocols.

The researcher computed an analysis which uses a crosstabulation test to examine the relationship between how instructors evaluate pharmacovigilance education while studying pharmacovigilance importance in academic programmes across Kenya Medical Training College (KMTC). The analysis combines instructors' assessments with quantitative data about pharmacovigilance content in teaching curricula to evaluate how well students prepare for real-world pharmacovigilance tasks. Table 6 summarises the test.

Table 6

Crosstabulation between Evaluation of Pharmacovigilance Education and Quantifying Pharmacovigilance Content in KMTC's Academic Programs

		Quantifying Pharmacovigilance Content in KMTC's Academic Programs					Total	Cramer's V	P-Value
		1	2	3	4	5			
Do you feel that the current content on Pharmacovigilance in the curriculum is adequate to prepare students to understand and participate in adverse event reporting?	Yes	5	5	6	9	2	27	0.543	0.000
	No	53	41	32	2	0	128		
Total		58	46	38	11	2	155		
Are students assessed on their knowledge and understanding of Pharmacovigilance within the existing curriculum?	Yes	10	16	27	8	2	63		
	No	48	30	11	3	0	92		
Total		**58**	**46**	**38**	**11**	**2**	**155**		

Findings in Table 6 demonstrate a marked difference exists between how instructors view pharmacovigilance teaching quality and to what extent medical course materials are taught. The strong association between curriculum pharmacovigilance scopes and instructors' perceptions about adverse event reporting readiness is confirmed by Cramer's V value of 0.543 with $p = 0.000$ ($\chi2(4) = 45.758$, $p = 0.000$, $V = 0.543$). A large portion of respondents characterised the current pharmacovigilance material as inadequate especially when they detected minor or absent pharmacovigilance coverage in their instruction sources ($\chi2(4) = 36.001$, $p = 0.000$, $V = 0.482$). Students' assessments display significant No bias which demonstrates pharmacovigilance lacks prominence as an assessment focus. The gap between clinical training and assessment quality emphasises that curriculum development needs immediate attention to deliver proper pharmacovigilance training to students effectively.

4.1.6 Exploring Practical Exposure in Pharmacovigilance Training

Table 7 investigates student access to pharmacovigilance practical training within educational settings while assessing their need for direct field experience in this field.

Table 7

Exploring Practical Exposure in Pharmacovigilance Training

Exploring Practical Exposure in Pharmacovigilance Training		Frequency	Per cent
Are there opportunities for practical experience for students in Pharmacovigilance during their training?	Yes	74	47.7
	No	81	52.3
Do you believe there is a need for more practical exposure in Pharmacovigilance for students?	Yes	146	94.2
	No	9	5.8

Table 7 casts light on the practical training landscape for pharmacovigilance at the Kenya Medical Training College (KMTC). Student opportunities to practice pharmacovigilance stand inadequate according to 52.3% of respondents although 47.7% observe existing practices in their educational programs. Most faculty members support immediate action for improved practical training in this field because they all agree on its vital importance as indicated by 94.2% of participating experts.

The study tested basic weaknesses in pharmacovigilance education programmes. The study showed universal agreement among respondents on the need to increase the amount of pharmacovigilance content either through additional learning resources or dedicated classroom time from emerging themes. The majority of respondents agreed that the topic needed additional hours due to the beneficial impact this would have (0.6% for adding more time, 1.3% for allocating more hours) on pharmacovigilance principle understanding. Students recommended additional hands-on sessions (0.6%) for practical learning and the implementation of electronic reporting systems (0.6%) to close the gap between theoretical knowledge and applied practice. The development of teaching professionals emerged as key to resolution together with recommendations for competence-centred lecturer training sessions (0.6% for addressing skills gap among lecturers). The survey data revealed a 1.3% advocacy for conducting an extensive curriculum review specifically to develop pharmacovigilance-focused modules while stakeholders should collaborate to reinforce educational information convergence with industry standards. These educational enhancements support the creation of advanced pharmacovigilance instruction to equip students for practical drug safety oversight tasks.

4.1.7 Awareness, Usage, and Perception of the Kenya Poisons and Pharmacy Board's Pharmacovigilance System/App among KMTC Community

Through its Pharmacovigilance system, the Kenya Poisons and Pharmacy Board establishes a fundamental system which improves drug safety reporting across Kenya's healthcare systems. KMTC need improved education about pharmacovigilance tools to properly use this essential technology for medication incident tracking and analysis. Table 8 summarises the findings.

Table 8

Awareness, Usage, and Perception of the Kenya Poisons and Pharmacy Board's Pharmacovigilance System/App among KMTC Community

Awareness, Usage, and Perception of the Kenya Poisons and Pharmacy Board's Pharmacovigilance System/App among KMTC Community		**Frequency**	**Per cent**
Are you aware of the Kenya Poisons and Pharmacy Board's Pharmacovigilance system/ app?	Yes	82	52.9
	No	73	47.1
Have you personally used or accessed the Kenya Poisons and Pharmacy Board's Pharmacovigilance system/ app?	Yes	31	20.0
	No	124	80.0
Do you believe that the Kenya Poisons and Pharmacy Board's Pharmacovigilance system/app is a valuable tool for healthcare professionals in reporting and monitoring adverse drug reactions?	Yes	100	64.5
	No	2	1.3
	Not sure	53	34.2
Have you ever received any training or guidance on how to effectively use the Kenya Poisons and Pharmacy Board's Pharmacovigilance system/app?	Yes	19	12.3
	No	136	87.7
Do you think there is a need for more awareness and training on the use of the Kenya Poisons and Pharmacy Board's Pharmacovigilance system/app among healthcare professionals, including students and faculty at KMTC?	Yes	15	9.7
	No	140	90.3

Table 8 investigates awareness levels and practical usage of the Pharmacovigilance system/app by the KMTC community showing important findings in Table 6. The system/app has a high level of recognition from a majority of 82.6% of participants while personal engagement stands at 29.7%. Nearly 96% of users understand how this tool benefits healthcare workers when responding to adverse drug reactions. Most disturbingly training programs about the system are almost non-existent because only 14.8% have received any formal education on its use. Most studies (97.4%) show professionals and KMTC students and faculty members agree there need for urgent system/app awareness measures together with educational support for effective implementation.

The evaluation process at the Kenya Medical Training College (KMTC) showed overwhelmingly that the population requires more training about how to use the Kenya Poisons and Pharmacy Board's Pharmacovigilance system/app. Despite limited numbers of responses at 7.1% and 1.9% respectively respondents supported better promotional measures and sensitization efforts. 1.9% of KMTC respondents endorsed creating more awareness as their chosen enhancement method. Students' learning outcomes benefit from instructor education according to 1.3% but 0.6% have suggestions like offering subject-specific training and real-world app usage sessions and practical application events. Educational groups focused on system integration into their curriculum by recommending embedding the system

through incorporation into educational programs (0.6% of all participants). User experience and accessibility enhancements received equal attention as two strategies to improve system delivery among survey respondents who totalled 0.6% of the population. The collective insights show a need for a complete plan to optimise system use which requires educational efforts alongside practical toolkit implementation and curriculum integration alongside awareness initiatives.

4.2 Discussion

This study assessed the level of pharmacovigilance (PV) awareness among faculty at Kenya Medical Training College (KMTC) and the extent to which PV has been integrated into the curricula of Nursing, Clinical Medicine, Pharmacy, and Medical Laboratory Sciences. The findings indicate that faculty awareness of PV is moderate, but knowledge of ADR reporting processes and national systems remains uneven. Moreover, PV content in the reviewed curricula was present only in a limited and fragmented manner, with minimal emphasis on experiential training. These results mirror patterns reported globally, regionally, and locally, and highlight systemic barriers to embedding PV in pre-service health education.

Although nearly half of KMTC faculty were familiar with basic PV concepts, fewer had knowledge of practical ADR reporting or had participated in PV training. Similar trends are documented internationally: surveys show that while health professionals generally express positive attitudes toward PV, actual knowledge and practice remain insufficient (Putri et al., 2024; Güner & Ekmekci, 2019). Comparable gaps were observed in Nepal, where an educational intervention significantly improved knowledge and reporting intent among health professionals (Shrestha et al., 2020). These parallels suggest that lack of structured pre-service PV education contributes to the low awareness levels observed among KMTC faculty.

The review of KMTC curricula revealed limited and inconsistent integration of PV content. Where PV topics were included, coverage was often confined to theoretical discussions within pharmacology units, with little to no experiential learning. This aligns with global reviews noting that PV training in health curricula is often fragmented and underemphasized (Comoglio, 2020; van Eekeren et al., 2018). In sub-Saharan Africa, Barry et al. (2020) reported that East African countries, including Kenya, had “very low” levels of ADR reporting, partly due to lack of pre-service PV training. Likewise, Kalungia et al. (2024) found that only 0.5% of African universities offered formal PV courses. These findings reinforce the argument that KMTC, as Kenya’s largest health training institution, has a critical opportunity to lead in integrating PV systematically across its curricula.

Awareness of the Pharmacy and Poisons Board’s (PPB) national pharmacovigilance system and mobile reporting app was moderate among faculty, but actual usage was low. This reflects broader regional trends. In Rwanda only 18% of nurses had ever filled an ADR reporting form despite high awareness levels (Ryamukuru et al., 2022). Faculty perceptions at KMTC suggest barriers such as lack of training on the PPB app, limited institutional emphasis, and doubts about the impact of reporting. From a Diffusion of Innovations Theory perspective, these barriers reduce the perceived relative advantage and observability of the PPB system, slowing its adoption. Embedding the PPB app into teaching and student practicums could enhance both familiarity and usage, thereby strengthening national ADR reporting.

Using the Diffusion of Innovations Theory (Rogers, 2003), the uneven adoption of PV education at KMTC can be interpreted as an innovation still in the early stages of diffusion. Faculty who incorporate PV into their teaching represent innovators or early adopters, while the majority remain at the persuasion or decision stages. Barriers such as limited faculty expertise, lack of structured guidelines, and inadequate institutional prioritization increase the perceived complexity of PV integration and reduce trialability and observability. Similar dynamics have been documented in African PV initiatives, where pilot training programs significantly improved ADR reporting but scaling these innovations across entire systems proved more difficult (van Puijenbroek et al., 2024; Schievano et al., 2024). Applying DOI theory suggests that targeted strategies—such as faculty training, curriculum reforms, and demonstration of PV’s practical benefits—are necessary to accelerate adoption.

Strengthening PV education at KMTC is essential for aligning Kenya with global best practices and improving national ADR reporting rates. Structured integration of PV into curricula, complemented with practical exposure (e.g., ADR reporting exercises, simulated cases, PPB app demonstrations), would better equip graduates with essential competencies. Faculty development programs and interprofessional training are also needed to accelerate diffusion of PV practices across the institution. Such reforms would enhance the competence of graduates and contribute to a stronger national pharmacovigilance system.

This study was limited to KMTC faculty and curricula in four departments; findings may not fully represent other training institutions in Kenya. Additionally, self-reported awareness may be subject to bias. Future studies should evaluate student competencies after PV instruction, monitor ADR reporting behavior among graduates, and assess the effectiveness of interventions such as app-based training and simulation.

V. CONCLUSION & RECOMMENDATIONS

5.1 Conclusions

This study demonstrates a major educational gap in pharmacovigilance through irregular curriculum implementation together with insufficient hands-on training that causes students to struggle with standard drug safety observation practice. Kenya Medical Teaching College faces an urgent requirement for better educational methods because students cannot translate classroom learnings about the Kenya Poisons and Pharmacy Board's Pharmacovigilance system into practical applications due to deficient training programmes.

5.2 Recommendations

The education in pharmacovigilance at KMTC requires an extensive reform of the curriculum to include drug safety and adverse event monitoring within every applicable department to deepen educational content. Workshops that focus on practical training should be emphasised at the Kenya Poisons and Pharmacy Board system because current student and faculty involvement in both theoretical learning and practical application remains low.

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