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Effectiveness of Eye Care Training of Critical Care Nurses on Practices Regarding Management of Ocular Surface Diseases in Two National Referral Hospitals in Kenya

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Abstract

Purpose: Ocular surface diseases (OSD) are common among critically ill patients, with global prevalence ranging from 20–42% and higher rates reported in low- and middle-income countries. Impaired eyelid closure, reduced blink reflex, and tear film instability predispose patients to corneal injury, infection, and vision loss. Despite this burden, up to 50–62% of essential eye care practices are omitted in intensive care units, largely due to inadequate nurse training and lack of standardized protocols.

Materials and Methods: A quasi-experimental study was conducted in two national referral hospitals in Kenya: Moi Teaching and Referral Hospital (intervention site) and Kenyatta National Hospital (control site). A census sample of 126 nurses (intervention n=42; control n=84) was included. Data were collected before and after intervention using validated questionnaires and observational checklists following six structured training sessions. Data were analyzed using SPSS version 26.0. Chi-square and independent t-tests were applied, with significance set at $p<0.05$. Effect sizes were estimated using risk difference (RD) and Cohen's h.

Findings: At baseline, over 75% of nurses had no prior eye care training. Post-intervention, significant improvements were observed in the intervention group: eyelid closure assessment increased from 0% to 56.7% (RD=0.567; h=1.23; p=0.006), dry cornea identification from 0% to 70% (RD=0.70; h=1.57), and identification of OSD risk factors from 8.8% to 63.3% (RD=0.545; h=1.18; p=0.005). Eye lubrication improved from 5.9% to 66.7% (RD=0.608; h=1.32), while eyelid taping increased from 2.9% to 43.3% (RD=0.404; h=0.96; $p<0.001$).

Implications to Theory, Practice, and Policy: Structured eye care training significantly improves nurses' competence in OSD management, with large effect sizes observed across key practices. Integration of standardized protocols and continuous professional development is essential to sustain improvements and enhance patient outcomes in critical care settings.

Keywords: *Ocular Surface Diseases, Critical Care Nursing, Eye Care Training, Intensive Care Unit, Kenya*

JEL Codes: I10, I18, I25, J24, O55

INTRODUCTION

Vision is a critical determinant of quality of life, and visual impairment remains a major global public health concern. Recent estimates indicate that at least 2.2 billion people worldwide live with vision impairment, a significant proportion of which is preventable or treatable (World Health Organization [WHO], 2019, 2023). The burden is disproportionately higher in low- and middle-income countries (LMICs), where access to eye care services remains limited and health systems face competing priorities.

While ocular surface diseases (OSD) may occur in the community due to chronic conditions such as dry-eye syndrome or allergic conjunctivitis (community-acquired OSD), the present study focuses on the acute, hospital-associated form, commonly termed as ICU-acquired OSD or Exposure Keratopathy. This type develops rapidly among critically ill patients when normal ocular-surface protection mechanisms fail during intensive-care admission.

Ocular surface diseases (OSD) encompass a range of disorders affecting the cornea and conjunctiva, often resulting from disruption of ocular surface integrity. Critically ill patients admitted to critical care units (CCUs) are particularly vulnerable because protective mechanisms such as the blink reflex, eyelid closure, and tear-film stability are frequently impaired by sedation, neuromuscular blockade, or mechanical ventilation (Zhao et al., 2022; Zhou et al., 2021). These disruptions expose the ocular surface to desiccation, microbial invasion, and epithelial breakdown, resulting in exposure keratopathy that can progress rapidly to corneal ulceration, scarring, and permanent vision loss if left unmanaged (Zhao et al., 2022; Zhou et al., 2021; Burton et al., 2021). Given that the cornea, which provides most of the eye's refractive power, is especially susceptible to such insult, preventive eye care is now recognized as an essential component of holistic nursing in intensive-care environments (European Society of Intensive Care Medicine, 2020)

Globally, the prevalence of OSD among critically ill patients ranges between 20% and 42%, with higher rates reported in mechanically ventilated and sedated populations (Zhou et al., 2021; Kousha et al., 2018). Recent studies in LMIC settings report even higher prevalence, including up to 60% in intensive care units, reflecting disparities in preventive care practices (Afenigus et al., 2024). In sub-Saharan Africa, limited data exist; however, emerging evidence suggests that inadequate eye care practices and resource constraints contribute to a substantial burden of preventable ocular complications among critically ill patients (Olusanya et al., 2022).

In Kenya, the National Eye Health Strategic Plan (2020–2025) highlights significant unmet needs in eye care services, with approximately 15.5% of the population requiring eye health interventions (Ministry of Health Kenya, 2020). These system wide shortages directly affect CCU environments, where specialized ophthalmic input and equipment are scarce, trained nursing staff are few, and life-saving procedures often overshadow preventive eye-care routines. Limited institutional protocols and the absence of routine screening in ICUs mean that the country's broader unmet needs in eye health translate into heightened vulnerability of critically ill patients to OSD. This is further compounded by gaps in nursing knowledge, absence of standardized protocols, and inconsistent documentation practices (Mutua et al., 2021).

The cornea, which provides the majority of the eye's refractive power, is particularly susceptible to damage in critically ill patients due to its exposure and reliance on protective mechanisms such as tear film, eyelid closure, and blink reflex. Failure of these mechanisms results in drying of the corneal epithelium, increasing the risk of infection, ulceration, and scarring (Zhao et al.,

2022). If not promptly managed, exposure keratopathy can progress rapidly, leading to irreversible blindness and long-term deterioration in quality of life (Zhou et al., 2021; Burton et al., 2021).

Despite the recognized importance of eye care, studies consistently report inadequate knowledge and suboptimal practices among critical care nurses. Evidence from recent studies indicates that many nurses do not routinely assess or document eye conditions, and adherence to evidence-based eye care protocols remains low (Gider et al., 2022; Alharbi et al., 2023). Conversely, structured educational interventions, including protocol-driven and simulation-based training, have demonstrated significant improvements in nurses' knowledge, skills, and compliance with recommended eye care practices (Alharbi et al., 2023; Jkhlab et al., 2025).

Effective prevention of OSD relies on early identification of risk factors, routine assessment, and implementation of evidence-based interventions such as ocular lubrication, eyelid closure techniques, and regular monitoring. Strengthening nurses' knowledge and practice through targeted training and integration of standardized protocols is therefore critical in reducing preventable ocular morbidity among critically ill patients. This study was designed to evaluate the effectiveness of eye care training on the comprehensive management of OSD among nurses in selected national referral hospitals in Kenya.

Statement of the Problem

Ocular surface disease (OSD) is a frequent complication among critically ill patients, with global prevalence ranging from 20 % to 42 (Zhou et al., 2021; Zhao et al., 2022). This heightened risk stems from impaired eyelid closure, sedation, paralytic medication, mechanical ventilation, and the ICU environment. All of these promote corneal drying, infection, and potential vision loss (Burton et al., 2021; Zhao et al., 2022). Exposure keratopathy and related OSDs can severely diminish quality of life after discharge, leading to long-term functional and psychosocial challenges (Sansome & Lin, 2020).

Nursing knowledge and practice in critical-care eye management remain inconsistent, inadequate, and poorly standardized (Gider et al., 2022; Alharbi et al., 2023). At Kenyatta National Hospital, the current ICU protocol that was developed in 2004 offers minimal guidance on eye care, while data from Moi Teaching and Referral Hospital (MTRH) are limited. However, recent ward reviews at MTRH (2022–2024) have revealed recurring cases of exposure keratopathy among ventilated patients, suggesting that this scarcity of documentation conceals a persistent and under-recognized clinical burden. Collectively, these findings indicate that Kenyan ICU patients face preventable ocular complications due to outdated guidelines and gaps in nurse training.

Critically, the root cause lies in the absence of an evidence-based educational framework to guide CCU nurses in the prevention and management of OSD. Without structured, research-driven training, nurses rely on inconsistent individual practices that compromise care quality and contribute to suboptimal patient outcomes.

Despite well-documented risk factors and the potential for serious ocular morbidity, little empirical evidence exists on CCU nurses' knowledge, attitudes, and practices regarding OSD prevention and management in Kenya. Addressing this gap through targeted, evidence-based training is essential for improving nursing competence, standardizing care, and protecting the ocular health of critically ill patients.

LITERATURE REVIEW

Theoretical Review

The current study is underpinned by three complementary nursing theories that guide the understanding of ocular surface disease (OSD) prevention and the role of nursing interventions in critical care units (CCUs).

Self-Care Deficit Nursing Theory (Orem, 1991): Dorothea Orem's Self-Care Deficit Nursing Theory posits that nursing is needed when individuals are unable to meet their own self-care requirements. The central tenet is that patients who cannot perform essential self-care activities depend on nurses to maintain health and prevent complications. In the context of critically ill patients, sedation and mechanical ventilation represent a breach of Orem's "Universal Self-Care Requisites" for maintaining normal physiological functions such as blinking and eye lubrication. These conditions create a self-care deficit that the nurse must address by ensuring ocular protection through hygiene, lubrication, and eyelid closure techniques (Orem, 1991; George, 2022). Structured eye-care training strengthens nurses' capacity to recognize this deficit and implement interventions that compensate for patients' lost self-care ability.

Need Theory (Henderson, 1966): Virginia Henderson's Need Theory frames nursing as assisting patients in performing activities they would do independently if able. The theory identifies 14 basic human needs, including physiological integrity and protection from harm. Eye protection and lubrication in critically ill patients align with Henderson's principles by supporting basic physiological needs, maintaining ocular integrity, and contributing to patient comfort, dignity, and recovery. The theory underscores the importance of nursing interventions in meeting essential patient needs when patients are incapacitated (Henderson, 1966; McEwen & Wills, 2021).

Novice to Expert Theory (Benner, 1984): Patricia Benner's Novice-to-Expert theory describes the development of clinical competence through education and experiential learning. In CCUs, competing priorities and lack of specialized training may cause nurses at the novice or advanced-beginner stages to overlook preventive eye-care practices. This study applies Benner's framework empirically: participants' progression along the novice to expert continuum will be measured through pre and post training knowledge and skill assessments, reflecting measurable gains in competence following the educational intervention (Benner, 1984; Black et al., 2020). The design thus operationalizes Benner's stages; novice, advanced beginner, competent, proficient, and expert into quantifiable variables that capture learning outcomes at each phase.

Theoretical Synthesis

Individually, each theory contributes unique insight, but together they form an integrated conceptual foundation for the study. Henderson's Need Theory defines what nurses must do, preserve fundamental physiological needs such as ocular protection. Orem's Self-Care Deficit Theory explains why nurses must act, because critically ill, ventilated patients cannot meet their Universal Self-Care Requisites, creating a deficit the nurse must fulfill. Benner's Novice-to-Expert Theory specifies how nurses can acquire the necessary expertise through structured, experiential learning assessed in pre- and post-training phases. Collectively, these frameworks justify the design of the educational intervention, elucidate its mechanisms of action, and predict that enhancing nurses' competence through evidence-based training will reduce preventable ocular morbidity among critically ill patients.

Conceptual Framework

The conceptual framework for this study is guided by the interaction between nurse-related factors (knowledge, training, and experience), patient-related risk factors (sedation, mechanical ventilation, incomplete eyelid closure), and institutional factors (protocols, resources, and support systems). These variables influence the implementation of eye care practices, which in turn affect patient ocular outcomes, including the incidence of OSD and quality of life post-ICU.

The framework assumes that structured eye care training strengthens nurses' knowledge and skills, enabling them to perform routine ocular assessments, provide lubrication, and protect the eyes effectively. Improved nursing practices are hypothesized to reduce the occurrence of exposure keratopathy, enhance patient comfort, and prevent long-term visual complications.

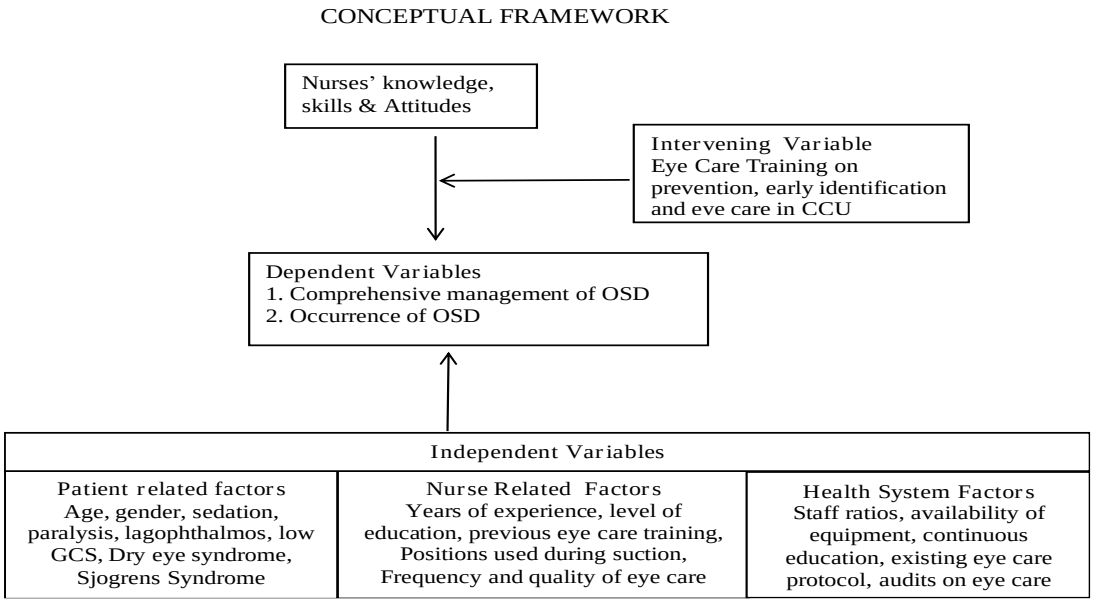

Figure 1: Conceptual Framework Illustration of the Relationship between Nurse Factors, Patient Factors, Institutional Factors, Eye Care Interventions and Patient Outcomes

Source: Chelogoi (2025)

Research Gaps

The reviewed literature reveals a paucity of data regarding the prevalence and management of ocular surface disorders (OSD) within the local and regional context. Existing evidence indicates that nurses possess limited knowledge on eye care practices, which are often inconsistent and lack standardization. Furthermore, there remains an evident gap in specialized training and the absence of clear, evidence-based guidelines to support nursing care for patients at risk of ocular complications, particularly those admitted to intensive care units (ICUs). This study addresses that methodological and contextual void by employing a quasi-experimental (pre- and post-intervention) design to evaluate the impact of structured eye-care training on nurses' knowledge, attitudes, and practices in Kenya's national referral hospitals. By introducing an interventional framework in a setting where prior research has largely been observational, the study provides empirical evidence on how capacity-building initiatives can translate into improved clinical practice and patient safety within Kenyan critical-care environments.

MATERIALS AND METHODS

The study adopted a descriptive, explanatory, prospective open-label observational design. It was conducted in the Critical Care Units (CCU) of Moi Teaching and Referral Hospital (MTRH) as the intervention site and Kenyatta National Hospital (KNH) as the control site. Both MTRH and KNH are public tertiary referral and teaching hospitals offering inpatient, outpatient, and specialized healthcare services, including CCU services. The two facilities, classified as level six hospitals, were purposively selected for the study. The target population comprised all nurses working in the CCUs of the two hospitals who met the inclusion criteria, and data were collected from all eligible participants using the census method. The sampling frame consisted of the nurses' duty rota from MTRH and KNH, which was used to identify participants actively working in the ICU during data collection and to allocate numbers for the study.

The intervention involved training CCU nurses on eye care to improve their management of ocular surface disorders. The training module was validated by experts in ophthalmology and critical care, with a Cohen's kappa coefficient of 0.97. The observation checklist used for data collection before and after the intervention had a Cronbach's alpha of 0.896, indicating high reliability. The training was conducted for one hour daily, one day per week in the morning, over a period of two months, yielding a total of six sessions at the intervention site. The sample size proportions were determined using Wang and Chow (2014), with 42 nurses in the intervention group and 84 in the control group.

Data were collected using an observation checklist and entered into SPSS version 26 for coding and analysis. Descriptive statistics, independent T-tests, and Chi-square tests were used to analyze differences in baseline and end line nurse practices regarding ocular surface disorder management. Data were presented in text, tables, graphs, and charts. Statistical significance was determined using p-values at a 95% confidence interval.

Ethical approval was obtained from the Kenyatta National Hospital/University of Nairobi Ethics and Research Committee (KNH/UON Ref: KNH P365/04/2022) and the Moi Teaching and Referral Hospital Institutional Research and Ethics Committee (IREC Ref: FAN: 0004290). A research permit was obtained from the National Commission for Science, Technology, and Innovation (NACOSTI Ref: NACOSTI P/22/21029) and Kiambu County. Written informed consent was obtained from all respondents prior to participation.

FINDINGS

The study analyzed the level of knowledge and practices among critical care nurses before and after an eye care training intervention at Kenyatta National Hospital (KNH) and Moi Teaching and Referral Hospital (MTRH).

Response Rate

A total of 102 questionnaires were distributed to 34 nurses from MTRH and 68 nurses from KNH before and after training. Out of these, 83 questionnaires were returned, yielding a response rate of 81.4%. According to Mugenda and Mugenda (2003), a response rate of 70% and above is considered satisfactory for analysis and reporting.

Table 1. Response Rate

Response	Frequency	Percent
Returned	83	81.4
Unreturned	19	18.6
Total	**102**	**100**

Socio-Demographic Characteristics

The study participants were predominantly female: 35 (67.3%) at KNH and 27 (87.1%) at MTRH. Most nurses at KNH (23; 43.4%) were aged between 40–49 years, while at MTRH a similar age distribution 26 (83.8%) was observed. The majority of nurses at KNH (14; 27.5%) had 11–15 years of experience, while those at MTRH (11; 35.5%) had 1–5 years of experience. A higher diploma in nursing was the most common qualification at both KNH (22; 41.5%) and MTRH (16; 53.3%), with only two respondents (3.8%) holding a master's degree. Most nurses were ICU-trained—KNH (47; 90.4%) and MTRH (25; 78.1%). However, only 17 (20.7%) across both hospitals had received prior eye care training.

Table 2. Socio-Demographic Characteristics of Study Participants in KNH and MTRH

Variable	Category	Study site		Total
		KNH	MTRH	
Gender	Male	17(32.7%)	4(12.9%)	21(25.3%)
	Female	35(67.3%)	27(87.1%)	62 (74.7%)
Age group	Below 30 Years	3(5.7%)	1(3.2%)	4 (4.8%)
	30-39 Years	16(30.2%)	13(41.9%)	29 (34.5%)
	40 - 49 Years	23(43.4%)	13(41.9%)	36 (42.9%)
	≥50 Years	11(20.8%)	4(12.9%)	15 (17.9%)
Years Of Experience	1 - 5 Years	10(19.6%)	11(35.5%)	21 (25.6%)
	6 - 10 Years	10(19.6%)	4(12.9%)	14 (17.1%)
	11 - 15 Years	14(27.5%)	10(32.3%)	24 (29.3%)
	16 - 20 Years	11(21.6%)	4(12.9%)	15 (18.3%)
	≥21 Years	6(11.8%)	2(6.5%)	8 (9.8%)
Level of Professional Education	Diploma	11(20.8%)	6(20%)	17 (20.5%)
	Bachelor's degree	18(34%)	8(26.7%)	26 (31.3%)
	HND in Nursing	22(41.5%)	16(53.3%)	38 (45.8%)
	Masters' Degree	2(3.8%)	0(0%)	2 (2.4%
ICU Trained	Yes	47(90.4%)	25(78.1%)	72 (85.7%)
	No	5(9.6%)	7(21.9%)	12 (14.3%)
Eye Care Training	Yes	10(19.6%)	7(22.6%)	17 (20.7%)
	No	41(80.4%)	24(77.4%)	65 (79.3%)
Total		**68**	**34**	**102**

Baseline Observed Eye Care Practices of CCU Nurses

At baseline, most nurses from MTRH (32; 94.1%) recorded general eye examinations compared to 32 (47.8%) at KNH, a statistically significant difference ($p < 0.001$). Recording of eyelid closure was low at KNH (26.9%) and absent at MTRH (0%) before training ($p = 0.002$). Most nurses did not record any risks for ocular surface disorders (OSD), KNH (69.2%) and MTRH (91.2%) ($p = 0.021$). Activities such as lubrication, use of sterile gloves, documentation of eye condition, and recommending ophthalmologist reviews were largely inadequate across both sites ($p < 0.05$). Key informant interviews revealed that eye care was inconsistently practiced and that there were no standardized protocols in the ICUs.

Table 3. Baseline Observed Eye Care Practices

		Hospital		Total	95% Confidence interval			
		KNH	MTRH		OR	Lower	Upper	P-value
Records general eye examination done	No	35(52.2%)	2(5.9%)	37				
	Yes	32(47.8%)	32(94.1%)	64	17.5	3.878	78.969	**<0.001**
Records pupil size and reaction to light	No	8(11.9%)	7(20.6%)	15				
	Yes	59(88.1%)	27(79.4%)	86	0.523	0.173	1.59	0.253
Records eye lid closure	No	49(73.1%)	34(100%)	83				
	Yes	18(26.9%)	0(0%)	18	Fischers exact			**0.002**
Records dry cornea	No	43(64.2%)	34(100%)	77				
	Yes	24(35.8%)	0(0%)	24	Fischers exact			**<0.001**
Identifies risks for OSD	No	45(69.2%)	31(91.2%)	76				
	Yes	20(30.8%)	3(8.8%)	23	0.218	0.06	0.796	**0.021**
Washes hands before eye care	No	15(22.4%)	11(32.4%)	26				
	Yes	52(77.6%)	23(67.6%)	75	0.603	0.24	1.513	0.281
Use of solution for eye care	No	3(4.5%)	25(73.5%)	28				
	Yes	64(95.5%)	9(26.5%)	73	0.017	0.004	0.067	**<0.001**
Uses normal saline	No	25(37.3%)	27(79.4%)	52				
	Yes	42(62.7%)	7(20.6%)	49	0.159	0.059	0.406	**<0.001**
Uses Artificial tears	No	59(88.1%)	34(100%)	93				
	Yes	8(11.9%)	0(0%)	8	Fischers exact			**0.049**
Uses Eye medication	No	62(92.5%)	33(97.1%)	95				
	Yes	5(7.5)	1(2.9%)	6	0.376	0.042	3.351	0.381
Use of sterile gloves during eye care	No	56(86.2%)	29(85.3%)	85				
	Yes	9(13.8%)	5(14.7%)	14	1.073	0.329	3.497	0.907
Lubrication done frequently	N0	52(77.6%)	32(94.1%)	84				
	Yes	15(22.4%)	2(5.9%)	17	0.217	0.046	1.01	0.052
Mechanical taping of the eye lid	No	58(86.6%)	33(97.1%)	91				
	Yes	9(13.4%)	1(2.9%)	10	0.195	0.024	1.61	0.129
Eye swab taken	No	59(89.4%)	34(100%)	93				
	Yes	7(10.6%)	0(0%)	7	Fischers exact		0.74	0.092
ETT suction done from one side	No	56(83.6%)	34(100%)	90				
	Yes	11(16.4%)	0(0%)	11	Fischers exact			**0.014**
Documentation on eye care done	No	41(61.2%)	34(100%)	75				
	Yes	26(38.8%)	0(0%)	26	Fischers exact			**<0.001**
Documentation of eye health status	No	55(82.1%)	34(100%)	89				
	Yes	12(17.9%)	0(0%)	12	Fischers exact			**0.007**
Consults/recommends ophthalmologists	No	53(79.1%)	34(100%)	87				
	Yes	14(20.9%)	0(0%)	14	Fischers exact			**0.002**

Post-Test Eye Care Practices of Nurses

Post-intervention results demonstrated significant improvements in eye care documentation and practices at MTRH compared to the control site, KNH. Recording of eye examination rose to 28 (93.3%) at MTRH versus 32 (47.8%) at KNH ($p < 0.001$). Recording of eyelid closure improved from 0% to 56.7% at MTRH ($p = 0.006$). Documentation of dry cornea improved from 0% to 70% ($p = 0.002$). The use of sterile gloves increased at MTRH (46.7%) compared to KNH (14.9%) ($p = 0.001$), and lubrication frequency also improved from 5.9% to 66.7% (p

< 0.001). However, consultation with ophthalmologists remained low and non-significant (p = 0.531). Key informant interviews confirmed improved documentation but identified persistent gaps in consistency, recommending regular audits and early ophthalmologist involvement.

Table 4. Post-Test Observation of Eye Care Practices of Nurses

Eye Care Practices		Site		Total	95% Confidence Interval			
		KNH	MTRH		OR	Lower	Upper	P-Value
Records Eye Examination Done	No	35(52.2%)	2(6.7%)	37				
	Yes	32(47.8%)	28(93.3%)	60	**15.313**	**3.374**	**69.491**	**<0.001**
Records Pupil Size	No	8(11.9%)	0	8				
	Yes	59(88.1%)	30(100%)	89		fischers exact		0.102
Record Eye Lid Closure	No	49(73.1%)	13(43.3%)	62				
	Yes	18(26.9%)	17(56.7%)	35	**3.56**	**1.445**	**8.772**	**0.006**
Record Dry Cornea	No	43(64.2%)	9(30%)	52				
	Yes	24(35.8%)	21(70%)	45	**4.181**	**1.655**	**10.565**	**0.002**
Risks For Osd, Sedation	No	45(68.2%)	11(36.7%)	56				
	Yes	21(31.8%)	19(63.3%)	40	**3.701**	**1.497**	**9.153**	**0.005**
Washs Hands	No	15(22.4%)	6(20%)	21				
	Yes	52(77.6%)	24(80%)	76	1.154	0.399	3.341	0.792
Use Of Sterile Gloves	No	57(85.1%)	16(53.3%)	73				
	Yes	10(14.9%)	14(46.7%)	24	**4.988**	**1.867**	**13.327**	**0.001**
Uses Saline For Eye Care	No	20(22.9%)	22(73.3%)	42				
	Yes	47(70.1%)	8(26.7%)	55	**0.115**	**0.059**	**0.406**	**<0.001**
Uses Artificial Tears	No	57(85.1%)	28(93.3%)	85				
	Yes	10(14.9%)	2(6.7%)	12	0.407	0.084	1.984	0.266
Uses Medication	No	61(91%)	29(96.7%)	90				
	Yes	6(9%)	1(3.3%)	7	0.351	0.04	3.048	0.342
Uses Other Solutions	No	48(71.6%)	29(96.7%)	77				
	Yes	19(28.4%)	1(3.3%)	20	**0.087**	**0.11**	**0.686**	**0.005**
Lubrication Done	No	52(77.6%)	10(33.3%)	62				
	Yes	15(22.4%)	20(66.7%)	35	**6.933**	**2.676**	**17.962**	**<0.001**
Mechanical Taping	No	58(86.6%)	17(56.7%)	75				
	Yes	9(13.4%)	13(43.3%)	22	**4.928**	**1.8**	**13.493**	**0.003**
Eye Swab	No	59(89.4%)	27(90%)	86				
	Yes	7(10.6%)	3(10%)	10	0.937	0.225	3.902	0.928
Ett Suction Done On The Side	No	56(83.6%)	23(76.7%)	79				
	Yes	11(16.4%)	7(23.3%)	18	1.549	0.534	4.493	0.42
Documentation On Eye Care Done	No	41(61.2%)	12(40%)	53				
	Yes	26(38.8%)	18(60%)	44	2.365	0.098	5.705	0.055
Documentation Of Eye Health Status	No	55(82.1%)	18(60%)	73				
	Yes	12(17.9%)	12(40%)	24	**1**	**1.169**	**7.988**	**0.023**
Consults/Recommends Ophthalmologists	No	53(79.1%)	22(73.3%)	75				
	Yes	14(20.9%)	8(26.7%	22	1.377	0.506	3.745	0.531

DISCUSSION

This study evaluated the effect of structured training on nurses' knowledge and practices regarding eye care among critically ill patients in CCUs at Moi Teaching and Referral Hospital (MTRH) and Kenyatta National Hospital (KNH). The findings demonstrated a significant improvement in several areas of practice after the intervention, particularly in the documentation of eye examinations, eyelid closure, dry cornea, and identification of risks for ocular surface disorders (OSDs).

Improvement in Eye Care Documentation and Practice

The results revealed that nurses in the intervention site showed significant improvement in recording general eye examinations following the training. These findings align with the work of Gungor et al. (2024), who established that in-service training and use of care protocols were positively associated with higher nurse competency scores in ocular care. Similarly, Saritas et al. (2013) observed variations in the frequency and quality of nurses' eye care practices, suggesting that training interventions can help standardize such methods. Comparable results were reported in Turkey, where Gider et al. (2025) found that over half of ICU nurses (54.1%) did not record eye problems, a pattern evident in the control site of the current study. This underscores the contribution of capacity building and continuous professional education to improving nursing documentation and patient outcomes.

Pupil Size and Neurological Assessment

Although the practice of recording pupil size and reaction to light was well established in both hospitals, no significant difference was observed post-training. The findings suggest that this component was consistently performed due to its established role in neurological monitoring of ICU patients, especially those with head injuries. This observation reinforces the notion that integration of eye assessments within other clinical assessment frameworks may help sustain documentation practices regardless of intervention exposure.

Eyelid Closure and Prevention of Lagophthalmos

Recording of eyelid closure increased sharply in MTRH from 0% at baseline to 56.7% after training, a statistically significant improvement ($p=0.006$). This finding emphasizes the importance of early assessment of eyelid functionality in preventing lagophthalmos, a major risk factor for OSD. Hearne et al. (2018) recommend that eyelid assessment be included at the onset of ICU care plans, with severity graded systematically to guide interventions. Similarly, Ghattas (2025) found that nurse competence in eye care improved from 18.75% to 84% following the implementation of clinical guidelines in Egypt, supporting the efficacy of structured training modules such as the one applied in this study.

Recording of Dry Cornea and Identification of OSD Risk

Dry cornea documentation rose significantly from 0% to 70% post-training in the intervention site compared to 35.8% among controls ($p = 0.002$). The identification and documentation of sedation as a risk factor for OSD also improved markedly from 8.8% to 63.3% following the intervention ($p = 0.005$). These findings underscore that targeted education not only enhances awareness but also translates knowledge into practical documentation of risk. This is consistent with the findings of De Araiyo et al. (2019), who reported that consistent use of artificial tear gel reduced dry eye incidence among ICU patients.

Use of Eye Care Solutions and Lubrication Practices

Despite improvements in several areas, the use of normal saline and artificial tears showed marginal gains. The limited progress could be attributed to factors such as cost constraints, availability of materials, or institutional policies. Nonetheless, documentation of lubrication practices improved significantly from 5.9% to 66.7% ($p < 0.001$), aligning with prior research that highlights lubrication as a critical preventive measure against exposure keratopathy (De Araiyo et al., 2019). Moreover, Mahani et al. (2024) demonstrated that using protective coverings, such as polythene shields, can effectively minimize the risk of corneal exposure in ICU patients. These findings collectively point to the need for resource-enabled eye care guidelines and supply consistency to support sustained practice.

Adherence to Universal Infection Prevention

Handwashing practices showed a non-significant improvement after training; however, compliance remained high (80% in the intervention group versus 77.6% among controls). While not statistically significant, this finding indicates adherence to established infection control protocols. Continuous reinforcement of universal infection prevention measures remains necessary to prevent hospital-acquired infections and maintain holistic patient safety.

Documentation and Eye Assessment Practices

Accurate and comprehensive documentation is an essential aspect of nursing accountability and evidence-based care. The study found that documentation of eye health status improved from 0% to 40% at the intervention site ($p = 0.023$). This improvement is consistent with previous studies indicating that training and standardized protocols enhance clinical documentation accuracy (Gungor et al., 2025). According to Tasew et al. (2019), thorough documentation supports continuity of care, demonstrates professional judgement, and validates that care has been delivered according to plan. Similarly, the American Nurses Association (2020) emphasizes that accurate documentation is pivotal for quality assurance and continuous improvement in patient outcomes.

The current findings also concur with previous research showing that eye care is frequently under-documented in ICU settings and that integrating structured eye assessment guidelines into critical care workflows can improve consistency and patient safety (Gider et al., 2025). Although quantitative results indicated notable improvements following training, qualitative data revealed that documentation remained episodic rather than continuous, reflecting partial adherence to best practice standards. Such discrepancies suggest a continuing gap between routine documentation behaviors and ideal standards of continuous patient evaluation.

Implications for Practice

This study highlights the importance of systematic training, protocol development, and regular audits as strategies for improving ICU nurses' proficiency in ocular surface management. The integration of standardized eye assessment checklists and routine documentation into daily nursing workflows can enhance patient outcomes and prevent preventable eye injuries. Additionally, institutional support through policy formulation, equipment provision, and continuous education may sustain the observed improvements and bridge existing gaps between knowledge and practice.

Conclusion

This study concluded that critical care nurses' knowledge and practice regarding ocular surface disorders (OSDs) improved significantly following structured eye-care training. Before the

intervention, eye-care practices were largely inadequate, with limited documentation of eyelid closure, lubrication, and risk identification for OSD. Lubrication with saline, use of sterile gloves, documentation of eye-care activities, recording of ocular health status, and recommendations for ophthalmologic review were often omitted.

After training, the intervention site demonstrated marked improvements in these practices, particularly in documentation of eyelid closure, recognition of OSD risk factors, and lubrication frequency. The findings affirm that structured, evidence-based training programs enhance nurses' clinical competence and adherence to best practice protocols in eye care. Persistent barriers including staffing shortages, inadequate equipment, limited time, and lack of standardized guidelines continued to affect optimal eye-care delivery.

Overall, the study demonstrates that strengthening nursing education, implementing institutional protocols, and providing ongoing professional support are pivotal for improving ocular health outcomes and preventing vision loss among critically ill patients.

Recommendations

Practice Recommendations

Hospitals with intensive care units should implement regular, structured training and refresher programs for nurses on ocular surface management and prevention of OSD. Training should emphasize early assessment, use of appropriate lubrication, eyelid protection, and consistent documentation using standardized tools.

Institutional leadership should ensure adequate staffing levels and provision of essential eye-care supplies, including sterile gloves, saline, and lubricant drops or gels. Assigning ophthalmologists to perform routine ICU ward rounds can facilitate timely identification and management of ocular complications.

Hospitals should also develop and routinely apply eye-care audit tools to monitor adherence to evidence-based practice and address identified gaps through targeted quality-improvement initiatives.

Educational Recommendations

Pre-service and in-service nursing curricula should include comprehensive modules on eye care for critically ill patients, aligned with national and World Health Organization (WHO) standards. Continuous professional education programs, simulation sessions, and mentorship should be expanded to promote competence and confidence in ocular-care delivery at the bedside.

Policy Recommendations

The Ministry of Health (Kenya), in collaboration with regulatory bodies and critical-care associations, should develop and enforce a national clinical guideline on ocular care in ICU settings. This guideline should specify standardized protocols for risk assessment, eye-care interventions, and documentation across healthcare institutions. Establishing uniform standards will enhance quality assurance, equity of care, and patient safety nationwide.

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