

Interdisciplinary practitioner knowledge and dry eye disease-related practices: A qualitative study



Authors:

Phindile P. Mdlalose¹
Vanessa R. Moodley^{1,2}
Naimah Ebrahim Khan¹

Affiliations:

¹Discipline of Optometry,
Faculty of Health Sciences,
University of KwaZulu-Natal,
Durban, South Africa

²Keratoconus Foundation
South Africa, Durban,
South Africa

Corresponding author:

Phindile Mdlalose,
phindilemdlalose01@
gmail.com

Dates:

Received: 02 June 2025
Accepted: 11 Nov. 2025
Published: 12 Mar. 2026

How to cite this article:

Mdlalose PP, Moodley VR,
Ebrahim Khan N.
Interdisciplinary practitioner
knowledge and dry eye
disease-related practices: A
qualitative study. *Afr Vision
Eye Health*. 2026;85(1),
a1080. [https://doi.org/
10.4102/aveh.v85i1.1080](https://doi.org/10.4102/aveh.v85i1.1080)

Copyright:

© 2026. The Authors.
Licensee: AOSIS. This
work is licensed under
the Creative Commons
Attribution 4.0 International
(CC BY 4.0) license
([https://creativecommons.
org/licenses/by/4.0/](https://creativecommons.org/licenses/by/4.0/)).

Read online:



Scan this QR
code with your
smart phone or
mobile device
to read online.

Background: Dry eye disease (DED) is a common condition affecting millions worldwide, causing vision problems, discomfort and decreased quality of life. Many factors cause this local ocular surface disease and involve multiple mechanisms. Effective management and care of DED is crucial to reduce associated risks.

Aim: This study aimed to evaluate practitioners' DED knowledge, clinical protocols and barriers experienced in the management of DED.

Setting: This study targeted three levels of spheres – primary, secondary and tertiary – in Durban, KwaZulu-Natal (KZN), South Africa.

Methods: An exploratory, descriptive qualitative design was used for this study. Participants were clinical eye care providers from the McCord Provincial Eye Hospital and its referral catchment facilities in South Africa. Three focus group interviews were conducted with 16 participants, lasting 60 min 80 min.

Results: Thematic analysis identified five major themes: eye care services, dry eye knowledge, diagnosis, management, and barriers and challenges. A key finding reported was that facilities lacked appropriate equipment to examine, diagnose and manage DED. Further, limited DED medicine availability, understaffing and inadequate practitioner knowledge of DED management were challenges cited in DED diagnosis and management.

Conclusion: Understanding the complexity of factors involved in diagnosing and managing DED will guide future facility planning, practitioner education and eye health policy development. It is recommended that facility leadership engage with respective health professions to identify and mitigate barriers to DED diagnosis and management.

Contribution: This article highlights challenges to DED management at the represented KZN health facilities and the need to upskill health practitioners and provide the necessary equipment to improve service delivery.

Keywords: dry eye disease; diagnosis; management; knowledge; South Africa.

Introduction

Dry eye disease (DED) is a common chronic condition affecting millions worldwide, causing vision problems, discomfort and decreased quality of life.¹ The disease is multifactorial, caused by a vicious cycle of dysregulated ocular inflammation involving multiple mechanisms and leading to chronic ocular surface dysfunction.² The inflammatory vicious cycle of dry eye is regarded as a core driver in DED.³ A global DED prevalence analysis revealed that it ranges from 5% to 50% worldwide. Dry eye disease has also been diagnosed in young adults and adolescents in recent years, even though DED is most frequently diagnosed in older people, as a result of increased use of visual display units (VDUs) and digital devices (tablets and smartphones).¹ South African studies in different provinces, including KwaZulu-Natal (KZN) province, revealed high DED prevalence, ranging from 40% to 92%.^{4,5,6,7} Multiple risk factors have been identified, including ageing, systemic diseases, poor nutrition and varied occupational settings.⁸

Patients in this modern society increasingly present with multiple systemic diseases (such as diabetes mellitus, thyroid disease, history of arthritis and hypertension) that have a negative impact on ocular health, with resultant associated DED.⁹ Further, the variety of systemic drugs prescribed may induce or exacerbate DED via multiple mechanisms.^{10,11} In addition to the clinical management of systemic conditions and associated DED receiving treatment, it is advised that the associated psychological conditions (depression and anxiety) experienced need equal attention, as patients also experience poor general health and role limitation.¹² This negative impact on the

patient's quality of life has led to DED being associated with depression and anxiety.¹³ Several lifestyle factors, including diet, sleep quality, increased screen time on digital devices, and sedentary behaviour, are associated with a greater risk of having DED, resulting in DED-related public health problems in society.¹⁴

Dry eye disease is a frequently encountered condition in optometry and ophthalmology practice worldwide.¹⁵ Effective management and care of DED is crucial to reduce associated risks, which can lead to complications that may impair vision.¹⁶ In addition to seeking care from optometrists and ophthalmologists, a significant number of patients go to the primary care physician (general practitioner) or other health professionals for their systemic diseases. In the public sector, patients may attend their local primary care clinic or district hospital for systemic disease management. Systemic disease management at these levels may include medication that results in DED as an associated side effect. Despite DED being a known common primary or associated eye disease, many people remain undiagnosed and untreated, especially in developing countries.¹⁷

In South Africa, the majority (over 70%) of the population goes to the public health sector for all their health conditions because of the high unemployment rate and increased cost of living.¹⁸ This sector remains strained by the increasing patient numbers, scarcity of resources, and shortage of doctors and other health professionals who emigrate or enter the private sector.¹⁹ According to Xulu-Kasaba et al., the rate of human resources in the KZN public sector was 0.89 for ophthalmologists, 4.8 for optometrists and 4.7 for ophthalmic nurses per 1 million population.²⁰ These deficiencies in the public health sector result in attending patients being denied comprehensive consultations. Large patient numbers force health professionals to concentrate only on the chief complaint, to ensure that every patient who comes to the health facility is seen. An increase in the eye health workforce is recommended to improve eye health service delivery for the people dependent on public eye health services.

A review of the scholarly literature revealed no information on knowledge, diagnosis, and management of DED in the public health sector in the KZN province, South Africa, nor existing clinical protocols of DED management in South Africa. Despite its high prevalence, DED remains poorly understood, diagnosed and treated, with no evidence as to whether current treatment protocols address the underlying causes.²¹ Anecdotal evidence suggests that most clinicians at different facilities (hospitals and clinics) do not perform tests for DED diagnosis, and no facility in the province has a specialised dry eye clinic.

This study aimed to ascertain the practitioner knowledge and dry eye-related practices for diagnosing and managing DED at the three spheres (primary, secondary and tertiary) of health services delivery to inform the development of effective DED management within the public sector in KZN, South Africa.

Research methods and design

Study design

This qualitative, descriptive study was conducted in May 2024. In-depth focus group interviews were used to collect data from an interdisciplinary group of health professionals, representing various health facilities, to evaluate dry eye knowledge and related practices in diagnosing and managing DED.

Setting

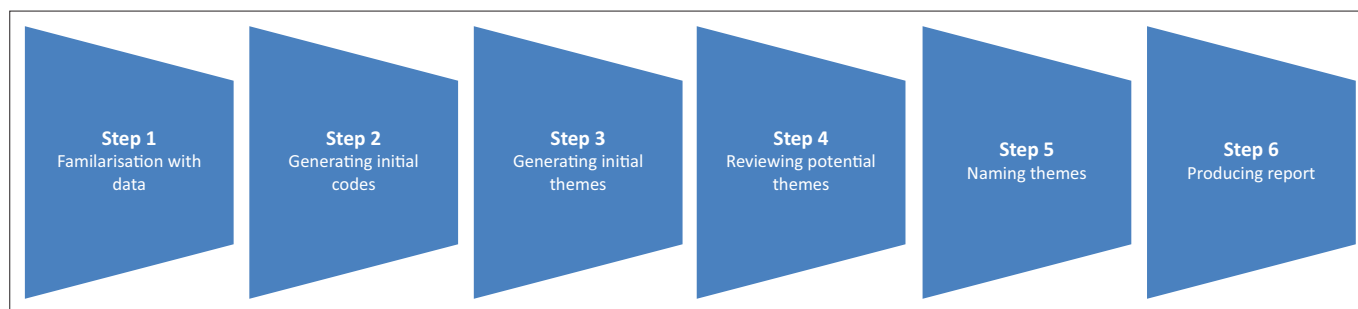
The study was conducted in public hospitals within the KZN province, South Africa. eThekweni district has 13 hospitals, but only five have eye care professionals and provide eye care services. Out of five, only three participated in the study, two of which are district hospitals, RK Khan Hospital (RKKH) and Dr Pixley Ka-Isaka Seme Memorial Hospital (DPKISMH), and McCord Provincial Eye Hospital (MPEH), a tertiary hospital. RK Khan Hospital and McCord Provincial Hospital are in an urban area, while DPKISMH is in a township or semi-urban area. Dr Pixley Ka-Isaka Seme Memorial Hospital serves primary clinics, such as Inanda clinic (community health centre [CHC]) and Phoenix clinic (CHC), and a secondary hospital (Mahatma Gandhi Hospital). Although these hospitals are located in an urban area, they are serving mostly people from rural areas. These hospitals have optometrists, and they provide comprehensive eye care services to the public within the district, except McCord Hospital, which serves the whole province. Services include screening, examination, diagnosis, and management of eye conditions, as well as outreach programmes.

Study population

Sixteen participants employed in the three public hospitals of the eThekweni district were included in the study. A purposive sampling was applied to select participants based on their shared experiences to gain in-depth insights into their characteristics and expertise. Before the interviews, participants were phoned to check their availability, and a convenient date was set for the interviews. Two optometrists were not available for the interviews, as one optometrist was in a meeting and the other was at the training, and one ophthalmic nurse decided not to participate in the study anymore. Participants were invited to a venue that ensured easy access and participant comfort, fostering a relaxed and cordial atmosphere during the interview. The purpose of the study was explained, and consenting participants read and signed a consent form before the interview.

Data collection

The questionnaire (interview tool), consisting of open- and closed-ended questions, was developed by the primary author based on the literature and the researcher's experience.²² It was then shared with the secondary authors and two experts in the field to assess its relevance, comprehensiveness and clarity.^{23,24} Their feedback was



Source: Braun V, Clarke V. Successful qualitative research: A practical guide for beginners. Los Angeles, CA; Sage, 2013; p. 1–400; and Braun V, Clarke V. Using thematic analysis in psychology. *Qual Res Psychol.* 2006;3(2):77–101. <https://doi.org/10.1191/1478088706qp063oa>

FIGURE 1: A thematic step-by-step data analysis.

then incorporated to refine the questionnaire. The questionnaire was piloted and amended prior to data collection. A pilot study was conducted with two health professionals in the public sector to assess the flow and duration of the interview, and necessary changes were made in the interview guide. These two health professionals were not included in the study. To avoid the inactivity from the other participants and to comprehensively evaluate the services offered, two focus group interviews were done for each facility, one for nurses, ophthalmic nurses, optometrists and a medical officer with an ophthalmology diploma and the other for pharmacy managers, pharmacists and pharmacist assistants. Information was gathered on eye care services provided by clinics and hospitals, dry eye knowledge and skills, equipment and dry eye treatment availability and diagnosis and management clinical protocols. The study also explored the barriers and challenges experienced by healthcare professionals in diagnosing and managing DED.

Sixteen participants, based at tertiary- or secondary-level facilities, were interviewed in May 2024. Facilities represented included MPEH (Tertiary), RKKH (Secondary), and DPKISMH (Secondary). Focus group interviews conducted in these facilities included six participants in the first facility, coded as P1–P6. The second facility included four participants, coded as P7–P10, and the last one had six participants, coded as P11–P16. The RKKH had a pharmacy manager, and the MPEH included a medical officer with an ophthalmology diploma and a pharmacy manager. An interview guide with probe questions was used to initiate discussions, and follow-up questions were structured to capture participants' opinions on dry eye knowledge and diagnosis and management practices. Study validity was ensured by including a minimum group of four participants and applying the principle of theoretical saturation in focus group discussions.^{25,26} The facilitator (researcher) was trained and skilled in interview techniques to ensure that the issues under discussion were addressed comprehensively. In all interviews conducted, it was observed that participants were positive and cheerful, with no mistrust or pessimism noted within the groups. All three focus group interviews were audio-recorded, lasting between 60 min and 80 min.

Data analysis

Qualitative data analysis was completed independently. Pilot testing, where codes were pilot-tested with a small dataset to refine the coding scheme, was conducted to ensure reliability of the coding process.²⁷

Recorded interviews were transcribed verbatim and returned to participants for confirmation before being analysed. Initially, the researcher familiarised herself with the content by reading and re-reading each transcript. Each transcript was analysed individually and manually to ensure a comprehensive understanding of participant perspectives. As shown in Figure 1, an inductive approach was applied to the data through a thematic step-by-step analysis.^{28,29}

A data-driven inductive analysis process was conducted first, where codes and themes were developed from the collected data.^{30,31} Key terms and phrases were then highlighted and coded. Thereafter, codes were developed, and initial themes were generated manually for interpretation.

These codes were subsequently refined and categorised, typically resulting in between 20 and 50 categories. Codes were alphabetised to support ease of reference and to aid in the organisation of data into meaningful thematic clusters. These codes were organised manually and grouped into preliminary themes based on emerging patterns across the data. Themes were systematically listed and arranged in column format, with abbreviated codes used to facilitate data organisation. The deductive thematic analysis was applied later to align the themes and the codes that were formed with the World Health Organization six-pillar framework for ease of reporting data.

Ethical considerations

Ethical clearance to conduct the study was obtained from the Biomedical Research Ethics Committee (BREC) of the University of KZN (reference number: BREC/00003439/2021). Permission to conduct the study was also obtained from the Department of Health (DOH) KZN (reference number: KZ-20211-033). A letter of support was received from the district, and gatekeeper letters were received from the hospitals' chief executive officers (CEOs) to conduct research in their area. Written informed consent was obtained from all participants, and participation in the focus group interviews was voluntary.

Results

A total of 16 participants were interviewed, including 11 female participants and five male participants. The representation from each professional category is shown in Table 1.

Main themes were identified from the data extracted, with 21 subthemes presented in Table 2. The themes were eye clinic services, DED knowledge, diagnosis, management, and barriers and challenges.

Theme 1: Eye clinic services

Subtheme 1.1: Services provided by the hospitals

Hospitals and clinics mainly provide refraction and screening services, which do not include dry eye screening. A participant reported:

‘By screening, I mean enquiring as to what is troubling the patient and then doing a basic assessment which involves doing a case history, checking vision and fundoscopy and then referring the patient accordingly.’ (Participant 1, focus group 1)

Although screenings are conducted, they do not include dry eye screening. Furthermore, all three facilities did not have a special dry eye clinic, including MPEH, which is a tertiary facility and the only provincial eye hospital. Most clinics (primary health care [PHC] and CHC) do not have a designated area for an eye clinic.

The majority of these clinics are covered by the surrounding secondary or district hospitals, which provide eye care services through outreach programmes where screening is done.

Subtheme 1.2: Staff (eye care professionals in the public sector)

There are many CHCs, PHCs and hospitals in the province, yet they do not have the capacity to meet the demand for eye care services, as most of these facilities do not have full-time eye care professionals:

‘As a secondary hospital, we do outreach to service three of our referral clinics [CHC/PHC] and one hospital [*secondary*], where they book patients for us to see.’ (Participant 9, focus group 2)

Most participants reported severe staff shortages, highlighting that in some facilities, health professionals resign, and their posts are not filled and remain frozen. Staff turnover negatively impacts the tertiary-level facilities, as expressed by participants:

‘Another challenge that we have as a regional hospital is that staff leave often. When they leave, their posts are not filled; instead, they are frozen.’ (Participant 9 [said as quoted in text and participant 10 reiterated the challenge], focus group 2)

A large number of patients are from rural areas, and usually go to local clinics for help. However, if there is no eye care staff to attend to these patients or no outreach services, they then have to go to hospitals. They struggle with access because of the long distances and have no choice but to use patient-planned transport to go to the hospital for eye care

TABLE 1: Professionals represented in the study.

Participant number	Gender	Years in current post	Occupation	Facility	Level of care	Area
1	Female	> 15	Optometrist	RKKH	Secondary	Urban
2	Female	11–15	Ophthalmic nurse	RKKH	Secondary	Urban
3	Female	10–15	Pharmacist	RKKH	Secondary	Urban
4	Female	< 5	Pharmacy assistant	RKKH	Secondary	Urban
5	Female	> 15	Pharmacist	RKKH	Secondary	Urban
6	Male	> 15	Pharmacy manager	RKKH	Secondary	Urban
7	Female	> 15	Pharmacist	DPKISMH	Secondary	Semi-urban
8	Female	< 5	Pharmacy assistant	DPKISMH	Secondary	Semi-urban
9	Male	> 15	Optometrist	DPKISMH	Secondary	Semi-urban
10	Female	11–15	Ophthalmic nurse	DPKISMH	Secondary	Semi-urban
11	Male	> 15	Medical officer (Ophthalmology)	MPEH	Tertiary	Urban
12	Male	6–10	Ophthalmic nurse	MPEH	Tertiary	Urban
13	Male	> 15	Pharmacy manager	MPEH	Tertiary	Urban
14	Female	> 15	Pharmacist	MPEH	Tertiary	Urban
15	Female	> 15	Optometrist	MPEH	Tertiary	Urban
16	Female	5–10	Optometrist	MPEH	Tertiary	Urban

MPEH, McCord Provincial Eye Hospital; RKKH, RK Khan Hospital; DPKISMH, Dr Pixley Ka-Isaka Seme Memorial Hospital.

TABLE 2: Themes and subthemes developed from the interviews.

Themes	1. Eye clinic services	2. Dry eye knowledge	3. Dry eye diagnosis	4. Dry eye management	5. Challenges
Subthemes	1.1 Services	2.1 Classification and risk factors	3.1 Equipment availability	4.1 Medication	5.1 Dry eye clinic
	1.2 Staff	2.2 Systemic diseases and medication	3.2 Consumables and tests	4.2 Patient education	5.2 Staffing
	1.3 Eye departments	2.3 Diagnostic tests		4.3 Treatment options	5.3 Lack of equipment
	1.4 Patient numbers	2.4 DED management options and updated management strategies		4.4 Medication collection	5.4 Medication restrictions
	1.5 Mode of eye clinic operation and services				5.5 Interfacility communication
	1.6 Payment structures				

DED, dry eye disease.

services. This creates huge numbers and backlogs at hospitals as highlighted by the participant below:

'Our facility has only one optometrist and ophthalmic nurse, yet we service such a large area. We can't afford to do outreach to our referral clinics. Additionally, if one of us is on leave, we have to reduce the number of patients to be seen. This also increases the backlog.' (Participant 1, focus group 1)

Eye clinics are generally run by nurses, with most facilities not having an ophthalmic nurse:

'Because of the shortage of eye care professionals in some hospitals and clinics [PHCs and CHCs], it is difficult for us as a tertiary hospital to discharge patients to their base hospitals or clinics. As they won't be properly followed up.' (Participant 16, focus group 3)

Subtheme 1.3: Eye departments in facilities

Eye departments at facilities (hospitals) where eye care services are provided are generally run by optometrists and nurses and ophthalmic nurses, with most clinics only having nurses. In CHCs and PHCs, nurses and staff who do eye screenings are often instructed to help in other departments, as eye departments in these clinics only operate part-time:

'In some clinics where we do outreach, they book patients for us. But sometimes you will find that nurses there are helping other departments, so you end up working alone without help from that clinic.' (Participant 9, focus group 2)

Participants raised this as a challenge, as most facilities, especially PHCs and CHCs, reported not having full-time eye-care staff. Sometimes, the nurses are asked to help in other departments, as they are usually small clinics at facilities with limited staff.

Participants expressed frustration that some hospitals and clinics (CHCs and PHCs) lack space for eye clinics or departments. In most facilities, the space to consult patients is usually a small area, enabling only one practitioner to consult patients at a time, limiting patient numbers:

'We have been using a park home as our clinic for patient consultations, as there is no space inside the hospital. Our patients wait outside the park home to be seen as we call them in one by one.' (Participant 2, focus group 1)

Subtheme 1.4: Number of dry eye patients seen in the eye clinic

Dry eye disease is a common condition and is more common in the older population.¹ Most participants mentioned that they see at least 25 dry eye patients each week (based on the patient's case history). In addition to the high number of older patients seen, hot weather was mentioned as a major contributing factor in DED. One participant said:

'Because of our area, Durban, which is always warm. Almost every patient we see has a dry eye.' (Participant 11, focus group 3)

Subtheme 1.5: Mode of eye clinic operation and services

Health facilities operate from 07:00 to 16:00, Monday to Friday, with no services available on weekends and public holidays. However, the services are not uniformly offered, with some being full-time and others intermittent. In the absence of eye care professionals, nurses conduct vision screening, as indicated by a participant:

'For some clinics, we do outreach, going to them once a week or every second week. But there are nurses doing screenings and bookings for us. Even though in some clinics screening is not done.' (Participant 10, focus group 2)

Subtheme 1.6: Payment to access eye care services

Patients pay to access eye care services, and the amount paid is predetermined in accordance with the salary scales of public-sector users. Pensioners, the unemployed, and those receiving social grants do not pay for the services:

'We are not involved in patients' payments, but patients pay to access services. Pensioners and the unemployed are exempted, but they must bring proof of unemployment.' (Participant 1, focus group 1)

Theme 2: Practitioner knowledge of dry eye

Subtheme 2.1: Dry eye classification and risk factors

Understanding and being knowledgeable about DED classification and risk factors is important for early detection and prevention of complications.¹¹ It further enables healthcare practitioners to offer personalised care.³² With those that qualified a long time ago indicating that they do not remember much about dry eye classification, with a few reporting having no knowledge at all:

'I did that more than 20 years ago; I don't remember much about dry eye classification.' (Participant 11, focus group 3)

Although participants expressed some knowledge regarding DED risk factors, they could only name a few. Those with some knowledge had 5–7 years of work experience. Participants admitted to not being able to adequately advise patients about risk factors to help alleviate DED symptoms.

Subtheme 2.2: Systemic diseases and medications associated with dry eye disease

Most participants reported having a limited understanding of systemic diseases and medications related to DED, with only one participant being knowledgeable about systemic diseases and medication side effects associated with DED. Participant 2 in focus group 1 mentioned many of them, as she subscribes to most eyecare newsletters and regularly does continuing professional development (CPD). Participants conceded that the majority of people attending public health facilities have some underlying systemic disease or are on systemic or ocular medication:

'Most of our patients are elderly, and they have comorbidities which may contribute to DED [*dry eye disease*].' (Participant 15, focus group 3)

Subtheme 2.3: Tests used to diagnose dry eye disease

Numerous clinical tests can be done to diagnose DED, including the Schirmer test, tear break-up time (TBUT), lissamine green, corneal staining, among others.³³ Participants mainly mentioned knowing the TBUT and Schirmer dry eye tests and had poor knowledge of additional clinical tests or dry eye questionnaires:

'There is TBUT [*tear break-up time*], Schirmer and TTT.' (Participant 9, focus group 2)

Subtheme 2.4: Dry eye management strategies

Dry eye management strategies include medical treatment, eye care habits, lifestyle modifications, surgical options and alternative therapies.¹¹ The majority of participants admitted poor knowledge of updated DED management strategies and admitted that they needed their knowledge to be updated. Only one participant mentioned that she stays informed and explained how she obtains her knowledge:

'I am doing CPD [*continuing professional development*] monthly and affiliated with a nursing association where I get updates.' (Participant 2, focus group 1)

It was also noted that even at a tertiary hospital, no other dry eye management strategies are available besides eye drops.

Theme 3: Dry eye diagnosis

Dry eye disease diagnosis involves a combination of patient history (ocular and medical), clinical evaluation using the slit lamp, and diagnostic tests (e.g. TBUT).^{33,34}

Subtheme 3.1: Equipment availability

Essential equipment is required to diagnose DED. The study revealed that, in the participants' opinion, most facilities lack adequate and appropriate equipment for eye care practice, including the equipment required to diagnose DED. A frustrated participant added:

'We have been applying to get equipment in general for the eye clinic, for example, a slit-lamp, but it never gets approved. We have been trying to get it approved for years now.' (Participant 1, focus group 1)

Participants generally felt that the eye clinic is not prioritised like other departments in most facilities:

'As our facility is a big one, so they prioritise other departments, as they feel that eye clinic is a small department.' (Participant 1, focus group 1)

Equipment deficiencies at facilities make it hard to diagnose dry eye properly. Providers mainly depend on the patient's symptoms to diagnose and treat DED. In a few instances where the equipment is available, they are compromised by the staff shortage:

'We mainly focus on the patient's symptoms because there is no time for a comprehensive dry eye exam. There are few of us, yet we have to see many patients.' (Participant 11 [said as quoted in text and participant 15 reiterated], focus group 3)

Subtheme 3.2: Consumables and tests used to diagnose dry eye disease

The lack of basic DED consumables was raised by most participants who stressed that they do not have essential consumables such as Schirmer strips, fluorescein solutions, or fluorescein strips to diagnose DED. Only one facility (MPEH) mentioned that they do have fluorescein, even though practitioners (ophthalmic nurses, optometrists and medical officers) do not use it most of the time because of their workload:

'Fluorescein is provided in the clinic, but we don't do TBUT [*tear break-up time*] because of time. There are so many patients that we have to see.' (Participant 11, focus group 3)

Participants only depend on the patient's symptoms to diagnose DED, as most facilities do not have the consumables and equipment to diagnose DED. When exploring related practices further, it was also noted that none of these participants used, or ever considered using, any dry eye questionnaire for diagnosis:

'Even though we have the slit lamp, we don't have these consumables to diagnose dry eye; we don't even use the dry eye questionnaire. We only depend on patients' symptoms in diagnosing dry eye.' (Participant 9, focus group 2)

The lack of consumables and equipment to diagnose DED compromised patient care as participants only depend on symptomatic patients to treat DED, missing all asymptomatic patients.

Theme 4: Dry eye disease management

Subtheme 4.1: Eye drops available for dry eye disease management

All participants indicated that Duratears™ and Refresh™ or Spersatears are the only eye drops available at their respective facilities and hence prescribed irrespective of dry eye type (aqueous-deficient dry eye [ADDE] and evaporative dry eye [EDE]). Further, apart from the tertiary hospital, which always has both, most facilities usually have one of the two tear supplements available. Participants also mentioned that even if they advise patients to obtain medication privately, only a few can afford to purchase medications privately, finding them very expensive. They reiterated that the majority of their patients are unemployed or receive social grants:

'Most of our patients are either pensioners or unemployed. Even if you advise them to buy medication privately, they can't afford it because eye drops are quite costly.' (Participant 15 [said as quoted in text and participant 16 reiterated], focus group 3)

Subtheme 4.2: Patient education

Few participants educate dry eye patients, admitting that they mostly just give whichever eye drop is available at the facility for DED management:

'For a patient with dry eye, I just give eye drops. I hardly do dry eye education to patients.' (Participant 1, focus group 1)

Subtheme 4.3: Treatment options

All participants mentioned that they did not have a comprehensive DED management strategy and no clinical guidelines to follow. Across all facilities, only eye drops (Duratears™ and/or Refresh™ or Spersatears [benzalkonium chloride-BAK preservative]) are considered as treatment for DED:

'Facilities only prescribe what is available as we only procure what is on tender that specific time.' (Participant 13, focus group 3)

This compromises patient care as not much is available for DED management, with facilities only having Duratears™ or Refresh™ or Spersatears procured on a tender system:

'For medication we only procure what is on tender, because that is how the Department of Health operate.' (Participant 6 [said as quoted in text and participant 5 reiterated], focus group 2)

The main challenge is that it is not easy to add eye drops to the essential drug list (EDL) that will benefit the patients because of the policies involved in medication procurement. Two (Participant 13 and Participant 14 from focus group 3), reported that, despite having limited eyedrops, the main concern is that these eye drops have preservatives:

'The problem is that these patients have other eye conditions, and most use more than one eye drop. Many of these eye drops have preservatives which exacerbate the dry eye.' (Participant 14 [said as quoted in text and participant 13 reiterated], focus group 3)

Another challenge noted by one participant was that their facility uses original medicine, not generic, and original medicine is expensive. Additionally, the patient's inability to afford dry eye treatment is also another problem:

'Eye drops are expensive and costly, unlike other conditions where you can have a cheaper version of it or generic so you can get more to cover more patient's medication or even in facilities, it is a toll as the medication is expensive.' (Participant 13, focus group 3)

Subtheme 4.4: Follow-up care and repeat prescription patterns

Although patients are advised to collect their repeat eye drops at their respective facilities, the availability is inconsistent. At times, patients arrive at the facility and do not receive the eye drops, with a practitioner stating:

'Sometimes eye drops are out of stock, but patients are given a note to come to collect it 2 weeks to a month later.' (Participant 8, focus group 2)

'Patients are coming back to the tertiary hospital for medication as they are not getting medication on time.' (Participant 13, focus group 3)

The lack of interfacility communication between the tertiary hospital and referral facilities was also raised as a barrier, which results in patients not receiving medication on time:

'When these patients come for their medication, we are not aware that they are coming. Should we have known before, we would have ordered medication for them before they came to us.' (Participant 7, focus group 2)

Although patients generally collect their medication at their respective facilities, the facility does not follow up with DED patients to monitor treatment progress. Patients who are followed up have other ocular conditions or diseases like VKC (keratoconjunctivitis sicca):

'We hardly follow up on patients with dry eye condition, only patients with other eye conditions like VKC [vernal keratoconjunctivitis].' (Participant 7, focus group 2)

Theme 5: Challenges and barriers

Many participants indicated they experience challenges and barriers in their facilities, making them unable to help dry eye patients. Because of previously presented equipment and consumable constraints, eye clinic space, interfacility communication, staffing, and medication restrictions, most health professionals admitted that they depend on the patient's symptoms alone for DED diagnosis. They emphasised that although they may be aware of DED, most are not updated about the latest options available for DED management. Availability of various dry eye drops in the public health sector is restricted, which makes it challenging to treat DED properly.

Discussion

This study aimed to evaluate practitioner knowledge and dry eye services available at the three spheres of healthcare facilities (primary healthcare clinics, regional or secondary hospitals, and tertiary hospitals). Findings revealed that hospitals and clinics mainly provide refraction and screening services, which do not include dry eye screening. To avoid DED cases being missed, a dry eye symptom questionnaire could be administered by nurses at the primary level to screen for DED and refer patients accordingly.

The study revealed a general shortage of eye care professionals in facilities in KZN. As noted by Mashige & Martin, this shortage is underpinned by health system deficiencies as when a health professional resigns, the post is not filled and remains frozen despite the increasing demand in the province for eye care services.³⁵ Suggestions for the DOH to consider aiding retention include offering competitive salaries and internship programmes, providing performance incentives, allowing flexible working hours, and enabling career pathing.

Most facilities, at all levels, have long waiting lists for eye consultations, which are worse in clinics.^{36,37} Although secondary-level facilities send staff to help with the demand at their referral catchment centres, it is still not sufficient as they only do outreach weekly, every fortnight or monthly. Staff shortages limit the frequency of outreach services. Partnering with non-profit organisations (NPOs), utilising mobile clinics, and the usage of telehealth services may be implemented to improve the outreach programmes.

Staff shortages and distribution in the province remain a challenge. Xulu-Kasaba et al. highlighted in 2020 that the required number of staff was not met,²⁰ and this negatively impacts the WHO target of achieving 25% reduction in vision impairment and avoidable blindness.³⁸ This is a major concern as it suggests that not much has changed in prioritising eye health in the province three years later. High-income countries meet the optometrist-to-patient ratio, which is 1:10000, as compared with low-income countries, which is 1:50000.³⁹ Additionally, despite having more than 200000 ophthalmologists globally with an increase of 2% – 3% annually, there is a shortfall in developing countries worldwide.⁴⁰ An appropriate distribution of optometrists and ophthalmologists will ensure full coverage for vulnerable populations to meet eye care needs.⁴¹ These findings call for the KZN DOH to urgently prioritise eye health care by increasing the human resources for eye health. Strategies could include unfreezing previously frozen posts, employing more healthcare practitioners and exploring task-shifting to enhance eye care service delivery.

Apart from insufficient equipment, some facilities lack a proper space for an eye clinic, which limits the number of patients seen and the quality of care. These results correlate with the study conducted by Maake and Moodley,⁴² which evaluated the optometric services provided in the public sector in KZN and found that a minimum standard of optometric care is not practised because of a lack of equipment. To provide comprehensive eye care services, facility planners should factor in specific eye care clinic space requirements in future planning, informed by data such as patient numbers, equipment requirements and employee numbers.

The admitted knowledge gaps on DED risk factors, diagnosis and management indicate that participants cannot adequately advise patients about risk factors to help patients alleviate dry eye symptoms and classify and appropriately manage different types of DED. It is vital for optometrists and general practitioners, who are the first-line healthcare personnel, to be aware of the entire spectrum of DED, risk factors, systemic diseases and the medication associated with DED and the updated DED management options.¹¹ The study's findings agree with the interdisciplinary study conducted by Tashbayev et al., which also found a lack of knowledge of the relationship between oral and ocular dryness symptoms.⁴³ The health department is responsible for supporting health professionals to meet service provision requirements, which will also apply to DED management. It is recommended that education programmes, such as DED workshops and seminars, be implemented to strengthen DED management at all eye care levels. Adequate training will serve to improve the diagnosis and treatment of dry eye to improve the quality of life of the affected patients.^{11,44} Additionally, providing patients with educational materials and resources is important to help them understand their condition, treatment options and the importance of taking medication and attending follow-up care appointments.

Equipment deficiencies hamper patient care. Equipment such as keratographs, optical coherence tomographers, tear lab osmometers and meibographers are essential at tertiary hospitals for DED diagnosis and management. While referral catchment facilities, especially secondary facilities, require basic equipment such as slit-lamps with adequate supplies of consumables like Schirmer and fluorescein strips to enable essential dry eye screening and examination.⁴⁵ Audits of each facility should be conducted to determine resource gaps and to adequately resource all facilities.

Compromises in the quality of services were highlighted in this study, which revealed that, even in tertiary hospitals, participants mainly depend on the patient's symptoms for dry eye diagnosis. There is a need for more efficient systems as participants reported that basic dry eye tests are not performed because of the long patient queues at facilities. Further, the current system does not have a protocol that meets the minimum expected clinical standard to enable accurate diagnosis, classification and appropriate management of DED patients. Academic and clinical stakeholders should collaborate to develop a DED clinical protocol for the public health sector, with facility leadership taking responsibility to ensure implementation and standards monitoring.

Dry eye disease management differs across continents and countries,⁴⁶ with a wide range of management strategies available or used for each DED type and severity.⁴⁷ Results revealed that most facilities had severely limited DED treatment options available, with most having only Duratears™ and Refresh™ or Spersatears available. This falls short of international recommendations for a wide range of DED management options. These include patient education, preservative-free lubricants, lid scrubs, nutritional supplements, oral antibiotics, topical anti-inflammatories, therapeutic contact lenses, essential fatty acids, intense pulse light therapy and punctal plugs for different types of dry eye.⁴⁵ An organisational challenge raised in the study was that adding eye drops for DED to the EDL will not be easily accomplished because of the existing policies. Perumal-Pillay et al. revealed that getting medication approved for addition to the EDL is a long, arduous process and still does not guarantee approval because of the high-cost factors encountered.⁴⁸ In addition to providing medication, patient education on lifestyle modifications (blinking exercises, lid hygiene, dietary change, stress management, supplements and humidifiers) can be provided in the form of brochures or videos.

Participants stated that eye drops prescribed at public-sector facilities are only original brands, unlike generic medications available for other conditions. This creates financial strain as eye medication is considered expensive by participants and may contribute to eye drops often being out of stock in clinics.^{49,50} Efforts are needed to increase the use of generic prescriptions to enhance the availability of key drugs at facilities.⁵¹ Suggesting that patients buy medication is not feasible as participants stressed that their respective facilities mainly see pensioners, the unemployed and social grant-

receiving patients who, when advised to obtain medication from private pharmacies, cannot afford to buy them. Hence, to alleviate these distressing challenges for financially disadvantaged individuals, policymakers need to improve drug management cycles, ensuring consistent essential drug availability in clinics.⁵²

Noting the inconsistencies in clinical care across the various facilities highlighted in the study, it is recommended that clinicians benchmark and standardise their practice to that of peers. Dry eye protocols can include standardised assessments (dry eye questionnaires and clinical tests), treatment algorithms (pharmacological, surgical and nutritional) and follow-up care. The KZN DOH should adequately finance eye care services and revisit public policies to align with national and global DED management standards.⁵³ It is also pivotal for the department to direct efforts to implement preventative strategies, such as patient education, to reduce the overall impact of DED.^{54,55} It is important to train healthcare professionals before implementation to ensure clinical competence and establish communication pathways between healthcare professionals for efficiency in the referral systems.

This study has highlighted a gap in interdisciplinary management of DED patients as most facilities do not have optometrists or ophthalmologists. At lower levels of care, facilities mainly have nurses; in many instances, these are not ophthalmic nurses. The challenge with not having practitioners with competencies to manage DED at these lower-level facilities is that most of these patients, referred to tertiary-level hospitals, rarely return for follow-up care to their local clinics. This results in them persistently returning to tertiary hospitals for help and basic follow-up procedures, making it difficult for the tertiary hospitals to discharge them to their clinics. Follow-up care for DED patients at the primary and secondary levels can reduce the burden at a tertiary hospital and clear backlogs.

Clearly defined interdisciplinary clinical protocols aid in role clarification, and comprehensive interdisciplinary evaluations help choose the correct treatment strategies.⁴⁴ It is advised that efforts be made to establish a multidisciplinary team to provide comprehensive care and promote a team-based approach to DED management. Additionally, an electronic referral system will facilitate seamless communication between primary and secondary eye care providers. Gagnon & Roberge⁵⁶ suggest that to help with communication between facilities, it will be beneficial to provide these healthcare professionals with group work skills necessary for working effectively in interdisciplinary environments. Lastly, Donthineni et al. also recommended that it is essential for optometrists, ophthalmologists, general practitioners, occupational physicians and cornea and ocular surface specialists to undertake risk factor management in addition to delivering conventional care to all patients.⁵⁵

Limitations

There was no representation of all facilities, as access was denied in three facilities, and there was no response in the other four. However, although access was denied in seven facilities, data collected from the other facilities gave a clear understanding, and consistent information was noted across all areas of investigation. Additionally, data from the seven inaccessible facilities would not have significantly altered the results, and the current data set is robust enough. Another limitation was that the researcher aimed to include the ophthalmologists in the focus group, but it was not feasible for them to make it for the focus group interviews. However, information gathered from representative professions gave a comprehensive indication of how dry eye was managed by the facilities, in general, across disciplines.

Recommendations

A strategy for DED, informed by all relevant stakeholders, should be developed for all levels of healthcare service delivery. Facilities should have adequate, consistent services, clinic facilities, equipment, consumables and adequate number of knowledgeable staff to diagnose and manage DED. As MPEH is the only public eye hospital in the province, a specialised dry eye clinic should be established, which will require resources and support from the DOH. Resources required will be well-trained clinical (ophthalmologists, optometrists, dry eye specialists, ocular surface specialists, and nurses) and non-clinical (technicians and administrative personnel) staff, state-of-the-art equipment with the latest digital technology, financial and operational support from the institution (MPEH) and the district, as well as strategic partnerships and collaborations with industry and NPOs. Continuous training programmes for practitioners and monitoring of quality standards will further help to ensure optimal patient care.

Conclusion

This qualitative study revealed that public-sector facilities are not adequately and appropriately managing DED. Diagnostic limitations and key barriers highlight infrastructural limitations, a lack of equipment, staff deficiencies and limited DED treatment options. Furthermore, noting the exponential advancements in DED globally, it is concerning that public-sector eye care providers are not knowledgeable and updated on the latest management options. Therefore, to ensure optimal patient care, a continuous training programme for DED management should be developed for KZN eye care practitioners. A comprehensive DED clinical guideline that meets minimum practice standards should be developed for all facilities across all levels of health care in KZN and form part of the overall suggested strategy for DED management.

Acknowledgements

The authors thank the eye care providers who willingly participated in the study and shared their experiences. They are also grateful to Minenhle Mpungose, who assisted with transcribing interviews. This article includes content

that overlaps with research originally conducted as part of Phindile P. Mdlalose's doctoral thesis titled 'Comprehensive dry eye management: A public health sector intervention model', submitted to the Department of Optometry, Faculty of Health Science, University of KwaZulu-Natal, South Africa in 2025. The thesis was supervised by Vanessa R. Moodley and co-supervised by Naimah Ebrahim Khan. Portions of the data, analysis, and discussion have been revised, updated, and adapted for publication as a journal article. The original thesis is currently unpublished and was not publicly available online at the time of publishing this article. The author affirms that this article complies with ethical standards for secondary publication, and appropriate acknowledgement has been made of the original work.

Competing interests

The authors declare that they have no financial or personal relationships that may have inappropriately influenced them in writing this article.

CRedit authorship contribution

Phindile P. Mdlalose: Conceptualisation, Data curation, Formal analysis, Investigation, Methodology, Project administration, Visualisation, Writing – original draft, Writing – review & editing. Vanessa R. Moodley: Conceptualisation, Supervision, Writing – review & editing. Naimah Ebrahim Khan: Supervision, Writing – review & editing. All authors reviewed the article, contributed to the discussion of results, approved the final version for submission and publication, and take responsibility for the integrity of its findings.

Funding information

The author, Phindile P. Mdlalose, received a student grant from the College of Health Sciences, University of KwaZulu-Natal to cover data collection.

Data availability

The data that support the findings of this study are available from the corresponding author, Phindile P. Mdlalose, upon reasonable request.

Disclaimer

The views and opinions expressed in this article are those of the authors and are the product of professional research. The article does not necessarily reflect the official policy or position of any affiliated institution, funder, agency, or that of the publisher. The authors are responsible for this article's results, findings, and content.

References

- Cutrupi F, De Luca A, Di Zazzo A, Micera A, Coassin M, Bonini S. Real life impact of dry eye disease. *Semin Ophthalmol*. 2023;38(8):690–702. <https://doi.org/10.1080/08820538.2023.2204931>

- Craig JP, Nichols KK, Akpek EK, et al. TFOS DEWS II definition and classification report. *Ocul Surf*. 2017;15(3):276–283. <https://doi.org/10.1016/j.jtos.2017.05.008>
- Yamaguchi T. Inflammatory response in dry eye. *Invest Ophthalmol Vis Sci*. 2018;59(14):DES192–DES199. <https://doi.org/10.1167/jovs.17-23651>
- Gillan WD. A small-sample survey of dry eye symptoms using the Ocular Surface Disease Index. *Afr Vis Eye Health*. 2009;68(4):188–191. <https://doi.org/10.4102/aveh.v68i4.167>
- Castelyn B, Majola S, Motilal R, et al. Prevalence of dry eye amongst black and Indian university students aged 18–30 years. *Afr Vis Eye Health*. 2015;74(1):6. <https://doi.org/10.4102/aveh.v74i1.14>
- Nonkula DM. The prevalence of dry eye syndrome among patients at the eye clinic in Nelson Mandela Academic Hospital. Bloemfontein: University of the Free State; 2019.
- Mefane TK. The prevalence and determinants of dry eye disease amongst people living in Kwa-Mhlanga [doctoral dissertation]. Polokwane: University of Limpopo; 2021.
- Shetty R, Sethu S. Newer paradigms in dry eye disease research. *Indian J Ophthalmol*. 2023;71(4):1064. https://doi.org/10.4103/IJO.IJO_599_23
- Kawashima M. Systemic health and dry eye. *Invest Ophthalmol Vis Sci*. 2018;59(14):DES138–DEC142. <https://doi.org/10.1167/jovs.17-23765>
- Gomes JA, Azar DT, Baudouin C, et al. TFOS DEWS II iatrogenic report. *The Ocul Surf*. 2017;15(3):511–538. <https://doi.org/10.1016/j.jtos.2017.05.004>
- Sheppard J, Shen Lee B, Periman LM. Dry eye disease: Identification and therapeutic strategies for primary care clinicians and clinical specialists. *Ann Med*. 2023;55(1):241–252. <https://doi.org/10.1080/07853890.2022.2157477>
- Shen Y, Song Z, Yao X, Huang X. Disease perception and coping in patients with dry eye disease: A qualitative study. *Research Square*; 2023. PREPRINT (Version 1). <https://doi.org/10.21203/rs.3.rs-3748621/v1>
- Van der Vaart R, Weaver MA, Lefebvre C, Davis RM. The association between dry eye disease and depression and anxiety in a large population-based study. *Am J Ophthalmol*. 2015;159(3):470–474. <https://doi.org/10.1016/j.ajo.2014.11.028>
- Magno MS, Hynneklev L, Hammond CJ, Utheim T, Vehof J. Are we amid a dry eye epidemic? The increasing prevalence of dry eye disease in Europe. *Invest Ophthalmol Vis Sci*. 2024;65(7):2855.
- Hantera MM. Trends in dry eye disease management worldwide. *Clin Ophthalmol*. 2021;15:165–173. <https://doi.org/10.2147/OPTH.S281666>
- Tidke SC, Tidake P. A review of corneal blindness: Causes and management. *Cureus*. 2022;14(10):e30097. <https://doi.org/10.7759/cureus.30097>
- Bekibele CO, Baiyerolu AM, Ajaiyeoba AI, Akang EE, Ajayi BG. Tear function and abnormalities of ocular surface: Relationship with subjective symptoms of dry eye in Ibadan, Nigeria. *Middle East Afr J Ophthalmol*. 2008;15(1):12–15. <https://doi.org/10.4103/0974-9233.53369>
- Cowling N. Distribution of health care choices of households in South Africa in 2023 [homepage on the Internet]. 2023 [cited 2023 Sept 20]. Available from: <https://www.statista.com>
- Rensburg R. Healthcare in South Africa: How inequity is contributing to inefficiency [homepage on the Internet]. *The Conversation*. 2021 [cited 2021 July 7]. Available from: <https://www.wits.ac.za/news/latest-news/opinion/2021>
- Xulu-Kasaba ZN, Mashige KP, Naidoo KS. An assessment of human resource distribution for public eye health services in KwaZulu-Natal, South Africa. *Afr Vis Eye Health*. 2021;80(1):8. <https://doi.org/10.4102/aveh.v80i1.583>
- Bisetty S, Ebrahim Khan N. Prevalence of dry eye syndrome in a South African diabetic paediatric population. *Contact Lens Ant Eye*. 2024;47(5):102175. <https://doi.org/10.1016/j.clae.2024.102175>
- Adhabi E, Anozie CB. Literature review for the type of interview in qualitative research. *Int J Educ*. 2017;9(3):86–97. <https://doi.org/10.5296/ije.v9i3.11483>
- Scorsolini-Comin F. *Técnicas de Entrevista: Método, Planejamento e Aplicações* Vetur Editora. 2020.
- Teixeira E, Silva C, Vicente A. Development and validation of an interview guide for examining the effects of sports careers on the quality of life of retired Portuguese football players. *Front Psych*. 2024;15:1374784. <https://doi.org/10.3389/fpsyg.2024.1374784>
- Hennink MM, Kaiser BN, Weber MB. What influences saturation? Estimating sample sizes in focus group research. *Qual Health Res*. 2019;29(10):1483–1496. <https://doi.org/10.1177/1049732318821692>
- Braun V, Clarke V. To saturate or not to saturate? Questioning data saturation as a useful concept for thematic analysis and sample-size rationales. *Qual Res Sport Exerc Health*. 2021;13(2):201–216. <https://doi.org/10.1080/2159676X.2019.1704846>
- Gani A, Imtiaz N, Krishnasamy HN. A pilot test for establishing validity and reliability of qualitative interview in the blended learning English proficiency course. *J Crit Rev*. 2020;7(5):140–143. <https://doi.org/10.31838/jcr.07.05.23>
- Braun V, Clarke V. *Successful qualitative research: A practical guide for beginners*. Los Angeles, CA: Sage, 2013; p. 1–400.
- Braun V, Clarke V. Using thematic analysis in psychology. *Qual Res Psychol*. 2006;3(2):77–101. <https://doi.org/10.1191/1478088706qp0630a>
- Smith B, Sparkes AC, editors. *Routledge handbook of qualitative research in sport and exercise*. 1st ed. London: Routledge; 2016.
- Braun V, Clarke V. What can 'thematic analysis' offer health and wellbeing researchers? *Int J Qual Stud Health Well-Being*. 2014;9(9):26152. <https://doi.org/10.3402/QHWV9.26152>

32. Aragona P, Giannaccare G, Mencucci R, Rubino P, Cantera E, Rolando M. Modern approach to the treatment of dry eye, a complex multifactorial disease: A PICASSO board review. *Br J Ophthalmol*. 2021;105(4):446–453. <https://doi.org/10.1136/bjophthalmol-2019-315747>
33. Wolffsohn JS, Arita R, Chalmers R, et al. TFOS DEWS II diagnostic methodology report. *Ocul Surf*. 2017;15(3):539–574.
34. Vidal-Rohr M, Craig JP, Davies LN, Wolffsohn JS. The epidemiology of dry eye disease in the UK: The Aston dry eye study. *Contact Lens Anterior Eye*. 2023;46(3):101837. <https://doi.org/10.1016/j.clae.2023.101837>
35. Mashige KP, Martin C. Utilization of eye care services by elderly persons in the northern Ethekwini district of Kwa-Zulu-Natal province, South Africa. *Afr Vis Eye Health*. 2011;70(4):175–181. <https://doi.org/10.4102/aveh.v70i4.113>
36. Mbwogge M, Astbury N, Nkumbe HE, Bunce C, Bascaran C. Waiting time and patient satisfaction in a subspecialty eye hospital using a mobile data collection kit: Pre-post quality improvement intervention. *JMIRx Med*. 2022;3(3):e34263. <https://doi.org/10.2196/34263>
37. Nwagbara UI, Hlongwana KW, Chima SC. Mapping evidence on the factors contributing to long waiting times and interventions to reduce waiting times within primary health care facilities in South Africa: A scoping review. *PLoS One*. 2024;19(8):e0299253. <https://doi.org/10.1371/journal.pone.0299253>
38. World Health Organisation. Universal eye health: A global action plan 2014–2019 [homepage on the Internet]. Geneva: World Health Organisation; 2013.
39. Naidoo KS, Govender-Poonsamy P, Morjaria P, et al. Global mapping of optometry workforce. *Afr Vis Eye Health*. 2023;82(1):850. <https://doi.org/10.4102/aveh.v82i1.850>
40. Resnikoff S, Felch W, Gauthier TM, Spivey B. The number of ophthalmologists in practice and training worldwide: A growing gap despite more than 200 000 practitioners. *Br J Ophthalmol*. 2012;96(6):783–787. <https://doi.org/10.1136/bjophthalmol-2011-301378>
41. Resnikoff S, Lansingh VC, Washburn L, et al. Estimated number of ophthalmologists worldwide (International Council of Ophthalmology update): Will we meet the needs? *Br J Ophthalmol*. 2020;104(4):588–592. <https://doi.org/10.1136/bjophthalmol-2019-314336>
42. Maake ME, Moodley VR. An evaluation of the public sector optometric service provided within the health districts in KwaZulu-Natal, South Africa. *Afr Vis Eye Health*. 2018;77(1):1–9. <https://doi.org/10.4102/aveh.v77i1.407-1>
43. Tashbayev B, Rusthen S, Young A, et al. Interdisciplinary, comprehensive oral and ocular evaluation of patients with primary Sjögren's syndrome. *Sci Rep*. 2017;7(1):10761. <https://doi.org/10.1038/s41598-017-10809-w>
44. Nkoana PM, Mashige PK, Moodley VR. Experiences of keratoconus patients attending public eye care facilities in South Africa. *Afr J Prim Health Care Fam Med*. 2024;16(1):3974. <https://doi.org/10.4102/phcfm.v16i1.3974>
45. Wolffsohn JS, Huarte ST, Jones L, Craig JP, Wang MTM, TFOS Ambassadors. Clinical practice patterns in the management of dry eye disease: A TFOS international survey. *Ocul Surf*. 2021;21:78–86. <https://doi.org/10.1016/j.jtos.2021.04.011>
46. Rathi VM, Sangwan VS. Prevention, diagnosis & management of dry eye in South Asia. *Community Eye Health*. 2017;30(99):S3–S4.
47. Jones L, Downie LE, Korb D, et al. TFOS DEWS II management and therapy report. *Ocul Surf*. 2017;15(3):575–628. <https://doi.org/10.1016/j.jtos.2017.05.006>
48. Perumal-Pillay VA, Suleman F. Selection of essential medicines for South Africa – An analysis of in-depth interviews with national essential medicines list committee members. *BMC Health Serv Res*. 2017;17(1):17. <https://doi.org/10.1186/s12913-016-1946-9>
49. Newman-Casey PA, Woodward MA, Niziol LM, Lee PP, De Lott LB. Brand medications and medicare part D: How eye care providers' prescribing patterns influence costs. *Ophthalmology*. 2018;125(3):332–339. <https://doi.org/10.1016/j.ophtha.2017.05.024>
50. Meagher A, Gurwood A. Generic vs branded: When RX makes a difference. *Optom Times J*. 2021;13(11).
51. Fattouh R, Abu Hamad B. Impact of using essential drug list: Analysis of drug use indicators in Gaza Strip. *East Mediterr Health J*. 2010;16(8):886–892. <https://doi.org/10.26719/2010.16.8.886>
52. World Health Organisation. Practical guidelines on pharmaceutical procurement for countries with small procurement agencies. Manila, Philippines: World Health Organization Regional Office for the Western Pacific; 2002.
53. Mayer H. Good expert knowledge, small scope. *Work*. 2014;47(3):353–364. <https://doi.org/10.3233/WOR-141822>
54. Latham SG, Williams RL, Grover LM, Rauz S. Achieving net-zero in the dry eye disease care pathway. *Eye*. 2024;38(5):829–840. <https://doi.org/10.1038/s41433-023-02814-3>
55. Donthineni PR, Shanbhag SS, Basu S. An evidence-based strategic approach to prevention and treatment of dry eye disease, a modern global epidemic. *Healthcare*. 2021;9(1):89. <https://doi.org/10.3390/healthcare9010089>
56. Gagnon LL, Roberge GD. Dissecting the journey: Nursing student experiences with collaboration during the group work process. *Nurse Educ Today*. 2012;32(8):945–945. <https://doi.org/10.1016/j.nedt.2011.10.019>