KNOWLEDGE, ATTITUDE AND PERCEPTION OF DRY EYE AMONG STUDENTS OF THE UNIVERSITY OF BENIN

BY

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BENIN CITY.

NOVEMBER, 2025.

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A PROJECT SUBMITTED TO THE FACULTY OF OPTOMETRY, UNIVERSITY OF BENIN, BENIN CITY, IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE AWARD OF DOCTOR OF OPTOMETRY (OD) DEGREE.

NOVEMBER, 2025.

CERTIFICATION

This is to certify that this research project titled: **KNOWLEDGE, ATTITUDE AND PERCEPTION OF DRY EYE AMONG STUDENTS OF THE UNIVERSITY OF BENIN** as carried out by **OGHENEKUME OGHENETEGA PEARL** in the Faculty of Optometry University of Benin in partial fulfillment of the requirement for the DOCTOR OF OPTOMETRY (OD) degree in the 2024/2025 Academic Session.

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EXTERNAL EXAMINER	**DATE**

DEDICATION

This project is lovingly dedicated to my wonderful parents —Mr. Simeon Oghenekume and my late mother, Mrs. Evelyn Oghenekume.

To my father, for your unwavering love, support, and encouragement that continually inspire me to strive for excellence.

To my beloved mother, though you are no longer here, your kindness, strength, prayers and the beautiful memories you left behind remain a constant source of inspiration in my life.

This work stands as a tribute to both of you — one of my greatest blessings and my unwavering source of motivation.

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ABSTRACT

This study assessed the knowledge, attitude, and perception (KAP) of dry eye disease (DED) among students of the University of Benin. A descriptive, questionnaire-based cross-sectional survey was conducted among 712 eligible undergraduates aged 17 – 30 years. Data were collected through a self-administered instrument adapted from a previously validated KAP questionnaire distributed both online and in person. Information gathered included demographics, ocular history, self-reported symptoms, and awareness, attitudes, and perceptions related to DED. Descriptive statistics summarized participant characteristics, while bivariate analyses examined associations between KAP domains and biodemographic variables. Commonly reported symptoms included light sensitivity (42.3%), blurry vision (28.7%), and eye fatigue (22.8%), whereas 26.8% reported none. Although 61.7% of respondents demonstrated good knowledge of DED, attitudes and practices were only moderately positive (54.4%), and perception levels were relatively weak (45.9%). Faculty of study showed a significant association with knowledge ($p = 0.007$), but no demographic factor was significantly linked to attitude or perception. These findings reveal a disconnect between awareness and behavioral practice, as many students experiencing symptoms lacked consistent preventive habits or concern regarding disease seriousness. Overall, University of Benin students exhibited satisfactory knowledge and moderately positive attitudes toward DED but suboptimal perception of personal risk. This underscores the need for strengthened health education and behavioral interventions aimed at enhancing awareness, perception, and regular preventive practices such as the use of lubricating drops, scheduled screen breaks, and protective eyewear. The observed trend aligns with similar KAP studies (Al-Mohaimeed et al., 2019; Al-Rajhi et al., 2021).

Keywords: Dry eye disease, Knowledge, Attitude, Perception, University students, Cross-sectional study, Ocular symptoms, Health education, Preventive practices, University of Benin

CHAPTER ONE

1.0 INTRODUCTION

Dry eye syndrome (DES), also known as dry eye disease (DED) or keratoconjunctivitis sicca, is a complex, multifactorial ocular surface disorder that occurs when the tear film becomes imbalanced, leading to symptoms such as discomfort, visual disturbances, and potential harm to the ocular surface. The updated definition of DED given in the DEWS II report (2017) by the Tear Film & Ocular Surface Society affirms this understanding. The tear film, which is vital for maintaining the health and clarity of the eye, comprises three layers: the lipid layer, the aqueous layer, and the mucin layer. Each of these layers plays a crucial role in stabilizing the tear film, preventing evaporation, and protecting the eye from environmental stressors (Craig *et al*., 2017). Disruption in any of these layers—whether from decreased tear production or increased tear evaporation—can lead to the development of dry eye symptoms ranging from mild irritation to severe discomfort and visual impairment (Shuaibu *et al*., 2021).

The global prevalence of DES has been reported to vary widely, with estimates ranging from 5% to 50% across different populations and age groups (Stapleton *et al*., 2017). Traditionally, DES has been associated with older adults, particularly those suffering from systemic conditions such as Sjögren's syndrome, diabetes, and rheumatoid arthritis, as well as post-menopausal women whose hormonal changes affect tear production (Bron *et al*., 2017). Several studies have highlighted the high prevalence of DES among students, with estimates ranging from 17% to 30% in various populations (Uchino *et al*., 2017; Akkaya & Atakan, 2018).

For the present research, attention was focused on university students, a demographic particularly vulnerable to DES because the academic environment required prolonged periods

of concentration on visually demanding tasks, such as reading and using digital devices. These activities reduced blink rates and disrupted tear function (Tsubota *et al*., 2017). Moreover, the widespread use of air conditioning in study areas, coupled with long hours spent in front of computers and smartphones, further increased the risk of developing dry eye symptoms among this population.

Within Nigeria, and particularly at the University of Benin, the issue of dry eye syndrome among students had not been extensively studied before this work, despite growing global awareness of its impact on younger individuals. A recent investigation of smartphone effects on tear quantity and quality among University of Benin students showed that these students were predisposed to dry eye (Idu *et al*., 2024). The hot and dry climate prevalent in many parts of Nigeria exacerbated tear evaporation, while cultural and economic factors influenced awareness and management. Inadequate and irregular sleep patterns were also found to contribute to the development of dry eye.

In Africa more broadly, a meta-analysis estimated the prevalence of dry eye disease at 42.0% (95% CI: 30.7-53.8%) in the African population. In Nigeria the estimated prevalence was about 41.4% in that study. Studies among university and student populations in Ethiopia also found a prevalence of symptomatic dry eye about 44.5% (95% CI: 40-49.3) among postgraduate students at Hawassa University. Another African university study at the University of KwaZulu-Natal in South Africa found that, though 81% of students had clinical signs of dry eye by objective tests, only 41% reported symptoms using the OSDI questionnaire.

The present study assessed the knowledge, attitude, and perception of dry eye among students of the University of Benin, and explored how well students recognized symptoms, prevention, and management of the condition. A cross-sectional survey of undergraduates from multiple faculties revealed that many students had experienced red, scratchy, or burning eyes,

fluctuating vision, and a sensation of dryness—classic symptoms of dry eye. Nonetheless, a substantial proportion did not recognize these symptoms as part of a clinical problem, believing instead that they were due merely to fatigue or dust. Analysis showed that students who had used computers or smartphones for more than six hours per day had significantly greater awareness of dry eye—though knowledge about preventive measures like blinking breaks and environmental adjustments remained low.

The findings of this project build on existing Nigerian and African work and confirm that while many students report symptoms, fewer had strong knowledge of diagnosis or management. Attitudes toward seeking professional care were mixed. Perception—how serious students believed dry eye to be—also varied, with many downplaying its importance until it interfered with academic tasks or comfort.

1.1 BACKGROUND INFORMATION

1.1.1 DRY EYE DISEASE (DED) DEFINITION

Dry Eye Disease (DED) is a multifactorial disorder affecting the ocular surface, where loss of tear-film homeostasis leads to symptoms such as dryness, burning, irritation and fluctuating vision (Craig *et al*., 2017). According to the Tear Film & Ocular Surface Society (TFOS) DEWS II report, DED arises from an imbalance in tear production, stability and quality, which triggers ocular surface inflammation, damage and neurosensory abnormalities. The condition has wide implications for ocular comfort, visual performance and quality of life, particularly in groups exposed to high visual demands or environmental stress.

In university student populations, DED may go under-recognised because symptoms may be attributed to fatigue, dust or digital screen use rather than a distinct ocular surface pathology. Understanding DED in this demographic is therefore vital for prevention and timely intervention.

1.1.2 Pathophysiology and Classification of Dry Eye Disease

The Tear Film and Ocular Surface Society (TFOS) DEWS II report reframed DED as a disorder of tear-film homeostasis in which tear-film instability and hyperosmolarity, ocular surface inflammation, and neurosensory abnormalities interact in a self-perpetuating cycle of damage and symptoms (Craig *et al*., 2017; Stapleton *et al*., 2017). This modern conceptualisation emphasises that DED is multifactorial and that single-test approaches will often under-detect the condition.

Clinically and mechanistically, DED is often separated into two broad—but overlapping—categories: aqueous-deficient dry eye, where lacrimal secretion is reduced, and evaporative dry eye, where normal aqueous production is present but increased evaporation (commonly due to meibomian gland dysfunction, poor blink dynamics, or adverse environment) leads to tear-film instability (Nelson *et al*., 2017; Bron *et al*., 2017). TFOS explicitly notes that most patients present with mixed features and that meibomian gland dysfunction (MGD) is a principal cause of evaporative dry eye worldwide (Geerling *et al*., 2017).

At the tissue and molecular level, tear hyperosmolarity—the concentrating of salts and inflammatory mediators in the tear film—is central to pathogenesis; this triggers a cascade of epithelial stress, inflammatory signalling, and neurosensory alterations that perpetuate symptoms and signs (Bron *et al*., 2017; Willcox *et al*., 2017). The recognition of neurosensory abnormalities (including corneal and trigeminal nerve dysfunction) as contributors to symptoms explains, in part, why signs and symptoms sometimes diverge—patients with marked symptoms may have minimal signs, and vice versa (Craig *et al*., 2017; Wolffsohn *et al*., 2017). This insight has important consequences for how clinicians and educators frame disease recognition and patient-centred care.

1.1.3 Risk Factors and Predisposing Conditions

DED arises from a mix of non-modifiable and modifiable risk factors. Age and female sex are consistently associated with higher DED prevalence in many studies (through hormonal

influences, glandular changes and cumulative exposures), while systemic autoimmune disease (e.g., Sjögren's syndrome), diabetes and certain systemic medications are recognised non-modifiable or disease-related contributors (Craig *et al*., 2017; Stapleton *et al*., 2017). However, in many student and young-adult samples, behavioural and environmental exposures predominate.

Prominent modifiable risks include: prolonged visual display terminal (VDT) and smartphone use (which reduces blink rate and increases tear evaporation), contact lens wear (mechanical and evaporative effects), meibomian gland dysfunction (lipid-layer deficiency), and low ambient humidity (air-conditioning, dusty or windy conditions such as the Harmattan). Multiple recent reviews and original studies have established strong mechanistic and epidemiological links between these exposures and symptomatic DED in younger adults and student populations (Bron *et al*., 2017; Betiku *et al*., 2022).

The TFOS DEWS II report emphasises that DED is not merely a deficiency of tears but a complex interaction of tear film instability, hyperosmolarity, ocular surface inflammation and damage, and neurosensory abnormalities. These inter-related mechanisms create a self-perpetuating inflammatory cycle that worsens with time if untreated (Craig *et al*., 2017).

Tear Film Structure

The tear film is a dynamic, trilaminar structure composed of:

i. Lipid layer (outermost) – produced mainly by the meibomian glands; retards evaporation and stabilises the tear film.
ii. Aqueous layer (middle) – secreted by the main and accessory lacrimal glands; provides nutrients, oxygen and antimicrobial proteins.
iii. Mucin layer (innermost) – secreted by conjunctival goblet cells; ensures uniform tear film spread across the hydrophobic corneal epithelium (Bron *et al*., 2017).

Disruption of any of these layers destabilises the tear film and triggers symptoms such as dryness, grittiness, fluctuating vision and reflex tearing.

Core Mechanisms

1. Tear Film Instability and Hyperosmolarity – increased evaporation or decreased secretion concentrates solutes, stressing epithelial cells and activating inflammatory cascades.

2. Inflammation – cytokines (IL-1, TNF-α) and matrix metalloproteinases (MMP-9) amplify ocular surface damage (Pflugfelder *et al*., 2020).

3. Neurosensory Abnormalities – altered corneal innervation may cause either heightened discomfort or reduced reflex tearing (Craig *et al*., 2017).

TFOS DEWS II Classification

The TFOS DEWS II consensus groups DED into two primary, often overlapping categories:

Type	Pathogenesis	Key features	Common causes
Aqueous-Deficient Dry Eye(ADDE)	Reduced lacrimal secretion	Low Schirmer scores, minimal tear meniscus	Sjögren's syndrome, lacrimal gland dysfunction, systemic autoimmune disease
Evaporative Dry Eye (EDE)	Excess tear evaporation despite normal productio	Rapid tear break-up, meibomian gland dysfunction (MGD)	Meibomian gland disease, eyelid disorders, environmental dryness

Mixed presentations are frequent; many patients exhibit elements of both mechanisms.

Additional Classifications

i. Primary vs. Secondary – primary occurs without identifiable systemic disease; secondary follows autoimmune disorders, ocular surface disease or medications.
ii. Acute vs. Chronic – based on duration and persistence of symptoms.

African and Nigerian studies have highlighted environmental and sociocultural specifics: the effect of dry seasons, indoor air-conditioning in study spaces, contact-lens and self-medication practices, and rapidly increasing smartphone use among students. Population and clinic studies in Nigeria (e.g., Iperu Remo and Kaduna) reported associations between common local exposures and increased DED signs or symptoms, reinforcing the relevance of these risk factors in the University of Benin context.

1.1.4 Diagnostic Tests and Clinical Evaluation of Dry Eye

Because DED is multifactorial and symptoms do not always align with clinical signs, modern diagnostic methodology recommends combining validated symptom questionnaires with objective clinical tests. The TFOS DEWS II Diagnostic Methodology report summarised best practice: start with a validated symptom instrument (e.g., OSDI) and follow with targeted objective tests (TBUT, Schirmer's, ocular surface staining, meibomian gland imaging or expression) to classify disease and guide management (Wolffsohn *et al*., 2017).

Symptom questionnaires. The Ocular Surface Disease Index (OSDI) and other validated instruments (e.g., DEQS) quantify symptoms and functional impact, and are widely used in prevalence and KAP studies because they are inexpensive, reproducible and correlate moderately with QoL metrics (Schiffman *et al*., 2000; Sakane *et al*., 2013). Selecting appropriate cut-offs is important for comparability across studies.

Objective clinical tests. Tear break-up time (TBUT) measures tear-film stability after fluorescein instillation and is sensitive to evaporative disorders; Schirmer's test estimates basal and reflex tear production and helps detect aqueous deficiency; corneal and

conjunctival staining (fluorescein, lissamine green) reveal epithelial disruption; meibography (infrared imaging of meibomian glands) and meibum expression assess gland morphology and function and are increasingly accessible in clinical settings (Nelson *et al*., 2017; Bron *et al*., 2017). TFOS provides technical guidance on test order, interpretation and limitations (Wolffsohn *et al*., 2017).

Resource considerations in low-resource settings. Tear-osmolarity testing and specialised imaging may not be widely available in many African clinics, which means combination symptom-plus-simple-objective approaches (OSDI + TBUT/Schirmer + staining) remain pragmatic and are the basis for many Nigerian and African prevalence studies (Ebenye *et al*., 2020; Betiku *et al*., 2022). This is why many regional prevalence studies use OSDI thresholds plus TBUT/Schirmer cut-offs to operationalise DED in population or clinic samples.

Table of key diagnostic tests

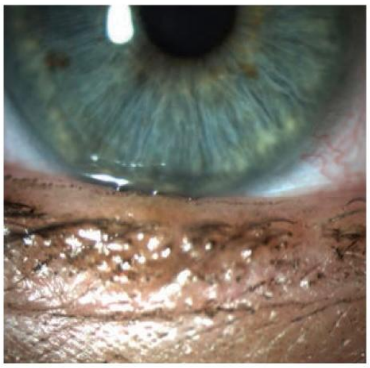
OSDI	Symptom severity & QoL	≥13 suggests DED	Screening, research
TBUT	Tear-film stability	<10 s abnormal	Evaporative DED
Schirmer's	Basal tear output	<10 mm/5 min	Aqueous-deficient DED
Fluorescein/Lissamine Staining	Epithelial integrity	Grading scales	Ocular surface damage
Meibography	Gland structure	% gland loss	Meibomian dysfunction

• **Symptom assessment.** Symptom assessment is considered one of the most critical initial steps in evaluating patients for dry eye disease. Patient-reported symptoms often provide the earliest and most reliable clues to ocular surface dysfunction. Although some individuals may initially deny discomfort, targeted questioning about situations that provoke symptoms—such as extended computer use, air travel, or windy conditions—can reveal underlying dryness (Stapleton *et al*., 2017).

Validated questionnaires such as the Ocular Surface Disease Index (OSDI) are widely used due to their proven reliability, sensitivity, and specificity in distinguishing between normal, mild, moderate, and severe dry eye (Schiffman *et al*., 2000). Other instruments like the Standard Patient Evaluation of Eye Dryness (SPEED) and Dry Eye Questionnaire-5 (DEQ-5) also provide reproducible symptom scores, while surveys such as the Impact of Dry Eye on Everyday Life (IDEEL) and National Eye Institute Visual Function Questionnaire (NEI VFQ-25) assess the quality-of-life burden associated with DED (Bron *et al*., 2017).

• **Schirmer's and phenol red thread.** Tear volume testing remains an important aspect of clinical evaluation. **The Schirmer I test**, which measures both basal and reflex tear secretion without anesthesia, involves placing a standardized paper strip in the lower eyelid for five minutes; readings of less than 10 mm indicate reduced tear production (Nelson *et al*., 2017). Although variability has been reported, the Schirmer test continues to be widely recommended—especially for detecting aqueous-deficient dry eye and in the diagnosis of Sjögren's syndrome, where a result of less than 5 mm of wetting is generally considered suspicious (Craig *et al*., 2017).

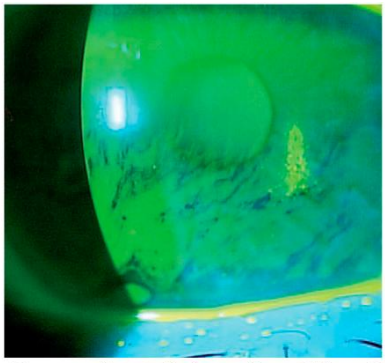
The Phenol Red Thread (PRT) test provides a faster, less invasive alternative, requiring only about 15 seconds and no anesthesia. The pH-sensitive thread changes from yellow to red when moistened by tears, with less than 10 mm of colour change indicating probable tear deficiency. Comparative studies show mixed findings between PRT and Schirmer's results, though both remain valuable depending on clinical context (Cho & Douthwaite, 1995; Koh *et al*., 2008).



Tear film reduction, as seen in this rosacea patient, can be related to external stressors.

• **Fluorescein staining.** Fluorescein staining is a valuable test for assessing the location, severity, and likely cause of ocular surface damage in dry eye disease. Inferior corneal staining often suggests incomplete blinking, lagophthalmos, or poor eyelid closure, whereas patchy central staining can indicate more severe aqueous deficiency, as seen in Sjögren's syndrome (Bron *et al*., 2017).

While fluorescein staining is highly informative for disease grading and management, it has limited sensitivity for early or mild cases. This is because epithelial disruption must already be present before staining appears—making it a tool best suited for moderate to advanced disease rather than early screening (Nelson *et al*., 2017; Wolffsohn *et al*., 2017). As many authors note, relying solely on fluorescein to detect dry eye would be comparable to waiting for visual field loss before treating glaucoma; early pathophysiologic changes often occur well before visible staining develops.



Corneal staining in this dry eye patient shows epithelial barrier disruption.

When performing fluorescein staining, timing is critical to obtain accurate diagnostic findings. After instilling the dye, clinicians should wait at least two to five minutes—depending on the volume used—to allow excess fluorescein to disperse and prevent fluorescence quenching (Bron *et al*., 2017; Wolffsohn *et al*., 2017). Immediately after instillation, the cornea may appear uniformly bright, masking subtle epithelial defects beneath the tear film. Allowing sufficient time for the dye to equilibrate ensures that staining patterns representing true epithelial compromise can be observed, rather than surface fluorescence from the tear film itself (Craig *et al*., 2017).

• **Ocular Surface Staining.** The TFOS DEWS II definition of dry eye acknowledges that the disease can occur even in the absence of ocular surface damage (Craig *et al*., 2017). Nevertheless, ocular surface staining remains a core diagnostic and monitoring tool and is frequently used as an inclusion criterion in dry-eye studies (Wolffsohn *et al*., 2017). Vital dyes are extensively employed to evaluate the cornea, conjunctiva and lid margin, and repeated testing at follow-up visits provides a useful indication of clinical improvement or progression. The pattern of punctate epithelial staining across the cornea can offer valuable diagnostic clues, aiding clinicians in identifying associated conditions such as lagophthalmos or meibomian gland dysfunction (Bron *et al*., 2017).

Three dyes are most commonly used in clinical practice: sodium fluorescein (NaFl), lissamine green (LG) and rose bengal. While rose bengal historically served as a diagnostic dye, it has been shown to cause ocular discomfort, reflex tearing, and cytotoxicity to corneal epithelial cells. Consequently, lissamine green—comparable in diagnostic performance but less irritating—is now preferred (Pflugfelder *et al*., 2020).

Best practices for ocular surface staining include temporal instillation to avoid mechanical artefacts near the conjunctiva or lid margin, sequential staining using more than one strip to improve sensitivity, and consistent documentation of results across follow-up visits (Jones *et al*., 2017). Several grading systems are available to quantify staining severity and distribution, including:

i. **van Bijsterveld Score –** whole-cornea and conjunctival staining, each graded 0–3.

ii. **NEI Workshop Scale –** divides the cornea into five sectors, scoring each 1–3.

iii. **Oxford Staining System –** grades from 0 to V based on the density of staining.

iv. **Ocular Staining Score (OSS) –** quantifies punctate corneal staining dots:

v. Grade 0 = 0 dots

vi. Grade 1 = 1–5 dots

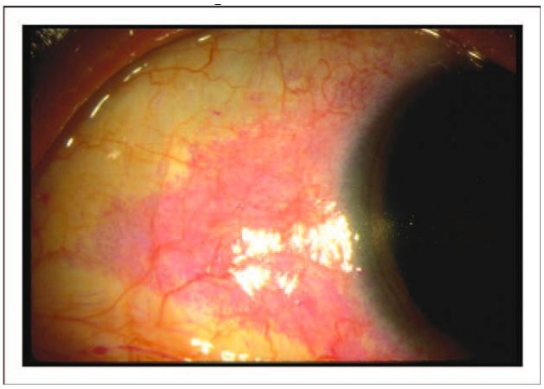
vii. Grade 2 = 6–30 dots

viii. Grade 3 = > 30 dots

Using validated grading scales improves inter-observer agreement and enhances repeatability in both corneal and bulbar-conjunctival assessment (Bron *et al*., 2017; Willcox *et al*., 2017).

Lissamine green staining

Lissamine green is valuable for evaluating conjunctival damage, conjunctivochalasis, and the line of Marx along the lid margin. The line of Marx is a distinct zone of parakeratinized cells that anchors the tear film, and any alteration to it can significantly affect tear film stability. Rose bengal, though diagnostically useful, may cause discomfort upon instillation and is best applied after fluorescein evaluation is complete.



Staining of the conjunctiva with rose bengal. Image from a patient with aqueous deficiency. Rose bengal may be used to highlight areas of the conjunctiva that are abnormal or unhealthy in patients with dysfunctional tear syndrome (DTS). Moderate staining of the conjunctiva is shown with a classic pattern for keratoconjunctivitis sicca.

Lid Margin/Meibomian Gland Evaluation

In addition to ocular surface staining, assessment of the lid margin and meibomian gland function provides valuable diagnostic insight into dry eye and related ocular surface disorders. Staining of the lid margin and lid wiper region using fluorescein (NaFl) and lissamine green

(LG) can reveal epithelial compromise and friction-related damage during slit-lamp examination.

Lid Wiper Epitheliopathy (LWE).

LWE is commonly associated with dry eye symptoms and results from increased friction between the lid margin and the ocular surface. It can be evaluated by repeat instillation of LG. The standard procedure involves wetting an LG strip, allowing the dye to elute for approximately five seconds, and instilling it into the temporal conjunctiva. After about five minutes, a second instillation is performed, and staining is evaluated under white light three to six minutes later. LWE is considered present when staining extends more than 2 mm in length or covers more than 25% of the lid margin's sagittal width (excluding the line of Marx).

Meibomian Gland Expression.

Diagnostic evaluation of meibomian gland (MG) function is an integral part of slit-lamp examination. Expression can be performed manually (using a thumb or cotton swab) or with a standardized device such as the Meibomian Gland Evaluator (Johnson & Johnson Vision), which applies pressure equivalent to a natural blink.

The evaluator is sequentially applied to the nasal, central, and temporal lid regions, exerting pressure on approximately eight glands at a time.

The Meibomian Gland Yielding Liquid Secretion (MGYLS) score represents the number of glands (out of eight) that express a liquid secretion. The expressed meibum is graded on a 0–3 scale:

i. 0 = no expression
ii. 1 = paste-like expression
iii. 2 = turbid expression
iv. 3 = clear, thin, oil-like secretion

This evaluation can be repeated at follow-up visits to monitor functional improvement or progression of evaporative dry eye.

Diagnostic vs. Therapeutic Expression.

Diagnostic MG expression differs from therapeutic procedures, which apply greater pressure to evacuate obstructed glands. Therapeutic expression may involve eyelid warming followed by manual compression with forceps or paddles, or use of devices that combine heat and pressure to improve meibum flow.

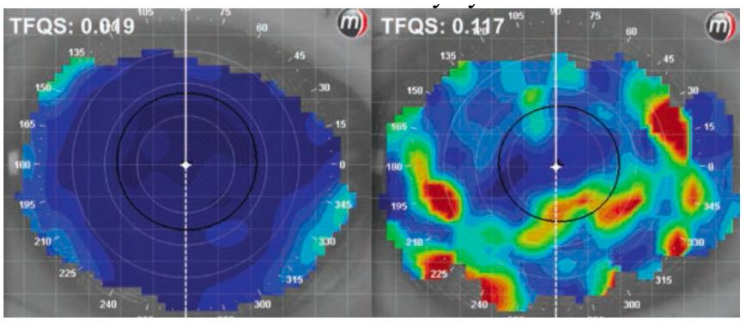
Bulbar Redness Assessment. Conjunctival injection remains one of the most common and easily observable clinical signs of ocular surface inflammation. This assessment is typically performed during a routine slit-lamp examination. A bulbar redness score of grade 2 or higher generally indicates ocular surface inflammation, whereas grade 1 or less is considered within normal limits (Efron, 2019).

Before attributing redness to dry eye disease (DED), alternative etiologies—such as allergic conjunctivitis, infection, or trauma—should be carefully excluded. Additionally, conjunctivochalasis should be evaluated, as redundant conjunctival folds can disrupt tear flow and contribute to ocular discomfort and dryness (Mimura *et al*., 2013).

Objective or automated assessments of bulbar redness are now available through videokeratoscopes and integrated ocular surface analyzers, often incorporated within the same devices used for meibography. These digital grading systems enhance repeatability and inter-observer reliability compared with traditional subjective grading scales (Schulze *et al*., 2020). For consistency, bulbar redness should be assessed before any invasive testing, such as dye instillation or tear film disruption, and repeated at follow-up visits to monitor treatment response and inflammatory changes.

• **Corneal topography.** Although corneal topography is not traditionally considered a primary diagnostic test for dry eye disease (DED), it plays an increasingly valuable role in surgical and preoperative assessments. In candidates for cataract or refractive surgery, topography can serve as an early indicator of ocular surface irregularity. Research demonstrates that subtle topographic distortions often reflect tear-film instability and epithelial dehydration, even before overt signs appear (Epitropoulos *et al*., 2015).

A telltale finding is inferior steepening caused by epithelial dehydration, which can sometimes mimic early keratoconus. Additional topographical indicators include irregular Placido disc reflections and asymmetric keratometry readings between eyes. These features highlight the importance of ruling out ocular surface disease before surgical planning, as untreated DED can alter keratometric accuracy and intraocular lens (IOL) calculations.



Tear film quality scores (TFQS) as measured by placido disc topography. A low score (left) indicates better tear film quality than a higher score (right).

Beyond structural relevance, there is growing evidence that untreated or unrecognised DED significantly affects quality of life, influencing mental well-being, concentration, and daily activities. Symptom-based questionnaires such as OSDI and DEQS capture this impact effectively in young adults, justifying their inclusion in Knowledge, Attitude, and Practice (KAP) studies. Understanding how individuals perceive symptoms and when they seek care can help reduce chronic progression through early recognition and intervention.

Blink and Lid Closure Analysis. Assessment of lid closure and blink dynamics is vital in understanding exposure-related components of DED. The Korb-Blackie light test (Korb & Blackie, 2013) can be used to evaluate the adequacy of eyelid seal during sleep. With the patient semi-reclined, a Finoff transilluminator is placed gently against the closed upper eyelid. The degree of light transmission between the eyelids is scored on a 0–3 scale:

i. 0 – No light transmission (complete seal)
ii. 1 – Minimal light
iii. 2 – Moderate light
iv. 3 – Severe leakage

A score greater than zero indicates some degree of incomplete lid closure, correlating with morning dry eye symptoms due to nocturnal exposure.

This differs from nocturnal lagophthalmos, in which eyelids visibly remain partially open during sleep. Clinicians can confirm this history by asking whether the patient has been told they "sleep with their eyes open." Associated findings include inferior conjunctival staining, exposure keratopathy, and lid laxity on gentle closure.

Even when eyelids appear closed, subtle gaps may be present. The Korb-Blackie test objectively demonstrates these micro-openings, confirming a pathway for tear evaporation and surface desiccation. The test is best performed with the patient semi-reclined and relaxed, using minimal contact between the transilluminator and upper eyelid while observing for escaping light.

Korb-Blackie test indicating incomplete closure of the eyelids due to light being seen emanating from the lid margin of the right eye.

The assessment of lid closure and blink dynamics provides insight into exposure-related dry eye mechanisms. The Korb-Blackie light test (Korb & Blackie, 2013) is a simple yet revealing procedure to evaluate the integrity of eyelid closure during rest or sleep.

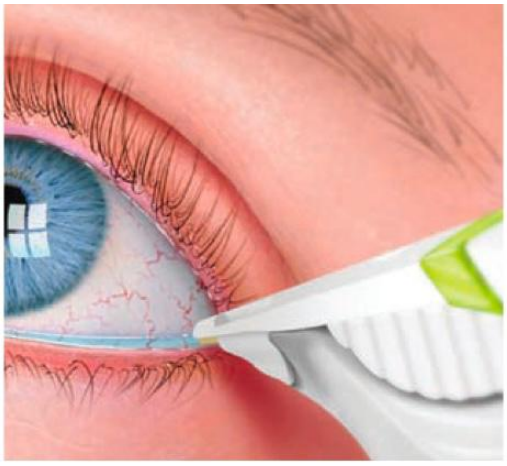
Procedure:

1. Seat the patient in a semi-reclined position—the headrest should support the head comfortably to mimic a relaxed, sleeping posture.
2. Ask the patient to gently close their eyes, as though preparing for sleep (not forcefully shut).
3. Using a Finoff transilluminator, position the light gently along the superior tarsal plate near the superotemporal region of the upper eyelid.
4. Barely touch the eyelid surface—minimal pressure prevents artificial lid separation.
5. Observe for light "leaks" or glow escaping between the upper and lower eyelids.

Reduced blink rate and incomplete blinks are major contributors to tear-film instability, especially during prolonged digital device use. To assess blink rate clinically, observe the patient while using a smartphone or computer for 15 seconds and count blinks; multiply this by four to estimate blinks per minute. A rate of fewer than 12–15 blinks per minute suggests digital eye strain and predisposition to evaporative DED (Portello *et al*., 2013).

Patients demonstrating reduced blink rates can benefit from blink training, frequent breaks, or digital ergonomics counselling to restore tear-film stability. These behavioural adjustments are simple yet effective early interventions for preventing progression of DED in screen-dominant lifestyles.

• Osmolarity testing. Osmolarity testing indicates whether or not the patient has a higher "salt" content than normal. Tear osmolarity serves as a key biomarker for dry eye disease (DED), reflecting the balance—or imbalance—between tear volume and solute concentration.



Procedure (TearLab Osmolarity System)

1. Using a TearLab osmometer, collect a 50-µL tear sample from the inferior lateral meniscus of each eye.
2. This is done via a single-use microchip sampling pen that draws tears onto a sample card—no topical anesthesia is required.
3. The card is inserted into the TearLab reader, which analyzes the specimen and displays a digital osmolarity value within approximately two minutes.

A reading of ≤307 mOsm/L is generally considered within normal limits.

i. Values above 308 mOsm/L in either eye indicate tear hyperosmolarity consistent with DED.
ii. Interocular differences ≥8 mOsm/L are also diagnostically significant, suggesting tear film instability and asymmetrical surface stress.

These measurements not only confirm the presence of DED but also help categorize severity and track treatment progress across visits.

Alternative Device: I-Pen Osmometer (I-Med Pharma)

For patients with severe aqueous deficiency, obtaining a sufficient liquid tear sample can be difficult. The I-Pen osmometer provides a practical alternative by employing single-use disposable sensors to measure osmolarity through electrical impedance rather than direct tear collection.

i. The probe is gently applied to the tear-soaked palpebral conjunctiva for 2–5 seconds.
ii. It records the electrochemical resistance of the tissue and calculates osmolarity based on that reading.

Because the I-Pen requires only brief tissue contact and no tear extraction, it is particularly suitable for patients with minimal tear volume or those intolerant to sampling.

Both methods—TearLab and I-Pen—offer quantitative, objective data that support clinical grading and treatment evaluation, complementing other diagnostic indices such as NITBUT, Schirmer's test, and ocular surface staining.

• **MMP-9 Testing.** Matrix metalloproteinase-9 (MMP-9) is a proteolytic enzyme secreted by stressed epithelial cells and is elevated in ocular surface inflammation. Increased tear MMP-9 levels have been strongly associated with dry eye disease (DED), making it a useful inflammatory biomarker (Sambursky, 2016; Messmer, 2015).

A positive result indicates MMP-9 ≥ 40 ng/mL, suggestive of inflammation—though not specific to DED, since elevations may also occur in infection or allergy.

InflammaDry® Test (Quidel):

This point-of-care test functions like a pregnancy test. A tear sample is collected from the palpebral conjunctiva with the test fleece, activated with buffer, and read after ≈ 10 minutes:

i. Blue line only: Negative (< 40 ng/mL)

ii. Blue + red line: Positive (≥ 40 ng/mL)

Elevated MMP-9 correlates with symptom severity, reduced TBUT, increased corneal/conjunctival staining, and topographic irregularity (Sambursky *et al*., 2013).

Thus, MMP-9 testing adds an objective inflammatory marker to complement osmolarity and staining assessments in diagnosing and monitoring DED.

• **Non-invasive Keratograph break-up time (NIKBUT).** Non-invasive keratograph break-up time (NIKBUT) is a dye-free assessment of tear film stability that employs Placido disc–based corneal topography. It measures both initial and average break-up times, providing an objective evaluation of tear film quality (Best *et al*., 2013).

Using white light, the system records tear film dynamics, including tear meniscus height, lipid layer interference patterns, and particle flow velocity, which tracks reflective particles across the tear film surface. These parameters collectively help differentiate evaporative from aqueous-deficient dry eye.

The Keratograph 5M (Oculus) integrates blue diodes for fluorescein image documentation and generates patient-friendly reports with quantitative summaries and pie-chart visuals. Interferometric assessment allows clinicians to visualize lipid spread and particle flow, offering valuable insight into tear stability and ocular surface function (Downie *et al*., 2020).

• **Meibography.** Meibography is an imaging technique used to evaluate the structure and integrity of the meibomian glands (MGs), which play a crucial role in maintaining tear film stability. Meibomian glands can plug, dilate, truncate, or atrophy over time, and such changes are often invisible on external examination. Therefore, imaging is essential to assess gland dropout and viability—information that is critical for guiding appropriate therapy (Arita *et al*., 2017).

Infrared meibography allows clinicians to visualise gland morphology directly and to quantify gland dropout. The Meibomian Gland Dysfunction (MGD) Workshop suggested that individuals under 20 years should show no gland loss, whereas those over 20 years may exhibit up to 25% dropout (Nichols *et al*., 2011).

Normal meibomian glands **Moderate gland dysfunction**

Severe gland dysfunction

Assessing gland structure helps determine whether interventions such as warm compresses or lipid-based artificial tears are likely to be effective, as patients with severe gland atrophy may derive limited benefit from such therapies.

A comprehensive evaluation includes **slit-lamp assessment** of the lacrimal lake, puncta, and eyelid margins, noting any pouting or capping of gland orifices. **Gentle digital pressure** over the tarsus for 10–15 seconds can help detect non-obvious MGD—clear, easily expressed meibum indicates healthy glands, whereas turbid or absent secretion suggests obstruction or atrophy.

In addition, by manually moving the eyelids and assessing the meibomian glands and palpebral conjunctiva, complete with lid eversion, more details are revealed.

• **Lipid layer thickness (LLT) assessment.** An insufficient lipid layer is a key cause of tear film instability and fluctuating vision, and is considered a hallmark of evaporative dry eye. Automated interferometric assessment of lipid layer thickness (LLT) helps determine whether a patient's dry eye is primarily due to lipid deficiency, thereby guiding management toward meibomian gland–targeted therapies and lipid-containing artificial tears (Blackie *et al*., 2009; Finis *et al*., 2014).

Devices such as the Lipiview II interferometer (Johnson & Johnson Vision) quantify LLT by analysing the interference patterns produced by the tear film's lipid layer, while the Keratograph 5M provides complementary information on non-invasive tear break-up time (NIKBUT) and tear film dynamics. Identifying a deficient lipid layer directs treatment toward interventions that enhance meibomian gland function and restore tear film stability.

Tear Meniscus Height (tmh) Assessment. Tear meniscus height (TMH) is a widely accepted indicator of tear film volume and an important parameter in evaluating aqueous-deficient dry eye. It can be assessed at the slit lamp by comparing the meniscus height to the lower lid margin or to a calibrated slit beam, though optical coherence tomography (OCT) provides greater precision and repeatability (Chen *et al*., 2010; Tung *et al*., 2014).

Normal TMH values typically range from 0.2–0.7 mm, while a measurement of ≤0.1 mm is generally considered suggestive of tear insufficiency (Savini *et al*., 2010). TMH correlates significantly with Schirmer's test and tear break-up time, supporting its role as a non-invasive predictor of tear deficiency.

• **Microscopy.** Specular microscopy provides non-contact, objective evaluation of the corneal endothelium, allowing quantification of cell density, morphology, and loss that may occur secondary to chronic dry eye (Bourne, 2003). This imaging modality is valuable for monitoring disease progression and therapeutic outcomes and can also serve as an educational tool to improve patient understanding and compliance.

Corneal Sensitivity Testing. Corneal sensitivity testing evaluates the functional integrity of corneal nerves, which may be reduced in dry eye disease or neurotrophic keratitis. A simple screening method involves gently touching the cornea with a cotton wisp, tissue corner, or waxed dental floss, observing for a blink or discomfort response. While quick and inexpensive, this method is subjective.

For quantitative assessment, the Cochet–Bonnet esthesiometer uses a fine nylon filament of adjustable length to determine corneal sensitivity—the longer the filament that elicits a response, the greater the sensitivity (Belmonte *et al*., 2017). Testing is typically performed at the central cornea and four quadrants to identify regional nerve deficits

1.1.5 Impact of Dry Eye on Quality of Life and Academic Performance

DED is not merely an ocular nuisance—patient-reported outcomes literature demonstrates meaningful impacts on visual function, daily activities and psychosocial well-being. Reviews and multi-centre studies document that higher symptom scores (e.g., OSDI) correlate with reduced health-related quality of life, problems with near work and reduced productivity. In working adults, DED has been linked to measurable productivity losses (absenteeism/presenteeism), and treatment is associated with QoL improvements—findings that translate plausibly to student populations where near vision and prolonged study are central.

Several student-focused studies reported particularly high symptom burdens and linked them to impaired study activities, reduced concentration, visual fatigue and decreased academic engagement. Institutional surveys in various countries documented that a substantial minority of students experienced DED symptoms that interfered with reading, screen-based learning and examination performance. These data underline why investigations of awareness, attitudes and perception among students are relevant—not only for prevention but also for protecting learning outcomes.

1.1.6 Knowledge, Attitude and Perception Studies on Dry Eye

Compared with the abundance of clinical and epidemiological studies, KAP research on Dry Eye Disease (DED) remains relatively limited. Existing studies, however, consistently reveal a disconnect between symptom experience, awareness, and preventive behaviour. International surveys indicate that many individuals attribute dry eye symptoms to transient environmental factors—such as fatigue, dust, or prolonged screen use—and consequently delay seeking professional care. Awareness of preventive measures (e.g., regular blinking, screen breaks, eyelid hygiene, and appropriate use of lubricants) also tends to be low, particularly in settings with minimal public health education on ocular surface disorders (Hassan *et al*., 2021; Uchino & Schaumberg, 2013).

In Africa and Nigeria, published work has largely focused on prevalence and clinical risk factors, with limited emphasis on structured assessments of knowledge, attitudes, and perceptions. The African meta-analysis on DED prevalence explicitly highlighted the need for population-specific behavioural research to inform effective public health interventions (Nkum *et al*., 2022). Nigerian community and clinical studies have identified contributory behaviours—such as self-medication, unsupervised use of over-the-counter eye drops, and poor contact lens hygiene—but have rarely quantified underlying attitudes or perceived disease severity. This gap, especially among university students, underscores the need for KAP-based investigations to understand behavioural drivers of DED within this population.

Where KAP or awareness studies have been implemented internationally, findings suggest that targeted educational interventions—featuring concise, practical messages about blinking frequency, screen ergonomics, environmental control, and early clinical consultation—can improve both preventive practices and help-seeking behaviour (Alzahrani *et al*., 2020; Gupta

et al., 2021). Establishing baseline KAP data among Nigerian university students, such as within the University of Benin community, is therefore essential to develop context-specific, culturally sensitive dry eye education strategies.

1.1.7 Preventive and Management Strategies for Dry Eye

Management of DED is multimodal and should be tailored to the underlying subtype(s). For evaporative disease and MGD, conservative measures (lid hygiene, warm compresses, manual expression) and environmental modifications (humidifiers, reduced air-conditioning exposure, blink training) are first-line actions; for aqueous deficiency, topical lubricants and, in more severe cases, anti-inflammatory therapy or punctal occlusion may be indicated (Tear Film & Ocular Surface Society [TFOS] DEWS II Management & Therapy Report, 2017).

Non-pharmacological treatments (thermal pulsation, intense pulsed light for refractory MGD) and targeted educational interventions (20-20-20 rule; blink reminders; contact-lens hygiene education) have shown benefit in selected populations; however, resource constraints shape what is feasible in many university health services (American Academy of Ophthalmology Review on Thermal Pulsation in MGD, 2023).

Public-health and educational strategies that integrate eye-health messages into university orientation, student clinics, and digital wellbeing programmes can be effective. The evidence base supports brief, behaviourally focused interventions that are repeated and easy to implement (e.g., push notifications, posters in libraries, optometry outreach days), but local adaptation and evaluation are required—hence the need for local KAP data to tailor content.

A Simple Treatment Approach

Because management of dry eye disease (DED) must be tailored to each individual, a straightforward yet evidence-based regimen is generally recommended in clinical practice as follows:

• **Omega fatty acids.** Supplementation with fish oil is often initiated- ideally one that contains gamma-linolenic acid—as dietary omega-3 intake has been shown to reduce ocular surface inflammation and improve tear stability (Efficacy of Omega-3 Intake in Managing Dry Eye Disease, 2023). A daily dose of about 2,000 mg taken with breakfast is generally recommended.

A lipid-based artificial tear (e.g., OcuSoft) is typically recommended for use at least four times daily, with preservative-free formulations preferred in cases of marked ocular surface staining.

● **Reduce acute inflammation.**

A one-month course of topical corticosteroid should be sufficient to quickly suppress ocular surface inflammation, an off-label but effective approach. Accordingly, treatment with Lotemax Gel drops is initiated at four times daily for two weeks, then reduced to twice daily for the following two weeks.

Although any steroid can elevate intraocular pressure (IOP), loteprednol has a lower risk, and any increase typically resolves upon tapering (Practical Guidance for the Use of Loteprednol Etabonate Ophthalmic, 2021).— and even if the IOP does increase, by the time it goes up, you are already tapering or have stopped the steroid.

● **Debride the lid margin.**

Gentle debridement of the meibomian gland orifices may be performed when obstruction is evident. Using a sterile golf-club spud, the clinician lightly scrapes along the margin to facilitate meibum outflow. This quick, non-anaesthetised procedure can help restore lipid secretion into the tear layer.

- **Suppress long-term inflammation.** For recurrent or chronic low-grade inflammation, pulse dosing of loteprednol is sometimes used as an off-label maintenance strategy to reduce flare-ups and maintain comfort.

1.2 STATEMENT OF PROBLEM

Dry eye disease (DED) is a widespread condition that affects a significant portion of the global population, including students, and can lead to discomfort, visual disturbances, and a reduction in quality of life. A recent study investigating smartphone effect on tear quantity and tear quality among the students of the University of Benin showed that these students were predisposed to dry eye (Idu *et al*., 2024). Despite its prevalence, many individuals remain unaware of the symptoms, underlying causes, and effective management strategies for dry eye. Among university students, factors such as prolonged screen time, irregular sleep patterns, environmental exposure, and frequent use of contact lenses may contribute to the development or worsening of dry eye symptoms. However, there is limited research on the awareness/knowledge of dry eye symptoms and risk factors within this demographic, particularly in the University of Benin context. A lack of awareness can delay diagnosis and treatment, leading to unnecessary discomfort and potential long-term effects on ocular health.

In Nigeria, some population-based studies have highlighted a high prevalence of DED and associated risk factors but have not deeply assessed awareness among students. For example, a study in Southwest Nigeria (Iperu Remo) found prevalence of DED at 28.2% in adults, with significant associations with age and female gender. Also, Maidawa *et al*. (2021) at the National Eye Center, Kaduna, reported a prevalence of 45.9% among adult patients, with age, gender, and educational status being significant risk factors. Although these studies addressed risk factors in adults, they did not investigate how well university students understood those factors or could recognize symptoms/prevention.

Therefore, understanding the level of awareness of dry eye symptoms and its associated risk factors among students is crucial to implementing educational programs and preventative measures that can help reduce the burden of dry eye disease in this population. This study

seeks to fill the gap in knowledge and provide valuable insights into the awareness levels among university students regarding dry eye symptoms and risk factors.

1.3 RESEARCH QUESTIONS

1. What is the level of knowledge of dry eye among University of Benin students?

2. What attitudes do students of the University of Benin hold toward dry eye disease?

3. How do students of the University of Benin perceive dry eye disease and it's impact on daily life?

4. Are there specific demographic factors that influence students knowledge,attitude or perception of dry eye disease?

1.4 AIMS AND OBJECTIIVES

1.4.1 Aim of study

The aim of this study is to assess the knowledge, attitude and perception of dry eye among students of the University of Benin.

1.4.2 Objectives of the study

1.To assess the level of knowledge of dry eye among University of Benin students.

2. To assess the attitude of the university of Benin students towards dry eye.

3. To assess the perception of dry eye amongst students of the University of Benin.

4. To investigate the relationship between demographic factors, attitude and knowledge towards dry eye disease.

1.5 SIGNIFICANCE OF STUDY

1. Increased knowledge: The study identifies knowledge gaps about dry eye symptoms and
2. risk factors, enabling targeted educational efforts.

3. Promotion of Healthy Habits: It highlights lifestyle changes that can reduce dry eye risk,
4. such as limiting screen time and improving contact lens care.
5. Guiding/Informed Health Interventions: Findings can help university health services
6. design effective programs to manage and prevent dry eye.
7. Early Detection and Prevention: The study promotes early recognition and prevention,
8. improving students' eye health and quality of life.

1.6 DEFINITION OF TERMS

Aqueous-Deficient Dry Eye

A subtype of DED where the lacrimal glands fail to produce enough aqueous tears. Common causes include autoimmune disease (e.g., Sjögren's syndrome), ageing, and certain medications.

Attitudes (Operational)

Participants' feelings and dispositions toward dry eye disease and its prevention, measured by their responses to statements about care and management practices.

Awareness (Operational)

For this research, awareness refers to a student's ability to correctly recognise dry eye symptoms, name recognised risk factors (e.g. prolonged screen time, environmental dryness), and describe simple preventive measures. Awareness was measured through direct questionnaire items rather than clinical testing.

Dry Eye Disease (DED) / Dry Eye Syndrome (DES) / Keratoconjunctivitis Sicca

A multifactorial disease of the ocular surface characterised by loss of tear film homeostasis and accompanied by ocular symptoms such as irritation, foreign-body sensation, and fluctuating vision (Craig *et al*., 2017). Pathophysiological mechanisms include tear film instability, hyperosmolarity, ocular surface inflammation, and neurosensory abnormalities.

This project adopted these terms interchangeably, consistent with international and Nigerian literature, to capture the broad spectrum of clinical presentations among students.

Evaporative Dry Eye

A subtype where tear production is normal but tears evaporate too quickly. Causes include meibomian gland dysfunction, long hours of screen use that reduce blinking, dusty or low-humidity environments, and contact lens wear.

Knowledge (Operational)

In this study, knowledge means accurate understanding of dry eye symptoms, recognised risk factors, and evidence-based preventive or management strategies. Assessment was based on correct responses to structured questionnaire items, not on clinical skill or professional training.

Meibomian Gland Dysfunction (MGD)

Blockage or abnormal secretion of the oil-producing glands in the eyelids. MGD leads to rapid tear evaporation and is a major cause of evaporative dry eye.

Perception (Operational)

Students' subjective judgement regarding the seriousness of DED and its potential impact on visual function, comfort, and academic performance. Perception encompasses beliefs about whether dry eye requires professional care or self-management.

Visual Display Terminal (VDT) / Screen Time

Any electronic device with a visual screen (e.g., desktop computers, laptops, tablets, smartphones). Prolonged screen time (>4–6 hours/day) decreases blink rate and destabilises the tear film, a well-documented precipitant of DED among young adults (Tsubota *et al*., 2017). Awareness of this link was a core variable in the questionnaire.

CHAPTER TWO

2.0 LITERATURE REVIEW

As a multifactorial disorder, dry eye is influenced by various internal and external factors, including age, environmental conditions, and lifestyle choices. Among these factors, prolonged use of digital screens, a common feature in modern academic life, has been highlighted as a significant risk factor for DES. This literature review aims to explore existing research on the knowledge, perception, and attitudes towards dry eye symptoms, particularly among young adults, such as university students, who are at higher risk due to their academic and lifestyle habits.

2.1.1 Prevalence and Risk Factors of Dry Eye Syndrome

Dry eye syndrome is increasingly recognized as a significant public health issue. Studies suggest that the prevalence of DES varies globally, with reports ranging from 5% to 50% depending on the population and diagnostic criteria used (Craig *et al*., 2017). Among university students, the prevalence tends to be higher, particularly because of long hours spent in front of screens for academic and recreational purposes. In a study by Lee *et al*. (2019), approximately 38% of university students reported symptoms of dry eye, with factors such as prolonged digital screen use, air-conditioned environments, and irregular sleep patterns being major contributors. The primary risk factors for DES include:

1. Digital Screen Use: Prolonged screen time reduces the frequency of blinking, which leads to increased evaporation of the tear film and contributes to dry eye symptoms. A study by Sheppard and Davies (2016) found that individuals who spent more than six hours daily on digital devices were significantly more likely to report symptoms of

DES.

2. Contact Lens Wear: Contact lens users are at an increased risk of DES due to mechanical irritation, reduced oxygen supply to the cornea, and disruption of the tear film. Research by

Stapleton *et al*. (2017) suggests that contact lens wearers experience significantly more discomfort and dryness compared to non-wearers.

3. Environmental Factors: Air pollution, exposure to smoke, and dry, dusty conditions, often prevalent on university campuses, can exacerbate DES. Additionally, air- conditioned environments contribute to the accelerated evaporation of tears (Moss *et al*., 2018).

4. Age and Hormonal Changes: Younger individuals, particularly university students, may be less aware of the long-term consequences of DES. However, factors such as hormonal changes during adolescence or early adulthood can play a role in the development of dry eye (Doughty & Fonn, 2018).

2.1.2 Knowledge of Dry Eye Syndrome

Knowledge about dry eye syndrome plays a critical role in how individuals perceive its severity and how they address or mitigate symptoms. Several studies have examined the level of awareness and knowledge regarding DES among different populations, with findings indicating a general lack of awareness, especially among younger adults. A study conducted by Altan-Yaycioglu *et al*. (2016) in Turkey found that while university students recognized common dry eye symptoms such as eye dryness and redness, only 23% were aware of the term “dry eye syndrome.” Similarly, Rojas *et al*. (2018) found that university students lacked sufficient knowledge about the underlying causes of DES and its potential long-term effects on ocular health.

A significant gap in knowledge also exists regarding the prevention and management of DES. Few students reported knowing the appropriate preventive measures, such as taking regular breaks from screens, using lubricating eye drops, and maintaining proper hydration (Chia *et al*., 2017). This gap suggests that education and awareness campaigns targeting young adults are crucial for improving early detection and management of DES.

2.1.3 Perception and Attitude Toward Dry Eye Syndrome

Perception of the severity of DES and the attitudes towards seeking medical help are crucial in determining the willingness of individuals to adopt preventive measures and treatment. Research has shown that many students tend to downplay the symptoms of dry eye, considering them as a minor inconvenience rather than a serious condition (Schiffman *et al*., 2017). This lack of perceived severity may be due to the episodic nature of the symptoms and their resemblance to common eye discomforts caused by factors such as lack of sleep or allergies.

A study by Rieger *et al*. (2020) found that while students recognized dry eye symptoms such as irritation and redness, they were generally less likely to seek medical intervention unless the symptoms were severe. Additionally, the study revealed that students exhibited a generally passive attitude toward adopting preventive measures. This was particularly evident in their reluctance to reduce screen time, despite knowing it could exacerbate dry eye symptoms.

Attitudes toward self-care practices, such as the use of eye drops or adjusting screen time, also varied. While some students were proactive about using artificial tears or taking screen breaks, many others were unaware of these options or lacked the motivation to integrate these practices into their routines (Sharma *et al*., 2018). The perception of DES as a non-serious, self-limiting condition likely contributes to this reluctance to seek treatment or adopt preventive measures.

2.1.4 Health Education and Intervention

Health education is an essential component in addressing the rising prevalence of DES, particularly in younger populations. Studies have shown that awareness campaigns and educational interventions can significantly improve the knowledge and attitudes of university students. For instance, a study by Khatri *et al*. (2018) highlighted the positive impact of

awareness programs in improving students' understanding of the causes and consequences of DES, as well as their willingness to adopt preventive measures. Interventions focusing on reducing screen time, educating students about proper hydration, and the use of eye lubricants have been shown to be effective in alleviating symptoms of DES. In particular, university-based health programs that integrate eye health education into student wellness initiatives could be an important step in reducing the burden of DES among students (Patel *et al*., 2020). Cross-sectional studies are particularly suitable for evaluating the prevalence and distribution of conditions like DED and for identifying associated risk factors. According to Pourazizi *et al*. (2022), a cross-sectional approach effectively captured epidemiological data on DED among students and allowed for associations to be drawn between environmental exposure and dry eye symptoms.

2.1.5 Methodological Basis from Previous Studies

Online questionnaire

The use of self-administered, online questionnaires has also become increasingly validated in eye health research. Online distribution via platforms like WhatsApp, Telegram, or email facilitates easy access to a wide student population and ensures anonymity, which may improve response honesty and rates (Kawazoe *et al*., 2013). Web- based questionnaires are not only cost-effective but also time-efficient, especially in educational settings.

Cross-sectional survey

Cross-sectional survey designs are widely accepted in health and public-health research because they provide a "snapshot" of a population's characteristics, including attitudes, knowledge, and exposure at one point in time (NORDIC Federation of Societies of Obstetrics and Gynecology, 2018). These designs are particularly suited for prevalence studies and are effective in assessing risk factors and behavioral correlates when resources or longitudinal follow-up are limited (Pérez-Guerrero & Guillén-Medina, 2024). Given that the present study

aims to assess the knowledge, attitude and perception regarding dry eye disease among a defined student population at a specific period, a descriptive cross-sectional survey was therefore deemed appropriate for facilitating efficient data collection, achieving representation and enabling statistical analysis of associations without requiring extended follow-up.

Scoring and Categorization of KAP Variables

Several studies on ocular health and public health have employed dichotomization of KAP responses to simplify interpretation and facilitate statistical analysis. Knowledge items are typically classified as poor or good based on the number of correct responses, allowing identification of gaps in awareness (Al-Mohaimeed et al., 2019; Al-Dubai et al., 2011). Attitude is often measured using frequency-based questions (e.g., "Never," "Rarely," "Sometimes," "Often," "Always"), which reflect an individual's predisposition or willingness to engage in preventive behaviors rather than the absolute frequency of the behavior itself. These responses are then categorized as positive or negative, a method widely applied in KAP research on health behavior (Al-Mohaimeed et al., 2019). Perception items, assessing participants' subjective evaluation of risk or severity, are similarly classified as strong or weak, consistent with prior studies on risk perception and health behavior (Wang et al., 2022). Dichotomization using thresholds such as median or mean values has also been employed in KAP studies to create meaningful categorical variables for analysis (Wang et al., 2022; Al-Mohaimeed et al., 2019).

In line with these approaches, previous KAP studies have commonly dichotomized overall scores to facilitate analysis and interpretation. Participants' summed responses for knowledge, attitude, or perception were classified as above or below the median or mean, thereby creating categories such as "good" vs "poor" knowledge, "positive" vs "negative" attitude, or "strong" vs "weak" perception (Ranjan et al., 2015; Al-Mohaimeed et al., 2019). This data-

driven method provides a reproducible framework for categorization when standardized cut-offs are not established and allows for meaningful comparisons across participants.

Dichotomization of continuous or ordinal KAP scores using thresholds such as the median or mean is a common approach in health research to simplify data interpretation and facilitate statistical comparisons (Altman & Royston, 2006). This method allows researchers to classify participants into groups (e.g., high vs. low knowledge, strong vs. weak perception) while preserving meaningful distinctions between respondents. Previous KAP studies on ocular health and other public health topics have applied this strategy to identify individuals with above- or below-average awareness, attitudes, or perceptions, thereby enabling clearer identification of knowledge gaps or behavioral patterns (Al-Mohaimeed et al., 2019; Wang et al., 2022).

2.1.6 Global and Local Perspectives on Dry Eye Disease

Dry eye disease (DED) has been recognised internationally as a significant public-health problem that impairs comfort, visual function, and overall quality of life. The Tear Film and Ocular Surface Society's **Dry Eye Workshop II (TFOS DEWS II)** provided the modern, clinically useful definition that is now widely adopted: DED is a multifactorial disease of the ocular surface characterized by loss of tear-film homeostasis and associated ocular symptoms and signs (Craig *et al*., 2017). This definition emphasises the central role of tear-film instability, hyperosmolarity, inflammation, and neurosensory abnormalities. DEWS II provided a modern, clinically useful definition and classification to guide research and practice.

Global Burden

Worldwide prevalence estimates vary widely—from about 5 % to more than 50 %—depending on diagnostic criteria, geographic region, and study methodology (Stapleton *et al*., 2017). Large population studies in Asia report some of the highest rates: for example, the

Beijing Eye Study found a prevalence of about **21 %** using the Ocular Surface Disease Index (OSDI), while nationwide Japanese surveys reported values approaching **30 %** (Uchino *et al*., 2017). North American data typically range from **6 % to 15 %**, with higher rates among women and older adults, while European estimates range from **10 % to 30 %**, influenced by climate and lifestyle factors (Craig *et al*., 2017). These differences reflect not only environmental variation but also under-diagnosis and differing clinical definitions across studies.

African Context

Evidence from Africa, though more limited, indicates a **comparable or even higher burden** of DED. A recent meta-analysis pooling African data estimated an overall prevalence of **42 % (95 % CI 30.7–53.8)**, highlighting the need for locally relevant public-health responses (Alemayehu *et al*., 2023). The review also noted wide heterogeneity by study type and diagnostic method, recommending more epidemiological and population-specific work to guide policy and prevention efforts.

Nigerian Studies

Within Nigeria, several population- and clinic-based studies confirm substantial prevalence:

i. **South-West Nigeria (Iperu Remo):** a community study reported **28.2 %** prevalence using combined criteria of OSDI ≥ 13 and tear break-up time (TBUT) < 10 s (Ajibode *et al*., 2021).

ii. **Kaduna**: a tertiary-hospital study documented **45.9 %** prevalence among adult eye-clinic attendees, with age, gender and educational status as significant risk factors (Maidawa *et al*., 2021).

iii. **University of Benin:** Idu *et al*. (2024) showed smartphone use significantly reduced tear quantity and quality, indicating a high risk of DED among students.

These Nigerian findings demonstrate that DED is not merely a problem of older adults in high-income countries but also a common ocular health issue in sub-Saharan Africa.

University and Young-Adult Populations

Younger adults—particularly **university students**—have emerged as an important demographic in contemporary DED epidemiology. Lifestyle and environmental exposures such as **intense digital screen use, extended indoor study periods, contact-lens wear, air-conditioned spaces, and irregular sleep patterns** can all promote tear-film instability.

Evidence from African universities reinforces this concern:

i. **Ethiopia:** postgraduate students at Hawassa University had a **44.5 %** symptomatic prevalence (95 % CI 40–49.3) (Nigussie *et al*., 2020).

ii. **South Africa:** at the University of KwaZulu-Natal, **81 %** of students showed objective signs of dry eye (by TBUT and Schirmer testing), yet only **41 %** reported symptoms on the OSDI questionnaire, revealing a substantial gap in awareness (Moodley *et al*., 2019).

In Nigeria, a recent University of Benin study demonstrated that **smartphone use significantly reduced tear quantity and quality**, indicating a high risk of DED among students (Idu *et al*., 2024).

Implications

Together, these global and local data underscore the **need for context-specific research** in Nigerian university settings, where hot, dry climates, frequent air-conditioning, and prolonged screen exposure may intensify risk. Understanding the **knowledge, attitude and perception (KAP)** of DED among undergraduates is therefore critical for developing educational and preventive strategies tailored to this vulnerable group.

CHAPTER THREE

3.0 METHODOLOGY

3.1 RESEARCH DESIGN

This study was a descriptive, questionnaire-based cross-sectional survey that assessed the knowledge, perception, and attitudes toward dry-eye symptoms and risk factors among students of the University of Benin. This design was appropriate because it enabled data to be gathered from participants once within a defined period, making it possible to identify patterns and relationships efficiently. It was selected for its ability to capture attitudes and behaviours without the need for long-term follow-up or experimental intervention.

3.2 RESEARCH LOCATION

This study was carried out across the entire University of Benin, Benin City.

3.3 STUDY POPULATION

The study population was defined as subjects who met the inclusion criteria.

3.4 SAMPLING TECHNIQUE/SAMPLE SIZE DETERMINATION

3.4.1 SAMPLING TECHNIQUE

A convenience sampling technique was employed for this study. Although participants were selected based on their availability and willingness to participate, efforts were made to ensure broad representation by involving students from all faculties and various departments within the University of Benin.

3.4.2 SAMPLE SIZE DETERMINATION

Using Fischer's formula

Where:

- n = the desired sample size if population is more than 10,000
- Z = Z-score (based on the confidence level)
- P = estimated proportion/maximum reported prevalence

- E = margin of error (e.g., 0.05)
- A prevalence (p) of 50% was adopted for the sample size calculation, based on the study by Tadesse *et al*. (2023) conducted among university students in Ethiopia, given the absence of prior prevalence data among students in Benin City as a whole.

n = ?, Z=1.96, P=50% 0.50, E= 0.035 (for a 3.5% margin of error)

Therefore:

Required sample size was 784

We considered a 10% non-participation rate (attrition rate)

10% attrition rate = 0.10

Therefore Adjusted sample size became = 871

The aim was to recruit **871 participants** to ensure that, after accounting for the 10 % attrition, at least **784 valid responses were obtained.**

3.5 MATERIALS

The primary research instrument was a **structured, self-administered questionnaire,** adapted from a previously validated tool (Khalid *et al*., 2021) and modified to suit the context of this study. The questionnaire was created and distributed using **Google Forms,** allowing participants to access and complete it on smartphones, tablets, or computers. No additional physical equipment or laboratory materials were required.

3.5.1 QUESTIONNAIRE DESIGN

Data for this study were collected using a structured, self-administered questionnaire that had been adapted from a previously validated instrument developed by Khalid *et al*. (2021). The

questionnaire was designed to obtain both quantitative and qualitative information on students' knowledge, attitudes, and perceptions of dry-eye symptoms and risk factors.

The instrument was divided into five sections as follows:

Section 1: Consent Form

Participants were asked to indicate voluntary agreement to take part in the research by selecting either Yes or No after reading a brief statement of informed consent explaining the purpose of the study and assuring confidentiality.

Section 2: Demographic Data

This section captured participants' age group, gender, year of study, faculty, and course of study.

Section 3: Past Medical History

Questions in this section elicited information on chronic systemic diseases, medication use, previous eye conditions or surgery, and the presence of common dry-eye symptoms (e.g., eye dryness, burning, redness, blurred vision, photophobia, eye fatigue).

Section 4: Eye-Care Attitudes

Participants reported the frequency of specific eye-care practices (such as wearing protective eyewear, taking breaks from screens, using lubricating drops, and maintaining hydration) using a five-point Likert scale from Never to Always. Additional items documented contact-lens use, cleaning routines, and any special eye-care habits.

Section 5: Knowledge and Perception of Dry Eye Syndrome (DES)

This section assessed understanding of the term "dry eye syndrome," awareness of recognized risk factors, perceived impact on quality of life, perceived seriousness of the condition, willingness to seek professional help, and readiness to adopt preventive lifestyle changes.

The final questionnaire was pilot-tested for clarity among a small group of students before full deployment. It was administered both online—via social-media platforms and email—and in person by providing QR codes for participants to scan and access the form.

3.6 INCLUSION/EXCLUSION CRITERIA

3.6.1 INCLUSION CRITERIA

1. Participants were required to be currently enrolled students of the University of Benin.
2. Only students aged 17–30 years, of any gender, were included.
3. Participants provided informed consent before taking part.
4. Participants needed to have access to a device to complete the online survey.

3.6.2 EXCLUSION CRITERIA

Individuals who did not meet the above inclusion criteria were excluded from the study.

3.7 DESCRIPTION OF PROCEDURE

Students who provided informed consent filled out a digitally administered questionnaire. It was distributed via a secure Google Form, designed so that each device could submit only once to reduce accidental bias. A convenience sampling method was used to recruit participants from the University of Benin.

The questionnaire link was shared with faculty representatives and student leaders, who circulated it within their academic and departmental groups. In addition, the survey was posted on official university student forums and relevant social media platforms to maximize reach. The form was also distributed in person, with students scanning a QR code to access the survey.

The response rate was monitored, and reminder emails and messages were sent when necessary to encourage participation. Although the initial target was 871 students aged 17–30

years to allow for attrition, data collection concluded with 750 completed responses. This number was still considered adequate and representative of the study population.

The survey could be filled out on any device and at any time of day, allowing students to respond at their convenience. A clear deadline of approximately two to three weeks was set for completion.

After data collection ended, the responses were cleaned and analyzed to assess the knowledge, perception, and attitudes of University of Benin students toward dry eye disease.

3.7.1 PILOT TESTING

A pilot test was conducted with 10 participants who were not part of the main study to assess the

clarity, reliability, and validity of the questionnaire. This process helped identify and resolve ambiguities in the questions, ensuring that the instrument effectively captured the intended data. The pilot test also provided an opportunity to estimate the time required for questionnaire completion, ensuring a smooth data collection process during the main study.

3.7.2 DATA COLLECTION

Students were approached within the University of Benin community through both online and in-person outreach. After obtaining informed consent, each participant accessed a structured, self-administered questionnaire hosted on Google Forms. The survey link was shared via faculty and departmental groups, official student forums, and social media platforms, and was also made available through QR codes for convenient scanning.

Participants completed the questionnaire independently on their own devices, with clarification provided only when necessary through brief online or in-person communication. Responses were submitted electronically and recorded automatically, ensuring minimal data loss and maintaining a seamless, efficient, and participant-friendly data collection process.

3.7.3 VALIDITY AND RELIABILITY

Validity

The validity of the study was a critical aspect considered during the research design and implementation. To ensure that the questionnaire accurately measured the constructs of interest, the

study relied on established and relevant literature. Specifically, the questionnaire was crafted based

on adaptations of instruments from previous. These sources provided a validated structure and

relevant items that were modified to fit the unique context of this study.

Reliability

To enhance reliability, the questionnaire underwent a pilot testing phase before the main data collection. This initial testing involved a small sample of students, which allowed for the identification and correction of any issues related to question clarity, wording and overall functionality. The feedback obtained from this pilot testing was used to refine the questionnaire,

ensuring that it was both clear and effective in capturing the intended data.

The use of a 3.5% margin of error during sample size determination enhanced the reliability and precision of the study estimates. This smaller margin of error, compared with the conventional 5%, necessitated a larger sample size, thereby increasing statistical power and improving the ability to detect modest associations between variables. Consequently, the findings are expected to more accurately reflect the characteristics of the target population.

Additionally, the study employed a standardized data collection procedure, with all questionnaires being administered in a consistent manner to minimize variations in responses. This included using the same format and instructions for every participant, thereby ensuring

that any differences in responses were attributable to the participants' views rather than to inconsistencies in the administration process.

3.8 DATA ANALYSIS

The collected data were first organized and cleaned using Microsoft Excel 2016. Subsequently, statistical analysis was conducted using Python (version 3.13) with relevant libraries including *pandas*, *numpy*, and *scipy* for data manipulation and statistical computations. Descriptive statistics such as frequency, mean, standard deviation, and percentages were used to summarize the data. Inferential analyses, including chi-square tests, were performed to examine relationships between variables. The results were presented in tables and visualized using *matplotlib* and *seaborn* libraries through pie charts and column charts for clearer interpretation of the findings.

For analysis, participants' responses were dichotomized to simplify interpretation and allow statistical comparisons. Knowledge items were classified as poor or good based on correct responses, consistent with prior KAP studies on ocular health (Al-Mohaimeed et al., 2019; Al-Dubai et al., 2011). Attitude was assessed using frequency-based questions (e.g., "Never," "Rarely," "Sometimes," "Often," "Always"), reflecting participants' predisposition or willingness toward preventive behaviors rather than absolute behavior occurrence. Responses were categorized as positive (higher frequency of recommended practices) or negative (lower frequency), following conventional KAP scoring approaches in health behavior research (Al-Mohaimeed et al., 2019). Perception items, measuring participants' subjective assessment of risk or severity, were classified as strong or weak, as has been done in studies of risk perception and health behavior (Wang et al., 2022).

To categorize participants' responses into dichotomous outcomes (e.g., poor/good knowledge, positive/negative attitude, strong/weak perception), scores were summed across items within each domain. A threshold at the median or mean score was used to define the groups:

participants scoring greater than or equal to the median/mean were classified as "good," "positive," or "strong," while those scoring below were classified as "poor," "negative," or "weak." This approach is commonly used in KAP studies when no standard cut-off exists, as it provides a data-driven, reproducible method for grouping participants based on the distribution of responses (Ranjan et al., 2015; Al-Mohaimeed et al., 2019).

The coding process was guided by the conceptual framework of the study, which focused on three key domains: Knowledge, Attitude, and Perception toward dry eye disease.

Each domain consisted of a set of related questions with predefined response options. Using Python's pandas library, the responses were first standardized (e.g., trimming spaces, converting to lowercase) to ensure consistency. Thereafter, categorical responses were grouped as follows:

- Perception:

  Responses such as *Likely*, *Very Likely*, *Willing*, *Very Willing*, *Yes*, and *Older People* were categorized as Strong Perception, while responses such as *Unlikely*, *Very Unlikely*, *Neutral*, *Not Sure*, *Both Equally*, and similar expressions were classified as Weak Perception.

- Attitude:

  For questions assessing behavioral patterns (e.g., use of eye protection, screen-time breaks, hydration), the options *Always*, *Often*, and *Sometimes* were grouped as Positive Attitude, while *Rarely* and *Never* were classified as Negative Attitude.

- Knowledge:

  Knowledge-related items were recoded into two categories: Good Knowledge and Poor Knowledge. Responses reflecting correct understanding or agreement with factual statements were categorized as *Good Knowledge*, while responses such as *Not*

Sure, *I am not sure what it means*, *Poor*, *Very Poor*, *Neutral*, *Disagree*, *Strongly Disagree*, or *No* were grouped under *Poor Knowledge*.

Each respondent's overall classification (Good/Poor, Positive/Negative, or Strong/Weak) was derived based on their responses within the respective domain. Subsequently, Chi-square tests were computed (using *Python's scipy.stats.chi2_contingency* function) to assess associations between these categorical variables and demographic factors (Age, Gender, Year of Study, Faculty). The results were summarized in tabular form, showing frequencies, percentages, and p-values to indicate statistical significance.

3.9 ETHICAL CONSIDERATION

Ethical approval for the study was obtained from the Research and Ethics Committee of the Department of Optometry, University of Benin. The REC approval number is **EC/UBEN/LSC.OPT/25/159.**

Participants were provided with detailed information about the study, and only those who gave informed consent were included. To ensure anonymity, no personal identifying information was collected. Data were handled confidentially and used solely for research purposes. The study adhered to the principles of the Declaration of Helsinki to maintain the highest ethical standards.

3.10 LIMITATIONS OF THE STUDY

Every research study has inherent limitations that may impact the interpretation and generalizability of its findings. The following are the limitations of this study:

I. **Time constraint:** The original intention of this study to be conducted with a sample size of 784 was hampered by the limited time available to complete the study. More participants could have been recruited over a longer period of time, and the required

sample size could have been reached. Nonetheless, a total of 712 participants were obtained, representing a figure close to the initially targeted sample size.

So although a 3.5% margin of error was planned, the final sample of 712 yielded ≈3.67%, a minimal difference that slightly reduces precision but is unlikely to affect the interpretation of major findings.

II. **Convenience Sampling:** Although the convenience sampling was deemed the most appropriate for this study, it may have potentially selection bias and limiting the representativeness of the sample. This may impact the generalizability of the findings beyond the sampled population.

III. **Cross-Sectional Design:** The study utilized a cross-sectional design, allowing for the assessment of patient satisfaction at a single point in time. However, this design constraint limited the exploration of temporal changes in satisfaction levels or the establishment of causal relationships between variables.

IV. **Self-Reported Measures:** The reliance on self-reported measures, such as questionnaire responses, may have introduced social desirability bias, leading to inaccuracies in the data collected. Despite efforts made to strengthen the research process, participants may have provided desirable answers, masking their true thoughts and feelings.

V. **Generalizability:** The findings will primarily apply to the University of Benin community and may not be generalizable to other university settings or larger populations outside the university context. Despite the limitations that are associated with the study's methodology and scope, the study seeks to improve transparency as well as the reliability of its findings by recognizing them.

CHAPTER FOUR

4.0 RESULTS

4.1 Bio-Demographic Characteristics of Respondents

A total of 712 participants who met the inclusion criteria completed the study questionnaire. Participants' ages ranged from 17 to 30 years, with the majority (458; 64.3%) between 17–21 years, followed by 235 (33.0%) aged 22–26 years, and 19 (2.7%) aged 27–30 years. Among them, 481 (67.6%) were females, 230 (32.3%) were males, and 1 (0.1%) identified as other. Regarding academic level, 169 (23.7%) were in their first year, 103 (14.5%) in second, 134 (18.8%) in third, 132 (18.5%) in fourth, 106 (14.9%) in fifth, and 68 (9.6%) in sixth year.

Participants were drawn from various faculties, most commonly Life Sciences (133; 18.7%), Basic Medical Sciences (121; 17.0%), Engineering (116; 16.3%), and Pharmacy (79; 11.1%). Other faculties represented smaller proportions, including Physical Sciences (68; 9.6%), Education (58; 8.2%), Management Sciences (32; 4.5%), Arts (30; 4.2%), Agriculture (22; 3.1%), Social Sciences (18; 2.5%), Environmental Sciences (16; 2.3%), Law (12; 1.7%), and Vocational and Technical Education (7; 1.0%).

Regarding chronic diseases, the majority (667; 93.7%) reported none. A small proportion indicated asthma (18; 2.5%), hypertension (6; 0.8%), diabetes mellitus (3; 0.4%), thyroid disorders (2; 0.3%), hypercholesterolemia (1; 0.1%), and other conditions (15; 2.1%) (See Table 4.1).

Table 4.1: Bio-demographic data of study participants in the University of Benin

Bio-demographic data	No	%
Age in years		
17-21	458	64.33%
22-26	235	33.01 %
27-30	19	2.67 %
Total	712	100.00 %
Gender		
Female	481	67.56 %
Male	230	32.30 %
Other	1	0.14 %
Total	712	100.00 %
Year of Study		
1st year	169	23.74 %
2nd year	103	14.47 %
3rd year	134	18.82 %
4th year	132	18.54 %
5th year	106	14.89 %
6th year	68	9.55 %
Total	712	100.00 %
Faculty		
Life Sciences	133	18.68 %
Basic Medical Science	121	16.99 %
Engineering	116	16.29 %
Pharmacy	79	11.10 %
Physical Sciences	68	9.55 %
Education	58	8.15 %
Management Sciences	32	4.49 %
Faculty Of Arts	30	4.21 %
Agriculture	22	3.09 %
Social Sciences	18	2.53 %
Environmental Science	16	2.25 %
Law	12	1.69 %

Vocational And Technical Education	7	0.98 %
Faculty(Total)	712	100.00 %
Chronic diseases		
None	667	93.68
Diabetes	3	0.42 %
Hypertension	6	0.84 %
Thyroid disorders	2	0.28 %
Hypercholesterolemia	1	0.14
Asthma	18	2.53 %
Other	15	2.11 %
Dry Eye		
Diagnosed with Dry Eye	24	3.4
Not diagnosed with Dry Eye	668	96.6
Total	712	100
Eye Surgery		
Have undergone eye surgery	92	12.9
Have not undergone eye surgery	617	86.7
Total	712	100

4.2 Past Medical History

Table 4.2 presents the past medical history of the study participants. Sixty (8.4%) participants reported using medication, while the majority (91.6%) did not. A total of 291 (40.9%) participants had previously been diagnosed with an eye condition, whereas 421 (59.1%) had not. Regarding symptoms associated with dry eye, 72 (10.1%) participants reported experiencing eye dryness, 92 (12.9%) reported a burning sensation, 142 (19.9%) reported redness, 204 (28.7%) experienced blurry vision, 301 (42.3%) reported sensitivity to light, and 163 (22.8%) experienced eye fatigue. Conversely, 191 (26.8%) participants indicated they had not experienced any of these symptoms, while only one participant (0.1%) reported other symptoms. Refer to table 4.2 below.

Table 4.2: Past medical History

Medical background items	**N**	**%**
Do you use any medication?		
Yes	60	8.43 %
No	91.57	
Have you ever been diagnosed with any eye condition?		
Yes	291	40.87 %
No	421	59.13 %
Have you ever experienced the following symptoms of dry eye?		
Eye dryness	72	10.11 %
Burning sensation	92	12.92 %
Redness	142	19.94 %
Blurry Vision	204	28.65 %
Sensitivity to light	301	42.28 %
Eye Fatigue	163	22.81 %
No I haven’t experienced any of these symptoms	191	26.83 %
Other	1	0.14 %

4.3 Respondents' Knowledge, Practices, and Perceptions of Dry Eye Disease

Table 4.3.1 presents the overall knowledge of respondents regarding dry eye syndrome (DES). The results indicate a generally high level of awareness among participants, although certain gaps persist in specific areas of understanding. Slightly more than half of the respondents (51.4%) demonstrated good knowledge of the term "dry eye syndrome," correctly recognizing it as a condition arising from inadequate tear production or excessive tear evaporation, while 48.6% exhibited poor understanding of the concept. A similar trend was observed in identifying the risk factors for dry eye syndrome, where 61.9% of respondents showed good awareness of common causes such as prolonged screen exposure, environmental conditions, and lifestyle factors, compared to 38.1% who lacked adequate knowledge in this area.

In assessing perceptions of disease severity, an equal proportion of participants (51.4%) viewed dry eye syndrome as a serious health condition, suggesting moderate awareness of its clinical implications, whereas 48.6% underestimated its seriousness. Knowledge of symptoms appeared more substantial, with two-thirds (67%) of respondents rating their understanding as good, indicating that most students could identify typical manifestations such as dryness, irritation, or burning sensations. Furthermore, a significant majority (76.7%) agreed that dry eye disease affects quality of life and daily activities, reflecting strong recognition of its broader impact on visual comfort and daily performance.

Overall, these findings reveal that while most respondents possess a good level of knowledge (61.7%) about dry eye syndrome, notable proportions remain insufficiently informed (38.3%). This highlights the need for sustained educational and awareness campaigns to reinforce understanding of the condition's definition, seriousness, and associated risk factors among university students. See table 4.3.1 below.

Table 4.3.1: Overall Knowledge of Dry Eye Syndrome Among Participants

Question	Poor N(%)	Good N(%)
What do you understand by the term "dry eye syndrome"?	346(48.6)	366(51.4)
Which of the following are risk factors for developing dry eye syndrome/disease?	271(38.1)	441(61.9)
Do you think dry eye syndrome is a serious health condition?	346(48.6)	366(51.4)
How would you rate your knowledge of the symptoms of dry eye syndrome?	235(33)	477(67)
In your opinion, does dry eye disease affect the quality of life and daily activities?	166(23.3)	546(76.7)
Overall Knowledge	1364(38.3)	2196(61.7)

Table 4.3.2 presents the attitudes and eye care practices of participants toward the prevention and management of dry eye syndrome (DES). The results reveal a generally positive disposition toward eye care among respondents, although specific practices remain inconsistently adopted. Less than half of the participants (44%) reported regularly wearing protective eyewear, while a larger proportion (56%) did not, indicating that preventive use of eyewear is not yet a common habit. Conversely, a substantial majority (72.6%) frequently took breaks from screen use—an encouraging finding that reflects growing awareness of the link between prolonged screen exposure and ocular discomfort.

However, only 16.6% of respondents reported frequent use of lubricating eye drops or artificial tears, suggesting that proactive management of dryness symptoms is still limited among this population. In contrast, hydration practices were remarkably strong, with 93.7% of participants indicating that they drink enough water to stay hydrated—an important protective behavior for ocular surface health.

Contact lens habits appeared largely positive, as 97.1% of respondents reported responsible lens use. Yet, only a small subset (15.4%) indicated that they clean their lenses regularly, reflecting inconsistent adherence to proper lens hygiene. Additionally, less than half (41.2%) reported following a specific eye care routine, suggesting that while attitudes are favorable, structured practices remain underdeveloped.

Overall, 54.4% of respondents demonstrated positive attitudes and practices toward eye care, while 40% exhibited negative or inconsistent behaviors. These findings indicate a generally proactive orientation toward eye health among participants but emphasize the need for continuous education and behavioral reinforcement to ensure consistency in preventive and maintenance practices related to dry eye syndrome. See table 4.3.2.

Table 4.3.2: Attitude and Eye Care Practices Among Participants

Question	Negative N(%)	Positive N(%)
How often do you engage in the following eye care practices? a) Wearing protective eyewear	399 (56)	313 (44)
How often do you engage in the following eye care practices? b) Taking breaks from screens	195(27.4)	517(72.6)
How often do you engage in the following eye care practices? c) Using lubricating eye drops or artificial tears	594(83.4)	118(16.6)
How often do you engage in the following eye care practices? d) Drinking enough water to stay hydrated	45(6.3)	667(93.7)
How often do you wear contact lenses?	21(2.9)	691(97.1)
Do you clean your contact lenses regularly (if applicable)?	319(44.8)	110(15.4)
Do you follow any specific routine to care for your eyes?	419(58.8)	293(41.2)
Overall Attitude	1992(40)	2709(54.4)

Table 4.3.3 presents the perceptions of participants regarding dry eye disease (DED). The findings reflect a mix of strong awareness in certain areas and misconceptions in others, indicating that while many respondents understand key aspects of DED, perceptual gaps still persist. A vast majority (80.5%) recognized that lifestyle factors—such as screen time, diet, and hydration—play a significant role in the development of dry eye disease, suggesting a strong appreciation of behavioral and environmental influences on ocular health.

However, 77.2% of participants incorrectly believed that DED is more common among younger individuals, while only 22.8% correctly associated the condition with older age, revealing a notable misperception regarding age-related susceptibility. Encouragingly, 80.3% of respondents expressed a strong willingness to adopt lifestyle changes, such as reducing screen exposure, using artificial tears, and wearing protective eyewear, to manage or prevent DED—highlighting a proactive attitude toward eye health maintenance.

Interestingly, all participants (100%) reported that they were unlikely to seek professional help if they experienced symptoms of dry eye, indicating a significant behavioral and perceptual barrier to effective diagnosis and management. This underscores a critical area where awareness and health-seeking behavior need to be improved.

Overall, 45.9% of participants demonstrated strong perceptions, while 54.1% exhibited weaker or inaccurate beliefs about DED. These findings suggest that although participants generally acknowledge lifestyle influences and express readiness for behavioral change, misconceptions about susceptibility and reluctance to seek professional care remain key challenges that must be addressed through targeted eye health education and awareness programs. See table 4.3.3 below.

Table 4.3.3: Perceptions of Dry Eye Disease Among Participants

Question	Weak N(%)	Strong N(%)
Do you believe lifestyle factors (such as screen time, diet, hydration) contribute to the development of dry eye disease?	139(19.5)	573(80.5)
Do you think dry eye disease is more common in younger people or older people?	550(77.2)	162(22.8)
How willing are you to adopt lifestyle changes (such as reducing screen time, using artificial tears, wearing protective eyewear) to prevent or manage dry eye disease?	140(19.7)	572(80.3)
How likely are you to seek medical/professional help if you experience symptoms of dry eye (e.g., irritation, dryness, blurry vision)?	712(100)	0(0)
Overall Perception	1541(54.1)	1307(45.9)

4.4. Knowledge on Dry Eye Disease

Table 4.4 presents the distribution of respondents' knowledge regarding dry eye disease across selected demographic and clinical factors. Overall, the majority (94%) demonstrated good knowledge of dry eye disease, while only 6% exhibited poor knowledge, indicating a generally high level of awareness among participants. Knowledge scores varied slightly across age groups, with respondents aged 27–30 years showing the highest proportion of poor knowledge (10.5%) compared to those aged 22–26 years (4.3%) and 17–21 years (6.8%), though these differences were not statistically significant ($p = 0.298$). Similarly, knowledge improved progressively with higher levels of study, as sixth-year students had the highest proportion of good knowledge (97.1%) compared to first-year students (90.5%), suggesting that academic progression may contribute to increased awareness, although the association was not statistically significant ($p = 0.184$). In terms of gender, male respondents demonstrated slightly higher good knowledge (95.2%) than females (91.3%), but the difference was not significant ($p = 0.119$). However, a statistically significant difference ($p = 0.007$) was observed across faculties, where respondents from the Faculty of Environmental Science recorded the lowest knowledge levels (68.8%), while those in Pharmacy (97.5%) and Life Sciences (97.0%) exhibited the highest, indicating that discipline-related exposure to health topics may influence knowledge. Regarding clinical factors, participants who had been diagnosed with dry eye syndrome all demonstrated good knowledge (100%), compared to 93.8% among those not diagnosed ($p = 0.408$). Similarly, those who had undergone eye surgery (94.6%) and those who had not (93.8%) reported comparable knowledge levels ($p = 0.875$). See table 4.4 below.

Table 4.4: Distribution of Responses on Knowledge of Dry Eye Disease Among Respondents

Factors	Category	Poor N(%)	Good N(%)	p-value
Age				**0.298**
	17–21	31 (6.8)	427 (93.2)	
	22–26	10 (4.3)	225 (95.7)	
	27–30	2 (10.5)	17 (89.5)	
Year of Study				**0.184**
	1st year	16 (9.5)	153 (90.5)	
	2nd year	5 (4.9)	98 (95.1)	
	3rd year	4 (3.0)	130 (97.0)	
	4th year	8 (6.1)	124 (93.9)	
	5th year	8 (7.5)	98 (92.5)	
	6th year	2 (2.9)	66 (97.1)	
Gender		23 (4.8)	458 (95.2)	**0.119**
	Female	20 (8.7)	210 (91.3)	
	Male	0 (0)	1 (100)	
	Other			
Faculty				**0.007**
	Agriculture	1 (4.5)	21 (95.5)	
	Basic Medical Science	4 (3.3)	117 (96.7)	
	Education	3 (5.2)	55 (94.8)	
	Engineering	10 (8.6)	106 (91.4)	
	Environmental Science	5 (31.2)	11 (68.8)	
	Faculty Of Arts	2 (6.7)	28 (93.3)	
	Law	1 (8.3)	11 (91.7)	
	Life Sciences	4 (3.0)	129 (97.0)	
	Management Sciences	3 (9.4)	29 (90.6)	
	Pharmacy	2 (2.5)	77 (97.5)	
	Physical Sciences	6 (8.8)	62 (91.2)	
	Social Sciences	1 (5.6)	17 (94.4)	
	Vocational And Technical Education	1 (14.3)	6 (85.7)	
Dry Eyes				**0.408**
	Diagnosed with Dry Eye	0 (0)	24 (100)	
	Not diagnosed	43 (6.2)	645 (93.8)	
Eye Surgery				**0.875**
	Have undergone an eye surgery	5 (5.4)	87 (94.6)	
	Have not undergone an eye surgery	38 (6.2)	579 (93.8)	
	Missing	0 (0)	3 (100)	

4.5. Attitude toward Dry Eye Disease

Table 4.5 presents the distribution of respondents' attitudes toward dry eye disease across demographic and clinical variables. Overall, a vast majority (97.5%) demonstrated a positive attitude toward dry eye disease, while only 2.5% exhibited a negative attitude, reflecting generally favorable perceptions and openness toward preventive eye care practices among the participants.

Across age groups, respondents aged 27–30 years recorded the highest proportion of negative attitudes (5.3%), followed by those aged 22–26 years (3.0%), though these differences were not statistically significant ($p = 0.609$). Similarly, positive attitudes increased slightly with higher academic levels, as sixth-year students reported 98.5% positivity compared to 99.4% among first-year students, indicating consistently favorable attitudes across all study levels ($p = 0.386$).

Gender analysis showed that female respondents exhibited a marginally higher rate of positive attitudes (97.9%) than males (96.5%), but the difference was not significant ($p = 0.532$). Attitudes across faculties were also broadly positive, with several faculties—such as Agriculture, Environmental Science, Law, Pharmacy, Physical Sciences, Social Sciences, and Vocational & Technical Education—recording 100% positive attitudes. In contrast, the Faculty of Arts (93.3%) and Management Sciences (93.8%) showed slightly lower proportions of positive attitudes, though the association across faculties was not statistically significant ($p = 0.349$).

With respect to clinical factors, all participants diagnosed with dry eye syndrome (100%) exhibited positive attitudes, similar to those not diagnosed (97.4%), indicating that personal experience with the condition did not significantly influence attitudes ($p = 0.888$). Likewise,

all respondents who had undergone eye surgery reported positive attitudes compared to 97.1% among those without such experience (p = 0.241). See table 4.5 below.

Table 4.5: Distribution of Respondents' Attitudes toward Dry Eye Disease

Factors	Category	Negative N(%)	Positive N(%)	p-value
Age				**0.609**
	17–21	10 (2.2)	448 (97.8)	
	22–26	7 (3.0)	228 (97.0)	
	27–30	1 (5.3)	18 (94.7)	
Year of Study				**0.386**
	1st year	1 (0.6)	168 (99.4)	
	2nd year	3 (2.9)	100 (97.1)	
	3rd year	4 (3.0)	130 (97.0)	
	4th year	4 (3.0)	128 (97.0)	
	5th year	5 (4.7)	101 (95.3)	
	6th year	1 (1.5)	67 (98.5)	
Gender				**0.532**
	Female	10 (2.1)	471 (97.9)	
	Male	8 (3.5)	222 (96.5)	
	Other	0 (0)	1 (100)	
Faculty				**0.349**
	Agriculture	0 (0)	22 (100)	
	Basic Medical Science	2 (1.7)	119 (98.3)	
	Education	3 (5.2)	55 (94.8)	
	Engineering	5 (4.3)	111 (95.7)	
	Environmental Science	0 (0)	16 (100)	
	Faculty of Arts	2 (6.7)	28 (93.3)	
	Law	0 (0)	12 (100)	
	Life Sciences	4 (3.0)	129 (97.0)	
	Management Sciences	2 (6.2)	30 (93.8)	
	Pharmacy	0 (0)	79 (100)	

	Physical Sciences	0 (0)	68 (100)	
	Social Sciences	0 (0)	18 (100)	
	Vocational & Technical Education	0 (0)	7 (100)	
Dry Eye				**0.888**
	Diagnosed with Dry Eye	0 (0)	24 (100)	
	Not diagnosed	18 (2.6)	670 (97.4)	
Eye Surgery				**0.241**
	Had eye surgery	0 (0)	92 (100)	
	No eye surgery	18 (2.9)	599 (97.1)	
	Missing	0 (0)	3 (100)	

4.6. Perception toward Dry Eye Disease

Table 4.6 presents the distribution of respondents' perception regarding dry eye disease across demographic and clinical characteristics. Overall, most participants (96.3%) demonstrated a strong perception toward dry eye disease, while only 3.7% exhibited weak perception, suggesting generally sound awareness and recognition of the condition's implications among university students.

Across age categories, perception levels were consistently strong, with all respondents aged 27–30 years reporting strong perception (100%), while those aged 17–21 years had a slightly higher proportion of weak perception (3.9%) compared to 22–26 years (3.4%), though this difference was not statistically significant ($p = 0.650$). Similarly, perception improved modestly with academic advancement, as sixth-year students recorded the highest rate of strong perception (98.5%) relative to first-year students (94.7%), indicating gradual strengthening of understanding through years of study ($p = 0.752$).

Gender distribution showed comparable levels of perception between females (96.7%) and males (95.7%), with no significant association ($p = 0.779$). Across faculties, perception levels were generally strong; however, notable variation was observed, with respondents from Environmental Science (81.2%) and Vocational & Technical Education (85.7%) showing relatively weaker perception compared to those from Law, Agriculture, and Social Sciences, who all recorded 100% strong perception. Despite these differences, the relationship between faculty and perception was not statistically significant ($p = 0.131$).

In relation to clinical factors, all respondents diagnosed with dry eye syndrome demonstrated strong perception (100%), compared to 96.2% among those not diagnosed ($p = 0.677$). Similarly, respondents who had undergone eye surgery (96.7%) and those who had not (96.3%) exhibited comparable perception levels ($p = 0.921$). See table 4.6 below.

Table 4.6: Distribution of Responses on Perceptions and Preventive Attitudes Toward Dry Eye Disease

Factors	Category	Weak N(%)	Strong N(%)	p-value
Age				**0.650**
	17–21	18 (3.9)	440 (96.1)	
	22–26	8 (3.4)	227 (96.6)	
	27–30	0 (0)	19 (100)	
Year of Study				**0.752**
	1st year	9 (5.3)	160 (94.7)	
	2nd year	4 (3.9)	99 (96.1)	
	3rd year	4 (3.0)	130 (97.0)	
	4th year	5 (3.8)	127 (96.2)	
	5th year	3 (2.8)	103 (97.2)	
	6th year	1 (1.5)	67 (98.5)	
Gender				**0.779**
	Female	16 (3.3)	465 (96.7)	
	Male	10 (4.3)	220 (95.7)	
	Other	0 (0)	1 (100)	
Faculty				**0.131**
	Agriculture	0 (0)	22 (100)	
	Basic Medical Science	3 (2.5)	118 (97.5)	
	Education	2 (3.4)	56 (96.6)	
	Engineering	7 (6.0)	109 (94.0)	
	Environmental Science	3 (18.8)	13 (81.2)	
	Faculty of Arts	1 (3.3)	29 (96.7)	

	Law	0 (0)	12 (100)	
	Life Sciences	4 (3.0)	129 (97.0)	
	Management Sciences	1 (3.1)	31 (96.9)	
	Pharmacy	2 (2.5)	77 (97.5)	
	Physical Sciences	2 (2.9)	66 (97.1)	
	Social Sciences	0 (0)	18 (100)	
	Vocational & Technical Education	1 (14.3)	6 (85.7)	
Dry Eye				**0.677**
	Diagnosed with Dry Eye	0 (0)	24 (100)	
	Not diagnosed	26 (3.8)	662 (96.2)	
Eye Surgery				**0.921**
	Had eye surgery	3 (3.3)	89 (96.7)	
	No eye surgery	23 (3.7)	594 (96.3)	
	Missing	0 (0)	3 (100)	

CHAPTER FIVE

5.0 DISCUSSION

Dry eye disease (DED) is a multifactorial disorder of the tear film characterized by tear instability and ocular surface inflammation, resulting in symptoms such as dryness, burning, and visual fatigue. Globally, DED has become a growing public health concern due to its impact on visual performance, quality of life, and productivity, particularly among students and young professionals with heavy digital screen exposure. This study examined the knowledge, attitudes, and perceptions (KAP) related to DED among students of the University of Benin, providing insight into awareness levels, behavioral tendencies, and demographic influences within a young adult population.

A total of 712 undergraduates participated, with most respondents aged 17–21 years (64.3%) and a predominance of females (67.6%). Participants represented diverse faculties and academic levels, ensuring a comprehensive cross-section of the university community. Nearly one-third reported at least one classic DED symptom—such as dryness, burning, redness, blurred vision, or light sensitivity—consistent with findings from Ajibode et al. (2021), Betiku et al. (2022), and Abraham et al. (2023), who observed similar symptom prevalence among university students and digital device users. These manifestations show the silent but substantial burden of DED in youthful populations traditionally assumed to be at low risk.

Overall, students demonstrated satisfactory knowledge (61.7%) and moderately positive attitudes (54.4%) toward DED, but their perceptions remained weak (45.9%). This pattern—good knowledge yet suboptimal perception and inconsistent preventive behavior—mirrors findings from comparable KAP studies (Al-Mohaimeed et al., 2019; Al-Rajhi et al., 2021), emphasizing that awareness alone rarely translates into proactive eye-care practices. Respondents generally understood that DED affects visual comfort and quality of life, but misconceptions persisted regarding its etiology and seriousness. Similar knowledge gaps

were reported among educated populations in Saudi Arabia and Nigeria (Ajibode et al., 2021; Betiku et al., 2022), suggesting that while awareness campaigns have increased familiarity with DED, they have not yet fostered deep conceptual understanding.

Faculty-based variation was significant: students in health-related disciplines such as Pharmacy, Life Sciences, and Basic Medical Sciences demonstrated superior knowledge compared to those in non-health fields like Environmental Science and Vocational Education. This disciplinary gap aligns with Alemayehu et al. (2023) and Abraham et al. (2023), who observed that biomedical exposure enhances disease-specific literacy. The pattern highlights the importance of multidisciplinary health education, as non-health students—equally exposed to digital strain—may lack sufficient preventive awareness. Knowledge also improved modestly with academic progression, echoing Gupta et al. (2021) and Alqurashi et al. (2024), who reported that academic maturity correlates with health literacy and experiential awareness of eye strain. Although older participants (27–30 years) showed slightly lower knowledge, the differences were not statistically significant. Gender differences were minimal, corroborating Hassan et al. (2021) and Khalid et al. (2021), who noted narrowing gender disparities in health awareness among university cohorts.

Respondents' attitudes reflected generally favorable dispositions toward eye-care practices, with most agreeing on the importance of preventive action and professional consultation when necessary. Such positivity suggests openness to health-promotion interventions and aligns with findings from Alharbi et al. (2023) and Anbesse et al. (2024), who reported similar enthusiasm among tertiary students. However, these attitudes were not always reflected in consistent behavior. While many participants practiced screen breaks and maintained hydration, fewer used lubricating drops or protective eyewear. This mismatch between intention and behavior parallels reports by Gupta et al. (2021) and Ajayi et al. (2011), indicating that favorable attitudes may not ensure compliance without sufficient motivation

or accessibility. The tendency to adopt low-cost measures while neglecting technical interventions may also reflect economic or infrastructural barriers, as suggested by Aina et al. (2020) and Shuaibu et al. (2021). The Health Belief Model offers a plausible explanation: individuals are more likely to engage in preventive behavior when they perceive personal susceptibility and severity, yet many students may not view DED as a serious or chronic condition.

Perceptual patterns further illustrate this behavioral gap. Although most respondents acknowledged that lifestyle and environmental factors influence ocular health, many underestimated their personal vulnerability and the long-term consequences of untreated DED. This superficial perception of risk explains why high awareness coexists with low professional consultation rates. Comparable patterns have been reported among students in Jordan and Ethiopia (Abu-Ismail et al., 2023; Tadesse et al., 2023) and among Saudi youths (Alqurashi et al., 2024), where self-management and symptom trivialization were common. The persistence of these misconceptions indicates the need for experiential learning and risk-based communication strategies that deepen understanding beyond factual awareness.

Across demographic categories, perception did not differ significantly, suggesting that weak perception is widespread rather than confined to specific subgroups. Even among those diagnosed with DED or who had undergone eye surgery, perception strength was not markedly higher—an observation consistent with Gonzalez-Gonzalez et al. (2023), who found that exposure to ocular discomfort does not always translate into preventive vigilance. Furthermore, while many respondents scored high on perception items, qualitative interpretation suggests that this “strong perception” reflected general agreement with positive statements rather than nuanced understanding of DED pathophysiology or risk. This finding aligns with Zhu et al. (2022), who cautioned that elevated perception scores may not equate to behavioral commitment.

Collectively, the findings from this study reveal an encouraging but incomplete picture of ocular health awareness among young adults. Knowledge of DED is relatively good, attitudes toward eye care are positive, yet perception and practical engagement remain weak. This cognitive-behavioral disconnect reinforces conclusions drawn by Rim et al. (2023) and Ajibode et al. (2021): that information dissemination alone is insufficient to change health behavior without reinforcement through structured interventions, peer influence, and environmental support.

CHAPTER SIX

6.1 CONCLUSION

In conclusion, most University of Benin students possess satisfactory knowledge and moderately positive attitudes toward dry eye disease, but their perceptions remain weak. This highlights the need for more targeted educational and behavioral interventions to improve not only awareness but also personal risk perception and regular preventive practices such as the use of lubricating drops, screen breaks, and protective eyewear.

6.2 RECOMMENDATIONS

1. Health Education Campaigns: Incorporate structured eye-health education programs within the university, emphasizing the risks of prolonged screen time, poor hydration, and environmental exposure.
2. Routine Eye-Health Screenings: Organize periodic optometric screenings and awareness drives to help students recognize early symptoms of dry eye disease.
3. Integration into Student Orientation: Introduce basic ocular hygiene and digital-eye-strain management sessions for first-year students.
4. Behavioral Interventions: Promote practical behavior changes through visual reminders, posters, and digital campaigns encouraging regular breaks and proper eye care habits.
5. Further Research: Conduct qualitative or longitudinal studies to explore underlying reasons for weak perceptions and inconsistent practices despite fair knowledge levels.

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APPENDIX I

APPENDIX II

QUESTIONNAIRE

Section 1: Consent form

I consent to voluntarily contribute to the awareness about dry eye symptoms and risk factors among students of the University of Benin research and I agree to participate in this study.

( )Yes ( )No

Section 2: Demographic data

1. Age:

( )17-21 ( )22-26 ( )27-30

2. Gender

( )Male ( )Female ( )Other

3. Year of Study

( )1st year ( )2nd year ( )3rd year ( )4th year ( )5th year ( )6th year

4. Faculty

( )Pharmacy ( )Engineering ( )Education ( )School of Medicine ( )Basic Medical Sciences ( )Faculty of Arts ( )Law ( )Social Sciences ( )Physical sciences ( )Life Sciences ( )Agriculture ( )Management Sciences ( )Environmental Sciences ( )Veterinary Medicine ( )Vocational and Technical Education

5. Course of study _____

Section 3: Past Medical History

Please answer the following questions about your past medical history related to your eye and general health.

1. Which of the following chronic disease do you have?

( ) Diabetes ( ) Hypertension ( ) Thyroid disorders ( ) Hypercholesterolemia

( ) Asthma ( ) None ( ) Others

2. Do you use any medication?

( ) Yes ( ) No

3. Have you ever been diagnosed with any eye condition?

( ) Yes ( ) No

4. Have you ever experienced the following symptoms of dry eye? (Select all that apply)

( ) Eye dryness ( ) Burning sensation ( ) Redness ( ) Blurry vision ( ) Sensitivity to light ( ) Eye fatigue ( ) No I haven't experienced any of these symptoms

( ) Other

5. Have you ever been diagnosed with dry eye syndrome (DES) by a healthcare professional?

( ) Yes ( ) No

4. Have you ever undergone any eye surgery or treatment?

( ) Yes ( ) No

Section 4: Eye care Attitude

Please respond to the following questions about how you care for your eyes.

1. How often do you engage in the following eye care practices?

(Select one for each practice)

- Wearing protective eyewear (e.g., sunglasses, safety glasses)

( ) Never ( ) Rarely ( ) Sometimes ( ) Often ( ) Always

- Taking breaks from screens (e.g., computer, phone)

( ) Never ( ) Rarely ( ) Sometimes ( ) Often ( ) Always

- Using lubricating eye drops or artificial tears

( ) Never ( ) Rarely ( ) Sometimes ( ) Often ( ) Always

- Drinking enough water to stay hydrated

( ) Never ( ) Rarely ( ) Sometimes ( ) Often ( ) Always

2. How often do you wear contact lenses?

( ) Never ( ) Occasionally ( ) Frequently ( ) Daily

3. Do you clean your contact lenses regularly (if applicable)?

( ) Yes ( ) No

4. Do you follow any specific routine to care for your eyes, such as avoiding excessive screen time or using special eye drops?

( ) Yes ( ) No

Section 5: Knowledge and Perception Regarding Dry Eye Syndrome (DES)

Please answer the following questions about your knowledge and perception regarding dry eye syndrome (DES).

Knowledge

1. What do you understand by the term "dry eye syndrome"?

( ) A condition caused by insufficient tear production or excessive tear evaporation

( ) A temporary condition that causes slight irritation in the eyes

( ) I am not sure what it means

2. Which of the following are risk factors for developing dry eye syndrome/disease?

(Select all that apply)

( ) Prolonged screen time ( ) Age (Older age)

( ) Hormonal changes (e.g., during pregnancy or menopause)

( ) Wearing contact lenses ( ) Environmental factors (e.g., air pollution, smoke)

( ) Medications (e.g., antihistamines, antidepressants) ( ) Other

3. In your opinion, does dry eye disease affect the quality of life and daily activities?

( ) Strongly agree ( ) Agree ( ) Neutral ( ) Disagree ( ) Strongly disagree

3. Do you think dry eye syndrome is a serious health condition?

( ) Yes ( ) No ( ) Not sure

4. How would you rate your knowledge of the symptoms of dry eye syndrome?

( ) Very Poor ( ) Poor( ) Average ( ) Good ( ) Very Good

Perception

5. Do you believe lifestyle factors (such as screen time, diet, hydration) contribute to the development of dry eye disease?

( ) Yes ( ) No ( ) Not sure

6. Do you think dry eye disease is more common in younger people or older people?

( ) Younger people ( ) Older people ( ) Both equally ( ) Not sure

7. How likely are you to seek medical/professional help if you experience symptoms of dry eye (e.g, irritation, dryness, blurry vision)?

( ) Very Unlikely ( ) Unlikely ( ) Neutral ( ) Likely ( ) Very Likely

8. How willing are you to adopt lifestyle changes (such as reducing screen time, using artificial tears, wearing protective eyewear) to prevent or manage dry eye disease?

( ) Very willing ( ) Willing ( ) Neutral ( ) Unwilling ( ) Very unwilling

Questionnaire adapted from a previously validated questionnaire by Khalid et al.

APPENDIX II
Output format

Code_Mapping

Code	Question
K1	Consent form I consent to voluntarily contribute to the knowledge, attitude and perception of dry eye among students of the University of Benin research and I agree to participate in this study.
K2	Have you ever been diagnosed with any eye condition?
K3	Have you ever experienced the following symptoms of dry eye? (Select all that apply)
K4	Have you ever been diagnosed with dry eye syndrome (DES) by a healthcare professional?
K5	What do you understand by the term "dry eye syndrome"?
K6	Which of the following are risk factors for developing dry eye syndrome/disease? (Select all that apply)
K7	Do you think dry eye syndrome is a serious health condition?
K8	How would you rate your knowledge of the symptoms of dry eye syndrome?
K9	How likely are you to seek medical/professional help if you experience symptoms of dry eye (e.g, irritation, dryness, blurry vision)?
A1	Consent form I consent to voluntarily contribute to the knowledge, attitude and perception of dry eye among students of the University of Benin research and I agree to participate in this study.
A2	Have you ever been diagnosed with dry eye syndrome (DES) by a healthcare professional?
A3	How often do you engage in the following eye care practices? (Select one for each practice) a)Wearing protective eyewear (e.g., sunglasses, safety glasses)
A4	b)Taking breaks from screens (e.g., computer, phone)
A5	c)Using lubricating eye drops or artificial tears
A6	How often do you wear contact lenses?
A7	Do you clean your contact lenses regularly (if applicable)?
A8	Do you follow any specific routine to care for your eyes, such as avoiding excessive screen time or using special eye drops?
A9	How willing are you to adopt lifestyle changes (such as reducing screen time, using artificial tears, wearing protective eyewear) to prevent or manage dry eye disease?
P1	Consent form I consent to voluntarily contribute to the knowledge, attitude and perception of dry eye among students of the University of Benin research and I agree to participate in this study.
P2	In your opinion, does dry eye disease affect the quality of life and daily activities?
P3	Do you think dry eye syndrome is a serious health condition?
P4	Do you believe lifestyle factors (such as screen time, diet, hydration) contribute to the development of dry eye disease?
P5	Do you think dry eye disease is more common in younger people or older people?
P6	How likely are you to seek medical/professional help if you experience symptoms of dry eye (e.g, irritation, dryness, blurry vision)?
P7	How willing are you to adopt lifestyle changes (such as reducing screen time, using artificial tears, wearing protective eyewear) to prevent o r manage dry eye disease?

Code	Question
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K4	Have you ever been diagnosed with dry eye syndrome (DES) by a healthcare professional?
K5	What do you understand by the term "dry eye syndrome"?
K6	Which of the following are risk factors for developing dry eye syndrome/disease? (Select all that apply)

K7	Do you think dry eye syndrome is a serious health condition?
K8	How would you rate your knowledge of the symptoms of dry eye syndrome?
K9	How likely are you to seek medical/professional help if you experience symptoms of dry eye (e.g, irritation, dryness, b
A1	Consent form I consent to voluntarily contribute to the knowledge, attitude and perception of dry eye among students Benin research and I agree to participate in this study.
A2	Have you ever been diagnosed with dry eye syndrome (DES) by a healthcare professional?
A3	How often do you engage in the following eye care practices? (Select one for each practice) a)Wearing protective eye safety glasses)
A4	b)Taking breaks from screens (e.g., computer, phone)
A5	c)Using lubricating eye drops or artificial tears
A6	How often do you wear contact lenses?
A7	Do you clean your contact lenses regularly (if applicable)?
A8	Do you follow any specific routine to care for your eyes, such as avoiding excessive screen time or using special eye c
A9	How willing are you to adopt lifestyle changes (such as reducing screen time, using artificial tears, wearing protective manage dry eye disease?
P1	Consent form I consent to voluntarily contribute to the knowledge, attitude and perception of dry eye among students Benin research and I agree to participate in this study.
P2	In your opinion, does dry eye disease affect the quality of life and daily activities?
P3	Do you think dry eye syndrome is a serious health condition?
P4	Do you believe lifestyle factors (such as screen time, diet, hydration) contribute to the development of dry eye disease
P5	Do you think dry eye disease is more common in younger people or older people?
P6	How likely are you to seek medical/professional help if you experience symptoms of dry eye (e.g, irritation, dryness, b
P7	How willing are you to adopt lifestyle changes (such as reducing screen time, using artificial tears, wearing protective manage dry eye disease?

Demog_vs_knowledge

Question Code	QuestionText	Demographic	Chi-square	df	p-value
P1	Consent form I consent to voluntarily contribute to the knowledge, attitude and perception of dry eye among students of the University of Benin research and I agree to participate in this study.	Age	3.356	2	0.1868
P1	Consent form I consent to voluntarily contribute to the knowledge, attitude and perception of dry eye among students of the University of Benin research and I agree to participate in this study.	Gender	0.689	2	0.7084
P1	Consent form I consent to voluntarily contribute to the knowledge, attitude and perception of dry eye among students of the University of Benin research and I agree to participate in this study.	Year of Study	8.145	5	0.1484
P1	Consent form I consent to voluntarily contribute to the knowledge, attitude and perception of dry eye among students of the University of Benin research and I agree to participate in this study.	Faculty	31.06	12	0.0019
P1	Consent form I consent to voluntarily contribute to the knowledge, attitude and perception of dry eye among students of the University of Benin	Course of Study	169.753	168	0.4476

	research and I agree to participate in this study.				
P1	Consent form I consent to voluntarily contribute to the knowledge, attitude and perception of dry eye among students of the University of Benin research and I agree to participate in this study.	How often do you engage in the following eye care practices? (Select one for each practice) a)Wearing protective eyewear (e.g., sunglasses, safety glasses)	1.621	4	0.805
P1	Consent form I consent to voluntarily contribute to the knowledge, attitude and perception of dry eye among students of the University of Benin research and I agree to participate in this study.	How willing are you to adopt lifestyle changes (such as reducing screen time, using artificial tears, wearing protective eyewear) to prevent or manage dry eye disease?	8.361	4	0.0792
K2	Have you ever been diagnosed with any eye condition?	Age	3.363	2	0.1861
K2	Have you ever been diagnosed with any eye condition?	Gender	25.083	2	0
K2	Have you ever been diagnosed with any eye condition?	Year of Study	9.738	5	0.083
K2	Have you ever been diagnosed with any eye condition?	Faculty	12.711	12	0.3904
K2	Have you ever been diagnosed with any eye condition?	Course of Study	173.759	168	0.3643
K2	Have you ever been diagnosed with any eye condition?	How often do you engage in the following eye care practices? (Select one for each practice) a)Wearing protective eyewear (e.g., sunglasses, safety glasses)	153.014	4	0
K2	Have you ever been diagnosed with any eye condition?	How willing are you to adopt lifestyle changes (such as reducing screen time, using artificial tears, wearing protective eyewear) to	4.35	4	0.3607

		prevent or manage dry eye disease?			
K3	Have you ever experienced the following symptoms of dry eye? (Select all that apply)	Age	144.526	166	0.8843
K3	Have you ever experienced the following symptoms of dry eye? (Select all that apply)	Gender	127.396	166	0.9885
K3	Have you ever experienced the following symptoms of dry eye? (Select all that apply)	Year of Study	428.469	415	0.3136
K3	Have you ever experienced the following symptoms of dry eye? (Select all that apply)	Faculty	965.747	996	0.7485
K3	Have you ever experienced the following symptoms of dry eye? (Select all that apply)	Course of Study	15235.76	13944	0
K3	Have you ever experienced the following symptoms of dry eye? (Select all that apply)	How often do you engage in the following eye care practices? (Select one for each practice) a)Wearing protective eyewear (e.g., sunglasses, safety glasses)	419.461	332	0.0008
K3	Have you ever experienced the following symptoms of dry eye? (Select all that apply)	How willing are you to adopt lifestyle changes (such as reducing screen time, using artificial tears, wearing protective eyewear) to prevent or manage dry eye disease?	263.272	332	0.9978
A2	Have you ever been diagnosed with dry eye syndrome (DES) by a healthcare professional?	Age	2.3	2	0.3167
A2	Have you ever been diagnosed with dry eye syndrome (DES) by a healthcare professional?	Gender	1.022	2	0.6
A2	Have you ever been diagnosed with dry eye syndrome (DES) by a healthcare professional?	Year of Study	1.506	5	0.9124
A2	Have you ever been diagnosed with dry eye syndrome (DES) by a healthcare professional?	Faculty	12.118	12	0.4363
A2	Have you ever been diagnosed with dry eye syndrome (DES) by a healthcare professional?	Course of Study	225.936	168	0.0019
A2	Have you ever been diagnosed with dry eye syndrome (DES) by a healthcare professional?	How often do you engage in the following eye care practices? (Select one for each practice) a)Wearing	15.122	4	0.0045

		protective eyewear (e.g., sunglasses, safety glasses)			
A2	Have you ever been diagnosed with dry eye syndrome (DES) by a healthcare professional?	How willing are you to adopt lifestyle changes (such as reducing screen time, using artificial tears, wearing protective eyewear) to prevent or manage dry eye disease?	4.503	4	0.3421
K5	What do you understand by the term "dry eye syndrome"?	Age	20.196	4	0.0005
K5	What do you understand by the term "dry eye syndrome"?	Gender	3.42	4	0.4901
K5	What do you understand by the term "dry eye syndrome"?	Year of Study	39.55	10	0
K5	What do you understand by the term "dry eye syndrome"?	Faculty	84.308	24	0
K5	What do you understand by the term "dry eye syndrome"?	Course of Study	426.527	336	0.0006
K5	What do you understand by the term "dry eye syndrome"?	How often do you engage in the following eye care practices? (Select one for each practice) a)Wearing protective eyewear (e.g., sunglasses, safety glasses)	13.758	8	0.0883
K5	What do you understand by the term "dry eye syndrome"?	How willing are you to adopt lifestyle changes (such as reducing screen time, using artificial tears, wearing protective eyewear) to prevent or manage dry eye disease?	9.707	8	0.2862
K6	Which of the following are risk factors for developing dry eye syndrome/disease? (Select all that apply)	Age	148.977	152	0.5542
K6	Which of the following are risk factors for developing dry eye syndrome/disease? (Select all that apply)	Gender	111.892	152	0.9938

K6	Which of the following are risk factors for developing dry eye syndrome/disease? (Select all that apply)	Year of Study	495.381	380	0.0001
K6	Which of the following are risk factors for developing dry eye syndrome/disease? (Select all that apply)	Faculty	858.747	912	0.8955
K6	Which of the following are risk factors for developing dry eye syndrome/disease? (Select all that apply)	Course of Study	11980.058	12768	1
K6	Which of the following are risk factors for developing dry eye syndrome/disease? (Select all that apply)	How often do you engage in the following eye care practices? (Select one for each practice) a)Wearing protective eyewear (e.g., sunglasses, safety glasses)	318.526	304	0.272
K6	Which of the following are risk factors for developing dry eye syndrome/disease? (Select all that apply)	How willing are you to adopt lifestyle changes (such as reducing screen time, using artificial tears, wearing protective eyewear) to prevent or manage dry eye disease?	261.666	304	0.9622
P3	Do you think dry eye syndrome is a serious health condition?	Age	6.858	4	0.1436
P3	Do you think dry eye syndrome is a serious health condition?	Gender	3.882	4	0.4222
P3	Do you think dry eye syndrome is a serious health condition?	Year of Study	19.947	10	0.0298
P3	Do you think dry eye syndrome is a serious health condition?	Faculty	25.025	24	0.4044
P3	Do you think dry eye syndrome is a serious health condition?	Course of Study	327.448	336	0.6206
P3	Do you think dry eye syndrome is a serious health condition?	How often do you engage in the following eye care practices? (Select one for each practice) a)Wearing protective eyewear (e.g., sunglasses, safety glasses)	9.918	8	0.2709

P3	Do you think dry eye syndrome is a serious health condition?	How willing are you to adopt lifestyle changes (such as reducing screen time, using artificial tears, wearing protective eyewear) to prevent or manage dry eye disease?	22.89	8	0.0035
K8	How would you rate your knowledge of the symptoms of dry eye syndrome?	Age	36.608	8	0
K8	How would you rate your knowledge of the symptoms of dry eye syndrome?	Gender	8.491	8	0.387
K8	How would you rate your knowledge of the symptoms of dry eye syndrome?	Year of Study	74.693	20	0
K8	How would you rate your knowledge of the symptoms of dry eye syndrome?	Faculty	72.271	48	0.0133
K8	How would you rate your knowledge of the symptoms of dry eye syndrome?	Course of Study	650.649	672	0.7158
K8	How would you rate your knowledge of the symptoms of dry eye syndrome?	How often do you engage in the following eye care practices? (Select one for each practice) a)Wearing protective eyewear (e.g., sunglasses, safety glasses)	59.415	16	0
K8	How would you rate your knowledge of the symptoms of dry eye syndrome?	How willing are you to adopt lifestyle changes (such as reducing screen time, using artificial tears, wearing protective eyewear) to prevent or manage dry eye disease?	46.228	16	0.0001
P6	How likely are you to seek medical/professional help if you experience symptoms of dry eye (e.g, irritation, dryness, blurry vision)?	Age	6.529	8	0.5882
P6	How likely are you to seek medical/professional help if you experience symptoms of dry eye (e.g, irritation, dryness, blurry vision)?	Gender	6.046	8	0.6421
P6	How likely are you to seek medical/professional help if you experience symptoms of dry eye (e.g, irritation, dryness, blurry vision)?	Year of Study	18.737	20	0.539

P6	How likely are you to seek medical/professional help if you experience symptoms of dry eye (e.g, irritation, dryness, blurry vision)?	Faculty	48.761	48	0.4422
P6	How likely are you to seek medical/professional help if you experience symptoms of dry eye (e.g, irritation, dryness, blurry vision)?	Course of Study	651.622	672	0.7065
P6	How likely are you to seek medical/professional help if you experience symptoms of dry eye (e.g, irritation, dryness, blurry vision)?	How often do you engage in the following eye care practices? (Select one for each practice) a)Wearing protective eyewear (e.g., sunglasses, safety glasses)	25.767	16	0.0574
P6	How likely are you to seek medical/professional help if you experience symptoms of dry eye (e.g, irritation, dryness, blurry vision)?	How willing are you to adopt lifestyle changes (such as reducing screen time, using artificial tears, wearing protective eyewear) to prevent or manage dry eye disease?	120.012	16	0