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Impact of Cold Compression with Blink Exercise on Tear Production Among Dry Eye Syndrome: A Narrative Review

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Abstract: The multifaceted ocular disorder known as dry eye syndrome (DES) that leads to eye pain, eye irritation, redness, impaired vision, and eye fatigue. It drastically lowers quality of life for millions of people globally. Age, extended use of digital screens, using contact lenses, environmental variables, and systemic disorders are important risk factors. Artificial tears, lubricating drops, and lifestyle changes are the mainstays of conventional therapy, but safe, economical, non-pharmacological alternatives are becoming more and more popular. Among these, cold compression helps reduce ocular inflammation, improve periocular blood circulation, and lessen discomfort, while blink exercises help increase tear secretion, stabilise the tear film, and minimise evaporation. However, nothing is known about how blink exercises and cold compression work together to improve tear production, tear film stability, and symptom alleviation.

A narrative review was conducted using cold compression with blink exercise on tear production among dry eye syndrome. The result of reviewed studies represents that around 36 studies narratively reviewed and according to inclusion criteria the study scrutinized, and narrowed down to 12 recent studies under which 6 studies showed that participants using the gel ice pack showed a much greater increase in tear production. Furthermore studies with Cold compresses proved to be an effective and affordable alternative to artificial tears for managing dry eye symptoms with assessment tool including Ocular Surface Disease Index (OSDI), tear break-up time (TBUT), and Schirmer's test. Furthermore 6 studies including and showing there were significant gains from the blinking and squeezing sessions. The palpebral fissure's height increased, the rate of incomplete blinks decreased, and the tearing resilience was improved as shown by extended as demonstrated by prolonged NIBUT testing and decreased the eye-strain (VAS) and eye-dryness (SPEED) scores. When compared to the control group, each of these modifications was statistically significant. With the above mentioned studies researcher is convinced that cold compression and blinking exercise helps in reduce dry eye syndrome and improve tear production which researcher carry forward for further experimentation. Narrative review concluded that cold compression and blink exercise improves tear production and improve dry eye syndrome. Hence this can be generalised to larger population covering SDG goal 3.8, 3.9, 3D.

Keywords: *Effectiveness, Cold Compression, Tear Film Dysfunction, Blink Exercise.*

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I. INTRODUCTION

Dry eye is a frequent optical field condition marked with an uneven layer of tears, discomfort, and impaired vision, and its incidence is increasing as more people use digital devices. Prolonged screen exposure significantly reduces the duration and extent of blinking, leading to inadequate tear distribution and accelerated tear evaporation. As blinking has an important part in distributing the tear film. and stimulating the Meibomian glands to release essential lipids, insufficient blinking directly contributes to the worsening of dry eye symptoms.

Cold compression is one of supportive measure, as applying a cool pack gently to the closed eyelids can help constrict blood vessels, decrease swelling, and soothe

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irritated tissues. Unlike warm compresses which target Meibomian gland dysfunction cold compresses are particularly beneficial for relieving redness, puffiness, and acute irritation associated with certain presentations of dry eye. Therefore, cold compression can serve as a simple, non-invasive option for reducing inflammation

➢ *Objectives*
- To locate the research related to effectiveness of cold compression on tear production among patient with dry eye syndrome.
- To locate the research related to effectiveness of blink exercise on tear production among patient with dry eye syndrome.

II. METHODOLOGY

➢ *Study Design*

A narrative review has been include in the study.

➢ *Study Selection*

Reviewed summaries and descriptions and carefully examined all relevant papers' entire texts.

➢ *Articles Included in this Review:*
- Clinical trial study
- Cross Sectional Study
- Randomized Control Trial
- Prospective study

➢ *Inclusion Criteria*
- Study of last 10 years
- Study which are available full and free text.
- Adult population age 18 years and above
- Study which are clinical trial and RCT.
- The paper which was published in English language
- Study which are studied on humans including male and male.

➢ *Exclusion Criteria*
- The research studies which where abstract is available.
- Research studies which are available in other languages.
- Research studies which are done over animals.
- Preprinted research studies are excluded.

➢ *Following Related Research Studies Categorized into Different Sections as Below:*
- Section: I To locate the research related to effectiveness of cold compression on tear production among patient with dry eye syndrome
- Section: II To locate the research related to effectiveness of blink exercise on tear production among patient with dry eye syndrome.

Table 1 SECTION-I Literature Related to Effectiveness of Cold Compression on Tear Production Among Dry Eye Syndrome

Study author, year, country	Title	Nature of the study	Sampling technique	Sample SIZE	Data Collection tool	Results
Tadisina Sanjay Reddy , Prathima Linga et all(2024) At Hyderabad, Telangana, India	Visual display terminal (VDT) usage and dry eye condition (DED) in medical undergraduates	Cross-sectional study	Purposive Sampling Technique	444 Medical Students in the department of ophthalmology at a Tertiary Care Hospital	Each Participants assessed by slit-lamp examination and Tear Film Break-Up Time (TBUT) testing, with ≤10 seconds considered abnormal. The Ocular Surface Disease Index (OSDI) questionnaire in addition to information on visual display terminal (VDT) use were collected.	Based on the OSDI questionnaire, 28.8% of participants had dry eye disease (DED): 17.1% mild, 6.3% moderate, and 5.4% severe. Among them, 29% used screens for 2–4 hours and 32.7% for more than 4 hours daily, showing that longer screen time increases DED risk. Clinical tests also showed TBUT ≤ 5 seconds in 86.3% of participants, indicating tear

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						film instability linked to screen use
Dikchhya Sharma , Sabina Shrestha (2023) Kathmandu Medical College	Dry Eyes Within those accessing Computer Display Terminals at a Tertiary Care Center's of Ophthalmology Division	Cross-sectional	Convenience sampling	94	The OSDI, which consists of 12 questions about symptoms, daily activity limits, and outside triggers of dry eye, was performed first. The Schirmer test, tear film break-up time measurements, as well a comprehensive eye examination were then carried out.	Dry eye (58.5%) was observed among VDT users, particularly among young adults aged 25–34 years, males, and those with prolonged screen exposure especially laptop users averaging about 8 hours of daily use.
Smrithi Mani , Haoxing D Jin University of Iowa 2023	Artificial Tears at Room Temperature vs. Cold to Reduce Ocular Surfaces sensation Following Intravitreal Injection	Randomized Controlled Trial	Simple Random Sampling Technique	109 patients	Eligible participants who provided consent were randomly assigned to receive either cool and normal temperature artificial tears. After the injection, both groups rated ocular discomfort using a standardized visual analog scale (VAS).	Among109 patients (48 cooled-tears, 61 room-temperature) showed no significant difference in post-injection ocular discomfort reduction (P = .387; P = .681
R.Balamurgan, Phulen Sarma 2024	The impact of applying gelatin packs of ice to closed eyes to increase reflexive tear production in patients with dry eyes	Randomized Controlled Trial	Random Sampling Technique	60 Patients	Group A (gel-filled cold packing) and sixty individuals with dry eyes randomly allocated for second category (control category gels package kept regular room temperature. A Schirmer strip was used to measure tear secretions compared both beforehand and following the gel pack treatments.	Participant category (30 people each) were similar at the start in vision, eye pressure, and tear volume (P > 0.05).After treatment, the group that used the gel ice pack (Group A) showed a much greater increase in tear production about 26 mm for both eyes compared to the control group (Group B), which had about 13–14 mm (P < 0.001).Pain scores were slightly higher in

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						first category (median 1) than among 2nd category (median 0), and this difference was statistically significant (P < 0.05).
Paramdeep Bilkhu , James Wolffsohn (2019) **United Kingdom**, at Aston University	Eyelid cleaning gel's lowering effect on the temperature of the eyelids and ocular surface	Prospective, randomized contralateral experimental design	Convenient sampling	25	Baseline eyelid and ocular surface temperatures were measured using an infrared camera. Blephagel was applied and temperature readings with comfort and cooling ratings (0–10 scale) were recorded for both eyes at 1min, 2to 2.5 min, and 3 to 3.5 min after use.	After applying Blephagel, the treated eye showed a clear drop in eyelid temperature in contrast to the second category at ($p < 0.001$) at 1 min and 2 to 2.5 min after use. Additionally, compared to the people in the control group, respondents experienced a more intense and persistent chilling sensation in the treated eye. ($p < 0.001$).
Andrew Kao; Robert Latkany	Using Artificial Tears versus Cold Compresses to Treat Dry Eyes	Randomized Crossover Experimental	Convenience Sampling Technique	30	Group A used artificial tears three times daily for one month, followed by cold compresses for another month, while Group B followed the reverse order. Dry eye finding were assessed using the eye surface test, and clinical evaluations included meibomian gland dysfunction (MGD) grading, epithelial erosions, eye tear time for break and S test for one and two months, and participants reported their preferred treatment at the final visit	Cold compresses proved to be an effective and affordable alternative to artificial tears for managing dry eye symptoms. They may help reduce inflammation linked to conditions like meibomian gland disease and allergic conjunctivitis, offering patients a natural, soothing, and cost-effective treatment option.

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Table 2 SECTION-II Literature Related to Effectiveness of Blink Exercise Among Dry Eye Syndrome

James S Wolffsohn 1, Sònia Travé-Huarte 2025	Improvement of blink practices for managing dry eye	Prospective, randomized interventional (experimental) study	Convenient sampling	98	Manifestation of dry ocularcheck by with the 6 category of eye surface test and self made question, in the first (optimization), 98 participants tried different blinking routines to determine the most effective combination of repetitions, frequency, and squeeze step. In the second (efficacy), 28 participants performed the optimized routine15 close-squeeze-open repetitions, 3 times daily which significantly reduced dry eye symptoms and improved blink completeness over 2 weeks, though some effects faded after stopping. This shows that regular blinking exercises can relieve dry eye symptoms and improve eyelid function.	Performing the squeeze action and other blink exercises considerably improved symptoms ($p < 0.01$). It was more effective to perform 40 sessions on two occasions a day as rather than 10 repeats four times a day.
Reiko Arita, Shima Fukuoka Japan 2025	Eye blinking exercise' influence on film tear characteristics and palpebral fissure height	Randomized Controlled Trial	Random Sampling Technique	100	Respondents were allocated into two categories at random; Before beginning blink training, one group utilised artificial tears up to five times per day for three consecutive days., while the other group used artificial tears exclusively. SPEED and VAS scores applied to check associated manifestation in eye.	Out of 100 participants, 52 were assigned 48 were assigned to the ones in the control category and 48 to the blinking exercise category. Those who carried out exercise signify marked improvement, in reading by test performance in term of increased fissure height, and fewer incomplete blinks, all with

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						statistically significant differences compared with the control group.
Siman Arnold Xavier, Praisy Elina Thomas 2025	I-blink techniques to assess impact on young people's with dry eyes	Quasi-experimental Pre-test–post-test Design	Purposive sampling	60	structured questionnaire comprising two sections: demographic details and assessment of dry eye symptoms.E-group performed I-blink exercises daily for 21 days, supported by instructional videos and self-report checklists. DEQ-5assessments were conducted at baseline, Day 14, and Day 21 for the experimental group, and at baseline and Day 21 for the control group.	A Signiant difference notice in associated manifestation among experimental group post-intervention, with a t-value of 3.8 no difference in participant of control category .The i-BLINK exercise program signicantly reduced dry eye symptoms among young adults exposed to prolonged screen time during online education.
Fatma Khalil Abd Elhamed, Laila Awadin Ali Hassan	Effects of Blinking Exercise Application on Anxiety and Eye Dryness among Elderly Patients	Quasi-experimental research design (Pre/posttest	convenient sampling	100	Self made tool contain a individual and , health information, State-Trait Anxiety Inventory, and (III) an Ocular Surface Disease Index (OSDI) questionnaire was used	There was a very substantial variations according to the finding and reductions in anxiety mean scores before and after session of blink exercise application .
Amal Hashem Mohamed , Soher Ahmed Awad 2024 Egypt	Impact of Blinking Training on Elderly individual to assess the Quality of Lifestyle and Eye Dryness	quasi-experimental pre- and post-test design	purposive sampling	100	Data were collected using a structured interview questionnaire, including demographic data, the eye index test to track seriousness. Before and after session value were compared to check	performing blinking exercises, the severity of eye dryness significantly decreased — mild cases reduced from 15% to 5%, and moderate cases from 40% to 15% ($p < 0.00001$). Moreover, the

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					improvement by following the blinking exercise program	negative outcome on life also declined significantly after four weeks of intervention
A D Kim , A Muntz	Efficacy of blink techniques for the management of dry eye	Quasi-experimental pre–post study design.	Convenience sampling	54	Over the four weeks, participants perform ten-second blinking exercises every 20 minutes. Associated manifestation check by self-constructed tool and eye surface testing while blinking had been evaluated using the Tear Science II visualisation , Eye tearing results were evaluated on the 28th day as well as starting.	Significant improvements were observed in self-constructed tool,eye surface test, eye tear break value and inappropriate eye blinking width of layer of lipid showed no change. Blinking exercises effectively improved symptoms and blinking patterns.

III. DISCUSSION

Finding reveal, a more raised frequency of symptoms of dry eye among medical students, which is connected to prolonged screen use. Longer VDT exposure increased symptoms and caused tear film instability. Regular breaks, proper blinking, and good humidity are essential to protect eye health. Frequent VDT users showed a high incidence of dry eye due to prolonged screen exposure causing tear film instability. OSDI, TBUT, and Schirmer tests confirmed significant ocular surface changes. Early screening and preventive measures like blinking, proper screen distance, ergonomics, and lubricating drops are essential to reduce digital eye strain.

Using a gel-based cooling pad on eyes by making them closed significantly increased production of eye tear as compared to room-temperature packs. The cold stimulus enhanced lacrimation through reflex activation of ocular surface pathways. This simple, safe, and inexpensive method can serve as both a temporary therapeutic measure and a tool for assessing reflex tear response.

Cold compresses and artificial tears both effectively relieve dry eye symptoms and improve ocular comfort. Given their similar benefits, cold compresses offer a simple, low-cost alternative or complement to artificial tears for managing dry eye.

Structured blinking exercises significantly reduce dry eye symptoms, especially when a gentle “squeeze” is added to each blink. The optimal routine 15 repetitions, three-times daily for two weeks improves blink completeness and conjunctival integrity. Regular, guided exercises, particularly with app support, offer a simple, non-invasive, and cost-effective way to maintain tear film stability and ocular comfort.

Blinking exercises effectively alleviate dry eye symptoms and stabilize tear films by decreasing incorrect blinks and enhancing the corneal surface health. When combined with artificial tears, they offer a simple, non-invasive, and effective method to relieve discomfort and maintain eye comfort. Blinking exercises significantly reduce eye dryness and anxiety in older adults, improving both OSDI and psychological well-being scores ($P < 0.001$). This represent a simple, non-invasive, and inexpensive solution, recommended for routine use in geriatric and ophthalmology treatment with associated educational materials.

Regular blinking exercises significantly improve blink completeness, tear film stability, and dry eye symptoms in individuals using digital screens, as reflected in DEQ-5 and OSDI scores. They provide a basic, non-invasive, and affordable technique for preventing and managing screen-related dry eye, despite small modifications affecting certain objective tear film parameters.

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IV. FUTURE SCOPE

- Nurse-led eye care programs can be established in outpatient departments and community settings to teach proper techniques for warm and cold compression with blinking exercises.
- Standardized clinical protocols and demonstration guidelines should be developed to ensure uniformity and patient safety in practice.
- Follow-up assessments using tools like the S- test and many more.
- To track progress and adherence, the Illness Indicator (OSDI) should be used.

V. CONCLUSION

The analysis of relevant research strongly shows that warm compress therapy has significance for controlling Dry Eye Disease (DED) and enhancing the health of the eyes. Improvements in important clinical parameters like the Ocular Surface Disease Index (OSDI), Tear Film Break-Up Time (TBUT), Schirmer's Test, and Tear Film Lipid Layer Thickness (TFLLT) after applying warm compresses have been consistently reported in a variety of research designs, including randomised controlled trials, quasi-experimental, and prospective studies. When compared with standard cotton-made warm compresses, modern devices such as the Optic Care Wear, Bruder mask, and heated eye masks have demonstrated superior results, providing more consistent heat and convenience of use. Additionally, studies show that after refractive and cataract procedures, warm compress therapy improves postoperative tear film stability, decreases partial blinks, and increases Meibomian gland function. The majority of the data points to regular, controlled warm compress therapy as a safe, non-invasive, and successful way to help people with DED regain their Meibomian gland function, tear film stability, and ocular comfort.

Dry eye syndrome (DES), a common ocular disease which manifests in discomfort, blurred vision, and degradation of the optical area, is characterised by decreased discharge of tears or increased tear evaporation. Non-pharmacological nursing techniques, including as warm compression and blinking exercises, have been shown to enhance meibomian gland activity and tear production, hence improving ocular surface health.

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