CHAPTER 3

MATERIALS & METHODS

3.1 Materials

Following materials were used for the present for clinical studies: logMAR chart for distance and near visual acuity, trial lens set, streak retinoscope, stop watch, infra-red meibography, Computer Vision Syndrome questionnaire (CVS-Q), Ocular Surface Disease Index (OSDI) questionnaire, Schirmer’s strip/Whatman filter paper no. 41, Fluorescein strips, saline solution, slit lamp [Topcon SL-2G] with cobalt blue filter, proparacaine HCL 0.5%.

3.2 Methods

3.2.1 Study design

Present study was cross-sectional study covering population of Ludhiana, India of Visual Display Terminal (VDT) with CVS and non-VDT users. The study was performed with a total duration of 36 months at Sankara Eye Hospital, Punjab, India where regular and comprehensive eye care check-ups is done.

3.2.2 Sample design and sample size calculation

Simple random sampling was done on VDT and non-VDT users which included 140 subjects (male and female) in each group (VDT and non-VDT). Sample size was calculated using following formula [194]:

\[ n = \frac{ME^2}{z^2} \times \frac{1-p}{p} \]

where

- \( n \) = (sample size)
- \( p \) = 0.899 (prevalence of dry eye in VDT users) [4]
- \( z \) = z score, 1.96 for 95% confidence interval, \( ME \) = desired margin of error [assuming it to be 5% with significance level 0.05% for 95% confidence interval]

Therefore, \( n = 0.0899 \times 1.96^2 / 0.05^2 = 140 \) subjects

3.2.3 Working Hypothesis

- Null hypothesis- There is no significant changes in the tear film of VDT users and non-VDT users.
3.2.4 Subject, data collection, inclusion and exclusion criteria

Detail ocular and general history, Vision and refraction were done for all the subjects. OSDI questionnaire was used for VDT and non-VDT users to find out symptomatic dry eye score followed by blink rate, infra-red meibography, Tear film break up time (TBUT), Corneal staining and Schirmer’s test II in order to know the tear film changes in both VDT having CVS and non-VDT users.

Subjects for the study were selected from the general non-clinical population after screening from bank, information technology (IT) department of hotel and hospital, newspaper press, security guard agency and housekeeping staff. More than 700 subjects were screened to get the sample size. The screening consisted of detailed history, visual acuity and refraction. A total of 300 subjects in each group of VDT and non-VDT were selected based on inclusion criteria and were advised to visit Sankara Eye Hospital, Ludhiana, Punjab for further evaluation. Of which every alternate subjects visiting eye hospital in each group of VDT and non-VDT were included for the study. Total of 144 subjects were included in each group of VDT and non-VDT. 12 subjects were excluded due to lack of time and incomplete data. Questionnaires were explained to all the subjects and consent form was taken. All selected subjects underwent detailed ocular examination and medical history to fit inclusion criteria. Subjects were categorized into two subcategories: VDT respondents or non-VDT respondents. The duration of daily VDT work was specified into two as follows: VDT ≥2 hours per day and non-VDT ≤ 2 hours per day.

For the Socio-economic status (SES) and its relationship with CVS in VDT users, socio-statistic factors (age, sexual orientation etc.) were gained from subjects. The subjects were chosen based on their education, occupation and family income as a classification of SES aged between 18 to 35 years. Their SES was grouped into upper class, upper middle class, lower middle class, upper lower class and lower class using Revised Kuppuswamy SES scale [22] (Used with author’s permission) dependent on education, occupation and family income per month in rupees (Annexure I).

Inclusion criteria: VDT and non-VDT users with best corrected visual acuity of at least 0.1 logMAR for distance and near were included. VDT respondents were who used visual display terminal devices in their daily life for more than 2 hours daily and from more than a
year. Non-VDT respondents were subjects who did not use any visual display terminal device, or their uses were limited to less than 2 hours per day.

**Exclusion criteria:** Patients with the following factors and characteristics were excluded such as age above 35 years, subjects with any ocular disease, subjects undergone refractive surgery, history of contact lens wear, history of diabetes mellitus, connective tissue disease, hepatitis C infection, postmenopausal estrogens therapy, history of medications like lubricating eye drop, Vitamin A therapy, antihistamine, antihypertensive agents, antipsychotic agents, antidepressants, antileprosy agents, sedatives and hypnotics, antimalarial agents, antiviral, anti-rheumatic gents/analgesic use, radiation therapy.

Prior permission was taken from the organization and subjects. Informed consent was taken after explaining all the procedures to the subjects before performing the clinical tests (OSDI, Blink rate, Meibography, TBUT, Tear meniscus height, Corneal staining and Schirmer test) and before giving the CVS-questionnaire, respectively. Selected subjects were equally grouped as VDT and non-VDT users.

### 3.2.5 OSDI and CVS assessment

**Principle:** The OSDI (©1995 Allergan. Used with permission. All rights reserved) is 12-item questions intended to give a fast assessment of the symptoms of visual disturbance (Annexure II) [13].

**Procedure:** To assess the extent of computer usage and to collect data of preliminary symptoms of the population under study, CVS-Questionnaire (CVS-Q) (used with author permission) (Annexure III) [195] was distributed to VDT users to calculate the CVS score for comparison and grouping of the population as VDT and non-VDT users. The CVS-Q included 16 symptoms that are scored utilizing two rating scales, one for frequency and the other for intensity. The reaction to the two rating scales for every symptom is consolidated multiplicatively into one rating scale for the investigation, bringing about a single symptom severity score. Estimation of total score for CVS was as follows:

\[
\text{Total Score} = \text{[frequency of symptoms occurrence]} \times \text{[intensity of symptom]}
\]

*Frequency: Never=0, occasionally=1, Often or always=2, Intensity: Moderate=1, Intense=2*

*If the total score is ≥6, the specialist is considered to suffer from CVS.*

Chosen subjects were equally assembled as VDT and non-VDT respondents. OSDI questionnaire and Revised Kuppuswamy Socio-economic scale was utilized for VDT and
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non-VDT respondents to discover symptomatic dry eye score and to categorize the socio-economic class of the subjects. The OSDI was surveyed on a size of 0 to 100, with higher scores representing more prominent disability. OSDI is a 12-item survey dependent on visual function, ocular symptoms and environmental factors, where subjects review indications of 1 week. Total OSDI scores are determined as OSDI = total of scores x 25/total number of questions answered. Thus, the scores extending 0 to 12 represented normal, 13 to 22 as mild DED, 23 to 32 moderate DED, and >33 as severe DED.

3.2.6 Blink rate

*Principle:* Blinking of an eye spread tears on the whole surface and provides lubrication, wash away dust and microorganisms. Blinking guarantees the normal circulation of the tear film on the ocular surface [84]. Any abnormalities to blinking may result in poor tear dissemination and consequently cause harm to the ocular surface [141].

*Procedure:* Blink rate was assessed by instructing subjects to read text aloud. The text was composed of cognitively demanding stories. VDT users were told to peruse from a laptop screen (dell with a 14-in screen) and non-VDT users were told to peruse from printed copy at a viewing distance of 40 cm for a continuous 2-minute time span. A forehead rest was utilized all through the test to keep up a steady viewing angle and working separation. The content was single spaced, dark, 10-point Times New Roman textual style, with a contrast of around 80%. To guarantee focus, subjects were informed that they would be asked questions about the passage toward the end of the session. During the task, blink rate was assessed by video recording the procedure for a minute.

3.2.7 Meibography: Visualization of meibomian glands

*Principle:* Meibography is a visualization procedure of the meibomian glands (MG) by transillumination of the eyelid. It suggests photographic documentation of the picture of the gland under illumination. Minor departure from the topic incorporates the utilization of infrared photography or video photography. It has a basic influence in the assessment of dry eye [75, 76].

*Procedure:* The subjects were seated comfortably. They were instructed to look up; the upper lid and lower lid was everted. The most basic version of infrared ray light was used. The presence and morphology of the gland was observed, and gland loss was quantified. MG dropout can be graded as follows [81].
Grade 0: no dropout  
Grade 1: dropout of less than 1/3 of total area of glands  
Grade 2: dropout of more than 1/3, but less than 2/3 of total area of gland  
Grade 3: dropout of more than 2/3 of total area of glands

### 3.2.8 Tear Film Break Up Time (TBUT)

**Principle:** The tear film break-up time interval between the last complete blink and the first appearance of a dry spot, or disruption in the tear film [139].

**Procedure:** Subjects were seated comfortably. Subjects head and chin were rested at a slit lamp head rest and chin rest respectively. Sodium fluorescein (2%) was instilled onto the bulbar conjunctiva without inciting reflex tearing. The patient was told to blink normally, without squeezing, a few times to appropriate the fluorescein. Slit lamp amplification was set at 10X, by keeping the foundation enlightenment power consistent (cobalt blue light). After few second of the fluorescein instillation, the patient was asked to stop blinking. Stopwatch was utilized to record time between last total blink and first appearance of black spot; Once TBUT was observed, patient can blink normal [66, 120]. Recording and calculation was done if TBUT ≤ 10 seconds = dry eye; TBUT > 10 seconds = normal [180].

### 3.2.9 Assessment of Tear Meniscus Height (TMH)

**Principle:** Slit lamp utilizes high-intensity light source can be engaged to focus a thin slit of light into the eye. It is used in conjunction with a biomicroscope. Slit lamp is used to analyze, diagnose and observe anterior and posterior structure of eye. It also produces Slit lamps, produces "cobalt blue" light.

**Procedure:** Subjects were seated comfortably. Subjects head and chin were rested at a slit lamp head rest and chin rest respectively. Slit lamp illumination was set in conical beam and the cobalt blue filter was utilized to measure and compare the tear film height. Fluorescein was ingrained onto the bulbar conjunctiva and after 5mins the tear meniscus formed on the lower lid margins was assessed to find tear volume. A tear meniscus height less than 0.25 mm is suggestive of dry eye [94, 95].

### 3.2.10 Corneal staining

**Principle:** Corneal Staining is represented by punctate dots on a series of panels by using sodium fluorescein dye under cobalt blue light.

**Procedure:** Subjects were seated comfortably. Subjects head and chin were rested at slit lamp head rest and chin rest respectively. Fluorescein strip was wetted was ingrained on palpebral
conjunctiva. Subjects were approached to blink several times and staining is observed and graded [85,86].

3.2.11 Schirmer’s test

*Principle:* This is a test that aims to measure aqueous tear production, if a person experiences excessive watery eyes or dry eyes. Assessment of tear production in subjects is done with suspected watery or dry eyes by using a strip of filter paper in lower fornix. A negative (>10 mm of moisture on the filter paper in five minutes) test result is normal.

*Procedure:* Subjects were asked to seat comfortably. A topical anesthetic drop was ingrained preceding estimation to decrease the disturbing impacts of the strip on the conjunctiva. A strip of filter paper [35 × 5 mm] is folded toward the end and is embedded over mid-path between the center and outer third of the inferior lid margin. And the length of wetted filter paper is estimated in millimeters. The patients are coordinated to look forward and to blink normally throughout the test, and the wet length was recorded following five minutes. Wetting less than 15 mm is viewed as predictable with DED [92, 93].

3.2.12 Socio-economic status (SES) classification

It is characterized as 'the arrangement, families, households and census tracts or other aggregates with respect to the capacity to create or consume goods that are valued in our society. Revised Kuppuswamy Socio-Economic Scale is the most generally utilized scale for deciding the SES. It considered three parameters specifically, education, occupation, and income of the individual which decides the SES [26].

3.3 Statistical analysis

Data was analysed using SPSS software v.21 for means, standard deviations and percentages. The normality test using shapiro-wilk’s test (p>0.05) showed normally distributed values for VDT and non-VDT users. The difference in results was tried utilizing, Wilcoxon signed rank test and one-way ANOVA. Multivariate investigation of components related with dry eye indications was directed utilizing logistic regression analysis. Correlation analysis was performed between VDT and non-VDT respondents using independent t- test. A p-value of <0.05 and Confidence Interval [CI] of 95% was considered significant.