Original Research

Digital eye strain: prevalence and associated socio-demographic factors among banking assistants in Colombo District, Sri Lanka

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Abstract

Introduction: Along with the technological advancement, many sectors had digitalized including banking, education and health sectors. With the excess usage, digital eye strain is now becoming the most common occupational hazard among the digital device users.

Objectives: To determine the prevalence of banking assistants with the digital eye strain (DES) and associated socio-demographic factors among banking assistants in a divisional secretariat division in Sri Lanka

Methods: A descriptive cross-sectional study was done among all the branches of randomly selected banks in a purposively selected divisional secretariat division. On selected banks, 372 eligible banking assistants were selected by systematic sampling. Data were collected by a structured pretested self-administered questionnaire. DES was detected using Computer Vision Syndrome Questionnaire (CVS-Q). Selected factors were cross-tabulated by the presence or absence of DES and the association was assessed using Chi-squared followed by multiple logistic regression. A p value of 0.05 was used to determine the significance.

Results: The response rate was 94.08%. The mean age of study population was 32.5 (95% CI: 31.88-33.11) years. Majority were females (n=206; 58.9%), married (n=228; 65.4%) and had a university degree (n=175; 50%). The duration of employment of the banking assistance varied from 3 months to 15 years. Sixty percent (n=210) of the banking assistants worked in the financial section. DES was detected in 70.6% of the employees. Civil status ($p<0.001$), education level ($p=0.014$) and working section ($p=0.039$) were found to be significantly associated with the presence of DES.

Conclusions & Recommendations: The prevalence of DES among banking assistants was notably high. Early detection efforts should prioritize married employees, those in operational roles, and non-graduates to mitigate the condition's impact.

Keywords: digital eye strain, prevalence of digital eye strain, banking assistants, occupational hazard

Introduction

Globally, rapid advances in digital technology have transformed many sectors including the banking, education and health sectors into digital platforms, in view of increasing the productivity. This digitalization resulted paper-based activities with movement and posture variation shifted into prolonged seated work in front of computers, mobile phones, smartphones and other digital devices (1). With this, more than 50% of a person's daily activities are linked with digital device usage and nearly 45 million employees stare at computers for hours (2).

While digitalization offers many benefits, excessive use of devices has led to health issues like sedentary lifestyles, non-communicable diseases and musculoskeletal and digital eye strain (DES) due to fixed postures. Of these, DES has emerged as the most important occupational hazards of the 21st century that mainly affect the workforce productivity and the youth (3-4). According to the American Optometric Association (AOA), DES or computer vision syndrome (CVS) is defined as "a group of eye and vision related problems which occur as a result of prolonged use of digital devices such as computers, mobile phones, tablets and e- readers". The most common symptoms associated with DES are stated as eyestrain, blurred vision, dry eyes, headache and neck or shoulder pain (5).

The human eye finds it challenging to focus on pixelated images with unclear edges and fluctuating brightness on screens. To compensate, blinking decreases from 20 to 5 times per minute due to cognitive demand (6). Primary gaze position of the monitors also contributes if kept above the eye level, thus increasing the exposure of cornea (4). These lead to frequent focusing and refocusing process, lag of accommodation, increased corneal exposure and undue fatigue in the ciliary muscles resulting in DES related symptoms (7). Users often adopt awkward postures leading to headaches, neck pain, and posture-related DES symptoms (8). Globally, around 60 million people are affected with DES. It is estimated that nearly one million would be affected annually (9). According to a systematic review and meta-analysis which was recently done in Ethiopia, bank employees were the professional subgroup that had the highest prevalence of DES (73.76%) (10). DES was reported among 85.2% of bank workers in Egypt where 65.6% were males and 34.4% were females with a mean age of 38.9 years (95% CI: 23-59 years) (11). DES was also reported among 69.3% information technology professionals in Chennai (12) and among 67.4% computer office workers in Sri Lanka. In the latter Sri Lankan study, the prevalence of DES was significantly higher among female employees compared to male employees which was (69.5% versus 65.4%; $p<0.05$) (13).

Although no permanent outcome or damage has been identified following DES, due to undue strain on the eyes, it reduces workplace productivity by 4-19% (8). DES also results in a 40% reduction in accuracy of a special task. As DES is a newly emerging condition, a globally accepted proper diagnostic criterion has not yet been developed by the field specialists. At present, it is screened by a variety of instruments. Objective assessments for diagnosing are done for those detected to have DES following subjective screening (14). Those include refraction and binocular vision assessment and tear film evaluation which are expensive and not available at many settings (4). DES is a preventable occupational disease condition. As causes are multifactorial, multiple approaches are recommended for symptomatic management. Therefore, assurance and client education are the main pillars of management. Most of the preventive measures are simple and can be adjusted easily without any expense (2).

Around 160,000 employees are engaged in the financial and insurance industry in Sri Lanka (15). Among bank employees, banking assistants are more exposed to digital work than the other categories within the bank system as they are more involved in financing than the operational categories. Hence, this study aimed to describe the proportion of banking

assistants with DES and to identify of DES associated socio-demographic factors among them.

Methods

This was an institutional-based descriptive cross-sectional study with an analytical component. Eleven licensed-commercial banks located in the divisional secretariate division that has the highest bank density in Colombo District were selected for the study. They were categorized as government, semi government and private sector banks (16) and from a list prepared alphabetically within each sector, one bank was selected randomly. Lists of branches and employees of each selected bank were obtained. This included 50 branches.

Data collection was carried out in January 2022. Sample size was calculated using a statistical formula (17). Expected proportion of employees that DES can be detected was assumed to be 67.4% based on the previous study (13). Expected response rate was considered as 90%. The number of participants needed at data collection stage was calculated as 372. Different dates and times were allocated for data collection. All banking assistants at cash counters and the office and who have been employed in this position with the usage of digital devices for at least three months were invited to the study. Banking assistants who had conjunctivitis at the time of data collection or who had undergone any kind of ocular surgery previously in the past were excluded.

Systematic sampling was applied within each selected bank as the sampling frame. Every alternate banking assistant, starting from the ground floor and following the seating order, was chosen for the study in each selected bank until the required sample size was reached. A structured, pretested, self-administered questionnaire with coded identities was used. All stems were in English, Sinhala and Tamil languages. It consisted of questions on basic socio- demographic data and CVS-questionnaire (CVS-Q) (18), which is a user-friendly DES screening questionnaire developed in Spain by Segui and colleagues. It has been validated to measure visual symptoms related to exposure to digital devices at workplaces. The initial version was developed following information obtained regarding DES from extensive literature review and underwent a pre-test, pilot test and re-test. The questionnaire consisted of 16 symptoms that were scored using two rating scales, one for frequency and the other for intensity. The modified questionnaire was administered to 266 computer users in a public institute who routinely used the computer during their workdays.

Using the CVS-Q, total score was calculated as frequency of symptom occurrence x intensity of symptom. For the frequency of symptoms, marks were allocated as 0 for ‘never’, 1 for ‘occasional’ and 2 for ‘often or always’ responses. Intensity of symptoms were scored as 1 for ‘moderate’ and 2 for ‘intense’ symptoms. If the total score was ≥6 points, the worker was considered to suffer from CVS/DES.

Data analysis

Data were analysed by Statistical Package for the Social Sciences (SPSS) version 21. The basic socio-demographic characteristics of the study population were described with descriptive statistics. Identified factors were cross tabulated with the presence or absence of DES in order to identify factors associated with DES. Chi-squared test with a significance level of 5% was used following with multivariate analysis done with multiple logistic regression.

Results

The study included 350 banking assistants with a response rate of 94.1%. The mean age of study population was 32.5 (95% CI: 31.88-33.11) years while the median age was 32 years. As shown in Table 1, the majority were females (58.9%), married (65.4%) and had a university degree (50%). The mean duration of work was 8 years while 60% worked in the financial section.

Table 1: Distribution of the study population by selected socio demographic characteristics (N=350)

Socio-demographic characteristics	No.	%
Sex		
Male	144	46.1
Female	206	58.9
Highest level of education		
Completed G C E Advanced Level*	145	41.4
Graduate	175	50.0
Postgraduate	30	8.6
Working section		
Financial	210	60.0
Operational	140	40.0
Civil status		
Single	122	34.6
Married	228	65.4
Duration of employment		
≤ 5 years	140	40.0
> 5 years	210	60.0

*General Certificate of Education

Majority of the banking assistants (n=247; 70.6%) were found to have DES (Table 2). The mean score obtained was 17.34 (95% CI: 16.21-18.48) while the median mark was 16. A higher proportion of female employees (70.4%) and those above 35 years of age (91.5%) had DES.

Table 2: Factor associated with DES

Factors	DES present (n=247)		DES not detected (n=103)	
	No.	%	No.	%
Sex				
Female	145	70.4	61	29.6
Male	102	70.8	42	29.2
Age				
≤ 35 years	160	62.7	95	37.3
> 35 years	87	91.5	8	8.5
Working station				
Financial	127	60.5	83	39.5
Operational	120	85.7	20	14.3

The most commonly reported symptom was headache 93.1% while the least reported symptoms were eye redness 47.4% and double vision 47.4% (Figure 1). Fifty six percent (n=196) of banking assistants had previously sought medical advice for the above-mentioned symptoms.

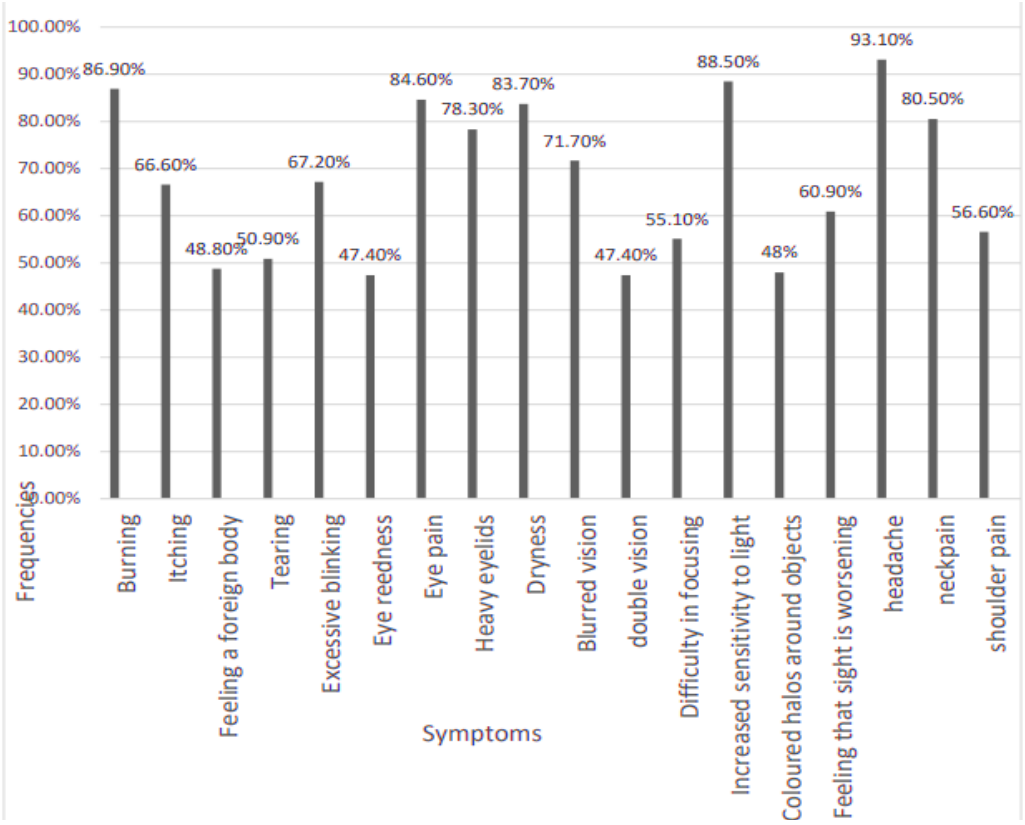

Figure 1: Distribution of the study sample according to symptoms related to digital eye strain

As shown in Table 3, following multiple logistic regression, civil status (p<0.001), education level (p=0.01) and working section (p=0.04) were found to be significantly associated factors with the presence of DES. Being married had 4.1 likelihood of having DES compared to unmarried bank workers. Having a higher education level following advanced level (OR=0.45; 95% CI: 0.22-0.84) and working in the finance sector (OR=0.41; 95% CI: 0.18-0.96) were seemingly protective factors from getting DES.

Table 3: Multivariate analysis of association of DES with socio demographic characteristics

Category	ß	p value	(OR (95% CI)	
Sex	0.069	0 .835	1.072	(0.557 - 2.062)
Age	-0.824	0.180	0.439	(0.132 - 1.462)
Civil status	1.400	0.000	4.105	(2.067 - 7.957)
Educational level	-0.838	0.014	0.452	(0.222 - 0.841)
Working station	-0.886	0.039	0.412	(0.178 - 0.957)

Discussion

This was the first study conducted in Sri Lanka with the aim of determining the proportion of banking assistants suffering from the digital eye strain and to determine the sociodemographic factors associated with DES among them. In the present study, DES was detected in 70.6% of employees. Civil status (p=0.003), education level (p=0.006) and working section (p=0.027) were found to be significantly associated factors with the presence of DES. Sex, age and duration of employing within banking sector were not significantly associated with DES.

Even though this has been done as a cross-sectional study, it allows quantification of disease burden in a given population and formulation of hypothesis to determine the association between factors (19). Banking assistants were selected as the study population as they are a relatively young working population and also engage in more digital device usage during working hours. Rigorous sampling would have enabled having a representative sample minimizing selection bias.

The mean age of the study population was 32.5 years. The age range of the Sri Lankan study among video display terminal workers was 18 to 60 years with a mean age of 30.8 (SD=8.1) years (13). The studies done among bank employees in Egypt and Ethiopia also had working population aged 38.9 (SD=9.9) years and 28.29 (SD=4.66) years (11, 20). Egyptian study which has been done among computer workers had a similar group of information technology professionals with mean age of 32.3 (SD=5.97) years with 63% of females (21).

The proportion of DES detected among the study population was 70.6%. This value was more than that reported by the key study done in Sri Lanka among telephone operators (67.4%) in 2016 where presence of at least one symptom either intermittently or continuously for at least one week during previous year was considered for diagnosis (13). Furthermore, the present study was carried out nearly six years later and at a point when the COVID-19 pandemic pushed majority of work to the digital platform. However, the proportion obtained from the present study is lower than the studies done recently in Egypt among computer workers (82.4%) (21). This study had used the same CVS-Q to assess the visual symptoms of DES (15). A meta-analysis and systematic review done in Ethiopia revealed that DES was more prevalent among bank employees than among other professionals who used computers (73.21%; 95% CI: 70.32-76.11) (10).

The mean (SD) score obtained for the CVS-Q in the present study was 17.34 (1.13) which was similar to the 15.4 (8.7) obtained for the CVS-Q in the Egyptian study. This again could be attributed to the fact that both studies were carried out among bank employees. This also shows us that the use of a uniform criterion for screening would be useful to identify affected individuals more preciously as well to compare the available data across the globe. This would thereby help to develop standards or protocols in preventing or minimizing this kind of occupational hazard in the current digital era.

The most common symptoms mentioned by the participants were headache (93.1%) followed by increased sensitivity to light (88.5%) and burning sensation of eyes (86.9%). Although a different tool was used to assess DES in the study carried out on telephone operators in Sri Lanka, the most commonly reported symptom of that study group was also headache (45.7%) followed by dry eyes and (31.1%) and pain around the eyes (28.7%) (13). Headache has been reported as the most common symptom by similar other studies (20, 22).

In the current study, multivariate analysis predicted that being married (p<0.001), being a graduate (p=0.01) and working in finance section (p=0.04) were significant factors associated with the presence of DES. However, another study done in Sri Lanka in 2009 among telephone operators, female sex (OR=1.28) and duration of occupation (OR=1.07)

were significant (13). Being married (OR=4.105) had a higher likelihood of DES compared to unmarried bank workers. Having a higher education level (OR=0.45; 95% CI: 0.22-0.84) and working in the finance sector (OR=0.41; 95% CI: 0.18-0.96) were seemingly protective factors from getting DES.

Conclusions & Recommendations

The proportion of banking assistants detected with DES in the present study was relatively high. Being married, being a graduate and working in the operational section were significantly associated with the presence of DES. Hence, early detection must be promoted specially among these priority groups.

Public Health Implications

- The high prevalence of digital eye strain (DES) among banking assistants emphasizes the urgent need for proactive measures.
- Efforts need to be focused on early detection, especially for employees who are married, non-graduates and those in operational section. Implementing preventive strategies and ergonomic intervention in the workplace plays a crucial role in mitigating DES. If this issue is addressed properly, it will improve ocular health and occupational well-being of banking assistants in the digitalized work environment. Indirectly, it will help to align with the evolving landscape of technology in workplaces and its impact on health.

Author Declarations

Competing interests: The authors declare that they have no competing interests.

Ethics approval and consent to participate: Ethical clearance and approval were obtained from the Ethics Review Committee of Postgraduate Institute of Medicine of the University of Colombo (ERC/PGIM/2021/122). Informed written consent was obtained from participants prior to data collection.

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