PROPOSAL

ON

Prevalence of Myopia and Dry Eye Disease among the Digital Device Users of Faculty Members and Staff of North South University

This proposal is prepared for partial fulfillment of the requirements of the Master of Public Health (MPH) Degree of North South University, Dhaka, Bangladesh

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MASTER OF PUBLIC HEALTH PROGRAM
DEPARTMENT OF PUBLIC HEALTH
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BANGLADESH
2022

The proposal Entitled

Prevalence of Myopia and Dry Eye Disease among the Digital Device Users of Faculty Members and Staff of North South University

This proposal is submitted to the Department of Public Health, North South University for the partial fulfillment of the requirements of the Master of Public Health (MPH) degree

Dated: …….....……....…..……..…….....

Name: Md Tamzid Hasan

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DEPARTMENT OF PUBLIC HEALTH

MASTER OF PUBLIC HEALTH

We, the members of the proposal defense committee certify that we have carefully read the proposal and recommended it to the Dean for approval of the proposal entitled.

Prevalence of Myopia and Dry Eye Disease among the Digital Device Users of Faculty Members and Staff of North South University

Submitted by Md Tamzid Hasan**, Student's ID: 213 5194 080** for partial fulfillment of the requirements of the Master of Public Health (MPH) degree

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Executive summary

The world has become digital, from developing to developed countries. With the rapid digitalization of the world, the threat of DED and myopia are now more concerning than ever. The excessive use of digital devices, including laptops, smartphones, and tablet screens, results in longer blinking intervals which exacerbates the evaporation of tears which is the ultimate risk of increasing the development of dry eye disease (DED). By 2050 half of the population may be myopic, as the World Health Organization estimated.

To give urgency, to controlling myopia and DED, we choose to conduct a cross-sectional study among the university faculty members and staff from North South University in Dhaka City. The study will be conducted through face-to-face interviews with all faculty members from four different schools and staff of North South University with 354 respondents where demographic details of the individual, along with other histories will be documented.

Study data will be analyzed, maintaining standard analytical procedures. All the procedures will be conducted following the ethical guidelines of the IRB. The primary outcome of this study is to understand the prevalence of myopia and dry eye disease among the digital device users of university faculty members and staff of North South University, which will further augment us to see how the prevalence of DED and myopia changed over time and how severe the association is between extensive use of the devices, and DED and intolerance.

Eventually, this study will guide us as an essential benchmark for diagnosing individuals at greater risk of experiencing myopia and dry eye disease and will help to measure the excessive use of digital devices like computers or laptops, mobile phones, and tablets may have a strong association with developing myopia and dry eye disease, and prolonged use of the digital device would increase the loss our vision and be life-threatening to our life. And some disease-related factors and systemic factors are directly related to inducing our eye vision.

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ABBREVIATIONS

DED	**Dry Eye Disease**
KCS	**Keratoconjunctivitis Sicca**
AL	**Axial Length**
CR	**Corneal Radius of Curvature**
CVS	**Computer Vision Syndrome**
OSDI	**Ocular Surface Disease Index**
TBUT	**Tear film break-up time**
CVD	**Cardiovascular Disease**
HTN	**Hypertension**
VDT	**Video Display Terminal**
DEQ5	**Dry Eye Disease Questionnaire 5**
CI	**Confidence Interval**
SD	**Standard Deviation**
OR	**Odds Ratio**
IQR	**Interquartile Range**
WHO	**World Health Organization**
NSU	**North South University**
IRB	**Institutional Review Board**
SBE	**School of Business & Economics**
SEPS	**School of Engineering & Physical Science**
SHSS	**School of Humanities & Social Science**
SHLS	**School of Health & Life Science**

CHAPTER I
INTRODUCTION

1.1Introduction

The eye is the essential organ of the human body, and it´s visualizing realistic scenarios of the world in front of us. Due to an unhealthy lifestyle and overusing the digital screen, we have developed myopia and dry eye disease in the very early stages of our lives, and prolonged digital device use is significant for Dry Eye Disease (DED) (1). Myopia is a prevalent condition of the eyes to see near objects clearly and blurry for far objects, and it develops rapidly during childhood (2). On the other hand, DED, also known as dry eye syndrome and keratoconjunctivitis sicca, is a multifactorial disease of the ocular surface, and it occurs when tears are unable to provide adequate lubrication to the eye. Myopia can lead to more severe conditions like cataracts, glaucoma, and blindness, while untreated DED may lead to inflammation, abrasion of the corneal surface, Corneal ulcers and vision loss (3). These two-play severe etiological roles in losing our vision of the eye (4). By 2050, 5 billion people will develop myopia (5).

Globally, most eye morbidity is caused by refractive error, which comprises myopia, hypermetropia, and astigmatism (6)(7). Uncorrected refractive error is always the leading cause of moderate and severe visual impairment and reduces the quality of life (7). Nowadays, DED is a significant public health issue globally, and many studies reported that age, sex, and previous ocular surgery are the major risk factors for DED (8). DED is the sixth most common visual disorder in the USA, and its prevalence ranges from 5% to 15%, which is remarkably higher in women (9). In Nigeria, they have found a 17% prevalence of refractive error among the drivers of public institutions. Hypermetropia is associated with increased age, so the majority of adult hypermetropia among the 70 years old citizen population is very much higher than 40 years old citizens (7). In another study, we found the prevalence of dry eye disease in workers who use digital screens ranged from 9.5% to 87.5% (10).

The prevalence of DED is significantly higher in Asia than in North America (11). One study documented that the digital device use rate is very high in Korea, approximately more than 90% (12). And this rate is significantly higher in adolescents because parents easily give them devices to keep them busy (10). In Thailand, the prevalence of DED

among the adult population is 34%, and most myopia is 11.1% (11). Prevalence of myopia depends on geography, ethnicity, sex, and age, and it is varying on country to country. In Japan, many studies showed that the prevalence of severe DED among men and women was 11.5% and 18.7%, respectively, and in Taiwan, the prevalence among the elderly population was 33.7% (13). DED is now a severe health issue; it affects the patient´s health, well-being, ocular health, quality of life, and the economic burden on the family (14).

Dry eye syndrome and myopia are overall morbidities in the South Asian population compared to the American and European countries due to lack of Vitamin A deficiency, nutritional deficiency, cigarette smoking, air pollution, humidity, skin allergy, and inappropriate uses of medicine (15). Mobiles, tablets, and other digital devices use rate among the young and adult populations are comparatively very high like Korean people. The young and adult generation is primarily devoted to their additional time on digital devices for using social media, playing online games, watching movies, and online teaching education (16). A 61.2% prevalence of moderate DED among the age group 21-40 years was found in the North Indian population; urban regions and desk jobs were associated with influence on to the development of the DED (17). Several South Asian studies conducted that the prevalence rate for myopia in India was 34.6% among the aged more than 40 years, but in East Asia, this rate is very high; in Singapore, this rate was 38.7%, and in Japan, this was 41.5% among the same aged group (18). In Pakistan, the prevalence of DED was more than 19%, and the majority for myopia was 37% (19)(20).

Bangladesh is one of the most population-density and developing countries worldwide and the second largest in South Asia (21). People of this country live in different socioeconomic conditions with various earning sources. And their lifestyle, nutritional status, and health conditions are different due to their different religious perception, income, and parental medical history. The majority percentage of the people lives in urban slum and lead unhygienic life, which is the cause of acute illness. A quarter of people in urban slums develop eye diseases like dry eye disease, myopia, glaucoma, and other severe eye diseases (22)(23). Three lakh children are diagnosed with eye disorders yearly in Bangladesh according to their parent's previous family history of vision problems (24). Morbidity of dry eye disease among adults after forty years is prevalent globally, and myopia is increased with age (25). The prevalence of myopia among 30-39 years of age is 17.5%, and the age until 70s, this rate is 65.5%. This study also identified that morbidity

of myopia is more prevalent in employed people than in unemployed people (25). In Bangladesh, one study was conducted about dry eye disease among garment workers, and the prevalence was 64.5% (22). Nowadays, myopia and dry eye diseases are significant public health concerns for our country.

Furthermore, no specific investigation has been done on the relation between device usage and the development of myopia and DED in Bangladesh. It is important to conduct a proper investigation into the state of myopia and DED prevalence in Bangladesh because this phenomenon has increased worldwide, especially in countries in Asia (26). Myopia suspected comorbidities like cataracts, glaucoma, hypermetropia, eye allergies, uveitis, age-related macular degeneration, water tearing, and dry eyes are profoundly associated; and other specific disease-related comorbidities which directly affect the eyes like diabetes mellitus, hypertension, blood pressure, hematologic malignancies, and systemic infections (27). Myopia, if left untreated, can lead to much more serious conditions later in life such as cataracts, detached retinas and glaucoma, and even blindness (28), while untreated DED may lead to inflammation, abrasion of the corneal surface, corneal ulcers, and vision loss (2). Understanding where Bangladesh stands in terms of the severity of the problem can then allow doctors and healthcare workers to act accordingly to ensure that the condition does not become dire.

This study aims to identify the prevalence of Myopia and Dry Eye Disease among University faculty members and staff. Excessive use of digital devices like computers or laptops, mobile phones, and tablets may have a strong association with developing myopia and dry eye disease, and prolonged use of the digital device would increase the loss our vision and be life-threatening to our life. And some disease-related factors and systemic factors are directly related to inducing our eye vision.

1.2 Justification of the study

The world has become digital, from developing to developed countries. With the rapid digitalization of the world, the threat of DED and myopia are now more concerning than ever. People are more likely to use digital devices than reading books or newspapers. The way we consume knowledge has also changed. We prefer to read online newspapers and e-journals instead of physical copies. It saves time, reduces paper waste, and is much more convenient. This habit of using online media has spread to the younger population, and children these days prefer to enjoy their free time playing online games or watching movies and videos. The rapid urbanization and destruction of playgrounds have limited the option for outdoor recreational activities for children, further pushing them indoors and towards using computers, smartphones, and tablets. In short, it can be said that laptops, smartphones, and tablets have become an integral part of our lives.

In all professions, the computer or laptop use rate is very high; without this device, it's tough to lead a professional life. Every educational institution, like a university, is mandatory; otherwise, we cannot battle with the real world. Everyone now depends on digital devices like laptops or computers, mobiles, and tablets to do their daily work. The researcher is doing their research on a computer, students are doing their homework and lab work, and online classes are familiar to students and teachers. So, we focus our eyes on the digital screen for maximum time in a day.

The excessive use of digital devices, including laptops, smartphones, and tablet screens, results in longer blinking intervals which exacerbates the evaporation of tears which is the ultimate risk of increasing the development of dry eye disease (DED). Previously, the use of digital devices was infrequent, and the prevalence of DED was 5 to 50%, varying with age (29). During the lockdown, screen time increased in a significant way. Now this percentage is likely to have increased massively among younger to older people.

On the other hand, myopia is a significant health issue worldwide. By 2050 half of the population may be myopic, as the World Health Organization estimated. Researchers found that in recent years not spending adequate time in outdoor activities is a major risk factor for developing myopia (30). Outdoor activities have decreased these days as people are increasingly leading a sedentary life and the lockdown worsened the situation. People almost completely stopped going out of the house, staying home, and using their

digital devices excessively. Screen time usage was high among people and the burden of myopia may have worsened during this period.

After ten or twenty years, these would be a severe health issue for our generation. It is an excellent opportunity for all researchers to discover all associated factors and reduce the risk of myopia and dry eye disease. So, given the urgency to control DED and myopia, we chose to conduct a cross-sectional study among teachers and employees from North South University in Dhaka city. The aim is to see how the prevalence of DED and myopia changed over time and how severe the association is between extensive use of the devices, and DED and intolerance.

1.3 Operational Definitions

Myopia: Myopia is a prevalent condition of the eyes to see near objects clearly but blurry for distant objects, and nowadays, it's a pervasive vision problem for all ages (31). It develops rapidly during childhood.

Dry Eye Disease: Dry eye disease (DED) is a multifactorial disease of the ocular surface, and it occurs when tears are unable to provide adequate lubrication to the eye (32).

Keratoconjunctivitis Sicca: Keratoconjunctivitis Sicca (KCS) is also a multifactorial disease. DED is known as Keratoconjunctivitis Sicca (33).

Multifactorial Disease: Diabetes, asthma, allergy, high blood pressure, arthritis, etc., are the factors of health problems. Gene also includes nutrition, lifestyle, alcohol and tobacco, some medicines, illness, and pollution. When genes and other factors cause health problems, we are called multifactorial diseases (34).

Glaucoma: It's a serious cause to our eyes; it damages the optic nerve with abnormally high pressure on the eyes. Globally, this is the leading cause of blindness and is very common in the elderly (35).

Corneal Ulcer: A corneal ulcer is one of the leading causes of vision loss and blindness, and it's an open sore on the eyes. A corneal ulcer is also known as keratitis. Wearing contact lenses basically during sleeping time, cold sore, shingles, chickenpox, dry eye, etc., are the causes of infections in the eyes, and disease is the most common for corneal ulcer (36).

Systemic Disease: Systemic means it affects the whole body rather than a single organ and tissue. So, systemic diseases like flu affect the whole body part of the human (37).

Systemic Infection: When a body is infected in the bloodstream, it is called a systemic infection.

Refractive Error: It's a type of vision problem and makes the eye see too hard. It happens when the shape of the eye does not bend light correctly to the retina (38).

Hypermetropia is also known as hyperopia, a pervasive vision disorder among young to older adults. It causes the length of the vision to be concise and not strong enough (39).

Astigmatism: It's a prevalent and treatable cause of near vision. It occurs when the cornea or the natural lens of the inside eyes is mismatched with the curves (40).

Keratoconus: When the front surface of dome-shaped eyes gradually swells outward into cone shape eyes. It causes sensitivity of the eyes and blurred vision (41).

Diabetes Mellitus: It refers to a group of diseases and disorders of the body that does not produce enough insulin. It causes abnormally high blood sugar (42).

Uveitis: Uveitis is the inflammation of the eyes. It affects three parts of the eyes, and it also inflames both eyes. Uvea, the eye's middle layer, is irritated and swelled by uveitis (43).

Macular Degeneration: Basically, it is known as age-related macular degeneration. It is one of the eye diseases that causes blur in the central vision of the eye. It is a common cause for older adults (44).

Hematologic Malignancies: Hematologic malignancies are cancers it begins in blood-forming tissues. Leukemia, lymphoma, and multiple myeloma are the three major types of hematologic malignancies (45).

Eye Discomfort: Achy, dry, or itchy, redness, sensitivity to light, severe pain, and burning to the eyes is the leading cause of eye discomfort (46).

Watery Eyes: It is common in smoky, cold environments, when the wind blows, or with an eye injury. But sometimes it causes an allergy, eyelid problems, dry eye syndrome, or a temporary face field weakness(47).

1.4 Research Question:

1. What is the burden of eye disease among the digital device users of university faculty members and staff?

2. What is the prevalence of myopia and dry eye disease among the digital device users of university faculty members and staff?

CHAPTER II
LITERATURE REVIEW

Badmus SA et al., this study was conducted on the association between axial length (AL) to corneal radius of curvature (CR) ratio and refractive status among the healthy Nigerian senior citizen. The total sample size was 350 and the age was between 18-60 years. This study confirmed that AL has strong determinants of refraction, but CR has no significant differences in the refraction groups. 35.43% were myopic, 22% of participants were hypermetropic, and 82.6% of total participants were astigmatism which ranges between -0.25DC to -4.25DC was revealed from this study. Further study is needed to determine the very high refractive error and other variables which are more associated with this study among the senior citizens (48).

Anajekwu et al., this study was conducted among the staff of Nigerian University to determine the prevalence of uncorrected refractive error. It was a cross-sectional study, and the total sample size was 1,083. A self-administered and interviewer-administered questionnaire was used to collect data from the target population. 13.8% (95% CI = 11.9-15.9) prevalence was counted in this study. The common refractive error was astigmatism, and its prevalence was 8.6% (95% CI = 6.9-10.3) (49).

Uncorrected refractive error is the most common symptom in the non-academic staff than academic staff due to (49)---

1. Nature of their jobs
2. Visual demands of their jobs
3. Academic staff are more aware to seek eye care than non-academic staff

For achieving VISION 2020 (49):

1. The right to sight
2. Needs primary eye care
3. Provide primary eye care support in every university

Verma et al., a study was conducted with the computer operator at a teaching institute to assess computer vision syndrome (CVS) and dry eye disease (DED). The total sample size was 100. It was a cross-sectional study. Ocular surface disease index (OSDI), refraction,

Schirmer's test 1, and tear film break-up time (TBUT) questionnaire were used to collect data. From this study, the prevalence of CVS was found 74%. According to the Schirmer test questionnaire, 59% DED in the right eye and 58% DED in the left eye were found in the target population. From TBUT questionnaire, also found the same prevalence as like Schirmer test. CVS and dry eye have statistically significant also determined from this study (50).

Bourne et al., the main purpose of this study was the correction of refractive error in the adult population of Bangladesh. The total sample size was 12,782 adults age range more than 30 years and all the samples were nationally representative. A total of 11,624 subjects were examined where 22.1% were myopes, and 20.6% were hyperopes. The percentage of the spectacle's coverage was relatively higher in men and urban populations. This study also found that 81% had an inadequate correction of refractive error. The estimation of the national population is 6.7% (1.5 million) adult men and 9.2% (1.8 million) women who have seriously needed refractive correction. The spectacle coverage rate is very low in Bangladesh. Rural areas need more improvement in refractive errors (25).

Data (national blindness and low vision survey) analyzed to (25)---

- Refractive error calculation for the met and unmet needs among the adult population of Bangladesh
- Investigation of the associate factors of spectacle correction and the accuracy of the habitual correction
- Best refractive correction needed for Bangladesh perspective

Findings from this study (25)---

- Unmet needs among 50 years aged, women are higher than for men
- The low level of spectacles coverage is the major finding of this study
- Lower coverage found in the rural area

Pinazo-Duran et al., review the article on eclectic ocular comorbidities and systemic diseases with eye involvement. This study looked at some ocular conditions and mostly relevant systemic disorders which are affecting the eye (27).

Ocular comorbid conditions (27)---

- Keratoconjunctivitis sicca

- Refractive errors
- Glaucoma
- Cataracts
- Uveitis
- Retinopathies

Systemic disorders (27)---

- Ocular disease involvement with some pathologies
- Systemic disorders induced by ocular manifestations

Genetic syndromes (27)---

- Multidisciplinary actions
- Comprehensive evaluation

Some systemic diseases with eye involvement are given below (27):

- Hematologic diseases
- Cardiovascular diseases
- Nutritional disorders
- Metabolic disorders
- Pulmonary diseases
- Renal disorders
- Systemic viral and bacterial infections
- Nematode infections
- Dermatologic pathology
- Phacomatoses
- Collagen diseases
- Granulomatous diseases
- Genetic syndrome
- Hereditary metabolic disorders
- Heritable connective tissue diseases
- Neoplastic diseases
- Ocular complications
- Immunosuppressive agents
- Multisystemic autoimmune diseases

- Vitamins and eye diseases
- Miscellaneous systemic diseases

Ocular involvement in major pathologies (27):

- Diabetes mellitus
- Hypertension blood pressure
- Hyperthyroidism
- Sarcoidosis
- Tuberculosis
- Arthritis
- Psoriasis
- Scleroderma
- Systemic infections
- Diabetic macular edema

Ayub et al., the purpose of this study are the prevalence and risk factors of dry eye disease among the Pakistani population. This is a hospital-based cross-sectional study. The total sample size was 300 and all samples are collected from the department of ophthalmology, Jinnah Hospital, Lahore. All participant's ages were 18 years with various ophthalmic complications. Maximum participants are female. From this study, the prevalence of DED was found at 18.7% (19). Multivariate regression analyses were used to show the risk of developing DED and the following risk factors were found in this study (19)---

- Outdoor workers
- Working in AC
- Housewives
- Diabetics
- Smokers
- Exposed to excessive sunlight
- Wind
- Temperature
- Suffering meibomian gland dysfunction

Hanyuda et al., the aim of this study is physical inactivity, prolonged sedentary behaviors, and use of visual display terminals as potential risk factors for dry eye disease in a population-based cross-sectional study. The total sample size was 102,582 and all participants were aged 40 to 70 years. This study found that in both sexes, physical activities are significant to decrease the DED. Similarly, prolonged uses of VDT were a higher prevalence of developing DED in both sexes (51).

Frequency of physical activity for this study (51)---

- Less than once per month
- 1-3 times per month
- 1-2 times per week
- 3-4 times per week
- Almost everyday

And the duration of physical activity for both sexes (51)---

- Less than 30 minutes
- 30-59 minutes
- 1-2 hours
- 2-3 hours
- More than 4 hours

Limitations of this study (51):

- In a cross-sectional study, not possible to show the causal relationship between physical activity, sedentary behaviors, the digital device using time, and DED.
- Confounding factors were unmeasured in longitudinal observational studies.

Sood et al., the purpose of this study was to assess myopia among medical students in Western India vis-à-vis the East Asian epidemic. It was a cross-sectional descriptive study, and 148 participants were voluntarily recruited from the medical college of western Maharashtra. Myopia was diagnosed by distance visual acuity (DVA). 45% prevalence was found in this study (52).

The global prevalence of myopia among medical students is mentioned below (52)---

Taiwan- 93% prevalence

Singapore- 82%-90% prevalence

China- 71% prevalence

Pakistan- 58% prevalence

Norway- 50% prevalence

Denmark- 50% prevalence

India- 45% prevalence

Bangladesh- 63.8% prevalence

Turkey- 33% prevalence

Poland- 32% prevalence

This study also found that optometry students were more at risk to developed myopia due to extensive near work. Because excessive near work is the underlined findings of myopia develops gradually. Auto refraction lacking was the main limitation of this study (52).

Gupta et al., the main purpose of this study was to show the association between screen time, quality of sleep, and dry eye in college-going women of northern India. It was a cross-sectional and comparative questionnaire-based study among 547 college-going women. Dry eye was measured by the SPEED questionnaire and quality of sleep was examined by the Mini Sleep Questionnaire. The significant association between dry eye and quality of sleep was shown by multinomial logistic regression (53). These two are major global health issues in the present era.

Five domains were found in the questionnaire (53)---

Demographic domain

General question domain

Screen time domain

Sleep-wake domain

Dry eye domain

This study showed that a total of 65.61% of the women reported they have dry eye symptoms and, they have faced difficulties of sleep (53).

Limitations of this study (53):

- Limitations for the establishment of temporal relation
- Recall bias
- Non-random sampling technique

Tounaka et al., the purpose of this study was to investigate the dry disease is associated with deterioration of mental health in male Japanese university staff. The total sample size was 163 university staff where 99 male and 64 female staff. In Japan, the prevalence of clinically diagnosed dry eye disease was 2.1% and generally, it was 7.9% for both males and females (54).

Findings from this study (54)---

- Contact lens users among females were higher than among males
- No significant differences were found in vision quality, smoking habits, exercise, hypertension, diabetes, hyperlipidemia, and mental diseases between males and females.

Limitations in this study (54)---

- Single organizations don't a representative of the general population
- University staff involved in many digital operations
- Considering the consulting behavior of sex

This study showed that dry eye disease reduced the mental health-related quality of life, and the cause is unclear. DED symptoms treatment improves the mental health-related quality of life (54).

Li et al., the main purpose of this study was to assess dry eye disease and associated risk factors among the hospital-based population in Southeast China. It was a cross-sectional study and a total of 6,657 outpatients were measured for this study who has dry disease presence. 635 patients were clinically diagnosed with defined dry eye disease. Women were higher than men. The dry disease is also associated with a hormonal change in women patients. 163 women patients were found in this study who has hormonal problems and developed dry eye disease. Many factors were associated with dry eye disease, but this study found environmental and occupational factors were seriously associated with dry eye disease to develop dry eye disease and most of them were from the hospital-based population.

Prevalence of symptomatic dry eye disease was found at 9.54% and clinically it was 7.99% (6).

Alkabbani et al., the purpose of this study was to assess the severity and risk factors for dry eye disease in Dubai. It was an analytical cross-sectional survey-based study. From the survey, 452 participants were counted for this study. The survey was conducted online. Most of these surveys were women. Because most of the women used contact lenses and used digital screens for their leisure time. The prevalence of dry eye was found at 62.6%. The main limitation of this study was selection bias because all respondents were not literate in English. And this study was geographically limited to represent the entire population (55).

CHAPTER III

RESEARCH METHODOLOGY

3.1 Study Objectives

3.1.1 General Objective

To assess the burden of eye disease among the university faculty members and staff.

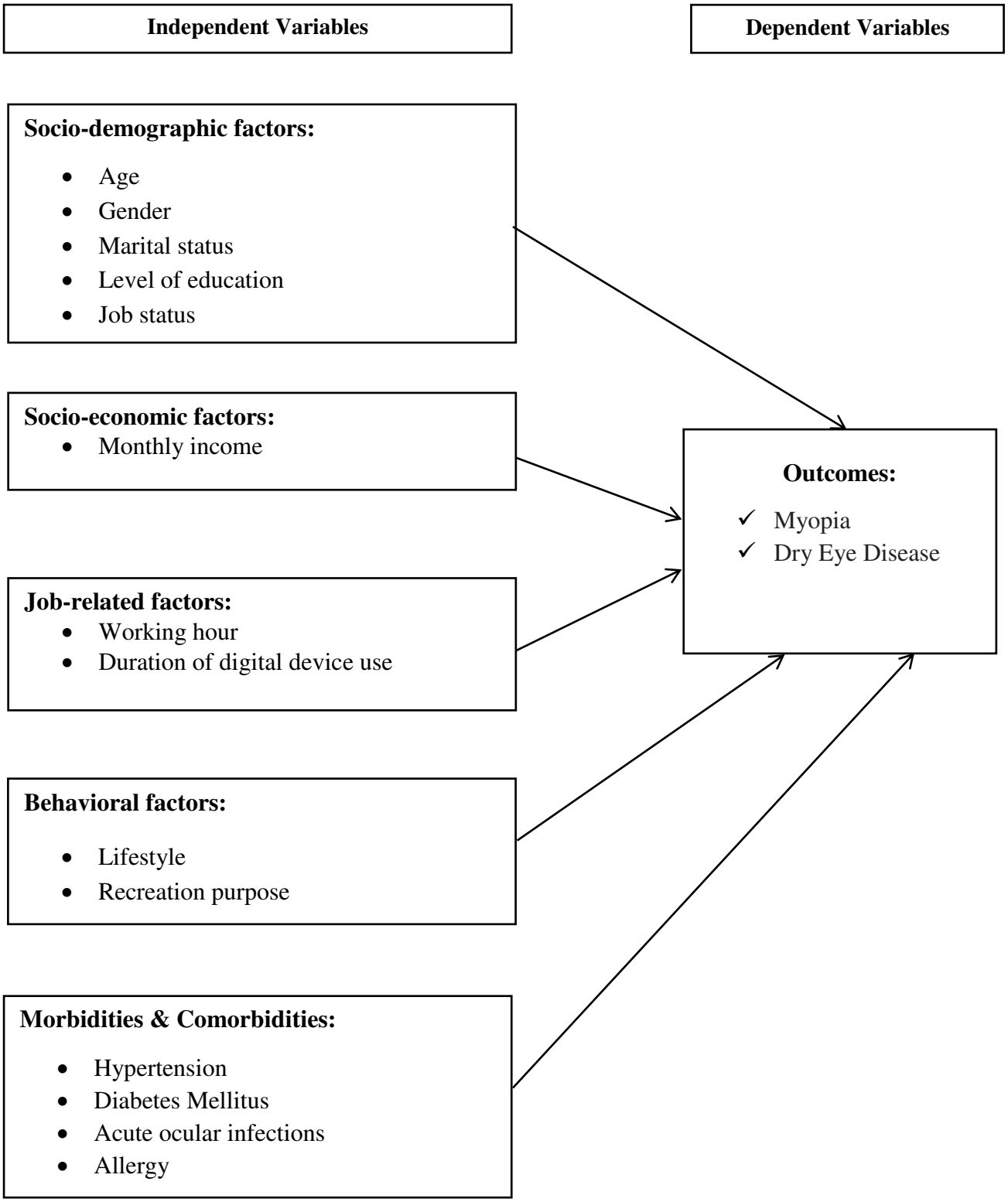
3.1.2 Specific objective:

1. To determine the prevalence of myopia among the university faculty members and staff.

2. To determine the prevalence of dry eye disease (DED) among the university faculty members and staff.

3. To measure the morbidities and comorbidities with myopia and DED among the university faculty members and staff.

3.2 Conceptual Framework



3.3 Study design:

A cross-sectional study will be conducted

3.4 Target Population

The target population of this study will be the university faculty members and staff of North South University.

3.5 Study Site & Area

The study site will be North South University, Dhaka, Bangladesh.

3.6 Study Period

September 2021 to December 2021 (4 months)

3.7 Sample Size

The sample size for this study has been calculated to precisely estimate the prevalence of Dry Eye Disease. After reviewing the literature, we assumed the prevalence in our population about 64.2% and computed the sample size using the following formula:

$$n = \frac{(z_{1-\frac{\alpha}{2}})^2 \, pq}{d^2} \qquad \ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Where n = Expected sample size

z = Statistics corresponding level of confidence

= 1.96 (95% confidence interval for both sided)

p = Anticipated prevalence of DED = 64.2% = 0.642

q = 1-p = 1 – 0.642 = 0.358

d = Precision

= It would be 5% = 0.05

From formula (1),

$$n = \frac{(1.96)^2 \, X \, 0.642 \, X \, 0.358}{(0.05X0.05)^2}$$

= 353.175 = 354 (rounded)

3.8 Inclusion criteria:

- University faculty members and staff of North South University, Dhaka, Bangladesh.

3.9 Exclusion criteria:

- Any history of gross lid abnormalities, life-threatening systemic disease, extra and intraocular surgery within the last 6 months.

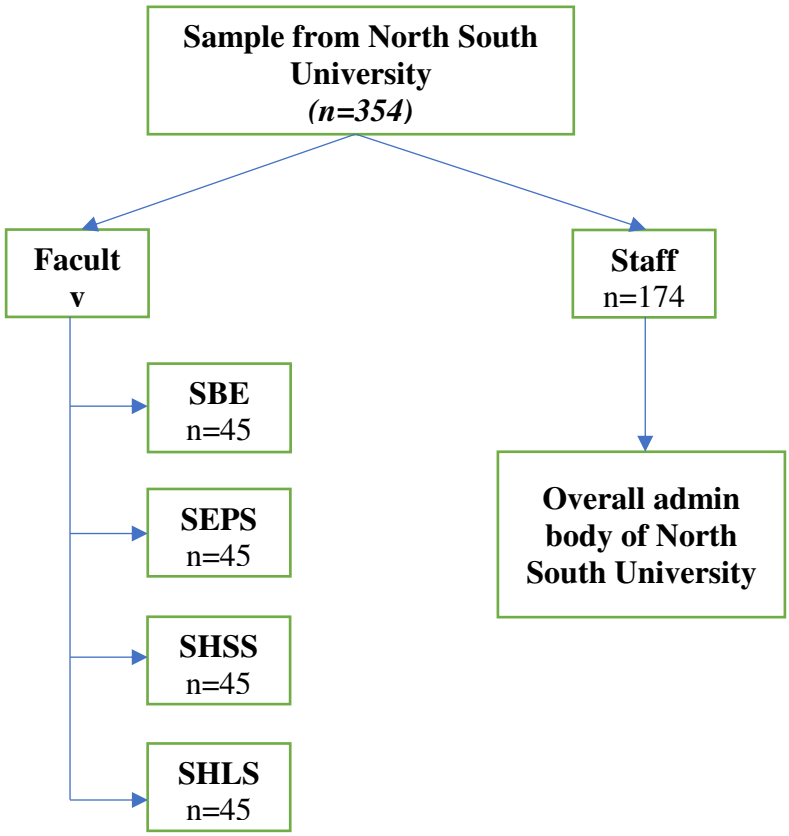
3.10 Sampling method:

A nonrandom quota sampling technique will be applied for this study. Participants will be recruited with reasonable representation from each faculty and work unit.

To collect data from the participants, we will enroll 354 respondents (180 faculty members and 174 staff) from North South University. Respondents will be equally distributed across the faculty and work unit.

The number of respondents selected is shown in the flow chart below---

Flow Chart: Sample distribution



NSU= North South University, SBE= School of Business & Economics, SEPS= School of Engineering & Physical Science, SHSS= School of Humanities & Social Science, SHLS= School of Health & Life Science

3.11 Data collection tools:

An interviewer-administered questionnaire will be developed to collect data from selected faculty and staff of North South University. Firstly, the questionnaire will be developed in English and translated into Bengali. We will use the DEQ5 scale for Dry Eye Disease, which is standard for global use.

3.12 Data management & analysis plan:

After data collection, all interviewed questionnaires will be checked by the editor for their completeness, correctness, and internal consistency to exclude missing or inconsistent data, which will be discarded. Correct data will be entered into the computer, and the data will be analyzed using statistical software, namely R (version 4.2.1) for data entry we will use IBM SPSS version 25.

Univariate analysis for quantitative data will be measured in terms of central tendency (mean and median) and dispersion (standard deviation (SD) and interquartile range (IQR)). And the categorical data will be measured as frequency and percentage. We will conduct bivariate analysis by t-test/ANOVA and chi-square test to analyze the association between different outcomes and independent variables. Bivariate and multivariable logistic regression will be used to identify the magnitude of association between dependent and independent variables. Factors significant at $p \leq 0.20$ level in the univariate logistic regression analysis will be included in the multivariable logistic regression analysis that will be carried out to identify the net association of the factors associated with the risk of any outcomes. Before running multivariate logistic regression analysis, multicollinearity will be checked between any two independent variables that will be significant at the 10% level in the bivariate analysis. We will perform binary logistic regression to calculate the odds ratios (ORs) and the corresponding 95% confidence intervals (95% CIs) used as indicators of the strength of association. All tests will be two-sided; $p \leq 0.05$ will be considered statistically significant.

3.13 Quality Control & Quality Assurance

Follow the standard research protocol and guidelines of North South University under the supervision of the Department of Public Health and it will be implemented to report writing. The supervisor and Co-supervisor will maintain their regular help and provide adequate knowledge and support for this study. The data collection questionnaire will be translated and simplified and rechecked by the supervisor and data will be monitored. For maintaining confidentiality all the data will be stored in a password-protected device and the authorized team will access the data. Data quality and data accuracy would be highly inspected by the research personnel during data coding and cleaning.

3.14 Ethical consideration:

One of the most critical parts of conducting research is to have certain ethical considerations. Ethical considerations are a set of principles that direct the research design and practices. For the manual phase of this research, permission will be taken from the Institutional Review Board (IRB) of North South University. Approval for data collection from our specific study site will be approached for permission. Every participant in this study will be described the study objective before data collection and their privacy and all confidentiality will be highly ensured. Every participant will give their written and verbal consent for this study, and they will cancel the interview at any moment.

3.15 Expected Outcome:

The prevalence of myopia and dry eye disease among the university faculty members and staff will be determined from this study and identified morbidities and comorbidities associated with myopia and dry eye disease. The duration of Digital Devices using time associated with Myopia and Dry Eye Disease among the Digital Device users of university faculty members and staff will be measured.

3.16 Work plan:

Activities	September 2022		October 2022		November 2022		December 2022		January 2023	
Literature Review & Study Design										
Proposal Development & Approval										
Data Collection Tools & Questionnaire Preparation										
Data Collection										
Data Entry										
Data Analysis										
Report Writing										
Submission & Approval of Report										

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APPENDICES

APPENDIX-A

Inform Decision Making Consent Form

Serial No…… **Date** ……

Name of Respondent ……

I, **Md Tamzid Hasan**, student of MPH program of North South University, am conducting research on "**Prevalence of Myopia and Dry Eye Disease among the Digital Device Users of Faculty Members and Staff of North South University"**

As a part of this study, your participation would be highly appreciated and would contribute a lot to this research study. You will be asked to answer several questions. Your identity will not be disclosed and will be kept confidential.

Your participation in this study will not involve any inconvenience or risks. If any questions asked to you during the study poses embarrassment or discomfort, you are free to refuse to answer those questions. Your participation is voluntary. Refusal to participate or withdrawal of your consent or discontinuing participation in the study will not result in any penalty or loss of benefits. The results of this study will be presented anonymously.

North South University has reviewed and approved the procedures of this study. If you have any questions about this study, you should feel free to ask now or anytime throughout the study. If you have understood the nature of the study and have agreed to participate, please sign in the place, indicated below. Thanking you,

……... ……

Participant's signature & date **Investigator's signature & date**

Appendix-B

CONSENT FORM (BENGALI)

কোডঃ.....

তারিখঃ.....

নামঃ.....

প্রিয় সুহৃদ, **মোঃ তামজীদ হাসান,** নর্থ সাউথ বিশ্ববিদ্যালয়ের এমপিএইচ প্রোগ্রামের ছাত্র । আমি একটি গবেষণা কর্ম করছি যার শিরোনাম হল "**Prevalence of Myopia and Dry Eye Disease among the Digital Device Users of Faculty Members and Staff of North South University**" । আমি আপনাকে এই গবেষণায় অংশগ্রহণের আমন্ত্রণ জানাচ্ছি। আপনাকে উক্ত গবেষণা কর্মে কিছু প্রশ্নের উত্তরও দিতে হবে যা এই ফর্মে উল্লেখ করা আছে।

আমি আপনাকে জানাতে চাই যে এটি সম্পূর্ণরূপে একটি একাডেমিক গবেষণাকর্ম এবং আপনার প্রদত্ত তথ্য সমূহ অন্য কোন উদ্দেশে ব্যবহৃত হবে না। আপনার নাম প্রকাশনায় গোপন থাকবে।

এই গবেষণা কর্মে আপনার অংশগ্রহণ ঐচ্ছিক এবং গবেষণাকর্মের যেকোন সময় এতে অংশ নেয়া থেকে বিরত থাকতে পারবেন। ইন্টারভিউ চলাকালীন কোন নির্দিষ্ট প্রশ্নের উত্তর না দিতে চাইলে, প্রশ্নের উত্তর না দেয়ার অধিকার আপনি সংরক্ষণ করেন।

আমি আপনার সহযোগিতায় কৃতজ্ঞ থাকব। আপনি যদি গবেষণায় যোগ দিতে সম্মত হন, তবে অনুগ্রহ পূর্বক নির্দিষ্ট স্থানে স্বাক্ষর করুন।

তথ্য গ্রহণকারীর স্বাক্ষর ও তারিখঃ .....

গবেষণায় অংশগ্রহণকারীর স্বাক্ষর ও তারিখঃ .....

Appendix-C

Questionnaire – English

Name:

Identification No:

Department:

*******Are you suffering from any of the following problems?***

		Yes	No
1	Gross lid abnormalities		
2	Life-threatening systemic disease		
3	Extra and intraocular surgery within the last six months		

PART A: Socio-demographic information

1. What is your age (in years)?

   …… Years

2. Where is your home district?

   ……

3. What is your status in university?

1	Student	
2	Faculty	
3	Administration	
4	Others	

4. What is your highest education level?

1	Graduation	
2	Post-Graduation	
3	PhD	
4	Others (specify):	

5. What is your father´s education level?

1	Primary Education	
2	Secondary Education	
3	Higher Education	
4	No Education	

6. What is your father´s occupation?

1	Government Job	
2	Private Job	
3	Business	
4	NGO	
5	Other (Specify):	

7. What is your mother´s education level?

1	Primary Education	
2	Secondary Education	
3	Higher Education	
4	No Education	

8. What is your mother´s occupation?

1	Government Job	

2	Private Job	
3	Business	
4	NGO	
5	Housewife	
6	Other (Specify):	

9. What is your (faculty/administration/other) or your family's (student) monthly income?

…… (In Taka)

10. What is your marital status?

1	Married	
2	Widowed	
3	Separated/Divorced	
4	Unmarried (skip to question 13)	

11. How many children do you have?

……

12. Are you currently pregnant?

1	Yes	
2	No	
3	Not Applicable	

13. What type of family do you live in?

1	The nuclear family (With your husband and children only)	
2	Joint Family (With your brother and sisters-in-law)	

3	Extended family (With your father and mother-in-law)	
4	Other (specify):	

14. How is the financial condition of your family?

1	Very much solvent	
2	Quite solvent	
3	Fairly solvent	
4	Poor/ Ill-off	
5	Not Applicable	

15. To your knowledge, are you suffering from any of the following problems?

		Yes	**No**
1	Hypertension	1	2
2	Diabetes Mellitus	1	2
3	Acute ocular infections	1	2
4	Allergic Conjunctivitis	1	2
5	Others (specify):		

16. Systemic medication history is known to cause dry eyes and steroid use history.

		Yes	**No**
1	Antihistamine	1	2
2	Anticholinergic	1	2
3	Topical steroids	1	2
5	Anti-glaucoma	1	2
6	Others (specify):		

17. Do you have to continue any ocular treatment within the last six months?

Yes ☐ **No** ☐

PART B: Myopia Questionnaire

Domain 1: Refractive Errors

18. Are you wearing glasses?

Yes ☐ **No** ☐

If "Yes"

What is the purpose of wearing glasses?

1	Cosmetic Use	
2	Refractive Error	
3	Therapeutical	

19. Are you wearing contact lenses?

Yes ☐ **No** ☐

If "Yes"

What is the purpose of wearing glasses?

1	Cosmetic Use	
2	Refractive Error	
3	Therapeutical	

What type of contact lens do you use?

1	Soft	
2	RGP	
3	Therapeutic	

20. Pattern of your refractive error

1	Myopia	
2	Hypermetropia	
3	Astigmatism	

Glasses Rx

	Sph	**Cyl**	**Axis**	**Add**	**PD**
OD					
OS					

Domain 2: Family History

21. Parental myopia history

Yes ☐ **No** ☐

If "Yes"

1	Father has myopia	
2	Mother has myopia	
3	Both have myopia	

22. Is there a family member with previous ocular history?

		Yes	**No**
1	Glaucoma	1	2
2	Cataract	1	2
3	Retinal Disease	1	2
4	Keratoconus	1	2
5	Other (Specify)	1	2

Domain 3: Near Work (multiple answers available)

23. Gadgets available at your home

1	Computer or Laptop	
2	Internet Access	
3	Tablet	
4	Mobile	

24. Time to spend doing near work (daily)

		(1-3) hrs	**(3-5) hrs**	**5 hrs>**
1	Duration of laptop use			
2	Duration of tablet use			
3	Duration of mobile use			
4	Social media use			
5	Duration of playing games on mobile			
6	Duration of the device used in the darkroom			

25. Do you or your parents have concerns about the near work-induced myopia?

1	Near work can induce myopia	
2	Face close to the book while reading	
3	Face close to the book while writing	

Domain 4: Outdoor activities

26. Duration of outdoor activities on weekdays

…… (in hours)

27. Duration of outdoor activities on holidays/weekend

…… (in hours)

28. Types of outdoor activities (multiple answers available)

1	Exercise/GYM	
2	Jogging	
3	Swimming	
4	Cycling	
5	Running	
6	Playing sports (Football, Cricket, Badminton, etc)	
7	Participate in religious activities	
8	Others	

PART C: DEQ 5 for Dry Eye Disease (DED) questionnaire

Questions about "Eye Discomfort"

29. During a typical day in the past month, how often did your eyes feel discomfort?

Never	**Rarely**	**Sometimes**	**Frequently**	**Constantly**
0	1	2	3	4

30. When your eyes felt discomfort, how intense was this feeling of discomfort at the end of the day, within two hours of going to bed?

Never have it					**Very intense**
0	1	2	3	4	5

Questions about "Eye Dryness"

31. During a typical day in the past month, how often did your eyes feel dry?

Never	Rarely	Sometimes	Frequently	Constantly
0	1	2	3	4

32. When your eyes felt dry, how intense was this feeling of dryness at the end of the day, within two hours of going to bed?

Never have it					Very intense
0	1	2	3	4	5

Questions about "Watery Eyes"

33. During a typical day in the past month, how often did your eyes look or feel excessively watery?

Never	Rarely	Sometimes	Frequently	Constantly
0	1	2	3	4

Score	Q. 29	Q. 30	Q. 31	Q. 32	Q. 33	Total

Appendix-D

Questionnaire – বাংলা

নামঃ

পরিচিতি নাম্বারঃ

ডপিার্টমন্েটঃ

আপনার নিম্নোলিখিত কোনো দীর্ঘমেয়াদী রোগ আছে কি?

		হ্যাঁ	না
১	শেষ ৬ মাসে এক্সট্রা ও ইন্ট্রাওকুলার অপারেশন হয়েছে কিনা		
২	গ্রস লিড অ্যাবনর্মালিটিস		
৩	জীবন হুমকি নাশক সিস্টেমিক রোগ		

ক বিভাগঃ RbwgwZ msµvš— Z_¨

১। আপনার বয়স কত?

…….

২। আপনার নিজ জেলা কোথায়?

…….

৩। আপনি কোন পেশায় নিয়োজিত আছেন?

১	ছাত্র	
২	ফ্যাকাল্টি	
৩	প্রশাসনিক	
৪	অন্যান্য	

৪। আপনার সর্বোচ্চ শিক্ষাগত যোগ্যতা কি?

১	গ্রাজুয়েশন	
২	পোস্ট-গ্রাজুয়েশন	
৩	পিএইচডি	
৪	অন্যান্য	

৫। আপনার পিতার সর্বোচ্চ শিক্ষাগত যোগ্যতা কি?

১	প্রাথমিক শিক্ষা	
২	সেকেন্ডারী শিক্ষা	
৩	উচ্চতর শিক্ষা	
৪	শিক্ষা নেই	

৬। আপনার পিতার পেশা কি?

১	সরকারী চাকুরী	
২	বেসরকারী চাকুরী	
৩	ব্যাবসা	
৪	এন জি ও	
৫	অন্যান্য	

৭। আপনার মাতার সর্বোচ্চ শিক্ষাগত যোগ্যতা কি?

১	প্রাথমিক শিক্ষা	
২	সেকেন্ডারী শিক্ষা	
৩	উচ্চতর শিক্ষা	
৪	শিক্ষা নেই	

৮। আপনার মাতার পেশা কি?

১	সরকারী চাকুরী	
২	বেসরকারী চাকুরী	
৩	ব্যাবসা	
৪	এন জি ও	
৫	গৃহিনী	
৬	অন্যান্য	

৯। আপনার অথবা আপনার পরিবারের মাসিক আয় কত?

..... (টাকা)

১০। আপনার বৈবাহিক অবস্থা কি?

১	বিবাহিত	
২	বিধবা	
৩	বিবাহবিচ্ছেদ/তালাক	
৪	অবিবাহিত (১৩ নং প্রশ্নে যান)	

১১। আপনার সন্তান সংখ্যা কতজন?

.....

১২। আপনি কি বর্তমানে গর্ভবতী?

১	হ্যাঁ	
২	না	
৩	প্রযোজ্য নয়	

১৩। আপনি কিরূপ পরিবারে বাস করেন?

১	একক পরিবার (স্বামী ও সন্তানসহ)	
২	যৌথ পরিবার (ভাসুর-দেবর ও ননদ সহ)	
৩	যৌথ পরিবার (শ্বশুর-শ্বাশুড়ি সহ)	
৪	অন্যান্য	

১৪। আপনার পরিবারের অর্থনৈতিক অবস্থা কিরূপ?

১	অনেক বেশি সচ্ছল	
২	বেশ সচ্ছল	
৩	মোটামুটি সচ্ছল	
৪	অসচ্ছল	
৫	প্রযোজ্য নয়	

১৫। আপনার জানামতে আপনার নিম্নোলিখিত কোনো রোগ আছে কি?

		হ্যাঁ	না
১	অ্যালার্জিক কনজাঙ্কটিভাইটিস	১	২
২	অ্যাকিউট ওকুলার ইনফেকশন	১	২
৩	ডায়াবেটিস মেলিটাস	১	২
৪	হাইপারটনেশন	১	২
৭	অন্যান্য		

১৬। এমন কোন পদ্ধতিগত ঔষধ সেবন করা হয় যার জন্য চোখ শুষ্ক হয় এবং তার জন্য স্টেরয়েড ব্যাবহার করা হয় কিনা

		হ্যাঁ	না
১	অ্যান্টিহিস্টামাইন	১	২

২	অ্যান্টিকোলিনার্জিক	১	২
৩	টোপিক্যাল স্টেরয়েড	১	২
৫	অ্যান্টি-গ্লুকোমা	১	২
৬	অন্যান্যঃ		

১৭। শেষ ছয় মাস ধরে আপনার চোখের কোন চিকিৎসা চলতেছে কিনা?

হ্যাঁ ☐ **না** ☐

খ বিভাগঃ মাইওপিয়া সংক্রান্ত তথ্য

ডোমেইন ১ঃ রিফ্রাক্টিভ এরোর

১৮। আপনি কি চশমা পড়েন?

হ্যাঁ ☐ **না** ☐

যদি হ্যা হয়-

চশমা পরার কারন কি?

১	কসমেটিক হিসেবে	
২	রিফ্রাক্টিভ এরোর	
৩	থেরাপিউটিক্যাল	

১৯। আপনি কন্টাক্ট লেন্স পরেন?

হ্যাঁ ☐ **না** ☐

যদি হ্যা হয়-

কন্টাক্ট লেন্স পরার কারন কি?

১	কসমেটিক হিসেবে	
২	রিফ্রাক্টিভ এরোর	
৩	থেরাপিউটিক্যাল	

কোন ধরনের কন্টাক্ট লেন্স ব্যবহার করেন?

১	সফট	
২	আর জি পি	
৩	থেরাপিউটিক	

২০। রিফ্র্যাক্টিভ এরোর এর প্যাটার্ন

১	মাইওপিয়া	
২	হাইপারমেট্রোপিয়া	
৩	অ্যাস্টিগমাটিজম	

Glasses Rx

	Sph	**Cyl**	**Axis**	**Add**	**PD**
OD					
OS					

ডোমেইন ২ঃ পারিবারিক তথ্য

২১। পিতামাতার মাইওপিয়া আছে কি না

হ্যাঁ ☐ **না** ☐

যদি হ্যা হয়-

১	পিতার মাইওপিয়া আছে	
২	মাতার মাইওপিয়া আছে	
৩	দুইজনেরই আছে	

২২। পরিবারের কারো পূর্ব থেকেই ওকুলার হিস্টরি আছে কিনা?

		হ্যাঁ	না
১	গুলুকোমা	১	২
২	ক্যাটার‍্যাক্ট	১	২
৩	রেটিনাল ডিজিস	১	২
৪	কেরাটোকোনাস	১	২
৫	অন্যান্য	১	২

ডোমেইন ৩ঃ নিকটবর্তী কাজ (একাধিক উত্তর গ্রোহনযোগ্য)

২৩। কোন ধরনের গ্যাজেট বাসায় আছে

১	কম্পিউটার/ল্যাপটপ	
২	ইন্টারনেট	
৩	ট্যাবলেট ডিভাইস	
৪	মোবাইল	

২৪। প্রতিদিন কতক্ষন সময় ব্যয় করা হয়

	(১-৩) ঘন্টা	**(৩-৫) ঘন্টা**	**৫ ঘন্টা>**

১	ল্যাপটপ ব্যাবহারের সময়			
২	ট্যাবলেট ডিভাইস ব্যাবহারের সময়			
৩	মোবাইল ব্যাবহারের সময়			
৪	সোশ্যাল মিডিয়া			
৫	মোবাইল গেমস			
৬	অন্ধকার কক্ষে ডিভাইস ব্যাবহারের সময়			

২৫। ডিভাইস নিকটবর্তী কাজ মাইওপিউয়াকে প্রভাবিত করে, এই সম্পর্কে অবগত কিনা?

১	নিকটবর্তী কাজ মাইওপিউয়াকে প্রভাবিত করে	
২	পড়ার সময় মুখ বইয়ের খুব কাছে রাখেন	
৩	লেখার সময় মুখ খুব কাছে রাখেন	

ডোমেইন ৪ঃ আউটডোর অ্যাক্টিভিটিস

২৬। প্রতিদিন কতক্ষন আউটডোর অ্যাক্টিভিটিস করা হয়

.....(ঘন্টা)

২৭। ছুটির দিন কতক্ষন আউটডোর অ্যাক্টিভিটিস করা হয়

.....(ঘন্টা)

২৮। কোন ধরনের আউটডোর অ্যাক্টিভিটিস করা হয়

১	অনুশীলন/জিম	
২	হাটা	
৩	সাতার	
৪	সাইক্লিং	

৫	দৌড়	
৬	খেলাধুলা (ফুটবল, ক্রিকেট, ব্যাডমিন্টন, ইত্যাদি)	
৭	ধর্মীয় অনুষ্ঠানে অংশগ্রহন	
৮	অন্যান্য	

গ বিভাগঃ <u>DEQ 5- DED সংক্রান্ত তথ্য</u>

"Eye Discomfort" সংক্রান্ত প্রশ্ন

২৯। গতমাসে একটি সাধারন দিনে আপনার চোখ কতবার অস্বস্তি অনুভব করেছিল?

কখনই না	**কদাচিৎ**	**কখনও কখনও**	**ঘন ঘন**	**ক্রমাগত**
০	১	২	৩	৪

৩০। যখন আপনার চোখে অস্বস্তি অনুভূত হয়, তখন ঘুমানোর দুই ঘন্টার মধ্যে দিনের শেষে এই অস্বস্তি অনুভূতি কতটা তীব্র ছিল?

কখনই নেই					**খুবই তীব্র**
০	১	২	৩	৪	৫

"Eye Dryness" সংক্রান্ত প্রশ্ন

৩১। গতমাসে একটি সাধারন দিনে আপনার চোখ কতবার শুকিয়ে গিয়েছিল?

কখনই না	**কদাচিৎ**	**কখনও কখনও**	**ঘন ঘন**	**ক্রমাগত**
০	১	২	৩	৪

৩২। যখন আপনার চোখে শুষ্ক অনুভূত হয়, তখন ঘুমানোর দুই ঘন্টার মধ্যে দিনের শেষে এই শুষ্কতা অনুভূতি কতটা তীব্র ছিল?

কখনই নেই					**খুবই তীব্র**
০	১	২	০	১	২

"Watery Eyes" সংক্রান্ত প্রশ্ন

৩৩। গতমাসে একটি সাধারন দিনে আপনার চোখ কতক্ষন অতিরিক্ত জল অনুভব করত?

কখনই না	**কদাচিৎ**	**কখনও কখনও**	**ঘন ঘন**	**ক্রমাগত**
০	১	২	৩	৪

স্কোর	**প্রশ্ন ২৯**	**প্রশ্ন ৩০**	**প্রশ্ন ৩১**	**প্রশ্ন ৩২**	**প্রশ্ন ৩৩**	**মোট**