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REPUBLIC OF TURKEY
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PREVALENCE OF VISUAL IMPAIRMENT AMONG PEOPLE AGED 50 YEARS AND OLDER AND RELATED FACTORS IN NANGARHAR PROVINCE OF AFGHANISTAN

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Program of Epidemiology

DOCTOR OF PHILOSOPHY THESIS

ANKARA

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This study has been approved and accepted as a PhD dissertation in the program of "Epidemiology" by the examining committee, whose members are listed below, on 19.12.2017.

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This dissertation has been approved by the committee above in conformity to the regulations and by laws of Hacettepe University Graduate Programs.

13 Şubat 2018

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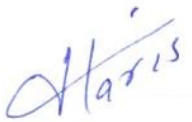
In this thesis study, I declare that all the information and documents have been obtained in the base of the academic rules and all audio-visual and written information and results have been presented according to the rules of scientific ethics. I did not do any distortion in data set. In case of using other works, related studies have been fully cited in accordance with the scientific standards. I also declare that my thesis study is original except cited references. It was produced by myself in consultation with supervisor Prof. Dr. Bahar (GÜÇİZ) DOĞAN and written according to the rules of thesis writing of Hacettepe University Institute of Health Sciences .



Mohammad Haris ABDIANWALL

AKNOWLEDGEMENT

I would like to acknowledge the following persons and institutions for their support during my whole academic period:

- Prof. Dr. Bahar Güçiz Doğan, my academic supervisor, for her guidance and timely responses during the entire study period.
- Prof. Dr. Aysun İdil and Doç. Dr. Umut ARSLAN, as my thesis monitoring committee members, for their valuable and corrective suggestion and advices during analysis and writing the final report.
- All Professors, Associates and Assistants along with the administrative staffs of Institute of Health Science, Public Health Institute, Public Health Department of Medical Faculty, as well as Biostatistics Department of Hacettepe University, for their nice lectures, workshops, seminars and creation of friendly environment.
- My sponsors University of Nangarhar, Ministry of Higher Education of Afghanistan for the scholarship.
- All my colleagues in the Ophthalmology Department of Nangarhar University Hospital for their hard working for compensating my absence during my education period in Turkey.
- Local administration of Public Health and Municipal Department of Nangarhar Province for their support and providing facilities during data collection in the field work.
- All friends participated in hot summer days of field work.
- All participants of my thesis study.
- Alhaj Jalalluddin Iqbal for his unlimited and any kind of support of my family and me during the five year period of academic years.
- My parents and wife for their patience and prayers during my education period. The work of the thesis is dedicated to my parents and wife.

ABSTRACT

Abdianwall, M. H. Prevalence of Visual Impairment among People Aged 50 Years and Older and Related Factors In Nangarhar Province of Afghanistan, Hacettepe Unıversity, Institute of Health Science, Epidemiology Program Doctor of Philosophy Thesis, Ankara, 2018. The study was aimed to determine the prevalence, main causes, and related factors of visual impairment among 50 years and over population in Jalalabad City and four surrounding districts, Nangarhar Province of Afghanistan. The data of this population based cross-sectional study was gathered in the year 2015. The sample size was calculated as 1,353 and allocated to urban and rural strata using probability proportion to size method. Visual impairment was defined as presenting visual acuity of less than 6/18 and blindness as visual acuity less than 3/60 in the better eye by using Snellen chart only. Data was analyzed using IBM SPSS 21.0 computer software program. At the end of the field study, 1,281 eligible completed the interview and eye examination. The prevalence of visual impairment was 22.6% (95% CI, 20–25) of which 13.9% (95% CI, 12–16) was low vision and 8.7% (95% CI, 7–10) was blindness. The most common causes of the visual impairment were cataract (52.8%), followed by refractive error (RE) (26.9%) and glaucoma (8.6%). Number one cause of the low vision was RE (42%), followed by cataract, glaucoma, age related macular degeneration (AMD) and diabetic retinopaty (DR), while for blindness cataract (72%), other posterior segment disorders, glaucoma, RE and AMD. Illiteracy, bad economic status, hypertension and overweight were factors independently associated with both visual impairment and low vision, whereas, age, illiteracy, bad economic status, hypertension and using of sunglasses were independently associated with blindness. Cataract, RE, glaucoma, AMD and DR were the leading causes of visual impairment and blindness in the study area, which are avoidable mostly. For decreasing the burden of visual impairment and blindness, applying already developed policies concerning prevention of visual impairment and blindness is strongly recommended for the area as well as the whole country.

Keywords: Prevalence, visual impairment, blindness, Afghanistan

ÖZET

Abdianwall, M. H. Afganistan'ın Nangarhar Eyaleti'nde 50 Yaş ve Üstü Kişilerde Görme Yetersizliği Prevalansı ve İlişkili Faktörler, Hacettepe Üniversitesi, Sağlık Bilimleri Enstitüsü, Epidemiyoloji Programı Doktora Tezi, Ankara, 2018. Bu çalışma, Afganistan'ın Nangarhar Eyalet'inde yer alan Jalalabad kent merkezinde ve çevresinde yer alan dört kırsal bölgede yaşayan 50 yaş üstü kişilerde görsel yetersizlik prevalansı, temel nedenleri ve ilişkili faktörleri belirlemek amöacıyla yapımıştır. Toplum tabanlı kesitsel bir araştırma olan çalışmanın verileri 2015 yılında toplanmıştır. Örnek büyüklüğü 1.353 olarak hesaplanmış ve büyüklüğe orantılı olarak kent ve kır tabalalarına dağıtılmıştır. Görsel yetersizlik, Snellen eşeli kullanılarak, görme keskinliğinin iyi olan gözde 6/18'den düşük olması şeklinde, körlük ise 3/60'tan düşük olması şeklinde tanımlanmıştır. Veriler IBM SPSS 21.0 bilgisayar programı kullanılarak analiz edilmiştir. Saha çalışmasının sonunda, kriterlere uygun olan 1,281 kişi ile görüşülmüş ve göz muayeneleri yapılmıştır. Görsel yetersizliği prevalansı %22.6 (%95 GA, 20–25) olarak saptanmış olup, %13.9'u (%95 GA, 12–16) az görme, %8.7'si (%95 GA, 7–10) körlüktür. Görsel yetersizliğin en sık görülen nedeni katarakt olup (52.8%), bunu kırma kusuru (KK) (26.9%) ve glokom (8.6%) izlemektedir. Az görmenin ilk sıradaki nedeni KK'dir (42%) ve katarakt, glokom, yaşa bağlı maküler dejenerasyon (YBMD) ve diyabetik retinopati (DR) bunu izlemektedir; körlük nedenleri ise sıarsıyla, katarakt (72%), diğer posterior segment bozuklukları, glokom, KK and YBMD'dir. Lojistik regresyon analizi sonunda, okuryazar olmamak, ekonomik durumun kötü olması, hipertansiyon ve fazla kilolu olma hem görsel yetersizlk, hem de az görme için bağımsız ilişkili faktörlerdir. Yaş, okuryazar olmama, ekonomik durumun kötü olması, hipertansiyon ve güneş gözlüğü kullanmama ise körlük ile ilişkili faktörler olarak bulunmuştur. Çalışma bölgesi için katarakt, glokom, YBMD ve DR çoğunlukla önlenebilir görsel yetersizlik ve körlük nedenleridir. Bütün ülkede olduğu gibi, bölgede de görsel yetersizlik ve körlüğün hastalık yükünü azaltabilmek için bu hastalıkların önlenmesi amacıyla halen var olan politikaların uygulanması önerilmektedir.

Anahtar kelimeler: Prevalans, görsel yetersizlik, körlük, Afganistan

CONTENTS

ABREVATIONS

AFR	African Region
AMD	Age-related Macular Degeneration
AMR	American Region
ANC	Anti Natal Care
ARED	Age Related Eye Disease
BA	Bronchial Asthma
BHC	Basic Health Center
BMI	Body Mass Index
BPHS	Basic Package of Health Services
CDC	Chronic Dacryo-Cystitis
CHC	Comprehensive Health Center
CO	Corneal Opacity
COPD	Chronic Obstructive Pulmonary Disease
CSR	Cataract Surgical Rate
DATC	Drug Addicted Treatment Center
DDOE	Distant Direct Ophthalmoscopic Examination
DH	District Hospital
DM	Diabetes Mellitus
DR	Diabetic Retinopathy
EMR	Eastern Mediterranean Region
EUR	European Region
FFA	Fundus Fluorescein Angiography
GDMA	Global Digital Mapping Alliance
GDP	Gross Domestic Product
HP	Health Post
HSC	Health Sub Center
HTN	Hypertension
IAM	International Assistance Mission
ICD	International Classification of Diseases
IHD	Ischemic Heart Disease
ILO	International Labor Organization

IOFB	Inter Ocular Foreign Body
IOP	Intra Ocular Pressure
MHT	Mobile Health Team
MMR	Maternal Mortality Ratio
MoHE	Ministry of Higher Education
MoPH	Ministry of Public Health
NCD	Non Communicable Disease
NGOs	Non-Government Organizations
NIC	National Identification Card
NRVA	National Risk and Vulnerability Assessment survey of Afghanistan
NSH	National Specialty Hospital
OHA	Oral Hypoglycemic Agent
OPD	Out Patients Department
PH	Provincial Hospital
RAAB	Rapid Assessment of Avoidable Blindness
RE	Refractive Error
RH	Regional Hospital
RVC	Retinal Vein Occlusion
SEAR	South-East Asia Region
SES	Socio Economic Status
TISA	Transitional Islamic State of Afghanistan
UNESCO	According to the United Nations Educational, Scientific and Cultural Organization
VA	Visual Acuity
WHO	World Health Organization
WPR	Western Pacific Region

FIGURES

TABLES

1 INTRODUCTION

1.1 Rationale

In 2010, the visual impairment and blindness was estimated to be 285 million globally. 65% of the global visual impairment was among people aged 50 years and over. 246 million of visual impairment was estimated to have low vision and 39 million was blind. 63% of low vision and 82% of blind people were aged 50 years and over (1).

Visual impairment is unequally distributed in the World Health Organization (WHO) regions with the lowest rates in the Americas and Europe (29.1 and 31.7 cases per thousand population respectively), the WHO African and Western Pacific (without China) regions have 32.7 and 33.3 cases per thousand, while the highest rates are found in the WHO Eastern Mediterranean, with 40.5 per thousand, and South-East Asia Region (without India) with 48.2 per thousand. India has 53 cases of visual impairment per thousand population while China has 55.4 per thousand (2, 3).

More than 90% of the world's visually impaired people live in developing countries, 60% of them comprised by China, India and Sub-Saharan Africa and the vast majority of them in rural areas of the least-developed countries (4-6). The prevalence of visual impairment is higher in almost all developing countries.

Women compare to men are more likely to become visually impaired or blind even after controlling for age. In every region of the world, some studies are indicative of high prevalence of visual impairment among women. Male/female ratios range from 1.5 to 2.2 (4, 7). Longer life expectancy, poor socioeconomic status and limited access to the eye care services are suggested as probable reasons for high prevalence of blindness and visual impairment (4).

Globally, the main causes of visual impairment are uncorrected Refractive Error (RE) accounting for an estimated 43% of all cases, and cataract which accounts for an estimated 33% of cases. Other causes of visual impairment include glaucoma (causing an estimated 2% of cases), Diabetic Retinopathy (DR), trachoma, Age-related Macular Degeneration (AMD), and Corneal Opacity (CO) accounting for around 1% of cases each. Undetermined causes of visual impairment are 18% (1). Cataract is the cause of an estimated 51% of all cases of blindness, glaucoma causing

8% of cases, AMD 5%, CO and childhood blindness 4% each, trachoma and uncorrected RE 3% each, DR 1%, and 21% of causes are undetermined (1).

In developed countries, vision loss is to a great extent related to the aging process. Although cataract is still an important cause of vision loss, the leading cause of profound vision loss in North America and other developed countries are AMD, DR, and glaucoma. Other causes are herpes simplex keratitis, retinal detachment, retinal vascular disorders, and inherited retinal degenerative disorders. In developing countries, cataract is the leading cause of blindness, followed by glaucoma, infection diseases (trachoma, leprosy, Onchocerciasis), injuries and xerophthalmia. Corneal scar is a significant cause of monocular vision loss in the developing world (8).

Even though, the primary eye care has recently been placed in the second revision of Basic Package of Health Services (BPHS) (9), still integration of primary eye care in primary health care remained in policy level. Eye care services are delivered only in tertiary level or in regional hospitals (RH).

Eye care services available in 12 out of 34 provinces which are limited just in provincial capital and people living in the rural districts have very less access to the eye care services. To provide eye care services for people who are living in rural districts far from the provincial center, the Ministry of Public Health (MoPH) and Non-Government Organizations (NGOs) organized outreach surgical eye camps on a temporary basis. However, security concerns have stopped International Assistant Mission (IAM) from further implementation of such services. They did not provide such services since 2010.

For designing of meaningful preventive and curative strategies, it is very important to identify the prevalence of visual impairment, relative factors, and main causes of the visual impairment for each geographical location. Therefore, a population based cross sectional study was designed to determine the prevalence of visual impairment, main causes of visual impairment, and factors related to the visual impairment in one province in Afghanistan.

1.2 Aim and Objectives

The aim of the study is to determine the prevalence of visual impairment, related factors of visual impairment as well as five main causes of visual impairment, which are; RE, Cataract, Glaucoma, AMD, and DR.

1.2.1 Short-term Objectives

- To determine the prevalence of visual impairment
- To determine the five main causes (RE, Cataract, Glaucoma, AMD, and DR) of visual impairment.
- To determine factors related to visual impairment (low vision and blindness)
- To determine the barriers related to low utilization of eye care services.

1.2.2 Mid-term Objectives

- To recommend a program for primary and secondary prevention of visual impairment
- To provide recommendations for elimination of barriers related to the low utilization of eye care services

1.2.3 Long-term Objectives

- To eliminate avoidable blindness in Afghanistan

2 GENERAL INFORMATION

In this chapter, anatomy of the eye, physiology of the eye, mechanism of the vision, assessment of the vision, visual impairment and its global magnitude, its economic impact, its regional distribution, its main causes and situation in Afghanistan are included.

2.1 Anatomy of the Eye

The eye is one of the most complex organs of sense in the human body. Each of the two eye located in the orbit. It is the primary organ of the vision and allows seeing and interpreting the shapes, colors, and dimensions of objects in the world by processing the light they reflect or emit. Eyes have been used in almost every activity performed either reading, working, watching television, writing a letter, driving a car or in countless other ways (8).

The shape of the eye is almost spherical, average anterior-posterior diameter is about 2.5 cm (centimeter) and it is maintained distended by its internal pressure. The volume of the eyeball is about 7cc and the space between the eye and the orbital wall filled by the fat tissue. The bony wall of the orbit and the fat helps to protect the eye from injury. Both eyes are work as a pair, however structurally they separated. It is possible to see with only one eye, but three-dimensional vision is impaired when only one eye is used especially in relation to the judgement of distance (8).

Anatomically, the eyeball is consisted of layers (outer, middle, inner), structures inside the eyeball (aqueous humour, lens and vitreous), accessory structures (eyebrows, eyelids and eyelashes, lacrimal apparatus, extraocular muscles), segments, visual pathway and orbital cavities (10).

The **first** is outer (fibrous) layer consists of three parts (8, 10, 11):

- Cornea – forms the anterior 1/6 of the fibrous layer of the eye. The transparent, ellipsoid, anterior part of the eyeball is known as the cornea. It is the main refracting surface of the eye and the dioptric power is + 43 to + 45 D.
- Sclera – or white of the eye forms the firm, fibrous outermost layer of the eye. It maintains the shape of the eye and gives attachment to the extraocular muscles. It is about 1 mm thick. The sclera becomes thin (seive-like membrane) at the site where the optic nerve pierces it. It is called Lamina cribrosa.

- Limbus – is the junction of the cornea and sclera. There is a minute arcade of blood vessels about 1 mm broad present at the limbus.

The **second** layer is middle (vascular) layer and consists of three parts, which from anterior to posterior are; iris, ciliary body and choroid (10, 11):

- Iris – is a colored, free, circular diaphragm with an aperture in the center (the pupil). It divides the anterior segment of the eye into anterior and posterior chambers which contain aqueous humour secreted by the ciliary body. It consists of endothelium, stroma, pigment cells and two groups of plain muscle fibers, one is circular (sphincter pupillae) and the other radiating (dilator pupillae).
- Ciliary – body is triangular in shape with base forwards. The iris is attached to the middle of the base. It consists of non-striated muscle fibers (ciliary muscles), stroma and secretory epithelial cells. It consists of two main parts, namely pars plicata and pars plana.
- Choroid – is a dark brown, highly vascular layer situated between the sclera and retina. It extends from the Ora serrata up to the aperture of the optic nerve in the sclera.

The **third** layer is inner (nervous) layer which is concerned with visual function and consisted of retina, optic disc and optic nerve (10, 12).

- Retina – It is composed of ten layers of nerve cells and nerve fibers lying on a pigmented epithelial layer. It lines about 3/4 of the eyeball. Macula lutea is a yellow area of the retina situated in the posterior part with a central depression called fovea centralis. It is the most sensitive part of retina.
- Optic disc – It is a circular, pink colored disc of 1.5 mm diameter. It has only nerve fiber layers so it does not excite any visual response. It is known as the blind spot.
- The optic nerve – It extends from the lamina cribrosa up to the optic chiasma. The total length of the optic nerve is 5 cm. It has four parts, namely, Intraocular (1 mm), Intra orbital (25 mm), Intraosseous (4-10 mm) and Intracranial (10 mm).

Structures inside the eyeball (10, 11, 13):

- Aqueous Humour – Both anterior and posterior chambers contain a clear aqueous humour fluid secreted into the posterior chamber by the ciliary epithelium. It passes in front of the lens, through the pupil into the anterior chamber and returns

to the venous circulation through the canal of Schlemm situated in the angle of anterior chamber (10, 11).

- Lens – is a transparent, circular, biconvex structure lying immediately behind the pupil. It is suspended from the ciliary body by the suspensory ligament or zonule of Zinn. It is enclosed within a transparent capsule (10, 11).
- Vitreous - it is a transparent, colorless, inert gel which fills the posterior 4/5 of the eyeball. It contains few hyalocytes and wandering leucocytes. It consists of 99% water, some salts and mucoproteins (11, 13).

Accessory structures of the eye: the eye is a delicate organ which is protected by several structures called eyebrows, eyelids, eyelashes and extraocular muscles.

- Eyebrows are two arched ridges of the supraorbital margins of the frontal bone. Numerous hair (eyebrows) projects obliquely from the surface of the skin. They protect the eyeball from sweat, dust and other foreign bodies (12, 13).
- The eyelids are two movable folds of tissue situated above and below the front of each eye (Figure 2.1.). There is short curved hair, the eyelashes situated on their free edges. The eyelid consists of thin covering of skin, three muscles (the orbicularis oculi, levator palpebralis superior and Müller's muscles), a sheet of dense connective tissue (the tarsal plate) and a lining of the conjunctiva (12, 13).
- Lacrimal Apparatus consists of lacrimal gland and its ducts, accessory lacrimal glands, lacrimal canaliculi, lacrimal sac and nasolacrimal duct (Figure 2.2.). The tears are secreted by the lacrimal gland and accessory lacrimal glands. They drain into the conjunctival sac by small ducts. The tears then pass into the lacrimal sac (via the two canaliculi), nasolacrimal duct and finally into the nasal cavity (inferior meatus) (4, 5).

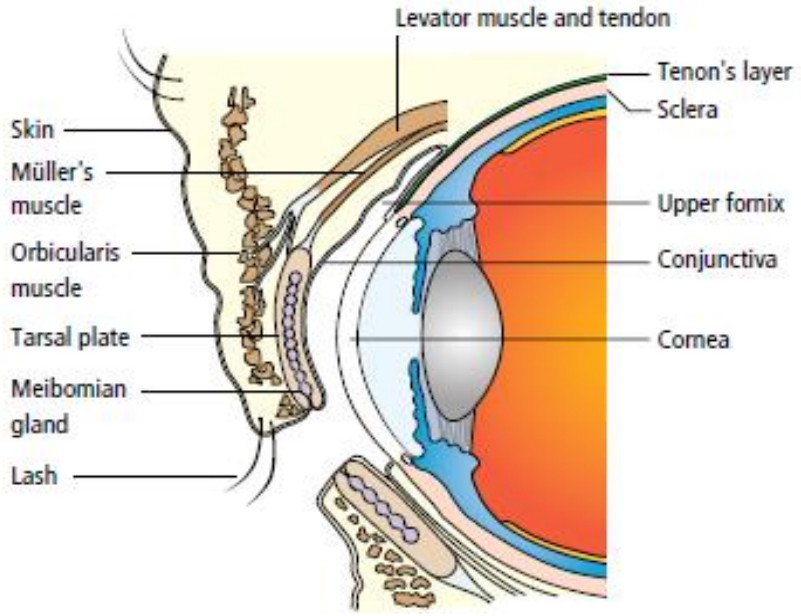


Figure 2.1. The anatomy of the eyelid (13)

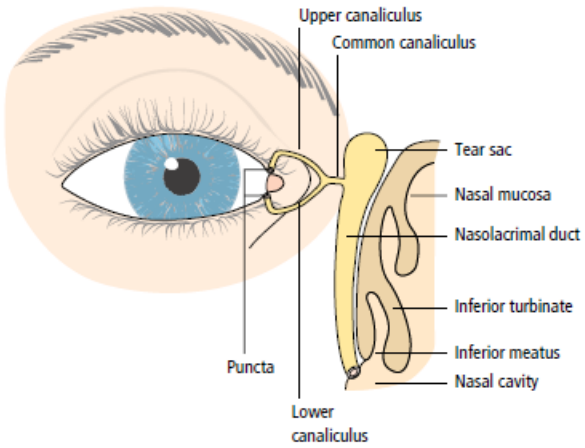


Figure 2.2. The major components of the lacrimal drainage system (13)

- Extraocular Muscles of the Eye (Figure 2.3.): Six extrinsic muscles are responsible for movement of the eyeballs. Their one end attached to the eyeball and the other to the wall of the orbital cavity. Four of them are straight and two of them are oblique in shape. Movement of the eyes to look in a particular direction is under voluntary control but co-ordination of movement needed for convergence and accommodation to near or distant vision is under autonomic

control. The medical rectus rotates the eyeball inwards, the lateral outwards, the superior upwards and the inferior downwards. Superior oblique is responsible for the rotation of the eyeball in such a direction that corneal turns in downward and outward direction and inferior oblique is responsible for turning the cornea upward and outward (10).

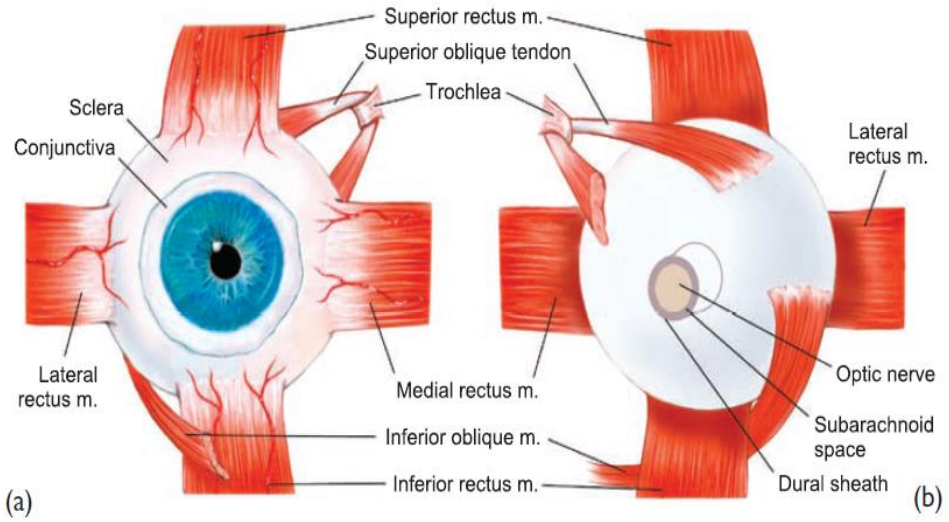


Figure 2.3. Grass anatomy of the extraocular muscles of the eye (10)

Segments of the eye: The eyeball divided into two segments, anterior and posterior (Figure 2.4.). Anterior segment includes crystalline lens and structure anterior to it such as iris, cornea and two aqueous humour-filled spaces, namely anterior chamber and posterior chamber. Posterior segment includes the structure posterior to lens such as vitreous humour, retina, choroid and optic disc (8, 11).

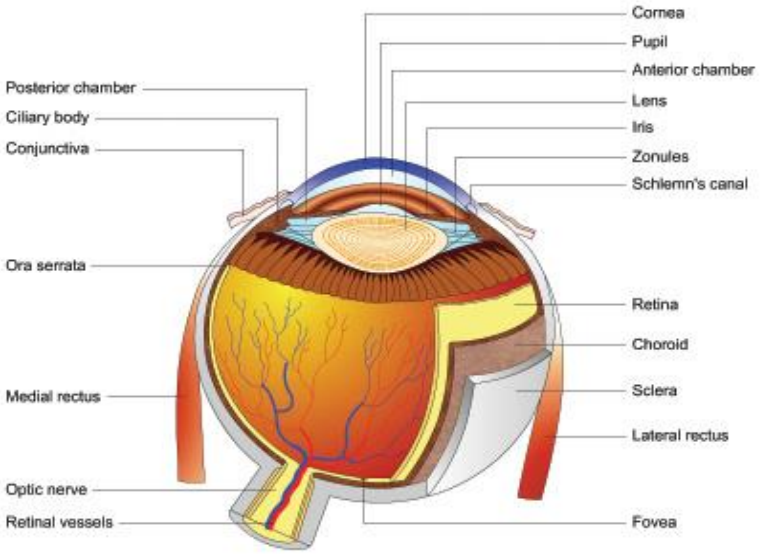


Figure 2.4. Grass anatomy of the eye (11)

Eye perceives the images and transmits the sensations to the brain (visual cortex) via visual pathway which comprises optic nerve, optic chiasma, optic tract, geniculate bodies and optic radiations (8, 11) (Figure 2.5.).

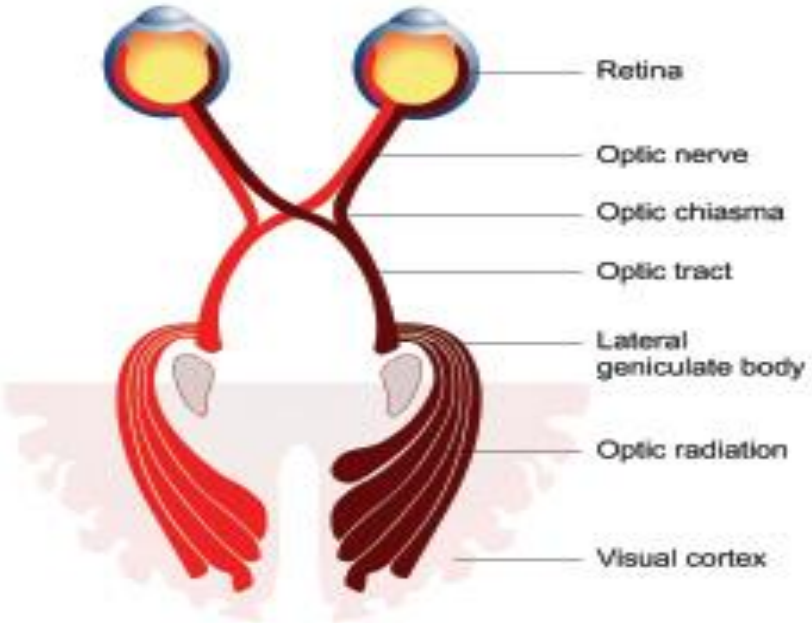


Figure 2.5. Grass anatomy of the visual pathway (11)

Each eyeball is suspended by extra ocular muscles and fascial sheaths in a quadrilateral pyramid-shaped bony cavity called orbit (8, 11).

Blood supply to the eye (10):

- Arterial Supply: The eye is supplied by the 20 short and 2 long ciliary arteries and the central retinal artery. These are branches of the ophthalmic artery, which is one of the branches of the internal carotid artery.
- Venous Drainage: It is done by the short ciliary veins, anterior ciliary veins, 4 vortex veins and the central retinal vein. These eventually empty into the cavernous sinus.

Nerve supply of the eye: The eye is supplied by three types of nerves, namely motor, sensory and autonomic.

- The Motor Nerves (10, 12, 13): The third cranial nerve (oculomotor): Superior division supply levator palpebralis superior and superior rectus while its inferior division supplies medial rectus, inferior rectus, inferior oblique, through branch of ciliary ganglion, it supplies sphincter pupillae and ciliary muscles.
  The 4th cranial nerve (trochlear): It supplies the superior oblique muscle.
  The 6th cranial nerve (abducens): It supplies the lateral rectus muscle.
  The 7th cranial nerve (facial): It supplies the orbicularis oculi muscle.
- The Sensory Nerve: Ophthalmic division of the 5^{th} cranial nerve (trigeminal) supplies the whole eye.
- The Autonomic Nerves
- The sympathetic nerve: It supplies the Iris dilator pupillae muscle, Ciliary body, Müller's muscle in the lids and lacrimal gland through the cervical sympathetic fibers.
- The parasympathetic nerve: It supplies originates from the nuclei in the midbrain. It gives branches to Iris Sphincter pupillae muscles, Ciliary body and Lacrimal gland.

2.2 Physiology of the Eye

Two eyes and their central connections together perform the sense of vision which is a multifaceted function of the eyes. Maintenance of clear ocular media, of normal intraocular pressure and image forming mechanism along with physiology of vision, binocular vision, pupil, and ocular motility are physiological activity of the eye and very necessary for the sense of the vision. The main prerequisite for visual function is the maintenance of clear refractive media of the eye. The major factor

responsible for transparency is the lack of blood vessels in ocular media. The structures forming refractive media of the eye from anterior to posterior are tear film, cornea, aqueous humour, crystalline lens and vitreous humour (8, 11).

2.2.1 Physiology of Vision (8, 11)

Physiology of vision has not been understood yet clearly. Known mechanism is described as bellow:

- Initiation of vision, a function of photoreceptors (rods and cones): Light receiving to retina cause photochemical changes in the rods and cones cells which function as sensory nerve endings for visual sensation. Photochemical changes prompt biochemical changes and generate electrical impulses.
- Processing and transmission of visual sensation: It is performed by cells of retina and visual pathway. Initiated electrical impulses in the photoreceptors are transmitted via visual pathway by electronic conduction to the visual cortex.
- Visual perception: It is a function of the visual cortex and related areas of cerebral cortex. It is a complex integration of light sense, form sense, sense of contrast and color sense. The light sense is the awareness of the light. Form sense is the ability to discriminate between the shapes of the objects. Sense of contrast is the ability of the eye to perceive slight changes in the luminance between regions which are not separated by definite borders. Color sense is the ability of the eye to discriminate between different colors excited by light of different wavelengths.

2.2.2 Mechanism of the Vision

The light rays from the object pass through the cornea, aqueous humour, lens and vitreous humour. All these structures refract the light such that it falls on the retina. This is called focusing. Maximum focusing is done by the cornea and the lens. The light then falls on the retina. The light is received by the photoreceptors, rods and cones, on the retina. The absorbed light activates the pigments present in the rods and cones, causes release of chemical substances, which farther initiates electrical impulses. Thus, electrical impulses travel as nervous impulses through the rod or the cone cell and reach the synaptic knobs. From here, the impulses are transmitted to

the bipolar nerve cells, then to the ganglions and then to the optic nerves. Thus, the nervous impulses generated in the retina are carried to the brain by visual pathway. The information received is processed in the visual cortex and person could be able to see the image. The image formed on the retina is inverted. However, the brain makes someone see the image erect (8, 11) (Figure 2.6.).

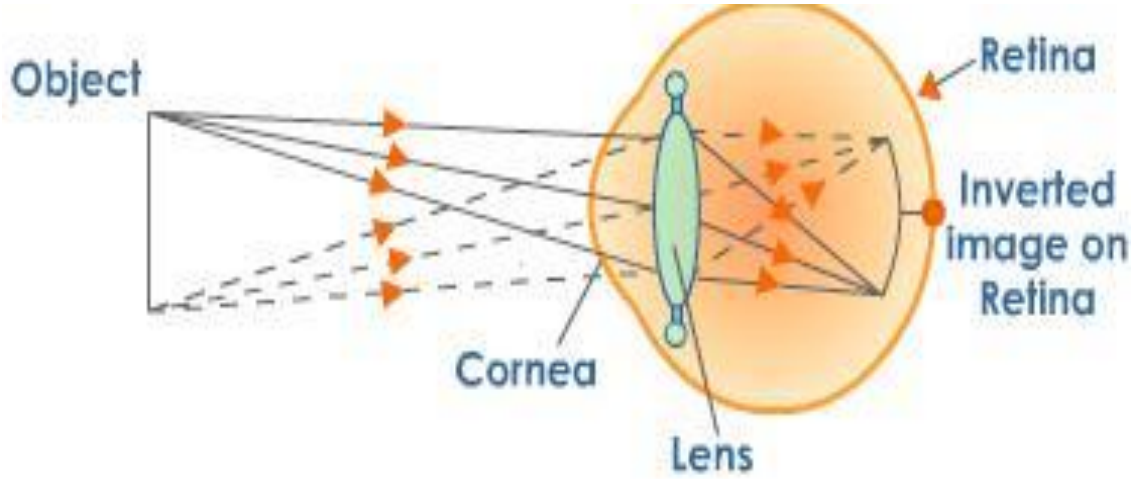


Figure 2.6. Mechanism of the vision (11)

Any abnormality along the optical and neurological visual pathway such as RE, clouding or interference from the ocular media (corneal edema, cataract, or hemorrhage in the vitreous or aqueous space) and malfunction of the retina and visual pathway causes wide range of visual loss, which is very difficult to categorize. Separation of different degrees of vision loss is important because it requires various medical, social and rehabilitative interventions (8, 11).

2.2.3 Assessment of Vision

Assessment of vision is performed with the test of visual acuity (VA) at 6 meter by Snellen chart (Figure2.7.). The Snellen chart is composed of rows with progressively smaller letters, each row designated by a number corresponding to the distance in meters from which a normal eye can read the letters of the row. For example, the letters in 36 rows are large enough for the normal eye to see from 36 meters away. VA is scored as fraction for example 6/36. The first number represents the testing distance between the chart and the patient, and the second number represents the smallest row of letters that the patient's eye can read. Hence normal

vision is 6/6 and 6/36 acuity indicates that the patient's eye can only read from 6 meters large enough for a normal eye to read from 36 meters (8, 11).

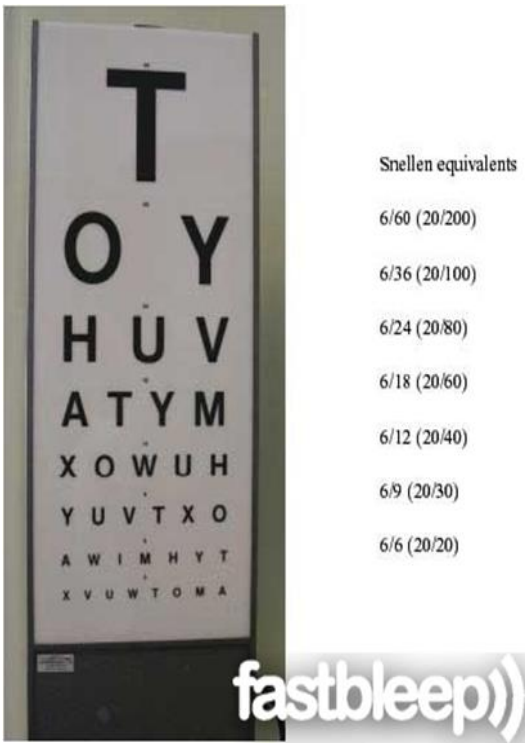


Figure 2.7. Snellen chart (8)

2.3 Visual Impairment and Blindness

In the 10th revision of the WHO International Classification of Diseases (ICD 10), the visual impairment (maximum vision less than 6/18, Snellen) has been divided into 5 categories. Category 1 (moderate visual impairment) was defined as VA less than 6/18 but equal to or more than 6/60, category 2 (severe visual impairment) as VA less than 6/60 but equal to or more than 3/60, category 3 (blindness) as VA less than 3/60 but equal to or more than 1/60, category 4 (blindness) as VA less than 1/60 to light perception and category 5 (blindness) as no light perception. Category 1 and 2 constitute "low vision" which is defined as presenting VA of less than 6/18 but equal to or better than 3/60, or a corresponding visual field loss to less than 20° in the better eye, and categories 3, 4 and 5 constitute "blindness" which is defined as presenting VA of less than 3/60 or a corresponding visual field loss to less than 10° in the better eye. 'Visual impairment' includes both

low vision and blindness. Patients with the visual fields between 5° and 10° are placed in category 3 and those with less than 5° in category 4 and 5 (14).

The term “best corrected vision” in the better eye, used in the previous definition of visual impairment and blindness, under estimated the magnitude of visual impairment and blindness. Based on that definition, a large proportion of persons with visual impairment and blindness due to uncorrected RE are ignored. If the best corrected vision is used, the estimate excludes RE as a cause of visual impairment and blindness. The prevalence of blindness is higher about 15% for all ages and as high as 25-30% for older adults when the definition of presenting vision is used instead of the best corrected vision and it was discovered by the results of some studies (15-18). This increase in prevalence of low vision in older adults could be up to 60% (19). Therefore, the definition was changed from best corrected visual impairment to presenting VA in ICD 10 (1).

2.3.1 Magnitude of Visual Impairment

In 2010, the visual impairment and blindness was estimated to be 285 million globally. 65% of the global visual impairment was among people aged 50 years and over. 246 million of visual impairment was estimated to have low vision and 39 million was blind. 63% of low vision and 82% of blind people were aged 50 years and over (1).

2.3.2 Worldwide Distribution of Visual Impairment

The estimates which were based on studies from 39 countries conducted since 2004 and on earlier studies that are still representative show that the prevalence rates of blindness are 7.3/1000 in the WHO African Region (AFR), 3.5/1000 in the Region of Americas (AMR), 8.5/1000 in the Eastern Mediterranean Region (EMR), 3.0/1000 in Europe (EUR), 6.9/1000 in South-East Asia (SEAR) (excluding India), and 5.3/1000 in the Western Pacific Region (WPR) (excluding China). Because of their large population size, the figures for blindness in India and China were calculated separately as 6.8 and 6.1 per million, respectively (2, 3).

The extent of blindness per region does not necessarily correlate with the extent of low vision as stated by the study of global data on blindness, for each blind

person there is 3 person with low vision (20). Thus, while the American and European regions had the lowest prevalence rates of blindness per thousand population, their prevalence rates of low vision (25.6 and 28.7 per thousand respectively) are higher than AFR (25.4 per thousand). The EMR has 32 persons with low vision per thousand populations, SEAR (excluding India) has 41.3/1000 and WPR (excluding China) has 28.0/1000. India and China are estimated to have prevalence rates of low vision thousand populations of 46.2 and 49.3 respectively.

Finally, visual impairment is unequally distributed in the WHO regions with the lowest rates in the Americas and Europe (29.1 and 31.7 cases per thousand population respectively), the WHO African and Western Pacific (without China) regions have 32.7 and 33.3 cases per thousand, while the highest rates are found in the WHO Eastern Mediterranean, with 40.5 per thousand, and South-East Asia Region (without India) with 48.2 per thousand. India has 53 cases of visual impairment per thousand population while China has 55.4 per thousand (2, 3). The number of people visually impaired and corresponding percentage of the global visual impairment by WHO region in 2010 is shown in Table 1-1 (7).

2.3.3 Visual Impairment in Developed versus Developing Countries

More than 90% of the world's visually impaired people live in developing countries, 60% of them comprised by China, India and Sub-Saharan Africa and the vast majority of them in rural areas of the least-developed countries (4-6). The prevalence of visual impairment is higher in almost all developing countries. The national blindness survey of Pakistan, which was conducted on people aged 30 years old and over shows that the prevalence of visual impairment is 17.7% (21). In Tehran, the prevalence of visual impairment for people aged 50 years old and over was estimated as 14% (22). In Southern Urban China, the prevalence of visual impairment was estimated as 10.7% for people aged 50 years old and over (23). The result of Rapid Assessment of Avoidable Blindness (RAAB) which was conducted on people aged 50 years old and over in Nakura-Kenya shows that the prevalence of visual impairment is 9.3% (24). In India, the prevalence of visual impairment is estimated as 32.5% for the people aged 50 year old and over (25). On the other hand the prevalence of blindness and low vision in high income countries and in Estern

and centeral Europe was estimated as 0.1% and 1% respectively (26). The number and percentages of the visual impairment by WHO Regions was shown in (Table 2-1.)

Table 2.1. Number (percentage) of visual impairment by WHO Regions 2010 (7)

WHO Regions	Total population million (%)	Blindness number in million (%)	Low vision number in million (%)	Visual impairment number in million (%)
African Region	804.9 (11.9)	5.888 (15.0)	20.407 (8.3)	26.295 (9.2)
Region of the Americas	915.4 (13.6)	3.211 (8.0)	23.401 (9.5)	26.612 (9.3)
Eastern Mediterranean Region	580.2 (8.6)	4.918 (12.5)	18.581 (7.6)	23.499 (8.2)
European Region	889.2 (13.2)	2.713 (7.0)	25.502 (10.4)	28.215 (9.9)
South-East Asian Region (India excluded)	579.1 (8.6)	3.974 (10.1)	23.938 (9.7)	27.913 (9.8)
Western Pacific Region (China excluded)	442.3 (6.6)	2.338 (6.0)	12.386 (5)	14.724 (5.2)
India	1181.4 (17.5)	8.075 (20.5)	54.544 (22.2)	62.619 (21.9)
China	1344.9 (20.0)	8.248 (20.9)	67.264 (27.3)	75.512 (26.5)
World	6737.5 (100.0)	39.365 (100.0)	246.024 (100)	285.389 (100.0)

2.3.4 Distribution of Visual Impairment by Some Personal Characteristics

- Age: The global estimated number of people visually impaired by age group is shown in Table 1-2. This age distribution of the visual impairment and blindness was non-disaggregated by gender (7).
- Gender: Women compare to men are more likely to become visually impaired or blind even after controlling for age. In every region of the world, some studies are indicative of high prevalence of visual impairment among women. Male/female ratios range from 1.5 to 2.2 (4, 7). Longer life expectancy, poor socioeconomic status and limited access to the eye care services are suggested as probable reasons for high prevalence of blindness and visual impairment (4). Table 2.2. Illustrate the global prevalence of visual impairment by age.

Table 2.2. Global prevalence of visual impairment by age 2010 (7)

Ages (years)	Population (millions)	Blind number (millions) (%)	Low vision number (millions) (%)	Visually impaired number (millions) (%)
0 – 14	1848.5	1.421 (0.077)	17.518 (0.95)	18.939 (1.02)
15 – 49	3548.2	5.784 (0.16)	74.463 (2.1)	80.248 (2.26)
50 and older	1340.8	32.16 (2.4)	154.043(11.45)	186.203(13.89)
All	6737.5	39.365 (0.58)	246.024 (3.65)	285.389 (4.24)

2.3.5 Socioeconomic Consequences of Visual Impairment and Blindness:

In terms of global distribution of visual impairment, a large prevalence of visual impairment un-equally existed in low income developing countries. Cataract and trachoma are the biggest causes of avoidable blindness in the countries. Access to the preventives and eye curatives services are severely limited due to lack of the services or un-equal distribution (27).

The real financial cost of visual impairment worldwide is estimated to be US$ 2,954 billion in 2010. The real financial cost is comprised of two components: direct (health-related) costs of vision loss estimated as US$ 2,302 billion, and indirect costs (production losses, informal care and deadweight welfare losses) estimated as US$ 652 billion (28).

The WHO estimated burden of disease due to visual impairment as 3.9% of the total disability adjusted life years in the year (2004) (29).

2.3.6 Main Causes of Visual Impairment

Globally, the main causes of visual impairment are uncorrected RE accounting for an estimated 43% of all cases, and cataract which accounts for an estimated 33% of cases. Other causes of visual impairment include glaucoma (causing an estimated 2% of cases), DR, trachoma, AMD, and CO accounting for around 1% of cases each. Undetermined causes of visual impairment are 18% (1).

Cataract is the cause of an estimated 51% of all cases of blindness, glaucoma causing 8% of cases, AMD 5%, CO and childhood blindness 4% each, trachoma and uncorrected RE 3% each, DR 1%, and 21% of causes are undetermined (1).

RE (ametropia) is defined as a state of refraction when the parallel rays of light coming from infinity (with accommodation at rest) are focused either in front or behind the sensitive layer of retina in one or both the meridians. The ametropia includes myopia, hypermetropia and astigmatism. In clinical setting, RE are diagnosed either by refractometry or skiascopy (11). In the field, it si determined as phakic eyes with VA less than 6/18, improving with pinhole or optical correction to 6/18 or better.

Development of any opacity in the lens is known as cataract. Cataract is diagnosed in clinical setting when the red reflex is not seen by Oblique İllumination Examination, Test for Iris Shadow, Distant Direct Ophthalmoscopic Examination and Slit Lamp Examination. In the field, it is determined by observing obvious lens opacity, obscuring a clear red reflex which is likely to affect vision and it is done often by the using of direct ophthalmoscope (11).

Glaucoma is a group of disorders characterized by a progressive optic neuropathy resulting in a characteristic appearance of the optic disc and a specific pattern of irreversible visual field defects that are associated with raised Intra Ocular Pressure (IOP). Glaucoma is diagnosed in clinical setting by tonometry, gonioscopy, documentation of optic disc changes, slit-lamp examination of anterior segment to rule out causes of secondary open angle glaucoma, perimetry for detection of visual field defect, nerve fiber layer analysis and provocative tests are required in border-line cases (11). In the field, it is assigned as glaucoma when the following criteria are present: the eye is hard as a stone on digital palpation, an afferent pupil defect and corneal oedema and the vertical cup-disk ratio is 0.8 or greater by direct Ophthalmoscopic examination.

DR refers to retinal changes seen in patients with Diabetes Mellitus (DM). In the clinical setting, it is diagnosed by urine examination, blood sugar estimation, for elucidation of new vascularization, leakage and capillary no perfusion, Fundus Fluorescein Angiography (FFA) is carried out (11). In the field, the diagnosis applies only for persons with confirmed diabetes. The retina shows either proliferative retinopathy (growth of new blood vessels with or without haemorrhages) or diabetic macular oedema (extensive swelling of the central retina), assessed by Ophthalmoscopic examination.

AMD diagnoses is made by the Ophthalmoscopic examination of the macula, slit-lamp bi-microscopic examination of the macula with a +90D/+78D non-contact lens or mainster contact lens and FFA (11). In the field, it is determined by obvious or severe pigment disturbances at the macula. The visually impaired person is assigned as AMD if any of the following suggested criteria is seen by the ophthalmoscope: the pigment epithelium is disturbed by atrophy or proliferation (mottling), drusen (yellow colloid-like dots), swelling or oedema of the central retina, circinate exudates, and hemorrhage or macular hole.

2.3.7 Main Causes of Blindness in Developed versus Developing Countries

Common causes of blindness in developed countries are different from those of developing countries.

In developed countries, vision loss is to a great extent related to the aging process. Although cataract is still an important cause of vision loss, the leading cause of profound vision loss in North America and other developed countries are AMD, DR, and glaucoma. Other causes are herpes simplex keratitis, retinal detachment, retinal vascular disorders, and inherited retinal degenerative disorders.

In developing countries, cataract is the leading cause of blindness, followed by glaucoma, infection diseases (trachoma, leprosy, Onchocerciasis), injuries and xerophthalmia. Corneal scar is a significant cause of monocular vision loss in the developing world (8).

2.3.8 Prevention of Visual Impairment

After development of the WHO Global Data Base on blindness and visual impairment and starting of the WHO programs for prevention of blindness in the year 1978, vast efforts have been made to technically support establishing national prevention of blindness programs (30).

The first global estimate of visual impairment, in 1975, indicated that there were 28 million blind people in the world. In the 1990s, it was estimated that the global population was likely to increase from 5.8 billion in 1996 to 7.9 billion by 2020. These population growth projections were used in turn to estimate the expected increase in the number of blind people. Estimates based on the 1990 world

population indicated that there were 38 million blind people and almost 110 million with low vision (31). This estimate was later extrapolated, first to the 1996 world population (45 million blind and 135 million people with low vision) and then to the projected 2020 population (76 million blind). These estimates indicated that the global extent of visual impairment would double in the period 1990–2020, assuming that current levels of eye care services continue and this realization provided the motivation for the launch of VISION 2020 in 1999.

It was established as a partnership between WHO and the International Agency for the Prevention of blindness. This initiative is promoting prevention of avoidable blindness and visual impairment, based on disease control, human resource development, and infrastructure and technology. In order to introduce this strategy in countries, the World Health Assembly, in resolution WHA56.26, urged Member States to establish national VISION 2020 committees. The Secretariat and the regional coordinating offices of the International Agency for the Prevention of Blindness supported Member States in implementing and periodically monitoring and assessing their national and subnational VISION 2020 plans for eye health and prevention of blindness (32).

Eye-care services must be comprehensive, encompassing eye-health promotion, prevention, treatment and rehabilitation. The full range of these services must be integrated into health-care systems and delivered to the population in a stepwise manner (4).

Partner organizations of VISION 2020 have been active in encouraging the integration of comprehensive eye-care services into national health-care systems by:

- ❖ Increasing political commitment to the prevention of visual impairment.
- ❖ Increasing professional commitment to the prevention of visual impairment.
- ❖ Increasing the provision of high-quality, sustainable eye care.
- ❖ Increasing public awareness and use of eye health-care services, and
- ❖ Encouraging the commitment and support of non-governmental organizations and the private sector (4).

There are several strategies used for the prevention of blindness in the world such as general approach, disease oriented approach, service oriented approach, strategy oriented approach, and community oriented approach. Each country

optionally selects and implements one or several of the above strategies according to their situation and resources.

2.4 Situation in Afghanistan

Afghanistan is a country that it's all core institutions were approximately completely distracted by almost more than three decades of war. The destruction of institutions of the state and heavily war torn economy led to unrivaled levels of absolute poverty, national ill health, illiteracy and gender inequity.

In March 2002, for the rebuilding of national health system, the Afghan MoPH developed BPHS to solve the great health problems. The BPHS represents the official policy of the Transitional Islamic State of Afghanistan (TISA), and those delivering health services to Afghans must provide the Basic Package first before adding other services.

BPHS includes maternal and newborn health, child health and immunization, public nutrition, communicable diseases, mental health, disability and supply of essential drugs (33).

The purpose of BPHS is to provide a standardized package of basic services which forms the core of service delivery in all primary health care facilities and to promote a redistribution of health services by providing equitable access, especially in underserved areas. Health services operate in three levels in Afghanistan (Table 2.3.).

Table 2.3. Public Health Services in Afghanistan 2010 (9)

Level	Public Health Services	Health Facility type
1	Primary Care	Health Post (HP), Health Sub-center (HSC), Basic Health Center (BHC), Mobile Health Team (MHT) and Comprehensive Health Center (CHC)
2	Secondary Care	Comprehensive Health Center at district and District Hospital (DH)
3	Tertiary Care	Provincial Hospital (PH), Regional Hospital (RH) and National Specialty Hospital (NSH)

Afghanistan is in the list of low developing countries. There are no figures regarding the prevalence, main causes and related factors of visual impairment as well as the many other diseases. RAAB was conducted between 2007 and 2011 in Badakhshan, Herat and Laghman Provinces but the findings were not reliable and not compliant on the actual prevalence of blindness and Cataract Surgical Rate (CSR) because of some methodological problems and low survey coverage. Therefore the figures were not published.

Even though, the primary eye care has recently been placed in the second revision of BPHS (9), still integration of primary eye care in primary health care remained in policy level. Eye care services are delivered only in tertiary level or in RHs.

Eye care services available in 12 out of 34 provinces which are limited just in provincial capital and people living in the rural districts have very less access to the eye care services. To provide eye care services for people who are living in rural districts far from the provincial center, the MoPH and NGOs organized outreach surgical eye camps on a temporary basis. However, security concerns have stopped IAM from further implementation of such services. They did not provide such services since 2010.

For designing of meaningful preventive and curative strategies, it is very important to identify the prevalence of visual impairment, relative factors, and main causes of the visual impairment for each geographical location. Therefore, a population based cross sectional study was designed to determine the prevalence of visual impairment, main causes of visual impairment, and factors related to the visual impairment in one province in Afghanistan.

3 MATERIALS AND METHOD

3.1 Type of the Study

This study is population based cross-sectional study which was performed in Nangarhar province, Afghanistan.

3.2 Study Area

This study carried out in five divisions of Jalalabad city, the capital of Nangarhar Province, and four rural districts around the provincial capital of Nangarhar Province in Afghanistan (Figure 3.1). Nangarhar Province was selected because of the following reasons: 1) Due to the financial and time limitations, it was not possible to perform a nationwide study. 2) The researcher resided in Nangarhar Province and he is working at the University of Nangarhar. 3) Related to the second reason, it was easy to select appropriate manpower, communicate the project and performed the study.

Afghanistan is a land-locked country in South-Central Asia, strategically located at the crossroads of major North-South and East-West trade routes. It occupies an area from latitude 29º 35'N to latitude 38º 40'N and longitude 60º 31'E to longitude 75º 00'E, with elevations ranging from 258 meters to 7,492 meters. The capital of the country is Kabul. The country is bounded by six different countries, namely, Pakistan, Iran, Tajikistan, Uzbekistan, Turkmenistan, and China. The longest country to border Afghanistan is Pakistan, whereas the smallest is China. Afghanistan stretches 1,240 kilometers from East to West and 565 kilometers from North to South. The total land area of the country is 652,290 square kilometers (34).

For administrative purposes, Afghanistan is divided into eight development regions, namely the North-Eastern, Northern, Western, Central-Highland, Capital, Eastern, South-Eastern and Southern regions. Afghanistan is also divided into 34 provinces and 398 administrative districts. There are 15 large cities and 32 towns. Districts are further divided into smaller units called villages and municipalities.

Figure 3.1. Map of Afghanistan

The total population of Afghanistan in the year 2013 was estimated around 27 million of which 51% were males and 49% females. Distribution of population between urban and rural areas shows that out of the settled population 19.4 million are living in rural areas and 6.1 million in urban areas in addition a 1.5 million are living as nomads. The most striking feature of the Afghan population is its very young age structure. Some 46.1% (11.7 million) are under the age of 15 years, where elderly of 65 or over are around 3.7%. The proportion under 15 is among the highest in the world and significantly higher than that of the neighboring countries. Based on 2005 household listing data, the growth rate of Afghan population was calculated as 2.03 percent per annum. Population growth due to rural-urban migration is higher in urban areas (35). Overall the security is good in the provincial center and adjacent districts but in the periphery of districts and especially poppy growing areas the security is not satisfactory.

Nangarhar Province is located in the Eastern zone (Figure 3.2); it is bordered in the North- East by the Kunar province, in the North-West by Laghman province, in the West by the Kabul and Logar, and in the South-West by the Paktya province.

Figure 3.2. Map of Nangarhar province

The province is divided by 22 districts namely the provincial capital Jalalabad, Bihsud, Surkh Rod, Chaprehar, Rodat, Kama, Kuz Kunar, Dar-I-Nur, Sher Zad, Hisarak, Khugyani, Pachir Wa Agam, Dih Bala, Kot, Achin, Nazyan, Dur Baba, Shirwar, Bati Kot, Muhmand Dara, Goshta, and Lal Pur. Nangarhar is home to 5.8% of the total population of Afghanistan. With its 1,342,514 inhabitants, it is the fourth most populous province in the county. The large majority of the population (84.4%) lives in the rural area and the remaining is living in the urban. The rural population of Nangarhar inhabitants is distributed over 1400 smallest settlements of varying size, called villages (36). Population of 50 years and over composed 10% of the total population in the urban and 11% of the total population in rural district of Nangarhar province (37).

Totally, in Nangarhar Province, of eight languages, Pashtu spoke by about 92.1% villages. The remaining 8% speak Pashaie, Dari, Uzbaki, Turkmani and some unspecified language (36).

Major occupations of the people are agriculture, animal husbandry, day labor, forestry, and nurseries. Overall literacy rate is 27% with a female/male ratio 1:8, little or no access to electricity outside of the Jalalabad (36).

This study was conducted in 5 divisions called “Nahias” of Jalalabad city (which is subdivided by 70 Locus, called “Gozar”) and four rural districts (Bihsud, Kuz Kunar, Kama, and Surkh Rod), which are located 20 Km around the provincial center.

Jalalabad City is provincial capital of Nangarhar. In October 2012, the official maps of the five divisions ‘’*Nahias’’* that make up the urban core were officially endorsed and transmitted to GDMA (Global Digital Mapping Alliance).

The five *Nahias* at the center of the metropolitan region encompass an urban area of 19.13 square km. Totally 219,300 people are living in the 5 *Nahias* of Jalalabad City and 10% (21,930 persons) are 50 years and over but the exact number of population is not known for each division (37). There are totally 17 active health facilities in Jalalabad City. Two of them are RH and one is PH; one RH related to Ministry of Higher Education (MoHE) and the other related to MoPH. Eye care services are available in both RHs. Besides, there is one CHC, 8 BHC, 4 MHT and one Drug Addicted Treatment Center (DATC) (38, 39).

Bihsud District contains 66 main villages, is located around provincial capital Jalalabad, spanning both sides of the Kabul River. Oranges, rice, and sugarcane grow in the fertile district, and the capital city has industries of cane processing and sugar refining as well as papermaking. The district's year-round summery weather attracts many visitors. As 2014 estimations, the total population of the district was 114,200 of which population aged 50 years and above was estimated as 11% (12,562 persons) (37). Fifty five percent of population is Pashtun, 40% Afghan Arab, and 5% Tajik. The primary employment is agriculture and animal husbandry. There are 9 active health facilities in Bihsud District, two of them are CHC and 7 of them are BHC; neither of them provides eye care facilities (38, 39).

Kama is located in the East of Jalalabad City, which contains 68 villages. Its population (100% Pashtun) was estimated as 77,200 in 2014 (37). Population aged 50 years and above was estimated as 11% of total population (8,492 persons) (37). The district center is the village of Sanger Saray Kama. The districts include most of the Kama valley, connecting Jalalabad with the other cities of the country as well as with Khyber Pass. There are 4 active health facilities in Kama District: these include

one DH, one CHC, one BHC, and one SHC; neither of them delivering eye care facilities (38, 39).

Kuz Kunar is located in the West of Nangarhar province, on the Kunar River, which contains 65 villages. It is 22 Km to the East of the Jalalabad City. Its population, which is 75% Pashtun was estimated as 55,300 in 2014 (37). Population aged 50 years and over was estimated as 11% of total population (60,83) (37). Six health facilities is working in the district; one of them is CHC, three BHC, and two HSC, however none of them providing eye care services (38, 39).

Surkh Rod is located in the North of Nangarhar province, which contains 95 villages. It is located 7 km far from the city of Jalalabad. The district center is the town of Sultanpur. It is popular among locals because of its abundance of fertile land; however, it is currently facing a lack of water. The population is about 5% Tajik, 88% Pashtun and 7% other Eastern-Iranian groups (mostly sub-groups of the Tajiks). The total population was estimated as 121,000 in 2014 (37). Population of aged 50 years and above was estimated as 13,310 (11% of the total population) (37). There are 11 active health facilities in the district but none of them provide eye care services: one CHC, nine BHC and one HSC (38, 39).

3.3 Study Population

The universe of the study composed of 50 years old and over population residing in the study area, five divisions ‘’*Nahias*’’ of Jalalabad City (70 Gozars) and four districts of Nangarhar province. Since, there were no figures about proportion of 50 year old and over population in each study area, it assumed that these places have similar proportion as the whole province, which estimated as 10% for city center and 11% for districts. The estimated number of 50 years old and over population has shown in (Table 3.1.).

Six villages from Bihsud District, 21 villages from Surkh Rod District, 4 villages from Kama District and 22 villages from Kuz Kunar District were left out because of either security constraint or transportation problems (Totally 53 from 294 villages were left out from the study).

Table 3.1. Estimated number of 50 years old and over population

Study areas	Total Pop	Number of villages/ Gozars	Number of villages/Gozars covered by the study	Estimated Total 50+ Pop	Estimated 50+ study Pop
Jalalabad City	219,300	70	70	21,930	21,930
Bihsud	114,200	66	60	12,562	11,420
Kama	77,200	68	64	8,492	7,993
Kuz Kunar	55,300	65	43	6,083	4,024
Surkh Rod	121,000	95	74	13,310	10,368
Total	587,100	70 G and 294 V	70 G and 241 V	62,377	55,735

*G=Gozar, *V=Village

3.4 Sampling Frame

The sampling frame included 5 divisions (70 Gozars) of Jalalabad City and 241 villages, located in the four districts of Nangarhar Province.

3.5 Sample Size Calculation

The sample size calculated, using the following formula:

$$n= \frac{\mathbf{NZ^2PQ}}{\mathbf{(N-1)d^2+Z^2PQ}}\text{*DE}$$

n = the minimum sample size

P = 17.7% (which is the prevalence of visual impairment in neighbor country, Pakistan) (21)

N = 55,735 (total study population aged 50 years and over)

Z = 1.96 (the value of z table at the α = 0.05 level)

Q = 1-P

d = 3%

DE (Design Effect) = 2

Sample size calculated as bellow:

$$n= \frac{\mathbf{55735*1.96^2*0.177(1-0.177)}}{\mathbf{(55735-1)0.03^2+1.96^2*0.177(1-0.177)}}\text{*2} = \frac{\mathbf{31176.9}}{50.7} *2 = 614.9*2 = 1{,}229.9 \approx 1{,}230$$

Considering the probable non-response rate as 10%, therefor 10% of the calculated sample size (1,230) is constituted 1,230 * 0.1 = 123 and it was added to the calculated sample size.

At the end, the sample size increased to 1,230 + 123 = 1,353 people.

3.6 Sampling Method

Simple one stage cluster sampling method has been used for the selection of sample. The study considered both urban and rural areas of Nangarhar province. Seventy Gozars of Jalalabad City as urban and 241 villages of four districts as rural area were listed separately. Calculated sample size was allocated to urban and rural stratas, using probability proportion to size method. The estimated number of 50 years old and over population, proportion to size allocation, and number of Gozars/villages, which included in the study has shown in (Table 3.2.).

Table 3.2. Proportion to size allocation (Nangarhar-Afghanistna)

Study areas	Estimated 50 year old and over study population		Proportion to size allocation of sample size to strata	Gozars/villages	Number of Gozars and villages (G/V) to be included in the study
	No	%			
Jalalabad City	21,930	39.3	532	70 G	70 G
Bihsud	11,420	20.5	277	60 V	3 V
Kama	7,993	14.3	194	64 V	4 V
Kuz Kunar	4,024	7.2	98	43 V	3 V
Surkh Rod	10,368	18.6	252	74 V	5 V
Total	55,735	99.9	1,353	70 G and 241V	70 Gozars and 15 Villages

As it was sated before, the exact population and distribution of the population by sex and age of the survey site could not be available in any sources, the figures related to the sample size allocations to the residences given in Table 3.2 were estimates also.

Thirty nine point three percent (532 persons) of the calculated sample size was planned to take from 70 Gozars of Jalalabad city, 20.5% (277 persons) of the calculated sample size was planned to take from 3 villages of Bihsud District, 14.3% (194 persons) was planned to take from 4 villages of Kama District, 7.2% (98 persons) was planned to take from 3 villages of Kuz Kunar District and 18.6% (252 persons) was planned to take from 5 villages of Surkh Rod District.

3.7 Inclusion and Exclusion Criteria

Inclusion criteria

- Aged 50 years and over
- Lived in the selected area for at least six months
- Had cooperation with the interviewer
- Accepted to participate the study

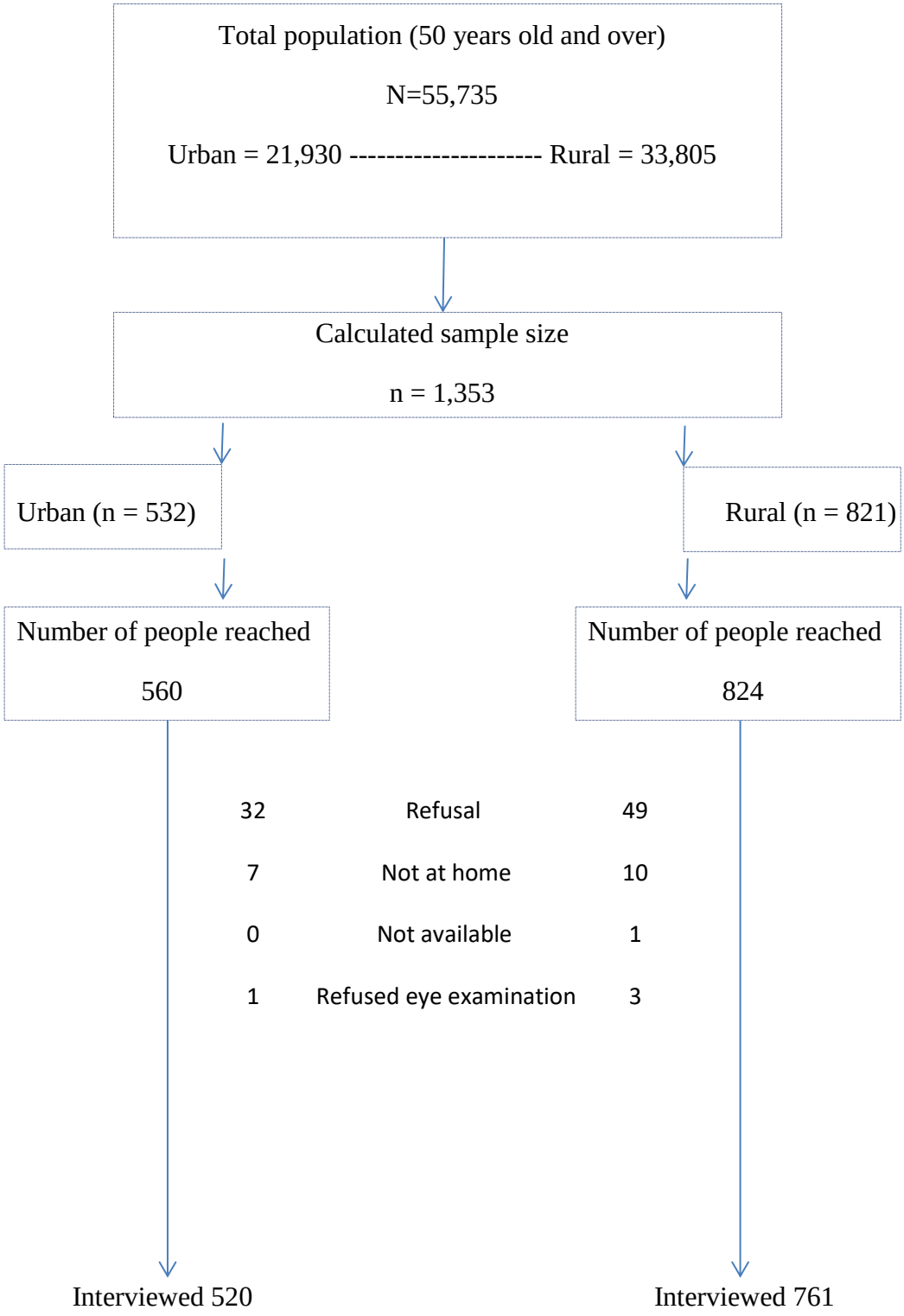
Exclusion criteria

- Not available during two successive visits
- Accept the interview, but rejected the eye examination

3.8 Flow Chart of the Study

The flow of the study has been summarized in this chart and detailed information about sample selection in Jalalabad City and rural residences are given as follows.

Flow chart


Total population (50 years old and over)
N=55,735
Urban = 21,930 ---------- Rural = 33,805
Calculated sample size
n = 1,353
Urban (n = 532)
Rural (n = 821)
Number of people reached
560
Number of people reached
824
32 Refusal 49
7 Not at home 10
0 Not available 1
1 Refused eye examination 3
Interviewed 520
Interviewed 761

3.8.1 Sampling in Jalalabad

Totally, 532 persons were alocated to Jalalabad City by probablity proportion to size method. As there was 70 Gozars in the city, in order to estimate the number of people interrviewed from each Gozar, the sample size was divided by the number of Gozars (532 persons/70 Gozars = 7.6). At the end, 8 persons per Gozar were planed to reach.

Each Gozar in Jalalabad City, headed by a reeve, called “Wakil-i-Gozar”. By the help of each Wakil-i-Gozar, streets of the each locus (Gozar) were identified and then two streets were selected randomly (one principle and the other reserve). The side of the street was again selected randomly. Visit started from the first house of the selected side of the selected street, and then went forward to the next household until the required sample size (8 persons) for a single Gozar obtained. If we could not find 8 eligible persons along the selected Principle Street, the side of the reserved street would have been selected randomly and households were visited to achieve expected eligible persons.

By inviting 8 people per Gozar and completing 70 Gozars, 560 eligible people were invited for participation. Out of 560 persons, 520 persons accepted, 32 persons refused, 7 persons were not at home and one person rejected the eye examination.

3.8.2 Sampling in Districts

As there was no information about characteristics of general population, socio- economic conditions, geographical conditions, health service facilities and population size of each village, it was assumed that all above conditions were similar among the 241 villages of the four districts. Depending on the above mentioned assumption, the estimated number of eligible people in each village of Bihsud District calculated as 190 (Estimated number of people aged 50 years and over divided by the number of villages: 11,420/60 = 190). To cover 277 people, 5 villages (three villages as principle which were Tangi, Miran and Qasem abad, and two villages as reserve which were Tamirat and Saracha) from Behsud District were randomly selected and all eligible people from each household of three principle villages were invited to participate the study by house to house visit. In Tangi

village, 110 people were requested to participate, 108 people were accepted (one person was absent and one refused to participate). In Miran village, totally 70 people were requested for participation, 59 people were accepted (10 persons refused participation and one person refused eye examination). In Qasem Abad village, 97 people were invited for participation. Of them 96 were accepted participation and one person refused eye examination. Totally in three principle villages 277 people were invited and 263 people were completely interviewed (one person was absent, 11 persons were refused to participate and two people was interviewed but not accept eye examination). Thus, totally, 277 people were invited to participate, 263 accepted, 11 refused, one was not at home and 2 person refused eye examination part of the questionnaire in the three villages. There was no need to went to the reserve villages.

The estimated number of eligible people in each village of Kama District calculated as 125 (Estimated number of people aged 50 years and over divided by the number of villages 7,993/64 = 125). To achieve 194 people, 5 villages, three villages as principle (Dahi Ghaze, Qala Akhound Shaikhan and Mama Khail) and two villages as reserve (Bazed Khail and Shirgar) were randomly selected from Kama District. All eligible people from each household of three principle villages were invited to participate the study by house to house visit. In Dahi Ghaze village, 50 people were invited, 48 accepted and two persons refused the participation. In Qala Akhound Shaikhan, 55 people were proposed to participate. From 55 people, 47 people accepted and eight people refused. In Mama Khail village, 60 people were proposed for participation, 58 people accepted and two people refused. Totally 165 people proposed participation in three principle village, 12 people refused participation and 153 people were interviewed. Since it was not achieved the calculated sample size for Kama District in three selected principle villages, Bazed Khail was taken from reserved villages. In Bazed Khail village, 28 people were proposed participation. Twenty-two out of 28 accepted (two refused participation, 3 were not at home and one refused eye examination part of the study). Thus, totally, 193 people were invited, 175 accepted participation, 14 refused participation, 3 were not at home and one person refuse eye examination part of the questionnaire in four villages of Kama District.

The estimated number of eligible people in each village of Kuz Kunar District calculated as 94 (Estimated number of people aged 50 years and over divided by the number of villages 4,024/43 = 94). To achieve 98 people, 4 villages (two villages as principle, Dakan Kalay and Islam Pur) and two villages as reserve (Qala Tak and Darba Khail) from Kuz Kunar District were randomly selected and all eligible people from each household of two principle villages were invited by house to house visit. In Dakan Kalay, 19 people were proposed for participation and without any refusal all accepted participation. In Islam Pur, 40 people were proposed participation (thirty-seven accepted, two refused and one person was not available). In the two principle villages, the calculated sample size could not be achieved, therefore, Qala Tak Village was taken from reserve villages list. In Qala Tak village, 39 people were requested for participation. Thirty-seven were accepted and two people refused to participate. Thus, totally, 98 people were proposed invitation, 93 accepted, 4 refused and one person was not available in the three villages of Kuz Kunar district.

The estimated number of eligible people in each village of Surkh Rod calculated as 140 (Estimated number of people aged 50 years and over divided by the number of villages 10,368/74 = 140). To achieve 252 people, 4 villages as principle (Ghochak, Naghrak, Char Bagh Safa and Qala mahroof one) and 2 villages as reserve (Khayrabad and Sultan Pur Hulya) villages were randomly selected. In Ghochak Village, 57 people were invited but 51 people accepted and six people refused participation. In Naghrak Village, 40 people were invited to participate, thirty-six accepted, 3 refused and one person was absent. In Char Bagh Safa Village, 63 people were invited to participate, 58 accepted, 4 refused and one person was absent. In Qala mahroof one, 42 people were requested for participation, 38 accepted, three refused and one was absent. In Khayrabad Village, 54 people invited for participation, 47 accepted, 4 refused and 3 were absent. Thus, it was achieved totally 256 people in the four principle and 1 reserved villages of Surkh Rod District. In Surkh Rod District, 230 out of 256 people accepted, 20 refused and 6 persons were not at home.

In four districts, generally, 824 eligible people were invited to participate the study; 761 accepted, 49 refused, 10 were not at home, one was not available and 3 refused eye examination part of the questionnaire.

By reaching 560 people in all Gozars of Jalalabad city, 277 people in Bihsud District, 193 people in Kama District, 98 people in Kuz Kunar District, and 256 people in Surkh Rod District, a total of 1384 people were achieved. Considering the ethical issue as it was mentioned before, all screening demands in sampled villages have been fulfilled.

Finally, the net sample size was calculated as 1,230, it was added 10% of the calculated sample size as probable non-response rate (0.1×1,230), therefore sample size was increased to 1,353 people. In the field, in total, 1,384 people were requested to participate in the study, 560 (40.5%) in Jalalabad city and 820 (59.5%) in 4 districts (277, 98, 193, and 256 in Behsud, Kuz Kunar, Kama and Surkhrud respectively). Out of 1,384 people 1,281 (92.6%) people accepted participation and 103 (7.4%) were not. Net calculated sample size, calculated sample size + 10% non-responders, the number of people requested to participate and the number of interveiwed participants illustrated in Table 3.3.

Table 3.3. Calculated, + 10% non-responders and achieved sample size (Nangarhar-Afghanistan, 2015)

Study Aria	Net calculated sample size	Calculated sample size+10% non-responder	Requested to participate	Interveiwed
Jalalabad	484	532	560	520
Bihsud	252	277	277	263
Kama	89	98	98	92
Kuz-kunar	176	194	193	176
Surkhrut	229	252	256	230
Total	1,230	1,353	1,384	1,281

3.9 Variables

Dependent variables: Visual impairment (blindness and low vision), Cataract, Glaucoma, RE, DR, and AMD.

Independent variables: Socio-demographic characteristics, behavioral and medical history of the participants.

- Some socio-demographic characteristics of the participants (age, sex, marital status, level of education, occupation, economic status and health status).

- Behavioral factors of the participants (tobacco use, smoking, hours spent outdoor, and utilization of eye protective measures).
- Medical history of the participants (obesity, presence of DM, duration of DM, presence of HTN and medicine used for lowering high blood pressure).

3.10 Terms and Criteria

- Visual impairment: Visual impairment was used as presenting VA less than 6/18 but equal to or more than no light perception using Snellen chart.
- Low vision: Low vision was used as a category 1 and 2 of visual impairment, presenting VA of less than 6/18 but equal to or better than 3/60 using Snellen chart.
- Blindness: Blindness was used as category 3, 4 and 5 of visual impairment, presenting VA of less than 3/60 using Snellen chart.
- Cataract: It is referred to obvious lens opacity, obscuring a clear red reflex, which is likely to affect vision, and it is done often by the using of direct ophthalmoscope.
- Glaucoma: It is diagnosed by the presence of the following criteria: the eye is hard as a stone on digital palpation, an afferent pupil defect, corneal edema and the vertical cup-disk ratio is 0.8 or greater by direct Ophthalmoscopic examination.
- RE: It is referred to the phakic eyes with VA less than 6/18, improved with pinhole or optical correction to 6/18 or better.
- DR: The diagnosis of DR is applied only for persons with confirmed diabetes when the retina showed either proliferative retinopathy (growth of new blood vessels with or without haemorrhages) or diabetic macular oedema (extensive swelling of the central retina), assessed by Ophthalmoscopic examination.
- AMD: It is an obvious or severe pigment disturbance of the macula. The visually impaired person is assigned as AMD if any of the following suggested criteria could be seen by using of ophthalmoscope: the pigment epithelium was disturbed by atrophy or proliferation (mottling), drusen (yellow colloid-like dots), swelling or oedema of the central retina, circinate exudates, and hemorrhage or macular hole.

3.11 Survey Instrument

A structured, pre-tested questionnaire form which has been developed by the researcher was used for data collection (Annex-1). The question form consisted of 3 parts. In the first part, some socio-demographic and personal characteristics of the person were recorded. In the second part, chronic disease history was questioned. In the third part, some characteristics related to visual impairment and eye care utilization took place.

The VA screening results, height and weight measurements were recorded at the end of the questionnaire form on a separate sheet.

The questionnaire form was prepared in English, translated into local language, and implied in local language.

3.12 Examination of the Eye

Both eyes (each eye separately) of the participants were screened by using Snellen's test type during household visits by ophthalmic nurses at outdoor under day light and the result was recorded on the eye examination section of the questionnaire form.

The Snellen's test type was placed in six-meter distance at a higher position facing the sun in less than 10-degree angle to avoid excessive glazing and set at the eye level of the person to be tested. In order to make a standard measurement in each household, a six-meter rope was used. Those, who scored 6/18 or greater in both eyes were in no need of further examination.

Those, who scored less than 6/18 in either eye, were reexamined (ophthalmic nurse) using a pinhole. If their VA could not be improved by the pinhole, they were completely examined by an ophthalmologist to make the diagnosis related to the visual impairment. If the exact diagnosis of the person could not be made at the time of the survey, this person was given referral letter and sent to the Ophthalmology Department of Nangarhar University Hospital for the final diagnosis and the questionnaire was completed from the daily record of the hospital. Those, who scored less than 6/18 in either eye and their VA was improved to or above 6/18 by pinhole, they were recorded as RE in the questionnaire form and were given a

referral letter to the Ophthalmology Department of Nangarhar University Hospital for discrimination of the type of the RE.

The eye examination included anterior segment evaluation using illuminating torch and posterior segment evaluation using an ophthalmoscope to diagnose the main causes of visual impairment with major emphasis on RE, cataract, glaucoma, AMD and DR.

Any opacity of the lens visible with direct ophthalmoscope through an undilated pupil was classified as cataract.

Glaucoma diagnosed, when the eye is hard like stone by digital tonometry, defect on the afferent pupil with corneal oedema, and vertical cup-disk ratio was 0.8 or greater.

DR was denoted only for persons with confirmed diabetes when the retina shows either proliferative retinopathy (growth of new blood vessels with or without hemorrhages), or diabetic macular oedema (extensive swelling of the central retina), and AMD was referred to obvious or severe pigment disturbances at the macula. AMD was diagnosed by the observation of any of the following criteria:

- The pigment epithelium was disturbed by atrophy, or proliferation (mottling).
- Drusen (yellow colloid-like dots).
- Swelling or oedema of the central retina.
- Circinate exudates.
- Haemorrhage.
- Macula hole.

Eye examination was done in accordance to the WHO's methods of assessment of avoidable blindness (40). Sterility of eye examination instruments were maintained and sterile gloves was changed before each examination to reduce infection transmission.

Height and weight of all the subjects were measured. Weight of the subject was measured with cloths only using bathroom scale and recorded to the nearest 0.1 kg and height was measured without shoes, on flat surface and recorded to the nearest 0.1 cm, using 'drop down' tape measure. A reliable measurement could be taken by marking a point (top of clients head) against a wall and measuring up to it.

3.13 Data Quality Control

The data collection instrument was reviewed by the researcher, advisor, and another ophthalmologist. After finalization of the survey form, it was pre-tested before the implementation. The pre-test procedure was done at one non-sampled village of the Bihsud District on at least 70 persons. The necessary revision was performed.

Recruitment of the data collection team members was done with the consultation with the Ophthalmology Department of Nangarhar University hospital and effort was made for recruiting skilled and experienced staff for the study.

Team members were trained with emphasis on familiarizing the survey objectives, methodology, recording the VA, measurement of height and weight and filling out the questionnaire. The field work was supervised by the team leader at all steps of field study.

3.14 Man Power and Training

The study team was consisted of three ophthalmic, three public health nurses and an ophthalmologist. The ophthalmologist (who is the researcher) was the team leader and responsible for all activity in the fieldwork. Training on study's aim, objectives, method of the study, interviewing techniques, filling out the questionnaire, recording VA and measuring height and weight has been conducted by the team leader to the nurses for two days in Nangarhar University Hospital, Department of Ophthalmology. All of ophghalmic nurses had approximately 10 years of experience in performing VA and refraction, and participating in periodic training conducted in Nangarhar University Hospital. Two of them were working in Ophthalmology Department (one is working in Ophthalmology Department of Public Health Hospital and the other is in Ophthalmology Department of University Hospital). The third one was working with Fred Hollows Foundation dealing with school eye screening program in Afghanistan.

3.15 Data Entry and Statistical Analysis

At the end of the day all completed forms were checked for any mistake and incompleteness and were completed in the field. Data was analyzed by the researcher

himself using IBM SPSS Statistics 21 software program at the Institute of Public Health, Hacettepe University, Ankara-Turkey. After data entry, the data were edited and analyzed. The findings were presented by using marginal and contingency tables. In bivariate analysis, all independent variables with $p<0.05$ considered as significant. Logistic regression analysis was used for determining the strength of the association between dependent and independent variables. All independent variable with $p<0.20$ and variables considered as medically significant were put in the regression model, backward conditional method of logistic regression was selected, Odds ratio (OR) and 95% confidence intervals (95% CI) were calculated and $p<0.05$ was considered as statistically significant for remaining of the variables in the model.

3.16 Ethical Issues

Ethical permission for this study was obtained from Non-interventional Clinical Research Ethics Board of Hacettepe University (Annex-2.). Before the starting of study, the permissions were also obtained from Nangarhar Medical Faculty and Regional Public Health Administration of Afghanistan. Furthermore, the objectives of the study and the procedure were explained to every participant and a written consent was taken. The participation depended on voluntarily basis. According to Chapter 2, Article 52 of Afghanistan Constitution, the State is responsible for free provision of preventive and curative health care services to all citizens of Afghanistan (41). Therefore, study participants with cataract, glaucoma and AMD were convinced and referred to Nangarhar University Hospital for operation or/and medical treatment. Participants with DR were convinced for regular eye examination by ophthalmologist.

Free of cost spectacles and treatment was provided for participants with RE and minor ailment such as conjunctivitis. The cost of transportation was also provided for people who were referred to University Hospital for diagnosis, treatment or operation and were not being able to pay for transportations.

4 RESULTS

In this study, the prevalence of visual impairment, its main caucuses, relative factors as well as barriers to utilization of eye care services among 50 years and older population were studied in Jalalabad City and four relevant districts, Nangarhar Province, Afghanistan.

Out of 1,384 people 1,281 (92.6%) people accepted participation and 103 (7.4%) were not participate. From non-responder, 65 (63%) were males and 38 (37%) were females. 81 (78.6%) of non-responder (52 males and 29 females) refused participation, 17 (16.5%) consisting of 9 (52.9%) males and 8 (47.1%) females were not present at home during the field work, a man (0.1%) was not available, and 4 (3.9%) persons consisting of 3 (75%) males and 1 (25%) female were only interviewed but rejected eye examination. In terms of residential place, the proportion of non-responder were nearly the same, 7.1% and 7.6% in urban and in rural respectively (p = 0.726). Table 4.1. illustrates distribution of the non-responder by sex

Table 4.1. Distribution of the non-responder by sex (Nangarhar-Afghanistan, 2015).

Sex	Interview status								Total	
	Refused participation		Not at home		Not available		Refused examination			
	N	%	N	%	N	%	N	%	N	%
Male	54	66.7	10	58.8	1	100.0	3	75.0	68	66.0
Female	27	33.3	7	41.2	-	-	1	25.0	35	34.0
Total	81	100.0	17	100.0	1	100.0	4	100.0	103	100.0

4.1 Descriptive Analysis

4.1.1 Socio-demographic Characteristics of the Participants

A total of 1281 people participated in this study, out of which 53.2% were men (Table 4.2.). Less than one-fourth (23.5%) of the participants were aged 65 years and over. Females are younger (19.4% were 65 years old and over) than their male counterparts of which 27.2% were 65 years old and over. The observed difference in age by sex was statistically significant (p<0.001).

In general, almost two-third (63.4%) of the participants were illiterate and only 1.8% were university graduate. In both sexes, the trend from illiteracy to

university graduation was generally the same, but the percentages are different in males and females. Among males, the percentage of illiteracy is 52.5 while it is 75.8% in females that is almost 1.5 times higher than males. The percentage of other education levels in male were more than two times that of females and university graduate which was 3.2% in males, 0.2% in females (almost 16 times higher). The difference was statistically significant ($p < 0.001$).

In terms of marital status, totally almost three-fourth of the sample was married and one-fourth was widowed; the numbers of the singles were very few. In males, 0.6% was single, 82.8% was married and almost 16.6% was widowed, while in females it was 0.2%, 61.8% and 37.9% respectively. The difference was statistically significant ($p<0.001$).

Approximately three-fifth (60%) of participant was drawn from the rural and two-fifth (40%) of the participants were drawn from urban areas. The residential distribution of the participants by sex was similar ($p = 0.557$).

In general, 47.0% of the participants reported their socioeconomic status as average, one-fifth (20.5%) as good and 25% as bad. Among males, 51.3% reported their socioeconomic status as average and 21.0% as bad while these figures were 42.1% and 30.7% respectively in females ($p<0.001$).

Fifty-four point nine percent of the people in the sample were lived since birth at the current residence (denizen) while 45.1% of them coming from other localities (not denizen). There is no statistically significant difference between male and female regarding the status of denizenship ($p = 0.886$).

Among people who were not denizen, 64% come from the rural and 36% come from the urban area. The proportion of people either coming from rural or urban area is different on the word of the male and female ($p = 0.0265$).

Table 4.2. Socio-demographic characteristics of participants by sex (Nangarhar-Afghanistan, 2015).

Characteristics	Sex						p-value
	Male		Female		Total		
	n	%	n	%	n	%	
Age							
50-54	156	22.9	181	30.2	337	26.3	<0.001
55-59	165	24.2	172	28.7	337	26.3	
60-64	176	25.8	130	21.7	306	23.9	
65-69	105	15.4	78	13.0	183	14.3	
70-74	53	7.8	28	4.7	81	6.3	
>=75	27	4.0	10	1.7	37	2.9	
Level of education							
Illiterate	358	52.5	454	75.8	812	63.4	<0.001
Literate	78	11.4	40	6.7	118	9.2	
Primary school	54	7.9	37	6.2	91	7.1	
Secondary school	47	6.9	19	3.2	66	5.2	
Lycee	123	18.0	48	8.0	171	13.3	
University graduate	22	3.2	1	0.2	23	1.8	
Marital status							
Single	4	0.6	1	0.2	5	0.4	<0.001
Married	565	82.8	371	61.8	936	73.1	
Widowed	113	16.6	227	37.9	340	26.5	
Current residence							
Urban	282	41.3	238	39.7	520	40.6	0.557
Rural	400	58.7	361	60.3	761	59.4	
Self-reported SES[1]							
Excellent	23	3.3	10	1.7	33	2.6	<0.001
Good	139	20.4	123	20.5	262	20.5	
Average	350	51.3	252	42.1	602	47.0	
Bad	143	21.0	184	30.7	327	25.5	
Very bad	27	4.0	30	5.0	57	4.4	
Status of denizenship							
Not denizen	309	45.3	269	44.9	578	45.1	0.886
Denizen	373	54.7	330	55.1	703	54.9	
Residence came from[2]							
Rural	185	59.9	185	68.8	370	64.0	0.026
Urban	124	40.1	84	31.2	208	36.0	
Total[3]	682	53.2	599	46.8	1281	100.0	

[1]Socio-economic Status, [2]Percentages were calculated from the number of participants who were not hailed from the same residence (n=578), [3]Row percentages; others are column percentages

In Table 4.3, characteristics of the participants related to the hours spent outdoors have been shown by their own statment. On average almost one-third of the

participants (31.0%) spending more than 8 hours outdoors; this amount decreased to 9.1% in winter times and increased to 36.0% in summer times. In both summer and winter seasons, males spent more hours outdoor than their female counterparts and the difference is statistically significant (p<0.001).

Table 4.3. Characteristics of participants by the hours spent outdoor per day and sex (Nangarhar-Afghanistan, 2015).

Hours sent outdoor/day	Sex					p-value[1]
	Male		Female		Total	
	n	%	n	%	n	
Summer time						
3-4 hours	45	6.6	21	3.5	66	<0.001
5-6 hours	156	22.9	191	31.9	347	
7-8 hours	213	31.2	194	32.4	407	
>=9 hours	268	39.3	193	32.2	461	
Mean ± SD	3.03±0.94		2.93±0.88		2.99±0.92	
Median; Quartiles (1st-3rd);	3; 2-4		3; 2-4		3; 2-4	
Min-Max	1-4		1-4		1-4	
Winter time						
3-4 hours	50	7.3	35	5.8	85	<0.001
5-6 hours	246	36.1	289	48.2	535	
7-8 hours	314	46.0	231	38.6	545	
>=9 hours	72	10.6	44	7.3	116	
Mean ± SD	2.60±0.774		2.47±0.717		2.54±0.75	
Median; Quartiles(1st-3rd)	3; 2-3		2; 2-3		3; 2-3	
Min-Max	1-4		1-4		1-4	
Whole year (Average)						
3-4 hours	46	6.7	21	3.5	67	<0.001
5-6 hours	156	22.9	193	32.2	349	
7-8 hours	239	35.0	229	38.2	468	
>=9 hours	241	35.3	156	26.0	397	
Mean ± SD;	2.99±0.92		2.87±0.84		2.93±0.89	
Median; Quartiles(1st-3rd)	3; 2-4		3;2-4		3; 2-4	
Min-Max	1-4		1-4		1-4	
Total	682	53.2[2]	599	46.8[2]	1281	100.0

[1]Chi-square test, [2]Row percentages others are column percentages

As regards to the outdoor eye protection use, almost three-fourth (n=991, 77.3%) of the sample was not using any eye protection while they were at outdoors (Table 4.4.). From 290 eye protection-users, 143 stated that they were using sunglasses, 80 scarves, 68 turbans and 5 hats. The percent of sunglass user in males was higher (62.2%) which is more than double that of females (28.2%). Almost all

participants mentioned scarf as eye protectors were female and turbans were male, hats was mentioned by the males only.

Table 4.4. Characteristics of the participants related to the eye protection usage while being outdoor (Nangarhar-Afghanistan, 2015).

Characteristics	Sex					p-value
	Male		Female		Total	
	n	%[1]	n	%[1]	n	
Outdoor eye protection use						
No	502	73.6	489	81.6	991	0.001
Yes	180	26.4	110	18.4	290	
Sunglasses[1]	112	62.2	31	28.2	143	<0.001
Scarf[1]	1	0.6	79	71.8	80	[2]
Turban[1]	68	37.8	-	-	68	[2]
Hat[1]	5	2.8	-	-	5	[2]

[1]More than one answer; percentages were calculated separately from the number of eye protection users (n=180 for male and n=110 for female), [2]No statistical test was performed; the number of observations was not enough

Totally 477 people were working of which 391 (82%) were male and 86 (18%) were female. In males the proportion of laborers was the highest (19.9%), followed by farmers (15.6%), carpenters (13.0%), shopkeeper and government employees 11.0% and 10.7% respectively, teachers (8.4%), drivers (5.6%) and all others (backer, metal worker, tailor, guard, mechanic, army soldier, health personnel, imam, cook, painter, engineer, mason, singer and electrician) are under 4% each. But in females the proportion of teachers was the highest at 29.1%, followed by tailors at 23.3%, labors almost at 19.8%, government employees almost at 15.1%, farmers at 8.1% and all others (cook, shopkeeper and backer) composed of almost 5%. Professions of the of the participants have been shown in (Table 4.5.).

Table 4.5. Distribution of participants by profession and sex (Nangarhar-Afghanistan, 2016).

Profession[1]	Sex				
	Female		Male		Total
	n	%	n	%	n
Carpenter	0	-	13	13.0	13
Labor	17	19.8	78	19.9	95
Teacher	25	29.1	33	8.4	58
Shopkeeper	1	1.2	43	11.0	44
Engineer	0	-	4	1.0	4
Tailor	20	23.3	12	3.1	32
Metal worker	0	-	13	3.3	13
Farmer	7	8.1	61	15.6	68
Government Employee	13	15.1	42	10.7	55
Health personnel	0	-	5	1.3	5
Army soldier	0	-	9	2.3	9
Driver	0	-	22	5.6	22
Imam	0	-	5	1.3	5
Guard	0	-	12	3.1	12
Backer	1	1.2	14	3.6	15
Singer	0	-	1	0.3	1
Electrician	0	-	1	0.3	1
Mechanic	0	-	10	2.6	10
Cook	2	2.3	5	1.3	7
Painter	0	-	5	1.3	5
Masson	0	-	3	0.8	3
Total	86	18.0[2]	391	82.0[2]	477

[1]More than one answer; percentages were calculated separately from the total number of participants who worked (male=391, female=86),[2]Row percentages; others are column percentages

Overall, 37.2% (57.3% of males and 14.4% of females) of the participants were working and this difference was statistically significant ($p<0.001$). Out of 477 persons who were working, 255 (53.5%) were not using any eye protection material while working, 136 (28.5%) answered as no need for eye protection, 77 (16.1%) were using glassess and 9 (1.9%) persons were using other protective materials (goggle and welding hand shield) to protect their eyes from the threat of the injury while working. With reference to male and female the use of eye protection while working was statistically significant ($p<0.001$). Characteristics related to eye protection usage during working have been shown in (Table 4.6.).

Table 4.6. Distribution of participants by working status, eye protection use while working and sex (Nangarhar-Afghanistan, 2015).

Characteristics	Sex					p-value
	Male		Female		Total	
	n	%[1]	n	%[1]	n	
Working status(n=1281)[1]						
No	291	42.7	513	85.6	804	<0.001
Yes	391	57.3	86	14.4	477	
Eye protection while working(n=477)[2]						
No	205	52.4	50	58.1	255	0.001
Spectacles	73	18.7	4	4.7	77	
Others[3]	9	2.3	0	0.0	9	
No need	104	26.6	32	37.2	136	
Total[4]	682	53.2	599	46.8	1281	

[1]Percentage were calculated form total number of participants [2]Percentages were calculated from the number of participants who were working (male n=391 and female n=86) [3]Goggle and welding hand shield [4]Row percentages other are column percentage

Characteristics related to the professions and eye protection usage have shown in (Table 4.7.). Although some of professions in fact required eye protection while working, some of the participants did not use or responded as no need for it. For instance; some of the carpenters, labors, mechanics, drivers and farmers were not using any eye protector or responded as no need whereas it is a necessity for those professions. On the other hand, some participants stated that they were using eye protection while working even their profession really didn't require.

Table 4.7. Distribution of participants by their professions and eye protection (Nangarhar-Afghanistan, 2015).

Profession[1]	Eye protection						
	No		Yes		No need		Total
	n	%	n	%	n	%	n
Carpenter	6	46.2	6	46.2	1	7.7	13
Labor	67	70.5	15	15.8	13	13.7	95
Teacher	17	29.3	5	8.6	36	62.1	58
Shopkeeper	15	34.1	5	11.4	24	54.5	44
Engineer	0	0.0	4	100.0	0	-	4
Tailor	21	65.6	2	6.3	9	28.1	32
Metal worker	3	23.1	10	76.9	0	-	13
Farmer	58	85.3	3	4.4	7	10.3	68
Health personnel	1	20.0	1	20.0	3	60.0	5
Army soldier	2	22.2	7	77.8	0	-	9
Driver	13	59.1	2	9.1	7	31.8	22
Imam	2	40.0	0	0.0	3	60.0	5
Guard	6	50.0	6	50.0	0	0.0	12
Bakery	8	53.3	6	40.0	1	6.7	15
Singer	1	100.0	0	0.0	0	-	1
Electrician	0	-	1	100.0	0	-	1
Mechanic	3	30.0	4	40.0	3	30.0	10
Cook	6	85.7	0	-	1	14.3	7
Painter	1	20.0	4	80.0	0	-	5
Masson	3	100.0	0	-	0	-	3
Total	255	53.5[2]	86	18.0[2]	136	28.5[2]	477

[1]Percentages were taken from the participants, who are currently working, [2]Row percentages

In males, the highest proportion of responders who responded as “No need” for eye protection use while working were shopkeepers 24 (23.1%), followed by government employee 22 (21.2%), teachers 19 (18.3%), labors 11 (10.6%), drivers 7 (6.7%) and all other professions composed of 21 (26.8%). In females, teachers represent with highest proportion 17 (53%) followed by government employee 6 (18.8%), tailors 5 (15.6%), and labors and farmers 2 (6.3%) each. Professions and gender characteristics of participants responded as ‘No need’ to eye protection usage while working was shown in (Table 4.8.).

Table 4.8. Distribution of participants who said no need to eye protection use by profession and sex (Nangarhar, Afghanistan-2016).

Characteristics	Sex				
	Male		Female		Total
	n	%	n	%	n
Carpenter	1	1.0	0	0.0	1
Labor	11	10.6	2	6.3	13
Teacher	19	18.3	17	53.0	36
Shopkeeper	24	23.1	0	0.0	24
Tailor	4	3.8	5	15.6	9
Farmer	5	4.8	2	6.3	7
Government employee	22	21.2	6	18.8	28
Health personnel	3	2.9	0	0.0	3
Driver	7	6.7	0	0.0	7
Imam	3	2.9	0	0.0	3
Bakery	1	1.0	0	0.0	1
Mechanic	3	2.9	0	0.0	3
Cook	1	1.0	0	0.0	1
Total	104	76.5[1]	32	23.5[1]	136

[1]Row percentages; others are column percentages

Professions and gender characteristics of participants responded as ‘No’ to eye protection usage while working was shown in (Table 4.9.). In males, 53 (25.9%) of farmers were answered “No” to eye protection use while working which was the highest, followed by laborers 52 (25.4%), government employees 16 (7.8%), shopkeepers 14 (6.8%), drivers 13 (6.3%) and other profession each less than 5%, whereas, in female, laborers represent with the highest proportion at 15 (30%) followed by tailors 14 (28%), teachers 7 (14%), government employee 6 (12%), farmer 5 (10%) and cook 2 (4%).

Table 4.9. Distribution of participants who answered "no" to eye protection use by profession and sex (Nangarhar, Afghanistan-2016).

Profession	Sex				
	Male		Female		Total
	n	%	n	%	n
Carpenter	6	2.9	0	-	6
Labor	52	25.4	15	30.0	67
Teacher	10	4.9	7	14.0	17
Shopkeeper	14	6.8	1	2.0	15
Tailor	7	3.4	14	28.0	21
Metal worker	3	1.5	0	-	3
Farmer	53	25.9	5	10.0	58
Government employee	16	7.8	6	12.0	22
Health personnel	1	0.5	0	-	1
Army soldier	2	1.0	0	-	2
Driver	13	6.3	0	-	13
Imam	2	1.0	0	-	2
Guard	6	2.9	0	-	6
Bakery	8	3.9	0	-	8
Singer	1	0.5	0	-	1
Mechanic	3	1.5	0	-	3
Cook	4	2.0	2	4.0	6
Painter	1	0.5	0	-	1
Mason	3	1.5	0	-	3
Total	50	19.6[1]	205	80.4[1]	255

[1]Row percentages; others are column percentages

4.1.2 Characteristics Related to the Responder's Health Status, Chronic Disease and Medications

Concerning health status, generally 170 (13.3%) of the participants reported health status as poor, 620 (48.4%) fair and 491 (38.3%) good. In male, poor-health status was reported by almost 67 (9.8%) of the participants while in female, it was 103 (17.2%). Fair-health status was reported by approximately more than half of the participants 352 (51.6%) in male, while in female; it was approximately 268 (44.7%). Good health status was reported by male and female similarly. Statistically significant difference was observed between male and female related to self-reported health status ($p<0.001$).

Table 4.10. Characteristics of participants related to health status, chronic diseases and medication by sex (Nangarhar – Afghanistan 2015).

Characteristics	Sex						p-value
	Male		Female		Total		
	n	%	n	%	n	%	
Self-reported health status							
Poor	67	9.8	103	17.2	170	13.3	<0.001
Fair	352	51.6	268	44.7	620	48.4	
Good	263	38.6	228	38.1	491	38.3	
Any chronic diseases							
No	501	73.5	411	68.6	912	71.2	0.056
Yes	181	26.5	188	31.4	369	28.8	
Self-reported chronic diseases[1]							
HTN	117	17.2	150	25.0	267	20.8	0.001
Dyspepsia	75	11.0	56	9.3	131	10.2	0.331
DM	30	4.4	29	4.8	59	4.6	0.706
BA	17	2.5	15	2.5	32	2.5	0.989
IHD	3	0.4	4	0.7	7	0.5	0.581
COPD	7	1.0	0	0.0	7.0	0.5	0.013
Taking any medications							
No	512	75.1	422	70.5	934	72.9	0.063
Yes	170	24.9	177	29.5	347	27.1	
Total	682	53.2[2]	599	46.8[2]	1281	100.0	

[1]More than one answer; percentages were calculated separately from the total number of participants (male=682, female=599), [2]Row percentage others are column percentage

Related to chronic diseases, approximately 1/3 (28.8%) of the participants reported having chronic diseases, and statistically significant difference was not found among male and female (p = 0.056).

Among chronic diseases, the proportion of HTN was higher than the other chronic diseases 20.8%, followed by dyspepsia 10.2%, DM 4.6%, BA 2.5% and IHD and COPD 0.5% each. Statistically significant differences were observed between male and female only in HTN (p<0.001) and COPD (p = 0.013).

Overall, approximately less than one-third (27.1%) of the participants were taking any medicine and statistically significant difference was not found between male and female (p = 0.063) (Table 4.10.).

Table 4.11 describes some socio-demographic characteristics of the participants related to their health status. By increasing of the age, the proportion of participants reported their health status as poor were also increased, whereas the

proportion of participants who reported their health status as fair was remained approximately the same, around 48.7% among all age groups. Poor health responders were the highest (23.9%) among 65 + age groups while the good health responder was the highest (43%) among 50-55 age groups. Statistically significant difference was observed between age group and reported health status of the participants ($p<0.001$).

The proportion of poor health responders is higher among females, whereas proportion of the fair health responders were higher among males and the difference between them was statistically significant ($p<0.001$).

Of currently not married participants, 20.9% were reported to have poor health status, which is nearly double that of reported by currently married participants at 10.5%, fair and good health status was reported by currently married participants more than currently not married participants and the difference was statistically significant ($p<0.001$).

In illiterate, 16.4% of the participants reported their health status as poor, which is more than three times that of reported in high school graduate at 5.2%, wherease in high school graduates, the proportion of good health respondents was 51.5%, which is about one and a half times that of the reported in illiterate at 37.1% and this difference is statistically significant ($p<0.001$). However, the association between level of education and self rated health status didn't follow any decreasing or increasing pattern.

Related to self-reported economic status, in participants reported having excellent economic status, the proportion of reported poor health status was the lowest (3%) and it is increasing by the worsening of the economic status, it is the highest 38.6% in participant reported economic status as very bad. On the other hand, the proportion of reported good health status was the highest 66.7% among participants reported their economic status as excellent and it is decreasing by the worsening of the economic status, it is the lowest 28.1% among participants reported economic status as very bad. Statistically significant difference was found between them ($p<0.05$).

Table 4.11. Socio-demographic characteristics of the participants related to self-reported health status (Nangarhar-Afghanistan, 2015).

Characteristics	Self-reported health status						Total	p-value
	Poor		Fair		Good			
	n	%	n	%	n	%		
Age group								
50-54	31	9.2	161	47.8	145	43.0	337	<0.001
55-59	26	7.7	170	50.4	141	41.8	337	
60-64	41	13.4	149	48.7	116	37.9	306	
65,+	72	23.9	140	46.5	89	29.6	301	
Sex								
Female	103	17.2	268	44.7	228	38.1	599	<0.001
Male	67	9.8	352	51.6	263	38.6	682	
Marital status								
Currently not married	72	20.9	161	46.7	112	32.5	345	<0.001
Currently married	98	10.5	459	49.0	379	40.5	936	
Level of education								
Illiterate	133	16.4	378	46.6	301	37.1	812	<0.001
Literate	11	9.3	88	74.6	19	16.1	118	
Primary school	8	8.8	45	49.5	38	41.8	91	
Secondary school	8	12.1	25	37.9	33	50.0	66	
High school	10	5.2	84	43.3	100	51.5	194	
Self-reported economic status								
Excellent	1	3.0	10	30.3	22	66.7	33	<0.001
Good	26	9.9	113	43.1	123	46.9	262	
Average	42	7.0	353	58.6	207	34.4	602	
Bad	79	24.2	125	38.2	123	37.6	327	
Very bad	22	38.6	19	33.3	16	28.1	57	
Working status								
No	141	17.5	381	47.4	282	35.1	804	<0.001
Yes	29	6.1	239	50.1	209	43.8	477	
Residence								
Urban	97	18.7	206	39.6	217	41.7	520	<0.001
Rural	73	9.6	414	54.4	274	36.0	761	
Total	170	13.3[1]	620	48.4[1]	491	38.3[1]	1281	

[1]Row percentages

In terms of working status, in non-working participants, the proportion of poor health respondents was almost three times higher than currently working participant, whereas the proportion of good health respondents was lower among non-working than currently working participants and the difference was statistically significant ($p<0.001$).

Concerning the residence of the participants, in urban area the proportion of both poor and good health reporters was higher than the proportion of responders in rural area. Statistically significant difference was observed between the residence and reported health status ($p<0.001$).

Table 4.12 illustrates the characteristics of the participants reported taking any medicine. Generally, 347 (27.1%) of the participants (29.5% females and 24.9% of males) were using the medicine. The proportion of participants using any medication was increased by increasing of the age, it is the least at 14.8% in 50-54 age group and the most 44.5% in 65 years old and over and the difference was statistically significant ($p<0.001$).

Utilization of medicine was distributed almost similarly among males and females ($p = 0.063$).

Approximately one-third (35.9%) of the currently not married participants and one-fourth (23.8%) of the currently married participants were taking medicine. Currently not married participants taken more medicine than currently married participants ($p<0.001$).

Generally, by the increasing level of education the proportion of participant taking medicine was decreased, in illiterate participant, almost 30.8% of the participants were taking medicine, while in high school graduate, it is about 19.6%. The difference was statistically significant ($p<0.05$).

The proportion of participants taking medicine was increased by the worsening of self-reported economic status. In participants reported their economic status as excellent, the proportion of using the medicine was about 21.2%, whereas in participant reported their economic status as bad and very bad, it was 35.2% and 33.3% respectively. This difference is statistically significant ($p<0.05$).

Table 4.12. Distribution of the participants by taking any medication and some socio-demographic characteristics (Nangarhar-Afghanistan, 2015).

Characteristics	Any medication					p-value
	No		Yes		Total	
	n	%	n	%	n	
Age group						
50-54	287	85.2	50	14.8	337	<0.001
55-59	273	81.0	64	19.0	337	
60-64	207	67.6	99	32.4	306	
65,+	167	55.5	134	44.5	301	
Sex						
Female	422	70.5	177	29.5	599	0.063
Male	512	75.1	170	24.9	682	
Marital status						
Currently not married	221	64.1	124	35.9	345	<0.001
Currently married	713	76.2	223	23.8	936	
Level of education						
Illiterate	562	69.2	250	30.8	812	0.004
Literate	93	78.8	25	21.2	118	
Primary school	72	79.1	19	20.9	91	
Secondary school	51	77.3	15	22.7	66	
High school	156	80.4	38	19.6	194	
Self-reporting economic status						
Excellent	26	78.8	7	21.2	33	0.001
Good	191	72.9	71	27.1	262	
Average	467	77.6	135	22.4	602	
Bad	212	64.8	115	35.2	327	
Very bad	38	66.7	19	33.3	57	
Working status						
No	530	65.9	274	34.1	804	<0.001
Yes	404	84.7	73	15.3	477	
Residence						
Urban	364	70.0	156	30.0	520	0.053
Rural	570	74.9	191	25.1	761	
Total	934	72.9[1]	347	27.1[1]	1281	

[1]Row percentages

In non-employed participants, the proportion of taking any medicine was high (34.1%) compares to 15.3% in employed participants and this difference was found to be statistically significant ($p<0.001$).

The proportion of participants taking medicine is not different in reference to urban and rural areas ($p>0.053$).

Table 4.13. Socio-demographic characteristics of participants related to chronic diseases (Nangarhar-Afghanistan, 2015).

Characteristics	Any chronic diseases					p-value
	No		Yes		Total	
	n	%	n	%	n	
Age group						
50-54	276	81.9	61	18.1	337	<0.001
55-59	271	80.4	66	19.6	337	
60-64	202	66.0	104	34.0	306	
65,+	163	54.2	138	45.8	301	
Sex						
Female	411	68.6	188	31.4	599	0.056
Male	501	73.5	181	26.5	682	
Marital status						
Currently not married	212	61.4	133	36.6	345	<0.001
Currently married	700	74.8	236	25.2	936	
Level of education						
Illiterate	547	67.4	265	32.6	812	0.003
Literate	91	77.1	27	22.9	118	
Primary school	70	76.9	21	23.1	91	
Secondary school	50	75.8	16	24.2	66	
High school	154	79.4	40	20.6	194	
Self-reported Economic status						
Excellent	25	75.8	8	24.2	33	<0.001
Good	189	72.1	73	27.9	262	
Average	416	76.6	141	23.4	602	
Bad	202	61.8	125	38.2	327	
Very bad	35	61.4	22	38.6	57	
Working status						
No	513	63.8	291	36.2	804	<0.001
Yes	399	83.6	78	16.4	477	
Residence						
Urban	352	67.7	168	32.3	520	0.022
Rural	560	73.6	201	26.4	761	
Total	912	71.2[1]	369	28.8[1]	1281	

[1]Row percentages

Overall, 28.8% of the participants reported having any chronic diseases (Table 4.13.). The proportion of self-reported any chronic diseases were increased by increasing of the age, in 50-54 age group it is the lowest 18.1%, while it is the highest at 45.8% in 65 years old and over. The proportion of any chronic disease was differently distributed among age groups ($p<0.001$).

The proportion of self-reported chronic diseases in women was high 31.4% compared to their men counterparts, which was 26.5%, however, the difference was found to be not statistically significant ($p = 0.056$).

In currently not married participants, the proportion of any chronic diseases was higher than the currently married participants ($p<0.001$)

In illiterates, the proportion of chronic diseases was high 32.6% as opposed to the lowest proportion which could be seen in high school graduate at 20.6% and the difference was statistically significant ($p= 0.003$). However, the distribution of any chronic disease among level of education is not following any decreasing or increasing trend parallel to the level of education.

The proportion of participants who reported any chronic diseases was increased by the worsening of self-reported economic status. Among participants with excellent economic status, the proportion was 24.2% compared to the participants with very bad economic status, which was 38.6% and the difference was significant ($p<0.001$).

In not-working participants, the proportion of chronic diseases was high at 36.2%, which was more than double that of participant currently working at 16.4%. Statistically significant difference was found in the distribution of any chronic diseases among not-working and working participants ($p<0.001$).

In reference to the residence of the participants, 32.3% of urban residents and 26.4% of rural residents were reported having any chronic disease and this difference in the distribution of any chronic disease among urban and rural residence was observed to be statistically significant ($p = 0.022$).

Type of medication and gender characteristics of the participants has shown in (Table 4.14.). Overall, 73.8% (67.1% of the males and 80.2% of the females) were taking anti-hypertensive, 8.9% (10.0% of the males and 7.9% of the females) were taking anti-asthmatic medication and 34.3% (38.8% of the males and 29.9% of the females) were taking anti-dyspepsia medication. Other medications were taking by males and female participants almost evenly.

Table 4.14. Type of medication and gender characteristics of the participants (Nangarhar-Afghanistan, 2015).

Characteristics	Sex					
	Male (n=170)		Female (n=177)		Total (n=347)	
	n	%[1]	n	%[1]	n	%
Anti-hypertensive	114	67.1	142	80.2	256	73.8
Anti-hyperglycemic	30	17.6	29	16.4	59	17.0
Anti-angina	3	1.8	4	2.3	7	2.0
Anti COPD[2]	7	4.1	0	0.0	7	2.0
Anti-asthmatic	17	10.0	14	7.9	31	8.9
Anti-dyspepsia	66	38.8	53	29.9	119	34.3

[1]More than one answer, percentages were calculated separately from the number of participants used medications (n=347), [2]Chronic Obstructive Pulmonary Disease

In Table 4.15, characteristics of the responders related to eye health were shown. In general, 38.0% of the participants ever visited an ophthalmologist, male and females visited an ophthalmologist almost evenly (p = 0.705).

In terms of suffering eye complaints, 52.1% of the total participants have ever suffered from eye complaints. The percentage of males suffered from eye complaints were lower than females (p = 0.008).

Approximately 26% of the participants' eye diseases were diagnosed by a physician and 7.6% don't remember whether their eye diseases were diagnosed. The proportion of any eye diseases diagnosed by a physician was distributed among males and females almost the same (p = 0.528).

Nearly, 5.6% of the participants suffered from eye trauma and no statistically significant difference was observed between male and female (p = 0.872).

Table 4.15. Distribution of participants by some characteristics related to the eye health and sex (Nangarhar-Afghanistan, 2015).

Characteristics	Sex						p-value
	Male		Female		Total		
	n	%	n	%	n	%	
Ever visiting an ophthalmologist							
No	426	62.5	368	61.4	794	62.0	0.705
Yes	256	37.5	231	38.6	487	38.0	
Ever suffering eye complaint							
No	350	51.3	263	43.9	613	47.9	0.008
Yes	332	48.7	336	56.1	668	52.1	
Any eye diseases diagnosed by a physician							
No	464	68.0	390	65.1	854	66.7	0.528
Yes	167	24.5	162	27.0	329	25.7	
Don't remember	51	7.5	47	7.8	98	7.6	
Suffering from eye trauma							
No	642	94.1	565	94.3	1207	94.2	0.872[1]
Yes	39	5.7	33	5.5	72	5.6	
Don't remember	1	0.2	1	0.1	2	0.2	
Measures taken when a foreign body goes to eye[2]							
Try to remove by him/her self	324	47.5	284	47.4	608	47.5	0.973
Go to physician	236	34.6	174	29.0	410	32.0	0.033
Go to health personnel	165	24.2	153	25.5	318	24.8	0.577
Wash out	94	13.8	98	16.4	192	15.0	0.197
Instilling eye drops	46	6.7	68	11.4	114	8.9	0.004
Go to traditional healer	3	0.4	-	-	3	0.2	0.253[3]
Nothing just waiting	2	0.3	1	0.2	3	0.2	1.000[3]
Accomplishment after trauma[4]							
Went to eye care hospital	18	46.2	12	36.4	30	41.7	[5]
Went to private ophthalmologist	17	43.6	11	33.3	28	38.9	
Went to general physician	-	-	2	6.1	2	2.8	
Did nothing	4	10.2	8	24.2	12	16.7	
Total[6]	682	53.2	599	46.8	1281	100	

[1]Statistical test performed by excluding don't remember category, [2]More than one answer, percentages were calculated from the total number of participants (male n=682 and female n=599), [3]Fisher's Exact Test, [4]Percentages were calculated separately from the total number of participants who suffered eye trauma (males=39 and females =33), [5]Statistical test was not performed; the number of observations was not enough, [6]Row percentages others are column percentages

In response to measure taken when a foreign body goes to your eye, 47.5% of the participants tried by themselves, 24.8% went to health personnel, 15.0% washed

them out and the proportion of participants who go to traditional healers and do nothing were very less both about 0.4%. Generally, 8.9% of the participants were instilling eye drops available in their house. Women were instill eye drops more than men ($p = 0.004$). Approximately 32% of the participants went to physicians, the males went to physicians more than females ($p<0.033$).

With reference to activities after eye exposed to trauma, the proportion of the participants who went to the eye care services was the highest at 41.7%, followed by going to a private ophthalmologist at 38.9%, doing nothing at 16.7% and went to a general physician at 2.8%.

Table 4.16 illustrates Socio-demographic characteristics of the participants related to eye care utilization.

Totally, 487 (38.0%) of the participants ever visited an ophthalmologist. The proportion of participants visiting an ophthalmologist were increased by increasing of the age, in 50-54 age group it is the lowest 30.6%, whereas it is the highest at 48.5% in 65 years old and over ($p<0.001$).

The percentages of Males and females visited an ophthalmologist were almost the same ($p = 0.705$).

Approximately 43.2% of the currently not married participants and 36.1% of the currently married participants were reported visiting an ophthalmologist. This difference was significant ($p = 0.021$).

The proportion of participant reported visiting an ophthalmologist was almost evenly distributed among different level of education ($p = 0.106$).

The proportion of participants who visiting an ophthalmologist was the highest in participants reported their economic status as bad at 39.4%, while it is the lowest among very bad economic status respondents at 29.2% and the difference was statistically significant ($p<0.001$).

Table 4.16. Socio-demographic characteristic of the participants related to visiting an ophthalmologist (Nangarhar-Afghanistan, 2015).

Characteristics	Ever visited an ophthalmologist					p-value
	No		Yes		Total	
	n	%	n	%	n	
Age group						
50-54	234	69.4	103	30.6	337	<0.001
55-59	220	65.3	117	34.7	337	
60-64	185	60.5	121	39.5	306	
65,+	155	51.5	146	48.5	301	
Sex						
Female	368	61.4	231	38.6	599	0.705
Male	426	62.5	256	37.5	682	
Marital status						
Not currently married	196	56.8	149	43.2	345	0.021
Currently married	598	63.9	338	36.1	936	
Level of education						
Illiterate	501	61.7	311	38.3	812	0.106
Literate	78	66.1	40	33.9	118	
Primary school	66	72.5	25	27.5	91	
Secondary school	37	56.1	29	43.9	66	
High school	112	57.7	82	42.3	194	
Self-reported economic status						
Excellent	20	60.6	13	39.4	33	<0.001
Good	158	60.3	104	39.7	262	
Average	407	67.6	195	32.4	602	
Bad	169	51.7	158	48.3	327	
Very bad	40	70.2	17	29.2	57	
Self-reported health status						
Poor	82	48.2	88	51.8	170	<0.001
Fair	425	68.5	195	31.5	620	
Good	287	58.5	204	41.5	491	
Working status						
No	491	61.1	313	38.9	804	0.382
Yes	303	63.5	174	36.5	477	
Residence						
Urban	299	57.5	221	42.5	520	0.006
Rural	495	65.0	266	35.0	761	
Total	794	62.0[1]	487	38.0[1]	1281	

[1]Row percentages

Approximately more than half (51.8%) of the poor health responders, one-third (31.5%) of the fair health responders, and two-fifth (41.5%) of the good health

responder visited an ophthalmologist. Ever visiting an ophthalmologist was variously distributed among self-reported health status ($p<0.001$).

Participants either working or not have the same proportion of ever visiting an ophthalmologist ($p = 0.382$).

The proportion of urban participant visiting an ophthalmologist was high 42.5%, compared to rural participants which was 35% ($p = 0.006$).

Table 4.17 illustrates socio-demographic characteristics of the participants ever experienced eye complaints. In general, 668 (52.1%) of the participants ever suffered any eye complaints.

The proportion of self-reported suffering any eye complaint were increased by increasing of the age, in 50-54 age groups it was the lowest 43.9%, while in 65 years old and over, it is the highest at 65.8%. The proportion of suffering any eye complaints was different with regard to age groups ($p<0.001$).

Proportion of suffering any eye complaint in females was higher than males and this difference was statistically significant ($p = 0.008$).

Approximately 61.4% of the currently not married participants and 48.7% of the currently married participants were reported suffering any eye complaint and the difference was significant ($p<0.001$).

From illiterate to primary school graduate, by increasing the level of education the proportion of suffering any eye complaint was decreased and it was again increased to level of illiterate among secondary school graduates followed by high school graduates. The proportion of suffering any eye complaints in terms of education levels were different ($p = 0.002$).

Overall, the proportion of participants who reported suffering any eye complaint was increased by the worsening of self-reported economic status. The percentages of any eye complaints were higher among participants with very bad economic status than the participants with excellent economic status ($p<0.001$).

Table 4.17. Socio-demographic characteristics of the participants suffered any eye complaints (Nangarhar-Afghanistan, 2015).

Characteristics	Suffering from eye complaint					p-value
	No		Yes		Total	
	n	%	n	%	n	
Age group						
50-54	189	56.1	148	43.9	337	<0.001
55-59	181	53.7	156	46.3	337	
60-64	140	45.8	166	54.2	306	
65,+	103	34.2	198	65.8	301	
Sex						
Female	263	43.9	336	56.1	599	0.008
Male	350	51.3	332	48.7	682	
Marital status						
Not currently married	133	38.6	212	61.4	345	<0.001
Currently married	480	51.3	456	48.7	936	
Level of education						
Illiterate	357	44.0	455	56.0	812	0.002
Literate	68	57.6	50	42.4	118	
Primary school	53	58.2	38	41.8	91	
Secondary school	29	43.9	37	56.1	66	
High school	106	54.6	88	45.4	194	
Self-reported economic status						
Excellent	17	51.5	16	48.5	33	<0.001
Good	129	49.2	133	50.8	262	
Average	349	58.0	253	42.0	602	
Bad	105	32.1	222	67.9	327	
Very bad	13	22.8	44	77.2	57	
Self-reported health status						
Poor	38	22.4	132	77.6	170	<0.001
Fair	346	55.8	274	44.2	620	
Good	229	46.6	262	53.4	491	
Working status						
No	348	43.3	456	56.7	804	<0.001
Yes	265	55.6	212	44.4	477	
Residence						
Urban	234	45.1	286	55.0	520	0.091
Rural	379	49.8	382	50.2	761	
Total[1]	613	47.9	668	52.1	1281	

[1]Row percentages

Among poor health respondent, the proportion of participants reported any eye complaints was higher than the participants with good health (p<0.001).

In not working participants the percentages of suffered any eye complaints were higher 57% than that of participants who were working which was nearly 44% and the difference was statistically significant ($p<0.001$).

Related to the residence of the participants, the proportion of suffering any eye complaints was approximately the same ($p=0.091$).

Table 4.18 illustrates some socio-demographic characteristics of the participants with eye disease, diagnosed by physicians. Totally, 329 (25.7%) of the participants reported that their eye diseases were diagnosed by a physician.

The proportion of participants whose eye diseases diagnosed by a physician were increased by increasing of the age. In 50-54 age groups it is the lowest 21.4%, while it is the highest at 30.6% in 65 years old and over and the difference was statistically significant ($p<0.001$).

In reference to the sex, the proportion of participants whose eye diseases diagnosed by a physician was approximately the same, no statistically significant difference was found ($p = 0.528$).

Approximately 27.5% of the currently not married and 25.0% of the currently married participants was reported that their eye diseases were diagnosed by a physician, however, the difference was not significant ($p = 0.142$).

Participants whose eye diseases were diagnosed by a physician were distributed differently among various levels of education and this difference was statistically significant ($p = 0.002$).

Generally, the proportion of participants whose eye diseases were diagnosed by a physician was decreased by the worsening of self-reported economic status, In participants having excellent economic status, 36.4% reported that their eye diseases was diagnosed by a physician, whereas in participants having good, average and very bad economic status, it is about 28.2%, 20.9% and 17.5%. In participant having bad economic status, accidently, 32.7% reported that their eye diseases were diagnosed by a physician. The difference was statistically significant ($p<0.001$).

Table 4.18. Socio-demographic characteristics of the participants related to any eye diseases diagnosed by a physician (Nangarhar-Afghanistan, 2015).

Characteristics	Any eye diseases diagnosed by physician							p-value
	No		Yes		Don't remember		Total	
	n	%	n	%	n	%		
Age group								
50-54	251	74.5	72	21.4	14	4.2	337	<0.001
55-59	232	68.8	82	24.3	23	6.8	337	
60-64	196	64.1	83	27.1	27	8.8	306	
65,+	175	58.1	92	30.6	34	11.3	301	
Sex								
Female	390	65.1	162	27.0	47	7.8	599	0.528
Male	464	68.0	167	24.5	51	7.5	682	
Marital status								
Not currently married	217	62.9	95	27.5	33	9.6	345	0.142
Currently married	637	68.1	234	25.0	65	6.9	936	
Level of education								
Illiterate	536	66.0	214	26.4	62	7.6	812	0.002
Literate	82	69.5	34	28.8	2	1.7	118	
Primary school	74	81.3	11	12.1	6	6.6	91	
Secondary school	40	60.6	15	22.7	11	16.7	66	
High school	122	62.9	55	28.4	17	8.8	194	
Self-reported economic status								
Excellent	20	60.6	12	36.4	1	3.0	33	<0.001
Good	173	66.0	74	28.2	15	5.7	262	
Average	443	73.6	126	20.9	33	5.5	602	
Bad	173	52.9	107	32.7	47	14.4	327	
Very bad	45	78.9	10	17.5	2	3.5	57	
Self-reported health status								
Poor	88	51.8	58	34.1	24	14.1	170	<0.001
Fair	452	72.9	141	22.7	27	4.4	620	
Good	314	64.0	130	26.5	47	9.6	491	
Working status								
No	524	65.2	212	26.4	68	8.5	804	0.228
Yes	330	69.2	117	24.5	30	6.3	477	
Residence								
Urban	300	57.7	150	28.8	70	13.5	520	<0.001
Rural	554	72.8	179	23.5	28	3.7	761	
Total[1]	854	66.7	329	25.7	98	7.6	1281	

[1]Row percentages

The percentages of participants whose eye diseases were diagnosed by a physician was 34.1%, 22.7%, and 26.5% among participant reported their health

status as poor, average and good respectively and the difference was statistically significant (p<0.001).

Participants either working or not, reported nearly the same proportion of eye diseases diagnosed by a physician (p = 0.228).

Urban resident compared to rural resident reported a higher proportion of the eye diseases diagnosed by a physician (p <0.001).

Table 4.19. Distribution of participants by characteristics related to the barriers of not using eye care services and sex (Nangarhar-Afghanistan, 2015).

Visiting an ophthalmologist	Sex				
	Female		Male		Total
	n	%	n	%	n
Reasons for not visiting[1]					
Problem not felt	264	71.7	350	82.2	614
No money to go	54	14.7	41	9.6	95
No one to accompany	54	14.7	35	8.2	89
It is very far	14	3.8	7	1.6	21
It is from God side	2	0.5	5	1.2	7
No time for going to	0	0	6	1.4	6
Cannot go (other disease)	2	0.5	3	0.7	5
Reasons for visiting[2]					
Impaired vision	121	52.4	121	47.3	242
Near vision problem	15	6.5	33	12.9	48
Epiphora	23	10	28	10.9	47
Eye trauma	16	6.9	27	10.5	43
Eye pain	38	16.5	38	14.8	32
Itching	36	15.6	30	11.7	19
Burning sensation	25	10.8	25	9.8	7
Infection	2	0.9	0	-	2

[1]Mor than one answer percentages were calculated separately from the number of participants who have not visited an ophthalmologist (total n=794, male=426, female=368),[2]More than one answer; percentages were calculated from the number of participants who have visited an ophthalmologist (total n=487, male=231, female=256)

Table 4.19 illustrate the barriers to eye health service utilization. Generally, 794 (61.9%) of the participants have never visited an eye care services.

The barriers of not utilizing eye health services from top to down were ‘problem not felt’, ‘no money to go’, no one to accompany’, ‘it is very far’, ‘ it is from God side’, ‘ no time for going to’, and ‘cannot go (because of the other diseases) respectively.

Impaired vision, near vision problems, Epiphora, eye trauma, eye pain, itching and burning sensation of the eyes were the common complaints, which make the participants contacting eye health services.

Eye diseases, which were diagnosed by the ophthalmologist among participants was shown in (Table 4.20.). Overall, 329 participants (162 females and 167 males) reported that their eye diseases were diagnosed by the ophthalmologist. In female top 5 diseases, composed of nearly 77% were cataract at the top, followed by the infection, presbyopia, allergy and 'I don't remember'. The remaining 23% are composed of chronic dacryocystitis, eye trauma, glaucoma, RE, CO, age related macular degeneration and intra-ocular foreign body.

Table 4.20. Pattern of Eye diseases diagnosed by an ophthalmologist (Nangarhar-Afghanistan, 2015).

Eye disease[1]	Sex					
	Female		Male		Total	
	n	%	n	%	n	%
Cataract	62	38.3	47	28.1	109	33.1
Presbyopia	14	8.6	29	17.4	43	13.1
Infection	22	13.6	16	9.6	38	11.6
I don't remember	13	8.0	16	9.6	29	8.8
CDC	10	6.2	14	8.4	24	7.3
Eye trauma	10	6.2	13	7.8	23	7.0
Allergy	14	8.6	4	2.4	18	5.5
Glaucoma	7	4.3	7	4.2	14	4.3
RE	4	2.5	8	4.8	12	3.6
CO	4	2.5	4	2.4	8	2.4
AMD	1	0.6	6	3.6	7	2.1
IOFB	1	0.6	3	1.8	4	1.2
Total [3]	162	49.2	167	50.8	329	100.0

[1]Percentages were taken from the participants whose eye diseases were diagnosed by an ophthalmologist, [2]Chronic Dacryo Cystitis [3]Row percentages; others are column percentages

In males, top 5 diseases, composed of almost 73% were cataract at the top, followed by presbyopia, infection, 'I don't remember' and chronic dacryocystitis. The remaining 27% filed by eye trauma, allergy, glaucoma, RE, CO, age related macular degeneration and intra-ocular foreign body.

Place of residence of the participants and availability of health services have been illustrated in (Table 4.21.). Generally, 23.7% of the participants reported availability of health services in a distance of 2 km from their house. In rural area,

the proportion of participant reported the availability of health services were 30.6%, which was more than double that of urban area which was 13.5%.

In terms of the type of health services, in urban area almost more than 90% of the participant reported public health hospital, university hospital, and PH. Availability of CHC reported by only 8% of the urban participants. In rural area more than 40% of the participants reported the private physician clinics followed by BHC at 30.5%, CHC at 18.5% and SHC at 9%.

Table 4.21. Participant's place of residence and health services availability (Nagnarhar-Afghanistant, 2015).

Characteristics	Residence						p-value
	Urban		Rural		Total		
	n	%	n	%	n	%	
Presence of health services in 2 km distance	n=520		n=761		n=1281		
No	418	80.4	511	67.1	929	72.5	<0.001
Yes	70	13.5	233	30.6	303	23.7	
Don't know	32	6.2	17	2.2	49	3.8	
Type of health servicess[1]	n=70		n=233		n=303		
Public health hospital	20	28.6	-	-	20	6.6	
University hospital	21	30.0	-	-	21	6.9	
PH	23	32.9	-	-	23	7.6	
CHC	6	8.6	43	18.5	49	16.2	
BHC	-	-	71	30.5	71	23.4	
SHC	-	-	22	9.4	22	7.3	
Private Physician Clinic	-	-	97	41.6	97	32.0	

[1]Percentages were calculated from the number of participants who were answered "yes" to the presence of health services in 2 km distance

4.1.3 Characteristics of the Participants Related to Tobacco Use

Table 4.22. Smoking characteristics of the participants by sex (Nangarhar-Afghanistan 2015).

Smoking condition	Sex						p-value
	Male (n=682)		Female (n=599)		Total (n=1281)		
	n	%	n	%	n	%	
No	394	57.8	503	84.0	897	70.0	< 0.001
Ex-tobacco user	76	11.1	40	6.7	116	9.1	
Current tobacco user	212	31.1	56	9.3	268	20.9	
Total	682	53.2	599	46.8	1281	100.0	

[1]Row percentages others are column percentages

Characteristics related to the responder's tobacco smoking and sex has been described in (Table 4.22.). Totally 30% of the participants have ever smoked (20.9% were current smokers and 9.1% were ex-smokers). The proportion of both currently smoker and ex-smoker is higher among male participants ($p<0.001$).

Generally, 40.5% of ex-smoker had used snuff followed by cigarettes and hookah, but male and female didn't follow the same patterns. In males, the proportion of cigarette user was high at 50%, followed by snuff and hookah, whereas in females, the proportion of hookah user was high at 55% followed by snuff and cigarette. In reference to current smokers, 80.2% of tobacco users were used snuff followed by cigarette and hookah. The males and females follow the same patterns in general (Table 4.23.).

Table 4.23. Tobacco smoking characteristics of the participant and sex (Nangarhar - Afghanistan 2015).

Smoking condition	Sex					
	Male (n=682)		Female (n=599)		Total (n=1285)	
	n	%	n	%	n	%
No	394	57.8	503	84	897	70
Ex-tobacco user (n=116)[1]						
Cigarettes	38	50.0	5	12.5	43	37.1
Hookah user	14	18.4	22	55.0	36	31.0
Snuff user	30	39.5	17	42.5	47	40.5
Current tobacco user (n=268)[2]						
Cigarette	50	23.6	5	8.9	55	20.5
Hookah user	16	7.5	11	19.6	27	10.1
Snuff user	168	79.2	47	83.9	215	80.2
Total	682	53.2[3]	599	46.8[3]	1281	100.0

[1]More than one answer; percentages were calculated separately from the total number of participants who used and left (total n=116, male=76, female=40), [2]More than one answer; percentages were calculated separately from the total number of participants who were currently using tobacco (total n=268, male=212, female=56), [3]Row percentages other are column percentages

4.1.4 Socio-demographic Characteristics of the Participants with BMI

Table 4.24 illustrate characteristics of the responders related to obesity status. In general, the proportion of the underweight, overweight and obese were 46 (3.61%), 299 (23.3%) and 57 (4.4%) respectively.

Obesity status was nearly equally distributed among various age groups ($p =0.276$) and male and female ($p = 0.266$).

Table 4.24. Distribution of participants by socioeconomic characteristics and obesity status (Nangarhar-Afghanistan, 2015).

Characteristics	Obesity status									p-value
	Underweight		Normal weight		Overweight		Obese		Total	
	n	%	n	%[1]	n	%[1]	n	%[1]	n	
Age group										
50-54	7	2.1	234	69.4	86	25.5	10	3.0	337	0.276
55-59	15	4.5	233	69.1	72	21.4	17	5.0	337	
60-64	11	3.6	219	71.6	61	19.9	15	4.9	316	
65,+	13	4.3	193	64.1	80	26.6	15	5.0	301	
Sex										
Female	26	4.3	419	69.9	128	21.4	26	4.3	599	0.266
Male	20	2.9	460	67.4	171	25.1	31	4.5	682	
Marital status										
Currently not married	20	5.8	227	65.8	78	22.6	20	5.8	345	0.030
Currently married	26	2.8	652	69.7	221	23.6	37	4.0	936	
Level of education										
Illiterate	34	4.2	574	70.7	168	20.7	36	4.4	812	[2]
Literate	1	0.8	73	61.9	39	33.1	5	4.2	118	
Primary school	3	3.3	56	61.5	29	31.9	3	3.3	91	
Secondary school	1	1.5	39	59.1	22	33.3	4	6.1	66	
High school	7	3.6	137	70.6	41	21.1	9	4.6	194	
Self-reporting economic status										
Excellent	2	6.1	20	60.6	9	27.3	2	6.1	33	0.104
Good	9	3.4	181	69.1	63	24.0	9	3.4	262	
Average	13	2.2	412	68.4	149	24.8	28	4.7	602	
Bad	20	6.1	227	69.4	62	19.0	18	5.5	327	
Very bad	2	3.5	39	68.4	16	28.1	-	-	57	
Working condition										
No	33	4.1	555	69.0	179	22.3	37	4.6	804	0.030
Yes	13	2.7	324	67.9	120	25.2	20	4.2	477	
Residence										
Urban	16	3.1	334	64.2	133	25.6	37	7.1	520	<0.001
Rural	30	3.9	545	71.6	166	21.8	20	2.6	761	
Total	46	3.61	879	68.61	299	23.31	57	4.41	1281	

[1]Row percentages, [2]Statistical test was not performed, because the number of observations was not enough

The proportion of underweight in currently not married participants were 5.8%, which is almost double that of currently married at 2.8%. In addition, the proportion of obesity in currently not married participants was 5.8%, which was

slightly higher than in currently married participants, which were 4% and the difference was found to be statistically significant (p = 0.030).

In all categories of level of education, the distribution of obesity was almost around 4.6%. The proportion of underweight was the highest in illiterate 4.2%, whereas the highest proportion of overweight was in secondary school graduates at 33.3%.

Obesity status of the participant was almost equally distributed among self-reported economic status (excellent, good, average, bad and very bad), no statistically significant difference was observed (p = 0.104).

Obesity status (obesity, overweight and underweight) was unequally distributed among working and non-working participants and the unequal distribution were statistically significant (p = 0.030).

In urban area, the proportion of both obesity and overweight were higher than the proportion of obesity and overweight in the rural area (p<0.001).

4.1.5 Characteristics of the Participants Related to HTN and DM

Table 4.25. Distribution of participants by the characteristics related to the HTN and sex (Nangarhar-Afghanistan, 2015).

Characteristics	Sex					p-value
	Female		Male		Total	
	n	%	n	%	n	
Hypertension						
No	449	75.0	565	82.8	1014	0.001
Yes	150	25.0	117	17.2	267	
Duration of hypertension						
Mean ±SD	6.2±3.4		7.7±3.9		6.9±3.7	
Median	5		8		6	<0.001[1]
Quartile(1st - 3rd)	4.0-8.0		5.0-10.0		4.0-10.0	
Min - Max	1-17		1-20		1-20	
Treatment						
No	457	76.3	568	83.3	1025	0.002
Yes	142	23.7	114	16.7	256	
Total	599	46.82	682	53.22	1281	

[1]Mann-Whitney U

Table 4.25 illustrates hypertensive characteristic of the participants. Overall, 20.8% of the participants had HTN, but it is unequally distributed among female and male (p = 0.001).

With regard to treatment, female were more likely to take the medicine than males (p = 0.002).

Females and males were also different in reference to median duration of HTN, in females the median duration of HTN was 5 years while it was 8 years in male and the difference was statistically significant (p<0.001).

Characteristics of the responder with DM has been described in (Table 4.26.). Totally from 1281 participants, 59 (4.6%) were DM and the distribution among male and female was almost the same (p = 0.601). Its median duration was 8 years and all diabetic participants (59) were taking related medicine. Overall, 27 out of 59 diabetic participants were contacted for their eye checkup after DM diagnosis.

Table 4.26. Characteristics of participants related to the DM and sex (Nangarhar-Afghanistan, 2015)

Characteristics	Sex					p-value
	Female		Male		Total	
	n	%	n	%	n	
Diabetes mellitus						
No	570	95.2	651	95.5	1221	0.601
Yes	29	4.8	30	4.4	59	
I don't remember	0	0.0	1	0.1	1	
Duration of diabetes						
Mean ±SD	7.62±2.73		8.47±4.05		8.05±3.47	
Median	8.00		8.50		8.00	0.501[1]
Quartile(1st - 3rd)	6-10		5-12		6-10	
Min - Max	1-11		1-15		1-15	
Eye examination after diagnosis of the disease[2]						
No	17	58.6	15	50.0	32	0.506
Yes	12	41.4	15	50.0	27	
Total [3]	599	46.8	682	53.2	1281	

1Mann-Whitney U, [2]Percentages were calculated from the number of participants who are diabetic
[3]Row percentages; others are column percentages

4.1.6 Prevalence and Common Causes of Visual Impairment, Low Vision and Blindness

Table 4.27. Prevalence of low vision and blindness (Nangarhar-Afghanistan, 2015).

Condition	Frequency	Percent
Normal vision	991	77.4
Low Vision	178	13.9
Blindness	112	8.7
Total	1281	100

The prevalence of visual impairment was 22.6% (95% CI = 20.0-25.0) of which 13.9% (95% CI = 12-16) was low vision and 8.7% (95% CI = 7.0-10.0) was blind (Table 4.27.).

The most common causes of the visual impairment were cataract 52.8%, followed by the RE 26.9%, glaucoma 8.6%, other posterior segment disorders 4.8%, AMD 3.4%, CO and DR each at 1.4%, and cataract surgical complication and phthisis each at 0.3% (Table 4.28.).

Table 4.28. Prevalence of visual impairment and its main causes (Nangarhar-Afghanistan, 2015).

Visual Impairment	n	%[1]	%[2]
No	991	77.4	
Yes	290	22.6	
Cataract	153	52.8	11.9
Uncorrected RE	78	26.9	6.1
Glaucoma	25	8.6	1.9
Other Post Segment Disorders[3]	14	4.8	1.1
Age-related Macular Degeneration	10	3.4	0.8
Corneal Opacity	4	1.4	0.3
Diabetic Retinopathy	4	1.4	0.3
Cataract Surgical Complications	1	0.3	0.1
Phthisis	1	0.3	0.1

[1]More than one impairment; percentages were calculated from the number of participants who have any impairment (n=290), [2]More than one impairment; percentages were calculated from the total number of participants (n=1281), [3]Apart from diabetic retinopathy, age related macular degeneration, glaucoma other diseases related to posterior segment is recorded as posterior segment disorder,

Sex characteristics of the participant with visual impairment was given in (Table 4.29.). The prevalence of visual impairment was distributed among male and female differently (p = 0.020). Generally, 61.4% of visual impairment composed by

low vision and 38.6% by blindness. In females, 62.7% of visual impairment was low vision and 37.3% was blindness, while in male it was 59.9% and 40.1% respectively.

Table 4.29. Distribution of visual impairment by sex (Nangarhar-Afghanistan, 2015).

Characteristics	Sex					p-value
	Female		Male		Total	
	n	%	n	%	n	
Visual impairment						
No	446	74.5	545	79.9	991	0.020
Yes	153	25.5	137	20.1	290	
Low Vision	96	62.7	82	59.9	178	
Blindness	57	37.3	55	40.1	112	
Total	599	46.8[1]	682	53.2[1]	1281	

[1]Row percentages others are column percentages

Table 4.30. Main causes of low vision and blindness (Nangarhar-Afghanistan, 2015).

Characteristics	Visual impairment			
	Low vision(n=178)		Blindness(n=112)	
	n	%[1]	n	%[2]
Refractive Error	74	41.6	4	3.6
Cataract	72	40.4	81	72.3
Glaucoma	14	7.9	11	9.8
Age-related Macular Degeneration	8	4.5	2	1.8
Diabetic Retinopathy	4	2.2	-	-
Corneal Opacity	3	1.7	1	0.9
Other Post Segment Disorder	2	1.1	12	10.7
Cataract Surgical Complications	1	0.6	-	-
Phthisis	-	-	1	0.9

[1]Percentages were calculated from the total number of people with low vision (n=178), [2]Percentages were calculated from the total number of people with blindness (n=112)

Table 4.30 shows the common causes of low vision and blindness. Number one cause of low vision was RE 42% compared to the cataract for blindness at 72%. The second main cause of low vision was cataract followed by glaucoma, AMD, DR, CO, other posterior segment disorder and cataract surgical complication. The second common cause of blindness was other posterior segment disorder followed by glaucoma, RE, AMD, CO and phthisis.

4.2 Bivariate Analysis

4.2.1 Socio-demographic Characteristics of Visually Impaired (low vision and blindness) Participants

Socio-demographic characteristics of visually impaired participants was shown in Table 4.31. In reference to the sex, the proportion of female participants who were visually impaired was 25.5%, whereas in male it was 20%. The difference in distribution of VI among gender was statistically significant (p = 0.020).

The proportion of visual impairment was increased by increasing of the age. In 50-54 age groups it is the lowest about 16.6%, while it is the highest at nearly 29.2% in 65 years old and over, and the difference was statistically significant (p = 0.001).

By increasing of the age, prevalence of visual impairment was increased, in 50-54 year old participants, prevalence of visual impairment was 16.6%, while in 65 years old and over participants, the prevalence is the highest 29.2% and the difference is significant (p<0.001).

Approximately 28.1% of the currently not married and nearly 20.6% of the currently married participants was visually impaired. Statistically significant difference was observed in distribution of visual impairment among the marital status (p = 0.004).

Visual impairment was distributed among self-reported economic status and level of education differently and the level of significance for either of them was (p<0.001).

In currently working participants, the proportion of visual impairment was around 13.8%, while it is about 27.9% in participants who were not working and this difference was significant (p<0.001).

Visual impairment was distributed almost evenly among status of denizenship and place of residence.

Table 4.31. Socio-demographic characteristics of the participants with visual impairment (Nangarhar-Afghanistan, 2015).

Characteristics	Visual Impairment					p-value
	No		Yes		Total	
	n	%	n	%	n	
Sex						
Female	446	74.5	153	25.5	599	0.020
Male	545	79.9	173	20.1	682	
Age Group						
50 - 54	281	83.4	56	16.6	337	<0.001
55 - 59	270	80.1	67	19.9	337	
60 - 64	227	74.2	79	25.8	306	
>=65	213	70.8	88	29.2	301	
Marital Status						
Currently not married	248	71.9	97	28.1	345	0.004
Currently married	743	79.4	193	20.6	936	
Self-reported economic status						
Excellent	28	84.8	5	15.2	33	
Good	208	79.4	54	20.6	262	<0.001
Average	496	82.4	106	17.6	602	
Bad	219	67.0	108	33.0	327	
Very bad	40	70.2	17	29.8	57	
Level of education						
Illiterate	582	71.7	230	28.3	812	<0.001
Literate	98	83.1	20	16.9	118	
Primary school	85	93.4	6	6.6	91	
Secondary school	56	84.8	10	15.2	66	
High school/University	170	87.6	24	12.4	194	
Working status						
No	580	72.1	224	27.9	804	<0.001
Yes	411	86.2	66	13.8	477	
Status of denizenship						
Not Denizen	442	76.5	136	23.5	812	0.490
Denizen	549	78.1	154	21.9	118	
Place of residence						
Urban	406	78.1	114	21.9	520	0.613
Rural	585	76.9	176	23.1	761	
Total	991	77.4[1]	290	22.6[1]	1281	

[1]Row percentages

Table 4.32. Sociodemographic characteristics of the participants with blindness (Nangarhar-Afghanistan, 2015).

Characteristics	Blindness					p-value
	No		Yes		Total	
	n	%	n	%	n	
Sex						
Female	446	88.7	57	11.3	503	0.236
Male	545	90.8	55	9.2	600	
Age Group						
50 - 54	281	95.6	13	4.4	294	<0.001
55 - 59	270	90.9	27	9.1	297	
60 - 64	227	88.0	31	12.0	258	
>=65	213	83.9	41	16.1	254	
Marital Status						
Currently not married	248	87.6	35	12.4	283	0.153
Currently married	743	90.6	77	9.4	820	
Self-reported economic status						
Excellent	28	93.3	2	6.7	30	0.001
Good	208	89.3	25	10.7	233	
Average	496	93.2	36	6.8	532	
Bad	219	84.6	40	15.4	259	
Very bad	40	81.6	9	18.4	49	
Level of education						
Illiterate	582	87.1	86	12.9	668	0.001
Literate	98	95.1	5	4.9	103	
Primary school	85	97.7	2	2.3	87	
Secondary school	56	86.2	9	13.8	65	
High school/University	170	94.4	10	5.6	180	
Working status						
No	580	84.8	104	15.2	684	<0.001
Yes	411	98.1	8	1.9	419	
Status of denizenship						
Not denizen	442	88.9	55	11.1	497	0.364
Denizen	549	90.6	57	9.4	606	
Place of residence						
Urban	406	89.6	47	10.4	453	0.839
Rural	585	90.0	65	10.0	650	
Total[1]	991	89.8	112	10.2	1103	100.0

[1]Row percentages

Explanation of Socio-demographic characteristics of the blind participants have been illustrated in (Table 4.32.). The prevalence of blindness was distributed

equally among males and females (p = 0.236), marital status (p = 0.153), status of denizenship (p = 0.364) and place of residence (p = 0.839).

The prevalence of blindness was increased by increasing the age, in 50-54, it is the lowest about 4.4%, but in 65 years old and above, it is the highest at 16.1%. The difference in the distribution of blindness with reference to age groups was found to be statistically significant (p<0.001).

Generally, the prevalence of blindness was increased by the worsening of self-reported economic status. In participants reported their economic status as excellent, the prevalence of blindness was about 6.7%, which was the lowest, on the other hand the highest prevalence of blindness (18.4%) was among the participants reported their economic status as very bad and the difference was found to be statistically significant (p = 0.001).

The prevalence of blindness was distributed among level of education differently, and the difference was statistically significant (p = 0.001), however, didn't follow increasing or decreasing pattern together with the level of education.

The prevalence of blindness was higher among non-working participants (15.2%) than the participants who were working (1.9%) and the difference was statistically significant (p<0.05).

Table 4.33 illustrates socio-demographic characteristics of the participants with low vision. The prevalence of low vision in females and in males was respectively 17.7% and 13.1% (p = 0.028).

Commonly, the prevalence of low vision was increased by increasing the age, it is 13.3% among 50-59 whereas it is 18.1% among 65 years old and above, however, this difference was not statistically significant (p = 0.176).

Among currently not married participants, the prevalence of low vision is higher than currently married participants (p = 0.006).

Table 4.33. Sociodemographic characteristics of the participants with low vision (Nangarhar-Afghanistan, 2015).

Characteristics	Low Vision					p-value
	No		Yes		Total	
	n	%	n	%	n	
Sex						
Female	446	82.3	96	17.7	542	0.028
Male	545	86.9	82	13.1	627	
Age Group						
50 - 54	281	86.7	43	13.3	324	0.176
55 - 59	270	87.1	40	12.9	310	
60 - 64	227	82.5	48	17.5	275	
>=65	213	81.9	47	18.1	260	
Marital Status						
Currently not married	248	80.0	62	20.0	310	0.006
Currently married	743	86.5	116	13.5	859	
Self-reported economic status						
Excellent	28	90.3	3	9.7	31	<0.001
Good	208	87.8	29	12.2	237	
Average	496	87.6	70	12.4	566	
Bad	219	76.3	68	23.7	287	
Very bad	40	83.3	8	16.7	48	
Level of education						
Illiterate	582	80.2	144	19.8	726	<0.001
Literate	98	86.7	15	13.3	113	
Primary school	85	95.5	4	4.5	89	
Secondary school	56	98.2	1	1.8	57	
High school/University	170	92.4	14	7.6	184	
Working status						
No	580	82.9	120	17.1	700	0.026
Yes	411	87.6	58	12.4	469	
Status of Denizenship						
Not Denizen	442	84.5	81	15.5	523	0.823
Denizen	549	85.0	97	15.0	646	
Place of residence						
Urban	406	85.8	67	14.2	473	0.405
Rural	585	84.1	111	15.9	696	
Total[1]	991	84.8	178	15.2	1169	

[1]Row percentages

The prevalence of low vision was increased by the worsening of the economic status and statistically significant difference was found in the distribution of low vision among self-reported economic status ($p<0.001$).

Generally, the proportion of low vision was decreased by increasing the level of education, in illiterate, the prevalence of low vision was the highest at 19.8%, whereas in high school graduates, it is 7.6% and the difference was statistically significant ($p<0.001$).

The prevalence of low vision was also differently distributed among participants either working or not ($p = 0.026$).

The prevalence of low vision was almost equally distributed among participants either Denizen or not and either urban or rural.

4.2.2 Characteristics Related to Eye Health and General Health of the Visual Impaired Participants

Eye health characteristics of visual impaired participants illustrated in Table 4.34. Generally, the prevalence of visual impairment was equally distributed among status of outdoor eye protection use ($p = 0.830$), sunglasses use ($p = 0.076$), other eye protection materials use ($p = 0.085$), hours spent outdoors ($p = 0.398$) and any eye trauma ($p = 0.052$).

On the other hand, the prevalence of visual impairment was higher among participants had ever eye complaint ($p<0.001$).

Table 4.34. Participants with visual impairment and some characteristics related to eye health (Nangarhar-Afghanistan, 2015).

Characteristics	Visual Impairment					p-value
	No		Yes		Total	
	n	%	n	%	n	
Outdoor eye protection use						
No	768	77,5	223	22,5	991	0,830
Yes	223	76,9	67	23,1	290	
Sunglasses						
No	872	76,6	266	23,4	1138	0,076
Yes	119	83,2	24	16,8	143	
Other eye protection						
No	881	78,1	247	21,9	1128	0,085
Yes	110	71,9	43	28,1	153	
Ever eye complaint						
No	557	90,9	56	9,1	613	<0,001
Yes	434	65,0	234	35,0	668	
Ever eye trauma						
No	942	77,9	267	22,1	1209	0,052
Yes	49	68,1	23	31,9	72	
Hours spent outdoor/day						
3-4	55	82,1	12	17,9	67	0,398
5-6	264	75,6	85	24,4	349	
7-8	371	79,3	97	20,7	468	
>=9	301	75,8	96	24,2	397	
Total[1]	991	77,4	290	22,6	1281	

[1]Row percentages

Table 4.35 describes health, chronic diseases and obesity status of the visually impaired participants. The prevalence of visual impairment was found to be higher in participants with poor economic status than the participants with fair and good economic status ($p<0.001$). Similarly, it is distributed variously among participants with normal weight, overweight, obese and underweight ($p = 0.035$).

The prevalence of visual impairment among people reported having HTN was around 39.3%, which was more than double that of people reported not having HTN at 18.2% and this difference was statistically significant ($p<0.001$)

Table 4.35. Characteristics related to health, chronic diseases and obesity of visual impairment participants (Nangarhar-Afghanistan, 2015).

Characteristics	Visual impairment					p-value
	No		Yes		Total	
	n	%	n	%	n	
Health status						
Poor	103	60.6	67	39.4	170	<0.001
Fair	497	80.2	123	19.8	620	
Good	391	79.6	100	20.4	491	
Obesity status						
Underweight	30	65.2	16	34.8	46	0.035
Normal	698	79.4	181	20.6	879	
Overweight	222	74.2	77	25.8	299	
Obese	41	71.9	16	28.1	57	
Any chronic diseases						
No	753	82.6	159	17.4	912	<0.001
Yes	238	64.5	131	35.5	369	
Hypertension	162	60.7	105	39.3	267	<0.001
Diabetes mellitus	42	71.2	17	28.8	59	0.246
Other chronic disease	109	66.5	55	33.5	164	<0.001
Duration of HTN						
Mean ±SD	6.78±3.68		6.97±3.68		6.85±3.67	
Median	5.5		6		6	0.506[1]
Quartile (1st - 3rd)	4-10		4.5-10		4-10	
Min - Max	1-20		1-15		1-20	
Medication for HTN[1]						
No	9	81.8	2	18.2	11	
ACEI[2]	60	65.2	32	34.8	92	0.140
Others	93	56.7	71	43.3	164	
Duration of DM						
Mean ±SD	8.07±3.17		8±4.21		8.05±4.47	
Median	8.5		8		8	0.906[3]
Quartile (1st - 3rd)	6-10		5-11.5		1-15	
Min - Max	1-15		1-15		1-15	
Examination after DM diagnosis[4]						
No	20	62.5	12	37.5	32	0.109
Yes	22	81.5	5	18.5	27	
Total[4]	991	77.4	290	22.6	1281	

[1]Percentages were calculated separately from the total number of participants who had hypertension (n=267), [2]Angiotensin Converting Enzyme Inhibitor, [3]Mann Whitney U test, [4]Percentages were calculated separately from the number of participants who were diabetes mellitus (n=59), [5]Row percentages

Proportion of visual impairment among self-reported DM was about 28.8%, which was slightly higher than the participants who were not diabetics at 22.4%, but this difference is not statistically significant ($p = 0.247$).

The prevalence of visual impairment was distributed differently among participants who suffered any chronic diseases ($p<0.001$), and other chronic diseases ($p<0.001$).

In terms of medication, the prevalence of visual impairment was not differently distributed among various type for medicines ($p = 0.140$).

Among participants who visited an ophthalmologist after diagnosis of DM, the proportion of visual impairment was 18.5%, while it was 37.5% among participants who reported hadn't visited an ophthalmologist after diagnosis of DM, however, the difference was not statistically significant ($p = 0.109$).

The association of variables that describes eye health of the participants such as outdoor eye protection use, sunglass use, other type of protection (hate, turban and scarf), ever eye complaint, ever eye trauma, and hours spent outdoor per day with low vision were shown in Table 4.36.

Among participants experienced eye complaint in the past, the prevalence of low vision was high at 22.8%, while among participants with never complaining, it is 8.2% and this difference was statistically significant ($p<0.001$). ever eye trauma is another variable, which affect low vision. Among participants with experienced eye trauma in the past, the prevalence of low vision was 23.4%, wherease among never experienced participants, it is 14.8%, but the difference was marginally significant ($p = 0.06$). the prevalence of low vision was distributed among participants with other characteristics was not found to be statistically significant.

Table 4.36. Participants with low vision and some characteristics related to eye health (Nangarhar-Afghanistan, 2015),

Characteristics	Low visoin					p-value
	No		Yes		Total	
	n	%	n	%	n	
Outdoor eye protection use						
No	768	85.4	131	14.6	899	0.255
Yes	223	82.6	47	17.4	270	
Sunglasses						
No	872	84.8	156	15.2	1028	0.895
Yes	119	84.4	22	15.6	141	
Other eye protection						
No	887	85.3	153	14.7	1040	0.164
Yes	104	80.6	25	19.4	129	
Ever eye complaint						
No	557	91.8	50	8.2	607	<0.001
Yes	434	77.2	128	22.8	562	
Ever eye trauma						
No	942	85.2	163	14.8	1105	0.060
Yes	49	76.6	15	23.4	64	
Hours spent outdoor/day						
3-4	55	83.3	11	16.7	66	0.748
5-6	264	84.1	50	15.9	314	
7-8	371	86.3	59	13.7	430	
>=9	301	83.8	58	16.2	359	
Total[1]	991	84.8	178	15.2	1169	

[1]Row percentages

Table 4.37 shows health, obesity and chronic disease status of the participants with low vision. In terms of self-reported health status, the prevalence of low vision was higher among participants reported their health status as poor compare to fair and good ($p<0.001$). Likewise, it is higher among participants with chronic diseases ($p<0.001$) and HTN ($p<0.001$). Moreover, the prevalence of low vision was higher among hypertensive ($p<0.001$) participants, hwoever the duration of HTN was not influenced status of low vision ($p = 0.711$).

Table 4.37. Distribution of participants by low vision and some characteristics related to health, obesity and chronic diseases (Nangarhar-Afghanistan, 2015).

Characteristics	Low Vision					p-value
	No		Yes		Total	
	n	%	n	%	n	
Health status						
Poor	103	71.5	41	28.5	144	<0.001
Fair	497	86.9	75	13.1	572	
Good	391	86.3	62	13.7	453	
Obesity status						
Underweight	30	75	10	25	40	0.055
Normal	698	86.5	109	13.5	807	
Overweight	222	82.2	48	17.8	270	
Obese	41	78.8	11	21.2	52	
Any chronic diseases						
No	753	87.8	105	12.2	858	<0.001
Yes	238	76.5	73	23.5	311	
Hypertension	162	72.6	61	27.4	223	<0.001
Diabetes mellitus	42	77.8	12	22.2	54	0.143
Other chronic disease	109	83.2	22	16.8	131	0.596
Duration of HTN						
Mean ±SD	6.78±3.68		6.59±3.95		6.85±3.67	
Median	5.5		6.59		6.85	0.711[1]
Quartile (1st - 3rd)	4.0-10.0		4.0-10.0		4.0-10.0	
Min - Max	1-20		1-15		1-20	
Medication for HTN[2]						
No	9	81.8	2	18.2	11	0.286
ACEI[3]	60	77.9	17	22.1	77	
Others	93	68.9	42	31.1	135	
Duration of DM						
Mean ±SD	8.1±33.2		8.6±4.0		8.1±3.5	0.515[1]
Median	8.5		9.5		8	
Quartile (1st - 3rd)	6.0-10.0		5.3-11.8		6.0-10.0	
Min - Max	1-15		1-15		1-15	
Examination after DM diagnosis[4]						
No	20	71.4	8	28.6	28	0.244
Yes	22	84.6	4	15.4	26	
Total[5]	991	84.8	178	15.2	1169	

[1]Mann Whitney U test, [2]Percentages were calculated separately from the total number of participants who had hypertension (n=223), [3]Angiotensin Converting Enzym Inhibitor, [4]Percentages were calculated from the number of participants who were diabetes mellitus (n=54), [5]Row percentages

In contrast, low vision was evenly distributed among the level of obesity (p = 0.055), DM (p = 0.143) and other chronic diseases (p = 0.596). Furthermore, neither

duration of DM (p = 0.515) nor diagnosis of DM (p = 0.244) affect the prevalence of low vision among the participants.

Table 4.38 . Participants with blindness and some characteristics related to eye health (Nangarhar-Afghanistan, 2015)

Characteristics	Blindness					p-value
	No		Yes		Total	
	n	%	n	%	n	
Outdoor eye protection use						
No	768	89.3	92	10.7	860	0.261
Yes	223	91.8	20	8.2	243	
Sunglasses						
No	872	88.8	110	11.2	982	0.001
Yes	119	98.3	2	1.7	121	
Other eye protection						
No	887	90.4	94	9.6	981	0.074
Yes	104	85.2	18	14.8	122	
Ever eye complaint						
No	557	98.9	6	1.1	563	<0.001
Yes	434	80.4	106	19.6	540	
Ever eye trauma						
No	942	90.1	104	9.9	1046	0.319
Yes	49	86	8	14	57	
Hours spent outdoor/day						
3-4	55	98.2	1	1.8	56	0.120
5-6	264	88.3	35	11.7	299	
7-8	371	90.7	38	9.3	409	
>=9	301	88.8	38	11.2	339	
Total[1]	991	89.8	112	10.2	1103	

[1]Row percentages

From characteristics related to eye health, only using sunglasses (p = 0.001) and experienced eye complaint (p<0.001) were strongly associated with blindness by bivariate analysis. All other variables (using of outdoor eye protection, other eye protection such as hat, turban and scarf, ever experienced eye trauma and hours spent outdoor) were not influenced blindness in bivariate analysis (Table 4.38.).

Table 4.39. Health status chronic diseases and blindness (Nangarhar-Afghanistan, 2015).

Characteristics	Blindness					p-value
	No		Yes		Total	
	n	%	n	%	n	
Health status						
Poor	103	79.8	26	20.2	129	<0.001
Fair	497	91.2	48	8.8	545	
Good	391	91.1	38	8.9	429	
Obesity status						
Underweight	30	83.3	6	16.7	36	
Normal	698	90.6	72	9.4	770	0.426
Overweight	222	88.4	29	11.6	215	
Obese	41	89.1	5	10.9	46	
Any chronic diseases						
No	882	91.8	79	8.2	961	<0.001
Yes	109	76.8	33	23.2	142	
Hypertension	162	78.6	44	21.4	206	<0.001
Diabetes mellitus	42	89.4	5	10.6	47	0.911
Other chronic disease	109	76.8	33	23.7	142	<0.001
Duration of HTN						
Mean ±SD	6.73±3.74		7.05±3.25		6.85±3.67	
Median	5		8		6	0.084[1]
Quartile (1st - 3rd)	4-5		5-10		4-10	
Min - Max	1-20		2-15		1-20	
Medication for HTN[2]						
No	9	100.0	0	-	9	0.229
ACEI[3]	60	80.0	15	20.0	75	
Others	93	76.2	29	23.8	122	
Duration of DM						
Mean ±SD	8.19±3.33		6.6±5		8.05±4.47	
Median	9		5		8	0.213[1]
Quartile (1st - 3rd)	6-10		3.5-10.5		1-15	
Min - Max	1-15		2-15		1-15	
Examination of the eye after diagnosis of the Diabetes[4]						
No	20	83.3	4	16.7	24	0.348
Yes	22	95.7	1	4.3	23	
Total[5]	991	89.8	112	10.2	1103	100

[1]Mann Whitney U test, [2]Percentages were calculated from the total number of participants who had hypertension (n=206), [3]Angiotensin Converting Enzym Inhibitor, [4]Fisher's Exact Test [4]Row percentages

Health and chronic disease status of the blind participants were explained in Table 4.39. In participants having poor health status, the proportion of blindness was 20.2%, which is almost more than double that of having fair and good health status 8.8% and 8.9% respectively and this difference was statistically significant (p<0.001). Similarly, the prevalence of blindness was higher among participants with chronic disease in general (p<0.001), HTN (p<0.001), any medication use (p<0.001) and experienced any eye complaints (p<0.001).

On the other hand, the prevalence of blindness was approximately equally distributed among obesity status (p = 0.426) and diabetic and non-diabetic participants (p = 0.911). Duration of HTN (p = 0.084) and DM (p = 0.213) was not affecting the prevalence of blindness among the participants. Moreover, blindness was prevalent similar among participants taking no or different type of hypertensive drugs (p = 0.229). Diagnosis of DM was also didn't affect the prevalence of blindness (p = 0.348).

4.2.3 Smoking Characteristics of Visual Impaired Participants

Table 4.40. Distribution of participants by visual impairment, low vision and blindness and tobacco use (Nangarhar-Afghanistan, 2015).

Characteristics	Tobacco use					p-value
	No		Yes		Total	
	n	%	n	%	n	
Visual impairment						
No	712	79.4	279	72.7	991	0.008
Yes	185	20.6	105	27.3	290	
Low Vision						
No	712	86.0	279	81.8	991	0.071
Yes	116	14.0	62	18.2	178	
Blindness						
No	712	91.2	279	86.6	991	0.024
Yes	69	8.8	43	13.4	112	
Total[1]	897	70.0	384	30.0	1281	

[1]Row percentages; others are column percentages

Smoking characteristics of the visual impaired participants were described in Table 4.40. In tobacco user, the prevalence of both visual impairment (p = 0.008) and blindness (p =0.024) were higher, however the prevalence of low vision was distributed equally among smoking and non-smoking participants (p = 0.071).

4.3 Multivariate Analysis

For the strength of association between visual impairment and some independent variables, logistic regression analysis was performed. The binary logistic regression analysis was done, in order to identify confounders and / or effect modifiers, backward conditional method was selected. Odds Ratio (OR) with corresponding 95% Confidence Interval (CI) was used to estimate the strength of association between the retained independent predictors and visual impairment, threshold for statistical significance was set at $p<0.05$. Two variables (working status, and suffering any eye complaint) which were strongly associated with visual impairment in the bivariate analysis were decided to leave out from the multivariate analysis. The association of the working status and visual impairment was not known whether it is the cause or effect, therefore it was excluded. The other variable, 'have you ever suffered any eye complaint?' was not properly asked, so it was not included in the multiveriate analysis of visual impairment (low vision and blindness).

4.3.1 Visual Impairment

Three models were tried for visual impairment. The first model was developed by putting all variables $p<0.05$ (age group, sex, level of education, marital status, self-reported economic status, health status, chronic disease, eye trauma in the past, Body Mass Index (BMI) status and consuming tobacco product) in the analysis. Table 4.41 and Table 4.42 show the result of first and last step of backward conditional method of logistic regression.

Table 4.41 Logistic regression analysis of visual impairment-included p<0.05 variables (Nangarhar-Afghanistan, 2015). (FIRST STEP)

Variables	Number	OR (Confidence Interval)	p-value
Age group			
50-54	337	Ref	
55-59	337	1.258(0.836-1.893)	0.270
60-64	306	1.460(0.962-2.214)	0.075
>=65	301	1.439(0.927-2.233)	0.105
Sex			
Male	682	Ref	
Female	599	1.184(0.861-1.629)	0.298
Level of education			
High school	194	Ref	
Secondary school	66	1.055(0.464-2.400)	0.898
Primary school	91	0.426(0.165-1.103)	0.079
Literate	118	1.448(0.739-2.837)	0.281
Illiterate	**812**	**2.174(1.342-3.523)**	**0.002**
Marital status			
Currently married	936	Ref	
Currently not married	345	0.927(0.663-1.298)	0.660
Self-stated economic status			
Good	295	Ref	
Average	602	0.889(0.611-1.293)	0.538
Bad	**384**	**1.528(1.037-2.252)**	**0.032**
Health status			
Good	491	Ref	
Fair	620	0.921(0.672-1.263)	0.611
Poor	170	1.237(0.799-1.913)	0.340
Chronic diseases			
No chronic disease	912	Ref	
Yes. other chronic diseas	102	1.379(0.831-2.288)	0.214
Yes. hypertension with/without other chronic disease	**267**	**2.121(1.496-3.007)**	**<0.001**
Eye trauma in the past			
No	1209	Ref	
Yes	72	1.385(0.796-2.411)	0.250

R square =0.091(Cox and Snell). 0.139 (Nagelkerke). 0.163 (Hosmer and Lemeshow Test). first step. Backward: Conditional method

Table 4.41. (continued) Logistic regression analysis of visual impairment-included p<0.05 variables (Nangarhar-Afghanistan, 2015). (FIRST STEP)

Variables	Number	OR (Confidence Interval)	p-value
BMI			
Normal	925	Ref	
Over weight	**356**	**1.422(1.048-1.931)**	**0.024**
Consuming tobacco products			
No	897	Ref	
Yes. I used and left	116	1.183(0.727-1.925)	0.499
Yes. I am currently	268	1.336(0.931-1.918)	0.116

R square =0,091(Cox and Snell), 0,139 (Nagelkerke), 0,163 (Hosmer and Lemeshow Test), first step, Backward: Conditional method

Table 4.42. Logistic regression analysis of visual impairment-included p<0.05 variables (Nangarhar-Afghanistan, 2015). (LAST STEP)

Factors	No	OR (Confidence Interval)	p-value
Level of education			
High school	194	Ref	
Secondary school	66	1.044(0.462-2.361)	0.917
Primary school	91	0.435(0.168-1.121)	0.085
Literate	118	1.461(0.754-2.830)	0.262
Illiterate	**812**	**2.292(1.433-3.667)**	**0.001**
Self-stated economic status			
Good	295	Ref	
Average	602	0.847(0.586-1.226)	0.380
Bad	**384**	**1.580(1.084-2.303)**	**0.017**
Chronic diseases			
No chronic disease	912	Ref	
Yes. other chronic disease	102	1.540(0.943-2.514)	0.084
Yes. HTN with/without other chronic disease	**267**	**2.574(1.887-3.510)**	**<0.001**
BMI			
Normal	925	Ref	
Overweight	**356**	**1.417(1.048-1.916)**	**0.024**

R square =0,084 (Cox and Snell), 0,128 (Nagelkerke), 0,892 (Hosmer and Lemeshow Test), Last step (10th), Backward: Conditional method

In the first step of backward conditional regression analysis, illiteracy, self-reported bad economic status, being hypertensive alon or with other chronic disease and overweight was observed to be statistically significant. The prevalence of VI among illiterate compared to high school graduate was 2.2 times higher (OR = 2.2.

CI = 1.3 – 3.5, p = 0.002). It is also higher 1.5 fold among participants with self-reported bad economic status compared to good economic status OR = 1.5, CI = 1.0 – 2.3, p = 0.032. Moreover, it is higher among hypertensive and overweight participants than non-hypertensive and normal weighted participants. The OR for hypertensive and overweighted participants were respectively (OR = 2.1, CI = 1.5 – 3.0, p<0.001) and OR = 1.4, CI = 1.0 – 1.9, p = 0.024.

In the last step of backward conditional logistic regression analysis of VI, Factors identified as a predictors were; level of education (illiterate compare to high school graduate OR=2.3, CI=1.4-3.7, p = 0.001), self-stated economic status (bad economic status compare to good economic status OR=1.6, CI = 1.1 - 2.3, p = 0.017), chronic disease (HTN with/without other chronic disease compare to not chronic disease OR=2.6, CI = 1.9 - 3.5), and BMI status (obese compare to normal OR=1.4, CI=1.1-1.9).

In the second model, all explanatory variables with p< 0.20 at bivariate analysis (age group, sex, level of education, marital status, self-reported economic status, health status, chronic disease, eye trauma in the past, BMI status, consuming tobacco product, sunglass use and residence) were assumed to be associated with visual impairment and put in the analysis. Tables 4.43 and 4.44 explain the first and last step of backwar conditional logistic regression of VI respectively.

Table 4.43. Logisic regression analysis of VI-included p<0.20 variables (Nangarhar-Afghanistan, 2015). (FIRST STEP)

Variables	Number	OR (Confidence Interval)	p-value
Age group			
50-54	337	Ref	
55-59	337	1.265(0.840-1.906)	0.260
60-64	306	1.453(0.955-2.211)	0.081
>=65	301	1.426(0.914-2.223)	0.118
Sex			
Male	682	Ref	
Female	599	1.178(0.854-1.624)	0.319
Level of education			
High school	194	Ref	
Secondary school	66	1.042(0.456-2.379)	0.923
Primary school	91	0.427(0.163-1.119)	0.083
Literate	118	1.403(0.712-2.765)	0.328
Illiterate	812	**2.185(1.327-3.597)**	**0.002**
Marital status			
Currently married	936	Ref	
Currently not married	345	0.963(0.686-1.352)	0.826
Self-stated economic status			
Good	295	Ref	
Average	602	0.866(0.594-1.262)	0.453
Bad	**384**	**1.528(1.036-2.254)**	**0.032**
Health status			
Good	491	Ref	
Fair	620	0.908(0.661-1.248)	0.552
Poor	170	1.281(0.826-1.987)	0.268
Chronic diseases			
No chronic disease	912	Ref	
Yes. other chronic diseas	102	1.382(0.832-2.296)	0.211
Yes. hypertension with/without other chronic disease	**267**	**2.170(1.528-3.082)**	**<0.001**
Eye trauma in the past			
No	1209	Ref	
Yes	72	1.41(0.810-2.455)	0.224

R square =0,093 (Cox and Snell), 0,142 (Nagelkerke), 0,080 (Hosmer and Lemeshow Test), first step, Backward: Conditional method

Table 4.43. (Continued) Logisic regression analysis of VI-included p<0.20 variables (Nangarhar-Afghanistan, 2015) (FIRST STEP)

Variables	Number	OR (Confidence Interval)	p-value
BMI			
Normal	925	Ref	
Over weight	**356**	**1.462(1.074-1.990)**	**0.016**
Consuming tobacco products			
No	897	Ref	
Yes. I used and left	116	1.169(0.717-1.908)	0.531
Yes. I am currently	268	1.300(0.904-1.870)	0.157
Sunglass use			
Yes	143	Ref	
No	1138	0.842(0.503-1.410)	0.513
Residence			
Urban	520	Ref	
Rural	761	1.271(0.943-1.713)	0.115

R square =0,093 (Cox and Snell), 0,142 (Nagelkerke), 0,080 (Hosmer and Lemeshow Test), first step, Backward: Conditional method

The first step of the second model is almost the same as the first step of the first model with slightly difference in the coeffecients, confidence levels and significance levels of the variables. However, the models obtained at the last step of firs and second modeling were exactly similar to each other.

Table 4.44. Logistic regression analysis of VI-included p<0.20 variables (Nangarhar-Afghanistan, 2015). (LAST STEP)

Variables	Number	OR (Confidence Interval)	p-value
Level of education			
High school	194	Ref	
Secondary school	66	1.044(0.462-2.361)	0.917
Primary school	91	0.435(0.168-1.121)	0.085
Literate	118	1.461(0.754-2.830)	0.262
Illiterate	812	**2.292(1.433-3.667)**	**0.001**
Self-stated economic status			
Good	295	Ref	
Average	602	0.847(0.586-1.226)	0.380
Bad	**384**	**1.580(1.084-2.303)**	**0.017**
Chronic diseases			
No chronic disease	912	Ref	
Yes. other chronic diseas	102	1.540(0.943-2.514)	0.084
Yes. hypertension with/without other chronic disease	267	**2.574(1.887-3.510)**	**<0.001**
Obesity status			
Normal	925	Ref	
Over weight	356	**1.417(1.048-1.916)**	**0.024**

R square =0,084 (Cox and Snell), 0,128 (Nagelkerke), 0,892 (Hosmer and Lemeshow Test), Last step (9th), Backward: Conditional method

Finally, third model was tried; statistically significant (p<0.20) and variables thought to be medically significant (age group, sex, level of education, marital status, self-reported economic status, health status, chronic disease, eye trauma in the past, obesity status, consuming tobacco product, sunglass use, place of residence and hours spending per day outdoor) were put in the backward conditional regression analysis. Table 4.45 and Table 4.46 show the first and last step of the analysis respectively.

Table 4.45. Logistic regression analysis of VI-included p<0.20 and medically significant variables (Nangarhar-Afghanistan, 2015). (FIRST STEP)

Variables	Number	OR (Confidence Interval)	p-value
Age group			
50-54	337	Ref	
55-59	337	1.269(0.842-1.912)	0.254
60-64	306	1.469(0.964-2.238)	0.073
>=65	301	1.438(0.921-2.245)	0.110
Sex			
Male	682	Ref	
Female	599	1.197(0.865-1.655)	0.279
Level of education			
High school	194	Ref	
Secondary school	66	1.057(0.460-2.431)	0.896
Primary school	91	0.442(0.168-1.163)	0.098
Literate	118	1.428(0.718-2.843)	0.310
Illiterate	**812**	**2.229(1.343-3.699)**	**0.002**
Marital status			
Currently married	936	Ref	
Currently not married	345	0.955(0.680-1.343)	0.793
Self-stated economic status			
Good	295	Ref	
Average	602	0.847(0.578-1.243)	0.397
Bad	**384**	**1.507(1.019-2.227)**	**0.040**
Health status			
Good	491	Ref	
Fair	620	0.931(0.672-1.290)	0.667
Poor	170	1.317(0.842-2.058)	0.228
Chronic diseases			
No chronic disease	912	Ref	
Yes. other chronic diseas	102	1.385(0.834-2.302)	0.208
Yes. hypertension with/without other chronic disease	**267**	**2.181(1.534-3.102)**	**<0.001**
Eye trauma in the past			
No	1209	Ref	
Yes	72	1.389(0.794-2.428)	0.250

R square =0,094 (Cox and Snell), 0,143 (Nagelkerke), 0,091 (Hosmer and Lemeshow Test), first step, Backward: Conditional method

Table 4.45. (continued) Logistic regression analysis of VI-included p<0.20 and medically significant variables (Nangarhar-Afghanistan, 2015). (FIRST STEP)

Variables	Number	OR (Confidence Interval)	p-value
BMI			
Normal	925	Ref	
Over weight	**356**	**1.469(1.079-2.001)**	**0.015**
Consuming tobacco products			
No	897	Ref	
Yes. I used and left	116	1.154(0.706-1.885)	0.569
Yes. I am currently	268	1.294(0.898-1.864)	0.166
Sunglass use			
Yes	143	Ref	
No	1138	0.844(0.501-1.422)	0.523
Residence			
Urban	520	Ref	
Rural	761	1.280(0.947-1.729)	0.108
Hours spent outdoor/day			
3-4	67	Ref	
5-6	349	0.798(0.376-1.693)	0.556
7-8	468	0.850(0.404-1.786)	0.667
>=9	397	0.904(0.430-1.902)	0.791

R square =0,094 (Cox and Snell), 0,143 (Nagelkerke), 0,091 (Hosmer and Lemeshow Test), first step, Backward: Conditional method

The first step of the third model is almost the same as the first step of the first and second model with slightly difference in the coeffecients, confidence levels and significance levels of the variables. However, the models obtained at the last step of firs, second and third modeling were exactly similar to each other.

Table 4.46. logistic regression analysis VI-included p<0.20 and medically significant variables (Nangarhar-Afghanistan, 2015). (LAST STEP)

Variables	Number	OR (Confidence Interval)	p-value
Level of education			
High school	194	Ref	
Secondary school	66	1.044(0.462-2.361)	0.917
Primary school	91	0.435(0.168-1.121)	0.085
Literate	118	1.461(0.754-2.830)	0.262
Illiterate	**812**	**2.292(1.433-3.667)**	**0.001**
Self-stated economic status			
Good	295	Ref	
Average	602	0.847(0.586-1.226)	0.380
Bad	**384**	**1.580(1.084-2.303)**	**0.017**
Chronic diseases			
No chronic disease	912	Ref	
Yes. other chronic diseas	102	1.540(0.943-2.514)	0.084
Yes. hypertension with/without other chronic disease	**267**	**2.574(1.887-3.510)**	**<0.001**
Obesity status			
Normal	925	Ref	
Over weight	**356**	**1.417(1.048-1.916)**	**0.024**

R square =0,084 (Cox and Snell), 0,128 (Nagelkerke), 0,892 (Hosmer and Lemeshow Test), Last step (10th), Backward: Conditional method

4.3.2 Low Vision

For low vision three models were tried. In the first model, all independent variables with p< 0.05 at the bivariate analysis (sex, level of education, marital status, self-reported economic status, health status and chronic diseases) were assumed to be associated with visual impairment and were put into the backward conditional regression analysis of low vision. the first and last step of the first model has been illustrated in the Table 4.47 and Table 4.48, respectively.

Table 4.47. Logistic regression analysis of low vision-included variables p<0.05 (Nangarhar-Afghanistan, 2015) (FIRST STEP)

Variables	Number	OR (Confidence Interval)	p-value
Sex			
Male	682	Ref	
Female	599	1.031(0.727-1.461)	0.864
Level of education			
High school	194	Ref	
Secondary school	66	0.179(0.023-1.409)	0.102
Primary school	91	0.495(0.156-1.575)	0.234
Literate	118	1.864(0.843-4.123)	0.124
Illiterate	**812**	**2.320(1.273-4.228)**	**0.006**
Marital status			
Currently married	936	Ref	
Currently not married	345	1.068(0.732-1.560)	0.732
Self-stated economic status			
Good	295	Ref	
Average	602	1.030(0.648-1.637)	0.901
Bad	**384**	**1.612(0.995-2.610)**	**0.052**
Health status			
Good	491	Ref	
Fair	620	0.920(0.629-1.345)	0.667
Poor	170	1.364(0.819-2.270)	0.232
Chronic diseases			
No chronic disease	912	Ref	
Yes. other chronic diseas	102	1.014(0.525-1.956)	0.967
Yes. hypertension with/without other chronic disease	**267**	**2.029(1.356-3.038)**	**0.001**

R square =0,064 (Cox and Snell), 0,112 (Nagelkerke), 0,883 (Hosmer and Lemeshow Test), first step, Backward: Conditional method

In the first step of backward conditional regression analysis, illiteracy and being hypertensive alon or with other chronic disease were observed to be statistically significant. The prevalence of low vision among illiterate compared to high school graduate was 2.3 times higher (OR = 2.3, CI = 1.3 – 4.2, p = 0.006). Among hypertensive compared to non-hypertensive participants, the prevalence of low vision was 2 times higher (OR = 2.0, CI = 1.4 – 3.0, p = 0.001). Self-stated bad economic status was marginally significant p = 0.052. Among participants with self-reported bad economic status, the prevalence of low vision was 1.6 times higher compare to good self-reported economic status participants (OR = 1.6, CI = 0.9 – 2.6, p = 0.052).

Table 4.48. Logistic regression analysis of low vision-included p<0.05variables (Nangarhar-Afghanistan, 2015) (LAST STEP)

Factors	Number	OR (Confidence Interval)	p-value
Level of education			
High school	194	Ref	
Secondary school	66	0.184(0.023-1.440)	0.107
Primary school	91	0.499(0.158-1.583)	0.238
Literate	118	1.873(0.856-4.102)	0.116
Illiterate	**812**	**2.397(1.330-4.320)**	**0.004**
Self-stated economic status			
Good	295	Ref	
Average	602	1.007(0.636-1.596)	0.976
Bad	**384**	**1.716(1.073-2.743)**	**0.024**
Chronic diseases			
No chronic disease	912	Ref	
Yes. other chronic diseas	102	1.033(0.538-1.984)	0.921
Yes. hypertension with/without other chronic disease	**267**	**2.286(1.576-3.315)**	**<0.001**

R square =0,062 (Cox and Snell), 0,109 (Nagelkerke), 0,213 (Hosmer and Lemeshow Test), Last step (4th), Backward: Conditional method

Factor identified as a predictors of low vision in the last step of backward conditional logistic regression analysis of the low vision were; level of education (illiterate compare to high school graduate OR=2.4, CI=1.3 - 4.3), self-stated economic status (poor economic status compare to good economic status OR=1.7, CI=1.1-2.7), chronic disease (HTN with/without other chronic disease compare to not chronic disease OR=2.3, CI=1.6-3.3).

Second model was developed by putting all explanatory variables with a p< 0.20 (sex, level of education, marital status, self-reported economic status, health status, chronic diseases, eye trauma in the past, consuming tobacco product, age group and BMI status) that were expected to be associated with the low vision into the analysis. The first and last step of the model obtained from the analysis have been illustrated in Table 4.49 and Table 4.50.

Table 4.49. Logistic regression analysis of low vision-included p<0.20 variables (Nangarhar-Afghanistan, 2015) (FIRST STEP)

Variables	Number	OR (Confidence Interval)	p-value
Sex			
Male	682	Ref	
Female	599	1.182(0.802-1.743)	0.399
Level of education			
High school	194	Ref	
Secondary school	66	0.166(0.021-1.309)	0.088
Primary school	91	0.458(0.144-1.459)	0.186
Literate	118	1.777(0.800-3.948)	0.158
Illiterate	**812**	**2.294(1.252-4.204)**	**0.007**
Marital status			
Currently married	936	Ref	
Currently not married	345	1.074(0.716-1.611)	0.730
Self-stated economic status			
Good	295	Ref	
Average	602	1.053(0.660-1.680)	0.829
Bad	**384**	**1.595(0.981-2.594)**	**0.060**
Health status			
Good	491	Ref	
Fair	620	0.88(0.599-1.293)	0.516
Poor	170	1.359(0.81-2.281)	0.246
Chronic diseases			
No chronic disease	912	Ref	
Yes. other chronic diseas	102	0.969(0.494-1.902)	0.928
Yes. hypertension with/without other chronic disease	**267**	**1.826(1.196-2.790)**	**0.005**
Eye trauma in the past			
No	1209	Ref	
Yes	72	1.383(0.726-2.636)	0.324
Consuming tobacco products			
No	897	Ref	
Yes. I used and left	116	1.029(0.539-1.964)	0.931
Yes. I am currently	**268**	**1.548(1.007-2.381)**	**0.047**

R square =0,073 (Cox and Snell), 0,128 (Nagelkerke), 0,365 (Hosmer and Lemeshow Test), first step, Backward: Conditional method

Table 4.49. (continued) Logistic regression analysis of low vision-included p<0.20 variables (Nangarhar-Afghanistan, 2015). (FIRST STEP)

Variables	Number	OR (Confidence Interval)	p-value
Age group			
50-54	337	Ref	
55-59	337	0.935(0.579-1.511)	0.784
60-64	306	1.125(0.689-1.835)	0.639
>=65	301	0.934(0.552-1.582)	0.800
BMI			
Normal	925	Ref	
Over weight	**356**	**1.546(1.073-2.228)**	**0.019**

R square =0,073 (Cox and Snell), 0,128 (Nagelkerke), 0,365 (Hosmer and Lemeshow Test), first step, Backward: Conditional method

First step of the second model is differ from the first step of the first model for the low vision. In the first step of backward conditional regression analysis of low vision with variables p<0.20, illiteracy, HTN, currently smokers and overweight were observed to be statistically significant. Moreover, self-reported bad economic status was marginally significant (p = 0.06). The prevalence of low vision among illiterate compared to high school graduate was 2.3 times higher (OR = 2.3, CI = 1.3 – 4.2, p = 0.007), among hypertensive compared to non-hypertensive 1.8 times higher (OR = 1.9, CI = 1.2 – 2.8, p = 0.005), among currently smoker compared to non-smoker was 1.546 times higher (OR = 1.6, CI = 1.0 – 2.4, p = 0.047), among overweight compared to normal weight was 1.546 times higher (OR = 1.6, CI = 1.1 – 2.2, p = 0.019). Furthermore, among participants with self-reported bad economic status compared to good economic status, the prevalence of low vision is 1.6 times higher (OR = 1.6, CI = 0.9 – 2.6, p = 0.060).

Table 4.50. logistic regression analysis of low vision-included p<0.20 variables (Nangarhar-Afghanistan, 2015) (LAST STEP)

Variables	Number	OR (Confidence Interval)	p-value
Level of education			
High school	194	Ref	
Secondary school	66	0.174(0.022-1.363)	0.096
Primary school	91	0.475(0.149-1.511)	0.207
Literate	118	1.792(0.817-3.931)	0.146
Illiterate	**812**	**2.426(1.344-4.377)**	**0.003**
Self-stated economic status			
Good	295	Ref	
Average	602	0.999(0.629-1.584)	0.995
Bad	**384**	**1.724(1.077-2.762)**	**0.023**
Chronic diseases			
No chronic disease	912	Ref	
Yes. other chronic diseas	102	1.053(0.548-2.025)	0.876
Yes. hypertension with/without other chronic disease	**267**	**2.239(1.54-3.254)**	**<0.001**
Obesity status			
Normal	925	Ref	
Over weight	**356**	**1.508(1.053-2.161)**	**0.025**

R square =0,066 (Cox and Snell), 0,115 (Nagelkerke), 0,045 (Hosmer and Lemeshow Test), Last step (7th), Backward: Conditional method

Last step of the second model of low vision was differ with regard to variables retained in the model, coefficients, confidence interval and significance level of variables from the last step of the first model. Factors associated independently with low vision in the last step of the second model were illiteracy, self-reported bad economic status, HTN and overweight. The prevalence of low vision was higher 2.4 times (OR=2.4, CI=1.3-4.4, p = 0.003) among illiterate, higher 1.7 times (OR=1.7, CI=1.1-2.8, p = 0.023) among bad economic status, higher 2.2 times (OR=2.2, CI=1.5-3.3, p<0.001) among hypertensive and higher 1.5 times (OR= 1.5, CI=1.1-2.2, p = 0.025) among overweight participants.

The third model of low vision was developed by putting all explanatory variables that either thought to be medically significant or statistically p <0.20 (sex, level of education, marital status, self-reported economic status, health status, chronic diseases, eye trauma in the past, consuming tobacco product, age group, obesity status, residence and hours spending outdoor) in to the backward conditional

regression analysis. The first and the last steps of the low vision modelling have been illustrated in the Table 4.51 and Table 4.52.

Table 4.51. logistic regression analysis of low vision-included p<0.20 and medically significant variables (Nangarhar-Afghanistan, 2015). (FIRST STEP)

Variables	Number	OR (Confidence Interval)	p-value
Sex			
Male	682	Ref	
Female	599	1.194(0.806-1.768)	0.376
Level of education			
High school	194	Ref	
Secondary school	66	0.175(0.022-1.396)	0.100
Primary school	91	0.493(0.152-1.594)	0.237
Literate	118	1.866(0.816-4.267)	0.139
Illiterate	**812**	**2.478(1.318-4.658)**	**0.005**
Marital status			
Currently married	936	Ref	
Currently not married	345	1.108(0.734-1.671)	0.626
Self-stated economic status			
Good	295	Ref	
Average	602	0.993(0.617-1.596)	0.975
Bad	384	1.558(0.954-2.546)	0.076
Health status			
Good	491	Ref	
Fair	620	0.887(0.595-1.322)	0.556
Poor	170	1.447(0.847-2.472)	0.176
Chronic diseases			
No chronic disease	912	Ref	
Yes. other chronic diseas	102	0.961(0.488-1.893)	0.908
Yes. hypertension with/without other chronic disease	**267**	**1.904(1.242-2.918)**	**0.003**
Eye trauma in the past			
No	1209	Ref	
Yes	72	1.320(0.686-2.538)	0.406

R square =0,078 (Cox and Snell), 0,136 (Nagelkerke), 0,754 (Hosmer and Lemeshow Test), first step, Backward: Conditional method

Table 4.51. (continued) logistic regression analysis of low vision-included p<0.20 and medically significant variables (Nangarhar-**A**fghanistan, 2015) (FIRST STEP)

Variables	Number	OR (Confidence Interval)	p-value
Consuming tobacco products			
No	897	Ref	
Yes. I used and left	116	1.003(0.522-1.925)	0.993
Yes. I am currently	**268**	**1.516(0.983-2.338)**	**0.060**
Age group			
50-54	337	Ref	
55-59	337	0.929(0.573-1.504)	0.763
60-64	306	1.112(0.679-1.822)	0.672
>=65	301	0.933(0.547-1.592)	0.800
BMI			
Normal	925	Ref	
Over weight	**356**	**1.616(1.117-2.338)**	**0.011**
Residence			
Urban	520	Ref	
Rural	761	1.420(0.982-2.052)	0.062
Hours spent outdoor/day			
3-4	67	Ref	
5-6	349	0.476(0.211-1.074)	0.074
7-8	468	0.518(0.232-1.156)	0.109
>=9	397	0.539(0.242-1.204)	0.132

R square =0,078 (Cox and Snell), 0,136 (Nagelkerke), 0,754 (Hosmer and Lemeshow Test), first step, Backward: Conditional method

The first step of the third model for the low vision was different from the first step of the second model as well as first step of the first model. In the first step of backward conditional regression analysis of low vision with p<0.20 and probable medically significant variables, illiteracy, HTN, and overweight were observed to be statistically significant. Moreover, currently smokers was marginally significant (p = 0.06).

The prevalence of low vision among illiterate compared to high school graduate was 2.5 times higher (OR = 2.5, CI = 1.3 – 4.7, p = 0.005), among hypertensive compared to non-hypertensive 1.9 times higher (OR = 1.9, CI = 1.2 – 2.9, p = 0.003) and among overweight compared to normal weight was 1.6 times higher (OR = 1.6, CI = 1.1 – 2.3, p = 0.011). Furthermore, among currently smoker compared to non-smoker was 1.5 times higher (OR = 1.5, CI = 0.9 – 2.3, p = 0.060).

Table 4.52. logistic regression analysis low vision-included p< 0.20 and medically significant variables (Nangarhar-Afghanistan, 2015). (LAST STEP)

Factors	Number	OR (Confidence Interval)	p-value
Level of education			
High school	194	Ref	
Secondary school	66	0.174(0.022-1.363)	0.096
Primary school	91	0.475(0.149-1.511)	0.207
Literate	118	1.792(0.817-3.931)	0.146
Illiterate	**812**	**2.426(1.344-4.377)**	**0.003**
Self-stated economic status			
Good	295	Ref	
Average	602	0.999(0.629-1.584)	0.995
Bad	**384**	**1.724(1.077-2.762)**	**0.023**
Chronic diseases			
No chronic disease	912	Ref	
Yes. other chronic diseas	102	1.053(0.548-2.025)	0.876
Yes. hypertension with/without other chronic disease	**267**	**2.239(1.540-3.254)**	**<0.001**
Obesity status			
Normal	925	Ref	
Over weight	**356**	**1.508(1.053-2.161)**	**0.025**

R square =0,066 (Cox and Snell), 0,115 (Nagelkerke), 0,045 (Hosmer and Lemeshow Test), Last step (9th), Backward: Conditional method

Last step of the third model of low vision was exactly similar to the last steps of the second model with regard to variables retained, coefficients, confidence intervals and significance level of variables.

4.3.3 Blindness

Three models were tried for blindness as well. in the first model, all explanatory variables with p<0.05 (age group, level of education, self-reported economic status, health status, chronic disease, consuming tobacco product and sunglasses) were expected to be linked with the blindness and were put into the analysis. First and last step of the backward conditional regression analysis of the blindness were illustrated in Table 4.53 and Table 4.54 respectively.

Table 4.53. logistic regression analysis of the blindness-included p<0.05variables (Nangarhar-Afghanistan, 2015) (FIRST STEP)

Variables	Number	OR (Confidence Interval)	p-value
Age group			
50-54	337	Ref	
55-59	**337**	**2.073(1.032-4.165)**	**0.041**
60-64	**306**	**2.055(1.020-4.137)**	**0.044**
>=65	**301**	**2.437(1.228-4.836)**	**0.011**
Level of education			
High school	194	Ref	
Secondary school	66	2.530(0.934-6.849)	0.068
Primary school	91	0.316(0.066-1.518)	0.150
Literate	118	0.861(0.273-2.716)	0.799
Illiterate	812	1.660(0.809-3.403)	0.167
Self-stated economic status			
Good	295	Ref	
Average	602	0.686(0.395-1.193)	0.182
Bad	384	1.385(0.802-2.392)	0.242
Health status			
Good	491	Ref	
Fair	620	0.996(0.623-1.593)	0.986
Poor	170	1.058(0.561-1.994)	0.861
Chronic diseases			
No chronic disease	912	Ref	
Yes. other chronic diseas	**102**	**2.103(1.063-4.159)**	**0.033**
Yes. hypertension with/without other chronic disease	**267**	**2.626(1.590-4.336)**	**<0.001**
Consuming tobacco products			
No	897	Ref	
Yes. I used and left	116	1.356(0.724-2.541)	0.342
Yes. I am currently	268	1.145(0.683-1.918)	0.608
Sunglass use			
Yes	143	Ref	
No	**1138**	**4.906(1.150-20.923)**	**0.032**

R square =0,073 (Cox and Snell), 0,151 (Nagelkerke), 0,170 (Hosmer and Lemeshow Test), first step, Backward: Conditional method

In the first step of backward conditional regression analysis of blindness, age, other chronic disease, HTN and sunglass usage were observed to be statistically significant. The prevalence of blindness among 55-59 age group compare to the 50-54 age group was higher about 2.1 fold (OR=2.1, CI=1.0-4.2, p = 0.041), among 60-64 age group compare to 50-54 was higher about 2.1 fold (OR=2.1, CI=1.0-4.1, p =

0.044) and 65 year old and over compare to 50-54 was higher 2.4 fold (OR=2.4, CI=1.2-4.8). The prevalence of blindness among participants with having chronic diseases other than HTN compared to participant with no chronic disease was 2.1 times higher (OR = 2.1, CI = 1.1 – 4.2, p = 0.033). Among hypertensive compared to no chronic disease, the prevalence of blindness was 2.6 times higher (OR = 2.6, CI = 1.6 – 4.3, p<0.001). Furthermore the prevalence of blindness was higher among sunglass non-users about 4.9 times (OR=4.9, CI=1.2-20.9, p = 0.032).

The last step of the backwar conditional regression analysis of the blindness in the first model is almost the same as the first step with little difference in terms of coefficient, confidence intervals, significance levels of variables. Variables identified as a predictors of blindness were; age group (55-59 age group compare to the 50-54 age group OR=2.1, CI=1.0-4.2, 60-64 age group compare to age group 50-54 OR=2.1, CI=1.1-4.3 and 65 year old and over compare to age group 50-54 OR=2.6, CI=1.3-5.0), level of education (secondary compare to high school graduate OR=2.6, CI=0.9-7.0, illiterate compare to high school graduate OR=1.7, CI=0.8-3.4), self-stated economic status (poor economic status compare to good economic status OR=1.4, CI=0.8-2.4), chronic disease (other chronic disease compare to no chronic disease OR=2.3, CI=1.2-4.4, HTN with/without other chronic disease compare to not chronic disease OR=2.8, CI=1.8-4.4) and sunglass use (non-user compare to user OR=4.9, CI=1.2-21.0).

Table 4.54. Logistic regression analysis of blindness-included p<0.05variables (Nangarhar-Afghanistan, 2015) (LAST STEP)

Variables	Number	OR (Confidence Interval)	p-value
Age group			
50-54	337	Ref	
55-59	**337**	**2.081(1.036-4.181)**	**0.039**
60-64	**306**	**2.119(1.056-4.252)**	**0.035**
>=65	**301**	**2.555(1.298-5.032)**	**0.007**
Level of education			
High school	194	Ref	
Secondary school	66	2.590(0.960-6.984)	0.060
Primary school	91	0.312(0.065-1.500)	0.146
Literate	118	0.880(0.281-2.756)	0.827
Illiterate	812	1.645(0.803-3.368)	0.174
Self-stated economic status			
Good	295	Ref	
Average	602	0.688(0.397-1.191)	0.182
Bad	384	1.390(0.815-2.368)	0.226
Chronic diseases			
No chronic disease	912	Ref	
Yes. other chronic diseas	**102**	**2.253(1.157-4.387)**	**0.017**
Yes. hypertension with/without other chronic disease	**267**	**2.779(1.751-4.411)**	**<0.001**
Sunglass use			
Yes	143	Ref	
No	**1138**	**4.924(1.155-20.99)**	**0.031**

R square =0,072 (Cox and Snell), 0,149 (Nagelkerke), 0,356 (Hosmer and Lemeshow Test), Last step (3th), Backward: Conditional method

In the second model, all explanatory variables with a p<0.20 (age group, level of education, self-reported economic status, health status, chronic disease, consuming tobacco product, sunglasses and marital status) were thought to be associated with blindness and were put in the backwar conditional regression analysis. Table 4.55 and Table 4.56 illustrate the first and last step of the second modeling.

Table 4.55. Logistic regression analysis of blindness-included p<0.20 variables (Nangarhar-Afghanistan, 2015). (FIRST STEP)

Variables	Number	OR (Confidence Interval)	p-value
Age group			
50-54	337	Ref	
55-59	**337**	**2.135(1.061-4.297)**	**0.034**
60-64	**306**	**2.225(1.096-4.516)**	**0.027**
>=65	**301**	**2.786(1.373-5.657)**	**0.005**
Level of education			
High school	194	Ref	
Secondary school	66	2.580(0.953-6.984)	0.062
Primary school	91	0.309(0.064-1.491)	0.144
Literate	118	0.873(0.276-2.764)	0.818
Illiterate	812	1.719(0.836-3.532)	0.141
Self-stated economic status			
Good	295	Ref	
Average	602	0.677(0.389-1.178)	0.168
Bad	384	1.465(0.844-2.543)	0.175
Health status			
Good	491	Ref	
Fair	620	1.018(0.635-1.631)	0.942
Poor	170	1.089(0.577-2.057)	0.793
Chronic diseases			
No chronic disease	912	Ref	
Yes. other chronic diseas	**102**	**2.117(1.068-4.199)**	**0.032**
Yes. hypertension with/without other chronic disease	**267**	**2.668(1.613-4.413)**	**<0.001**
Consuming tobacco products			
No	897	Ref	
Yes. I used and left	116	1.285(0.682-2.423)	0.438
Yes. I am currently	268	1.109(0.661-1.862)	0.694
Sunglass use			
Yes	143	Ref	
No	**1138**	**5.084(1.190-21.722)**	**0.028**
Marital status			
Currently married	936	Ref	
Currently not married	345	0.700(0.430-1.139)	0.151

R square =0,075 (Cox and Snell), 0,155 (Nagelkerke), 0,505 (Hosmer and Lemeshow Test), first step, Backward: Conditional method

The first step of the second model is almost the same as the first step of the first first model but slightly different with regard to coefficients, confidence intervals and significance level of the variable retained in the model.

Table 4.56. logistic regression analysis of blindness-included p<0.20 variables (Nangarhar-Afghanistan, 2015). (LAST STEP)

Variables	Number	OR (Confidence Interval)	p-value
Age group			
50-54	337	Ref	
55-59	**337**	**2.081(1.036-4.181)**	**0.039**
60-64	**306**	**2.119(1.056-4.252)**	**0.035**
>=65	**301**	**2.555(1.298-5.032)**	**0.007**
Level of education			
High school	194	Ref	
Secondary school	66	2.590(0.960-6.984)	0.060
Primary school	91	0.312(0.065-1.500)	0.146
Literate	118	0.880(0.281-2.756)	0.827
Illiterate	812	1.645(0.803-3.368)	0.174
Self-stated economic status			
Good	295	Ref	
Average	602	0.688(0.397-1.191)	0.182
Bad	**384**	1.390(0.815-2.368)	0.226
Chronic diseases			
No chronic disease	912	Ref	
Yes. other chronic diseas	**102**	**2.253(1.157-4.387)**	**0.017**
Yes. hypertension with/without other chronic disease	**267**	**2.779(1.751-4.411)**	**<0.001**
Sunglass use			
Yes	143	Ref	
No	**1138**	**4.924(1.155-20.99)**	**0.031**

R square =0,072 (Cox and Snell), 0,149 (Nagelkerke), 0,556 (Hosmer and Lemeshow Test), Last step (9th), Backward: Conditional method

The last step of the second model is precisely the same as the last step of the first model.

In the third model, all explanatory variables with a p< 0.20 in bivariate analysis and variables thought to be medically significant (age group, level of education, self-reported economic status, health status, chronic disease, suffer any eye complaint, consuming tobacco product, sunglasses, marital status, obesity status, hours spent outdoor per day and sex) were supposed to be linked with blindness and were put into the analysis. First and last step of the backward conditional regression analysis of the blindness were illusterated in Table 4.57 and Table 4.58 respectively.

Table 4.57. Logistic regression of blindness-included p<0.20 and medically significant variables (Nangarhar-Afghanistan, 2015). (FIRST STEP)

Variables	Number	OR (Confidence Interval)	p-value
Age group			
50-54	337	Ref	
55-59	**337**	**2.116(1.048-4.270)**	**0.036**
60-64	**306**	**2.251(1.102-4.600)**	**0.026**
>=65	**301**	**2.734(1.322-5.654)**	**0.007**
Level of education			
High school	194	Ref	
Secondary school	66	2.264(0.828-6.190)	0.111
Primary school	91	0.275(0.056-1.343)	0.111
Literate	118	0.755(0.235-2.425)	0.637
Illiterate	812	1.534(0.727-3.238)	0.261
Self-stated economic status			
Good	295	Ref	
Average	602	0.675(0.383-1.192)	0.176
Bad	384	1.466(0.840-2.560)	0.179
Health status			
Good	491	Ref	
Fair	620	1.012(0.623-1.645)	0.961
Poor	170	1.090(0.571-2.081)	0.794
Chronic diseases			
No chronic disease	912	Ref	
Yes. other chronic diseas	**102**	**2.099(1.056-4.170)**	**0.034**
Yes. hypertension with/without other chronic disease	**267**	**2.575(1.548-4.283)**	**<0.001**
Consuming tobacco products			
No	897	Ref	
Yes. I used and left	116	1.348(0.707-2.572)	0.364
Yes. I am currently	268	1.134(0.657-1.959)	0.651

R square =0,078 (Cox and Snell), 0,161 (Nagelkerke), 0,051 (Hosmer and Lemeshow Test), first step, Backward: Conditional method

Table 4.57. (continued) logistic regression of blindness-included p<0.20 and medically significant variables (Nangarhar-Afghanistan, 2015). (FIRST STEP)

Variables	Number	OR (Confidence Interval)	p-value
Sunglass use			
Yes	143	Ref	
No	**1138**	**4.722(1.098-20.309)**	**0.037**
Marital status			
Currently married	936	Ref	
Currently not married	345	0.680(0.411-1.125)	0.299
BMI			
Normal	925	Ref	
Over weight	356	1.275(0.806-2.016)	0.134
Hours spent outdoor/day			
3-4	67	Ref	
5-6	349	3.595(0.456-28.322)	0.224
7-8	468	3.553(0.455-27.722)	0.226
>=9	397	3.766(0.482-29.443)	0.206
Sex			
Male	682	Ref	
Female	599	1.136(0.703-1.834)	0.603

R square =0,078 (Cox and Snell), 0,161 (Nagelkerke), 0,051 (Hosmer and Lemeshow Test), first step, Backward: Conditional method

The first step of the backward conditional regression analysis of the blindness in the third model was similar to the first steps of the firs and second models but with slightly differences with regard to coefficients, confidence intervals and significncee levels of variables.

Table 4.58. Logistic regression analysis of blindness-included p< 0.20 and medically significant variables (Nangarhar-Afghanistan, 2015). (LAST STEP)

Variables	Number	OR (Confidence Interval)	p-value
Age group			
50-54	337	Ref	
55-59	**337**	**2.081(1.036-4.181)**	**0.039**
60-64	**306**	**2.119(1.056-4.252)**	**0.035**
>=65	**301**	**2.555(1.298-5.032)**	**0.007**
Level of education			
High school	194	Ref	
Secondary school	66	2.590(0.960-6.984)	0.060
Primary school	91	0.312(0.065-1.500)	0.146
Literate	118	0.880(0.281-2.756)	0.827
Illiterate	812	1.645(0.803-3.368)	0.174
Self-stated economic status			
Good	295	Ref	
Average	602	0.688(0.397-1.191)	0.182
Bad	384	1.390(0.815-2.368)	0.226
Chronic diseases			
No chronic disease	912	Ref	
Yes. other chronic diseas	102	2.253(1.157-4.387)	0.017
Yes. hypertension with/without other chronic disease	267	**2.779(1.751-4.411)**	**<0.001**
Sunglass use			
Yes	143	Ref	
No	**1138**	**4.924(1.155-20.99)**	**<0.031**

R square =0,072 (Cox and Snell), 0,149 (Nagelkerke), 0,356 (Hosmer and Lemeshow Test), Last step (7th), Backward: Conditional method

The last step of the third model is exactly the same as the last step of the first and second model with regard to the variable retained, coefficients, confidence intervals and significance levels of variables.

5 DISCUSSION

This study was the first ever population based study concerning visual impairment, blindness and its relative factors in Nangarhar province of Afghanistan. The study included 50 years and over representative population of the Nangarhar capital city, Jalalabad and four districts around it.

5.1 Prevalence of Visual Impairment and Blindness

The prevalence of visual impairment (VA < 6/18 in the better eye on presentation) in people aged 50 years and older was determined as 22.6% (95% CI= 20.0%-25.0%). Moderate visual impairment (VA < 6/18 to ≥6/60 in the better eye on presentation) was identified as 11.0% (95% CI=9.3% - 12.7%), while severe visual impairment (VA < 6/60 to ≥ 3/60 in the better eye on presentation) and blindness (VA < 3/60 in the better eye on presentation) were identified as 2.9% (95% CI = 2.0% - 3.8%) and 8.7% (95% CI=7.0% - 10.0%) respectively. The prevalence of low vision (VA < 6/18 to ≥ 3/60 in the better eye on presentation) was identified as 13.9% (95% CI=12.0%-16.0%). Of the visual impairment, 61.4% was low vision and 38.6% was blindness (Look at. Table 4.27.).

The prevalence of visual impairment is higher when it is compared with the result of “Prevalence and causes of visual impairment and blindness in Sistan-va-Baluchestan Province, Iran” study. In this study, the total prevalence of visual impairment was 6.69% for 10 years old and over population of Sistan-va-Baluchestan while it is 1.51% for 10-19 years old, 2.93% for 20-39 years old, 9.40% for 40-59 years old and 53.07% for 60 years old and over population (42). It is also higher compared with “Pakistan National Visual Impairment and Blindness Survey” conducted in 2006. The prevalence of visual impairment in Pakistan was 17.7% (21). It is thought that the difference between the study conducted in Sistan-va-Baluchestan and the current study was caused by the definition of visual impairment and study population. In the current study, presenting VA was used and included people aged 50 years old and over, while Sistan-va-Baluchestan study used best corrected VA and included people aged 10 years and older. The Pakistan study also included people aged 30 year old and over (21). The prevalence of visual impairment was reported in different parts of China differed from 10.2% to 25.0% (43-46),

which cover the prevalence of visual impairment in this study. Furthermore, another study conducted in Sindhudurg District on the Western coastal strip of India, indicated that the prevalence of visual impairment was 48.3% among 50 year old and over population which is much higher than the prevalence in current study (47).

Although visual impairment is unequally distributed in the world with lowest rate among AMR and EUR and the highest among EMR (2, 3), approximately more than 90% of the world visual impaired people lived in the developing countries. China, India and Sub-Saharan Africa made up 60% of the visual impairment and blindness which are accounted as developing countries. The vast majority of them are existed in rural areas of the least-developed countries (4-6).

Inadequate or lack of available, affordable and good quality eye care services in the developing countries along with human resource scarcity might responsible for the high prevalence of visual impairment and blindness in developing countries. Afghanistan is one of the least-developed countries located in the EMR with worst health indicators and worst health system compared to the adjacent countries. The situation as whole in developing countries can be applied for the Afghanistan as well.

5.2 Ratio of Low Vision and Blindness

From the total number of visual impairment, 61.4% composed of low vision, while the remaining 38.6% composed of blindness. In females, 62.7% of visual impairment was low vision and 37.3% was blindness, while in males, it was 59.9% and 39.1%, respectively (Look at. Table 4.29.). When it is considered for the total population, the number of participants with low vision was 178 (13.9%) and with blindness 112 (8.7%).

The ratio of low vision and blindness was almost 1.5 which is very low when it is compared with the world's estimate 6.31 (7), and it is also very low compared with the regional estimates 2.4 to 5.8 (3). This low ratio might be due to the high number of blindness, which indicates insufficiency of eye care services in the region. Afghanistan is one of the EMR countries with the worst figures regarding the human resource for eye care; one ophthalmolgist per 332,255.8 person was estimated in 2006 (48). According to a survey, which was conducted in Afghanistan in 2007, estimated the ophthalmologist person ratio as one ophthalmologist per 200,000

person (49) indicative of the worst situation in terms of eye care services provision in Afghanistan.

5.3 Some Socio-demographic Characteristics of the Participants

A total of 1,281 people participated in this study; 53.2% were men and 46.8% were women (Look at. Table 4.2.). The ratio between male and female in this study was 1.14:1, which is meaningfully higher than the overall population male/female ratio 1.03:1 (50). Although the number of female non-responders is less than male, overall female participation in the study is less than male, which pointed out the influence of cultural factors that inhibited the complete participation of women in such activities. However, generally the sex ratio in this study follows the pattern of general male/female ratio in Afghanistan 1.03:1 (50).

Generally, 26.3% of the participants were aged 50-54, 26.3% aged 55-59, 23.9% aged 60-64 and 23.5% aged 65 years and over. Overall, age distribution of the study participants is somewhat different than the target population. In the target population (people aged 50 years old and over), 37.0% of the people are aged 50-54 years, 18.6% 55-59, 17.5% 60-64 and 26.9% 65 years or more (36). The majority of the sampled population did not have National Identification Card (NIDC), since they didn't know their exact age. However, it was tried to record the age of the responder as precise as possible. This situation might cause the difference between age distribution of the participants and target population.

According to the age distribution, females represented younger age structure, having 80.6% participants of aged 50-64 and 19.4% participants of 65 years old and over, than their male counterparts, 72.9% and 27.2% respectively ($p<0.001$). This structure of population follows the overall total population structure in which the percentage of women aged 65 is 1.8%, while the percentage of men aged 65 years and over is 3.1% (51). The younger population structure in women is indicative of bad health condition of women in terms of availability (accessibility and affordability) of ANC (Anti Natal Care) services and increased MMR (Maternal Mortality Ratio) in the region (52).

The overall literacy rate was found to be 36.6% (47.5% in males and 24.2% in females). Literacy rate in this study is slightly higher than overall literacy rate in

Afghanistan which is 31.4% (45.5% in males and 17% in females) (53). The reason for higher literacy rate in this study might be due to the relatively high security situation. Bihsud, Kama, Kuz kunar and Surkh Rud districts are located around Jalalabad City (capital of Nangarhar province), which are in some extend being secured with better availability and accessibility of schools for boys and girls.

Afghanistan is one of the countries with lowest literacy rate, which comes at third after Burkina Faso and South Sudan in the list of top 10 countries with the worst literacy rate in the world (54). According to the United Nations Educational, Scientific and Cultural Organization (UNESCO), literacy rate in Pakistan is 55% and it stands at 160th in the world (55). In Islamic Republic of Iran the literacy rate was estimated as 87.17% (56). In Uzbekistan, it was estimated 100% (57). In Turkmenistan and Tajikistan the literacy rate were estimated as 99.6% and 99.7%, respectively (58). In China the literacy rate is 95.1% (59).

In both males and females, the pattern from illiteracy to university graduate was generally the same but the percentages are different. In males, the percentage of illiteracy was 52.5%, while it was 75.8% in females, which is almost 1.5 times higher than males. The percentage of literates, secondary school graduates and high school graduates in males were 11.4%, 6.9%, and 18.0% respectively, which were more than two times that of females (6.7%, 3.2% and 8.0%). The percentage of university graduate was 3.2% in males; it is almost 16 times higher compared to females, which was 0.2% ($p < 0.001$). The difference in literacy rates between males and females might be due to the collection of some factors such as predominant culture norms (rule out attending of female to schools), lack of school in accessed distance, low demand for literacy particularly for female due to cultural barriers and early marriage of the female (60).

In terms of marital status, totally almost three-fourth (73.1%) of the sample was married and one-fourth (26.5%) were widowed. The number of the singles was very few (0.4%). In males, 0.6% were singles, 82.8% were married and 16.6% were widowed, while in females 0.2% were single, 61.8% married and 37.9% widowed ($P<0.001$). The figures with regard to marital status found out in this study are nearly the same as overall figures in Afghanistan. In 40-64 age groups, the proportion of married, widowed, divorced or separated and never married are 90.1%, 9.1%, 0.2%

and 0.6%, respectively. In 65 years old and over groups, the proportion of married people is 68.8%, followed by widowed (30.1%) and divorced or separated, and never married (each 0.5%) (53). However, there is huge difference between males and females in terms of marital status in the study population.

Approximately 2 and 12 percent of men aged, respectively, 40-64 and over-65 were widowers, whereas the corresponding figures for women were nearly 16 and 62 percent generally (53). The huge difference by sex with regard to marital status might be due to the following conditions: first, due to some cultural factors the remarriage rate is higher among men compared to women and very few men remained as widower after his wife passed a way but it is contradictory for women. Second, as widowed women classified in a vulnerable position in Afghan society, some women to show vulnerability falsely represent widowhood.

Approximately three-fifth (59.4%) of the participants was living in the rural and two-fifth (40.6%) in urban areas. The proportion of participants living in the urban area in this study is higher when compared with the overall people living in urban areas of Afghanistan which is 26.7% (50). It was included only 4 districts from a total of 22 rural districts and Jalalabad City, the capital of Nangarahar province, as urban area in this study and the difference might be due to this situation.

In this study, 47.0% of the participants reported their socioeconomic status as average, 20.5% as good and 25.5% as bad. Reported socioeconomic status as excellent and very bad was very less, 2.6% and 4.4% respectively. Afghanistan's economy has been improved considerably since 2002 by the assistance of global aids and investment as well as remittance from expatriates. This progress is also influenced by increasing agricultural production. However, Afghanistan is still one of the poorest and least developed countries in the world and depends heavily on foreign aid. The nation's Gross D**o**mestic Product (GDP) at current prices was about 19.3 billion US$; the GDP per capita at current prices was estimated as 576.3 US$ in 2017 (61). 35.8 percent of the country's population is unemployed and lives below the poverty line (62). Approximately, 55% of Nangarhar residence depends on agriculture as a major source of income, 28% derives some of their revenue from trade and services, 40% of them earn some of their income through non-agriculture related wage working. Livestock also contribute for some revenue in 14% of

situation (63). Besides, customarily people have a tendency to express their economic status as “average” when a researcher asked; this situation could be another reason for a high number of respondents of having the average socioeconomic condition.

In this study, more than half (51.3%) of the male participants reported having average socioeconomic status, while it is 42.1% in female. In males, 21.0% participants reported their socioeconomic status as bad, whereas the figure for females was 30.7% P<0.001. The reasons for low socioeconomic situation in females might be low overall employment rate which is 5.5% or might be due to lower rate of representation of household as a leader (3%) (34, 64). Furthermore, the involvement of women in un-payed wage influenced their economic status.

In this study, more than half (54.9%) of the participants lived since birth at the current residence (Denizen), while slightly less than half (45.1%) of the participants have come from other localities (not Denizen). The reasons for the high internal migration might be the bad security situation and lack of economic activities at the periphery of Nangarhar province (65).

5.4 Characteristics of Responders Related to Hours Spent Outdoor

On average almost one-third of the participants (31.0%) spending more than 8 hours outdoors; this amount decreased to 9.1% in winter times and increased to 36.0% in summer times (Look at. Table 4.3.). In both summer and winter seasons, males spent more hours outdoor than their female counterparts and the difference is statistically significant (p<0.001). This difference might be due to difference in the working hours and types of working such as males were working in agriculture for long hours than females and females in the majority working as a house wives. Almost 95% of the participants spent their 5 or more hours of their day time outdoors, day light; hence they are exposed to sun light which was accepted as strong risk factors for cataract causing visual impairment and blindness (66).

5.5 Eye Protection Use while Being Outdoor

More than three fourth (n=991, 77.3%) of the participants were not using any eye protection while being outdoors (Look at. Table 4.4.). From 290 (32.7%) eye

protection-users 143 (49.3%) persons used sunglasses, 80 (27.6%) scarves, 68 (23.4%) turban and 5 (1.7%) hats. The proportion of sunglass users in males was high at 62.2%, which is more than double that of females (28.2%). Almost all scarf users were females and all of turban users were males. Hats were mentioned by males only. Traditionally, all Afghan women used “Afghan Clad” or scarf and the majority of men used hat scarf or turban. When the question related to protection from sunlight at the outdoor was asked, most of the participants stated their traditional wearing as eye protector against sun rays. While using sunglasses are unique easy way to protect form ultraviolet B, found in the sunlight and is one of the known risk factors for the cataract (66), utilization of the sunglasses are very low and exposure to the sun light is very high in the sampled area.

5.6 Type of Professions

Totally 477 people were working of which 391 (81.9%) were male and 86 (18.0%) were female (Look at. Table 4.5.). In males, the proportion of labors was the highest 19.9%, followed by farmers 15.6%, carpenters 13.0%, shopkeepers 11.0%, government employees 10.7%, teachers 8.4%, drivers 5.6% and all others (backers, metal workers, tailors, guards, mechanics, army soldiers, health personnel, imams, cooks, painters, engineers, masons, singers and electricians are under 4% each. But in females, the proportion of teacher was the highest 29.1%, followed by tailors at 23.3%, labors 19.8%, government employees 15.1%, farmers 8.1% and all others (cooks, shopkeepers and backers) composed of 5%. It is thought that women compared to their male counterparts, have less opportunities to practice a variety of economic activities. It might be due to social and cultural barriers to women employment and the poor commitment of political and legal framework for women’s employment, which prevent women to engage in wide range of economic activities (67).

5.7 Eye Protection Use while Working

Overall, 37.2% (57.3% of males and 14.4% of females) of the participants were working and this difference was statistically significant ($p<0.001$) (Look at. Table 4.6.). Although employment rate is different based on sex and location, these

figures are very low compared to “Afghanistan National Risk and Vulnerability Assessment survey (NRVA) 2014” results. Overall, from 8.5 million active labor forces, 6.6 million (77.7%) are employed. In NRVA survey, working participation rate of men in urban areas is 82.5%, which is 48.9% for women. In rural areas, it is 81.8% for men and 64.9% for women, which is 83.2% for men and 79.0% for women in nomadic areas. The national participation force rates for men and women are 82.4% and 63.2%, respectively (53, 68). The difference in terms of general employment rate and sex difference, according to the employment rate between current study and NRVA survey might be due to the age difference and type of employment. In this study, study population consisted of people aged 50 years and above, while the study populations in NRVA survey was 14 years and over, and in this study, only paid employees were recorded, while in NRVA survey, all types of employment were recorded.

Out of 477 currently working participants, 255 (53.5%) people were not using any eye protection, 136 (28.5%) persons believed that eye protections were not needed for their professions, 77 (16.1%) persons used spectacles as an eye protector and 9 (1.9%) persons used other protective materials (goggle and welding hand shield) while working. With reference to male and female, the use of the eye protection materials was different ($p<0.001$) (Look at. Table 4.6.) Although, Afghanistan became the 60^{th} member of the International Labor Organization (ILO) in 1934 and is considered an original member State, the principle measures of Occupational Safety and Health was remained at policy level and not applied in various infrastructure of Afghanistan because of the poor commitment of the government. In Afghanistan, health services are delivered without cost, but during the work every person is responsible for his/her health working incidences. Primary prevention measures are not practiced in the working area; therefore, general awareness regarding the primary prevention is very low (69). In this study, therefore, almost more than half of the currently working participants were not using eye protection materials even it is necessary for their safety.

5.8 Type of the Work (Professions) and Eye Protection Usage

Although some of professions in fact required eye protection while working, some of the participants didn't use it or responded as not needed for it. For instance; 53.8% of the carpenters, 60% of mechanics, 23.1% of metal workers and 20% of painters did not use eye protection or responded as no need for them, whereas it is necessary for those professions (Look at. Table 4.7.). These responses (either not using or not needed for eye protection) might be due to the lack of awareness regarding the primary prevention of eye injury and trauma during working.

On the other hand, some participants stated that they were using eye protections while working even though the use of these protections were not necessary for their professions, for instance; 8.6% of the teachers, 11.4% of shopkeeper, and 6.3% of tailor. In above professions, utilization of eye protection is related to the place and quality of work in the study population. For example, the majority of the teachers who were working in the school and use white boards and markers, mentioned no use of the protection or no need for eye protection. On the other hand, the majority of the teachers, who were teaching children in the open area using blackboards and chalks, have to use eye protections while teaching. The same situation is true for driving; drivers who were working with government agencies, vehicles are modern having air-conditions and the windows are usually closed. These drivers mentioned no or no need for eye protection use in the working time, whereas vise-versa is true for the drivers using their own cars for earning.

Furthermore, some of the participants, who are imam, singer, cook and health personnel, certainly don't need to protect their eyes while working and they have to mention no need for eye protection or not using them.

5.9 Participants Health Status, Chronic Disease and Medications

Concerning health status, in total, 13.3% of the participants reported their health status as poor, 48.4% as fair, and 38.3% as good. The prevalence of the poor health was higher when it was compared to the global estimate of poor health in 2002, which is 9.8%. the difference between global estimate and current study might be due to differences in the study population, in current study, 50 years old and over

population was included, while in global estimate, 25 years old and over people were included (70) (Look at. Table 4-10.).

In males, poor health status was reported by 9.8% of the participants, while in females, it was 17.2%. Fair health status was reported by approximately more than half (51.6) of the participants in males, while in females it was reported by 44.7% of the participants. Finally, good health status was reported similarly by males and females, each at almost 38.6% and 38.1% respectively ($p<0.001$).

Afghanistan's health status is one of the worst in the world. Health indicators are three to five fold higher than in neighboring countries (71). Although, women and men facing many similar health problems, there are conditions that only women experience such as pregnancy and childbirth, which are not diseases, but biological and social processes that carry health risks and require specific health care. Some health challenges affect both women and men, but have a greater or different impact on women and so require responses that are personalized specifically to women's needs. Other conditions affect women and men more or less equally, however women face greater difficulties in getting the health care they need. Besides, the potential or actual experience of physical, sexual and emotional violence by women makes their health farther frustrated and vulnerable. Furthermore, gender-based inequalities for example, in education, income and employment might limit the ability of girls and women to protect their health. (72-78).

Related to chronic diseases, approximately 1/3 (28.8%) of the participants reported having at least one chronic diseases, and statistically significant difference was not found among males and females ($p = 0.056$).

In the last two decades, the world health scenery has suffered a quick transformation. People in the world are living longer than before, the population structure is being changed and the number of old people increased. Many countries have got noticeable outcome regarding the prevention of child mortality. Afghanistan life expectancy at birth was also increased from 49.86 years in 1990 to 60.72 years in 2015 due to increased access to health care, more hospital, clinics, and doctors along with health quality improvement (79, 80). Consequently, due to increased number of older people, the proportion of chronic diseases including chronic eye diseases was increased. Visual impairment and blindness started to get increase due to chronic eye

diseases themselves by one hand and by the other hand due to influence of chronic diseases on the eyes. In this study 28.8% of the participants reported having chronic diseases, and statistically significant difference was not found among male and female (p = 0.056). Apart from HTN and DM, epidemiological figures related to other chronic diseases for overall Afghanistan or specific province was not found to compare with the result of current study. In addition, the leading causes of death and disability have changed from communicable diseases to non-communicable diseases (NCD) with the difference in rich versus poor countries. More morbidity and mortality due to chronic diseases occurs before age 60 in low- and middle-income countries than in high-income countries. About one-third of deaths in middle-income countries and 44% of deaths in low income countries attributable to chronic diseases occur before age 60 (81). In Afghanistan, it was estimated that 37% of the total deaths attributed to NCDs (82).

Among chronic diseases, HTN was higher than the other chronic diseases at 20.8%, followed by dyspepsia at 10.2%, DM at 4.6%, Bronchial Asthma (BA) at 2.5% and ischemic heart disease (IHD) and COPD at 0.5% each in the survey participants. Statistically significant differences were observed between males and females only in HTN (p = 0.001) and COPD (p = 0.013). The prevalence of HTN for the whole country was estimated as 28.7% in 2010 (83) and it is higher than the proportion found in this study. The reasons for lower proportion of HTN might be it was self-reported. In the current study, blood pressure was not measured, it is questioned only. In a number of studies, the association of HTN and DM with the visual impairment and blindness was indicated (84-86). In other diseases such as BA and COPD, visual impairment or blindness developed due to the development of cataract or glaucoma as a complication of excessive usage of steroid for treatment of those conditions (87-90).

Overall, approximately less than one-third (27.1%) of the participants stated that they were taking medicine and statistically significant difference was not found between males and females (p = 0.063). It has been reported in some articles that some medical therapies such as anti-hypertensive, steroids, anti-tuberculosis medicine and some other drugs have an association with the visual impairment and

blindness due to posterior segment disorder, cataract, glaucoma, AMD and DR (91-98).

5.10 Relationship Between Socio-demographic Characteristics and Perceived Health Status

In this study, we found out that, by increasing age, the proportion of participants reported their health status as poor were increased, whereas good health responders decreased. Poor health responders were the highest (23.9%) among 65 + age groups while the good health responder was the highest (43.0%) among 50-55 age groups. Statistically significant difference was observed by age groups and reported health status of the participants ($p<0.001$) (Look at. Table 4.11.).

Generally, Afghanistan's health status is one of the worst in the world and health indicators are 3-5 times higher than the neighboring countries. Communicable diseases are such as Tuberculosis and Malaria, which can be easily prevented / treated by low cost strategies, still predominant. As the number of drug users is increasing, the number of HIV/AIDS is also emerging, however, there are no reliable data about HIV/AIDs. Outbreaks of some diseases such as cholera, Congo-Crimea hemorrhagic fever, measles, meningitis, pertussis and malaria are still persisted. Moreover, acute and chronic malnutrition are common (99).

In terms of health situations, older people became susceptible to much infectious as well as chronic disease which linked them to many disabilities such as weak eye sight, decreased mental capabilities and memory loss by one hand and lack of proper health services for older people by the other hand make them vulnerable. Therefore, in this study, higher proportion of the older people might be reported their health status as poor (100). In the current study the health situations of the participant were evaluated to discover the association of poor health status with the visual impairment or blindness.

In males, 9.8%, in females 17.2% of the participants reported poor health status. It could be thought that women' health status is worse than their male counterparts in the study area. The difference between males and females according to the reported health status was statistically significance ($p<0.001$). Probable risk factors for women's ill health and premature death in Afghanistan would be

primarily the high fertility rate, lack of access to health services, lack of adequate clean water and sanitation along with low rates of female education.

Of currently not married participants, 20.9% reported their health status as poor, which is nearly double that of reported by currently married participants at 10.5%, fair and good health status was reported as 46.7.0% and 32.5% by currently not married and as 49.0% and 40.5% by currently married participants. The difference was statistically significant ($p<0.001$).

In Afghanistan, women, mostly taking care of the children in large families, but they receive less support. Due to this responsibility, it is not easy for them to access to the outside home education, employment, health care, social engagement facilities and other community-based initiatives. They are mostly dependent on their husbands, therefore after their husbands; therefore after their husbands' death, they face a lot of problems, especially when their children are disabled, at younger ages or not having male children. Furthermore, currently not married women posed the problem of not having any one (male) accompany them to health care centers. Therefore, caused from all these factors, they might have reported having poor health status more than the women who are currently married.

In this study, it could be said that in general, level of education has a positive association with self-reported health status. By the increasing level of education, the proportion of poor health reported participants was decreased and good health was increased. In illiterates, 16.4% of the participants reported their health status as poor, which is more than three times that of in high school graduates at 5.2%. Oppositely, in high school graduates, the proportion of good health responders was 51.5%, which is about one and a half times that of reported in illiterate at 37.1%; this difference is statistically significant ($p<0.001$). By way of, level of educations have profound relationship with working condition, economic status, lifestyle and utilization of health services, it could be accounted one of the considerable factors playing role in the observed inequalities in health among different subgroups of population (101). In addition, illiterate and participants with low level of education, due to lack of awareness or low health literacy, might continuously have been experiencing negative health behaviors such as cigarette smoking, unhealthy food consumption, not doing exercises, not utilizing health services, and even not following advices of

the doctors with regard to medication or re-consulting. The findings of this study consistent with some studies conducted in the world indicating the positive association between level of education and health status (102-109).

In this study, the proportion of poor health respondents was the least at 3.0% in participants reported their economic status as excellent; it is increasing by the worsening of the economic status. It is about 38.6% in participant reported economic status as very bad. On the other hand, the proportion of good health respondents was the highest at 66.7% among participants reported their economic status as excellent and it is decreasing by the worsening of the economic status. It is around 28.1% in participants reported their economic status as very bad. The difference was found statistically significant ($p<0.001$). Per constitution of Afghanistan, health services are provided free of cost to all Afghan Nationality (41), however poor economic status were associated with health status in bivariate analysis. One explanation for this situation could be the association of economic status with level of education and employment status. The positive association of economic status and self-reported health status was also discovered by some studies conducted in the different parts of the world (110-117).

In terms of employment status, in participants who were currently not employed, the proportion of poor health responder was about 17.5%, which is almost three times that of participants employed (6.1%). On the other hand, the proportion of good health responders were lower (35.1%) among not working group than working group (43.8%); the difference was found to be statistically significant ($p<0.001$). Association of employment with good health and unemployment with bad health were indicated by many studies in the world (118-128). In this study the relation of unemployment with poor health status might be due to the interrelation between education level, employment status and economic status (123).

Rural residents compared to urban residents rated their health status as worse in the majority of studies in the world. Proposed reasons for this disparity were stated as differences in the availability (accessibility and affordability) of health services and socioeconomic status of residential places (129-134). In contrast, this study found out that the proportion of respondents with poor and good health were higher among urban residents at 18.7% and 41.7%, than the rural residents at 9.6% and

36.0% respectively (p<0.001). Practicing positive health behaviors (physical exercise, less smoking, having less sedentary life, and more physically active) by rural residents might be one explanation for the difference in this study.

5.11 Relationship Between Socio-demographic Characteristics and Chronic Diseases

In this study, each of the diseases stated by the participants was not analyzed separately because of insufficient sample size. Therefore, while analyzing the association of chronic diseases with some socio-demographic characteristics of the participants, the variable was considered as “having any chronic disease or not”.

Association of any chronic disease with age, marital status, educational level, self-reported economic status, working status and residence were evaluated.

There was a positive association between having any chronic disease and age; the prevalence was increasing by the increasing age. In 50-54 age group, it was the lowest at 18.1%, while it was the highest (45.8%) in 65 years old and over group (p<0.001) (Look at. Table 4.13.). WHO also stated that chronic non-communicable diseases associated with age and 15% of all deaths due to non-communicable disease occurs among 30-69 years-old age group, whereas more than 80% of these deaths occurred in low and middle income countries (135). Although age is not a direct risk factor for the chronic non-communicable disease, indirectly it is associated with some other modifiable risk factors such as consumption of less fruit and vegetables, high tobacco use and being overweight and obese (136).

The prevalence of chronic disease is higher among women (31.4%) compared to men which was 26.5%. Contrary to the result of this study, the prevalence of chronic disease was observed to be significantly higher among men in a study conducted in Iran (136). The reasons for the high prevalence of chronic diseases among women in this study might be the problems of accessibility to health services, cultural barriers to utilization of health care services and low level of education among the women. However the difference between men and women was not statistically significant in this study (p = 0.056).

Currently not married was suffering more (36.6%) than currently married women (25.2%) (p = 0.001). This finding was also found by a study which was

conducted on African American, indicated that marriage is a protective factor for HTN, DM and mortality (137).

Association between educational level and having any chronic disease is inverse, by the increasing level of education, the proportion of participants, who reported having at least a chronic disease was decreased. In illiterates, the proportion of any chronic diseases was high (32.6%) as opposed to the lowest proportion which was seen in high school graduates at 20.6%. The difference was found significant ($p = 0.003$). Among educated people, high level of knowledge about the risk factors, utilization of health services, and positive health behaviors might be some explanation of this association.

The association between self-reported economic status and having any chronic disease was also inverse, in participants who reported their economic status as excellent the proportion of chronic diseases was 24.2%, whereas it is about 38.2% and 38.6% respectively in participants who reported their economic status as bad and very bad, and the difference is statistically significant ($p<0.001$). As it is stated above, per constitution of Afghanistan, health services are provided free of cost to all Afghan Nationality (41), however poor economic status were found to be associated with health status. One explanation for this situation could be the association of economic status with level of education and employment status. The positive association of economic status and self-reported health status was also discovered by some study conducted in the different parts of the world (110-117).

Furthermore, any chronic disease was more prevalent among participants who were unemployed (not working) (36.2%) and urban resident (32.3%) than employed and rural residents at 16.4% ($p<0.001$) and 26.4% ($p = 0.022$) respectively. A study conducted in rural Vietnam on risk factors of chronic diseases found out the positive association between HTN and age, higher prevalence among men, higher prevalence among people with non-stable working condition, inverse association with educational level and positive association with socioeconomic level among men but inverse association among women (138).

In the study conducted in Vietnam, HTN is more prevalent among males; the opposite was found out in the current study revealed higher prevalence of chronic

disease among females. High prevalence among females indicated worse health situation of women in the study area by one hand.

On the other hand, high prevalence of chronic disease among women in the current study might be related to some methodological difference of the two studies. In this study, the type of reported chronic diseases were depended on self-reporting while in Vietnam study, HTN was defined bay taking blood pressure measurements. The sample in current study was consisted of both urban and rural residents while the sample in Vietnam study taken from rural area only. Moreover, the study population was aged 50 years and over in this study but in Vietnam study, the population was aged 25 years and over (138).

The results of this study almost follows the results of the other studies conducted on association of chronic diseases and socio-demographic factors such as Malaysia (139), India (140), Nigeria (141), Pakistan (142, 143).

5.12 Characteristics Related to the Participant's Medication Use and Sex

Totally, 73.8% of the hypertensive participants (67.1% of males and 80.2% of the females) used medication. This prevalence of antihypertensive medication use is nearly the same as in studies conducted in Pakistan, which estimated the prevalence of antihypertensive drugs use as 75% and 77% (144, 145). Among the participants of current study, 10.0% of the males and 7.9% of the females (totally 8.9%) were using anti-asthmatic medication and 38.8% of the males and 29.9% of the females (which totally makes 34.3%) were taking anti-dyspepsia medication. Other medication were taking by males and females almost evenly (Look at. Table 4.14.).

5.13 Characteristics Related to the Participant's Eye Health

In total, 38.0% of the participants had ever visited an ophthalmologist, in males it is 37.5% and in females it is 38.6% ($p = 0.705$) (Look at. Table 4.15.). In this study, eye care utilization prevalence was very low compared with the Karachi-Pakistan which is about 45.3% (146), with the results of South Korea study conducted on 12 years old and over people which is 73.5% (147), and the study conducted on 50 years old and over American people showed 69% of eye care services utilization in the past one year (148). The reasons for the low prevalence of

eye care utilization in this study might be due to poor accessibility since eye health services are only delivered in tertiary level hospital located at the province center, which is difficult to reach for older people living in the remote area in Afghanistan.

Approximately 52.1% of the total participants (48.7% of males and 56.1% of females, p = 0.008) have ever experienced any eye complaints (visual impairment, pain in the eye, near vision problem, infection, itching, eye trauma, burning sensation and watering). Mostly, people at least once in their whole life experience one or more eye complaints. In this study, proportion of ever experienced any eye complaints were low if it is compared with the results of a Nigerian study in which the majority of respondents (85%) had a history of ocular symptoms, either in the past or at the time of the study (149). In this study, the reasons for the low proportion of complaints might be participant's ignorance, not noticing the complaints and due to recall factors (people who were suffering low vision or blindness may remember the previous complaints very well). Some social, gender factors, along with less education and having less access to the health services are the factors that might play a major role in the high prevalence of any eye complaint among females.

Totally, 25.7% of the participants reported that their eye diseases were diagnosed by physicians, either accidently during an examination for another disease or during eye problems check-up. In Afghanistan, health services coverage increased from 9% in 2003 to 67% in 2015 and 82% in these days (150, 151), but eye care services is not delivered in primary health care services. Eye care service was integrated in the health care services in 2010, but it is still remained at the policy level (9). People prefer to use accessible health care services for any health problem at first and primary health care is more accessible than eye care services because eye care services are only available in the capital of the provinces. It was reported in this study that eye diseases of men and women were diagnosed by a physician in similar proportion (p = 0.527).

The proportion of the participants who complained about eye trauma in the past was 5.6% and no difference was observed by sex (p = 0.872). Of the participants' with eye trauma 30 (41.7%) went to eye care hospital, 28 (38.9%) to private ophthalmologist, 2 (2.8%) went to general physicians and 12 (16.7%) didn't take care about. Globally it was estimated that there are 1.6 million cases of

blindness, 2.3 million cases of low vision and 19 million cases of monocular blindness due to eye injuries (152). In Iran, the eye trauma history prevalence was 8.6%, 3.9%, 3.8%, and 1.93% for trauma as whole, blunt trauma, sharp trauma, and chemical burns, respectively (153).

Prevalence of eye trauma during work was found out as 5.8% to 9.0% in developed countries (five states of the US, including Iowa, Louisiana, Ohio, Tennessee, and Texas) (154). Although the impact of eye injury on blindness is very high on the global and local level, about 1 in 6 people with eye injury didn't take care about in the study area. While the impact of early treatment of the eye injuries was well documented and reduce the end stage result of visual impairment and blindness, the majority of the people with the eye trauma never consulted eye care services. This ignorance might be due to some cultural, economic and accessibility factors.

A study, which was conducted in the rural Nepal, estimated that 26.4% of the eye injured patients had VA less than 6/18 and 9.6% less than 3/60 upon presentation. 82% were examined after treatment at follow up: 11.2% of patients had VA worse than 6/18 and 4.6% had vision worse than 3/60. A poor visual outcome was found associated with increased age, care sought at a site other than the eye clinic, and severe injury (155). In another study, which was conducted in USA, It is discovered that 60.5% of eye injuries getting improved after treatment (156). In our study, nearly half of the participants (n=608, 47.5%) tried to remove the foreign body from the eye by themselves, approximately one in three (n=410, 32.0%) of the participants went to physicians, one in four (n=318, 24.8%) went to health personnel, one in six (n=192 15.0%) washed them out, one in eleven (n=114, 8.9%) were instilling eye drops available in their house. The majority of the participants exposed eye injury was wrongly treating it that may lead them to visual impairment or blindness. Wrongly handling of the eye injury might be due to low or lack of awareness and eye care education.

5.14 Socio-demographic Characteristics of the Participants Visiting an Ophthalmologist

In this study, it was found that the proportion of participants ever visiting an ophthalmologist was increased by the increasing age; in 50-54 age groups, it is the

lowest (30.6%), whereas it is the highest in 65 years old and over age group (48.5%) ($p<0.001$). Males and females equally visited an ophthalmologist at 38.6% and 37.5%, respectively ($p = 0.705$). The proportion was the highest in participants reported their economic status as bad at 48.3%, while it is 39.4% and 39.7% among the participants with excellent and good economic status respectively ($p<0.001$) (Look at. Table 4.16.).

More than half of the participants reported their health status as poor (51.8%), one-third as fair (31.5%) and more than two-fifth as good (41.5%) were ever visited an ophthalmologist ($p<0.001$). The proportion is higher among urban than rural residents (42.5% and 35.0%, respectively) ($p = 0.006$). The study of 'Eye care utilization by older adults in Low, Middle, and High Income Countries' indicated the older age, female gender, higher education, urban residence, greater wealth, worse self-reported health, having diabetes, and wearing glasses or contact lenses as factors associated with visiting an ophthalmologist (157). Another study which was conducted in Nigeria found out that respondents aged at least 70 years, males and educated individuals had a greater likelihood of seeking eye care (149). Another study named 'A Review of Factors Influencing the Utilization of Eye Care Services' was also indicated the influence of the sociodemographic factors such as age, sex, race, level of education, socioeconomic level, and knowledge of eye disease on utilization of the eye care services (158). In this study participant reported their economic status as bad and excellent, both uses the eye care services more compared to other economic levels expressed by participants. The positive association of economic level with visiting an ophthalmologist was consistent with the results of some studies conducted in the world (159-163).

5.15 Socio-demographic Characteristics of the Participants Experienced Eye Complaints

The proportion of any eye complaint was found as associated with age group, sex, marital status, level of education, economic status and working status in bivariate analysis (Look at. Table 4.17.).

The proportion of ever suffering any eye complaint was increased by the increasing age; in 50-54 age group, it is the lowest (43.9%) while it is the highest at in 65 years old and over participants (65.8%) ($p<0.001$). Eye complaint are come out

always based on an eye disease and if the complaint is neither considered seriously nor consulted eye care services, it may lead to visual impairment and blindness. As visual impairment and blindness was increasing by the increasing age and the complaints would have been started before becoming visual impaired, this might increase its proportion among older people. Some studies supported the result of this study, the study conducted in Ghana on 50 year old and over participants also shows that self-reported cataract was increased by increasing age (164). Another study which was conducted in Australian, also discovered association between age and visual impairment (165). Moreover, the Singapore Malay Eye Study similarly indicated that visual impairment is associated with the increasing age (166).

The proportion of having any eye complaint was higher among females than males ($p = 0.008$) in current study. National survey of visual impairment and blindness of Pakistan and some other countries also discovered that females were more suffered from visual impairment and blindness, which denoted that being a woman might be a risk factor for visual impairment and blindness (21, 167-169).

Currently not married women had eye complains more than married women ($p<0.001$) and this result is consistent with the result of the study conducted in the Korea which indicated that currently not married participants exposed to the risk of visual impairment two times higher than married participants (OR = 2.1; 95% CI = 1.7 – 2.6) (170). Currently not married population experiencing negative health behaviors, since the situation was occurred not only for any eye complaints but for overall health as well (171).

The negative association of educational level with the eye complaint was observed in this study ($p = 0.002$). The result is consistent with the study conducted in urban aria of Tehran-Iran, which shows the association of lower education with visual impairment, the prevalence of visual impairment in illiterates was almost 13.1 (95% CI = 5.1-33.6) times higher than university graduates (172).

Inverse association between economic status and eye disease complaining was found in this study ($p<0.001$). This is following the fact that was discovered by other studies conducted in Iran and some other parts of the world (173-175).

The proportion is lower in employed than unemployed participants ($p<0.001$) which was supported by a study conducted in Singapore. Singapore study revealed

that being unemployed exposed to the risk of visual impairment nearly 1.84 times (OR) (95% CI = 1.3 - 2.6) than employed (166).

5.16 Socio-demographic Characteristics of Participants' Eye Pproblems Diagnosed by Physician

Since accessibility for general health services is higher than eye care services in Afghanistan, people preferred primarily to consult a general physician first when they have any health complaints. Totally 329 (25.7%) of the participants used general health services for their eye problems. Proportion of consulting physicians were increased with the increasing age ($p<0.001$), high level of education ($p = 0.002$), excellent economic status ($p<0.001$), poor health status ($p<0.001$) and urban residence ($p<0.001$) (Look at. Table 4.18).

5.17 Barriers of Eye Care Services Utilization

In this study, it was determined that 794 (61.9%) of the total participant's never seeking eye care services along their lives. Most of the participants never contacted eye care services 614 (77.7%) mentioned that 'the problem not felt' as barrier to eye care services, followed by 95 (11.9%) 'No money to go to eye care services', 89 (11.2%) 'no one to accompany with', 21 (2.6%) 'It is very far' 7 (0.9%) 'It is from God side' 6 (0.8%) 'No time for going to eye care services' and 5 (0.6%) 'Cannot go' because of other health problems. Males and females followed the same pattern without any significant differences (Look at. Table 4.19.).

In this study, the greatest barrier is not perceiving the problem, which is indicative of lack of knowledge about either their eye sight was normal, either their eye was not diseased and either their eye disease could be prevented or treated. A study which was conducted in Nigeria estimated the barrier of need not felt as 33%, which is lower than our study at 77.7% (176). The reason for the high percentage of 'problem not felt' might be due to lower knowledge of having impaired vision, lower awareness of regarding the availability of eye care services, possibility of treatment and prevention of avoidable blindness. Also lower literacy rate of the participants and less exposure of the participants to mass media may broaden the problems of not perceiving eye diseases.

The second most common barrier was the economic problem. This problem is not related to the cost of eye care services directly, because health services including eye care are freely distributed to people in Afghanistan. It is just related to the transportation, food, and accommodation. Eye care services are only delivered in the capital city, patients from remote area have to stay at least one night at the hotel. The result of this study is in agreement with the focus group discussion conducted in Michigan, which also found out the transportation cost as a barrier for the eye care utilization (177).

The third barrier mentioned was ‘no one to accompany’. Visually impaired or elderly people need to have a companion to go to eye care services for prevention of other not-intentional situation. This problem is very profound for female patients because even healthy women were not allowed traditionally to go out alone. The barrier of no one to accompany is higher in the current study compared with the study conducted in Nigeria, which estimated as 8.3% (176). The reasons might be the accessibility of eye care services. In this study area, eye care services are only available in the capital city of the province, which is far from the districts around it. Therefore, people with visual impairment and females cannot go to eye care services alone.

Other barriers stated by the participants like lack of time and other health problems supported by the results of studies conducted (178-181). Males and females followed the same pattern without any significant differences related to the barriers of visiting an ophthalmologist.

Conversely 38.0% of the participants had ever used eye care services. The reasons for consultation of the eye care services were impaired vision stated by almost half of the participants 242 (49.7%), near vision problem 48 (9.9%), Epiphora 47 (9.7%), trauma 43 (8.8%), eye pain 32 (6.6%), itching 19 (3.9%), burning sensation 7 (1.4%) and infection 2 (0.4%). It was found that study participants never consulted eye care services for ‘the control of the eye health without any complaint or eye disease’s symptoms’. Therefore, eye disease’s symptoms and complaints were defined as attributing factors for eye care utilization. The result of this study is similar to studies conducted in Ghana, Iran, and Nigeria, discovered the association

of symptoms and self-perception of eye health problems with the utilization of eye care services (149, 179, 182).

Common eye ailments in females were impaired vision 121 (52.4)%, followed by pain in the eye (16.5%), itching (15.6%), burning sensation (10.8%), Epiphora (10.0%), eye trauma (6.9%) and near vision problem (6.5%). In males, impaired vision is the major ailments at 47.3%, followed by near vision problem, Epiphora, eye trauma, eye pain, itching, burning sensation and infection.

5.18 Pattern of Eye Diseases Diagnosed by an Ophthalmologist

Overall, 329 (25.7%) participants (162 females and 167 males) reported that their eye diseases was diagnosed by the ophthalmologist. The proportion of cataract is the highest at 33.1%, followed by presbyopia (13.1%), infection (11.6%), chronic dacryocystitis (7.3%), and trauma 7.0%; 8.8% of the participants stated that they did not remember the diagnosis (Look at. Table 4.20.). The remaining 19.7% composed of allergic eye disease, glaucoma, RE, CO, age related macular degeneration, and intra ocular foreign body. This pattern of eye diseases could explain the general picture of eye disease in the sampled area. Although pattern of eye disease is related to geographic, socioeconomic and cultural factors some studies illustrating approximately the same pattern of diseases. In the study conducted in the Kenia, cataract was the greatest with a percentage of 32.6% followed by conjunctival disease (31.3%), presbyopia (25%), cornea (12.6%) and optic nerve disorder (9.6%) (183). In another study conducted in Sudan tertiary hospital, cataract was again the top, followed by conjunctivitis and presbyopia (184). In a study conducted in Pakistan primary health centers, conjunctivitis was the most common disease (28.3%) followed by cataract (22%), corneal disease (6.9%), pterygium (6.9%) and glaucoma (6.4%) (185). In a study conducted in Nigeria, the most common eye disease was cataract followed by RE, trachoma, onchocerciasis, and vitamin A deficiency (186). In the study conducted in India, the most common disease was RE followed by cataract, and CO (187). The reasons for the differences between the current study and the studies conducted in other developing and under developed countries might be sourced from the study population and study area. This study was conducted in the community while others conducted at the hospitals or primary

health centers. The study population in current study was the people aged 50 years old and over whereas the study population of the other studies were different. Moreover, in this study, the disease was reported by the participants themselves while in the others studies the diagnosis was put by the ophthalmologist or another health personnel.

The obvious difference was not observed between male and female regarding the pattern of eye disease.

5.19 Place of Residence and Availability of Health Services

The Impact of the distance between the place of residence and health facility was discovered by some studies conducted in developing countries such as; Nigeria, Ghana, Kina, and Yemen (188-191). In this study, in total, 23.7% of the participants reported that health services were available in 2 km distance. In rural area, this availability was reported by 30.6% of the participants while in urban city, it was reported by 13.5%. The reason for higher proportion of health service availability in the rural area compare to the urban area is the type of health services reported by the participants in both areas. Residents of urban area reported just government health facilities because the majority is utilizing government health facilities. In contrast, rural residents reported government setting as well as private physician clinics as health facilities because they utilized both. In Jalalabad city, the availability of health services in 2 km distance will be truly more than rural area, if we consider private physician clinics as a health facility (Look at. Table 4.21.).

In urban area, almost more than 91.4% of the participants reported public health hospital, university hospital, and PH. Only 8.6% of the participants reported CHC in 2 km distance but in rural area, 41.6% of the participants reported the private physician clinics followed by BHC at 30.5%, CHC at 18.5% and Sub Health Center (SHC) at 9.4%. If it is assumed 2 km distance as physical accessibility to health care facility, than 23.7%, of the participants in the survey area have accessibility to health care services. This result could not be comparable with other studies conducted in other countries, since most of the other studies have measured accessibility by using time spent. A study conducted in Nigeria, discovered that 38% of the participants in dry season reached to health care service in one hour and in wet season the

percentage decreased to 24% (192). Another study conducted in South Africa discovered overall mean travel time to health facility as 73.6 minutes (193).

5.20 Characteristics of the Participants Related to Smoking

Besides the causal effect of smoking on lung cancer and cardiovascular diseases, it increases the risk of blinding diseases such as AMD, cataract, glaucoma, DR and dry eye, however many people do not realize that smoking can cause vision loss (194-201). In this study, data about tobacco smoking collected to see the association of smoking with main causes of blindness or visual impairment and blindness itself. Totally 30% of the participants have ever smoked (20.9% were currently smoker and 9.1% ex-smoker) (Look at. Table 4.22.). The proportion of both currently smokers and ex-smokers is higher among male participants ($p<0.001$). This prevalence is higher compared with the prevalence of Pakistan which is 19% among 15 year old and over population (202). Participants of the current study were 50 years and older, this difference might be sourced from the age differences of the study groups. The prevalence is also higher compared with Iran, which is almost 21.7% in males and 3.6% in females (203). It is almost the same with the result of a meta-analysis covered 187 countries which estimated the prevalence of smoking for males age 15 years or older as 31.1% and for females 6.2% (204).

In total, 40.5% of ex-tobacco users had used snuff followed by cigarettes and hookah but males and females didn't follow the same pattern. In males the proportion of cigarette users was high at 50.0% followed by snuff and hookah whereas in females the proportion of hookah users was high at 55.0% followed by snuff and cigarette. In reference to current tobacco users, 80.2% of tobacco users used snuff followed by cigarette and hookah. Males followed the same pattern as general but in females snuff users was 83.9% followed by hookah and cigarette. (Look at. Table 4.23.).

5.21 Socio-demographic Characteristics of Underweight, Overweight and Obese Participants

The calculated BMIs were categorized according to WHO criteria (205). As underweight if BMI<18.5, normal weight if BMI was between 18.5-24.99, overweight if BMI was between 25-29.9, and obese if BMI was equal or more than

30. In this study, the prevalence of obesity, overweight and underweight were found as 4.4%, 23.3% and 3.6%, respectively. The prevalence of overweight and obesity in this study were very low compared with the study conducted in Nigeria, estimated the overweight and obesity as 31.2% and 26.9%, respectively (206) (Look at. Table 4.24). Pakistan study, estimating the prevalence of overweight and obesity as 29% and 21%, respectively (207). Moreover, it is also lower compared with study conducted in Iran indicating the prevalence of overweight and obesity as 36.5% and 33%, respectively (208). The reasons for the low prevalence of overweight and obesity in the study area might be traditional food consuming habits, not being in sedentary life due to least development of science and technology, low level of socioeconomic status, and low rate of urbanization.

Obesity status was differently distributed among married and non-married participants. The prevalence of underweight, overweight and obesity were 5.8%, 22.6% and 5.8% among non-married participants while among currently married participants, they were 2.8%, 23.6% and 4.0% respectively ($p = 0.030$).

Conflicting results are present in the world regarding the association of marital status and obesity. In a study conducted in Netherlands, married participants were more likely to practice positive health behaviors (such as exercise and eating breakfast) and less likely to engage in negative ones (such as smoking or drinking heavily) than the other groups. Married men showed higher percentages of people with normal weight and the proportion of married women with overweight was lower than the widows with overweight (209). Some other studies supporting the findings which were discovered by Netherlands study (210-212).

In a number of other studies conducted in Poland, Greek, Iran, Saudi Arabia, and a Review of the Literature were in contrast to the result of current study indicating the higher proportion of overweight and obesity among married participants than others (213-217). The reason stated by the author of Poland study for this association was the marriage selection theory. In modern societies, the stigma of obesity may limit chances of marriage for individuals perceived as less attractive. In this research's study area, the condition is different from other countries. Female condition in the majority becomes worse by getting married, because the parents take decision about marriage related to their young daughters and sons. Males and

females are facing lots difficulties when they got married. For example, women are working in the large families without wage; could not go out without permission of the leader of the house even for getting services from health center they cannot go alone; when they need money for personnel expenditure they have to ask it from the leader of the house; after the marriage happened they have to get pregnant as soon as possible, otherwise the in law family search to find another wife for their son, and thereafter the problems of pregnancy and delivery will start.

The prevalence of underweight, overweight and obesity were 4.1%, 22.3% and 4.6% respectively among non-working participants while among working participants they are 2.7%, 25.2% and 4.2% respectively ($p = 0.030$). Underweight prevalence was higher among non-working participants whereas, the prevalence of overweight was slightly higher among working participants. Contrary to the current study findings, higher prevalence of overweight was discovered among non-employed participants by some other studies conducted in Korea, Gaza Strip, and Turkey (218-220). As overweight and obesity are multifactorial condition, many factors such as physical exercise, nutritional behavior and socioeconomic status might have influences the BMI. In this study, employed participants might get overweight because of the changes in socioeconomic status, sedentary life and nutritional behavior.

In urban area, the proportion of both obesity 7.1% and overweight 25.6% were higher than that of the rural area (2.6% and 21.8%); the difference was found to be statistically significant $p<0.001$). In urban area the opportunity might be limited for physical exercise and the residence is more likely to practice negative health behavior such as smoking and bad nutritional habits. The result of this study was supported by some other studies (221-223).

5.22 Some Characteristics Related to Hypertensive Participants

Overall, 267 (20.8%) of the participants had HTN but it is unequally distributed among females (25.0%) and males at 17.2% ($p<0.001$). Totally 19.9% (23.7% of the females and 16.7% of the males) of hypertensive participants were taking medicine for HTN ($p<0.002$). Median duration of HTN was 5 in females whereas, 8 in males ($p<0.001$) (Look at. Table 4.25.). In this study, HTN, its

treatment and mean duration was asked to investigate the association with visual impairment and blindness.

A study which was conducted in Brazil estimated self-reported prevalence of HTN as 27.7%, differently distributed among females and males as 25.4% and 19.5%, respectively (224). A meta-analysis estimated the global prevalence of HTN as 40.8%, from them 46.5% were aware of their condition of HTN and the majority of award participants (87.5%) taken drug treatment (225). Another study conducted in Iran estimated the prevalence of HTN as 5.3% (3.8 in males and 6.6 in females) (226).

Prevalence estimated by this study was approximately the same as Brazilian study, but it is very low compart with the global prevalence estimated as 40.8%, however, it is much higher compared with Iran study at 5.3%. These differences might be due to population sampled, in current study, the study population was aged 50 years old and over while in global study papulation age were different in different studies; in the study of Iran, included 25-65 age group.

Higher prevalence of HTN among females was consistent with the majority of the studies, which shows female gender as a probable risk factor for HTN (224-226).

Proportion of participants taking medicine for HTN was calculated as 19.9%, which means that 1% of the self-reported participants were not taking their medicine. The proportion of participant with HTN taking their medicine is higher than the global figure which was estimated as 87.5% of award HTN participants. This figure shows strictly adherence of the study participants with pharmacological medicine.

5.23 Some Characteristics of Diabetic Participants

Detailed questions were asked to the participants to investigate the association of DM, its treatment, mean duration and periodic eye examination with visual impairment and blindness. Totally 4.6% of the participant had DM and both sexes were affected almost similarly ($p = 0.601$) (Look at. Table 4.26.). For Afghanistan as a whole, DM prevalence was estimated as 6.7% in 2014 (83), the lower prevalence in this study might be causes from difference in study methodology and population. In the current study, 50 years and older participants reported their

status of diabetes by themselves, while it was measured for estimating DM prevalence for Afghanistan and the study population included all ages. 20-75 age group was included for global estimation and the prevalence was not calculated based on self-reported (227). Another study which was conducted in Delhi-India estimated self-reported DM prevalence as 8.5% which is also higher; the participants were 20 years and older in that study (228). Another study conducted in Iran shows self-reported prevalence of DM as 5.0% which is approximately the same as in this study (229).

Duration of DM is one of the important factors for inducing DR. In a meta-analysis, the association of diabetes duration and DR was investigated. In diabetic patients with the duration of 0-4 years, the prevalence of DR was estimated as 9.2%, with the duration of 5-9 years as 23.1%, with the duration of 10-19 years as 33.3% and with the duration of 20 years and over as 57.1% (230). In our study the mean duration of diabetes was estimated as 8.05±3.47 which is high enough to cause DR.

Although DR is more prevalent among diabetic patients, less than half of the diabetic patients (27 out of 59) contacted eye care service for detailed eye examination in this study. Low health literacy, lack of health education, lack of people awareness regarding the diabetes and DR might be the reasons for not contacting eye care services for detailed eye examination.

In terms of treatment, all participants with DM took medicine. In an analysis of 11 retrospective studies between 1966 and 2003, adherence (defined in some of the studies as taking 90% of medication) to Oral Hypoglycemic Agent (OHA) therapy ranged from 36% to 93% in patients remaining on treatment for 6–24 months (231). The proportion of drug adherence was 100% in this study among diabetic participants.

5.24 Common Causes of Visual Impairment

The most common cause of the visual impairment was cataract at 52.8% followed by the RE at 26.9%, glaucoma at 8.6%, other posterior segment disorders at 4.8%, age related macular degeneration at 3.4%, CO and DR each at 1.4%, and cataract surgical complication and phthisis each at 0.3% (Look at. Table 4.28.).

Global causes of visual impairment and blindness are as follows: RE 42% followed by cataract 33%, undetermined 18%, glaucoma 2% and all other causes such as AMD, DR, CO, trachoma and childhood blindness each at 1% (1).

In the year 2002, common causes of visual impairment for developing countries were estimated as cataract at the top with 47.9%, followed by glaucoma (12.3%), AMD (8.7%), corneal opacities (5.1%), DR (4.8%), childhood blindness (3.9%), trachoma (3.6%), and onchocerciasis (0.8%) (232).

The main causes of visual impairment in rural population of Northern Iran was estimated as uncorrected RE at 54.5% followed by cataract at 27.6%, AMD 5.1%, others at 4.5%, amblyopia 2.6% and glaucoma and CO each at 1.9% (233).

In the study conducted in the Saudi Arabia, the main 5 causes of visual impairment were indicated as RE at 39% cataract at 29% followed by DR 20.9%, optic atrophy at 8.1% and glaucoma at 5.8% (234).

A Polish study illustrated completely different pattern for main causes of visual impairment than developing countries: AMD at 18.2% was the leading cause followed by cataract and amblyopia each at 15.6%, other retinal disorders at 9.1%, glaucoma 7.8%, DR and corneal disorder at 6.5% each, eye injury and degenerative myopia each at 5.2%, retinal detachment and Retinal Vein Occlusion (RVO) each at 3.9% and other optic neuropathy at 2.5% (235).

According to the results of a study performed on older people in the United States of America, cataract was the leading cause of bilateral visual impairment, accounting for 42%, followed by AMD (20%), DR (12%), and glaucoma and other retinal causes (7%) each. Posterior capsule opacification in pseudophakic eyes was responsible for 2.4% of visual impairments, while other causes were CO, optic atrophy, Duane retraction syndrome, retro-bulbar neuritis, and undetermined causes (4.7%) (236).

In the Scandinavian countries, the major cause of visual impairment was cataract (35.9%), AMD (32.0%), DR (9.7%), myopic macular degeneration (7.7%), other retinal causes (3.8%), and other causes (10.6%). Thus, the 3 major causes of visual impairment accounted for 77.6% of all visually impaired persons (237).

In this study, the main cause's pattern of visual impairment is approximately follows the patterns in developing countries.

5.25 Distribution of Visual Impairment by Sex

The prevalence of visual impairment was different among males and females. In males it is 20% whereas in female it is 25.5% ($p<0.05$). Higher prevalence of visual impairment was consisted by some other studies such as Nigeria, Egypt and Latinos (168, 238, 239).

From visual impairment, 61.4% composed of low vision while the remaining 38.6% blindness. In females 62.7% of visual impairment was low vision and 33% was blindness while in males it was 59.9% and 39.1% respectively (Look at. Table 4.29.).

5.26 Main Causes of Low Vision and Blindness

Number one cause of low vision was RE (41.6%) followed by cataract (40.4%), glaucoma (7.9%), AMD (4.5%), DR (2.2%), CO (1.7%), other posterior segment disorders (1.1%) and cataract surgical complications (0.6%). Number one cause of the blindness is cataract (72.3%). The second causes of blindness was other posterior segment disorders (10.7%) followed by glaucoma (9.8%), RE (3.6%), AMD (1.8%) and CO and phthisis (0.9%) each (Look at. Table 4.30.). In the study area, almost 95% of low vision and 85% of the blindness are avoidable (treatable and preventable)

A study performed in Bangladesh shows that the main causes of low vision were cataract (74.2%), RE (18.7%), and macular degeneration (1.9%), whereas the first common causes of blindness was cataract (79.6%) followed by uncorrected aphakia (6.2%), macular degeneration (3.1%), optic atrophy, phthisical eye, other posterior segment disorder (2.5%) each, RE and glaucoma (1.2%) each (240).

A study which was conducted in Northern Jordan discovered the causes of bilateral low vision as cataract (39.1%) followed by RE (17.1%), DR (14.5%), glaucoma (11.3%), other and multifactorial (6.6%), CO (4.7%), other retinal and optic disorders (3.9%) and AMD (2.8%). The causes of bilateral blindness were cataract (60.1%) followed by DR (13.3%), glaucoma (8.5%), other and multifactorial (10.1%), CO (3.2%) and AMD (1.6%) (241).

According to the result of a study held in Malaysia, number one cause of low vision was RE (48.3%) followed by cataract (35.9%), other causes (8.6%), retinal

diseases (2.8%), corneal disorders (2.5%) and glaucoma (1.8%), whereas number one cause of blindness was cataract (39.1%) followed by retinal diseases (24.5%), other causes (27.0%), RE (4.1%), corneal disorders (3.4%) and glaucoma (1.8%) (242). In the current study, pattern of diseases caused low vision and blindness was similar to the causes of low vision and blindness in developing countries (mostly Malaysian).

5.27 Socio-demographic Characteristics of Visually Impaired Participants

In this study, the association of high prevalence of visual impairment was observed with female sex, increasing age, being currently not married, worse economic status, being illiterate and being unemployed in bivariate analysis ($p<0.05$) (Look at. Table 4.31.).

These associations of sociodemographic factors have been consistently reported in some other studies conducted in developing and developed countries (21, 166, 167, 170, 172, 243-249).

Distribution of visual impairment among males and females is likely to be global phenomena and being female appears probably to be one of the risk factors for visual impairment. In this study higher prevalence of visual impairment among female might be due to unavailability and lower utilization of eye care services by females because of some social, cultural problems and other barriers to uptake of eye care services. Therefore, provision of accessible eye care services to population and solving the barriers concerning the uptake of eye care services are suggested.

Increasing age was consistently associated with visual impairment in the majority of studies conducted in developed and developing countries and appears that might be a strong risk factor for visual impairment (21, 166, 167, 170, 172, 243-249). A study conducted in central Iran, reported that by increasing a decade of age, the odds of prevalence of visual impairment increase almost by 3 folds (250).

Similarly in the line with the results of other studies conducted in the world (21, 166, 167, 170, 172, 243-249), in this study, level of education inversely associated with the prevalence of visual impairment. People with high level of education correlated with better economic status and high health literacy, which finally might be resulted in frequent utilization of health services and practicing positive healthy behaviors.

Being not married may lead to low accessibility and utilization of eye care services properly and might practicing negative healthy behaviors, therefore, the prevalence of visual impairment was higher among this group of participants and it is consistent to some results of studies conducted in the world (166, 170, 243, 244).

In agreement with other studies (166, 170, 243), this study also indicated that unemployed situation associated with high prevalence of visual impairment. However, it was a cross sectional study, it is challenging to answer of temporality for all variable in the study.

In a study conducted in Iran reported that visual impairment was more prevalent in people with poorer SES (173). It was also discovered the same result in this study even all health services are free of cost and government responsibility in Afghanistan.

5.28 Socio-demographic Characteristics of Blind Participants

In bivariate analysis, blindness was found to be associated with increasing age, low level of education, worse economic status and being unemployed ($p<0.05$). In contrast to visual impairment, blindness equally prevalent among males and females, married and unmarried participants, and urban and rural residents in the study aria ($p>0.05$). In Timor-Leste study of prevalence and causes of blindness and visual impairment, the prevalence of blindness was almost 29.1 times higher among 70 years and older participants than participants aged 40-49 (251). Another study conducted in Bangladesh reported the association between increasing age and increasing prevalence of blindness; in age group of 70 years and older it was reached to 11.5% (252). The current study also follow the fact of increasing prevalence of blindness by the increasing age, it was 4.4% among age group 50-54 but it was reached to 16.1% among participants aged 65 years and older ($p<0.001$) (Look at. Table 4.32.).

In both studies of Bangladesh and East Timor, the prevalence of blindness was higher among illiterate participants when compare it with other remaining participants of the study (251, 252). Un-expectedly in current study, the prevalence of blindness was the highest in both secondary school graduate and illiterates, while

it was the least at primary school graduates. The prevalence is approximately the same for both literates and high school graduates.

Blindness was more prevalent among either unemployed or retired participants, indicated by the study conducted in Bangladesh and East Timor (251, 252). In current study, the prevalence of blindness follows the result of Bangladesh and East Timor studies, indicating that it was 15.2% among unemployed and 1.9% among currently working participants.

With regard to economic status, the prevalence of blindness was the lowest among participants reported having excellent economic status, while it was the highest among participants reported their economic status as very bad. This fact is also revealed by the study conducted in the South Africa, sampled with poorest economic status were experience 4.5 fold higher blindness than those with highest economy (253). It is also supported in the global level, countries with low level of socioeconomic status (for example some countries located in sub-Saharan Africa) experience more blindness than that of countries with high level of socioeconomic status such as established market economy (254).

5.29 Some Socio-demographic Characteristics of Participants with Low Vision

In this study, with bivariate analysis, it was found out that the prevalence of low vision was higher in female, currently not married, reported worse economic status and illiterate participants ($p<0.05$). However, some variables such as age and unemployment, associated with visual impairment were not found to be statistically significant with low vision ($p>0.05$). Many of the above socioeconomic and demographic parameters are interrelated. For example, educational level has close relationship with the occupation and good source of income which in turn affect the utilization of health services and practicing positive health behaviors. In agreement of this study, a study which was conducted in China reported that the prevalence of low vision has been affected by female gender, being not married, and low level of education or illiteracy (243). Furthermore, association of economic status in this study was supported by the study conducted in Indonesia (255) (Look at. Table 4.33.).

5.30 Eye Health of Visually Impaired Participants

It was found that participants who had experienced more eye complaints in the past were more likely to be visually impaired ($p<0.001$). 35.0% of the participants suffered eye complaint and 31.9% of the participants suffered eye trauma found to be visually impaired in this study however the difference related to eye trauma was not statistically significant ($p=0.052$) (Look at. Table 4.34.). Similar results that showed the association of complaints related to Age Related Eye Disease (ARED) and high proportion of visual impairment was also found by a study conducted in the United States (256). Although for decreasing recall bias, before eye examination it was first recorded sociodemographic, health related and medical characteristics in the current study, the probability of presence of recall bias has to be mentioned in prevalence of visual impairment among participants with history of any eye complaint.

The prevalence of visual impairment among those have had eye trauma in the past was higher in the study area compared with the study conducted a tertiary eye car hospital. The prevalence of visual impairment was reported to be 23% at presentation but after management of eye trauma and one year follow up, the prevalence was decreased to 2% (257). In the current study, the reasons for higher prevalence of visual impairment among participants have had eye trauma in the past might be problems in accessibility of eye care services, ignorance (“no need to consult a health personnel, the trauma heals by itself), traditional practicing and coming to eye care services very late with complication.

5.31 Health, Obesity and Chronic Diseases Status of Visually Impaired Participants

In this study, it was found that the prevalence of visual impairment was higher among participants who reported their health status as poor, whose underweight and obese, have experienced any chronic diseases and have self-reported hypertensive status ($p<0.05$).

The association of perceived health status and visual impairment was mentioned by a study conducted in the US. The study discovered that poor/fair health status responders were more likely to be visually impaired than good health

responders (256). It was found in this study that 39.4% of poor health responders compares to 20.4% of good health responders were visually impaired ($p<0.001$) (Look at. Table 4.35.).

Association of BMI status with visual impairment was observed in the study conducted in China. Overweight participants were 1.6 times more likely to be visually impaired than normal weight in presenting VA and 2 times more likely to be visually impaired in best corrected VA (167). In addition, overweight and obesity associated with AMD and lead to visual impairment (258, 259). Moreover, obesity by having association with glaucoma, cataract, diabetic retinopathies, and retinal vein and artery occlusion can also causes visual impairment and blindness (260). In the current study, it was found higher prevalence of visual impairment among overweight and obese participant (25.6% and 28.1% respectively) compare to normal participants which is 20.6%. It is necessary to control overweight and obesity in the study area by encouraging the older adults to physical exercise and consuming healthy nutrients.

Association of chronic disease with visual impairment was recorded by a study conducted in the Spanish population. This study revealed that chronic diseases such as stroke, DM, chronic lung diseases and arthritis were associated with distant visual impairment and near visual impairment (261). Moreover, higher prevalence of cataract was seen among participants with cardiovascular disease such as HTN and adherent to hypertensive medication (262). The prevalence of visual impairment was also found to be higher among participants reported having chronic diseases and HTN in the current study.

5.32 Health and Chronic Diseases Status of Participants with Low Vision

Likewise prevalence of visual impairment, prevalence of low vision was associated with poor health status, overweight and obesity, chronic disease and HTN in bivariate analysis ($p<0.05$) (Look at. Table 4.37.).

Association of low vision with poor economic status was supported in some studies (263-265) and poor economic status in turn associated with poor health status (266, 267). In agreement with these studies the prevalence of low vision found as

28.5% among poor health responders which is almost double that of participants with good and excellent health status in the current study ($p<0.001$).

Due to positive association of BMI with cataract (268, 269), with ocular HTN and glaucoma (270-272), with AMD (273-275), with DR (276, 277) and with retinal artery and vein occlusion (278), BMI can be a strong candidate for a probable risk factor of low vision and blindness. Association of overweight and obesity with low vision was also discover by the current study. In this study the prevalence of low vision was 17.8% and 21.2% among overweight and obese participants compared to the prevalence in normal participant which is 13.5%, however the significant is in borderline ($p = 0.055$).

Association of chronic disease with loss of vision was supported by a study, indicated that stroke, chronic lung diseases arthritis, and DM were associated with loss of vision (261). Nevertheless, high prevalence of cataract was observed among cardiovascular disease and HTN along with antihypertensive medication usage (262). As expected in the line with these studies (261, 262), high prevalence of low vision among participants with chronic disease and HTN were found in this study also.

5.33 Health and Chronic Diseases Status of the Blind Participants

Like visual impairment and low vision, blindness is also more likely to be prevalent among participants with poor health status, experience chronic disease, being hypertensive, taking any medication and suffered eye disease ($p<0.05$). However, the association between obesity and DM was not significant ($p = 0.426$) (Look at. Table 4.39.).

Socioeconomic and poor health status are interrelated, low income per capital was associated with poor health (266, 267), and poor health and worse economic status were associated with blindness in turn (254). The current study also follows the above fact, indicating almost two time higher prevalence of blindness among poor health responder than fair and good health responders.

Higher prevalence of blindness among participants experienced any chronic disease and HTN was found in the current study. This result was confirmed by other study which showed association of some chronic conditions and blinding diseases such as association of cardiovascular disease (HTN) with cataract (262, 279-281),

diabetes and cataract (281, 282), treatment of COPD patients by systemic or inhaled steroid with cataract and glaucoma (283-285), COPD with cataract (89, 281, 286, 287), chronic kidney disease with cataract (288), DM with glaucoma (289-291), HTN with glaucoma (292-294) and cardiovascular disease with AMD (92, 295, 296). In current study, the biggest cause of blindness was cataract and the positive association of cataract and chronic diseases was the foundation of the association between blindness and chronic disease.

Higher prevalence of blindness among participant experienced eye complaint than who did not ($p<0.001$) was also found in the current study. From the above association, it could be said that the perception of the participants is very important in prevention and early diagnosis and treatment of eye problems, if they do accordingly. If eye complaints based on various ocular disorders were ignored and not considered seriously, they would lead to visual impairment and blindness in the future. However, some social, economic and cultural factors might prohibit the people from consulting eye care services in the study area.

Finally, medication was also found to be associated with blindness in this study; the prevalence of blindness was higher among participants taking medication for chronic diseases ($p<0.001$). As expected in the line with the result of current study, medication such as steroid (297, 298), allopurinol (anti hyperuricemic agent) commonly used in treating gout, phenothiazine particularly chlorpromazine reported to have associated with cataract (298). Some other medications such as cholinesterase inhibitors, steroids, spironolactone, Nifedipine and analgesics were also found to have influence in the development of cataract (299). Moreover alpha blockers were also found to be associated with glaucoma (300).

5.34 Association of Tobacco with Visual Impairment, Low Vision and Blindness

High prevalence of visual impairment, low vision, and blindness among smoker was found in this study ($p<0.05$) (Look at. Table 4.40.). Association of tobacco smoking and some blinding diseases such as cataract, glaucoma and AMD were in some extend investigated. The association of smoking and cataract, which is the greatest cause of visual impairment and blindness in the current study as well as developing countries, was supported by some other studies (197, 198, 301-305).

Association of smoking with glaucoma which was found to be the third main causes of visual impairment and blindness in the current study have been discovered also (306-308). Furthermore, smoking was found to be associated with AMD (309).

We can say that the result of this study was consistent to the above mentioned studies as smoking was associated with the blinding eye diseases and those diseases have been found to be the major causes of blindness and visual impairment in current study. Although prevalence of smoking is low in the study area, it's association with blinding eye disease emphasizes the tobacco control program in the study site.

5.35 Association of HTN with Visual Impairment

Prevalence of visual impairment, low vision and blindness was found to be higher among patients with self-reported HTN ($p<0.05$). Low vision and blindness were also associated with antihypertensive medication ($p<0.05$). However, neither of them was significantly associated with DM ($p>0.05$) in bivariate analysis (Look at. Table 4.35., Table 4.37., Table 4.39.)

Cataract was the major cause of blindness and visual impairment in this study and across the world. Many epidemiological studies indicated that hypertension might play an important role in the development of cataract, while others not. An association between hypertension, visual impairment and blindness was also found in this study. In supporting of this association, a meta-analysis suggested that hypertension increases the risk of cataract particularly PSC (post sub capsular) (279). Moreover, many other studies conducted with the results to the favor of current study (280, 310, 311).

Although clear mechanism of association between HTN and cataract has not been understood, some procedures were suggested by some authors. In hypertensive person, the level of inflammatory markers such as IL-6 and TNF-a were found to be higher than non-hypertensive ones (312). Another study concluded that a senile cataract is a systemic disease with an inflammatory component (313), therefore, higher level of inflammatory markers was suggested as one of influencing factors for cataract. Another study discovered that systemic HTN induces changes in the protein conformational structure of the lens capsule, later on, due to changes in the

permeability and transportation of the membrane, cataract formation exacerbated (314).

Association of anti-hypertensive medication and blinding diseases were reported by some studies such as indicated association of nifedipine with cataract (299), indicated association of alpha blocker with glaucoma (300), indicated association of amiodarone and thiazide diuretic with cataract (315, 316), indicated association of beta-blocker with cataract,(317) and indicated association of anti-hypertensive medication in general with cataract (262). Even though the prevalence of low vision and blindness was significantly higher among participants using anti-hypertensive medication in the current study, the association could not be considered as real one. Because, the exact time of disease onset, time of starting medication, time of medication crossover and continuity (adherence) of medication which are very important for separating the effect of HTN and anti-hypertensive medication were not recorded in the study. Moreover, the blood pressure of the participants were not measured and recorded; self-stated status of HTN was considered as being hypertensive. Furthermore, the presence of recall bias has to be considered.

DM can cause cataract and DR, which is the main causes of visual impairment and blindness in the world, particularly in the developed countries. 1% of the visual impairment and 1% of the blindness are caused by the DR worldwide (1). In addition, DM can cause cataract, diabetic cataract (318). However, in the current study, significant association between visual impairment and blindness with DM was not found. The possible reasons for this situation might be the young papulation of the area, low health literacy of the participants, and self-reported DM. Besides the type of cataract during the examination of the lens in the field work was not recorded.

5.36 Multivariate Analysis

In multivariate analysis, it was found that illiteracy, self-reported bad economic status, self-reported HTN, and overweight was independently associated with visual impairment (Look at. Table 4.46).

The risk of visual impairment 2.3 times higher among illiterate compare to high school graduate (OR=2.3, CI=1.4-3.7, p = 0.001). Tehran Eye Study also

indicated that compared to college graduated, illiterate participants have 13 times higher risk of being visual impaired (OR=13.1, 95% CI= 5.1 to 33.6) (172). In general, compare to illiterate, educated people might owned higher level of health literacy, more knowledge about eye care services' locations and providers (government, charitable and private) along with more knowledge about preventability and curability of the major blinding disorders.

As level of education, working and economic status are having interaction with each other, they might collectively influenced unequal distribution of visual impairment among participants with various level of education. Furthermore, distribution of visual impairment among people with different level of education might be influenced by the quality of public health services and lack of or limited availability of eye care services among population. Government policy is another factor, which affects the distribution of visual impairment among people with various levels of education, for example: preventive and curative services related to eye have not been integrated with primary health care in practice, yet. Therefore, eye care services are limited only to the provincial capital, Jalalabad city, and the access to the services is not too easy for the illiterate and economically disadvantaged people who reside in the remote rural area.

In the current study, prevalence of visual impairment was 58% higher among bad economic status compared to good economic status (OR=1.58, CI=1.1-2.3, p = 0.017). While provision of health services including eye care is the responsibility of the government and free of cost in Afghanistan (41), economic status has been observed to have link with the access of the health services (319, 320). The study conducted in Iran supported the result of the current study that the prevalence of visual impairment was higher among people with poor economic status (173). Another study conducted in South Africa also confirm the result of this study, that the prevalence of visual impairment was higher among people with low socio-economic status (253).

A meta-analysis have shown that the risk of visual impairment was 30% higher among hypertensives than non-hypertensives (OR=1.3, 95% CI= 1.0–1.7) (86). Likewise, it was found that in hypertensive participants, prevalence of visual impairment was higher by 2.6 fold (OR=2.6, CI = 1.9-3.5, p<0.001) in this

study. Association of HTN and the major blinding eye diseases have been observed in certain number of studies; HTN and cataract (279, 280, 310, 311), HTN and glaucoma (293, 321, 322), HTN and AMD (323-325), HTN and retinopathy (326-328) and HTN and DR (329, 330). Thus, in the current study, relation of HTN with visual impairment might be due to positive and strong association of HTN with four common causes of visual impairment.

Overweight was another independent associated factor for visual impairment, in overweight participants compared to participant with normal weight, the prevalence of visual impairment was 42% higher (OR=1.4, CI=1.0-1.9, p = 0.024). Nigerian study of BMI and visual impairment also found that the status of BMI affected the visual impairment negatively (331). Due to association of obesity with cataract, glaucoma, AMD, DR and retinal artery occlusion (268-278), it is accounted as a strong associated factor of visual impairment and blindness.

In multivariate analysis of low vision (Look at. Table 4.52.), likewise the visual impairment, illiteracy, self-reported economic status, self-reported HTN, and overweight were independently associated with low vision. The model retained the same variable as the visual impairment's model, however, the coefficients of the variables, confidence intervals and levels of significances were different. In illiterate participants the low vision prevalence was 2.4 times higher compare to participants with graduated from high school (OR=2.4, CI=1.3-4.4, p = 0.003). Among participants with bad economic status, the prevalence of low vision was more than one and a half fold than participants with good economic status (OR= 1.7, CI=1.1-2.8, p = 0.023). Among hypertensive participants the prevalence of visual impairment was more than 2 times higher compared to non-hypertensive participants (OR=2.2, CI=1.5-3.3, p<0.001). Furthermore, the prevalence of low vision among overweight participants is almost one and a half times higher than the participants with normal body weight (OR=1.51, CI=1.1-2.2, p = 0.025).

In the third model, which was built by multivariate analysis of the blindness and its explanatory variables (Look at. Table 4.58.), indicated that in addition to the variables significantly associated with visual impairment, age and using of sunglasses were also associated with blindness. Age, illiteracy, self-reported economic status, HTN and using of sunglass for protection were found to be retained

in the model, however illiteracy and self-reported economic status were not significant.

Age associated with the prevalence of blindness, compare to 50-54 age group, among 55-59 years old participant the prevalence of blindness was almost 2 fold higher (OR=2.1, CI=1.0-4.2, p = 0.039), among 60-64 years old the prevalence of blindness was almost more than 2 times higher (OR=2.1, CI=1.1-4.3, p = 0.035) and among 65 year old and over, the prevalence of blindness is almost more than two and a half times (OR=2.6, CI=1.3-5.0, p = 0.007). Age is one of the re-known non-modifiable risk factors for blindness and visual impairment. In global scale, almost 32 million out of 39 million blindness occurred among people aged 50 years and older (1). The result of current study is in consistency with some other studies held in the developed as well as developing countries (21, 167, 170, 237, 243, 249-251, 332)

Prevention and delaying of the cataract formation by using sunglasses and other measures to protect the eye from ultraviolet B exposure (found in the light rays) has been confirmed by certain studies (66, 297, 333). A case control study conducted in the Australia, indicated that sunglass reduced the risk of the cataract among occupational exposure to sun by 3 fold (OR=3.00; 95% CI 1.23–7.12) (334). In our study, the proportion of sunglass users was very less at 11.16%, while more than 65% of the participants spent 7 hours or more of their day time outdoor in the work site. Exposure to ultraviolet rays and increasing the risk of blindness due to cataract was supported by The Beaver Dam Eye Study; showed that the risk of cataract was increased by 36% (OR = 1.36; 95% CI = 1.02, 1.79) among the participants who spent more time outdoors (335). Ultraviolet ray's association with the cataract blindness was approved by some other studies as well (334, 336-338).

Since this study was a cross-sectional study, the causal association between sociodemographic factors and visual impairment is not clears that whether the sociodemographic difference are the causes or the consequences. However, the result indicated difference between visual impairment, blindness and normal subject in terms of sociodemographic factors. Illiteracy, poor economic status, HTN, and overweight status were associated with visual impairment and advanced age, illiteracy, poor economic status, being hypertensive and use of the sunglasses were associated with blindness.

5.37 Limitations of the Study

- Chronic diseases were recorded based on self-report in the study group which came from a society with low literacy and low level of health awareness; therefore, the probability of recall bias might be present.
- VA of the participants were recorded in the summer sunny days. Even all possible measures were taken while eye examinations, sunlight might cause constriction of pupil in some extend which may further resulted in recording of VA lower than expected in people with premature or central nuclear cataract. Consequently, participants with low vision might have been recorded mistakenly as blind.
- Due to worse security situation, internal migration had been occurred before the data collection period. Older and female members of the families from far remote districts with worse security situation moved in safer localities and younger members stayed at their original residences to look after their lands, gardens and animals. This situation had been continued in some study districts during the fieldwork, also. For this reason, some older people who were not denizen (original resident) might have been included to the study even it was asked whether they were placed in the residence more than six months; this might lead to selection bias.
- The time of the chronic diseases onset, duration of disease, starting of medical therapy, time of changing the medication and adherence of particular medication other than DM an HTN had not recorded during the study. Moreover, the details of treatment related to DM and HTN were not recorded also. Hence, the association of disease from their treatment agents with VI could not be separated.
- The information about suffering any eye disease and complaint were asked as having until the survey time without mentioning any time period. This might cause a recall bias.
- Because of security constraints, the study was just limited to the Jalalabad City and four districts around it.

5.38 Strengths of the Study

This is ever first visual impairment and blindness prevalence study, which was conducted in Nangarhar province (Jalalabad capital and four districts around it). Prior to this study, other studies regarding the prevalence of visual impairment and blindness conducted neither in Nangarhar province nor in other province of Afghanistan. The present study therefore, provides valuable information about prevalence of visual impairment (low vision and blindness), factors related to the to the visual impairment and blindness, main causes of visual impairment and blindness and barriers of the eye care utilization services to the local public health administration as well as to the MOH, for evaluating the current status and for planning evidence based eye care services across the Nangarhar province as well as whole Afghanistan.

6 CONCLUSION

- The prevalence of visual impairment is high at 22.6% (low vision 13.9, blindness 7.8%) in the study population; it is even higher when it is compared to the neighboring countries
- Visual impairment and blindness were mostly seen among the participants aged 65 years and older.
- In the study area, almost 95% of low vision and 85% of the blindness are avoidable (preventable and curable) according to the WHO guidelines.
- Very low ratio of low vision and blindness (1:2) indicated that blindness is more than expected in the study area.
- The main causes of visual impairment and blindness is cataract; it composed almost 53% of the visual impairment and 72% of the blindness. The second cause of visual impairment is RE followed by glaucoma, other posterior segment disorder, AMD and CO while second cause of blindness is other posterior segment disorder followed by glaucoma, AMD and CO.
- The frequency of ever visiting an ophthalmologist is 28.8% which is very low, and the main barrier to the utilization of eye care is “problem not felt” mentioned by 70% of the participants.
- The prevalence of utilization of the sunglasses as an eye protective measure is very low in the study population while the duration of the exposure to the day sunlight is very high.

7 RECOMMENDATIONS

- A comprehensive eye care service (preventive, curative and rehabilitative) is urgently needed to be put in practice as its integration has been approved in primary health care by the Ministry of Health.
- Eye care services required focusing on cataract surgery and refractive services to decrease the burden of cataract and RE particularly for people aged 50 years and older population and females.
- Human resources development, supplying of equipment and cataract surgical quality improvement is recommended for elimination of such a great burden of avoidable blindness.
- Utilization of eye care service is needed to be increased by provision of accessible (available and affordable) eye care services on one hand, and on the other hand, barriers of eye care utilization is recommended to be addressed by the eye care education, which should be held both by the Ministry of Education and the Ministry of Public Health.
- Using of sunglasses, which is very simple and can be used easily along with 10% protection of cataract formation, have to be explained and emphasized to the population by the health educators as a strong protector of cataract in the study area.
- Outreach program and eye camping for cataract surgery to the far remote area of the provinces, particularly for disabled and elderly who have not accessed to the eye care services should be provided urgently.
- Organization of screening programs for DM and glaucoma have to be put in practice.
- Periodic screening programs in schools should also be implemented for early diagnosis of refractive error and optical correction.
- Missing approach like immunization could be used in primary health care settings for every applicant by examining with the Snellen chart.
- For determination of national prevalence of visual impairment and blindness, its main causes and associated factors, countrywide prevalence study of visual impairment is needed.

- For more elucidation and explanation of the associations of the obesity and sunlight exposure with ocular diseases, further analytical investigations are suggested.
- For the protective effects of the sunglasses against cataract, further analytical studies are proposed.
- For detailed explanation of association between chronic diseases and visual impairment and blindness, analytical studies with the measurement of the particular chronic diseases are proposed.

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APPENDICES

Appendix -1. Questionnaire form

Prevalence of visual impairment among people aged 50 years and older and related factors in Nangarhar province of Afghanistan

Form No: _____

Sampled Unit: _____

Household No: _____

Interviewer: _____

Date: / / 2015

Dear Participant,

The aim of this study is to determine the prevalence of visual impairment and related factors in the urban and rural areas of Nangarhar Province.

I'm an eye doctor working at Nangarhar University hospital.

At the end of the study valuable information for planning and improving of eye care services and prevention of avoidable blindness in Nangarhar Province will be obtained.

All information which is collected during the study will be kept secret and used just for this study purposes.

Thank you for attending and answering the questions completely and sincerely.

Dr. Mohammad Haris 'Abdianwall'

Please tell me the names of persons with 50 years old and over in this house

	Name	Age (years)	Sex (male, female)	Eligible person (Interviewee)	Interview status*
1					
2					
3					
4					
5					

***1= Not at home, 2= Not available, 3= Refused interviewed, 4= Refused eye examination, 5= Interviewed**

Socio-Demographic Characteristics

1. Sex ……
    1) Male
    2) Female

2. What is your age?……years

3. What is your marital status?
    1) Single
    2) Married
    3) Divorced
    4) Widow/widower
    5) Other (specify_____)

4. What is your Level of education? **(Attention! Graduates will be marked by the school level)**
    1) Illiterate
    2) Literate
    3) Primary school graduate
    4) Secondary school graduate
    5) High school graduate
    6) University graduate
    7) Others (specify_____)
5. How do you evaluate your economic status, when you compare it with your neighborhood?
    1) Excellent
    2) Good
    3) Average
    4) Bad
    5) Very bad
6. How long have you been living in this residence?
    6) Since my birth
    7) For ---------- years (from where did you come to this residence? _____)

7. Are you currently working in a job that brings you income?
    1) "No Job" (Do you have a regular source of income? Specify _____) (**if the answer is no, skip to question No 9**)
    2) Yes (what do you do? Please specify_____)
8. Do you use eye protective while you are working?
    1) No need
    2) No
    3) Yes (which material do you use? _____)

9. In average, how many hours do you spend outdoor per day? _____ hours
    Summer time_____ hours
    Winter time_____ hours

10. Do you use eye protective measures, when staying outdoor?
    1) No
    2) Yes (if yes, which protective measure do you use?)
        1. Hat
        2. Sunglasses

3. Others (specify_____)

11. How you rate your health status?
    1) Poor
    2) Fair
    3) Good
12. Have you ever visited an ophthalmologist?
    1) No (why? _____)
    2) Yes (what was the reason? _____)
13. Have you ever suffered from eye disease?
    1) No
    2) Yes (where did you go? _____)
14. Have ever any of your eye disease diagnosed by a doctor?
    1) No
    2) Yes (what was the disease? _____)
15. Have you ever had an eye trauma?
    1) No
    2) Yes (what happened? _____What did you do? _____)
    3)
16. What do you do, if you suffer from a foreign body in your eye? **(more than one choice could be assigned)**
    1) Nothing, just wait
    2) Going to a physician
    3) Going to health personnel
    4) Trying to remove it by myself
    5) Wash it out with water
    6) Instilling an eye drops, which is available in the house into the eye
    7) Going to the village's traditional healer
    8) Other (specify_____)
17. Is there any organization in 2 km distance or near, which providing health services?
    1) No
    2) Yes (what was that? _____ how far is that? _____)
    3) I don't know

Behavior factors:

18. Have you used any tobacco product so far?
    1) No (skip to question 20)
    2) Yes
19. Do you currently use any tobacco products?

1. No, I used and left 1. Which product of tobacco did you used? (more than one option can be chosen) 1. Cigarette 2. Cigar 3. Pipe 4. Hokka tobacco 5. Chewing tobacco 6. Snuff 7. Others (specify_____) 2. How old were you, when you used for the first time?_____ 3. How long have you used?_____ 4. In average how many stick/packet did you used per day ?_____	2. Yes I am currently using 1. How old were you, when you used for the first time?_____ 2. What porduct of tobacco do use? (more than one option can be chosen) 1. Cigarette 2. Cigar 3. Pipe 4. Hokka tobacco 5. Chewing tobacco 6. Snuff 7. Others (specify _____) 3. In average how many stick/packet do you use per day?_____

20. Do you have any chronic disease, has been diagnosed by a physician?

    1) No
    2) Yes (if yes, what is the disease? _____)

21. Do you currently taking any medicine?

    1) No
    2) Yes (if yes, what are the drugs? **(Attention! Medicine box, including traditional medicines, must be asked)** _____)

Diabetes Assessment (complete for everyone)
(Attention! If Diabetes is not specified in 20th questions, than ask question 22, if it is specified than skip to question No 23.)

22. Have you ever been told by a doctor or nurse that you have diabetes, sugar in your urine or high blood sugar?
    3) Yes
    4) I don't remember
    5) No (skip to question 26)

23. How many years before you were told you had diabetes? _____

24. Are you currently receiving treatment for diabetes:
    1) No
    2) Yes (which medicine do you use?) (More than one option can be selected.)
    (Attention! Medicine box, including traditional medicines, must be asked)
    1) Diet only
    2) Tablets
    3) Insulin

4) Other (specify _____)

25. After the diagnosis of the diabetes, have you examined, or did a doctor (health personnel) ever install a drop into your eyes and examine them, or was a photograph of your eyes taken by a doctor (health personnel)?
    1) No
    2) Yes
        1. When?_____

Question for known high blood pressure:
(Attention! If Hypertension was not specified in 20th questions, than ask question 26, if it is specified than skip to question No 27.)

26. Have you ever been told by a doctor or nurse that you have high blood pressure?
    1) No (skip to question No 28)
    2) I don't remember
    3) Yes (if yes, how many years before you were told that you had high blood pressure? _____)

27. How many years before you were told you had high blood pressure? _____

28. Are you currently receiving medication for high blood pressure?

(Attention! Medicine box, including traditional medicines, must be asked)
    1) No
    2) Yes (which of the following medication you are taking?)(more than one option can be selected)
        1. Beta blocker
        2. Angiotensin converting enzyme inhibitors
        3. Thiazide diuretics
        4. Loop diuretics
        5. Calcium channel blockers
        6. Peripheral vasodilators
        7. Other (specify _____)

29. Body weight? _____Kg

30. Height? _____m

31. Are you using distance spectacle?
    1) Yes
    2) No
    3) I don't have problem of distant vision
32. Are you using near spectacle?
    1) Yes
    2) No
    3) I don't have problem of near vision

33. Presenting vision

		Right eye		Left eye	
		(WG	**WOG)**	**(WG**	**WOG)**
1) Can see 6/18		____	_____	_____	_____
2) Cannot see	6/18	____	_____	_____	_____
But can see	6/60				

3)	Cannot see But can see	6/60 3/60	____	_____	_____	_____
4)	Cannot see But can see	3/60 1/60	____	_____	_____	_____
5)	Light perception (PL+)		____	_____	_____	_____
6)	No light perception (PL-)		____	_____	_____	_____

34. **Pinhole vision:**

			Right eye		Left eye	
			(WG	**WOG)**	**(WG**	**WOG)**
1)	Can see 6/18		____	_____	_____	_____
2)	Cannot see But can see	6/18 6/60	____	_____	_____	_____
3)	Cannot see But can see	6/60 3/60	____	_____	_____	_____
4)	Cannot see But can see	3/60 1/60	____	_____	_____	_____
5)	Light perception (PL+)		____	_____	_____	_____
6)	No light perception (PL-)		____	_____	_____	_____

35. **Main cause of presenting VA<6/18**

		Right eye	**Lift eye**
1)	Refractive error	_____	_____
2)	Aphakia, uncorrected	_____	_____
3)	Cataract, untreated	_____	_____
4)	Cataract surgical complication	_____	_____
5)	Trachoma	_____	_____
6)	Other corneal opacity	_____	_____
7)	Phthisis	_____	_____
8)	Glaucoma	_____	_____
9)	Diabetic retinopathy	_____	_____
10)	ARMD	_____	_____
11)	Other post segment	_____	_____
12)	All globe/CNS abnormalities	_____	_____
13)	Not examined can see 6/18	_____	_____
14)	Cataract Operation (ECCE+IOL)	_____	_____
15)	Cataract Operation (ICCE)	_____	_____

36. Quality of the interview
    1) High
    2) Moderate
    3) Low

Appendix -2. Ethical approval form of Hacettepe University

T.C.
HACETTEPE ÜNİVERSİTESİ
Girişimsel Olmayan Klinik Araştırmalar Etik Kurulu

Sayı : 16969557-806

ARAŞTIRMA PROJESİ DEĞERLENDİRME RAPORU

Toplantı Tarihi : 08.07.2015 ÇARŞAMBA
Toplantı No **:** 2015/14
Proje No : GO 15/459 (Değerlendirme Tarihi: 08.07.2015)
Karar No **:** GO 15/459 – 28

Üniversitemiz Tıp Fakültesi Halk Sağlığı Anabilim Dalı öğretim üyelerinden Prof. Dr. Bahar Güçiz DOĞAN'ın sorumlu araştırmacı olduğu, Dr. Mohammad Haris ABDİANWALL'in tezi olan GO 15/459 kayıt numaralı ve ***"50 Yaş ve Üstü Kişilerde Görme Bozukluğu Prevalansı ve ilişkili Faktörler, Nangarhar Eyaleti, Afganistan"*** başlıklı proje önerisi araştırmanın gerekçe, amaç, yaklaşım ve yöntemleri dikkate alınarak incelenmiş olup, idari izinlerin tamamlanması kaydı ile etik açıdan uygun bulunmuştur.

1.Prof. Dr. Nurten Akarsu	(Başkan)	9 Prof. Dr. Rahime Nohutçu	(Üye)
2. Prof. Dr. Nuket Örnek Buken	(Üye)	10. Prof. Dr. R. Köksal Özgül	(Üye)
İZİNLİ			
3. Prof. Dr. M. Yıldırım Sara	(Üye)	11. Prof. Dr. Ayşe Lale Doğan	(Üye)
4. Prof. Dr. Sevda F. Müftüoğlu	(Üye)	12. Doç. Dr. S. Kutay Demirkan	(Üye)
		İZİNLİ	
5. Prof. Dr. Cenk Sökmensüer	(Üye)	13 Prof. Dr Leyla Dinç	(Üye)
6. Prof. Dr. Volga Bayrakçı Tunay	(Üye)	14. Prof. Dr. Hatice Doğan Buzoğlu	(Üye)
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Ayrıntılı Bilgi için:

CURRICULUM VITAE

Personal data

Name:	Mohammad Haris
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Place of birth:	Jalalabad city
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Education background:

2007:	M.Sc. in community eye health from Pakistan Institute of Community Ophthalmology, Khyber Medical University, Peshawer, Pakistan
2005:	Medical Education certificate from International Research Center for Medical Education, Tokyo University, Japan
1999:	Graduated from Nangarhar Medical Faculty, Jalalabad city
1993:	Graduated from Nangarhar High school, Jalalabad city

Special courses:

- English language program from Kabul English Language and Computer Center
- MS office Computer software courses, from Gandahara Degree Collage of Computer Science
- Health Infromation System from PHC Nangarhar MoPH
- Program Management Training course, in UNAMA form AITM
- Project Planning and Proposal Writing Training course, in UNAMA from AITM
- Monitoring and Evaluation Training Course in UNAMA from AITM

Work experience:

200 – 2012: Assistant Professor of Ophthalmology in Ophthalmology department of Nangarhar University Hospital.

Languages:

Language	Writing	Reading	Speaking
Pashto	Fluent	Fluent	Fluent
Dari	fluent	fluent	fluent
English	fluent	fluent	fluent
Turkish	Good	Good	fluent

Publication in the last five years

Abdianwall M H, Özcebe H. Drivers' Behaviour Observation Regarding their Children Passenger Safety Seat. 5th Road Traffic Safety Symposium / Selected papers (2014) 2nd volume. 121-129.

Nuri Mehmet B, Haris A, Zafer C, Nasar Ahmad S, Deniz Y, Mutlu H. Evaluation of air quality and tuberculosis in Turkey by geographical information systemNasar Ahmad Shayan. European Journal of Public Health. 2016;26(suppl_1).

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