

# Prevalence, causes and factors associated with visual impairment in old age in Egypt.

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## Abstract

**Purpose:** Visual impairment is a major worldwide health and socioeconomic problem, so it is very important to estimate the prevalence, risk factors, and causes associated with visual impairment in the elderly population in Egypt.

**Methods:** Our cross-sectional study was made among low vision patients and 60 years old who attended the outpatient clinic of the ophthalmology department of Menoufia University Hospital, for their eye check.

**Results:** Our study participants included 329, composed of (55.9% female) and (44.1% males), and the mean  $\pm$  SD (was  $67.6 \pm 6.3$ ). The total prevalence of visual impairment was significantly high and its types were consisting of mild (20.1%), moderate and severe (70.2%), and blind (9.7%). The main causes of visual impairment were cataract (41.1%), refractive error (15.6%), ARMD (13.9%), diabetic retinopathy (9.5%), glaucoma (4.3%), hereditary causes (4.3%), retinal vascular diseases (4.3%), myopic macular degeneration (3.5%) and others (3.6%). The corrected or prevented causes of vision impairment were in the upper hand with 56.7% and non-corrected causes were 43.3%. The risk factors of visual impairment were HTN, DM, heart disease, atherosclerosis, bronchial asthma, and liver disease with high distribution and prevalence in old age.

**Conclusion:** The prevalence of low vision and blindness in the elderly population in Egypt is still very high compared to other neighbouring countries. This needs comprehensive national plans in collaboration with WHO to solve this problem. Cataract and errors of refraction remain the leading causes of visual impairment in the elderly population in Egypt.

**Keywords:** Visual Impairment, Low vision, Macular degeneration, Visual acuity.

## Introduction

Impairment of vision is a serious global health problem that impacts visually impaired patients significantly. Visual impairment affects badly the patients' quality of life, communication, and socioeconomic state, and intensifies the disability risk and depression in older age [1,2]. Low vision and blindness are the most significant forms of vision impairment [3]. Low vision is a significant reduction of vision not improved with ordinary glasses, contact lenses, or surgery [4].

Impairment of vision was defined by World Health Organization (WHO), 2021 as visual acuity at  $<6/12-3/60$  with the best correction in the better eye. Visual impairment was categorized as mild visual impairment if the best-corrected distance visual acuity in the better eye is between  $6/12$  and  $6/18$ , moderate visual impairment if the best-corrected distance visual acuity in the better eye is between  $6/18$  and  $06/60$ , severe visual impairment if best-corrected distance visual acuity in the better eye is between  $6/60$  and  $3/60$  and blindness if best-corrected distance visual acuity is worse than  $3/60$  in the better eye [5].

Impairment of vision is one of the most serious disabilities with high prevalence and is assumed to be increasing with increasing

life expectancy [6,7]. So, WHO through its program "VISION 2020 the Right to Sight" gives the priorities to the population database, preventive health care, planning, and the need for rehabilitation services and treatment measures [5].

Cataract, uncorrected errors of refraction, age-related macular degeneration, glaucoma, diabetic retinopathy, corneal opacity, and trachoma are the most important causes of visual impairment worldwide [8].

All participants in this study received a detailed explanation of the aim, objectives, and methodology of the study before obtaining approval and written consent.

## Materials and Methods

### Study design

We made a cross-sectional study including 329 patients men and women  $\geq 60$  years old. The visual acuity in all patients was less than  $6/12$  in the better eye. All the patients had no history of eye surgeries. They all attended the outpatient ophthalmic clinic of Menoufia University Hospital, for their eye check from June 2021 to December 2021.

### Clinical and ophthalmic examination

A detailed history was taken from all patients including age, gender, marital status and socio-demographic data. Also, medical and surgical history as well as systemic history was taken [9].

Then we did a full ophthalmic examination, including measuring the best-corrected distance visual acuity in both eyes using Snellen chart at a distance of six meters. Visual acuity was recorded. Also, other ophthalmic examinations were done as full examination of the anterior segment by slit lamp; we measured the intraocular pressure using Goldman applanation tonometer, pupil dilatation using Tropicamide 1% drops, and posterior segment examination by slit lamp biomicroscope with +90 D Volk lens for examination of the macula, optic disc, and retinal blood vessels. Also, we assessed the visual field using the Humphry visual field analyzer (24-2 strategy) [10].

### Data analysis

Data were collected and entered into the computer using SPSS (Statistical Package for Social Science) program for statistical analysis, (version 20, Inc., Chicago, IL). Then quantitative data were shown as mean & SD, qualitative data were expressed as frequency and percent and Chi-square test was used to measure the association between qualitative variables (Distribution of age & sex through categories of visual impairment in study participant).

The prevalence was calculated and presented with 95% CI and we assessed the statistical significance at the conventional level of p-value less than 0.5 (two-tailed).

### Results

In the current study, the total number of patients examined was 329. They composed of female participants 184 (55.9%) and male participants 145 (44.1%) from 60 years to older than 80 years old with Mean ± SD=67.6 ± 6.3, and then we made age sub-groups as follows from 60 years to 64 years were 108 patients (32.8%), from 65 years old to 69 years old were 103 patients (31.1%), from 70 years old to 74 years were 60 patients (18.2%), from 75 years to 79 years were 32 (9.7%), older than 80 years old were 26 (7.9%) (Table 1).

Variable	All patients	Mild or no visual impairment N (%)	MSVI N (%)	Blindness N (%)	Test of significance
Overall	329	66 (20.1%)	231 (70.2%)	32 (9.7%)	NA
Sex					
Female	184 (55.9%)	37 (20.1%)	132 (71.7%)	17 (11.7%)	χ <sup>2</sup> test=1.2 0.55*
Male	145 (44.1%)	29 (20.0%)	99 (68.3%)	15 (8.2%)	
Age (years)					
60-64	108 (32.8%)	27 (25.0%)	74 (68.5%)	7 (6.5%)	χ <sup>2</sup> test=18.6 0.02*

65-69	103 (31.3%)	23 (22.3%)	63 (61.2%)	17 (16.5%)
70-74	60 (18.2%)	9 (15.0%)	46 (76.7%)	5(8.3%)
75-79	32 (9.7%)	6 (18.8%)	23 (71.9%)	3(9.4%)
≥80	26 (7.9%)	1(3.8%)	25 (96.2%)	0(0.0%)

**Note:** N: Number, MSVI: Moderate to Severe Visual Impairment, \*= Not significant, NA: Not Applicable.

**Table 1.** Distribution of age & sex through categories of visual impairment in study participants.

The Prevalence of impairment of vision in our patients in this age group was very high, with 263 patients (79.9%) (95% CI=15.9 to 24.8) having visual impairment with best-corrected distance visual acuity less than 6/18 and 66 patients (20.1%) (95% CI= 75.2 to 84.1) having no visual impairment with best-corrected distance visual acuity more than 6/18. The prevalence of moderate and severe visual impairment whose best-corrected distance visual acuity was worse than 6/18 to 3/60 was (231=70.2%) with (95% CI=65 to 75.1). The prevalence of blind whose best-corrected distance visual acuity is between 3/60 and no light perception was (32=9.7%) with (95% CI=6.7 to 13.5) (Table 2).

Visual Impairment	N (%)	95% CI
Yes <6/18	263 (79.9%)	15.9 to 24.8
No ≥ 6/18	66 (20.1%)	75.2 to 84.1

**Note:** N: Number.

**Table 2.** Prevalence of visual impairment (N=329) in old age in Egypt.

For more detailed data we measured the prevalence of visual impairment according to age and sex. The total number of patients with mild or no vision impairment was 66 (20.1%) composed of 37 (20.1%) females and 29 (20.0%) males, while the total number of patients with moderate to severe vision impairment was 231 (70.2%) composed of 132 (71.2%) females and 99 (68.3%) males. Finally, the number of patients with blindness was 32 (9.7%) of which 15 (8.2%) were males and 17 (11.7%) were females.

According to the age groups 60-64, 65-69, 70-74, 75-79 and >80, the number of patients with mild or no vision impairment was 27 (25.0%), 23 (22.3%), 9 (15.0%), 6 (18.8%) and 1 (3.8%) respectively, while the number of patients with moderate to severe vision impairment was 74 (68.5%), 63 (61.2%), 46 (76.7%), 23 (71.9%) and 25 (96.2%) according to the same age groups respectively. Also, the number of blind patients was 7 (6.5%), 17 (16.5%), 5 (8.3%), 3 (9.4%) and 0 (0.0%) according to the same age groups respectively (Table 1).

Based on this study we found that 231 patients with moderate and severe vision impairment had a visual impairment risk factor with 95% CI 70.2 (65 to 75.1) and 32 blind old age also had a visual impairment risk factor with 95% CI 9.7 (6.7 to 13.5) and percentage 100%. This risk factor was a systemic disease between one of the following as hypertension, diabetes mellites, cardiac, asthmatic, and hepatic.

It is critical to identify the prevalence of risk factors in categories of visual impairment to be controlled, in the moderate to severe visual impairment group the most prevalent risk factor of vision impairment was hypertension, 88 (38.1%) which 95% CI was 26.7 (22 to 31.9), followed by diabetes mellites, 67 (29%) which 95% CI was 20.4 (16.1 to 25.1), then cardiac causes, 10 (4.3%) which 95% CI was 3 (1.5 to 5.5), then the number of patients with asthma was 7 (3%) which 95% CI was 2.1 (0.9 to 4.3 ), the number of patients with hepatic disease was 4 (1.7%) which 95% CI was 2 (0.3 to 3.1) and whom free was 5 (23 .9%) with 95% CI were 16.8 (12.5 to 21.5) (Table 3).

Rank	Visual impairment risk factors	N (231)	Risk factor-specific prevalence (95% CI)	(%) of MSVI
	Free	55	16.8 (12.5-21.5)	23.90%
1	HTN	88	26.7 (22 to 31.9)	38.10%
2	DM	67	20.4 (16.1 to 25.1)	29%
3	Cardiac	10	3 (1.5 to 5.5)	4.30%
4	Asthmatic	7	2.1 (0.9 to 4.3)	3%
5	Hepatic	4	1.2 (0.3 to 3.1)	1.70%
	Total	231	70.2 (65 to 75.1)	100%

**Note:** MSVI: Moderate and Severe Visual Impairment, HTN: hypertension, DM: Diabetes Mellitus, N: Number.

**Table 3.** Distribution and prevalence of risk factors among Moderate and Severe Visual Impairment (MSVI) in old age in Egypt.

In the blind group, the most prevalent risk factor was also hypertension with 13 patients (40.6%), which 95% CI was 4 (2.1 to 6.7), the number of patients with diabetes mellites was 13 (40.6%) which 95% CI was 4 (2.1 to 6.7), the number of patients with hepatic disease was 2 (6.3%) which 95% CI was 0.6 (0.1 to 2.2) and who free was 4 (12.5%) with which 95% CI was 1.6 (1 to 3.1) (Table 4).

Rank	Blindness risk factors	N (32)	Risk factor-specific prevalence (95% CI)	(%) of blindness
	Free	4	1.6 (1 to 3.1)	12.50%
1	HTN	13	4 (2.1 to 6.7)	40.60%
2	DM	13	4 (2.1 to 6.7)	40.60%
3	Hepatic	2	0.6 (0.1 to 2.2)	6.30%
	Total	32	9.7 (6.7 to 13.5)	100%

**Note:** HTN: Hypertension, DM: Diabetes Mellitus, N: Number.

**Table 4.** Distribution and prevalence of blindness among old age in Egypt.

To solve the global burden of visual impairment, it is a must to recognize its causes perfectly. In our study we found that the leading cause of moderate to severe visual impairment in old age in Egypt was Cataract, 95 patients (41.1%) 95% CI=28.9 (24 to 34.1), followed by uncorrected refractive errors, 36 patients (15.6%) which 95% CI was 10.9 (7.8 to 14.8), then age-related macular degeneration, 13.9 patients (13.9%) which 95% CI was 9.7 (6.7 to 13.5), diabetic retinopathy, 22 patients (9.5%) which 95% CI was 6.7 (4.2 to 9.9), glaucoma, 10 patients (4.3%) which 95% CI was 3 (1.5 to 5.5 ), hereditary, 10 patients (4.3%) which 95% CI=3 (1.5 to 5.5), Retinal vascular, 10 patients (4.3%) which 95% CI=3 (1.5 to 5.5), myopic macular degeneration, 8 patients (3.5%) which 95%CI=2.4 (1.1 to 4.7), others, 8 patients (3.6%) which 95%CI=2.6 (1.3 to 5.1). (Table 5).

Rank	Visual impairment causes	N=231	Cause-specific prevalence (95% CI)	(%) of MSVI
1	Cataract	95	28.9 (24 to 34.1)	41.10%
2	Error of refraction	36	10.9 (7.8 to 14.8)	15.60%
3	ARMD	32	9.7 (6.7 to 13.5)	13.90%
4	DR	22	6.7 (4.2 to 9.9)	9.50%
5	Glaucoma	10	3 (1.5 to 5.5)	4.30%
6	Hereditary	10	3 (1.5 to 5.5)	4.30%
7	Retinal vascular	10	3 (1.5 to 5.5)	4.30%
8	MMD	8	2.4 (1.1 to 4.7)	3.50%
9	Others	8	2.6 (1.3 to 5.1)	3.60%
	Total	231	70.2 (65 to 75.1)	100%

**Note:** MSVI: Moderate and Severe Visual Impairment, ARMD: Age Related Macular Degeneration, D: Diabetic Retinopathy, MMD: Myopic Macular Degeneration, N: Number.

**Table 5.** Distribution and prevalence of causes of Moderate And Severe Visual Impairment (MSVI) among old age in Egypt.

There were some causes of moderate to severe visual impairment in old age in Egypt that can be corrected such as cataract, errors of refraction, and others that can't be corrected such as age-related macular degeneration and hereditary causes. Among our study patients, there were 131 patients (56.7%) with 95% CI=39.8 (34.5 to 45.3) whose causes can be corrected, and there were 100 patients (43.3%) with 95% CI=30.4 (26.4 to 34.7) whose causes can't be corrected.

Blindness was caused by some disease such as cataract which was the leading cause with percentage (40.6%) by which 13 patients were detected with 95% CI=4 (2.1 to 6.7) other causes were diabetic retinopathy, 5 patients (15.6%) with 95% CI=1.5 (0.5 to 3.5), age-related macular degeneration, 4 patients

(12.5%) with 95% CI=1.2 (0.3 to 3.1), error of refraction, 3 patients (9.4%) with 95% CI=0.9 (0.2 to 2.6), glaucoma, 3 patients (9.4%) with 95% CI=0.9 (0.2 to 2.6), corneal opacity, 3 patients (9.4%) with 95% CI=0.9 (0.2 to 2.6), others, 1 patient (3.1%) with 95% CI=0.3 (0 to 1.1) and total patients were 32 with 100% and 95% CI 9.7 (6.7 to 13.5) (Table 6).

Rank	Blindness causes	N (32)	Cause-specific prevalence (95% CI)	(%) of blindness
1	Cataract	13 (40.6%)	4 (2.1 to 6.7)	40.60%
2	DR	5 (15.6%)	1.5 (0.5 to 3.5)	15.60%
3	ARMD	4 (12.5%)	1.2 (0.3 to 3.1)	12.50%
4	Error of refraction	3 (9.4%)	0.9 (0.2 to 2.6)	9.40%
5	Glaucoma	3 (9.4%)	0.9 (0.2 to 2.6)	9.40%
6	Corneal opacity, ulcer & edema	3 (9.4%)	0.9 (0.2 to 2.6)	9.40%
7	Others	1 (3.1%)	0.3 (0 to 1.1)	3.10%
	Total	32	9.7 (6.7 to 13.5)	100%

**Note:** ARMD: Age Related Macular Degeneration, DR: Diabetic Retinopathy, MMD: Myopic Macular Degeneration, N: Number.

**Table 6.** Distribution and prevalence of causes of blindness among old age in Egypt.

Finally, we try to correct and prevent causes of blindness that can be corrected which was 50% of the causes with 95% CI was 4.9 (2.8 to 7.8) and 50% percent cannot be corrected with 95% CI was 4.8 (2.6 to 7.5).

## Discussion

In our study, we evaluated the prevalence of impairment of vision and it seems to be (79.9%) with 95% CI (15.9 to 24.8) which was very high compared to other studies conducted in North West Ethiopia (36.5%), Saudi Arabia (13.9%), Juaben, Ghana (28.2%), Gondar, Ethiopia (15.3%), Eastern Taiwan (11.0%), Debre, Ethiopia (16.8%), Addis Ababa, Ethiopia (17.6%), Upper Egypt (29.9%) [11-18]. The difference in the prevalence may be due to the difference in the population of the sample, as in our study our patients were those who attended the ophthalmic clinic in Menoufia university hospitals with certain eye complaints. On the other hand, in Saudi Arabia study their study group were patients who attended primary health care centers for general health services, and in Eastern Taiwan, and Debre, Ethiopia studies, were done on more normally sighted people [15,16].

Another reason for this great difference may be due to different age groups as in our study, all the patients were of the elderly population over 60 years old and as the age increases, all the body functions including the visual system are negatively

affected as a result of physiological age-related changes and the elderly population becomes more affected by age-related eye diseases as cataract and age-related macular degenerations also increasing age makes the patients more reliable to systemic disease as hypertension, diabetes mellitus and hepatic diseases which are all risk factors to visual impairment [19,20].

While in other studies as in Addis Ababa, Ethiopia studies, eastern Taiwan, which includes more age groups, and the University of Gondar teaching hospital, 14 patients included were with age more than 14 years which lower the prevalence of age-related impairment of vision [14,15,17]. Also, in Upper Egypt they used subjects over 40 years old, this difference might also be due to the technological variation, better awareness, and better health care facilities in these countries compared to here in Egypt [18]. Also, the prevalence of visual impairment in low-income regions as here in Egypt is estimated to be four times higher than in high-income regions [21].

In our study, the prevalence of mild visual impairment, moderate and severe visual impairment and blindness was (20.1%), (70.2%) 95%CL (65 to 75.1), and (9.7%) 95%CL (6.7 to 13.5) respectively and it is higher than a study made also in Egypt 2014, which was (6.4%) 95%CL (4.3%-8.6%) and (9.3%) 95%CL (6.8%-11.8%) for moderate and severe visual impairment and blindness respectively and that difference is probably due to the difference in the age group in the two studies and also due to the large population in the second study [18]. Our study results also appeared very high in comparison to a study made on the older Chinese population in which the prevalence of moderate and severe visual impairment and blindness was (10.9%) 95% CI (9.4%-12.6%) and (2.2%) 95% CI (1.8%-2.8%) respectively, while in another study made in North West Ethiopia, the prevalence of blindness was (11.2%) with 95% CI (7.8%-14.6%), which gives near results to The University of Gondar teaching hospital study (14.4%) [11,14,22]. This similarity may be due to similar socio-economic characteristics, study area, study design, and similar study population, But it appeared to be more than a similar study made in Ghana (3.7%) [13].

Worldwide, women have a higher incidence of visual impairment, about two-thirds of the cases of impairment of vision and blindness, than men. This may be due to the female longer life expectancy, which results in a higher risk of age-related ocular disease development [23]. Also, there are many anatomical and hormonal changes that can participate in the gender discrepancy, as females have an increased risk of developing cataract. Also, usually, the females are much lower in social status than men in some rural areas, leading to their lower life quality and also of health care [24,25].

This result is in agreement with the current study, we also detected a higher prevalence of impairment of vision and blindness in women compared to men as follows; visual impairment (71.7%) versus (68.3%) and blindness (11.7%) versus (8.2%), respectively. In our current study cataract was the most common risk factor of visual impairment as compared to other causes, which was similar to a study conducted in

Upper Egypt (53.7%), Eastern Taiwan, Saudi Arabia, Ghana, Debre, Ethiopia, and University of Gondar teaching hospital [12-16]. It usually causes progressive painless diminution of vision that is usually not noticed by the patient until they become visually impaired and cannot accomplish their daily activities.

In our study cataract was followed by uncorrected refractive errors, age-related macular degeneration was the subsequent cause, diabetic retinopathy is very high due to the high percentage of diabetes mellites as a risk factor, and hereditary causes were of the same importance as glaucoma and retinal vascular diseases, finally neurological disorders, others such as retinal detachment, tumors, metastasis, vitreous hemorrhage, epiretinal membrane, uveitis, cystoid macular edema were of low percentage [26]. The leading visual impairment and blindness causes in Arab countries were Cataract, Glaucoma, uncorrected errors of refraction, Diabetic retinopathy, age-related macular degeneration or macular dystrophies, Corneal opacity, Hereditary, Amblyopia, retinitis pigmentosa, Trachoma and Trauma [27].

Blindness is the worst vision problem at all, our data collection was focused to recognize its causes, the leading cause was cataract with a high percentage, then Diabetic retinopathy and age-related macular degeneration, and in the same percentage were error of refraction, glaucoma and corneal causes, and others, the causes was half percentage corrected and the other half non corrected.

Despite being in the same country, the prevalence of visual impairment and blindness can differ generally between different societies, depending on the accessibility of primary health care and specialized ophthalmologic facilities [28]. In the industrialized countries of North America, Europe, and Australia, it is mainly due to disorders of the posterior segment of the eye (macular degeneration, diabetic retinopathy, and glaucoma). In Africa, Asia, and parts of South America, disorders of the anterior segment of the eye (cataracts, corneal scars of different origins, and glaucoma) are the most common causes.

In our study most participants were in the age group 60-64 years, then the age group 65 to 69 years, then 70-74 years old, then the number of patients decreased. This may be due to the difficulty in moving with aging that may affect seeking health care [2].

Fortunately, there are some causes of visual impairment that can be corrected such as cataract by cataract surgery, and controlled by glasses in cases of error of refraction, it is a must to control and proper treatment of diabetes aiming to decrease the incidence of diabetic retinopathy, this will have a great impact on decreasing the prevalence of visual impairment, there are also others that cannot be corrected such as age-related macular degeneration and hereditary causes due to genetic predisposing factors. Among our study patients, there were 131 patients (56.7%) with (95% CI=34.5-54.3) whose causes can be corrected, and there were 100 patients (43.3%) with (95% CI=26.4-34.7) whose causes can't be corrected.

It is noticed that in our study, with aging there were risk factors that may be predisposing to visual impairment such as hypertension and diabetes which are the main factors. It is very important to know that their prompt treatment may share in the preventive measures of visual impairment. The present study has a number of limitations as the relatively small sample size; the sample was better to be chosen more generally and not from an ophthalmic clinic and further studies is needed on more age groups to know the different causes of visual impairment in each group.

## Conclusion

In conclusion, the prevalence of low vision and blindness in the elderly population, especially women in Egypt is still very high compared to other neighboring countries. This needs comprehensive national plans in collaboration with WHO to solve this problem.

Cataract and errors of refraction remain the leading causes of visual impairment in the elderly population in Egypt and being reversible causes of visual impairment, this highlights the significance of encouraging performing cataract surgery protocols for the elderly population and also highlights the use of spectacles for the elderly population living in rural areas.

## Ethical Considerations

All study procedures were carried out and approved by the ethical committee of the Menoufia faculty of medicine and in accordance with the declaration of Helsinki. Participants' names will be kept on a password-protected database and will be linked only with a study identification number for this research.

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