Artigo Original

The results of a visual health screening in Lisbon – the importance of primary prevention

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ABSTRACT

Visual health problems are a major public health burden. Preventing avoidable visual impairment and blindness is a strategic objective of the national health program for 2011-2016. Population information, primary prevention and access to ophthalmological care are major aims of this program. The purpose of this project is to present the results of a visual health screening on the city of Lisbon. Retrospective analysis of the results of a visual health screening taken between September and November 2014. Each subject filled a questionnaire concerning demographic data, past medical history and past ophthalmologic history. Afterwards, an ophthalmological observation was undertaken, which included visual acuity (VA) evaluation and external eye observation. Referral for further ophthalmological evaluation was performed according to observation. General visual health information was provided. A total of 1955 subjects voluntarily participated in the screening. The majority were above 55 years of age, currently retired, with a low level of education. 13.2% stated that had never been evaluated by an ophthalmologist. Arterial Hypertension and Diabetes Mellitus were the most common systemic diseases. 78.2% of the subjects had a refractive error (RE) correction. Cataract, ocular trauma and glaucoma were the most frequent past ophthalmologic problems. One third of the cases had subnormal VA. 18% of the individuals who had no RE correction had a VA inferior to 20/40. 327 subjects were referred for ophthalmological evaluation. Visual health screening is a fundamental strategy to provide information to the population and an effective method to identify individuals at risk of severe visual impairment.

Keywords
Visual health screening, visual impairment, refractive error, visual acuity, primary prevention.

INTRODUCTION

Visual impairment is a major public health problem worldwide. The 2010 WHO Global Data on visual impairments report estimates a total of 285 million people visually impaired, from whom 39 million are blind. The majority of the visually impaired and blind people are 50 years of age or older and most of them are natural from the developing countries. The two major causes identified in this report are: uncorrected refractive errors (RE), responsible for 43% of the cases, and cataracts responsible for 33%[1].

Concerning developed countries, a population-based survey involving USA, Western Europe and Australia estimated that a third of persons 40 years or older suffers from a RE, projecting similar prevalence rates for year 2020[2]. Another study, involving countries from Asia, Africa and the U.S.A. focusing in near visual impairment, reported that the majority of the population 50 years or older need near vision RE correction and the uncorrected percentage of RE ranged from 40 to 90%, in urban and rural settings, respectively[3,4].

In Europe, the European Eye Epidemiology consortium estimated throw a meta-analysis of several population-based studies, that over half of the adult Europeans suffer from a refractive error, being myopia the most prevalent RE, with a growing prevalence in younger adults[5]. Similar results have been found in the U.S.A.[6]. It is also known that the refractive status alters with age. Both infants, by the potential of visual recovery if early correction is performed, and elderly, by the risk of potential vision threatening diseases, are age groups who should be addressed by screening and primary prevention measures[7-9]. Several differences in vision impairment and access to vision health care have been related to racial, education and economic factors[10,11].

At national level, the National Health program to avoid visual impairment and preventable blindness reports that around 50% of the population suffers of some degree of visual impairment. Around 20% of children and half of the adult population have a significant RE. It also reports that 60% of the people 60 years of age or older have signs of cataract development, of whom 170.000 are in need of treatment. This report states that over a third of all diabetic patients were never or are irregularly examined by an ophthalmologist, of whom 15.000 are in risk of blinding and highlights the weight of others causes of visual impairment, like glaucoma, corneal and retinal diseases. This report emphasizes the importance of primary prevention and early diagnosis, establishing as key strategies to prevent visual impairment and preventable blindness general population information, primary prevention and prompt access to ophthalmological care[12,13].

The main objectives of this study are to report the epidemiologic results of a visual screening conducted in the metropolitan area of Lisbon and evaluate the results of the screening.

METHODS

Study Sample

The sample includes 1955 individuals evaluated during a visual screening performed between September and October 2014. The screening was performed in mobile units in several different locations, over the 24 districts of Lisbon.

Visual screening evaluation

After the identity and eligibility was confirmed, all individuals signed a written informed consent to participate in the screening. Demographic data was collected, concerning age, gender, district of residency, education level and current professional situation. An extensive health questionnaire was performed, concerning past medical history, past ophthalmological history (refractive correction, drugs, surgery, amblyopia and trauma) and family history of ophthalmological pathologies. Subjects then underwent a screening examination that included testing of presenting visual acuity using a Sloan letters or "E" chart adapted for 10 feet. The chart provides a close approximation to the Early Treatment Diabetic Retinopathy Study (ETDRS) chart. Afterwards, external observation of the eye was performed by a trained nurse, to identify manifest ophthalmic abnormalities, as binocular misalignment, red reflex alterations and manifest eyelid or anterior segment changes.

Criteria for referral to ophthalmology consultation

Subjects were referred to complete ophthalmology observation for the following reasons: important past ophthalmological diseases not evaluated for more than 2 years; presenting visual acuity worse than 20/25 in any or both eyes; presenting ophthalmological abnormalities not previously identified or studied.

Statystical analysis

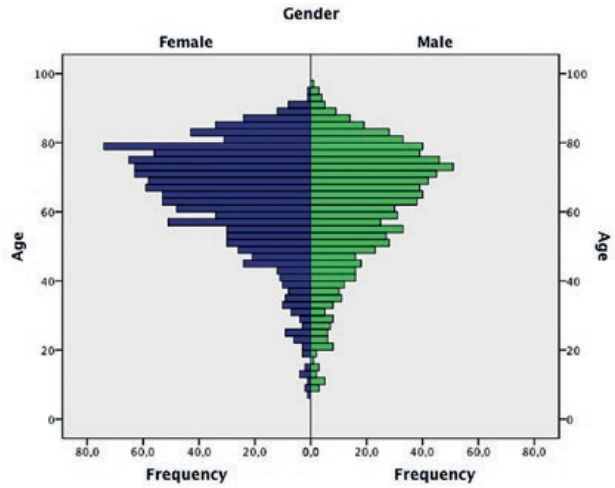
Demographic data analysis was performed. Association of demographic data and past medical history and visual acuity was performed using parametric tests. SPSS version 21.0 was used.

RESULTS

Demographic data is shown in table 1. Mean age of the sample was 63.3 ±16.4 years, with minimum age of 7 years and maximum of 97 years (Graph 1). Female gender

Table 1 | Demographic data.

Age (Mean ± SD)	63.3 ±16.4 years (range 7 - 97)
Gender	56.6% female 43.4% male
Education level	8.3% illiterate 53.6% primary education 8.0% Lower secondary education 9.0% Intermediate secondary education 12.6% Secondary school 1.3% Bachelor 6.1% College degree 1.0% Master 0.2% Doctoral
Current professional status	Student 2.0% employed 20.7% unemployed 17.6% retired 59.7%



Graph. 1 | Pyramid chart with frequencies of age for female (blue) and male (green) gender.

comprises 56.6% of the sample. Concerning education level, 53.6% of the individuals had a primary education level. Concerning professional status, 59.7 % of the individuals were currently retired.

Results regarding last ophthalmic evaluation are on table 2. Two hundred and fifty two individuals referred that had never been evaluated by an ophthalmologist.

Table 2 | Last ophthalmological evaluation.

Less than 6 monthts	11.6%
6 months to 2 years	24.8%
2 to 4 years	24.6%
more than 4 years ago	25.8%
never	13.2%

Concerning past medical history, 7% stated that didn´t have any kind of regular health surveillance. Past medical history data is summarized in table 3. Arterial hypertension (AH) and Diabetes Mellitus (DM) were the most frequently referred diseases, accounting for 49.9% and 18% of all individuals, respectively.

Chi-square analysis of the three most frequently referred past medical history diseases revealed that more than a third of the individuals had never been evaluated or had their last ophthalmological observation more than 4 years ago (table 4). In the group of patients with DM, 42% had their last ophthalmological evaluation 4 years ago or had never been evaluated.

From 967 patients with AH, 56% are not evaluated by an ophthalmologist for more than 2 years, 8,2% have never been evaluated ($p<0.001$).

From 345 patients with DM, 67% are not evaluated by an ophthalmologist for more than 2 years, 14,6% have never been evaluated ($p<0.001$).

From 280 patients with rheumatologic disease, 53,3% are not evaluated by an ophthalmologist for more than 2 years, 5,4% have never been evaluated ($p<0.001$).

Regarding past ophthalmological history a total of 1533 individuals (78.4%) used RE correction. Cataract, glaucoma and diabetic retinopathy diagnosis was referred

Table 3 | Past medical history.

Systemic hypertension	49.9% yes 50.1% no
Diabetes Mellitus	18% yes 82% no
Reumathological diseases	14.4% yes 85.6% no
Allergies	5.8% yes 94.2% no
Asma	3.2% yes 96.8% no
Infectious diseases	0.6% yes 99.4% no

Table 4 | Past ophthalmological history.

RE correction	78.4% yes 21.6% no
Ophthalmological surgery	16.6% yes 83.4% no
Ophthalmological medication	14.8% yes 85.2% no
Cataract	13.4% yes 86.8% no
Past ocular trauma	6.1% yes 93.9% no
Glaucoma	3.3% yes 96.7% no
Strabismus	0.9% yes 99.1% no
Diabetic retinopathy	0.8% yes 99.2% no
Ambliopia	0.2% 99.8%

Table 5 | Qui-square analysis: time from ophthalmology evaluation in the setting of most frequent systemic diseases.

	<6 months	6 months to 2 years	2 to 4 years	>4 years	never	p-value
AH (N=967)	15.1%	29%	24%	23.8%	8.2%	<0.001
Diabetes Mellitus (N=345)	18.8%	23.1%	25%	27.4%	14.6%	<0.001
Rheumatologic diseases (N=280)	14.6%	32.1%	25.4%	22.5%	5.4%	<0.001

Table 6 | Qui-square analysis: time from ophthalmology evaluation in the setting of several ocular morbidities.

	<6 months	6 months to 2 years	2 to 4 years	>4 years	never	p-value
RE correction (N=1511)	13.2%	28.3%	28.7%	25.3%	4.6%	<0.001
Cataract (N=258)	22.5%	36.0%	24.0%	15.9%	1.6%	<0.001
Diab. retinopathy (N=15)	33.3%	40%	20%	6.7%	0%	0.018
Glaucoma (N=65)	41.5%	43.1%	10.8%	4.6%	0%	<0.001

by 13.2%, 3.3% and 0.8% of the individuals, respectively. Ocular trauma had a prevalence of 6.1% (table 5).

Chi-square analysis of the most relevant referred past ophthalmological history diseases, concerning last ophthalomology observation, is shown in table 6.

From 1511 individuals with RE correction, 4,6% had never been evaluated by an ophthalmology specialist ($p<0.001$).

From 258 individuals who referred the diagnosis of cataract, 58,5% have been evaluated at least 2 years ago ($p<0.001$).

From 15 patients with diabetic retinopathy, 26.7%% have not been evaluated for more than 2 years ($p=0.018$).

From 65 patients with glaucoma, 41,5% had an evaluation less than 6 months ago and 43.1% between 6 months and 2 years. 4.6% of the patients with glaucoma referred not being evaluated for more than 4 years ($p<0.001$).

A similar parametric analysis was performed for ophthalmological past family history data. The analysis did not result in relevant statistical differences between groups. The most relevant findings were:

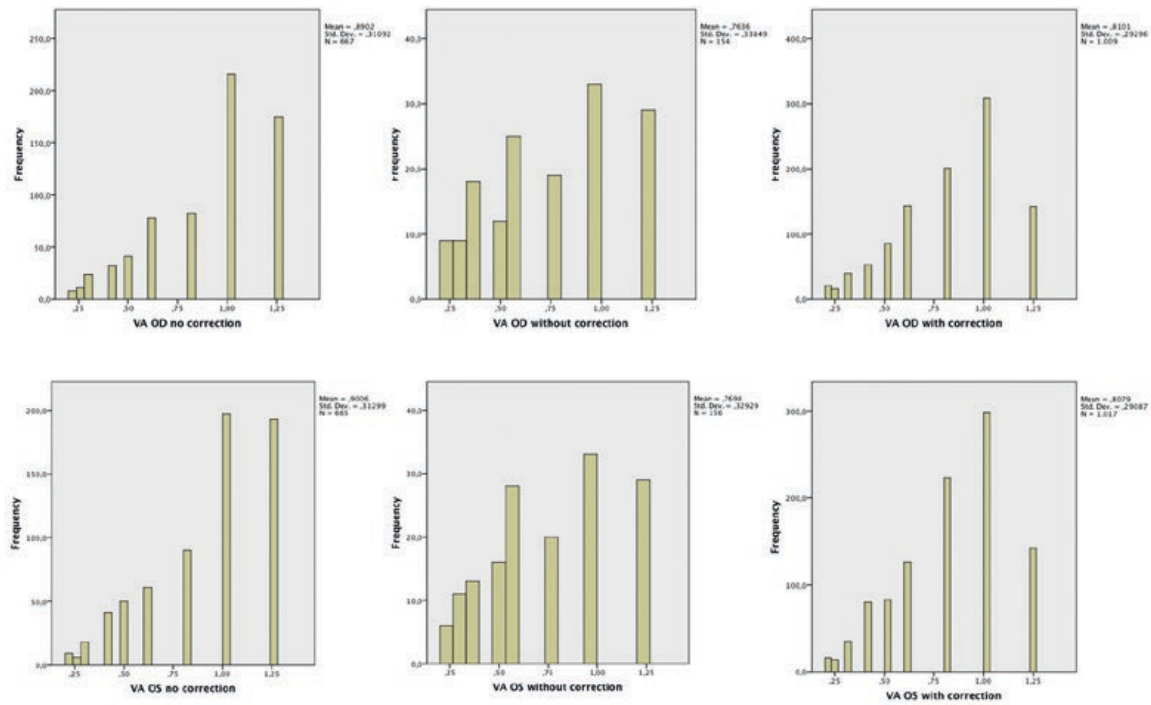
- From 1093 patients with family history of refractive error, 12,2% have never been evaluated ($p=0.08$).
- From 94 patients who reported family history of glaucoma, 6,4% have never been evaluated ($p=0.062$).

Considering VA score, a total of 66.6% of all right eyes and 68% of all left eyes had a VA score equal or superior to 20/25. In respect to low vision scores, 7% of all right eyes and 5,4% of all left eyes had a VA score equal or inferior to 20/60.

Results regarding VA analysis considering RE correction are shown in graphs 2 to 7. The sample was divided in: 1) individuals who did not have a RE prescription (Graph 2 and 5); 2) individuals who were evaluated without their RE correction (Graph 3 and 6); 3) individuals evaluated with their current RE correction (Graph 4 and 7). Individuals in group 1 have the best mean VA score for both eyes, but 16.7% (OD) to 18.1% (OS) of the elements of this group had VA equal or worse than 20/40. Individuals in group 2

Table 7 | Comparative analysis: mean VA score with level of education.

	mean VA OD (N=1761)	mean VA OS (N=1761)
illiterate	0,62 ±0,25	0,61 ±0,25
primary education	0,78 ±0,29	0,79 ±0,29
Lower secondary education	0,96 ±0,30	0,93 ±0,29
Intermediate secondary education	0,95 ±0,29	0,94 ±0,26
Secondary school	0,96 ±0,28	0,96 ±0,30
Bachelor	0,99 ±0,24	0,97 ±0,22
College degree	0,98 ±0,29	1,03 ±0,27
Master	0,97 ±0,30	1,03 ±0,33
Doctoral	1,08 ±0,22	0,78 ±0,41
p-value	<0.001	<0.001



Graph. 2-7 | Frequency charts of VA, for OD and OS in individuals with no RE correction, without current RE correction and with current RE correction.

had the worse mean VA score in both eyes. VA score was worse than 20/40 in 30,7% and 28.7% of the cases, on OD and OS, respectively.

Comparative analysis of VA results with education level and current professional status was performed throw One-Way ANOVA (Table 7 and 8). Both low level of education and unemployed or retired professional status was associated with lower VA scores (p<0.001).

Table 8 | Comparative analysis: mean VA score with current professional status.

	mean VA OD (N=1766)	mean VA OS (N=1766)
student	1,06 ±0,23	1,07 ±0,23
employed	0,99 ±0,27	1,02 ±0,26
unemployed	0,88 ±0,30	0,89 ±0,31
retired	0,76 ±0,29	0,76 ±0,30
p value	<0.001	<0.001

Comparative analysis was performed to relate mean VA score considering last observation by an ophthalmology specialist (Table 9). The mean VA score was lower in patients who we were recently observed by an ophthalmologist.

Table 9 | Comparative analysis: mean VA and time from last opthtalomogy evaluation.

	mean VA OD (N=1746)	mean VA OS (N=1746)
< 6 months	0,79 ±0,308	0,79 ±0,29
6 months to 2 years	0,83 ±0,31	0,82 ±0,30
2 to 4 years	0,86 ±0,28	0,86 ±0,29
> 4 years	0,84 ±0,30	0,84 ±0,31
never	0,88 ±0,32	0,90 ±0,31
p-value	0,045	0,001

Concerning external opthalmic observation, a total of 239 individuals had visible external ophthtalmologic alterations, 55 of them were referred due to eyelid disease, 22 to proptosis and the reminder to anterior segment abnormalities.

A total of 327 patients were referred to further ophthalmology evaluation and another 13 patients refused further evaluation.

DISCUSSION

This study analysed the results of a visual screening performed by health professionals in an urban setting in

Lisbon. The sample includes mostly elder people, currently retired and with a low level of education.

More than a third of the individuals evaluated do not have an adequate follow-up with an ophthalmology specialist, taking into account that more than a half was not evaluated for more than 2 years. Several studies have analyzed the importance of visual screening and have suggested that after 50 years of age a screening should be performed every two years, since the risk of developing ophthalmic diseases as primary open angle glaucoma and age-related macular degeneration increases significantly with age[14].

Furthermore, the high incidence of AH and DM, diseases associated with severe ocular complications, increases the relevance of regular ophthalmic evaluation. More than half of these patients were not evaluated for more than 2 years. Particularly in the case of the patients with DM, we verified that more than one third of the patients were not evaluated for more than 4 years. The importance of annual screening has been proved and is considered the standard of practice worldwide[15].

The prevalence of refractive error correction was 78.4%. Similarly to other studies, RE is the major cause of visual impairment[6,16-21]. The importance of correcting refractive errors in infants and elderly has been extensively investigated, to avoid future vision impairment in children[22-26] and to improve quality of life, independence and even physical activity performance in the elderly[27-29].

In this study we also verified an association between lower VA scores and lower levels of education. In fact, visual impairment, frequently caused by uncorrected RE, has been associated to lower educational and socioeconomial levels and poorer income[30-36]. On other hand, visual impairment has also been found to increase the likelihood of being unemployed[37]. Our study verified that unemployed individuals had a lower VA score. It adds further proof that VA impairment is more prevalent in the unemployed population, probably due to reduced need of 20/20 VA score, which in turn delays the search for ophthalmologic evaluation. In fact vision impairment has been found to affect the individuals both socially, reducing quality of life, as physically, since it increases the risk of depression, traumatic lesions and even reduces cardiorespiratory fitness[38-42].

This study also found that the patients who were observed recently by an ophthalmologist had the lowest VA scores. This fact probably is due to the fact that most of the population in our sample only seeks for ophthalmology care when vision impairment is already installed. This fact further emphasizes the importance of providing general population with information, underlining the importance of preventing visual impairment and having a regular ophthalmic screening, particularly for those older than fifty years of age.

CONCLUSION

Visual health screening is a key element for improvement of primary prevention of visual impairment. It is an effective way of screening for severe visual loss and also to provide the general population with information. Further screening initiatives can improve primary prevention in ophthalmologic care.

Aknowledgements: *Screening initiative supported by Santa Casa da Misericórdia de Lisboa, Núcleo Saúde Mais Próxima and Sociedade Portuguesa de Oftalmologia.*

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Os autores não têm conflitos de interesse a declarar.
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