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## Research Report

# Changes in Patterns of Age-Related Visual Impairment in the Netherlands: A Comparison of Two Cohorts of Patients Referred to Rehabilitation Programs 10 Years Apart

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In developed countries, age-related eye diseases represent the major workload in general ophthalmology. Despite all modern technology and knowledge, it is not possible to improve vision in all the persons with these diseases. As a result of the aging of the population, the number of persons with incurable eye diseases, particularly age-related macular degeneration (AMD), is expected to increase in the next decades (de Boer, Jansonius, Langelaan, & van Rens, 2004; Buch et al., 2004; Pizzarello, 1987; Wormald, Wright, Courtney, Beaumont, & Haines, 1992). This increase will have great consequences for elderly people, the society, and the practice of ophthalmology in low vision clinics. Most of the studies of the causes of visual impairment have been population-based studies (that is, they studied a representative sample of a population, country, or region) (Buch et al., 2004; Dimitrov, Mukesh, McCarty, & Taylor, 2003; Foran, Wang, & Mitchell, 2002; Klaver, Wolfs, Vingerling, Hofman, & de Jong, 1998; Nucci et al., 2005; Pizzarello, 1987; Saw, Foster, Gazzard, & Seah, 2004; van Splunder, Stilma, Bernsen, & Evenhuis, 2004; Weih, Van Newkirk, McCarty, & Taylor, 2000; Wormald et al., 1992). These population-based studies provide important information on the incidence and

prevalence of "theoretical" eye problems in a community. (By *theoretical* we mean those with a visual acuity of $\leqslant$ 0.30 or a visual field restricted to less than 20 degrees in the better eye.) However, not all those who are visually impaired, from a theoretical point of view, consider themselves as such and hence will not visit an ophthalmologist or accept the offer of low vision counseling. Others are unaware of the possibilities of rehabilitation or are not able to come to these clinics because of health problems, mental difficulties, or other reasons (Muñoz et al., 1999). This discrepancy between population-based studies and daily practice makes it difficult to develop strategies to offer low vision services to those who need them. In addition, little is known about the changes in patterns of visual impairment over time. Therefore, there is still a place for hospital-based or patient-based studies of the incidence and etiology of visual impairment. The aim of this study was to determine changes, over time, in the incidence and etiology of visual impairment in persons aged 50 and older who visited an eye clinic for an incurable age-related eye disease and who accepted an offer of rehabilitation.

## METHODS

### *Participants*

The participants were all the patients of the Department of Ophthalmology of the Elkerliek Hospital, Helmond, the Netherlands, who were aged 50 or older and were referred for the first time to a rehabilitation center for people with visual impairments or who underwent an examination at a special low vision clinic from January 1989 to July 1990 or from July 2000 to January 2003. The Elkerliek Hospital is the only hospital in the eastern part of the southeast of the province of North Brabant, the Netherlands. Within this general hospital, the Department of Ophthalmology serves approximately 162,000 inhabitants and provides care for 1% of the total Dutch population.

Only persons who visited the Department of Ophthalmology and proved to have a distance visual acuity of  0.3 in the best eye; those who reported serious problems with daily visual tasks, such as reading or watching television when the best-corrected acuity was better then 0.3; or those with severely restricted visual fields (hemianopia or field < 20 degrees) were referred for low vision services and were included in the study. Persons who had previously received low vision services were excluded, as were those who were not able to speak Dutch or who were mentally disabled.

## MEASUREMENTS

Visual acuity was measured using a traditional letter chart, but since logMAR values are accepted as a more appropriate measure, we included this notation in the study as well. Decimal visual acuity values were transformed to logMAR values ($^{10}$log 1/visual acuity) to enable meaningful computations.

During both periods, the best-corrected visual acuity was measured for both eyes separately. We adopted the definitions of blindness and low vision of the World Health Organization (WHO). The WHO definition of blindness is a visual acuity of < 0.05 (3/60) or a visual field of < 10 degrees around the central fixation; the definition of low vision is a visual acuity of 0.05-0.3 or a visual field of < 20 degrees around the central fixation.

For all the participants, the main cause of visual impairment was recorded. Since many participants had more than one cause of decreased visual acuity, the ophthalmologist decided which eye disease was primarily responsible for the visual impairment.

## RESULTS

### *Age and gender*

Table 1 shows the distribution of participants by age and gender during both periods of the study. In the first period (1989-90),

244 participants, 175 women (72%) and 69 men (28%) were included. The mean age of these participants was 76.4 years (range: 52-95 years); 81% of these participants were older than 70 years. During the second period (2000-02), 121 participants were included, 79 women (65%) and 42 men (35%). Their mean age was 77.9 years (range: 52-94 years), and 84.7% of them were older than 70 years. There was no significant difference in the mean age of the participants in the two periods (independent sample *t*-test, $df = 363$; $p = 0.11$), and no significant difference in gender between the two periods (chi-square test, critical value = 3.84; $p = 0.21$).

### BEST-CORRECTED VISUAL ACUITY

Table 2 shows the number of participants who were blind or had low vision for both periods--the group with low vision included severely visually impaired participants (with a visual acuity of 0.05-0.10) and participants who were profoundly visually impaired (with a visual acuity of 0.02-0.04), as defined by the *Guide for the Evaluation of Visual Impairment* (International Society for Low Vision Research and Rehabilitation, 1999). In the first period, 21 (8.6%) participants were blind and 182 (74.6%) had severe low vision. Ten years later, 6 (5.0%) participants were blind and 70 (57.8%) had severe low vision.

There was a significant difference in the mean visual acuity (independent sample *t*-test, $df = 362$; $p = .001$) between the two periods. In the first period, the mean visual acuity was 0.72 logMAR, and in the second period, it was 0.66 logMAR. In the first period, 16.8% of the persons presented with a visual acuity of 0.52 logMAR or less, whereas in the second period, 37.2% did so.

### CAUSES OF VISUAL IMPAIRMENT

Table 3 shows the main causes of visual impairment in the best eye. It is clear that in both periods, AMD was the most prevalent cause of visual impairment. In 1989-90, AMD was the cause in

44.3% of the participants, whereas in 2000-02, it was the cause in 56.8% of the participants; this increase is significant (chi-square test, critical value = 3.84; $p = .03$). The percentage of participants with diabetic retinopathy decreased from 18.6% to 13.6% from the first to the second period; this decrease is not significant (chi-square test, critical value = 3.84; $p = .23$).

## DISCUSSION

In this study, we looked at changes in age, gender, visual acuity, and diagnosis during a 10-year period among people aged 50 and older who were referred to low vision services for the first time. We found that from the first period to the second period, the participants presented with better eyesight and that there was a shift in diagnoses to more persons with AMD and to more men than women.

The findings clearly show that there was a change in the etiology of visual impairment from the first period to the second. In both periods, AMD was by far the most prevalent cause of visual impairment--44.3% in the first period and 56.8% in the second period (see Table 3)--a finding that was also found in earlier studies (Dimitrov et al., 2003; Pizzarello, 1987; Weih et al., 2000). In some other studies, cataract was also a major cause of visual impairment (Buch et al., 2004; Klaver et al., 1998; Saw et al., 2004). However, in our study, the proportion with cataract decreased from 9.1% in the first period to 5.9% in the second period. This decrease probably reflects the greater number of persons with cataract who are being surgically helped, so that cataract is no longer a major problem.

It is interesting to note that the incidence of all the other more or less treatable age-related eye diseases, such as diabetic retinopathy and glaucoma, decreased from 18.6% and 8.7%, respectively, in 1990 to 13.6% and 5.9%, respectively, in 2002. Considering the growing number of persons with diabetes, this decrease is remarkable (Kelly, Marrero, Gallivan, Leontos, & Perry, 2004). Because of the increase in the prevalence of

diabetes, one could expect an increase in diabetic complications, such as diabetic retinopathy. However, the treatment of diabetes has improved dramatically during the past 15 years, which could explain why fewer persons have severe vision loss caused by diabetic retinopathy.

In the second period, there were more referrals of persons with a visual acuity of > 0.3. This finding can be explained by the fact that, in modern society, people need better eyesight and thus will ask for help at an earlier stage of a disease (de Boer et al., 2004). Another finding, but not significant, is the decrease in the proportion of women--from almost 72% of all the participants in 1989-90 to 65% in 2000-02 (see Table 1). Given the population characteristics of the Netherlands, 65% seems to be more realistic, since 53% of the Dutch population aged 50 and older is female (Statistics Netherlands, 2004). However, other studies have also found that more women than men are visually impaired (Dimitrov et al., 2003; Foran et al., 2002; Klaver et al., 1998; Nucci et al., 2005; Saw et al., 2004; Wormald et al., 1992). Nevertheless, in both periods, there were more women than men, and the proportion of men increased in the second period. This finding may be explained by the fact that men in the Netherlands traditionally work in factory, construction, or agricultural environments that do not require fine visual skills and by the possibility that men are more reluctant to seek help than are women.

There are two limitations to our study. First, during the first period, there were 244 participants in an 18-month period, but in the second period, there were 121 participants in a 30-month period. Since there were no low vision clinics, except rehabilitation centers for children and young adults, in the 1970s and 1980s in the Netherlands, the data for the first period probably include a backlog of patients who had never before received treatment for their visual impairment. One may speculate on the influence of this backlog in terms of reliability, representativeness, age distribution, visual acuity, and the

possible influence of life expectation in relation to eye diseases, such as diabetic retinopathy, vascular diseases of the eye, and neurological syndromes. Our data show a nearly identical distribution by age. If the backlog had been an influence, the first cohort would probably have been older.

Second, best-corrected visual acuity is measured in various ways. In the past, Snellen charts were used, later on projectors, while today the Treatment of Diabetic Retinopathy Study (ETDRS) visual acuity charts are considered the most reliable form to express visual acuity. We adapted Snellen visual acuity to EDTRS visual acuity, which is less accurate than measuring visual acuity by EDTRS charts directly.

In conclusion, there are numerous sources of data on visual impairment, including patients' organizations, social service agencies, health insurance companies, ophthalmological clinics, special low vision clinics, and population-based studies. Most of these data give information about the prevalence of visual impairment within the field of the study. Reliable data about the changes over time of the etiology of visual impairment of those who enter rehabilitation programs are scarce. Therefore, it was valuable to analyze the data of our department, since they provide insights into the changes in visual impairment over time and can be used to develop strategies for offering services in the future.

Our study showed that today, people are referred for low vision services at an earlier stage of their visual impairment. An increasing number of these persons have AMD. Future research is needed to determine whether this trend will continue.

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