Self-reported visual impairment in elderly Canadians and its impact on healthy living

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ABSTRACT • RÉSUMÉ

Background: Using a nationwide sample from community- and institution-dwelling residents, we describe the prevalence of self-reported visual impairment in elderly Canadians and examine its association with selected social demographics and health factors.

Methods: Subjects were participants in the phase I clinical examination of the Canadian Study of Health and Aging. Vision state was ascertained from a self-reported question: "How is your eyesight (with glasses or contacts if you wear them)?" A response of "poor" (referred to as poor vision) or "unable to see" (referred to as blindness) was considered visual impairment. Other information was from in-person interviews or clinical examinations. Standardized weights were used in all analyses.

Results: Analyses included 2671 participants with a median age of 72 years. The overall prevalence was 6.2% for poor vision, 0.7% for blindness, and 6.8% for either. A higher prevalence was seen in women and in people aged 85 years or older. Participants with ≤6 years of education were approximately 2 times more likely to report visual impairment. Institutional residents and people with falls or a depressed mood were approximately 3 times more likely to state visual impairment. Smoking was associated with approximately 4 times higher odds of visual impairment, while persons presenting difficulty with everyday activities or with self-rated poor health were approximately 7 and 15 times more likely to report visual impairment.

Interpretation: Visual impairment in elderly Canadians is common and is associated with increased odds of institutionalization, frequent falls, difficulty with everyday activities, and poor health. Good eyesight may imply good health and good independence in the elderly.

Contexte : À partir d'un échantillonnage pancanadien de résidents vivant dans la communauté ou en institution, nous décrivons la prévalence de la déficience visuelle auto-signalées par les aînés et en examinons l'association avec certains facteurs sociaux sur le plan démographique et celui de la santé.

Méthodes : Les sujets se prêtaient alors à l'examen clinique, 1re phase de l'Étude sur la santé et le vieillissement au Canada. L'état de la vision a été établi à partir d'une question à laquelle chacun a répondu : « Comment est votre vue (avec lunette ou verres de contact si vous en portez) ? ». Une réponse disant « faible » (signifiant une vision faible) ou « incapable de voir » (signifiant cécité) était considérée comme déficience visuelle. Les autres renseignements provenaient d'entrevues en personne ou d'examens cliniques. Une méthode standard de pondération a été appliquée à toutes les analyses.

Résultats : Les analyses ont porté sur 2671 participants de 72 ans en moyenne. Dans l'ensemble, la prévalence de la déficience visuelle était de 6,2 %, celle de la cécité, 0,7 % et pour l'une ou l'autre, 6,8 %. La prévalence était plus forte chez les femmes et les personnes de 85 ans et plus. Les participants qui avaient ≤6 ans de scolarité étaient environ 2 fois plus enclins à signaler une déficience visuelle. Ce taux était d'environ 3 fois chez les résidents en institution et les personnes à risque de chutes ou d'humeur dépressive. Le tabagisme a été associé avec un risque environ 4 fois plus élevé de déficience visuelle, alors que les personnes ayant de la difficulté dans les activités quotidiennes ou qui se disaient de santé délicate étaient environ 7 à 15 fois plus susceptibles d'indiquer une déficience visuelle.

Interprétation : Au Canada, la déficience visuelle chez les aînés est fréquente et survient davantage chez les patients qui vivent en institution, qui sont plus sujets aux chutes, qui ont plus de difficultés dans les activités quotidiennes et qui ont une mauvaise santé. Chez les aînés, une bonne vue peut supposer une bonne santé et une bonne autonomie.

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Visual impairment interferes substantially with everyday activities such as reading, writing, and getting around, and increases a person's chance of falls, hip fractures, depression, and early reliance on home and community care and social welfare systems.[1–5] Worldwide studies, such as those from the United States,[6] Australia,[7] China,[8] and Denmark,[9] have repeatedly indicated that the prevalence of visual impairment increases rapidly with age. Given the growing proportion of senior people in developed countries[10] and the aging baby boomers, visual impairment and its consequences will become more important for public health, and corresponding social and health initiatives are needed to tackle this increasingly challenging issue. In Canada, little information is available about the prevalence of visual impairment, except for some small, regional reports.[11–13]

The Canadian Study of Health and Aging (CSHA) is a population-based, nationwide study with random samples drawn from people aged 65 years or older who resided in communities and institutions across Canada in 1991 and 1992. The major aim of the CSHA was to estimate the prevalence and incidence of dementia in elderly Canadians. By taking advantage of the unique and comprehensive data collected in the CSHA, we aimed to (1) estimate the prevalence of self-reported visual impairment in community- and institution-dwelling elderly Canadians, and (2) assess its association with selected social demographics and health factors.

METHODS

Study population and data collection

Subjects in this study were participants in the clinical examination of the first phase of the CSHA (CSHA-1) from 1991 to 1992. The methodology of the CSHA study has been published widely elsewhere.[14,15] Briefly, in 1991, a representative sample of Canadians aged 65 years or older living in communities and institutions was drawn from 36 cities and their surrounding rural areas based on the databases of provincial health insurance plans or the Enumeration Composite Record.[14] The aims of the CSHA were to study health- and aging-related issues, with a special focus on cognitive impairment. Ethics review boards in 18 study centres approved the study. In all, 9008 community-dwellers and 1255 institutionalized elderly persons participated in the CSHA-1.

Data collection for the CSHA-1 was done in 2 stages: a screening interview and a clinical examination. Participants living in communities were first interviewed at home by trained interviewers using a standard screening questionnaire to assess general health status and the Modified Mini-Mental State Examination (3MS, range 0–100) to detect possible dementia. All community participants screened positive by the 3MS (<78), a random sample of those screened negative (≥78), and all institutionalized participants in CSHA-1 were invited to undergo a comprehensive clinical examination. This included a nurse's basic evaluation, a physician's clinical history review, and a neurological examination, as well as a neuropsychologist's interpretation of a neuropsychological test battery administered to those with 3MS scores ≥50.

Information on vision state came from a self-reported question: "How is your eyesight (with glasses or contacts if you wear them)?" Listed responses were "Excellent," "Good," "Fair," "Poor," and "Unable to see." For community-dwelling participants, this question was asked by a trained home interviewer; for institutionalized participants, this question was administered by the study nurse at the time of clinical examination. In this study, we considered the response of "Poor" (referred to as poor vision in the article) or "Unable to see" (referred to as blindness in the article) to be visual impairment.

Information on each participant's age, sex, marital status, years of education completed, height, weight, and the answer to the question, "How would you say your health is these days?" were collected during the home interview or clinical examination. Information on smoking was obtained from participants' relatives or other informants through the question, "Has she/he ever been a smoker?" History and frequency of falls was assessed by the examining physicians, based on each participant's self-report and a review of the participant's medical history. The presence or absence of a depressed mood or difficulty with everyday activities was also determined by the examining physicians, based on information collected from the Cambridge Examination for Mental Disorders of the Elderly, section H. Body mass index (BMI) was derived as weight (in kilograms) over height (in meters) squared. Participants were initially classified into underweight (BMI < 18.5), normal weight (18.5 ≤ BMI < 25), overweight (25 ≤ BMI < 30), and obese (BMI ≥ 30), according to the recommendations of the World Health Organization (WHO).[16] However, because of high sampling variability for such a detailed classification, participants were finally grouped into under- or normal weight (BMI < 25) versus overweight or obese (BMI ≥ 25), to increase cell counts.

Statistical analysis

The prevalence of visual impairment was estimated as the proportion of participants who responded to the vision question as "Poor" or "Unable to see." The 95% confidence interval (CI) of the prevalence was calculated by the Wilson's method.[17] Standardized relative sampling weights were used in all analyses to generalize our findings to the Canadian elderly population.[18] Data with a coefficient variation >33.3% were not reported, to conform to Statistics Canada guidelines.[19] The estimated number of elderly Canadians with self-reported visual impairment in 1991 was generated by applying the reported age-specific prevalence to the 1991 Canadian census population. Taking visual impairment as a binary outcome, the association between self-reported visual impairment and

selected social demographics and health factors was assessed by the odds ratio (OR) and its 95% CI obtained from the logistic regression models. The OR is a relative measure of risk in 2 groups. An OR of 1 implies that the condition or event under study is equally likely in both groups. An OR greater than 1 indicates that the condition or event is more likely in the group compared with the reference group. An OR less than 1 indicates that the condition or event is less likely in the group compared with the reference group.

Results

Among 2914 participants in the CSHA-1 clinical examination, 2671 (91.7%) answered the vision question. The overall median age was 72 (range 65–99) years for community-dwelling participants, 83 (range 65–106) years for institution-dwelling participants, and 72 (range 65–106) years for all. Women comprised 57% of the community sample, 70% of the institutional sample, and 58% of both community and institutional subjects.

Table 1 shows the prevalence of self-reported visual impairment by age, sex, and place of residence. The overall prevalence was 6.2% for poor vision, 0.7% for blindness, and 6.8% for either. Higher prevalences were found in women and in people in the oldest age group (85+ years). Compared with those living in communities, seniors living in institutions had a significantly elevated prevalence of visual impairment in all categories in Table 1, as indicated by their separated 95% CIs. Applying these prevalence figures to the 1991 Canadian census population, we estimated that in 1991 approximately 219 380 elderly Canadians had visual impairment; of these, 20 824 were unable to see and 152 683 were women.

Table 2 shows the prevalence of visual impairment by selected social demographics and health factors. Among community participants, significantly higher prevalences were found for persons with <7 years of education; having never been married, or having separated, divorced, or been widowed; having ever been a smoker; having falls; with a depressed mood; presenting difficulty with everyday activities; or with a self-rated poor health condition. Prevalences in institutional participants revealed a similar trend but the difference was not as significant.

Table 3 shows the crude and adjusted ORs of visual impairment. Significantly increased odds were observed in women compared with men, and in people in the oldest age group (85+ years) compared with those aged 65 to 74 years. Subjects who had attained less education were approximately 2 times more likely to report visual impairment than those with more education. Institutional residents and persons with falls or a depressed mood were approximately 3 times more likely to have visual impairment. When people with a frequency of falls >1 per month were compared with those with no falls, the adjusted OR increased to 31.5. Smoking was associated with approximately 4 times higher odds of visual impairment. Among people presenting difficulty with everyday activities or with a self-rated poor health condition, the adjusted ORs were approximately 7 and 15, respectively. The positive association between marital status and visual impairment became nonsignificant after controlling for the effects of age, sex, and smoking.

Interpretation

With a nationwide sample drawn from both community- and institution-dwelling residents in Canada, we documented that the prevalence of self-reported visual impairment in elderly Canadians in 1991 and 1992 was 6.2% for poor vision, 0.7% for blindness, and 6.8% for either.

Data on the prevalence of visual impairment are critical for quantifying the need for eye care and rehabilitation services, and for monitoring changes and evaluating interventions. In an effort to estimate the global burden of visual impairment, the WHO compiled a data bank on visual impairment in 2002.[20] More than 200 population-based

Table 1—Prevalence of visual impairment by age and sex among Canadians aged 65 years and older residing in communities and institutions in 1991 and 1992*

	Total, % (95% CI)			Community, % (95% CI)	Institution, % (95% CI)
Demographic	Poor vision	Blindness	Poor vision or blindness	Poor vision or blindness‡	Poor vision or blindness‡
Overall	6.2 (5.3–7.2)	0.7† (0.4–1.0)	6.8 (5.9–7.8)	5.9 (5.0–6.9)	21.4† (15.8–28.4)
Sex					
Women	7.5 (6.3–8.9)	0.8† (0.5–1.4)	8.3 (7.0–9.8)	7.3 (6.0–8.7)	21.6† (14.9–30.0)
Men	4.4 (3.3–5.7)	§	4.8 (3.7–6.2)	4.1 (3.0–5.4)	21.1† (12.0–34.4)
Age, y					
65–74	5.2 (4.2–6.3)	§	5.2 (4.2–6.4)	5.0 (4.0–6.1)	§
75–84	5.8 (4.4–7.6)	§	6.7 (5.2–8.6)	5.8† (4.3–7.6)	17.5† (10.2–28.5)
≥85	15.0 (10.9–20.3)	4.2† (2.2–7.7)	19.2 (14.6–24.9)	16.0† (11.1–22.6)	26.5† (17.5–38.0)

*Data from the Canadian Study of Health and Aging.
†The coefficient of variation was between 16.6% and 33.3%, indicating marginal sampling variability according to Statistics Canada.
‡Results were not reported for poor vision and blindness separately because the coefficient of variation was >33.3%, indicating unacceptable sampling variability according to Statistics Canada.
§Results were not reported because the coefficient of variation was >33.3%, indicating unacceptable sampling variability according to Statistics Canada.

studies from nearly 70 countries were included, but none from Canada. This highlights the urgent need for epidemiological studies on visual impairment in Canada. Very recently, we saw a small regional report from this country, which used accurate visual acuity data from ophthalmic charts to estimate the prevalence of visual impairment.[12] In spite of different ascertainments of visual impairment, our self-reported, age-specific prevalences are similar to, or higher than, their clinically measured estimates using the WHO criteria (Table 4, Prince George report).[12] Compared with the age-specific data from the Beaver Dam Eye Study, the Blue Mountains Eye Study, the Melbourne Visual Impairment Project, the Rotterdam Study, and the pooled analysis based on published population studies in the U.S., Australia, and Europe,[7,21–23] where visual acuity was measured clinically among community-dwelling participants, with acuity 20/40 or worse being classified as visual impairment (the U.S. criteria),[12] our age-specific prevalences are close to, lower than, or higher than these reported figures (Table 4). This probably reflects differences in defining visual impairment, in including institutional participants or not, and in study periods and age categories. Overall, our self-reported visual impairment may be closer to the stringent WHO criteria (acuity 20/60 or worse).[12]

Over the past 2 decades, Statistics Canada has collected much useful information on self-reported difficulty seeing through, for example, the Health and Activity Limitation Survey (HALS) in 1991 and the Participation and Activity Limitation Survey in 2001 and 2006. According to these surveys, the number of people aged 65 years and older with a difficulty seeing in Canada was 298 370 in 1991, 303 540 in 2001, and 367 730 in 2006.[24–26] The differences between our estimate of 219 380 elderly Canadians having visual impairment in 1991 and the Statistics Canada data might be due to different study methodologies, different definitions of the studied visual outcome, different study populations, and different time periods. For example, the HALS targeted persons with any type of disabilities living in private households, and telephone-interviewed 80% of those who answered positively to the disability questions in the long census form and 10% of those who answered negatively. Further, the HALS defined persons as having a seeing disability if they (1) had difficulty seeing ordinary newsprint (with glasses or contact lenses if usually worn) or (2) had difficulty seeing the face of someone across a room (i.e., 4 meters or 12 feet with glasses or contact lenses if usually worn). A person who could read ordinary newsprint but could not recognize a face of someone across a room (defined as seeing disability in HALS) may have not necessarily answered “Poor” to the

Table 2—Prevalence of visual impairment by selected social demographics and health factors among elderly Canadians residing in communities and institutions in 1991 and 1992

Factor	Total, % (95% CI)	Community, % (95% CI)	Institution, % (95% CI)
Education			
≤6 years	12.8 (9.9–16.5)	11.4* (8.5–15.1)	25.8* (14.7–41.3)
>6 years	5.7 (4.8–6.7)	5.0 (4.1–6.0)	19.8* (13.4–28.2)
Marital status			
Never married	9.7* (6.1–15.1)	8.9* (5.3–14.6)	†
Married/common law	5.1 (4.0–6.3)	4.7 (3.7–5.9)	27.3* (13.7–14.6)
Separated/divorced/widowed	8.7 (7.1–10.6)	7.2 (5.7–9.1)	21.2* (14.6–29.6)
Body mass index			
<25	6.7 (5.4–8.3)	5.5 (4.3–7.0)	23.1* (15.4–33.0)
≥25	6.8 (5.6–8.3)	6.4 (5.2–8.0)	16.5* (8.5–29.4)
Smoking			
Yes	10.1 (8.2–12.3)	9.5 (7.6–11.7)	20.4* (11.3–34.1)
No	5.3 (4.4–6.5)	4.3 (3.4–5.3)	21.6* (14.9–30.2)
Falls			
Yes	15.8 (12.5–19.9)	14.9 (11.4–19.1)	22.5* (13.0–35.9)
Yes, with frequency >1/month	56.8 (42.7–69.9)	63.4 (47.9–76.5)	†
No	5.1 (4.3–6.1)	4.4 (3.6–5.4)	20.5* (13.6–29.5)
Depressed mood			
Yes	15.0 (11.8–18.9)	13.2 (9.9–17.3)	23.8* (15.1–35.5)
No	5.5 (4.6–6.5)	4.8 (4.0–5.8)	19.6* (12.8–28.7)
Difficulty with everyday activities			
Yes	27.3 (22.3–32.9)	29.1 (22.7–36.4)	24.4* (17.1–33.6)
No	4.6 (3.8–5.5)	4.3 (3.5–5.2)	16.1* (8.8–27.7)
Self-rated health			
Poor/very poor	‡	40.0† (30.1–50.7)	‡
Good	‡	4.7† (3.9–5.6)	‡

*The coefficient of variation was between 16.6% and 33.3%, indicating marginal sampling variability according to Statistics Canada.
†Results were not reported because the coefficient of variation was >33.3%, indicating unacceptable sampling variability according to Statistics Canada.
‡Data were available only for community participants.

vision question "How is your eyesight?" in our study. Although we included seniors living in institutions where visual impairment is more frequent and more severe, our estimate is less than that from the HALS survey. This suggests that our visual impairment definition may be more stringent and our estimate more conservative. In the workshop of the National Coalition for Vision Health in 2007, Ralf Buhrmann, MD, forecasted that the number of Canadians aged 40 years or older with vision loss would increase from 386 000 in 2006 to 775 000 in 2031 (Ralf Buhrmann, unpublished data). This highlights the urgent need for more research on visual impairment and more health care to treat it.

Table 3—Crude and adjusted odds ratios of visual impairment in elderly Canadians

Factor	Crude OR (95% CI)	Adjusted OR* (95% CI)
Sex (women vs. men)	1.8 (1.3–2.5)	3.1 (2.1–4.6)†
Age, y (reference: 65–74)		
75–84	1.3 (0.9–1.9)	1.1 (0.8–1.6)‡
≥85	4.3 (2.9–6.5)	4.5 (3.0–6.9)‡
Dwelling (institution vs. community)	4.3 (2.9–6.6)	2.6 (1.6–4.2)
Education (≤6 y vs. >6 y)	2.4 (1.7–3.5)	2.4 (1.7–3.4)
Marital status (reference: married or common law marriage)		
Never married	2.0 (1.1–3.4)	1.3 (0.7–2.5)
Separated/divorced/widowed	1.7 (1.3–2.4)	1.0 (0.7–1.4)
Body mass index (<25 vs. ≥25)	1.0 (0.7–1.4)	1.2 (0.8–1.7)
Smoking (yes vs. no)	2.0 (1.5–2.7)	3.8 (2.6–5.4)§
Falls		
Yes vs. no	3.5 (2.5–4.7)	3.0 (2.1–4.3)
>1/month vs. no	24.3 (13.2–44.5)	31.5 (16.2–61.5)
Depressed mood (yes vs. no)	3.1 (2.2–4.3)	2.8 (1.9–3.9)
Difficulty with everyday activities (yes vs. no)	7.9 (5.7–11.0)	6.6 (4.5–9.7)
Health (poor/very poor vs. good)	13.5 (8.4–21.8)	14.5 (8.7–24.3)

*Adjusted for age, sex, and smoking, unless otherwise specified.
†Adjusted for age and smoking only.
‡Adjusted for sex and smoking only.
§Adjusted for age and sex only.
Note: OR, odds ratio; CI, confidence interval.

Table 4—Selected age-specific prevalence of low vision from published reports

Age (y)	Prevalence (%)
This study	
65–74	5.2
75–84	5.8
85+	15.0
Prince George, Canada (WHO criteria)[12]	
65–74	5.2
75–84	3.6
85+	9.0
Australia (U.S. criteria)[7]	
60–69	4.51
70–79	11.41
80–89	28.75
90+	39.49
Pooled U.S. (U.S. criteria)[23]	
65–69	1.11
70–74	2.02
75–79	3.93
80+	16.68

Note: WHO, World Health Organization.

Consistent with prior findings from Britain, the Netherlands, and Australia,[27–29] this Canadian study corroborates that visual impairment is associated with an increased risk of falls, depression, and self-rated poor health. We believe that visual impairment is not an isolated impairment, and its effects extend well beyond the limitations of eyesight. Given the fact that most causes of visual impairment are readily diagnosed, and that nearly one-half of visual impairment is treatable or preventable,[7,30] keeping or maintaining good eyesight in old age could contribute to improving the quality of life and reducing the risk of death in the elderly.[31–35]

A major limitation of this study is that assessment of visual impairment is based on self-report rather than on examination by ophthalmologists. This may result in different estimations of visual impairment. Since people answer vision questions based on their presenting visual acuity (i.e., acuity measured using the subject's habitual correction), rather than the best-corrected visual acuity, the prevalence of visual impairment from self-report is usually higher than that from clinically measured best-corrected visual acuity.[36–38] However, it is a person's presenting visual acuity, not the best-corrected visual acuity, that maintains a person's day-to-day functions. We believe that self-reported prevalence estimates based on presenting visual acuity provide useful information that reflects the actual impact of visual impairment on people. The other limitation of this study is that we cannot separate cause and effect because of the nature of cross-sectional data collection.

The strength of this study is that it is a population-based assessment with nationwide samples from both community- and institution-dwelling elderly. The inclusion of participants who are institutionalized is very important because they are more often and more severely affected by visual impairment, as demonstrated in this study. Ignoring them, as was the case for most of the previous studies, may result in an incomplete or underestimated appreciation of visual impairment.

To sum up, we estimated the prevalence of visual impairment in elderly Canadians from 1991 to 1992 and studied its association with factors related to health living using a nationwide sample. This may, to some extent, close the information gap in vision epidemiology between Canada and other countries. Our results show that visual impairment was nearly as common as dementia or stroke,[14,39] and was higher in women, people aged 85 years or older, less educated persons, and smokers. Visual impairment was not an isolated impairment and was associated with greater odds of institutionalization, falls, depressed mood, difficulty with everyday activities, and poor self-rated health. Good eyesight may imply good health living in the elderly.

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