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Original Study

Prevalence of Vision Loss and Associations With Age-Related Eye Diseases Among Nursing Home Residents Aged ≥65 Years

William A. Monaco OD, MSEd, PhD [a,*], John E. Crews DPA [b], Anh Thy H. Nguyen MSPH [a], Areeb Arif [a]

[a] University of South Florida, Tampa, FL
[b] Independent Scholar, Atlanta, GA

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A B S T R A C T

Objectives: To examine data from Delaware nursing homes to determine prevalence of age-related eye diseases (AREDs), vision impairment, and blindness and to compare the findings with the results of 11 US investigations of vision and eye health in nursing homes.
Design: This is a cross-sectional, retrospective study of nursing home patients.
Setting and Participants: Twenty nursing homes in Delaware participated in the study, yielding comprehensive eye examination records for 2019 study participants.
Methods: Summary statistics and regression analyses.
Results: The overall prevalence of vision impairment or blindness was 63.8% and was above 60% for each age, sex, and race category. Prevalence of vision impairment or blindness was 68.4% among patients with cataracts, 69.4% among patients with macular degeneration, 70.5% among patients with glaucoma, and 68.4% among patients with diabetic retinopathy. Prevalence of blindness was 14.1%. Among patients with AREDs, prevalence of blindness ranged from 15.0% for patients with cataracts to 22.6% for patients with diabetic retinopathy. When compared with other investigations, we found wide variation in vision and eye factors reported and wide variation in the prevalence of those factors. Only 4 studies diagnosed both AREDs and visual function. Seven studies reported AREDs, and 7 reported vision impairment and/or blindness. Vision impairment or blindness ranged from 29% to 67%; cataract ranged from 32% to 83%; macular degeneration ranged from 4.6% to 70.7%. Glaucoma ranged from 5.3% to 41.4%; diabetic retinopathy ranged from 1.7% to 3.1%.
Conclusions and Implications: Comprehensive eye examinations showed that vision impairment and blindness affected 63.8% of nursing home residents. Compared with other studies, there was a wide range of vision factors reported and wide variation in the prevalence of vision impairment or blindness and AREDs. This investigation suggests the importance of eye care in nursing homes and the importance of reporting standard vision and eye health factors to inform policy and practice.

A recent study estimated that in 2015 about 12.44 million people age 40 years and older experienced vison problems in the United States, including 1.02 million people who were blind, 3.22 million people with vision impairment, and 8.2 million people who had vision impairment because of uncorrected refractive error.[1] Other studies show substantial demographic, social, and health disparities between older people (age ≥ 65 years) with and without vision impairment. People with vision impairment are more likely to be women, to represent racial and ethnic minorities, to be poorer, have less education,[2] and be more likely to report chronic conditions,[3] falls,[4,5] poorer health-related quality of life, poorer oral health, greater depression, and higher mortality.[6]

Although the development of knowledge about older people living in the community continues to be refined, the vision and eye health status of people residing in nursing homes remains fragmented, incomplete, and neglected. Vision concerns are often not addressed, and data regarding vision are not collected or reported in a systematic manner. People residing in nursing homes often have substantial cognitive limitations that compete with efforts to address vision.

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* Address correspondence to William A. Monaco, OD, MSEd, PhD, 31987 Mardelle Place, Wesley Chapel, Florida, USA.
E-mail address: wmonaco@usf.edu (W.A. Monaco).

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Moreover, vision loss is not an obvious disability, and vision problems may go underestimated, undetected, or ignored, and the progression of eye problems may be overlooked. The contribution of vision impairment to falls[7] and visual limitations caused by stroke may not be recognized.[8] The overall result, we suspect, is that vision loss and blindness among nursing home residents require additional understanding.

Although prior nursing home studies have demonstrated that residents are highly vulnerable to vision loss and blindness,[9–12] measures of vision impairment and eye diseases generally lack sufficient detail and consistent data collection to inform decisions regarding eye care or potential changes in the environment to enhance patient function and independence.

The lack of knowledge regarding vision and eye health among nursing home residents is demonstrated by a paucity of research. A literature review of published full articles in peer-reviewed journals between 1957 and 2007 of institutionalized patients revealed 10 studies estimating the prevalence of vision impairment and/or eye diseases among nursing home residents in the United States (see Table 1).[9,12,15,17–20,23]

Although all these studies lacked some key components to link clinical findings with outcomes, they were generally limited by small sample sizes, retrospective chart review, and often incomplete, inconsistent, and unreliable measures of vision and eye health; therefore, the estimated prevalence of visual impairment and blindness was generally not documented by clinical criteria. Andersson et al[21] recently reported results from Delaware Nursing Home Eye Study (DNHES) dataset, using different data collection methods and inclusion and exclusion criteria that differ from this study. His study yielded a smaller sample size. Whereas Andersson estimated the prevalence of vision impairment and blindness from nursing home and personal care residents, we estimated the prevalence of vision impairment and blindness as well as AREDs in a study sample of nursing home residents only. Ours is an independent analysis of data elements from the DNHES data set. One recent international study is included in our table for comparison because of its large sample of clinically derived data to determine visual impairment and blindness in nursing homes.[11,22]

National attempts to promote vision and eye health among institutionalized residents have largely been unsuccessful. Resolutions proposed by the American Public Health Association in 1992 and 1997 as well as the 2016 National Academies of Sciences, Engineering, and Medicine report[24] have resulted in little progress to document the clinical characteristics, functional capacity, and impact of vision loss on the lives of nursing home residents. We have explored and could find only isolated cases where skilled care facilities established protocol or commitment for eye care services. Yet, most vision problems are amenable to correction, improvement, or remediation—interventions that could substantially improve the quality of life and functioning of people living in nursing homes.[25] Early detection and treatment of age-related eye diseases and appropriate refractive corrections represent essential first steps in identifying key factors potentially linking vision loss with cognitive decline, frailty, and falls—all critical to care planning and resident centered care.[26–28]

The purpose of this study is 2-fold. First, we wish to examine the vision and eye health of a large study population of older people residing in nursing homes in Delaware. The DNHES contains 2019 complete patient eye examinations from 20 nursing homes collected by a single eye care professional over a 7-year period. Each patient record includes a comprehensive eye examination, with diagnosis of eye disease, acuity, and functional measures as well as demographic and health characteristics. Second, we wish to compare the findings of DNHES analysis with the reports of vision impairment in other US investigations. We are particularly interested in how vision is reported, that is, self-reported or staff reported vision impairment, case record review, measured visual acuity, or diagnosis of eye disease. Each vision factor has utility for improving the nursing home environment, staff-patient interaction, or ongoing eye care. For example, a general understanding of “vision impairment” should lead to greater attention to the environment, need for vision rehabilitation services, treatment of eye disease, or correction of refractive error. More granular knowledge of visual function and eye health should lead to more precise interventions leading to measurable improvements in function, overall health, and quality of life. We wish to use the findings from our examination of the DNHES to inform these important issues.

Table 1
Characteristics of Nursing Home Studies in the United States and the Most Recent European Study that Reported the Prevalence of AREDs and/or Vision Impairment and Blindness

Author (Year)	Design	No. of Facilities	N	Age, y	Methods	Cataract, %	Glaucoma, %	MD, %	DR, %	VI, %	Blind, %
Kornzweig (1957)[13]	P	1	1000	≥65	PH*, VA*, EH*	61	5.30	29.3	NA	NLP = 13.9	NA
Whitmore (1989)[14]	P	1	225	≥60	PH†, VA*, EH‡	81	NA	37	2.1	44	30
Wingert (1992)[15]	R	1	47	≥55	PH‡, VA‡, EH‡	83	6	17	NA	NA	NA
Tielsch (1995)[12]	P	30	499	≥40	PH*, VA*, EH*	NA	NA	NA	NA	18.8	17
Eichenbaum (1999)[9]	R	2	732	≥65	PH*, VA*, EH*	82.5	41.4	70.7	1.7	NA	NA
Keller (2001)[16]	R	2	134	≥60	PH†, VA*, EH*	51	11	17	3	46	15
West (2003)[17,§]	P	28	1305	≥65	PH*, VA*, EH‖	NA	NA	NA	NA	38	NA
Voytas (2004)[18]	R	1	160	Mean 83	PH*, VA**, EH**	NA	40	NA	NA	NA	NA
Friedman (2004)[19,§]	P	28	1307	≥65	PH*, VA*, EH‖	NA	NA	NA	NA	37	NA
Owsley (2007)[20]	P	17	380	≥55	PH*, VA*, EH‡	32.5	8.2	4.6	3.1	57	10
Andersson (2020)[21,††]	R	20	1856	≥65	PH*, VA*, EH*	NA	NA	NA	NA	67	8.7
Larsen (2018)[22,‡‡]	P	32	600	≥50	PH*, VA*, EH*	NA	NA	NA	NA	24	5

DR, diabetic retinopathy, MD, macular degeneration; NA, not available; NLP, no light perception; P, prospective; R, retrospective; VI, vision impairment.
Vision assessment: visual acuity and/or refraction; clinical methods varied by study. Eye health assessment: Clinical methods used varied by study.

*Methodology: yes.
†Methodology: performed but not described.
‡Methodology: patient records.
§Derived from Salisbury Study SS.
‖Methodology: those with vision impairment.
**Methodology: no.
††Derived from DNHES data set.
‡‡European study.

Methods

Data Set

The DNHES is a cross-sectional, retrospective study. Clinical data were collected from nursing home residents in Delaware from 2005 to 2011. This study followed the tenets of the Declaration of Helsinki and was approved by the Institutional Review Board of Salus University.

A total of 5720 clinical eye examination records from 20 Delaware nursing homes were selected and deidentified. Of those, a total of 2693 initial patient examinations were identified. After exclusion of patients younger than 65 years (n = 557), missing age (n = 22), and home care patients (n = 95), 2019 patients remained for analysis. Content and structure of the comprehensive eye examination is described elsewhere.[21]

Study Sites

At the time these data were collected, there were 48 certified Medicare and Medicaid nursing homes in Delaware; all were contacted, and 20 (42%) agreed to allow eye care services. The facilities ranged from 46 to 205 beds with the median of approximately 100 beds. Participating facilities represented approximately 1800 beds (43% of total state beds). Four were government facilities, and the remainder were for profit (11) and nonprofit (9).

Study Population Participation

Patients seen for vision examinations were referred based on federally established referral criteria or orders from the facility medical director or attending physicians. Families or patients could also make a request. At all 4 government facilities, vision examinations were made part of the entrance physical for each patient, and every patient received an eye examination when they were admitted and followed by standard clinical protocols thereafter.

Examination

All vision examinations were conducted by a single provider, the first author of this manuscript. Each patient received a standardized examination, in conformance with the Centers for Medicare & Medicaid Services guidelines. The examination included a detailed medical and ocular history, refraction, tonometry, biomicroscopy, and dilated funduscopy.[29] More than 200 variables were collected for each patient eye examination.

All examinations were performed in the patient's room or a designated examination area. Patients were seen bedside when not ambulatory. Presenting visual acuity was measured using a portable Burnell BC/1264 wall chart that was calibrated for a 10-foot testing distance. Letters were black on a white background. Acuity was tested with spectacles, if available. Near acuity was measured using a Good-Lite Company Standard Reading Test Card held at a 16-inch testing distance. Presenting visual acuity was selected as the variable to define the visual status of the patient. Corrected acuity could only be obtained by the use of a trial lens, which was not logistically possible for every patient examination, nor was it possible to measure corrected acuity at the time spectacles were dispensed. Therefore, presenting acuity represents the patient's visual status as it exists in facilities where there are no eye care services. Particular care was taken to obtain acuities from all patients, including those who could not verbally communicate or were illiterate. In these cases, patients were permitted to respond by raising their hand; if the patient could not subjectively respond, an objective method was employed. The examiner observed the presence or absence of foveal fixation to determine the classification of normal vision, vision impairment, and blindness. If patients were observed to hold fixation on a presented 20/40 acuity target for 2 to 3 seconds, acuity was classified as normal. If the patient did not hold fixation, acuity was classified as vision impaired. Blindness classification required acuity worse than 20/200, and was determined by objective standard clinical means. Intraocular pressure was measured using a Reichert Tono-Pen AVIA Tonometer. External ocular assessment was accomplished with a handheld WelchAllyn portable biomicroscope. Every patient was dilated and internal examinations were performed using a direct and indirect ophthalmoscope with a 20-diopter condensing lens. Refractive error was determined by use of the Welch Allyn SureSight Autorefractor. It was not possible to trial frame every patient, so retinoscopy with loose lenses was performed.

Study Variables

All study variables were programmatically abstracted using Python 3.7 from original patient examination records captured in Excel files. Where irregular or missing values were identified, records were manually reviewed.

Key Variables Selection Criteria

Presenting visual acuity was used to define the vision status of the patient. Vision impairment and blindness was defined by US criteria,[30] where vision impairment is defined as best-corrected acuity between 20/40 but better than 20/200 and blindness as 20/200 or worse. Age-related eye health variables were defined using clinically established criteria,[31,32] where cataract was defined as trace to +4 for any type of cataract; treated cataracts were also included; glaucoma was defined as cupping greater than 0.6, and/or intraocular pressure greater than 21, or patient was prescribed glaucoma medication. Macular degeneration was recorded when the documented diagnosis was "wet" or "dry," diabetic retinopathy when the documented diagnosis was nonproliferative or proliferative, and systemic diabetes when it was documented in the patient's medical record.

Results

Study Sample

Table 2 summarizes patient demographic and clinical characteristics overall and stratified by vision status. Patients had a mean age of 82.2 years (standard deviation = 8.2) and the majority were female (62.2%) and white (75.5%). Prevalence of AREDs in this population was 60% for cataract, 75% for macular degeneration, 26% for glaucoma, and 7.7% for diabetic retinopathy. In addition, 36.4% of the study sample had systemic diabetes. The proportion of patients with normal vision was 36.2% (n = 731), impaired vision was 49.3% (n = 997), and blindness was 14.1% (n = 291). Compared with people reporting normal vision, patients with impaired vision or blindness were on average older, more likely to be female, have an ARED, or systemic diabetes.

Table 3 presents the prevalence of patients who were vision impaired or blind as well as the prevalence of only blind patients. The overall prevalence of vision impairment or blindness was 63.8% [95% confidence interval (CI) 61.7-65.9] and was above 60% for each age, sex, and race category. Prevalence of vision impairment or blindness was 68.4% (95% CI 65.7-71.0) with cataracts, 69.4% (95% CI 65.2-73.4) with macular degeneration, 70.5% (95% CI 66.5-74.4) with glaucoma, and 68.4% (95% CI 60.4-75.6) with diabetic retinopathy. Overall prevalence of blindness was 14.1% (95% CI 12.9-16.0). Among patients with AREDs, prevalence of blindness ranged from 15.0% (95% CI 13.0-17.1) for patients with cataracts to 22.6% (95% CI 16.3-30.0) for patients with diabetic retinopathy.

Table 2
Characteristics of the Study Population Overall and Stratified by Vision Status

Variables	Total (N = 2019)	Normal Vision (n = 731)	Impaired Vision (n = 997)	Blind (n = 291)
Age, y, mean (SD)	82.2 (8.2)	81.4 (7.8)	82.2 (8.4)	84.2 (8.1)
Sex				
Male	763 (37.8)	305 (41.7)	357 (35.8)	101 (34.7)
Female	1256 (62.2)	426 (58.3)	640 (64.2)	190 (65.3)
Race				
White	1525 (75.5)	562 (76.9)	746 (74.8)	217 (74.6)
Black	443 (21.9)	153 (20.9)	225 (22.6)	65 (22.3)
Other	51 (2.5)	16 (2.2)	26 (2.6)	9 (3.1)
Cataract				
No	809 (40.1)	349 (47.7)	350 (35.1)	110 (37.8)
Yes	1210 (59.9)	382 (52.3)	647 (64.9)	181 (62.2)
Macular degeneration				
No	1522 (75.4)	579 (79.2)	764 (76.6)	179 (61.5)
Yes	497 (24.6)	152 (20.8)	233 (23.4)	112 (38.5)
Glaucoma				
No	1486 (73.6)	574 (78.5)	738 (74)	174 (59.8)
Yes	533 (26.4)	157 (21.5)	259 (26)	117 (40.2)
Diabetic retinopathy				
No	1864 (92.3)	682 (93.3)	926 (92.9)	256 (88.0)
Yes	155 (7.7)	49 (6.7)	71 (7.1)	35 (12.0)
Diabetes				
No	1285 (63.6)	481 (65.8)	622 (62.4)	182 (62.5)
Yes	734 (36.4)	250 (34.2)	375 (37.6)	109 (37.5)

Unless otherwise noted, values are n (%).

Table 4 presents association estimates for vision impairment or blindness with age, sex, race and ethnicity, AREDs, and systemic diabetics. In unadjusted analyses, odds of vision impairment or blindness were significantly higher among patients 95-104 years old compared with patients 65-74 years old [odds ratio (OR) 2.80, 95% CI 1.69-4.64] and was higher among women compared with men (OR 1.30, 95% CI 1.08-1.56). The odds were also significantly ($P < .01$) higher among patients with cataract, macular degeneration, and glaucoma. Adjusting for variables with unadjusted P value $< .15$, significantly increased odds were observed for patients with cataract (OR 1.95, 95% CI 1.60-2.38), macular degeneration (OR 1.36, 95% CI 1.08-1.72), and systemic diabetes (OR 1.25, 95% CI 1.03-1.53). In post hoc analysis, diabetic retinopathy replaced systemic diabetes in the adjusted model, and the resulting OR for patients with diabetic retinopathy was 1.35 (95% CI 0.94-1.93) (results not shown).

Table 5 presents association estimates for blindness ($P < .15$). In the adjusted model, the odds of blindness were over 2 times higher among patients with macular degeneration (OR 2.14, 95% CI 1.62-2.84), glaucoma (OR 2.20, 95% CI 1.69-2.86), or diabetic retinopathy (OR 2.09, 95% CI 1.38-3.15).

Discussion

In this examination of 2019 subjects aged ≥65 years from the Delaware Nursing Home Eye Study, we found that 1288 (63.8%) were visually impaired or blind. In addition, 59.9% had cataract or treatment, 75.4% were diagnosed with macular degeneration, 26.4% had glaucoma, and 7.7% had diabetic retinopathy. Most people who had AREDs also reported vision impairment and blindness; however, a portion of people with macular degeneration (20.8%), glaucoma (21.5%), and diabetic retinopathy (6.7%) continued to have normal vision. We also found that older old adults, women, and those with diagnosed eye diseases had greater odds of vision impairment and blindness.

We compared the findings of the DNHES to 11 previous nursing home studies (see Table 1). We found great variation in how vision impairment, blindness, and AREDs were assessed and reported as well as in resulting prevalence estimates. Only 4 studies diagnosed AREDs and characterized visual function. For the 7 studies reporting AREDs, the prevalence of cataract ranged from 32%[20] to 83%.[33] Our study showed a prevalence of 59.9%, which agrees favorably with 56.6% reported by Andersson from a smaller subset analyses of these data.[34] Macular degeneration ranged from 4.6%[20] to 70.7%.[9] Our study showed 75.4%. Glaucoma ranged from 5.3%[13] to 41.4%.[9] Our analysis showed 26.4%. Only 4 studies reported diabetic retinopathy, with prevalence ranging from 1.7%[9] to 3.1%.[20] Our study showed 7.7%. There are several factors that may contribute to this variability in responses. In our study, subjects were referred for eye care; therefore, there was wide variability of the referral patterns based on the facility. The referral average was 41% of new admissions; the range was 6% to 100% patient referrals. These are common barriers encountered when eye care services are provided in skilled care facilities. Some higher prevalence estimates may be attributed to selection criteria. Additionally, patient examination by an eye care specialist is likely to

Table 3
Prevalence of Vision Loss According to Demographics, Age-Related Eye Diseases, and Diabetes

Variables	n	Impaired or Blind		Blind	
		Cases	Prevalence (95% CI)*	Cases	Prevalence (95% CI)*
Age, y					
65-74	391	240	61.4 (56.4-66.2)	45	11.5 (8.5-15.1)
75-84	787	481	61.1 (57.6-64.5)	98	12.5 (10.2-15.0)
85-94	721	469	65.1 (61.4-68.5)	118	16.4 (13.7-19.3)
95-104	120	98	81.7 (73.6-88.1)	30	25.0 (17.6-33.7)
Sex					
Male	763	458	60.0 (56.5-63.5)	101	13.2 (10.9-15.9)
Female	1256	830	66.1 (63.4-68.7)	190	15.1 (13.2-17.2)
Race					
White	1525	963	63.2 (60.7-65.6)	217	14.2 (12.5-16.1)
Black	443	290	65.5 (60.1-69.9)	65	14.7 (11.5-18.3)
Other	51	35	68.6 (54.1-80.9)	9	17.7 (8.4-30.9)
Cataract	1210	828	68.4 (65.7-71.0)	181	15.0 (13.0-17.1)
Macular degeneration	497	345	69.4 (65.2-73.4)	112	22.5 (18.9-26.5)
Glaucoma	533	376	70.5 (66.5-74.4)	117	22.0 (18.5-25.7)
Diabetic retinopathy	155	106	68.4 (60.4-75.6)	35	22.6 (16.3-30.0)
Diabetes	734	484	65.9 (62.4-69.4)	109	14.9 (12.4-17.6)

*95% CI computed from exact binomial distribution.

Table 4
Unadjusted and Adjusted Associations With Vision Impairment or Blindness

Covariate	Unadjusted		Adjusted	
	OR (95% CI)	*P* Value	OR (95% CI)	*P* Value
Age, y				
65-74	Reference		Reference	
75-84	0.99 (0.77-1.27)	.93	1.07 (0.83-1.38)	.61
85-94	1.17 (0.91-1.51)	.23	1.36 (1.03-1.81)	.031
95-104	2.80 (1.69-4.64)	<.001	3.26 (1.92-5.55)	<.001
Sex				
Male	Reference		Reference	
Female	1.30 (1.08-1.56)	.006	1.29 (1.06-1.56)	.011
Race				
White	Reference			
Black	1.11 (0.89-1.38)	.37		
Other	1.28 (0.70-2.33)	.43		
Cataract				
No	Reference		Reference	
Yes	1.64 (1.37-1.98)	<.001	1.95 (1.60-2.38)	<.001
Macular degeneration				
No	Reference		Reference	
Yes	1.39 (1.12-1.73)	.003	1.36 (1.08-1.72)	.009
Glaucoma				
No	Reference		Reference	
Yes	1.51 (1.22-1.87)	<.001	1.46 (1.17-1.82)	<.001
Diabetic retinopathy				
No	Reference			
Yes	1.25 (0.88-1.77)	.22		
Diabetes				
No	Reference		Reference	
Yes	1.16 (0.96-1.40)	.13	1.25 (1.03-1.53)	.026

identify more pathology than review of potentially fragmented patient records. The age and racial or ethnic composition of nursing home residents may account for some variation in eye diseases.

Table 5
Unadjusted and Adjusted Associations With Blindness

Covariate	Unadjusted		Adjusted	
	OR (95% CI)	*P* Value	OR (95% CI)	*P* Value
Age				
65-74	Reference		Reference	
75-84	1.09 (0.75-1.59)	.64	1.03 (0.70-1.52)	.88
85-94	1.50 (1.04-2.17)	.030	1.23 (0.83-1.82)	.31
95-104	2.56 (1.53-4.30)	<.001	2.05 (1.19-3.55)	.010
Sex				
Male	Reference		Reference	
Female	1.17 (0.90-1.52)	.24	1.01 (0.77-1.32)	.97
Race				
White	Reference			
Black	1.04 (0.77-1.40)	.82		
Other	1.29 (0.62-2.69)	.49		
Cataract				
No	Reference			
Yes	1.12 (0.87-1.44)	.40		
Macular degeneration				
No	Reference		Reference	
Yes	2.18 (1.68-2.84)	<.001	2.14 (1.62-2.84)	<.001
Glaucoma				
No	Reference		Reference	
Yes	2.12 (1.64-2.75)	<.001	2.20 (1.69-2.86)	<.001
Diabetic retinopathy				
No	Reference		Reference	
Yes	1.83 (1.23-2.73)	.003	2.09 (1.38-3.15)	<.001
Diabetes				
No	Reference			
Yes	1.06 (0.82-1.37)	.67		

Seven of the 11 studies we reviewed reported visual acuity, vision impairment, and/or blindness. As noted in our findings, a small percentage of our study sample were diagnosed with eye disease and continued to demonstrate normal vision. Therefore, reports of visual function and vision impairment may underestimate AREDs. Nevertheless, vision impairment was not reported consistently among these 7 studies. One reported "poor vision—NLP" (no light perception) at 13.9%.[13] Two reported acuities, and 3 reported vision impairment and blindness. Vision impairment or blindness ranged from 29%[22] to 67%,[20,21] and visual acuity less than 20/40 ranged from 61%[16] to 74%.[14] Our study showed the prevalence of vision impairment and blindness to be 63.4%. Although each of the studies reporting acuity and vision impairment or blindness employed a standard evaluation protocol and case definition in their studies, wide variability remains.

The results from our investigation as well as comparisons of 11 other studies raise several important concerns regarding vision and eye health in nursing home settings. First, some studies have explored vision impairment as a risk factor for institutionalization. More needs to be known about vision impairment as it relates to risk for institutional care and how addressing vision health and vision rehabilitation might avert institutional care.[35,36] Second, vision and eye health should be regularly addressed when a resident is admitted and as a part of subsequent health care. Because of a lack of standard vision assessment, the magnitude of the problem is unknown. Our study, and others, demonstrate that vision and eye health are overwhelmingly great concerns for nursing homes, with well over 60% of residents reporting vision impairment. Third, robust data on eye disease and visual function should be collected in a systematic way across institutions, so data can be aggregated at the facility, state, and national levels to inform policy and practice. Fourth, even if vision is addressed, a question arises whether to identify AREDs or employ a measure of vision impairment or blindness. As noted, we found that a small percentage of people in Delaware nursing homes had eye diseases and continued to report normal vision. A measure of vision impairment or blindness would not capture these individuals. Moreover, knowing an eye disease potentially leads to interventions to maintain, improve, or restore visual function. The provision of appropriate refractions should improve function.[20] Fifth, although an assessment of visual function to identify vision impairment and blindness should lead to treatment, the high prevalence of vision impairment suggests that environments should be more accommodating for people experiencing vision loss. For example, changes to the built environment may include better illumination, better color and border contrast, decreased glare, reduction of trip hazards, and better use of landmarks. Staff might identify themselves when they enter or leave a room and explain and anticipate actions like taking medicines or walking to destinations. Sixth, given the growing knowledge regarding the association between falls, depression, Alzheimer's, and dementia, systematic efforts should be implemented to address these important dyads.[7,20,37–40]

Future Research

Although this study identified remarkably high prevalence of vision impairment and blindness and patterns of age-related eye diseases among nursing home residents, we believe this work creates the foundation for additional policy and practice research regarding vision and eye health care among people residing in nursing homes. For example, would an awareness campaign among nursing home care staff, administrators, providers, caregivers and physicians result in greater attention to eye care? Can eye care be integrated systematically into nursing homes at admission and at regular intervals to improve vision outcomes? What kind of resources and associated costs are required to provide eye care and follow-up care in a nursing home setting?

Limitations

The strength of this study is marked by the rigorous and comprehensive nature of the eye examinations and the large study population employed in this investigation. The study is limited by the selection criteria limiting participation in an eye examination. Retrospective assessment of clinical data prevented the use of best-corrected visual acuity. The characteristics of the residents of the Delaware facilities may not be representative of the state or the nation.

Conclusion and Implications

Our investigation shows that a remarkable proportion, 63.8% of nursing home residents, have vision impairment or blindness. The high proportion of vision impairment and AREDs suggests that vision and eye health should be well integrated into nursing care and research. In addition, the lack of consistent measures of visual function and eye diseases makes it impossible to aggregate information. Therefore, a systematic method to collect vision data could establish foundational evidence to improve eye health, overall health, and quality of life, and to inform practice and policy.

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