Health Status Attributes of Older African-American Adults with Hearing Loss

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This article describes a study that examined hearing loss and health-related quality of life (HRQoL) attributes of 71 African-American older adults ranging in age from 60 to 89 years. Demographic profiles were used to obtain pertinent case histories, audiometric testing was used to obtain estimates of peripheral hearing sensitivity, and middle-ear integrity was assessed via tympanometry. The health status (i.e., HRQoL) attributes were determined via self-report scores on the Medical Outcomes Study 36-Item Short-Form Health Survey (SF-36). Results from bivariate analyses determined statistically significant correlations between hearing loss and lower SF-36 scores across subscales. Multivariate regression models revealed a statistically significant impact between hearing loss and lower SF-36 scores across subscales, even after controlling for experimental confounds. These findings suggest that hearing loss is capable of contributing to HRQoL deficits in African-American older adults. The importance of these data in terms of pre-existing attitudes of African-American older adults towards hearing healthcare services and long-term effects of untreated hearing loss are considered.

Key words: African Americans ■ blacks ■ elderly ■ hearing loss ■ health status ■ quality of life

INTRODUCTION

Presbyacusis, a chronic health-related condition described as hearing loss associated with aging, presents as insidious, progressive, high-frequency, sensorineural hearing impairment.[1] The major complaint of older adults with presbyacusis is communicative difficulty, particularly in the presence of background noise and/or reverberation.[2-3] Presbyacusis has the ability to influence communication ability to the point where the older adult may be handicapped in a psychosocial (i.e., social, personal, emotional) manner. This condition is evident in the existing literature, where previous studies have shown that older adults with presbyacusis exhibit increased levels of depression, social isolation, loneliness, cultural detachment, and feelings of danger to personal safety.[4-10] As a result, presbyacusis may, in turn, affect an individual's degree of functional (i.e., physical and/or mental) health status and health-related quality of life (HRQoL).[11-14]

Although data are available from previous studies that have determined the influence of hearing impairment,[4-12,14] limited investigations exist that have attempted to explore HRQoL in older adults with hearing loss from culturally diverse backgrounds (i.e., African-American, Hispanic-American, Asian-American, Pacific Islander, Native-American).[15-18] In light of the hearing impairment prevalence rate among older adults, reported as low as 20% and as high as 45%,[19-22] ancillary research efforts are needed to explore the effects of hearing loss in more diverse populations. Given this circumstance, the impetus for this investigation was to assess health status in older African-American adults with documented hearing loss.

METHOD

Design and Subject Selection

The cross-sectional design of the study required subjects to complete case history and demographic information forms, a health status questionnaire, and undergo audiometric evaluation. Audiometric testing was used to determine hearing loss accord-

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ing to the pure-tone average (PTA), which represents an arithmetic mean threshold in decibels hearing level (dB HL) across octave frequencies 0.5 kHz, 1 kHz, and 2 kHz.[23] Categorical and continuous variables were associated with hearing loss, which were then used to determine the impact of hearing loss on self-reported HRQoL attributes.

Subjects were obtained based on printed announcements detailing the project, which were distributed to outpatient populations at a university-based speech and hearing clinic and a community-based healthcare practice in north central Florida. Inclusion criteria included: a) age between 60 and 90 years, b) English as a first language, and c) self-description of race/ethnic background as African-American on the case history/demographic profile. Exclusion criteria consisted of: a) normal hearing (PTA < 25 dB HL), b) chronic bedfast/chairfast history, c) history of chronic terminal illness or senile dementia, d) history of stroke or other cerebral vascular disorder with paresis/aphasia, and e) prior hearing-aid use (more than 30 days).

Variables

Independent variables in this investigation were gender and hearing loss. Gender was coded categorically, while the better hearing ear of each subject was determined numerically according to the ear with lower audiometric scores. In cases where PTAs were symmetrical bilaterally, the right ear was selected as the better hearing ear. Covariates such as age, income, highest level of completed education, number of medications in use, and number of coexisting medical conditions were obtained from written case history/demographic profiles.

Dependent variables were self-report scores across scales on the Medical Outcomes Study 36-Item Short-Form Health Survey (SF-36),[24-25] a well-established instrument used to determine the influence of chronic health conditions on quality of life and well-being.[26-31] The SF-36 is a standardized 35-item questionnaire that assesses HRQoL across eight separate dimensions: physical function (PF), role limitations due to physical problems (RP), bodily pain (BP), general health (GH),

Table 1. Characteristics of Study Participants (N=71)

Variable	N	%	Mean	SD	Range
Age (Years)			70.01	8.41	60–89
60–69	38	53.5			
70–79	24	33.8			
80–89	9	12.7			
Gender					
Male	24	33.8			
Female	47	66.2			
Completed Education					
< Junior high	23	32.4			
High school	31	43.7			
College	12	16.9			
College (Postgraduate)	5	7.0			
Work Status					
Unemployed	7	9.9			
Part-time	2	2.8			
Full-time	7	9.9			
Retired	55	77.5			
Income					
$0–$20,000	45	63.4			
$20,001–$40,000	13	18.3			
>$40,001	3	4.2			
Not reported	10	14.1			
Coexisting Medical Conditions			1.9	1.4	0-7
Medications in Use			2.3	1.8	0-9

Table 2. Means and Standard Deviations (SD) of Pure-Tone Audiometric Measures across Octave Frequencies 0.5–8 kHz in African-American Older Adults (N=71)

	Audiometric Frequency (Hz)[a]				
Gender	500 Mean (SD)	1,000 Mean (SD)	2,000 Mean (SD)	4,000 Mean (SD)	8,000 Mean (SD)
Male (n=24)					
Right ear	29 (11)	30 (10)	40 (16)	50 (17)	55 (25)
Left ear	28 (9)	27 (10)	36 (13)	49 (17)	54 (22)
Female (n=47)					
Right ear	35 (11)	34 (12)	36 (13)	44 (18)	52 (22)
Left ear	33 (13)	31 (14)	35 (16)	41 (21)	50 (24)

[a] Measures of peripheral hearing sensitivity are presented in decibels hearing level (dB HL).[23]

energy/vitality (VT), social function (SF), role limitations due to emotional problems (RE), and mental health (MH). Algorithms are available which can be used to compute scores for each dimension.[32] The 36th item of the survey is a health transition rating that asks respondents to rate their current health status compared to one year ago. This item was neither included in the present study nor used when scoring any of the eight dimensions. Lower scores across each dimension indicate greater HRQoL deficits. However, higher scores on the BP scale represent freedom from pain. High levels of test-retest reliability and high levels of internal consistency reliability on the SF-36 across race/ethnic boundaries have been established.[24,33,34]

Procedure

The informed consent document was combined with relevant case history forms and a SF-36 into a single packet. All potential subjects were provided with the packet along with printed instructions, with the intent on having each subject review and sign the informed consent document as well as complete all forms without assistance. Each subject was instructed to endorse those items that corresponded as closely as possible to their condition at the time of measurement.

In order to provide appropriate written responses on each document, it was required that all subjects possess the ability to read and/or understand material written in the English language. Documentation of sufficient literacy to read and/or comprehend the written documents was obtained via direct inquiry by the author or by additional research personnel involved in data collection. When subjects presented questions concerning unfamiliar items, verbal explanations and clarifications were provided as needed. Potential subjects unable to complete the forms or furnished partial data were considered ineligible, and their data were excluded from the study.

Subjects who met the inclusion criteria and completed the packet of forms underwent audiometric testing at no cost to the patient. Estimates of peripheral hearing sensitivity, obtained in sound-treated and isolated test environments under earphones, were measured in each ear at octave frequencies from 0.5–8 kHz using an adaptive ascending method of limits.[35] Assessment of middle-ear function was conducted via tympanometry. All tympanometry measures were considered normal if middle-ear pressure was within ±100 daPa, and Type A configuration was obtained.[36]

Statistical Evaluation

All data were stored on computer spreadsheets in a comma-delimited format and analyzed with SAS (version 8.2) software.[37] Case profiles were determined via descriptive and Chi-square statistical tests. Analysis of variance (ANOVA) tests were used to determine statistically significant differences in the estimates of peripheral hearing in each ear owing

Table 3. Means, SDs, and Ranges of Health Status Obtained from the SF-36 in African-American Older Adults (N=71)

Variable	Mean	SD	Range
Physical Function	58.22	27.74	0–100
Social Function	78.69	22.69	25–100
Bodily Pain	67.04	26.55	0–100
General Health	62.29	20.16	15–100
Energy/Vitality	58.45	21.65	0–100
Role Limitation—Physical	65.40	41.58	0–100
Role Limitation—Emotional	70.36	39.74	0–100
Mental Health	76.33	21.16	12–00

to gender as well as gender differences across SF-36 scores. Bivariate relations between health status attributes and hearing loss were determined via Pearson-Product correlation coefficients. Ordinary least squares (OLS) regression was used to examine the influence of hearing loss on the means of SF-36 scores while controlling for experimental confounds (age, income, education level, number of medications in use, and number of coexisting medical conditions). Standardized regression coefficients (betas) for differing levels of hearing impairment were also determined. Where applicable, p-values <0.05 were considered as statistically significant.

RESULTS

Subject Attrition

Of the 133 individuals who expressed an interest in the study, 71 individuals met the inclusion criteria and represented the study sample. The 47% (n=62) attrition was due to excluding data of subjects with packets that were considered incomplete (23), appointment(s) for the hearing test were not kept (31), and general disinterest/dropouts (eight).

Characteristics of the Sample

The 71 subjects ranged in age from 60 to 89 years (mean age=70.01 years, SD=8.41 years), with females representing 66% (n=47) and males representing 34% (n=24) of the total sample. Other descriptive characteristics are listed in Table 1. As shown, most study participants reported a high-school education, were retired, and yearly income ranging from $0 to $20,000. Statistically significant gender differences from Chi-square analyses were not found for each demographic variable.

Hearing Loss

Mean pure-tone audiometric thresholds for right and left ears across frequencies 0.5k–8kHz at octave intervals for male and female subjects are shown in Table 2. These findings reveal that all subjects included in the sample exhibited audiometric configurations in each ear consistent with mild-to-moderate high-frequency sensorineural hearing impairment. The ANOVA procedures, with one between subject factor (gender) and one within subject factor (audiometric frequency), indicated differences in audiometric thresholds across ears, and owing to gender were not statistically significant at any of the frequencies tested.

Irregularities obtained from background case data and ear inspection procedures (e.g., evidence of previous ear surgery, tympanic membrane perforations, excessive cerumen accumulation, impacted cerumen, foreign bodies and/or unspecified ear canal obstructions) did not exclude any of the subjects contained in the sample. Although not shown, tympanometric measures provided data consistent with normal middle ear functioning for all subjects.

Health Status Attributes

Means and standard deviations of SF-36 scores are shown in Table 3. Statistical evidence for a high level of internal consistency reliability was obtained, with Cronbach's coefficient alpha across attributes ranging from 0.82 to 0.86. One-way ANOVA revealed statistically significant gender differences in mean SF-36 scores did not occur.

Bivariate Analyses

Pearson-Product correlation coefficients used to determine relations between hearing loss and each health status attribute are shown in Table 4. Greater degrees of hearing loss were significantly ($p<0.05$) related to greater self-perceived deficits in physical function (PF: r=-0.39), social function (SF: r=-0.27), energy/vitality (VT: r=-0.30), role limitations due to physical problems (RP: r=-0.33), and mental health functioning (MH: r=-0.25). Statistically significant relations between hearing loss, bodily pain (BP),

Table 4. Bivariate Correlation Matrix for Hearing Loss and Health Status (SF-36) in African-American Older Adults (N=71)

Variable	1	2	3	4	5	6	7	8	9
1. Pure-Tone Average	—	-0.39**	-0.27*	-0.22	-0.18	-0.30**	-0.33*	-0.07	-0.25*
2. Physical Function		—	0.43	0.46	0.53	0.48	0.56	0.26	0.24
3. Social Function			—	0.54	0.47	0.62	0.54	0.41	0.46
4. Bodily Pain				—	0.37	0.58	0.53	0.45	0.27
5. General Health					—	0.52	0.45	0.21	0.28
6. Energy/Vitality						—	0.42	0.37	0.47
7. Role Limitation—Physical							—	0.62	0.27
8. Role Limitation—Emotional								—	0.45
9. Mental Health									—

*p≤0.05; **p≤0.01

general health (GH), and role limitations due to emotional problems (RE) did not occur.

Multivariate Analyses

Independent variables and covariates were included in an OLS modeling approach. Only the health status attributes (i.e., PF, SF, VT, RP, MH) that were significantly related to hearing loss in bivariate analyses were used in the multivariate analysis. Table 5 shows standardized regression coefficients (betas)—with standard errors in parentheses—of the difference in each selected health status attribute associated with a change of one standard deviation in hearing loss when holding constant the other independent variables and covariates. In doing so, hearing loss registered a statistically significant ($p<0.05$) independent effect of lower function scores on four of the five remaining health status attributes (PF: ß=-0.15; SF: ß=-0.21; VT: ß=-0.32; RP: ß=-0.29). These findings also point out that when controlling for experimental confounds, hearing loss was significantly related to greater self-perceived deficits in health status—most notably physical function and role limitations due to physical problems.

DISCUSSION

This study was conducted to determine the influence of hearing loss on health status attributes in African-American older adults. The hearing loss exhibited by subjects involved in this study are equivalent with previous age-, race-, and gender-related studies of hearing loss by other investigators using similar older adult populations.[11,12,15,38] These findings are important because hearing loss ranks among the top four chronic health conditions experienced by older individuals, exceeded by only arthritis, high blood pressure, and heart disease, followed by orthopedic problems, cataracts, chronic sinusitis, and diabetes mellitus.[39]

In terms of health status, the SF-36 has gained acclaim in medical and healthcare literature, in that it provides indices which are useful in understanding the burden associated with chronic health conditions.[26-31] It should be noted that SF-36 scores obtained from African-American older adults in this sample are consistent with national SF-36 norms that account for the influence of age and gender.[32] Additionally, Cronbach's coefficient alpha across SF-36 attributes ranged from 0.82 to 0.86. Cronbach's alpha is an index of reliability associated with the variation accounted for by the true score of each underlying construct. Higher levels of internal consistency are harmonious with increased reliability, and scores that equal or exceed 0.7 are preferable.[40] Reliability tests are especially important when the derivative variables are intended for subsequent predictive analyses. If the intended scale(s) show(s) poor internal consistency reliability, then individual items within scales must be re-examined, modified, or completely changed. Due to the high levels of internal consistency reliability across SF-36 attributes obtained in this investigation, modifications were not needed.

From bivariate analyses, hearing loss was significantly related to greater self-perceived deficits on five of the eight health status attributes (PF, SF, VT, RP, MH) on the SF-36. The most noteworthy finding from bivariate analyses occurred between hearing loss and physical function (PF: $r=-0.39$, $p<0.01$, see Table 4) as well as between hearing loss and role limitations due to physical problems (RP: $r=-0.33$, $p<0.01$, see Table 4). This condition remained in OLS models that isolated the effect of hearing loss on physical function (PF: ß=-0.15, $F=3.98$, $p<0.01$, see Table 5) and the effect of hearing loss on role limitations due to physical problems (RP: ß=-0.29, $F=3.47$, $p<0.01$, see Table 5), even after controlling for experimental confounds. However, a noticeable trend occurred; bivariate relations between hearing loss and each health status attribute was noticeably reduced in the OLS approach, and this occurrence is likely due to the variance shared by the combined effects of the other variables.

Findings contained here link hearing loss to HRQoL deficits in African-American older adults, yet these findings are limited, as they also suggest that hearing loss by itself is not an extremely robust predictor of health status. It is certain that other conditions, such as multiple medication usage as well as the presence of multiple medical conditions, may have a greater impact on health status than does hearing loss. It is also readily apparent that multiple medication usage superimposed upon multiple medical conditions has the ability to contribute equally if not greater to the total variance in health attitudes, health-seeking behaviors, and overall health status. At the core of this issue is that relatively little is known about how these prevailing medical conditions in African-American older adults, in addition to the increased likelihood of hearing loss, play a role in HRQoL. The influence of hearing impairment and its effect on health status lies in the difficulties that presbyacusis imposes on communication ability and ultimately independence—assertions that are readily supported clinically.[4-12,14,18,27]

Management of hearing impairment lies in identifying the presence of the condition. Primary care physicians and other healthcare providers can improve the detection process by utilizing a questionnaire approach and an audioscope as part of their screening regimen,[41] and patients with suspected hearing impairment from the physical examination and screening procedures should be referred to an otolaryngologist and an audiologist for a more comprehensive evaluation. If hearing impairment is confirmed, then the healthcare provider(s) should insist

upon an intervention program geared towards improving communication. However, several reports have determined that a large portion of older adults with hearing problems are neither diagnosed, treated, nor actively involved in audiological rehabilitation.[42-45] The consequences of this circumstance are apparent in a recent large-scale study,[46] where it was found that untreated hearing loss has serious long-term emotional and social consequences for older persons. When comparisons were made with individuals with hearing loss and used hearing aids, individuals with untreated hearing loss were more apt to report sadness, depression, worry, anxiety, paranoia, and less social activity. Even when controlling for external factors, such as the respondent's age, gender, and income, greater reductions in social, psychological, and functional health remained. These long-term consequences are pertinent to this study, as there were several African-American older adults who exhibited substantial hearing impairment and were not interested in further intervention, possibly obtaining hearing aids, or free trial periods with assistive listening devices. Hence, the long-term HRQoL effects of untreated hearing loss—even after controlling for sociodemographic factors—among these subjects are highly probable.

Several predisposing factors, other than the prevailing high cost of hearing aids, are offered that may preclude African-American older adults from utilizing hearing healthcare services. Lack of knowledge on behalf of African-American elderly and possibly their primary care providers of where to obtain assistance from hearing healthcare practitioners, how patient-provider relationships influence compliance behaviors, and lack of culturally sensitive educational materials about hearing loss serve as a few examples.[18,38,47-50] It may be due to these attitudes and/or preexisting conditions that hearing loss in African-American older adults may go untreated for extended periods of time and warrants further inquiry.

SUMMARY

This investigation provides data to support the notion that hearing loss is capable of contributing to HRQoL deficits, in terms of health status attributes determined via the SF-36 in African-American older adults. Generalizations based on the data contained here are most germane to independent older African-American adults with mild-to-moderate sensorineural hearing impairment. Trends from the data also suggest that African-American older adults with more pronounced degrees of hearing loss may exhibit greater self-perceived deficits in HRQoL than African-American older adults with lesser degrees of hearing loss. This study adds to the existing literature, as relatively few investigations to date exist that have determined hearing impairment through formalized audiometric testing in African-American older adult populations. More studies that identify hearing impairment among culturally diverse older adults, examine hearing loss and quality-of-life conditions across racial/ethnic boundaries, monitor utilization and compliance patterns of hearing healthcare services, and consider socioeconomic/demographic indicators in determining the influence of hearing loss are in dire need.

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Table 5. Ordinary Least Squares Regression Analysis for Hearing Loss and Health Status (SF-36) in African-American Older Adults (N=71)

	Health Status Attribute[a]							
Variable	**PF**	**SF**	**BP**	**GH**	**VT**	**RP**	**RE**	**MH**
Pure-tone average	-0.15 (0.30)*	-0.21 (0.26)*	—	—	-0.32 (0.24)*	-0.29 (0.45)*	—	-0.30 (0.25)
Gender	-0.07 (6.98)	0.06 (5.98)	—	—	0.17 (5.57)	-0.08 (9.67)	—	0.00 (5.56)
Age	-0.09 (0.45)	0.06 (0.39)	—	—	0.18 (0.36)	0.16 (0.69)	—	0.19 (0.36)
Income	0.15 (1.62)	0.00 (1.39)	—	—	-0.07 (1.29)	0.12 (2.48)	—	0.00 (1.29)
Completed education	0.11 (1.69)	0.13 (1.45)	—	—	0.08 (1.35)	0.05 (2.58)	—	0.11 (1.34)
Coexisting medical conditions	-0.13 (2.82)	0.00 (2.56)	—	—	0.06 (2.39)	-0.16 (4.32)		0.13 (2.43)
Medications in use	-0.30 (2.25)	-0.29 (2.04)	—	—	0.32 (1.91)	-0.28 (3.45)	—	-0.29 (1.94)
R^2	0.30	0.15	—	—	0.18	0.27	—	0.12
Model F value	3.98**	1.58	—	—	2.06	3.47**	—	1.23

[a] Regression coefficients are standardized beta with standard error in parentheses; *p≤0.05; **p≤0.01

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