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RESEARCH BRIEF

The Relationship Between Hearing Loss and Substance Use Disorders Among Adults in the U.S.

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Introduction: Hearing loss is common and associated with poorer health and impeded communication. Little is known about the association between hearing loss and substance use disorders in the general population. The objective of this study was to assess substance use disorder prevalence among individuals with hearing loss, versus those without hearing loss, in a nationally representative sample of adults.

Methods: Two years (2015 and 2016) of National Survey on Drug Use and Health (unweighted N=86,186) were combined to compare substance use disorders among adults with and without self-reported hearing loss. Statistical analysis included descriptive frequencies, chi-square tests, and multiple logistic regressions. Analyses were performed in 2018.

Results: Hearing loss prevalence across all age groups was 5.2%. Among younger age groups, after adjusting for sociodemographics, hearing loss was independently associated with an increased likelihood of experiencing a substance use disorder (ages 18−34 years, AOR=1.34, 95% CI=1.10, 1.64 vs 35−49 years, AOR=1.87, 95% CI=1.39, 2.53). Hearing loss was also associated with a greater likelihood of a prescription opioid use disorder (AOR=2.85, 95% CI=1.86, 4.39) in the group aged 18−34 years and, for the group aged 35−49 years, hearing loss increased the likelihood of both an alcohol use disorder (AOR=1.87, 95% CI=1.39, 2.53) and a prescription opioid use disorder (AOR=1.99, 95% CI=1.01, 3.91).

Conclusions: Hearing loss is independently associated with substance use disorders among those aged 49 years and younger; these associations are particularly pronounced for prescription opioid use disorders in the group aged 18−34 years. Given the concern of inappropriate use of prescription opioids, this information may have implications for healthcare providers' pain management for patients with hearing loss.

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INTRODUCTION

Hearing loss is common; approximately 15% of American adults are affected.[1−3] Studies show that hearing loss is associated with lower SES, poorer mental and physical health, reduced cognitive ability, and impaired activities of daily living.[4−8] Hearing loss appears to be associated with arthritis,[9] leading to the hypothesis that these individual use pain medications more often. A recent national survey of U.S. adults indicates that people with hearing loss were more likely to report regular or heavy use of alcohol and cannabis.[10] However, the analysis did not look at prescription drug use and was underpowered for overall drug use among individuals with hearing loss. This study analyzed the National Survey on Drug Use and Health (NSDUH) to

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investigate whether people reporting hearing loss, compared with hearing peers, have different rates of substance use disorder (SUD; alcohol, cannabis, prescription opioid use disorder, and any SUD), independent of sociodemographic factors.

METHODS

Study Sample

Data were extracted from the NSDUH, a nationally representative cross-sectional survey in the U.S. that provides assessments of functioning and SUDs. The NSDUH uses a multistage area probability sampling design for all 50 states plus the District of Columbia, and randomly interviews non-institutionalized individuals aged ≥12 years.[11] This study combined 2015 NSDUH data, the first year it assessed disability, with 2016 data. Adults aged ≥18 years (N=86,186) were studied and the sample was stratified into three age groups: 18–34 years (n=46,048), 35–49 (n=22,530), and ≥50 (n=17,608) to assess SUD prevalence in each age category. NSDUH interviewers administered the questionnaire using computer-assisted and audio computer-assisted self-interviewing techniques. The study received a "Not Regulated" determination by the University of Michigan IRB.

Measures

Participants were asked about sociodemographic characteristics, substance use, and disability status, including one hearing loss question: *Are you deaf or do you have serious difficulty hearing?* Participants were also asked questions about alcohol and drug use, including misuse of prescription drugs, within the past year and lifetime; this analysis focused on lifetime use. Participants were then categorized as meeting criteria for an alcohol use disorder, cannabis use disorder, or opioid use disorder; as well as for any SUD (non-nicotine), based on DSM-IV criteria.[12] Demographics evaluated included race/ethnicity, age (18–34, 35–49, ≥50 years), sex, income, health insurance, and employment status. This categorization of variables was based on NSDUH-suggested groupings to allow for comparison with other publications in this database.[13,14] Mental health prescription use in the past year was included in the analyses as a proxy for poor mental health.

Statistical Analysis

SAS, version 9.4 was used to account for the NSDUH complex sampling design. Statistical analyses included descriptive frequencies and multiple variable logistic regression. The weighted data was assessed via PROC SURVYEYFREQ and PROC SURVEYLOGISTIC, which incorporated the NSDUH-derived stratum, weight, and cluster variables. Analyses were performed in 2018.

RESULTS

Table 1 summarizes the findings. Hearing loss prevalence was 5.2%, ranging from 1.5% in the group aged 18–34 years to 9.4% in the group aged ≥50 years. In all age groups, individuals with hearing loss were more likely than their hearing peers to be male, poorer, and use mental health prescriptions; the younger age groups were more likely to be uninsured and unemployed. Hearing loss was not significantly associated with race/ethnicity in younger age groups but, in the ≥50 years age group, individuals were more likely to be white. Within the groups aged 18–34 years and 35–49 years, individuals with hearing loss were more likely to meet the current SUD criteria. After adjusting for sociodemographic factors and mental health, individuals with hearing loss in the group aged 18–34 years were more likely to meet criteria for any SUD (AOR=1.26, 95% CI=1.03, 1.54) as well as for prescription opioid use disorder (AOR=2.57, 95% CI=1.61, 4.11; Table 2). In the group aged 35–49 years, hearing loss status was associated with greater likelihood of meeting criteria for any SUD (AOR=1.83, 95% CI=1.36, 2.45), for alcohol use disorder specifically (AOR=1.89, 95% CI=1.43, 2.50), and for prescription opioid use disorder (AOR=1.98, 95% CI=1.02, 3.86) in adjusted models (Table 2). Cannabis use disorder was not higher in any hearing loss groups.

DISCUSSION

Adults with hearing loss aged 18–49 years are more likely to meet criteria for an SUD than their hearing peers; no difference was found in SUD prevalence among adults aged 50 years and older. In younger adults, the most consistent associations were seen between hearing loss and increased likelihood of prescription opioid use disorders; those with hearing loss were more than twice as likely to have a current opioid use disorder, even after adjustment. These findings are consistent with recent findings that individuals with hearing loss may abuse substances more frequently.[10] The current findings indicate that younger individuals with hearing loss appear more likely to develop an SUD.

Multifactorial pathways likely explain these associations of hearing loss and prescription pain medication abuse/dependency. Studies show associations between hearing loss and certain medical conditions, one of which is arthritis, which may increase one's likelihood to use prescription pain medication.[9] However, age is also correlated with arthritis and the authors did not see an association between hearing loss status and opioid use disorders among older adults. One small study found that 50% of patients with hearing loss reported chronic pain (e.g., fibromyalgia) requiring medications.[15] Individuals with hearing loss also report higher levels of stress and trauma, possibly elevating the risk of somatoform and stress-related disorders.[16,17] Furthermore, these individuals are four times more likely to report psychological distress than their hearing peers.[18] Worse mental health is a risk factor for SUD and poorer overall pain management outcomes[19] and may explain some of these findings among individuals with hearing loss. The increased prescription

Table 1. Characteristics of Adults Aged 18–34, 35–49, and ≥50 Years With and Without a Hearing Loss (Years 2015, 2016: Aged ≥18 Years; Unweighted N=86,186)

	18–34 years (N=46,048; weighted %=30)			35–49 years (N=22,530; weighted %=25)			≥50 years (N=17,608; weighted %=45)		
Characteristics	**Hearing loss**	**No hearing loss**	***p*-value**	**Hearing loss**	**No hearing loss**	***p*-value**	**Hearing loss**	**No hearing loss**	***p*-value**
Prevalence of hearing loss, *n* (weighted %)	722 (1.5)			556 (2.2)			1,697 (9.4)		
Male sex, % (95% CI)	55.5 (50.2, 60.9)	49.7 (49.1, 50.3)	**<0.05**	58.3 (52.0, 64.6)	48.6 (47.7, 49.5)	**<0.01**	59.1 (56.3, 61.9)	45.5 (44.4, 46.6)	**<0.0001**
Race/ethnicity, % (95% CI)									
Non-Hispanic white	59.9 (54.3, 65.6)	55.8 (54.9, 56.7)	ref	62.2 (57.2, 67.2)	59.4 (58.4, 60.4)	ref	80.1 (77.7, 82.5)	72.5 (71.3, 73.6)	ref
Non-Hispanic black	10.0 (7.3, 12.6)	13.5 (13.0, 14.0)	NS	8.1 (5.0, 11.2)	12.5 (11.9, 13.2)	NS	5.6 (4.2, 7.0)	10.8 (10.2, 11.4)	**<0.0001**
All others	30.1 (24.8, 35.4)	30.7 (29.9, 31.5)	NS	29.7 (25.5, 33.9)	28.1 (27.3, 28.9)	NS	14.2 (12.1, 16.3)	16.7 (15.9, 17.6)	**<0.0001**
Employment, % (95% CI)									
Full/Part-time	63.2 (58.1, 68.3)	72.6 (72.0, 73.2)	ref	63.1 (57.8, 68.4)	77.6 (76.8, 78.4)	ref	27.2 (24.4, 30.0)	49.2 (48.1, 50.3)	ref
Unemployed	11.5 (8.7, 14.3)	7.6 (7.2, 8.0)	**0.0002**	6.4 (4.0, 8.8)	4.6 (4.3, 5.0)	**0.02**	1.7 (1.0, 2.4)	2.7 (2.4, 3.0)	NS
All others	25.3 (20.6, 30.0)	19.8 (19.3, 20.3)	**0.0031**	30.5 (26.2, 34.7)	17.7 (17.1, 18.4)	**<0.0001**	71.1 (68.2, 74.0)	48.1 (47.1, 49.1)	**<0.0001**
Health insurance, % (95% CI)									
No coverage	20.4 (16.6, 24.3)	15.9 (15.4, 16.4)	**0.031**	14.3 (10.0, 18.5)	12.7 (12.1, 13.3)	0.46	3.0 (1.6, 4.4)	4.7 (4.3, 5.1)	**0.024**
Has health insurance	79.6 (75.7, 83.4)	84.1 (83.5, 84.6)	ref	85.7 (81.5, 90.0)	87.3 (86.7, 87.9)	ref	97.0 (95.6, 98.3)	95.3 (94.9, 95.6)	ref
Prescription drug use for mental health, past year, % (95% CI)									
Yes	15.9 (11.9, 20.0)	10.2 (9.9, 10.5)	**0.0005**	18.5 (14.4, 22.7)	13.3 (12.8, 13.8)	**0.004**	14.7 (12.8, 16.6)	11.9 (11.3, 12.4)	**0.004**
No	84.1 (80.0, 88.1)	89.8 (89.5, 90.1)	ref	81.5 (85.3, 86.7)	86.7 (86.1, 87.2)	ref	85.3 (83.4, 87.2)	88.1 (87.5, 88.7)	ref
Income, % (95% CI)									
<$20,000/year	31.0 (27.0, 35.1)	22.3 (21.6, 22.9)	**<0.0001**	25.5 (21.3, 29.7)	13.4 (12.7, 14.0)	**<0.0001**	20.8 (18.5, 23.1)	15.7 (14.9, 16.5)	**<0.0001**
$20,000–$49,999/year	32.2 (27.9, 36.5)	32.7 (31.9, 33.4)	NS	30.7 (26.3, 25.1)	26.2 (25.5, 27.0)	**<0.0001**	39.9 (36.6, 43.1)	29.3 (28.2, 30.3)	**<0.0001**
≥$50,000/year	36.7 (31.9, 41.6)	45.1 (44.2, 45.9)	ref	43.8 (38.3, 49.2)	60.4 (59.5, 61.3)	ref	39.3 (36.0, 42.3)	55.0 (53.9, 56.2)	ref

Note: Boldface indicates statistical significance ($p<0.05$).
NS, not significant.

Table 2. ORs for Substance Use Disorders of Adults With and Without a Hearing Loss (Years 2015, 2016: Aged ≥18 Years; Unweighted N=86,186)

Substance Use Disorder	All			18–34 years			35–49 years			≥50 years		
	Hearing loss	No hearing loss	AOR[a]	Hearing loss	No hearing loss	AOR[a]	Hearing loss	No hearing loss	AOR[a]	Hearing loss	No hearing loss	AOR[a]
Any substance use disorder, % (95% CI)	6.5 (5.5, 7.6)	8.1 (7.9, 8.3)	**0.79 (0.67, 0.93)**	18.3 (15.3, 21.4)	13.5 (13.1, 13.9)	**1.26 (1.03, 1.54)**	16.2 (11.9, 20.4)	8.1 (7.5, 8.6)	**1.83 (1.36, 2.45)**	4.0 (3.0, 4.9)	4.2 (3.8, 4.5)	0.8 (0.62, 1.05)
Alcohol use disorder, % (95% CI)	4.9 (4.0, 5.8)	6.2 (6.0, 6.4)	**0.78 (0.65, 0.94)**	12.0 (8.9, 15.0)	10.0 (9.6, 10.3)	1.12 (0.84, 1.49)	12.9 (9.4, 16.5)	6.4 (5.9, 6.9)	**1.89 (1.43, 2.50)**	3.1 (2.3, 4.0)	3.4 (3.2, 3.7)	0.77 (0.57, 1.05)
Marijuana use disorder, % (95% CI)	0.7 (0.5, 1.0)	1.4 (1.3, 1.5)	**0.51 (0.38, 0.70)**	5.0 (3.1, 6.9)	3.3 (3.1, 3.6)	1.34 (0.91, 1.97)	1.4 (0.7, 2.2)	1.0 (0.8, 1.1)	1.04 (0.57, 1.88)	0.2 (0.01, 0.4)	0.3 (0.2, 0.4)	0.47 (0.17, 1.26)
Prescription opioid use disorder, % (95% CI)	0.98 (0.45, 1.42)	0.74 (0.67, 0.81)	1.34 (0.85, 2.10)	3.5 (2.1, 4.8)	1.1 (0.9, 1.2)	**2.57 (1.61, 4.11)**	2.6 (1.0, 4.3)	0.9 (0.7, 1.1)	**1.98 (1.02, 3.86)**	0.5 (0.1, 0.9)	0.4 (0.3, 0.5)	1.1 (0.46, 2.63)

Note: Boldface indicates statistical significance ($p<0.05$).
[a]AORs include sex, race (white/black/all other), income (<$20,000, $20,000–$49,999, ≥$50,000), health insurance, employment (full/part time, unemployed, all others), and prescription medication use for mental health in the past year.

opioid use disorder among younger adults with hearing loss may be because of impaired clinician–patient communication surrounding pain management. Hearing loss impedes clinician–patient communication in healthcare settings.[20,21] Clinicians treating older adults may be more prepared to assess and integrate hearing loss into their communications, explaining the lack of SUDs in older individuals. Poor clinician–patient communication results in numerous adverse outcomes, including reduced patient treatment adherence and less awareness of healthy behaviors[22–26] and likely affects the understanding of certain management and treatment approaches.[20] This could reduce patients' ability to accept non-opioid treatments. This study's findings underscore the importance of understanding how someone may progress from initial use to development of an SUD.

Limitations

Limitations include the use of self-reported data and the inability to establish causality by which hearing loss is associated with SUDs. Hearing loss prevalence was lower than anticipated, possibly reflective of the type of question used ("deaf or has serious difficulty hearing") that identifies only those with more severe hearing loss. This may not accurately capture individuals with milder hearing loss. Also, no survey accommodations were provided, potentially affecting the inclusion of deaf signing individuals. Furthermore, data are lacking on whether/how participants addressed their hearing loss (e.g., hearing aids). A final limitation is the inability to distinguish the presence of additional comorbidities that may affect the findings. Study strengths included nationally representative data with an adequate sample of individuals with hearing loss.

CONCLUSIONS

Hearing loss among individuals aged younger than 50 years appears to increase risk for SUDs, in particular prescription opioid use disorders. Future studies should investigate the possible mechanisms causing this. Hearing loss is common, and these patients will benefit from closer screening and treatment while optimizing communication with pain-related diagnoses and preferably non-opioid pain management.

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