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ORIGINAL RESEARCH

Association Between Poor Pain Control and Sensory Impairment: A Cross-Sectional Study

Junjian Zeng[1], Zhiqiang Liao[1], Aiqing Lin[1], Yu Zou[1], Yixun Chen[1], Zhonghua Liu[1], Hongqing Luo[2], Zhidong Zhou[1]

[1]Department of Anesthesiology, The Second Affiliated Hospital, Jiangxi Medical College, Nanchang University, Nanchang, Jiangxi, 330006, People's Republic of China; [2]Department of Gastroenterology, The Affiliated Hospital of Qingdao University, Qingdao, People's Republic of China

Correspondence: Zhidong Zhou, Department of Anesthesiology, The Second Affiliated Hospital, Jiangxi medical College, Nanchang University, Nanchang, Jiangxi, 330006, People's Republic of China, Email 45285184@qq.com

Purpose: Poor pain control may lead to persistent physical discomfort and even reduced perceptual abilities. This research seeks to investigate the relationship between pain status and duration and sensory impairments.

Patients and Methods: This study used data on pain and sensory impairments from the National Health and Nutrition Examination Survey (NHANES) conducted from 2011 to 2014, including 8043 participants. Functional status of vision, hearing, smell, and taste was gathered using structured questionnaires. Logistic regression models were used to evaluate the association between pain status, duration, and the total number of sensory impairments and specific sensory deficits, while adjusting for key covariates such as age, gender, BMI, and socioeconomic status. Stratified analysis was performed to determine factors that might confound this relationship.

Results: The multivariable-adjusted regression model showed that individuals with pain for 1 to 3 years had a 64% increased risk of sensory impairment compared to those without pain (OR 1.640, 95% CI 1.132–2.376, $P = 0.016$), while those with pain for over 3 years had a 90.9% increased risk (OR 1.909, 95% CI 1.472–2.475, $P = 0.001$). We also found a statistically significant association between pain duration of ≥ 1 year and visual impairment (OR 1.841, 95% CI 1.252–2.705, $P < 0.01$). Furthermore, participants with pain duration > 3 years were significantly associated with olfactory impairment (OR 2.264, 95% CI 1.538–3.331, $P < 0.001$) and taste impairment (OR 2.070, 95% CI 1.335–3.209, $P < 0.01$). However, no statistically significant association was observed between pain duration and hearing impairment in any duration category.

Conclusion: The results of this study suggest that individuals with longer chronic pain duration are at higher risk of sensory impairments, particularly visual, olfactory, and taste impairments. Timely and effective pain management may help reduce the risk of long-term sensory impairments.

Keywords: pain, chronic pain, duration of pain, sensory impairment, NHANES

Introduction

In recent years, with population aging, environmental factors, and lifestyle changes, pain and sensory impairment issues have become increasingly prominent in the general population. Pain is one of the most common reasons people seek medical care worldwide, affecting around 1.5 billion people. The global cost of pain is immense, with billions of dollars spent each year on healthcare costs, productivity loss, and disability compensation.[1] Meanwhile, the prevalence of various sensory impairments, such as those affecting vision, hearing, smell, and taste, is also on the rise.[2,3] These sensory impairments not only directly decrease the quality of life for patients but are also frequently associated with functional decline, cognitive impairments, and mental health problems, thereby imposing a significant burden on both individuals and public health systems.[4,5] Therefore, a comprehensive understanding of the multiple factors that cause sensory impairments is crucial for developing effective prevention strategies and medical interventions.

Existing literature suggests that the occurrence of sensory impairments may involve multiple mechanisms, such as nervous system damage, disease progression, drug side effects, and changes in psychological states.[4–7] It should be noted that when faced with sensory impairments, many individuals do not experience a loss of just one type of sensation, but

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may experience multiple sensory deficits simultaneously. For instance, a person may simultaneously face difficulties with vision and hearing, which not only complicates daily life but may also lead to or worsen mental health problems. Interactions between different sensory impairments may occur, where one disorder could intensify the symptoms of another,[6–8] presenting more severe challenges for patients.

Pain is a complex, multifaceted experience that is both a sensory and emotional phenomenon, typically caused by actual or potential tissue damage. The International Association for the Study of Pain (IASP) defines pain as "an unpleasant sensory and emotional experience associated with actual or potential tissue damage".[9] The duration of pain is regarded as a key factor influencing its long-term effects. Chronic pain can lead to persistent inflammatory states, which in turn impair the function of sensory cells. For example, persistent neuroinflammation may reduce the sensitivity of the auditory and visual systems, thereby affecting hearing and vision.[10–12] Additionally, pain itself may alter the way sensory stimuli are processed, with patients exhibiting abnormal responses to sound, light, and taste.[13] Sigurðsson et al proposed that compared to participants without orofacial pain, those with facial pain have weaker appetite, taste, and sensory perception.[14] Similarly, studies have pointed out that individuals with migraine with aura show greater deficits in secondary olfactory-related structures, which may lead to distorted attention and judgment of odors.[15] The inflammatory state associated with pain is strongly linked to the development of sensory and emotional disorders, complicating pain management.[16,17] However, most studies focus on a single sensory modality or specific populations, and there is still insufficient systematic evaluation of the overall relationship between multi-sensory dysfunction and pain in the general population.

Building on the above background, this study used a cross-sectional design to systematically assess the relationship between pain status and duration and impairments in vision, hearing, smell, and taste, aiming to address a gap in this research area. By elucidating the relationship between pain, especially its duration, and sensory impairments, this study aims to offer a theoretical foundation and practical insights for early prevention and intervention strategies.

Methods

Study Population

This research used data from the National Health and Nutrition Examination Survey (NHANES) conducted from 2011 to 2014 to evaluate the relationship between pain status, duration, and sensory disorders among adults aged 20 and above. NHANES is a research initiative designed to gain a comprehensive understanding of the health and nutritional status of both adults and children in the United States, using strict multistage probability sampling methods to ensure national representativeness. All participants underwent standardized home visits and subsequently received physical examinations, laboratory tests, and additional interviews at Mobile Examination Centers (MEC). The NHANES research protocol received approval from the Institutional Review Board of the National Center for Health Statistics, and all adult participants provided written informed consent. To learn more about NHANES methodologies and ethical guidelines, visit the official CDC and NCHS websites (https://www.cdc.gov/nchs/nhanes).

In this study analysis, we initially reviewed data from 19,512 participants in the 2011–2014 NHANES dataset. A total of 7,178 individuals were excluded due to missing pain and sensory data to ensure the study population met the research criteria. To improve population comparability (eg, marital status and household characteristics), we restricted the study sample to adults aged 20 years and older, resulting in 10,069 participants, thereby enhancing the study's generalizability to the adult population. After excluding an additional 2,026 participants due to incomplete covariate data, the final effective sample size was 8,043 adults, comprising 5,860 individuals without reported sensory impairments and 2,183 individuals with sensory impairments. Figure 1 illustrates the detailed inclusion and exclusion process visually.

Assessment of Sensory Impairment

In this study, we collected information on sensory impairments through participants' self-reports (Table S1), including visual, auditory, olfactory, and gustatory impairments. The total number of sensory impairments ranged from 0 to 4. A range of questionnaire items (AUQ054, DLQ010, DLQ020, MCQ140, CSQ010, CSQ080) was used to identify these impairments, focusing on participants' hearing, vision, smell, and taste conditions. Questions included: "Do you have

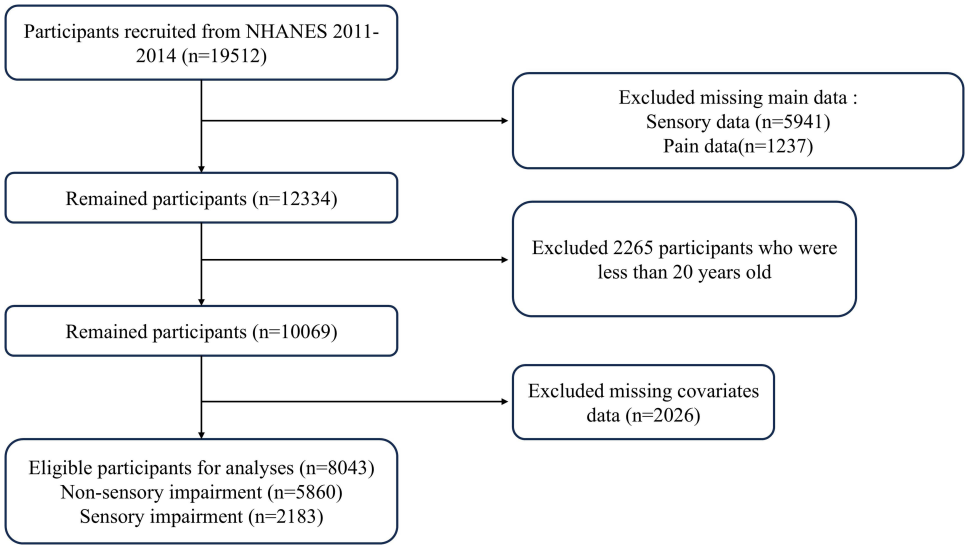

Figure 1 Flowchart of study selection.

severe hearing difficulties?", "Do you have vision problems?", "Did you experience olfactory issues in the past 12 months?", and "Did you experience gustatory issues in the past 12 months?" Participants reporting "moderate hearing difficulties" or worse were categorized as having hearing impairments (HI), while "yes" responses to other questions were classified as corresponding sensory impairments. Notably, previous studies have validated the effectiveness of using self-reported data to assess sensory impairments, indicating that self-reported information can serve as a reliable method for identifying the presence and severity of these impairments.[5,18,19]

Definition of Pain

To identify individuals with pain and determine the duration of pain (Table S1), we used a pain questionnaire (CKQ070Q, CKQ070U), which specifically inquired about the quantity and unit of pain duration. Responses of "I don't know" were regarded as no pain, while unanswered or skipped responses were treated as missing values. Given the highly dispersed distribution of pain duration data, we categorized participants based on their reported pain status and duration into six groups: no pain, < 3 months, 3–6 months, > 6 months to < 1 year, 1–3 years, and > 3 years. This classification method allowed for a clearer understanding of the incremental relationship between pain duration and the risk of sensory impairments, providing a more detailed analysis of the dose-response relationship.

Covariates

Based on literature review and clinical experience,[5,20–22] we identified the following variables as potential confounding factors that may influence the relationship between pain status, duration, and sensory impairments: gender (male and female), age, race (Mexican American, non-Hispanic White, non-Hispanic Black, or other), education level (less than high school, high school or equivalent, college or above), marital status (married/cohabiting, widowed/divorced/separated, never married), body mass index (BMI), Ratio of family income to poverty (PIR), smoking (smoked at least 100 cigarettes in lifetime), alcohol consumption (drank at least 12 drinks per year), hypertension (SBP ≥140 mmHg and/or DBP ≥90 mmHg, self-reported hypertension), diabetes (fasting blood glucose ≥7.0 mmol/L or HbA1c ≥6.5%, self-reported diabetes), cardiovascular disease (self-reported congestive heart failure, coronary heart disease, and heart attack), stroke, and cancer.

Statistical Analysis

This study accounted for the complex sampling design and weighting during analysis, employing weights provided by the Mobile Examination Center (MEC) for all statistical analyses. Since we merged data from the 2011–2012 and

2013–2014 cycles, WTMEC2YR/2 was used as the new weight variable. For continuous variables with a normal distribution, the mean (standard deviation, SD) was reported; for non-normally distributed variables, the weighted median and interquartile range were provided. Categorical variables were presented as unweighted frequencies and weighted percentages. Weighted logistic regression models were employed to investigate the association between pain status and duration and sensory impairments, yielding odds ratios (ORs) and 95% confidence intervals (CIs) with adjustments for potential confounders. Pain status and duration were divided into six categories, with the No pain group serving as the reference category. Crude model: without any covariate adjustments. Model 1 adjusted for age, gender, race, educational attainment, and marital status. Model 2 further adjusted for age, gender, race, educational level, marital status, PIR, BMI, smoking status, and alcohol consumption. Model 3 included adjustments for all covariates. Interaction and stratified analyses were also performed to investigate the impact of common factors such as age, BMI, gender, and PIR, assessing differences across population subgroups. The data analysis was performed using DecisionLinnc 1.0 software (https://www.statsape.com). A two-tailed $P < 0.05$ was deemed statistically significant.

Results

Basic Characteristics of the Study Population

A total of 8,043 participants were included in this study, representing a weighted sample of 168,195,525 individuals in the general population. Table 1 presents the characteristics of participants based on the presence or absence of sensory

Table 1 Participants' Characteristics Stratified by the Presence of Sensory Impairment

Variables	Overall (N = 8,043)	Non-Sensory Impairment (N = 5,860)	Sensory Impairment (N = 2,183)	*P*-value
Age, mean (SD)	53.69 (15.94)	51.59 (15.85)	59.34 (14.61)	<0.001
Gender, n (%)				0.184
Male	3,979.00 (48.65%)	2,926.00 (48.57%)	1,053.00 (48.91%)	
Female	4,064.00 (51.35%)	2,934.00 (51.43%)	1,130.00 (51.09%)	
Race, n (%)				<0.001
Mexican American	877.00 (7.04%)	611.00 (6.92%)	266.00 (7.42%)	
Other Hispanic	775.00 (5.44%)	534.00 (5.21%)	241.00 (6.13%)	
Non-Hispanic White	3,321.00 (69.77%)	2,328.00 (69.44%)	993.00 (70.75%)	
Non-Hispanic Black	1,921.00 (10.75%)	1,457.00 (11.07%)	464.00 (9.80%)	
Other Race	1,149.00 (6.99%)	930.00 (7.36%)	219.00 (5.90%)	
Education level, n (%)				<0.001
Less than high level	1,849.00 (15.70%)	1,184.00 (13.69%)	665.00 (21.66%)	
High level	1,752.00 (21.01%)	1,242.00 (19.77%)	510.00 (24.69%)	
More than high school	4,442.00 (63.29%)	3,434.00 (66.54%)	1,008.00 (53.65%)	
Marital status, n (%)				<0.001
Married/living with partner	1,304.00 (14.99%)	1,027.00 (16.27%)	277.00 (11.18%)	
Widowed/divorced/separated	4,679.00 (63.25%)	3,494.00 (64.17%)	1,185.00 (60.52%)	
Never married	2,060.00 (21.76%)	1,339.00 (19.56%)	721.00 (28.30%)	

(*Continued*)

Table 1 (Continued).

Variables	Overall (N = 8,043)	Non-Sensory Impairment (N = 5,860)	Sensory Impairment (N = 2,183)	*P*-value
PIR, mean (SD)	2.48 (1.63)	2.62 (1.62)	2.11 (1.59)	<0.001
Body mass index, mean (SD)	29.11 (6.68)	28.85 (6.53)	29.81 (7.00)	<0.001
Hyperlipidemia, n (%)	4,956.00 (62.90%)	3,480.00 (60.40%)	1,476.00 (70.36%)	<0.001
Diabetes, n (%)	1,221.00 (11.36%)	784.00 (9.70%)	437.00 (16.29%)	<0.001
Hypertension, n (%)	3,997.00 (45.04%)	2,641.00 (40.36%)	1,356.00 (58.92%)	<0.001
Cardiovascular disease, n (%)	703.00 (7.62%)	378.00 (5.47%)	325.00 (14.01%)	<0.001
Drinking, n (%)	5,761.00 (78.57%)	4,224.00 (79.19%)	1,537.00 (76.73%)	0.146
Smoking, n (%)	3,640.00 (45.60%)	2,485.00 (42.89%)	1,155.00 (53.66%)	<0.001
Stroke, n (%)	361.00 (3.50%)	184.00 (2.50%)	177.00 (6.45%)	<0.001
Cancer, n (%)	881.00 (12.53%)	533.00 (10.75%)	348.00 (17.80%)	<0.001
Pain month, median (IQR)	13.72 (57.31)	10.07 (47.99)	23.52 (77.71)	<0.001
Duration of pain, n (%)				<0.001
No pain	6,081.00 (75.57%)	4,603.00 (78.29%)	1,478.00 (67.47%)	
< 3 months	705.00 (8.65%)	507.00 (8.65%)	198.00 (8.64%)	
3–6 months	118.00 (1.49%)	85.00 (1.50%)	33.00 (1.47%)	
> 6 months to < 1 year	117.00 (1.68%)	80.00 (1.59%)	37.00 (1.94%)	
1–3 years	337.00 (3.71%)	199.00 (3.14%)	138.00 (5.41%)	
> 3 years	685.00 (8.90%)	386.00 (6.82%)	299.00 (15.06%)	

Notes: All analyses have been weighted to account for the survey's complex sampling design.
Abbreviation: PIR, Ratio of family income to poverty.

impairments. Among participants reporting sensory impairments, the mean age was 59 years (standard deviation, SD = 14.61), with 51% being female, and the majority being non-Hispanic white. Sensory impairments were identified in 2,183 participants (27.1%). Compared to those without sensory impairments, participants with sensory impairments were more likely to be female, non-white, live alone, and consume alcohol. Additionally, participants with sensory impairments typically had higher educational attainment, lower family income-to-poverty ratios, and were more likely to have hyperlipidemia, hypertension, and cancer (all $P < 0.001$). The median pain duration among participants with sensory impairments was 23.52 months ($P < 0.001$), indicating poorer pain control in this population (Table S2). Additionally, the median pain duration increased with the number of sensory impairments; specifically, participants with all four sensory impairments had a median pain duration of 37.83 months, indicating a potential association between pain duration and the number of sensory impairments (Table S3).

Correlation Between Pain Duration and Sensory Impairment

In cases of coexisting sensory impairments, the majority of individuals were affected by only one type (1,630 individuals), with a significant decrease in numbers as impairment types increased (Figure 2a). Furthermore, pain status showed a significant positive correlation with multiple sensory impairments (Figure 2b). Multivariable logistic regression was used to analyze the relationship between pain duration and sensory impairments. Table 2 shows a significant association between varying pain durations and sensory impairments. Compared to individuals without pain, those with

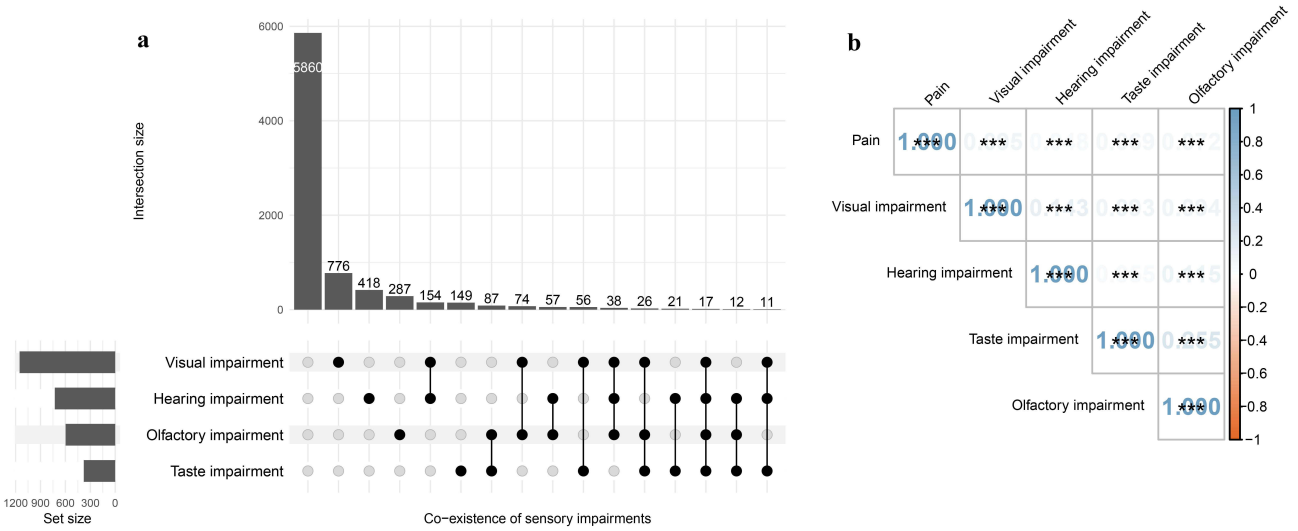

Figure 2 Co-existing pattern and correlation of sensory impairments.
Note: ***$P < 0.001$.

pain lasting more than three years had the highest risk of sensory impairments (OR 2.562, 95% CI 2.028–3.236, $P < 0.001$). In the fully adjusted weighted logistic regression model, participants with pain lasting 1–3 years had a 64% higher risk of sensory impairments (OR 1.640, 95% CI 1.132–2.376, $P = 0.016$) compared to the no-pain group, while those with pain lasting over three years had a 90.9% increased risk (OR 1.909, 95% CI 1.472–2.475, $P = 0.001$). Moreover, the results of the trend test (P for trend <0.001) further confirmed that the increasing risk of sensory impairments with prolonged pain duration was statistically significant rather than a chance finding.

Additionally, we examined the relationship between individual sensory impairments and pain duration. Figure 3 shows that individuals with pain lasting ≥ 1 year were significantly associated with visual impairment (OR 1.841, 95% CI 1.252–2.705, $P < 0.01$). Moreover, participants with pain lasting > 3 years were significantly associated with olfactory

Table 2 Association Between Duration of Pain and Sensory Impairment in Multiple Regression Model

Variables (N=8,043)	Crude Model		Model 1		Model 2		Model 3	
	OR (95% CI)	*P*-value	OR (95% CI)	*P*-value	OR (95% CI)	*P*-value	OR (95% CI)	*P*-value
No pain	1(Ref)		1(Ref)	0.401	1(Ref)		1(Ref)	
< 3 months	1.160 (0.895–1.503)	0.250	1.116 (0.855–1.456)	0.870	1.142 (0.854–1.525)	0.344	1.103 (0.795–1.529)	0.503
3–6 months	1.136 (0.615–2.098)	0.674	1.054 (0.544–2.040)	0.351	0.967 (0.494–1.893)	0.915	0.942 (0.430–2.064)	0.861
> 6 months to < 1 year	1.412 (0.775–2.572)	0.249	1.351 (0.701–2.602)	0.001	1.318 (0.651–2.671)	0.415	1.301 (0.609–2.777)	0.439
1–3 years	1.999 (1.477–2.707)	<0.001	1.795 (1.321–2.439)	<0.001	1.675 (1.221–2.299)	0.004	1.640 (1.132–2.376)	0.016
> 3 years	2.562 (2.028–3.236)	<0.001	2.352 (1.872–2.956)		2.089 (1.663–2.623)	<0.001	1.909 (1.472–2.475)	0.001
P for trend	<0.001		<0.001		<0.001		<0.001	

Note: Results are based on weighted data.
Abbreviations: OR, odds ratio; CI, confidence interval, Ref, reference.

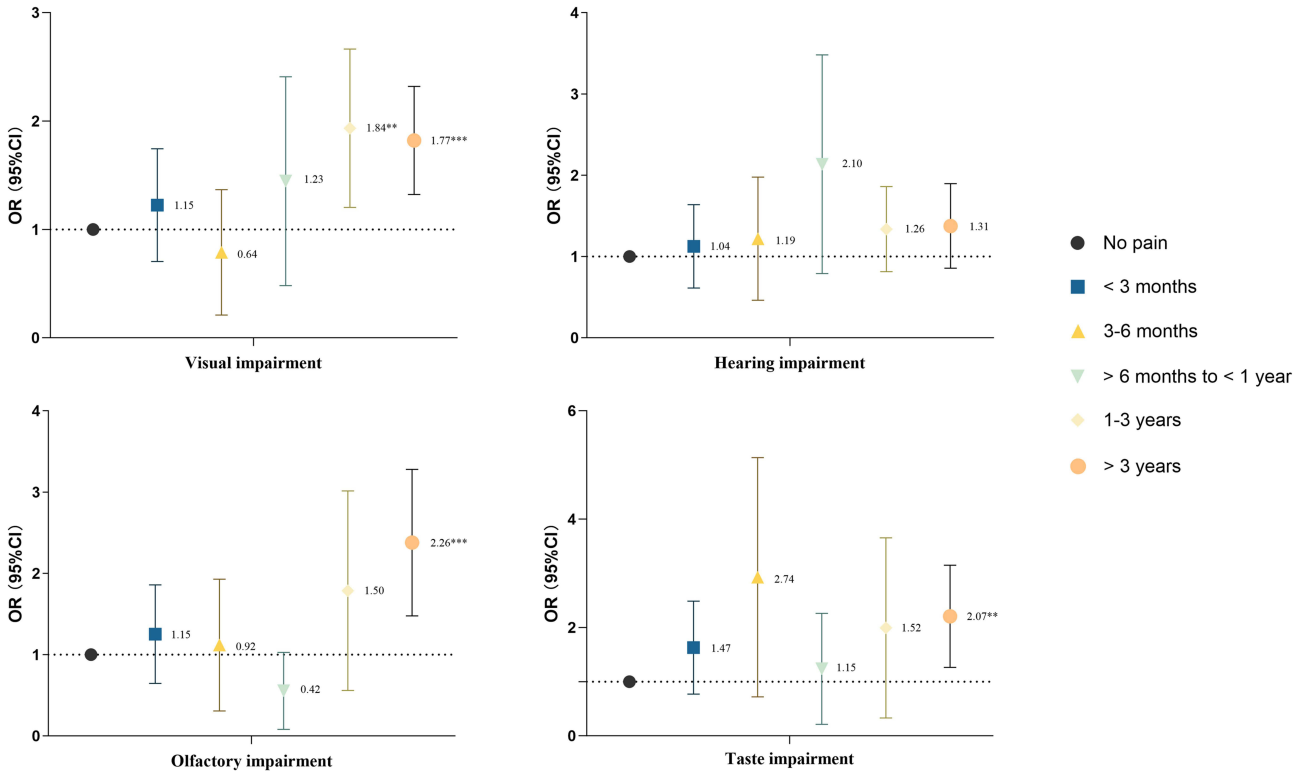

Figure 3 Associations of individual sensory impairment with duration pain.
Notes: **$P < 0.01$, ***$P < 0.001$. Results are based on weighted data.
Abbreviations: OR, odds ratio; CI, confidence interval.

impairment (OR 2.264, 95% CI 1.538–3.331, $P < 0.001$) and gustatory impairment (OR 2.070, 95% CI 1.335–3.209, $P < 0.01$). However, no significant statistical association was found between any pain duration category and hearing impairment. Likewise, the relationship between pain duration and composite sensory impairments deserves attention. Figure 4 indicates that participants with pain lasting ≥ 1 year were significantly associated with the simultaneous presence of three types of sensory impairments (OR 4.075, 95% CI 2.200–7.836, $P < 0.05$). Conversely, those experiencing pain for > 3 years were significantly associated with two types of sensory impairments (OR 2.611, 95% CI 1.612–3.831, $P < 0.001$). However, no statistically significant association was found between the presence of four sensory impairments and any pain duration category.

Stratified Analysis

Stratified analyses were conducted, considering gender, age, BMI, and PIR,[23] to assess the impact of various factors on the relationship between pain status, duration, and sensory impairments. The results of the stratified analyses (Figure 1) indicated that the association between pain duration and sensory impairments was more pronounced in females, younger individuals, and those with a low BMI. The interaction analysis results suggested that after adjusting for covariates, age influenced the relationship between pain duration and the risk of sensory impairments (interaction $P < 0.05$). Results for other groups indicated no significant interactions.

Sensitivity Analysis

In the sensitivity analysis, 728 individuals with hearing impairments were excluded, leaving 7,315 participants. In the fully adjusted model, participants experiencing pain for > 3 years showed significant associations with visual impairment (OR 1.799, 95% CI 1.329–2.435, $P = 0.002$), olfactory impairment (OR 2.239, 95% CI 1.404–3.570, $P = 0.004$), and gustatory impairment (OR 2.256, 95% CI 1.297–3.583, $P = 0.009$) (Table S4). Furthermore, participants with pain lasting > 3 years were significantly associated with the simultaneous presence of three types of sensory impairments (OR 7.395,

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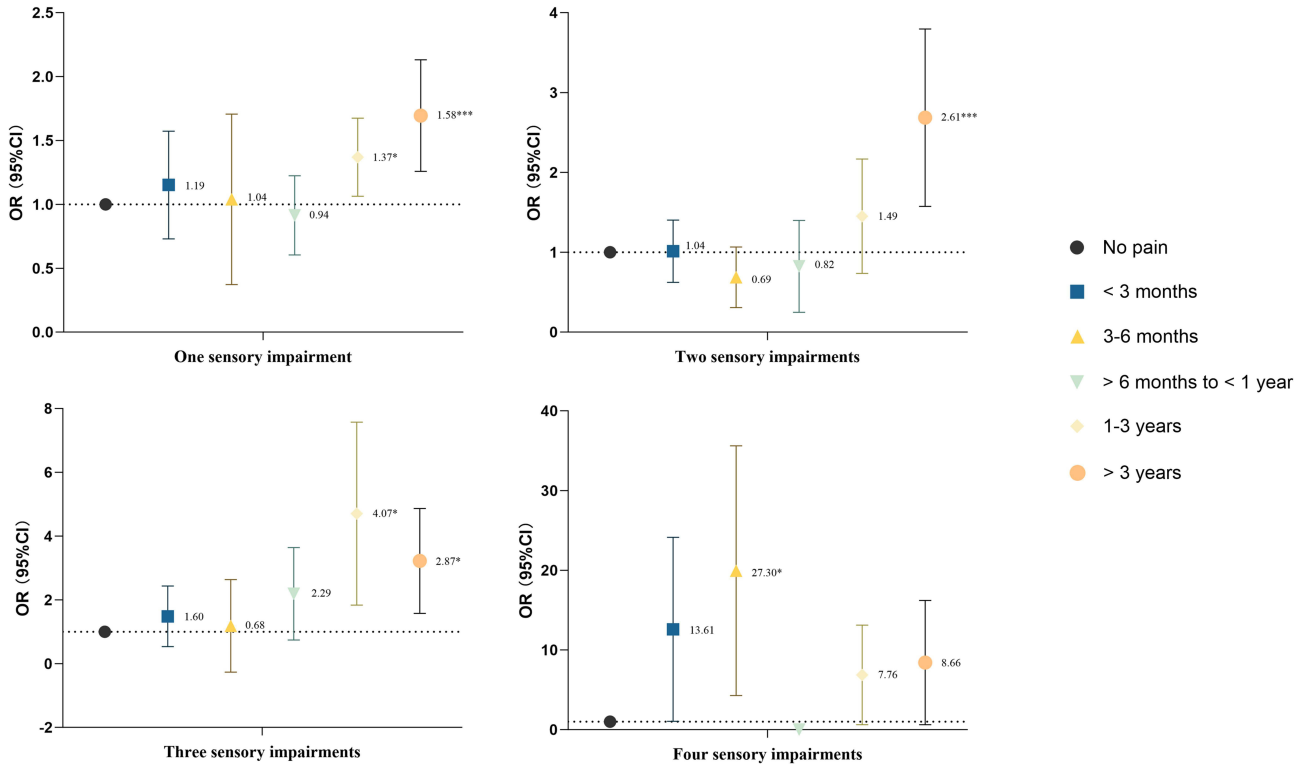

Figure 4 Associations of numbers of sensory impairments with duration of pain.
Notes: ***P < 0.001. Results are based on weighted data.
Abbreviations: OR, odds ratio; CI, confidence interval.

95% CI 1.843–29.669, P = 0.011) (Table S5). These findings suggest that the relationship between pain duration and other sensory impairments remained stable even after excluding hearing impairments.

Discussion

This population-based study of US adults provided strong cross-sectional evidence for independent associations between pain status, pain duration, and sensory impairments. The findings underscore the profound impact of long-term chronic pain on individual health and emphasize the need for a more comprehensive approach to assess and manage the risk of sensory impairments in chronic pain patients. To the best of our knowledge, this is the first study to specifically investigate the association between pain status, pain duration, and sensory impairments.

To enrich and improve the understanding of the relationship between pain and sensory impairments, recent studies have explored their interactions from different perspectives. For instance, some studies have found that in certain tinnitus patients, high-intensity muscle pain and postural instability are associated with hearing loss in specific frequency bands.[24] Additionally, experimental studies have revealed that prolonged pain experiences during the neonatal period may lead to hearing impairments in early adulthood, potentially due to decreased brain-derived neurotrophic factor (BDNF) levels and changes in dendritic spine density in the auditory cortex.[25] Nevertheless, our study did not identify a statistically significant association between pain duration and hearing impairment, in contrast to some previous findings that connected chronic pain with auditory dysfunction. A plausible explanation is that hearing impairment may be more influenced by environmental factors (eg, noise exposure) or genetic susceptibility rather than central sensitization or inflammation.

Pain could be a significant stressor leading to sensory impairments. Chronic pain first leads to a sustained inflammatory state that impairs sensory cell function. For instance, ongoing neuroinflammation may reduce the sensitivity of the auditory and visual systems, leading to impairments in hearing and vision.[10–12] Secondly, pain itself may cause changes in the processing of sensory stimuli, with patients showing abnormal responses to sounds, light,

and taste.[13] Sigurðsson et al proposed that participants with facial pain, compared to those without orofacial pain, show weaker appetite, taste, and sensory perception.[14] Similarly, studies have indicated that individuals with aura migraines exhibit greater impairments in secondary olfactory-related structures, which could distort their attention to and judgment of odors.[15] Moreover, studies on the interaction between taste and pain perception have shown that chronic pain patients exhibit marked differences in the intensity and sensitivity to basic taste stimuli (such as sweet, sour, salty, and bitter), which may reflect a shared dysfunction in the central nervous system's pain processing and taste information processing.[26,27] There is also preliminary evidence linking pain and olfaction, showing that pleasant or unpleasant odors can alter pain thresholds and tolerance, and even affect the activation patterns of pain-processing brain regions (eg, thalamus, amygdala, and anterior cingulate cortex),[13] suggesting complex and profound interactions between pain and basic sensory systems such as smell and taste. The inflammatory nature of pain is strongly linked to the development of sensory and emotional disorders, complicating pain management even further.[16,17] From a public health standpoint, increasing awareness of the potential link between chronic pain and sensory impairments is crucial, encouraging early pain management through health education and community interventions to reduce the risk of sensory dysfunction. On this basis, clinical practice must regularly assess the visual, olfactory, and taste functions of chronic pain patients, fostering multidisciplinary collaboration to create personalized, comprehensive management plans that improve overall health. Future studies need to investigate the underlying mechanisms linking chronic pain with sensory impairments, verifying their causal relationship through longitudinal research, and identifying effective pharmacological and non-pharmacological interventions to strengthen the scientific foundation for optimizing clinical management.

This study also has several limitations. First, as NHANES is a cross-sectional study, it cannot establish causal relationships or long-term impacts; future research should adopt prospective longitudinal designs to further confirm the link between the long-term effects of pain and sensory impairments. Secondly, the study did not delve into the analysis of different types of pain, such as pain nature, severity, intensity, and specific locations, which may impact the generalizability and explanatory power of the findings. Future studies should focus on in-depth analysis of different pain groups to clarify the potential differences and mechanisms between specific types of pain and sensory impairments. Additionally, pain data and sensory impairment diagnoses were obtained through self-reported questionnaires, which could be influenced by recall bias; future studies should combine various assessment tools and professional clinician interviews to enhance data accuracy and reliability. At the same time, it is crucial to consider the duration of sensory impairments and their impact on health, as this will provide more targeted guidance for clinical management. Lastly, because the 2011–2014 data on US adults lacked information on analgesic usage, future studies should further explore the impact of these medications on pain patients with concurrent sensory impairments. This will help provide a more thorough understanding of the role of pharmacological treatments in this complex relationship.

Conclusion

In summary, our study indicates that inadequate pain control, leading to prolonged pain duration, puts patients at a higher risk of sensory impairments, particularly in vision, smell, and taste functions. Specifically, compared to individuals without pain, those with pain lasting 1–3 years had a 64% higher risk of sensory impairment (OR 1.640, 95% CI 1.132–2.376, $P = 0.016$), and those with pain for more than 3 years had a 90.9% higher risk (OR 1.909, 95% CI 1.472–2.475, $P = 0.001$). However, due to limitations such as the inability to specify pain type and location, and the reliance on self-reported data, these findings should be interpreted cautiously. Clinically, these findings highlight the importance of integrating routine sensory assessments into chronic pain management programs. Future studies should employ more detailed pain characteristics and longitudinal designs to further clarify the causal mechanisms underlying the relationship between chronic pain and sensory impairments.

Abbreviations

NHANES, National Health and Nutrition Examination Survey; BMI, body mass index; NCHS, National Center for Health Statistics; CDC, Centers for Disease Control and Prevention; PIR, Ratio of family income to poverty.

Data Sharing Statement

Researchers and data users from all over the world can access the survey data on the internet (www.cdc.gov/nchs/nhanes/).

Ethics Approval and Informed Consent

The Institutional Review Board of the Second Affiliated Hospital of Nanchang University waived the requirement for ethical approval of this study, because the data came from the NHANES database. As the study was a retrospective study, the Institutional Review Board of the Second Affiliated Hospital of Nanchang University waived the requirement for written informed consent. The data accessed complied with Federal confidentiality laws including Section 308(d) Public Health Service Act [42 U.S.C. 242m(d)] and the Confidential Information Protection and Statistical Efficiency Act or CIPSEA [Pub. L. No. 115-435, 132 Stat. 5529 § 302].

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Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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Disclosure

The authors report no conflicts of interest in this work.

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