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Chronic Respiratory Disease and Cognitive Impairment in Older Mexican Adults

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Abstract

Background: Cognitive impairment has emerged as an important concern in clinical practice in aging population. Several comorbid factors contribute to etiopathogenesis; one disease of interest is chronic respiratory disease.

Aim: The aim of this study is to investigate the association of chronic respiratory disease with risk of cognitive impairment in older Mexicans.

Materials and Methods: Data were obtained from 2782 Mexicans, aged ≥60 years, enrolled in waves I (2001) and III (2012) of the Mexican Health and Aging Study, a prospective cohort of nationally representative sample of older Mexicans. Participants' self-reported responses were used to categorize them into having respiratory disease or not. Study outcome included participants categorized into "cognitively impaired" or "cognitively normal" groups. Multivariable logistic regression models were used to investigate the relationship.

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Conflicts of interest

There are no conflicts of interest.

Results: Overall, 16% of cohort participants reported cognitively impaired at Wave III. Compared with older Mexicans without chronic respiratory disease diagnosis, those diagnosed were not significantly associated with risk of cognitive impairment [adjusted odds ratio (OR): 0.94, 95% confidence interval (CI): 0.58–1.58].

Conclusion: Chronic respiratory disease is not significantly associated with risk of cognitive impairment in older Mexican adults.

Keywords

Chronic respiratory disease; cognitive impairment; older Mexican adult; prospective cohort

Dementia is a neurodegenerative syndrome characterized by deterioration in cognitive functioning.[1] Unprecedented decline in mortality rates have resulted in rapid increase in aging population, and dementia has thus emerged as an important concern.[1] In 2015, the global estimate of dementia among adults ≥60 years was 47.8 million, and it is expected to increase to 75.6 million by 2030 and 135.5 million by 2050, with a significant increase by approximately four times in Latin America.[1] Several modifiable factors such as smoking, physical inactivity, high saturated fat diet, and alcohol consumption, as well as comorbid diseases such as hypertension, stroke, and diabetes mellitus contribute to the etiology of cognitive impairment.[2] Other comorbid diseases of interest include chronic respiratory diseases such as chronic obstructive chronic pulmonary disease (COPD) and asthma, which were proposed to be associated with a risk of cognitive impairment, potentially through hypoxia-mediated neuronal damage, increased systemic inflammation, and comorbid atherosclerotic disease.[3]

Epidemiological studies have investigated the association of cognitive impairment with chronic respiratory diseases, including asthma,[4–7] and COPD[8–12] with inconsistent results. A majority of these studies were conducted using populations from high income countries. Given that approximately 58% of cognitively impaired people currently live in low and middle-income countries, such as Mexico, with the percentage expected to increase to 63% in 2030 and 71% in 2050, and that chronic respiratory disease remains one of the major causes of mortality in Mexico,[13] it is important to investigate their relationship. Thus, using a prospective cohort study of 2782 older Mexican adults aged ≥60 years, we investigated the association of chronic respiratory disease with cognitive impairment.

Materials and Methods

We obtained the study data from the Mexican Health and Aging Study (MHAS) cohort, details of which have been previously described.[14] We included participants aged ≥60 years with no evidence of cognitive or functional impairment in 2001 (Wave I) and who had completed ≥2 cognitive assessments in 2001, and either ≥2 cognitive assessments or a proxy measure for cognitive assessment in 2012 (Wave III). The MHAS study protocol was approved by the Institutional Review Board of the University of Texas Medical Branch.

Primary outcome was participants' cognitive impairment status at Wave III. Cognitive functioning for participants was assessed using the brief version of the Cross-Cultural

Cognitive Examination (CCCE), a validated screening instrument for epidemiological and cross-cultural assessment of patients designed for cognitive impairment screening.[15] Based on the diagnostic criteria established by National Institute on Aging-Alzheimer's Association workgroups, we classified an older adult as cognitively impaired if he/she performed ≥1.5 SD lower than what would be expected according to his/her age. For participants who were unable to complete the core questionnaire during Wave III due to limitations in health, language, or other reasons, cognitive functioning was assessed using the brief version of the Informant Questionnaire on Cognitive Decline in the Elderly (IQCODE).[16] We ascertained participants as cognitively impaired if they had an average score ≥3.4 on the IQCODE. Using the two instruments, all participants were categorized into two groups, namely, "cognitive normal" or "cognitive impaired."

Study exposure was diagnosis of chronic respiratory disease, which was assessed using a self-administered questionnaire at Wave I. We categorized a participant as being diagnosed with chronic respiratory disease if they responded positively to having been told by a physician that they had either asthma or COPD. MHAS measured COPD and asthma in one variable, and we combined them into chronic respiratory disease diagnosis because both are chronic lung diseases possibly leading to increased inflammation and a chronic hypoxic-hypercapnic state, and have similar effects on cognitive impairment. We selected several participant sociodemographic and lifestyle factors, as well as health conditions as covariates based on the existing literature.[5]

Descriptive statistics were presented as mean ± standard deviation for continuous variables and frequencies and proportions for categorical variables. Bivariate analyses were conducted to assess differences between chronic respiratory disease categories by participants' sociodemographic and lifestyle factors, and health conditions using Chi-square test for categorical variables and t-test for continuous variables. We conducted multivariable logistic regression analysis to estimate the relative odds of cognitive impairment with diagnosis of chronic respiratory disease, adjusting for confounders. We tested an a priori interaction hypotheses as to whether participants' gender, age, or other health conditions (defined as having at least one diagnosis of hypertension, diabetes, heart attack, stroke, or depression) were effect modifiers of the relationship by including each one as cross-product in separate adjusted models. A $P < 0.05$ was considered significant for all statistical inferences. Data management and analyses were conducted using R version 3.1 (Vienna, Austria).

Results

Table 1 presents the descriptive characteristics of the study cohort and the statistical differences in sociodemographic and lifestyle factors and health conditions between chronic respiratory disease groups. A total of 2782 older adults aged ≥60 years were included. The average age of participants at baseline was 66.5 years (±5.4 years). Overall, 57% of the older adults were females, 83% had less than 7 years of education, and 34% were not married. Approximately 12%, 39%, and 24% reported physician diagnoses of diabetes, hypertension, and depression, respectively. Approximately 14% and 29% were current smokers or alcohol consumers, respectively. When comparing characteristics between the two chronic respiratory disease categories, approximately 36% of older adults with chronic

respiratory disease had significantly high depressive symptoms, compared to 22% of those without chronic respiratory disease. Further, approximately 6% of older adults with chronic respiratory disease reported a physician diagnosis of heart attack, compared to 2.1% of those without chronic respiratory disease. Overall, 6.0% of older adults reported a physician diagnosis of chronic respiratory disease in Wave I. Overall, 16% of participants reported being cognitively impaired at Wave III. Figure 1 presents the unadjusted and adjusted estimates of the association of chronic respiratory disease with cognitive impairment after 11 years among older Mexican adults. When adjusted for confounders, compared to older adults who did not report a diagnosis of chronic respiratory disease, those who reported chronic respiratory disease diagnoses were 6% (adjusted odds ratio (OR) 0.94, 95% confidence interval (CI) 0.58–1.48) less likely to be cognitively impaired at Wave III, and the point estimate was not significant. No statistically significant interactions between age and chronic respiratory disease, gender, and chronic respiratory disease, and at least one health condition and chronic respiratory disease, on relationship with cognitive impairment were detected.

Discussion

In a prospective cohort of 2782 adults, we found that older Mexican adults diagnosed with chronic respiratory disease at baseline were not at risk of being cognitively impaired after 11 years of follow up.

Overall, 16.3% of older Mexican adults were cognitively impaired, similar to estimates from an earlier study on Mexican populations.[17] In our study, we found that chronic respiratory disease was not associated with an increased risk of cognitive impairment. Previous studies investigating this relationship reported inconsistent results. Studies by Peng et al.,[7] Chen et al.,[5] Eriksson et al.,[6] and Caldera-Alvarado et al.[18] reported significantly increased risk of cognitive impairment among older asthmatics, whereas Ray et al.[19] found no association. Studies by Liao et al.[10] and Crisan et al.[8] investigating the relationship between COPD and cognitive impairment reported significantly increased risk of impairment. We did not make specific distinction between asthma and COPD diagnosis status, making it difficult to draw comparisons with earlier studies. However, our study finding is important as studies demonstrating the mechanisms between chronic respiratory disease and cognitive impairment did not yield sufficient evidence.[20]

We identified approximately 6% of older adults aged ≥60 years being diagnosed with chronic respiratory disease at Wave I; the estimate is slightly less than that identified in earlier study.[13] Chronic respiratory diseases such as asthma and COPD are important causes of morbidity and mortality worldwide, however, they are often underdiagnosed and undertreated in older adults. With growing aging populations in Latin America, it is important to conduct pulmonary function tests and diagnose chronic respiratory diseases in older adults and reduce their associated morbidity later in life.

MHAS is a prospective cohort, however, the lengthy time gap between the Waves II (2003) and III (2012) did not allow us to identify the time/age at which a participant's cognition became impaired, limiting our ability to conduct time-to-event analysis. In addition, the

cohort is subject to loss to follow-up bias, as the cohort participants might have either migrated or died or been lost to follow-up during the follow up. Approximately 30% (n = 1462) and 12% (n = 565) of the cohort participants died or were lost during the follow-up and no information on their chronic respiratory disease or cognitive function was available. Study measures were obtained using self-reported responses, and thus might be subject to recall bias. A clinical diagnosis of study measures such as cognitive impairment, respiratory diseases, and other health conditions would help minimize measurement bias. Nevertheless, our study is the first study to investigate the association of chronic respiratory disease with risk of cognitive decline among older adults residing in Mexico, a country with a large aging population.

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Key Messages:

Epidemiological studies have investigated the association of cognitive impairment with asthma and/or COPD, but results were inconsistent. 2,782 older Mexican adults enrolled in Mexican Health and Aging Study were included in the study. Chronic respiratory diseases including asthma and COPD were not found to be significantly associated with risk of cognitive impairment in older Mexican adults.

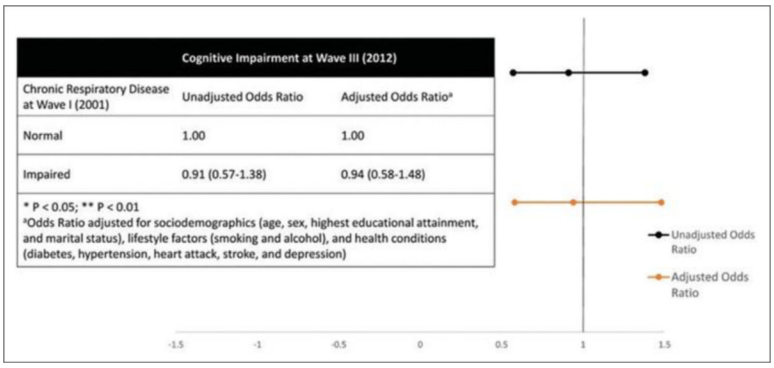

Figure 1:

Relationship of chronic respiratory disease with cognitive impairment among older Mexican adults, Mexican Health and Aging Study

Table 1:

Baseline sociodemographic, health conditions, and lifestyle characteristics by pulmonary disease category among older Mexican adults, Mexican Health and Aging Study, 2001–2012, *n*=2782

Characteristic	Chronic respiratory disease at Wave I		Total cohort
	No 94% (2616)	Yes 6% (166)	
Sociodemographics			
Age, mean±SD	66.5 (5.4)	66.5 (5.4)	66.5 (5.4)
Educational attainment, %(*n*)			
0 years	(26.1) 682	(29.5) 49	(26.3) 731
1-6 years	(57.0) 1492	(54.8) 91	(56.9) 1583
7+years	(16.9) 441	(15.1) 25	(16.8) 466
Gender, %(*n*)			
Male	(43.4) 1135	(37.3) 62	(43.0) 1197
Female	(56.6) 1481	(63.3) 104	(57.0) 1585
Marital status, %(*n*)			
Not married	(34.1) 892	(36.7) 61	(34.3) 953
Married	(65.9) 1724	(63.3) 105	(65.7) 1829
Health conditions			
Diabetes, %(*n*)			
No	(88.0) 2301	(86.7) 144	(87.9) 2445
Yes	(12.0) 313	(13.3) 22	(12.1) 335
Hypertension, %(*n*)			
No	(61.2) 1600	(56.0) 93	(60.9) 1693
Yes	(38.7) 1012	(43.4) 72	(39.1) 1084
Heart attack**, %(*n*)			
No	(97.8) 2559	(94.0) 156	(97.6) 2715
Yes	(2.1) 56	(6.0) 10	(2.4) 66
Stroke, %(*n*)			
No	(97.8) 2558	(98.2) 163	(97.8) 2721
Yes	(2.1) 54	(1.8) 3	(2.2) 57
Depression**, %(*n*)			
No	(75.1) 1965	(60.8) 101	(74.3) 2066
Yes	(22.2) 581	(36.1) 60	(23.7) 641
Lifestyle characteristics			
Smoking, %(*n*)			
Never	(57.5) 1504	(53.0) 88	(57.2) 1592
Former	(28.5) 746	(36.1) 60	(29.0) 806
Current	(14.0) 365	(10.8) 18	(13.8) 383
Alcohol consumption, %(*n*)			
Abstainer	(39.0) 1021	(33.7) 56	(38.9) 1077
Former	(31.5) 824	(35.5) 59	(31.9) 883
Current	(29.1) 762	(30.1) 50	(29.2) 812

Characteristic	Chronic respiratory disease at Wave I		Total cohort
	No 94% (2616)	Yes 6% (166)	
Cognitive impairment, 2012, %(*n*)			
Normal	(83.6) 2188(84.9) 141		(83.7) 2329
Impaired	(16.4) 428 (15.1) 25		(16.3) 453

*$P<0.05$

**$P<0.01$

***$P<0.001$