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Place of birth, age of immigration, and disability in Hispanics with multiple sclerosis

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Abstract

Background—Hispanics in the US are a diverse community where their knowledge and risk for developing disability in multiple sclerosis (MS) may relate to their level of acculturation.

Objective—To compare the risk of disability in Hispanics with MS in the US by place of birth and age of immigration.

Methods—We conducted a cross-sectional study of 304 Hispanics with MS residing in Southern California. Place of birth and age of immigration were used as proxies to acculturation. Individuals were classified as US-born, early and late-immigrant (<15 and ≥15 years at immigration to the US, respectively). Risk of disability (expanded disability status scale ≥6) was adjusted for age at symptom onset, sex, socioeconomic status, and disease duration, using logistic regression.

Results—Late-immigrants were older at symptom onset (34.2±11.9 vs. 31.9±12.9 vs. 28.5±10.2 years, $p<0.001$) and had more disability (28% vs. 9% vs. 18%, $p=0.04$) compared to early-immigrant and US-born respectively. There was no difference between groups by female sex, type of MS, ethnicity, chronic medical conditions, and disease duration while differences were noted by socioeconomic status. Being late-immigrant was independently associated with increased disability (adjusted OR 2.2, 95% CIs 1.04–4.74; $p=0.04$) compared to US-born.

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Conclusion—Later immigration to the US in Hispanics with MS is associated with greater disability. These findings may reflect differences in social, environmental and cultural factors that may act as barriers for accessibility and utilization of health services. An in-depth assessment of the perceptions and attitudes about MS are warranted in this population.

Keywords

Multiple sclerosis; Hispanic; immigration; acculturation; disability

Introduction

Migration patterns and age at migration are reported to primarily influence multiple sclerosis (MS) disease susceptibility,[1-3] and age of onset[4,5]. Recently, increased disease severity has been reported among non-European immigrants to Norway, France, and United Kingdom compared with natives, despite similar access to health care and biological markers in some [6,7,4]. While biological differences could be responsible, immigration can come at the expense of health concerns and proper care that could be playing a role in MS disease progression.

Hispanics in the United States (US) represent a complex population of US-born and foreign-born immigrants, [30] where immigration patterns have been noted to be influential in chronic inflammatory diseases [8]. Data indicate that these changing patterns among Hispanics may be related to acculturation, the process of cultural and psychological change that results following meeting between cultures [9]. Obesity, Type 2 diabetes risk, smoking, and cardiovascular disease in Hispanics are often observed more often with higher acculturated Hispanics paralleling their age of immigration or time in the US [10-13]. On the other hand less acculturated Hispanics are reported to eat healthier foods, but yet experience more barriers to healthcare and are less likely to seek preventive services[14,15]. Thus, it is possible that acculturation could influence MS disease progression among Hispanics living in the US. To investigate this notion further, we compared Hispanics that were US born, immigrated early and later to the US, and assessed the relationship between birth place and age of immigration, as a proxies to acculturation, on MS disability in order to unravel social determinants of health that may provide targets for intervention.

Methods

Study Population

Data for this cross-sectional study was extracted from the Hispanic MS Registry at the University of Southern California (USC) MS clinics [5]. The MS clinics include the MS Comprehensive Care center where private payer individuals are seen and the publicly funded specialty MS clinic at the Los Angeles County medical center serving uninsured/underinsured individuals; both of which are served by the same MS specialist neurologists. Clinical and demographic information were collected from participants with MS [16] between October 2008 and September 2013. Initial Hispanic self-identification was collected along with identification of country of origin, and later verified by a comprehensive, self-administered questionnaire. A neurological history, exam and an

expanded disability status scale (EDSS)[17] was conducted and assigned by an MS specialist. Hispanic ancestral background dating back to grandparent origin was completed for 99% of participants. The Institutional Review Board at USC approved this study and all patients provided informed consent prior to participation.

Clinical Characteristics

Clinical MS characteristics such as type of MS, date of first symptom, diagnosis, on treatment, clinic setting, and chronic medical conditions were extracted from the medical record system and registry database. Because individuals of low income (<40,000/year) are more likely to be underinsured or uninsured individuals, receiving treatment at the county clinic was used as a marker of socioeconomic status. Chronic inflammatory medical conditions were also collected using a standardized questionnaire at the time of entry to the registry and were classified as cancers, autoimmune conditions and vascular risk factors. Vascular risk factors included diabetes mellitus, hypertension, stroke, coronary artery disease, and hypercholesterolemia. Information on smoking was also included. An EDSS of less than 6.0 was used to indicate individuals that were still ambulating without assistance. Cases were thereby divided as having an EDSS <6.0, while those using constant support of a cane, walker, or wheelchair were appointed an EDSS of 6.0. Reaching an EDSS score of 6.0 was considered a clinical endpoint of severe disability.

Birth and Immigration

Information regarding immigration history and place of birth were obtained and served as indexes of acculturation. Detailed immigration history, including place of birth, year and age of immigration, was also recorded using structured, in-person interviews at registry entry. To address the possible effects of immigration on disability, we categorized patients into three groups according to time of immigration: late-immigrants were those who immigrated to the US after age 15 (n=67) and immigrants to the US before age 15 was termed early-immigrants, and compared them to those who were born in the United States (US-Born). We chose 15 years as this has been previously reported to be a critical age of migration for MS [3].

Statistical Analysis

All analyses were conducted in Hispanic MS cases with complete migration information. ANOVA was used to test for statistically significant differences in means of continuous variables between all three subgroups; for variables with non-parametric distributions the Kruskal-Wallis test was preferred. Binary or categorical variables were analyzed using chi-square or Fisher's exact test respective to sample size. Logistic regression was used to calculate the odds ratios (OR) and 95% confidence intervals (CIs) for the association of acculturation and disability. This was performed in relapsing remitting MS (RRMS) cases only and adjusted for age at first symptom, sex, socioeconomic status, and disease duration. All statistical analyses were performed using SAS 9.3 and *a priori* α -level of 0.05 was used to declare statistical significant.

Results

A total of 304 Hispanics affected with MS provided detailed information related to birth and immigration. The total sample was predominantly female, with RRMS, and mean disease duration of nine years (Table 1). Most received care at the county MS clinic (n=201, 66%) and were on a disease modifying treatment for MS (n=271, 90%). No differences were seen between groups in disease duration and lag time between symptom onset to diagnosis of MS. Significant differences were, however, seen in age and age of first symptom and diagnosis, showing that US-Born was more likely to be younger in all three parameters. Additionally, a higher proportion of late-immigrants were dependent on ambulatory assistance (EDSS 6.0), which was significantly higher compared to US-Born and early-immigrants (28% vs. 9% vs. 18%, $p=0.04$), respectively.

Birth and Immigration

The study population was predominantly of Mexican origin (71%), followed by Central American (8%), South American (3%), and two-percent with an ethnic background from the Caribbean islands (i.e. Cuba, Dominican Republic, and Puerto Rico). Unique to this sample also, 18% self-identified with Latin American parents and a grandparent of European background. The early-immigrant had come to the US on by age 6, whereas the late-immigrant group had median age of immigration of almost 23. Of interest, an average of >10 year lag time was observed between age of immigration and first symptom onset in the late-immigrant.

Medical Conditions

Chronic medical conditions in addition to MS were reported in 30% across all groups ($p=0.10$, Figure 1). Overall, late and early-immigrants reported more vascular risk factors, such as diabetes, hypertension, stroke, coronary artery disease, and hypercholesterolemia compared to US-Born. Smoking was evenly reported in 9% across all three groups ($p=0.92$). Hypercholesterolemia appeared to be the more commonly reported medical problem in the vascular category affecting late-immigrants compared to early-immigrant and US-born, respectively (6% vs. 3% vs. 0.5%, $p=0.002$). There were no differences in prevalence risk between late and early-immigrants with autoimmune co-morbidities and cancer. Other medical conditions appeared to be more common among US-Born and late-immigrants which were composed of gastrointestinal maladies, chronic sinusitis and mental conditions such as anxiety, depression, and chronic migraine.

Immigration and MS disability

Longer disease duration and immigrating to the US at a later age were independently associated with greater disability from RRMS compared to US-born (Table 2). Immigration after but not before the age of 15 years was independently associated with more MS-related disability compared to the US-Born group (Table 2).

To examine if the development of symptoms of MS were not already present in the immigrant, we restricted to those with adult onset MS (n=256, Table 3). In this restricted model, immigrating after age 15 was still associated with a 2 fold risk of disability,

compared to US-Born (OR 2.0, 95% CIs 0.87 to 4.43; $p=0.11$) but less significant. Being early-immigrant in both models appears to be associated with a decrease risk to disability without reaching statistical significance.

Discussion

In this sample of Hispanics with MS residing in Southern California, those who were 15 years or older but not those who were less than 15 years of age at immigration to the US had more disability compared to those who were US-born. The average age of immigration was well before the age of MS symptom onset in our population. Therefore, the potential for MS having gone undetected in the country of origin does not explain our findings. These observations suggest that factors associated with age of immigration, such as acculturation, may be important determinants of MS prognosis in US Hispanics that may surpass biological aspects of the disease.

Of the relapsing remitting cases, late-immigrants were greater than twice more likely to have ambulatory dependence and impairment. A study of individuals of West Indian background who immigrated to the United Kingdom (UK) were found to be more at risk of a severe course than natives[4]. While these results could be explained by genetic, ethnic/racial and environmental differences, behavioral and social factors that parallel migration should also be considered [4]. Stress, tobacco use, and mental health services are reported to be exacerbated in recent immigrants [18,8,19]. Smoking however was not a prominent finding in this group nor did it differ between groups but its relationship in other MS populations suggests that it be could important to MS progression (ref). Thus, the process of adaptation to the host culture (acculturation) is complicated. In addition, unplanned immigration may lead to a more sudden rupture of the social networks that support both psychological and physical well- being thereby creating an additional barrier for an individual with MS like symptoms to seek care in a timely manner[8,19].

The observation that late-immigrants report more vascular-related medical conditions is not surprising. Older age can be a risk factor to the development of medical co-morbidities such as hypercholesterolemia in this sample. In addition, preventive health use has been reported to be greater for persons with mobility problems [20,21]. Yet, of all major racial/ethnic groups in the US, Hispanics are reported to use fewer health care services than non-Hispanic whites, [22] suggesting that Hispanics with MS may not have a proclivity to engage in preventive care. Despite individuals receiving care from MS specialists in specialty clinics, the late-immigrant may have to grapple with other issues such as poverty, work disability, and lack of insurance. The lower female to ratio observed in this group compared to US-Born could be a manifestation of known immigration practices, where older immigrants to the US are more likely to be male and seeking employment [23]. Additionally, low-income Hispanics have been reported to have a general lack of adequate education available about treatment and resources for MS, and lack realistic expectations about treatments, which could be the case in our sample given that most receive their care at the county clinic despite being a specialized clinic with same MS providers [24]. Taken together, we speculate that late-immigrants may have low levels of acculturation and have more acculturative stress which could be preventing them from acquiring information about MS, utilizing MS

services, and/or engaging in preventative measures that could indirectly affect disease and MS progression.

In this diverse cohort, the places of birth and ethnic origin were mostly from Mexico, which is consistent with the population demographics of Los Angeles County (~48% of LAC are Hispanics with ~36% reporting Mexican background). Not surprisingly, the most common Central American country was El Salvador, which is consistent with census reports in Los Angeles County [31]. Mexicans in the US are reported to be the largest ethnic minority -67% of all Hispanic groups with 36% reported as foreign-born, and with at least 1/3 primarily Spanish speaking [32]. Because MS is becoming more increasingly diagnosed among Hispanics, these findings thereby offer a unique challenge and opportunity for US States, covering a large Hispanic and Mexican representation, to tailor appropriate medical attention in this population. More so, this study underscores our need to study Hispanics living with MS in the US, given that most of our treatment and care for MS to the patient is available in English and follows the understanding of caring and treating to non-Hispanic, white cohorts. Thus, recognizing the complex interplay between immigration and MS may alert us to the importance of incorporating non-biological factors related to acculturation in the examination of disability.

Limitations to this study include the cross-sectional design, possible ascertainment bias, and the lack of generalizability due to inclusion of predominantly Mexican Hispanics only. To date, studies about the health of Hispanic Americans with MS have typically focused on clinical characterization and have mostly aggregated them into one category despite existing ethnic diversities in culture, language, and immigration history [5,25-29]. While these findings should be confirmed in a cohort study, care should also be taken in extrapolating these findings to Hispanics of non-Mexican background or non-Hispanic immigrants. However immigration is a world-wide phenomenon and its ramifications should be considered in any chronic medical condition. Lastly, future studies should evaluate other indices of acculturation such as language use and generational status (9).

The strengths of our study include the large sample of Hispanics with detail clinical and immigration information. The findings from this study are novel and provide important information that suggests that factors associated with later age at immigration and thereby less acculturation, may be modifiable risk factors for MS-related disability in Hispanics. A better understanding of the varying beliefs and health behaviors in more and less-acculturated Hispanics with MS are needed to identify these factors. This type of information could be used as a framework for future studies aimed at implementing successful MS educational efforts and tailored interventions geared at minimizing MS-related disability in US Hispanics.

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Highlights

- Age of immigration to the US influences disability and age of first symptom
- Hispanics who immigrated to the US at a later age are at higher risk of disability
- US born Hispanics are younger at symptoms onset compared to immigrants.

Chronic Medical Conditions between US-Born, Early and Late-Immigrants in Hispanics with MS

Figure 1.

Chronic medical conditions were reported across 30% (n=90) of the sample (p=0.10). Vascular risk factors consist of diabetes, hypertension, hypercholesterolemia and history of heart conditions such as coronary artery disease and stroke. Other medical conditions include conditions like chronic infections (i.e. sinusitis), gastrointestinal (i.e. constipation) and mental health (i.e. depression, anxiety).

Table 1
Baseline characteristics, place of birth, and age of immigration of Hispanics with MS

Characteristics	US-Born n=202	Early-Immigrant n=35	Late-Immigrant n=67	Overall n=304	p-value
Female, n %	132 (65)	19 (54)	38 (57)	189 (62)	0.27
Relapsing Remitting, n %	189 (94)	30 (86)	61 (91)	280 (92)	0.09
Age, yrs*	39.1 (11.1)	42.4 (13.0)	44.9 (11.2)	40.8 (11.6)	0.001
Age 1 st symptom, yrs*	28.5 (9.7)	31.9 (12.9)	34.2 (11.9)	30.1 (10.8)	<0.001
Before age 17, n %	22 (11)	3 (9)	4 (6)	29 (10)	0.48
Age at diagnosis, yrs*	30.1 (10.4)	32.5 (13.8)	36.6 (11.1)	31.8 (11.2)	<0.001
Disease duration, yrs*	9.2 (7.5)	9.9 (8.3)	8.4 (7.6)	9.1 (7.6)	0.60
Lag time to diagnosis, yrs*	1.7 (3.2)	1.7 (2.8)	2.4 (4.8)	1.8 (3.6)	0.29
EDSS of 6, n %	37(18)	3 (9)	19 (28)	59 (19)	0.04
<i>Ethnic Origin:</i>					
Mexican	141 (71)	22 (63)	43 (62)	206 (67)	0.11
Central America	15 (8)	2 (6)	9 (14)	26 (9)	
South America	5 (3)	4 (11)	6 (9)	15 (5)	
Caribbean	3 (2)	2 (6)	0 (0)	5 (2)	
Mix Hispanic**	35 (18)	5 (14)	12 (18)	52 (17)	
Age of immigration, yrs***	0 (0,0)	6 (3, 12)	22.5 (19, 29)		<0.001
County, n %	124 (62)	27(77)	50 (75)	201(66)	0.05

Abbreviations:

* means and standard deviations, yrs=years

** Mix Hispanic represented mixture between different Hispanic backgrounds or a European (i.e. Mexican and Guatemalan),

*** Median, Interquartile range (Q1, Q3)

Table 2
The association between birth, timing of migration and disability in relapsing remitting MS only (n= 280)

Factors	Unadjusted OR (95% C.I.)	p-value	Adjusted OR (95% C.I.)	p-value
Sex (Female)	0.8 (0.42-1.37)	0.36	0.8 (0.41-1.55)	0.50
Age 1 st Symptom (yrs)	1.0 (0.98-1.03)	0.85	1.0 (0.99-1.06)	0.15
Disease Duration (yrs)	1.1 (1.05-1.14)	<0.0001	1.1 (1.08-1.19)	<0.0001
Socioeconomic (County)	1.6 (0.85-3.20)	0.14	1.3 (0.62-2.63)	0.51
US born	(ref)		(ref)	
Early-immigrant	0.5 (0.15-1.83)	0.31	0.4 (0.09-1.48)	0.16
Late-immigrant	2.1 (1.11-4.13)	0.02	2.3 (1.07-4.82)	0.03

yrs=years

Table 3
The association between timing of migration and disability in relapsing remitting MS and adults only (n=256)

Factors	Unadjusted OR (95% C.I.)	p-value	Adjusted OR (95% C.I.)	p-value
Sex (Female)	0.8 (0.42-1.49)	0.47	0.8 (0.41-1.70)	0.62
Age 1 st Symptom (yrs)	1.0 (0.98-1.05)	0.33	1.0 (0.99-1.07)	0.11
Disease Duration (yrs)	1.1 (1.05-1.14)	<0.0001	1.1 (1.08-1.20)	<0.0001
Socioeconomic (County)	1.4 (0.74-2.88)	0.28	1.1 (0.54-2.40)	0.73
US born	(ref)		(ref)	
Early-immigrant	0.6 (0.17-2.18)	0.45	0.4 (0.09-1.69)	0.20
Late-immigrant	1.9 (0.95-3.88)	0.07	2.0 (0.87-4.43)	0.11