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Relationship of Gender, Use of Disease-Modifying Therapies, and Health Insurance in Multiple Sclerosis

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Abstract

Recent findings have demonstrated that use of disease-modifying therapies (DMTs) in persons with multiple sclerosis was affected by health insurance. Many patients relied on free or discounted drug programs for DMT use and when they obtained DMTs through their health insurance, it was not uncommon for them to experience insurance challenges for DMT use. However, it is not known how these findings were associated with gender. Here we investigate the association between gender and (1) DMT use, (2) use of free or discounted drug programs, and (3) insurance challenges for DMT use using participants from North American Research Committee on Multiple Sclerosis (NARCOMS) Registry.

Keywords Multiple sclerosis; Disease-modifying therapies; Health insurance

Introduction

Although over 14 disease-modifying therapies (DMTs) are currently available for multiple sclerosis (MS) [1], the heavy utilization of health care in persons with MS [2] and the rising cost of DMTs [3] make the accessibility of these therapies increasingly more difficult. Furthermore, as a result of the high cost, insurance companies put restrictions on patients' access to these medications [4]. Wang, et al. [5] investigated the effects of health insurance on DMT use in a large registry survey, and concluded that persons with MS who had experienced negative insurance change over the last 12 months were less likely to take DMTs and more frequently relied on free or discounted drug programs for DMT use. When they obtained DMTs through their insurance, patients were more likely to encounter challenges for DMT use if negative insurance change had occurred [5]. However, the role of gender as a factor in DMT use has not been investigated.

Therefore the purpose of this study is to further investigate the association between gender and (1) DMT use, (2) use of free or discounted drug programs, and (3) insurance challenges for DMT use; extending the previous work of Wang et al. [5].

Methods

Participants from North American Research Committee on Multiple Sclerosis (NARCOMS) Registry, a large volunteer registry for patients with MS, was used. The NARCOMS registry collects information at participants' enrollment and updates that information semi-annually. The methods are described in more detail in Wang et al. [5] but are briefly described.

Information used in the analyses included gender, date of birth, race (dichotomized as Caucasian/non-Caucasian), marital status (dichotomized as married *vs.* not married), annual income (categorized as: ≤ $30,000, $30,001-100,000, >$100,000), current employment status (full-time, part-time, unemployed), age and year of MS diagnosis, current MS course (relapsing-remitting MS [RRMS], primary progressive MS [PPMS], and other), level of disability assessed using Patient-Determined Disease Steps (PDDS), and health insurance (yes/no) including type (categorized as private, public, private and public, public +[public plus supplemental]).

In the Fall 2014, participants were surveyed about whether the insurance changed compared with 12 months ago (categorized as negative insurance change *vs.* stable insurance). Using a 17-option questionnaire, participants also reported in the last 12 months: whether they took DMTs (yes/no), reasons for not taking DMTs (dichotomized as insurance/financial reasons *vs.* personal choice/physician recommendation), and financial resources used to pay for DMTs (categorized as self-pay only [no insurance], free or discounted drug programs, and insurance). Respondents who obtained DMTs through insurances, were further categorized to indicate whether they encountered any insurance challenges for DMT use (yes/no).

We compared male and female respondents using Pearson chi-square tests for categorical variables, analysis of variance for normally distributed continuous variables, and Wilcoxon or Kruskal-Wallis tests for non-normally distributed continuous variables or categorical variables. The association between gender and (1) DMT use, (2) use of free or discounted drug programs, and (3) insurance challenges for DMT use was investigated using multivariate logistic regression analysis [6] adjusting for the same set of potential confounders including age at the time of survey, PDDS, disease duration, annual income, marital status, disability status, and employment status in the last 6 months and insurance type. Because the clinical trials leading to DMT approval only enrolled persons with RRMS, we conducted the analyses on all the respondents and then repeated the analyses on the RRMS respondents [1].

All analyses were conducted using SAS 9.4 (SAS Institute Inc., Cary, NC). All p-values were based on two-sided tests and $p<0.05$ were considered significant.

Results

The 6662 respondents analyzed in the previous study [5] were also used for this study. Of these 6662, 5310 (79.7%) were female. Of all the respondents, female respondents were more likely to report negative insurance change and to have lower annual income, to be younger, employed, and not married with short disease duration, RRMS, and less severe disability (Table 1). Among those with RRMS, similar findings were observed (Table 1).

Of all the respondents, more females reported taking DMTs and relying on free or discounted drug programs for DMT use (Figure 1). Of the 3109 female respondents who obtained DMTs through insurance, 256 (8.2%) reported encounter of insurance challenges. For males, 47 (6.1%) of the 769 reported insurance challenges for DMT use. After adjusting for potential confounders, only the odds of relying on free or discounted drug programs for DMT use or experiencing insurance challenges for DMT use for females were higher than for males (Table 2).

Characteristic	All respondents included in this study (n=6662)			Respondents with RRMS (n=3813)		
	Female (n=5310)	Male (n=1352)	p Value	Female (n=3223)	Male (n=590)	p Value
Negative insurance change, n (%)	1226 (23.1)	246 (18.2)	0.0001	795 (24.7)	123 (20.9)	0.046
Caucasian, n (%)	4983 (93.8)	1258 (93.1)	0.28	3006 (93.3)	557 (94.4)	0.30
Age at the time of survey, y, mean (SD)	58.3 (10.1)	61.0 (9.9)	<0.0001	55.6 (9.9)	57.3 (9.4)	0.0002
Employment (prior 6 months), n (%)						
Full time	1168 (27.2)	303 (27.5)	<0.0001	980 (36.6)	202 (41.7)	<0.0001
Part-time	589 (13.7)	89 (8.1)		431 (16.1)	42 (8.7)	
Not employed	2531 (59.0)	711 (64.5)		1268 (47.3)	241 (49.7)	
Annual income, n (%)						
≤ $30,000	1134 (27.9)	250 (22.5)	0.0008	596 (23.9)	97 (19.4)	0.06
$30,001-$100,000	2068 (50.9)	590 (53.2)		1256 (50.3)	256 (51.1)	
>$100,000	859 (21.2)	270 (24.3)		647 (25.9)	148 (29.5)	
Type of insurance, n (%)						
Only private	2264 (44.8)	417 (32.6)	<0.0001	1751 (57.0)	276 (49.7)	0.0013
Only public	1038 (20.6)	372 (29.1)		537 (17.5)	127 (22.9)	
Public and private	1003 (19.9)	290 (22.7)		462 (15.0)	101 (18.2)	
Public+	746 (14.8)	200 (15.6)		321 (10.5)	51 (9.2)	
Income change (prior 6 months [yes]), n (%)	819 (16.5)	214 (16.7)	0.86	562 (18.6)	111 (19.6)	0.55
Married (yes), n (%)	3356 (63.7)	963 (71.8)	<0.0001	2109 (66.0)	428 (73.2)	0.0006
Age at disease onset, y, mean (SD)	38.3 (9.7)	39.4 (9.7)	0.0001	37.8 (9.4)	39.2 (9.4)	0.0015
Disease duration, y, mean (SD)	19.6 (9.7)	21.4 (10.4)	<0.0001	17.4 (8.8)	18.0 (8.9)	0.14
Current MS course, n (%)						
RRMS	3223 (60.7)	590 (43.6)	<0.0001	--	--	--
PPMS	1448 (27.3)	590 (43.6)		--	--	--
Current PDDS, median (interquartile range)	3 (1-5)	4 (2-6)	<0.0001	2 (1-4)	3 (1-4)	<0.0001
Disability benefits [yes], n (%)	1993 (45.8)	594 (55.2)	<0.0001	990 (37.0)	214 (46.3)	0.0001

DMTs: Disease-Modifying Therapies; PDDS: Patient Determined Disease Steps; RRMS: Relapsing Remitting MS; PPMS: Primary Progressive MS; Public+: Public insurance plus supplemental and/or other insurances

Table 1: Comparison of characteristics of female and male respondents included in this study.

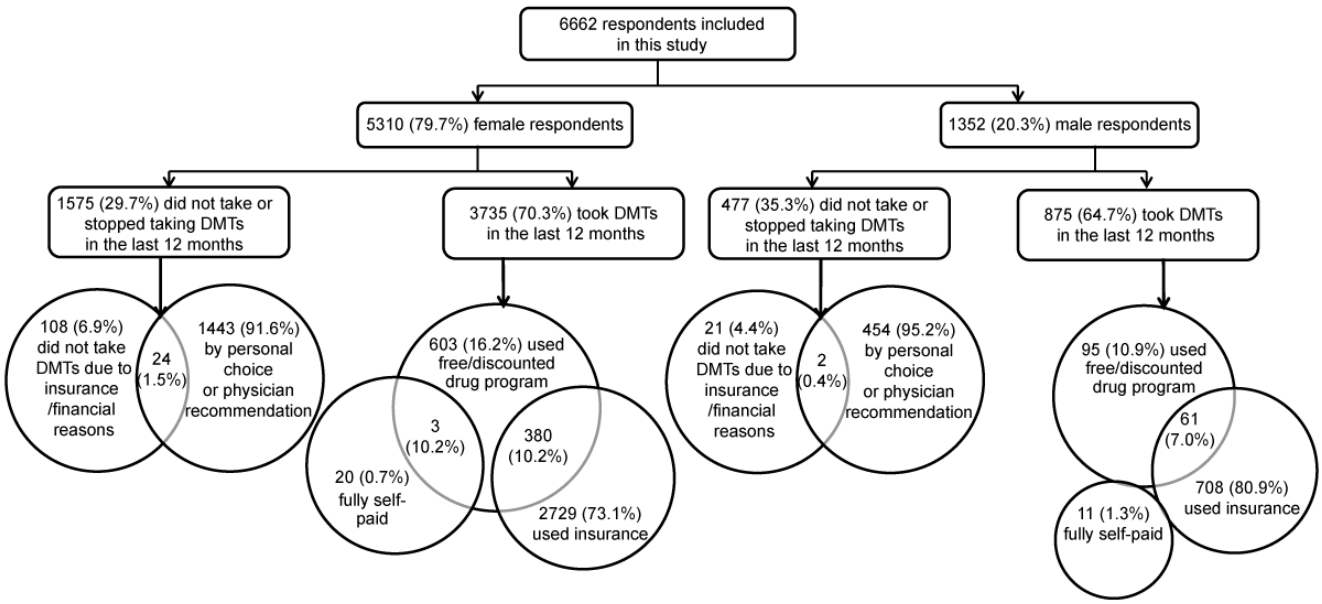

Figure 1: Disposition of all respondents by gender, followed by disease-modifying therapy (DMT) use (taking *vs.* not taking), next by reasons of not taking DMTs (personal choice *vs.* insurance/financial reasons) and by financial resources used to pay for DMTs (insurance *vs.* free/discounted drug programs *vs.* self-pay).

Covariates	Respondents who took DMTs			
	Free/discounted drug programs *vs.* covered by insurance		Insurance challenges (yes *vs.* no)	
	All (N=4138)	RRMS (N=2731)	All (N=3878)	RRMS (N=2569)
Gender: female *vs.* male	1.64 (1.17-2.32)		1.77 (1.08-2.92)	
PDDS	0.90 (0.84-0.96)	0.91 (0.84-0.997)		
Disease duration				
Annual income: low *vs.* high	5.97 (3.62-9.84)	5.30 (2.96-9.48)	2.42 (1.32-4.46)	
Annual income: median *vs.* high	4.22 (2.82-6.33)	4.29 (2.74-6.72)		
Negative insurance change *vs.* stable insurance	1.72 (1.32-2.26)	1.92 (1.40-2.64)	4.04 (2.87-5.68)	2.79 (1.82-4.28)
Insurance: public+ *vs.* public only	1.53 (1.03-2.27)			
Insurance: public+ *vs.* private and public	2.12 (1.38-3.25)	2.05 (1.14-3.68)		

*The same set of covariates were adjusted for each population in the multivariate logistic regressions: age at the time of survey, PDDS, disease duration, annual income, marital status, disability status, employment status in the last 6 months, and type of insurance. Only statistically significant odd ratios were presented in the table.

DMT: Disease-Modifying Therapy; RRMS: Relapsing Remitting MS, PDDS: Patient Determined Disease Steps; Public+: Public insurance plus supplemental and/or other insurances

Table 2: Associations [Odds Ratio (95% Confidence Interval)] for all respondents who took DMTs and in the RRMS subset*.

When restricted to RRMS respondents, similar results were observed in terms of DMT use and use of free or discounted drug programs (Figure 2). Of the 2148 females with RRMS, 171 (6.7%) reported insurance challenges for DMT use. And for males, a slightly lower proportion, 26 (6.2%) of the 421 respondents with RRMS reported insurance challenges. After adjusted for potential confounders, the odds of DMT use, relying on free or discounted drug programs for DMT use or experiencing insurance challenges for DMT use for females were not significantly different from male (Table 2).

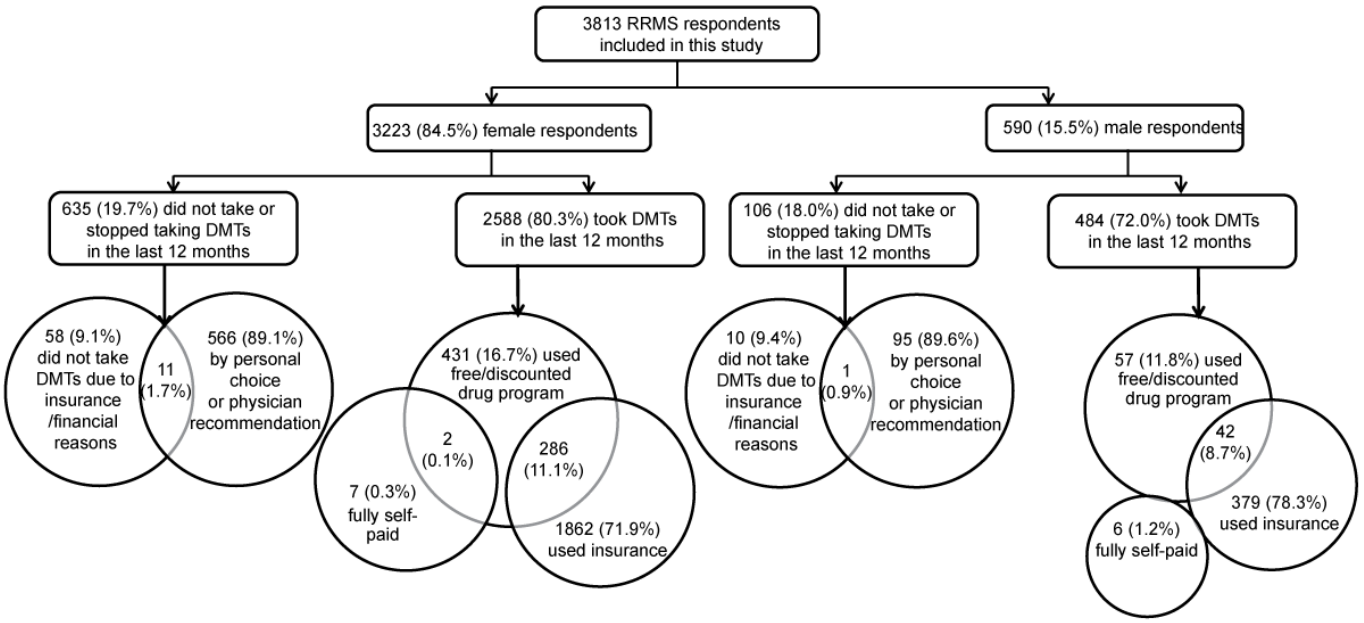

Figure 2: Disposition of respondents with relapsing-remitting MS by gender, followed by disease-modifying therapy (DMT) use (taking *vs.* not taking), next by reasons of not taking DMTs (personal choice *vs.* insurance/financial reasons) and by financial resources used to pay for DMTs (insurance *vs.* free/discounted drug programs *vs.* self-pay).

Discussion

In this study, we found that female respondents were approximately 5% more likely to report negative insurance change, to not take DMTs, and to rely on free or discounted drug programs for DMT use compared with male. When they obtained DMTs through insurance, they reported about 2% increased chance to experience insurance challenge. Similar results were found when limited to RRMS respondents.

When all the respondents were considered, females were significantly more likely to use free or discounted drug program and to encounter insurance challenges for DMT use than males after adjusted for all potential confounders. This may be due to the fact that significantly more females had private insurances and relapsing-remitting course. As observed in the previous study [5], respondents with private insurance reported more negative insurance change, which subsequently resulted in a larger odds of using free or discounted drug programs and encountering insurance challenges. Females had over 12% percent more private insurance than males, likely due to the facts that RRMS demanded more use of DMTs since all the currently approved DMTs are for RRMS and that private insurances were more effective than public insurance in preventing mortalities as demonstrated in an HIV study [7]. When limited to RRMS respondents, females and males did not significantly differ in DMT use, use of free or discounted drug programs, and insurance challenges for DMT use.

This study used self-reported survey data and thus had all the potential limitations inherent in self-reported surveys including recall bias, self-report bias, and selection bias. Additionally, the study is limited to residents of the United States, and thus it is challenging to compare the DMT use with the other countries such as Canada or European countries where other restrictions or challenges occur. Nonetheless, this study suggested that among RRMS respondents, gender was not associated with DMT use, how to pay for DMTs, and insurance challenge for DMT use.

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Author Contributions

Guoqiao Wang conducted the analyses and drafted the manuscript. Amber R. Salter drafted and edited the manuscript. Both authors approved of the version to be published.

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