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A study of dietary modification: Perceptions and attitudes of patients with multiple sclerosis

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ABSTRACT

Background: Modifiable risk factors for multiple sclerosis (MS), including obesity and the gut microbiome, have been studied and have been found to be potentially relevant. Given this, there is a growing interest in diet modification as a means of impacting MS risk and disease course.
Objectives: The aim of this study was to determine the current behaviors, level of interest, and relevant factors surrounding modification of diet in MS patients.
Methods: A total of 601 MS patients were mailed a dietary modification survey containing questions regarding subject demographics, disease course, and diet-related questions.
Results: Of the 199 survey responders, 17% admitted to currently attempting a diet for their MS and 91.5% were interested in diet modification as a means of benefiting their disease. Willingness to attempt diet therapy was not affected by demographic features or an individual's disease course. Over 85% of these patients were willing to attempt diet therapy for 3 months or longer.
Conclusions: The majority of survey responders expressed interest in diet modification in attempts to improve or treat their MS. Our data demonstrate the feasibility of patient recruitment for future studies assessing therapeutic intervention by way of diet modification for MS disease.

1. Introduction

Multiple sclerosis (MS) is a chronic inflammatory disease of the central nervous system (CNS) that is characterized by accrual of multifocal demyelinating lesions in the brain and spinal cord driven by an underlying, dysregulated immune response. The cause of MS is multifactorial, with recognized contributions from both genes and environmental exposures (Belbasis et al., 2015). Proposed environmental risk factors include vitamin D deficiency (Munger et al., 2006), exposure to smoking (Handel et al., 2011), Epstein Barr virus infection (Handel et al., 2010), and indigenous geography and migration patterns (Gale and Martyn, 1995; Hernan et al., 1999; Wallin et al., 2004). In addition to these environmental risk factors, obesity in adolescence appears to be associated with an increased risk of MS (Hedstrom et al., 2012; Langer-Gould et al., 2013). The underlying pathobiologic mechanism that accounts for the association between obesity and risk of multiple sclerosis is not known; however, it may potentially relate to the fact that obesity both increases the risk of vitamin D deficiency (Brenton et al., 2014) and is associated with the development of a chronic, serological pro-inflammatory state (Wisse, 2004; Sanna et al., 2003).

In line with the potential effects of obesity upon risk for MS, major attention has been given to the role that an individual's gut microbiome plays in the development of autoimmune disease. As gut-associated lymphoid tissue comprises the body's largest mass of lymphoid tissue, the bacterial milieu within the gastrointestinal tract likely has a substantial influence on an individual's immune response. To this end, small case-control studies have demonstrated differences in the gut flora between patients with MS and those without MS (Miyake et al., 2015). It stands to reason that dietary intake, thereby, has a direct influence upon gut flora and ultimately upon the expression of an individual's immune system.

Diet modification and its impact upon MS has been posited to have a potential effect on disease risk and clinical course. One of the greatest obstacles in any dietary study is ensuring and measuring subject compliance with a diet in order to assess long-term benefit upon MS disease course. Several studies have attempted to determine the impact of various diet modifications (Socha et al., 2014; Millar et al., 1973; Farez et al., 2015; Baarnhielm et al., 2014; Hoare et al., 2015); however, these studies are small, relatively short-term, and often rely on the patient's dietary recall. Despite a large proportion of MS patients reporting utilization of dietary strategies (Yadav et al., Baldauf-Wagner), studies aimed at rigorously defining impact of diet upon MS are few. A Cochrane

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meta-analysis assessed the impact of diet interventions upon MS and concluded that supportive evidence is insufficient, primarily due to a lack of randomized controlled trials within this field (Farinotti et al., 2012).

Conceptually, a subject's willingness and ability to adhere to diet therapy can be a challenging obstacle. While there have been several studies looking at diet modification in the MS population, we are unaware of any studies that directly address patient-focused perceptions and/or barriers to diet-based research within the MS community. Therefore, we performed a cross-sectional survey study of our MS patient population to determine the prevalence of MS patients currently attempting a diet, patient willingness to initiate and adhere to dietary modification in hopes of benefiting their disease, and factors that influence a patient's willingness to modify their diet.

2. Methods

This cross-sectional, survey-based cohort study was approved by the University of Virginia's Institutional Review Board. A total of 601 MS patients (including all MS subtypes), seen at the University of Virginia's J.Q. Miller Multiple Sclerosis Clinic, were mailed a 4-page survey packet with a return self-addressed, stamped envelope in April 2015. One page of this packet was dedicated to a diet survey and contained questions regarding subject demographics (gender, body mass index (BMI), current age, age-at-diagnosis), disease course (MS subtype, disease duration, number of disease modifying therapies (DMT) attempted), and diet-related questions (patient-perceived obesity, current diet, willingness to try a diet for MS and time willing to adhere to that diet). The first 3 pages of the questionnaire contained the 12 Item MS Walking Scale (MSWS-12) and the Modified Fatigue Impact Scale (MFIS), prepared as part of a separate study of item response theory for these two outcome measures. Given that obesity was hypothesized to have an impact on willingness to attempt diet modification, clinic-recorded BMI from the patient's last clinic visit was obtained for all returned surveys so that it could be compared to the patient-reported value.

Subjects who answered “yes” for interest in attempting dietary therapy for MS were then asked to select any or all diet types from a list of popular diets that they would be willing to attempt: high carbohydrate, paleo, vegan, vegetarian, low carbohydrate/high fat, and/or low salt diets. They were also asked to estimate how long they would be willing to adhere to diet therapy for the purposes of a diet-based study in MS. To be included in the survey mailing list, a patient had to have a neurologist-confirmed diagnosed of MS (Polman et al., 2011). Patients were automatically excluded from the study if they did not fully complete the questionnaire.

Data was compiled on all dietary surveys completed and received by October, 2015. Additionally, a chart review was conducted on all 402 subjects who were mailed a survey and did not respond. Data obtained on this non-responder population included gender, MS subtype, BMI, age-at-diagnosis, current age, disease duration, and number of DMTs attempted. Non-responders who had not been seen at our institution within the past 2 years of this chart review were excluded from the non-responder data analysis.

Statistical analysis was completed using SAS 9.2 software. Demographic factors were analyzed collectively for the entire responder pool. Following primary analysis, subjects were divided into two groups: those that would and those that would not change their diet in attempts to impact their MS disease course. Demographic traits were then compared between these two groups using *T*-test and chi-square as appropriate for continuous and ordinal variables. Similarly, demographic traits between the responder and non-responder cohorts were compared using the same statistical methods. A two-sided p-value of <0.05 was defined as statistically significant.

3. Results

From 601 mailed surveys, 199 subjects (33%) returned a fully-completed survey questionnaire. Of survey responders, there was a predominance of female sex (70%). Patients exhibited a mean disease duration of 12 years and a median duration of 9 years (range: <1 year to 54 years). MS subtype proportion in our study appeared representative of the expected clinical prevalence: relapsing-remitting MS (RRMS): 71.4%; progressive relapsing MS (PRMS): 7.5%; primary progressive MS (PPMS): 8.5%; secondary progressive MS (SPMS): 12.6%. The average, self-reported body mass index (BMI) of our collective responders was 28.3 (median: 26.6; range: 14.8 to 54.9).

Overall, 34 (17%) responders reported they were currently attempting a diet for their MS and 182 subjects (91.5%) were interested in diet modification as a means of benefiting their MS disease. Though the number of patients unwilling to attempt diet modification for MS was small, two cohorts were analyzed comparatively based upon willingness (or unwillingness) to alter diet in attempts to impact their underlying MS. Demographic factors (Table 1) were not significantly different between these two cohorts. A subject's willingness to attempt dietary therapy was not affected by the patient's gender, disease duration, BMI (self-reported and actual), self-perceived obesity, current diet, or number of DMTs attempted in the past. Willingness to attempt diet therapy may be more likely in younger MS subjects, as both age and age-at-diagnosis exhibited a trend toward significance ($p=0.07$ and $p=0.06$ respectively). Comparison among all four individual MS subtypes demonstrated a non-significant ($p=0.08$), but trending difference in a subject's willingness to attempt diet therapy; however, when directly comparing relapsing remitting versus

Table 1
Clinical Characteristics of Subjects Based on Willingness to Attempt Diet Modification.

	Would change diet	Would not change diet	p-Value
Number of patients	182 (91.5%)	17 (8.5%)	
Gender (Female)	70.30%	64.70%	0.63
Current age mean (Range)	50 years (21–80)	56.2 years (19–78)	0.07
Mean age at diagnosis (Range)	38.1 years (16–70)	43.9 years (18–73)	0.06
Disease subtype			0.08
Relapsing remitting MS	128 (70.3%)	14 (82.4%)	
Progressive relapsing MS	12 (6.6%)	3 (17.6%)	
Primary progressive MS	17 (9.3%)	0 (0%)	
Secondary progressive MS	25 (13.8%)	0 (0%)	
Patient-reported BMI, Mean (Range)	28.5 (16.4–54.9)	26.1 (14.8–41.5)	0.17
True BMI, Mean (Range)	29.0 (16.9–53.4)	27.3 (18.5–43.4)	0.33
Underweight (BMI < 18.5)	3 (1.6%)	2 (11.8%)	
Normal weight (BMI 18.5–24.99)	66 (36.3%)	6 (35.3%)	
Overweight (BMI 25–29.99)	44 (24.2%)	5 (29.4%)	
Obese (BMI > 30)	69 (37.9%)	4 (23.5%)	
Disease duration	11.9 years (0.5–54)	12.2 years (1–40)	0.61
Medications attempted	2 (0–7)	1.5 (0–6)	0.15
Current diet	32 (17.6%)	2 (11.8%)	0.54
Duration willing to attempt diet			
< 1 month	3 (1.5%)		
1–2 months	23 (12.5%)		
3–4 months	29 (16%)		
5–6 months	31 (17%)		
> 6 months	96 (53%)		