Vitamin A and Race in MS Patients Supplemented for Vitamin D

Jason Ledesma, BS[1], Padma Priya Puttagunta, MD[2], Kristen Berube, BS[2] and Bijal Mehta, MD, MPH[3], (1)Neurology, LA BIOMED, Torrance, CA, (2)Neurology, LA Biomed, Torrance, CA, (3)Neurology, Harbor-UCLA Medical Center, Torrance, CA

INTRODUCTION

Previous studies have promulgated the conception that demographic classification (such as gender, ethnicity, race, and age) may correlate to the likelihood of a patient's development of Multiple Sclerosis (MS), an autoimmune disease of the brain and spinal cord [7,13]. Furthermore, vitamin D supplementation is theorized to be beneficial in mitigating MS severity [5,6,9,10,11]. We propose that vitamin A, like vitamin D, may deter MS progression, as retinoic acids derivative of vitamin A have been shown to reduce pro-inflammatory cytokines characteristic of the disease.

OBJECTIVES

Thus, the current study aimed to establish any variation in vitamin A levels and other relevant MS-biomarkers in patients of different demographic backgrounds with corrected vitamin D levels.

METHODS

A total of 32 patients were pre-diagnosed with relapsing-remitting MS (RRMS) and analyzed at baseline. EDSS scores were collected as indicators of disease severity, and vitamin A, vitamin D, carotene, total cholesterol, high-density lipoproteins, low-density lipoproteins, and triglyceride levels were obtained to establish differences in lab values. Patients were categorized by ethnicity and race (13 Hispanic whites, 5 non-Hispanic whites, 14 non-Hispanic blacks), gender (17 females, 15 males), and age (4 born after 1985, 12 born between 1975 and 1985, 16 born before 1975)

Patient Demographics	
CATEGORY	**N VALUE**
Hispanic Whites	13
Non-Hispanic Whites	5
Non-Hispanic Blacks	14
Female	17
Male	15
Born After 1985	4
Born Between 1975 and 1985	12
Born Before 1975	16

Table 1. An overview of the patient population (n=32). The number of patients within each demographic category with respect to race, gender, and age are illustrated.

To correct for vitamin D level, patients were given oral supplements to ensure that 25-OH Vitamin D levels were greater than or equal to 30.00 ng/mL. Lab values for vitamin D, vitamin A, carotene, total cholesterol, high-density lipoproteins, low-density lipoproteins, and triglyceride levels were collected every three months.

Statistical analysis was performed at a single time point, with lab values taken at baseline. T-tests were performed between individual ethno-racial groups, individual gender groups, and individual age groups. ANOVA tests were performed across all racial, all gender, and all age groups.

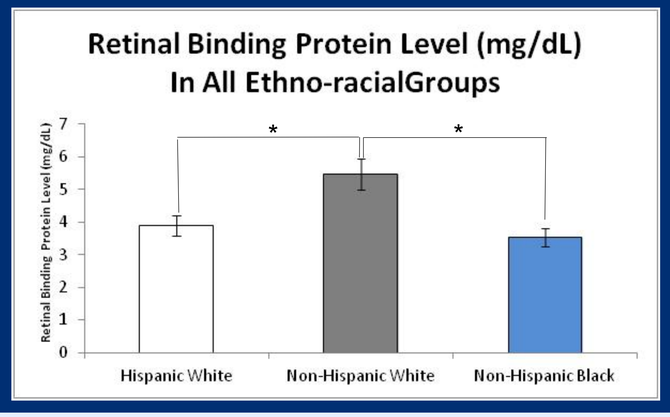

Figure 1. Retinal binding protein level (mg/dL) in the Hispanic white, Non-Hispanic white, and Non-Hispanic black groups. A bar graph of the RBP levels of the Hispanic white (n=13), Non-Hispanic white (n=5), and Non-Hispanic black (n=14) groups. Significant differences were seen between the Hispanic white and Non-Hispanic white groups and between the Non-Hispanic white and Non-Hispanic black groups. *Average RBP level of the Hispanic white group: 3.88. Standard error of the mean of the Hispanic white group: 0.307. Average RBP level of the Non-Hispanic white group: 5.46. Standard error of the mean of the Non-Hispanic white group: 0.486. Average RBP level of the Non-Hispanic black group: 3.52. Standard error of the mean of the Non-Hispanic black group: 0.282.*

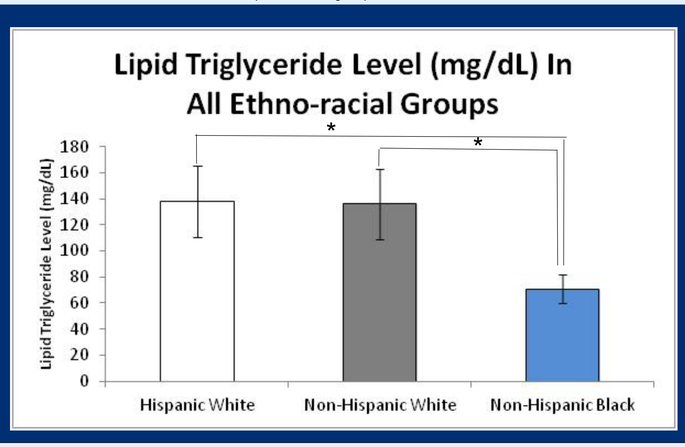

Figure 2. Lipid triglyceride level (mg/dL) in the Hispanic white, Non-Hispanic white, and Non-Hispanic black groups. A bar graph of the TGL level of the Hispanic white (n=13), Non-Hispanic white (n=5), and Non-Hispanic black (n=14) groups. Significant differences were seen between the Hispanic white and Non-Hispanic black groups and between the Non-Hispanic white and Non-Hispanic black groups. *Average TGL level of the Hispanic white group: 138. Standard error of the mean of the Hispanic white group: 27.6. Average TGL level of the Non-Hispanic white group: 136. Standard error of the mean of the Non-Hispanic white group: 27.3. Average TGL level of the Non-Hispanic black group: 70.8. Standard error of the mean of the Non-Hispanic black group: 10.8.*

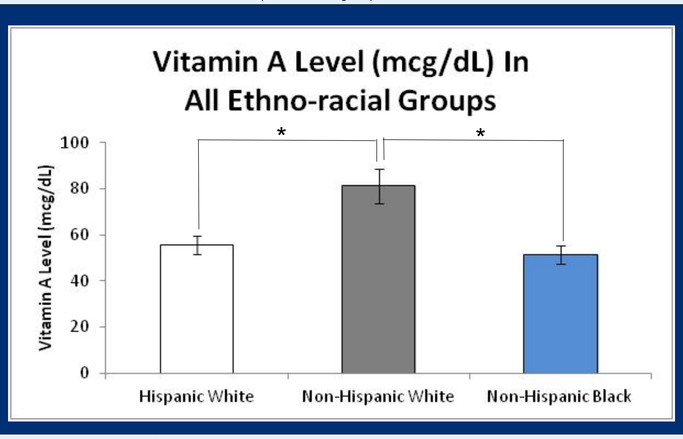

Figure 3. Vitamin A level (mcg) in the Hispanic white, Non-Hispanic white, and Non-Hispanic black groups. A bar graph of the vitamin A level of the Hispanic white (n=13), Non-Hispanic white (n=5), and Non-Hispanic black (n=14) groups. Significant differences were seen between the Hispanic white and Non-Hispanic white groups and between the Non-Hispanic white and Non-Hispanic black groups. *Average vitamin A level of the Hispanic white group: 55.5. Standard error of the mean of the Hispanic white group: 3.98. Average vitamin A level of the Non-Hispanic white group: 81.2. Standard error of the mean of the Non-Hispanic white group: 7.52. Average vitamin A level of the Non-Hispanic black group: 51.5. Standard error of the mean of the Non-Hispanic black: 4.06.*

RESULTS

Significant differences were seen when comparing vitamin A levels (P=0.005049) and RBP levels (P=0.015241) between the Hispanic white and non-Hispanic white groups, TGL levels (P=0.028509) between Hispanic white and non-Hispanic white groups, vitamin A levels (P=0.004418), RBP levels (P=0.002777), and TGL levels (P=0.014698) between the non-Hispanic white and non-Hispanic black groups, and vitamin A (P=0.002565) and RBP (P=0.006692) across all ethno-racial groups. No such distinctions could be made within the gender and age categories (P>0.05).

GROUPS	EDSS	VITAMIN A (mcg/dL)	RBP (mg/dL)	CAROTENE (mcg/dL)	VIT D (ng/mL)	TC (mg/dL)	HDL (mg/dL)	LDL (mg/dL)	TGL (mg/dL)
1, 2	0.637401	**0.005049**	**0.015241**	0.793964	0.264243	0.579966	0.339954	0.122203	0.971104
1, 3	0.875849	0.485092	0.391884	0.144031	0.509226	0.209684	0.755714	0.501486	**0.028509**
2, 3	0.753882	**0.004418**	**0.002777**	0.537442	0.498675	0.703094	0.30709	0.564916	**0.014698**
1, 2, 3	0.905148	**0.002565**	**0.006692**	0.413712	0.495249	0.454669	0.446144	0.485908	0.052834
F, M	0.608766	0.43508	0.535872	0.235337	0.97449	0.723437	0.720356	0.634744	0.309096
4, 6	0.059026	0.407403	0.492817	0.377867	0.34245	0.821393	0.703704	0.888873	0.481598
4, 5	0.091219	0.858778	0.79508	0.225771	0.092648	0.432819	0.291602	0.429135	0.313571
5, 6	0.667495	0.145927	0.177432	0.801012	0.262745	0.506278	0.136981	0.188355	0.900836
4, 5, 6	0.141926	0.307093	0.383787	0.550176	0.307093	0.721588	0.2906	0.421576	0.693948

Table 2. Statistical analysis of all patient category groups. The P values resulting from the T-tests and ANOVA tests are illustrated. Groups have been identified by symbolic numbers and letters (1=Hispanic whites, 2=Non-Hispanic Whites, 3=Non-Hispanic Whites, F=Females, M=Males, 4=Patients Born After 1985, 5=Patients Born Between 1975 and 1985, 6=Patients Born Before 1975).

CONCLUSIONS

Though significant differences in lab values were determined, particularly among the ethno-race group analyses, the EDSS scores signifying disease severity were indistinguishable. Such lack of significance could be attributed to low sample size and unequal group sizes. Further studies are required to better understand the biochemical disposition (particularly vitamin A disposition) of MS patients with diverse backgrounds.

ACKNOWLEDGEMENTS

Study Supported by: The Conrad N. Hiton Foundation

DISCLOSURE

The authors report no conflicts of interest in this work.

REFERENCES

1. Dorosty-Motlagh AR, Honarvar NM, Sedighiyan M, Abdolahi M (2016) The Molecular Mechanisms of Vitamin A Deficiency in Multiple Sclerosis. Journal of Molecular Neuroscience 60(1): 82-90
2. Erkelens MN, Mebius RE (2017) Retinoic Acid and Immune Homeostasis: A Balancing Act. Trends Immunol 38(3): 168-180
3. Fragoso YD, Stoney PN, McCaffery PJ (2014) The evidence for a beneficial role of vitamin A in multiple sclerosis. CNS Drugs 28(4): 291-9
4. Handono K, Firdausi SN, Pratami MZ, Endharti AT, Kalim H (2016) Vitamin A improve Th17 and Treg regulation in systemic lupus erythematosus. Clin Rheumatol 35(3): 631-8
5. Hartl C, Obermeier V, Gerdes LA, Brugel M, von Kries R, Kumpfel T (2017) Seasonal variations of 25-OH vitamin D serum levels are associated with clinical disease activity in multiple sclerosis patients. J Neurol Sci 375: 160-164
6. Muratli S, Tufan F, Bahat G, Karan MA (2016) Higher vitamin D levels may be associated with higher levels of sunlight exposure and higher intake of vitamin D by diet. Clin Interv Aging 11: 1107-9
7. Leray E, Moreau T, Fromont A, Edan G (2016) Epidemiology of multiple sclerosis. Rev Neurol (Paris) 172(1): 3-13
8. Raverdeau M, Mills KH (2014) Modulation of T cell and innate immune responses by retinoic Acid. J Immunol 192(7): 2953-8
9. Rosen Y, Daich J, Soliman I, Brathwaite E, Shoenfeld Y (2016) Vitamin D and autoimmunity. Scand J Rheumatol 45(6): 439-47
10. Torkildsen O, Loken-Amsrud KI, Wergeland S, Myhr KM, Holmoy T. (2013) Fat-soluble vitamins as disease modulators in multiple sclerosis. Acta Neurol Scand Suppl 196: 16-23.
11. Wang Y, Si S, Liu J, Wang Z, Jia H, Feng K, Sun L, Song SJ (2016) The Associations of Serum Lipids with Vitamin D Status. PLoS One 11(10):e0165157
12. Weinshener BG, Rice GPA, Noseworthy JH, Carrier W, Baskerville J, Ebers GC (1991) The Natural History of Multiple Sclerosis: A Geographically Based Study: 3. Multivariate Analysis of Predictive Factors and Models of Outcome. Brain 114(2): 1045-1056.
13. Zeitelhofer M, Adzemovic MZ, Gomez-Cabrero D, Bergman P, Hochmeister S, N'diaye M, Paulson A, Ruhrmann S, Almgren M, Tegner JN, Ekstrom TJ, Guerreiro-Cascais AO, Jagodic M 92017) Functional genomics analysis of vitamin D effects on CD4+ T cells in vivo in experimental autoimmune encephalomyelitis. Proc Natl Acad Sci U S A 114(9):E1678-E1687