

Introduction and Purpose

Multiple Sclerosis (MS) is an inflammatory and neurodegenerative disease of the central nervous system (CNS), to include the optic nerves.

Vitamin D deficiency has been associated with increased risk for developing MS as well as with increased disease severity. Vitamin D may have a modulating effect on the immune process leading to inflammation/demyelination and axonal damage.

Thinning of Retinal Nerve Fiber (RNFL) layer has been documented in MS patients with and without a history of optic neuritis (ON).

The purpose of this study is to determine the association of Vitamin D and the RNFL in MS patients without history of ON. This cross-sectional study compares the RNFL thickness in patients that are Vitamin D deficient with those with normal serum levels.

Our hypothesis is that individuals that have deficient Vitamin D levels will show a decrease of the RNFL thickness –independent of inflammation- compared to the sufficient group.

Methods

Subjects

This study was cross sectional in design and included two groups for a total of 95 eyes:

1. Vitamin D deficient (n=57 eyes, 25(OH)D = 17.2 ng/ml),
 2. Vitamin D sufficient (n=38 eyes, 25(OH)D = 43.8 ng/ml).
- Fifteen eyes had a history of ON and were excluded from the analysis.

Vitamin D measurement

Serum 25(OH) Vitamin D levels were measured in units of ng/ml using recommended procedures according to hospital's instructions. The laboratory followed these indices: Vitamin D deficient (<30 ng/ml), sufficient (≥30-100 ng/ml).

Acquisition protocol of RNFL and macular measurements

All scans were performed on un-dilated pupils using the Cirrus HD-OCT (Model 4000) (Carl Zeiss Meditec, Dublin, CA, USA). All eyes had Macular Cube 512 x 128 to evaluate central and average thickness. Optic Disc Cube 200 x 200 protocol was used to measure the RNFL by quadrants (superior, nasal, inferior and temporal) and as a total average (360°).

Statistical Analyses

The results of all descriptive analyses are reported as mean ± standard error for the two MS groups. A One-way Analysis of Variance (ANOVA) was conducted to determine group differences for age, total RNFL thickness, RNFL by quadrants, average macular thickness, and central macular thickness.

A Spearman Pearson correlation coefficient was done to examine the relationship between duration of MS and age as well as the components of measured by the OCT. Statistical analysis was performed using the Statistical Package for the Social Sciences, version 20.0 (SPSS, Chicago, IL, USA). Statistical significance was defined as a p value <0.05.

Results

A total of 62% of studied individuals were Vitamin D deficient.

We studied 57 eyes of patients that were Vitamin D deficient (mean 17.2 ng/mL), and 38 eyes of patients that were Vitamin D sufficient (mean 43.8 ng/mL).

Average RNFL, macular central, and macular average measurements were all thicker in the Vitamin D deficient group compared to that of the sufficient group, but did not reach significance (p>0.05).

In the vitamin D deficient group, thicker RNFL measures achieving statistical significance were identified in the left inferior quadrant (112 vs 96 μm, p=0.024), and left average macular thickness (274 vs 260 μm, p=0.022), compared to the vitamin D sufficient group.

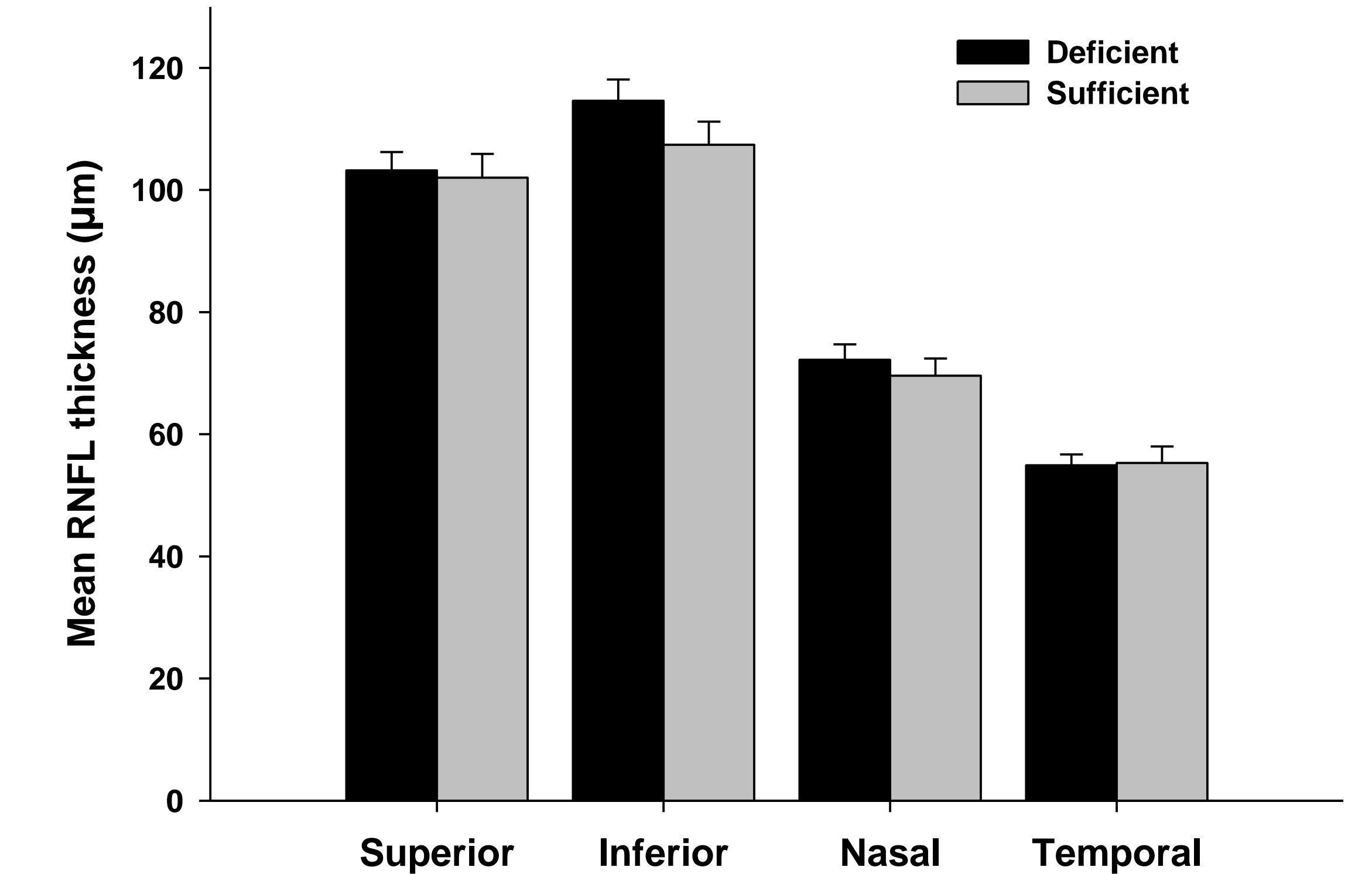
Significant differences were present for age between the two groups (p =0.009), with the sufficient group being older.

The deficient group had shorter disease duration than that of the sufficient group (7.7 years vs 13.4 years, p=.001).

When vitamin D levels were analyzed for seasonal variation, the results were not altered.

Table 1 Subject Characteristics (Mean ± SE)

	Deficient (n=34)	Sufficient (n=21)
Age (yrs)	43.0 ± 2.1	52.6 ± 2.7
MS duration (yrs)	7.7 ± .8	13.3 ± 1.5
Vitamin D (nmol/L)	17.2 ± 1.2	43.8 ± 3.2
RNFL (μm)	87.3 ± 1.6	82.0 ± 3.5
Superior (μm)	105.9 ± 2.6	98.2 ± 4.4
Nasal (μm)	71.7 ± 1.9	70.9 ± 4.1
Inferior (μm)	116.0 ± 2.9	105.7 ± 4.9
Temporal (μm)	56.6 ± 1.6	53.0 ± 3.0
Central (μm)	258.3 ± 4.5	250.6 ± 10.0
Average (μm)	273.2 ± 2.6	264.0 ± 4.4



P>0.05

Conclusions

MS individuals without history of ON and with vitamin D deficiency have higher RNFL volume measurements than those with normal Vitamin D levels.

RNFL volume loss in MS patients without history of ON is presumably due to a neurodegenerative process and not to an inflammatory/demyelinating event (as would be the case for cases of optic neuritis).

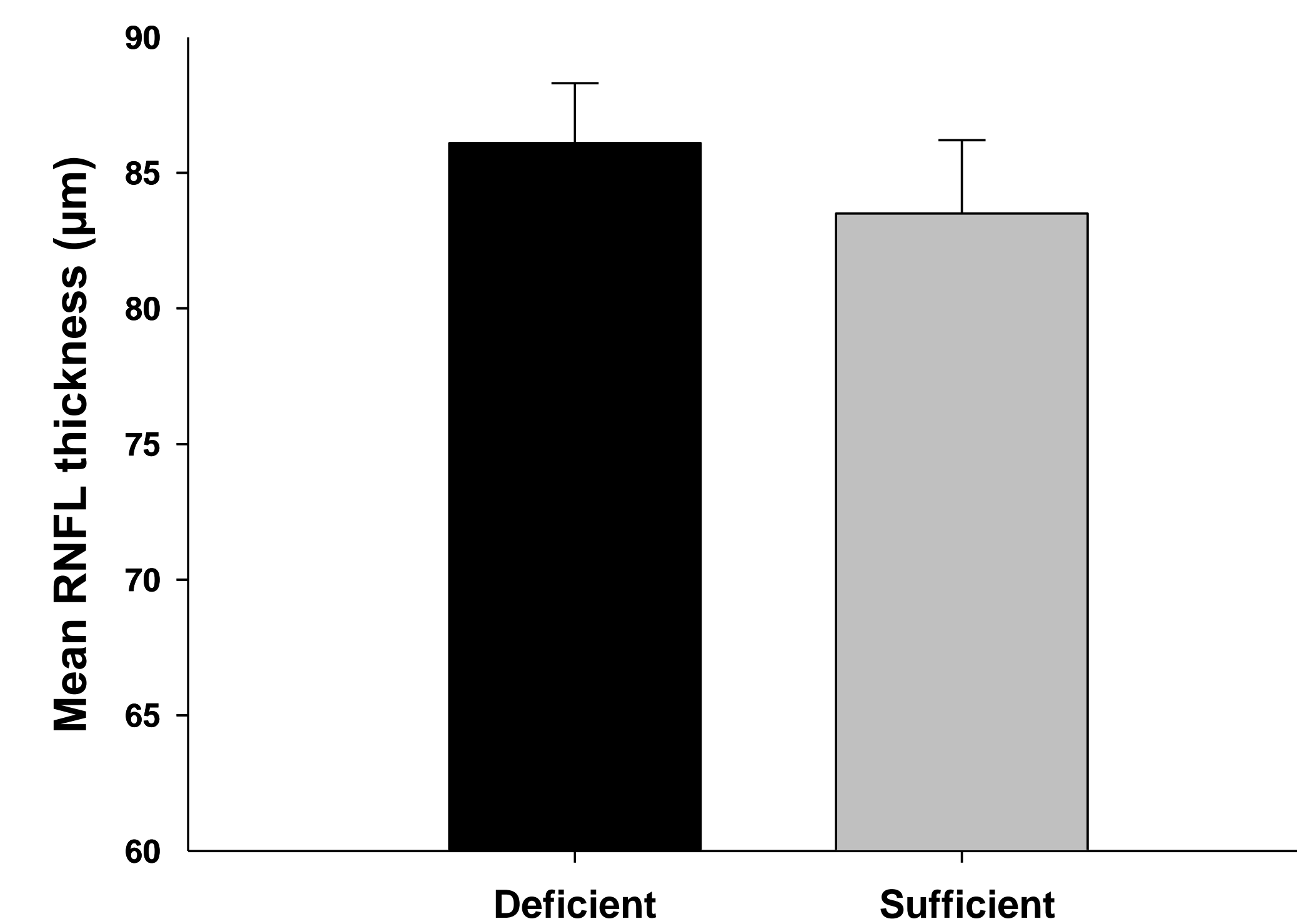
Since the group with deficient levels of vitamin D did not have higher degree of retinal axonal loss, the reported role of Vitamin D in reducing MS disease severity is probably related to anti-inflammatory activity.

Further longitudinal studies are warranted to see if vitamin D ultimately impacts the degree of axonal loss measured by OCT.

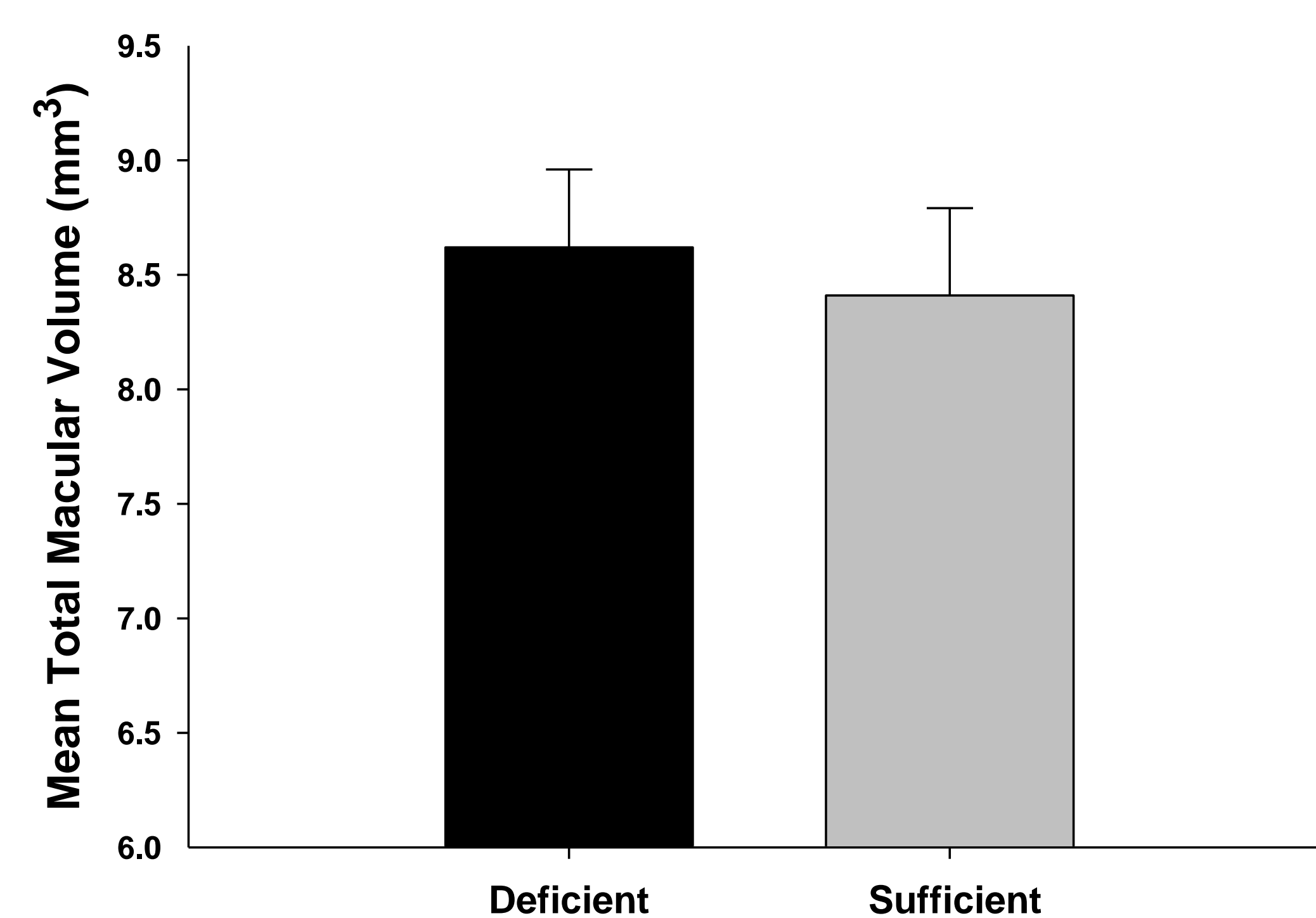
Disclosure

Disclosure: Dr. C. Fjeldstad, Dr. A. Fjeldstad and Dr. Pardo, have no conflicts of interest to report.

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P>0.05



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