

Serum Magnesium and Cognitive Function Among Qatari Adults

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ABSTRACT

Background: Previous studies found that low levels of magnesium can increase the risk of several diseases including cardiovascular diseases, diabetes, and hypertension which are associated with cognitive dysfunction. **Objective:** Examine the association between serum magnesium and cognitive function among Qatari adults. In addition to assessing the interaction relation between low serum magnesium, hypertension, and diabetes in relation to cognitive function. **Method:** Data from 1000 Qatari participants aged ≥ 20 years attending the Qatar Biobank Study were analyzed. Serum magnesium was measured by an automated calorimetric method and suboptimal magnesium was characterized by < 0.85 mmol/L. Cognitive function was measured by a computer-based self-administered test focusing on mean reaction time (MRT). Multivariable linear regression and logistic regression were used. **Results:** The prevalence of suboptimal magnesium was 57.1%. Across the quartiles of serum magnesium from high to low, the regression coefficients (95% CI) for MRT were 0, -17.79, -18.27, and -31.93 (95%CI 2.38–3.05), respectively (p for trend < 0.033). The presence of hypertension and diabetes significantly increased the MRT along with a wide range of low serum magnesium. Women with diabetes or hypertension were affected the greatest by low magnesium levels. **Conclusion:** There was a positive association between serum magnesium and cognitive function. Low magnesium levels were associated with a longer MRT. **Keywords:** serum magnesium, mean reaction time, cognition, and Qatar Biobank.

INTRODUCTION

Magnesium has several important functions within the nervous system, which include having an important role in neuromuscular conduction and nerve transmission, it also has a protective role against neuronal cell death¹. Cognitive dysfunction is a feature of dementia and a common disease among elderly². Higher dietary magnesium intake was associated with a reduced risk of developing cognitive impairment³. Subclinical magnesium deficiency (serum magnesium < 0.85 mmol/l) is common and positively associated with prediabetes, diabetes, poor glycemic control and hypertension in Qatari adults⁴. However, no studies have assessed the relationship between magnesium and cognition in Qatar, where the prevalence of diabetes is about 18.97%⁵.

RESULTS

The mean age of the sample was 35.8 years. The mean magnesium serum level was 0.84 mmol/L. Overall, 57.1% of participants had a subclinical magnesium deficiency. Across the quartiles of serum magnesium from low to high, there was no difference in age and gender, education, and smoking. However, insulin use, diabetes medication, and hypertension medications were higher among people who have low serum magnesium. Mean MRT is 715.3 milliseconds. Age and females were associated with a higher MRT while education was associated with a lower MRT (Figure 1).

Association between serum magnesium with MRT

Serum magnesium was inversely associated with MRT (Table 1).

	Q1	Q2	Q3	Q4	p for trend	Mg (continuous)	p
Model 1	0.00	-19.9 (-50.9-11.1)	-16.4 (-47.5-14.8)	-34.1 (-65.6--2.5)	0.049	-198.9 (-391.4--6.3)	0.043
Model 2	0.00	-17.8 (-48.4-12.8)	-18.3 (-49.0-12.5)	-31.9 (-63.0--0.8)	0.051	-206.3 (-396.1--16.4)	0.033
Model 3	0.00	-9.3 (-40.4-21.8)	-10.7 (-42.2-20.8)	-24.7 (-56.5-7.2)	0.144	-140.1 (-336.2-56.1)	0.161

Table 1: Association between quartiles of serum magnesium and cognitive function Model 1 adjusted for age and gender.

Model 2 further adjusted for education, smoking, physical activity, BMI, diabetes and hypertension, medication for diabetes and hypertension.

Model 3 further adjusted for medication use for diabetes and hypertension.

There was significant suboptimal magnesium, gender and age interaction in relation to MRT. There is a significant interaction ($p = 0.008$) between gender, low serum magnesium and hypertension in relation to MRT was observed (Figure 2). Women with suboptimal magnesium and hypertension had the highest MRT.

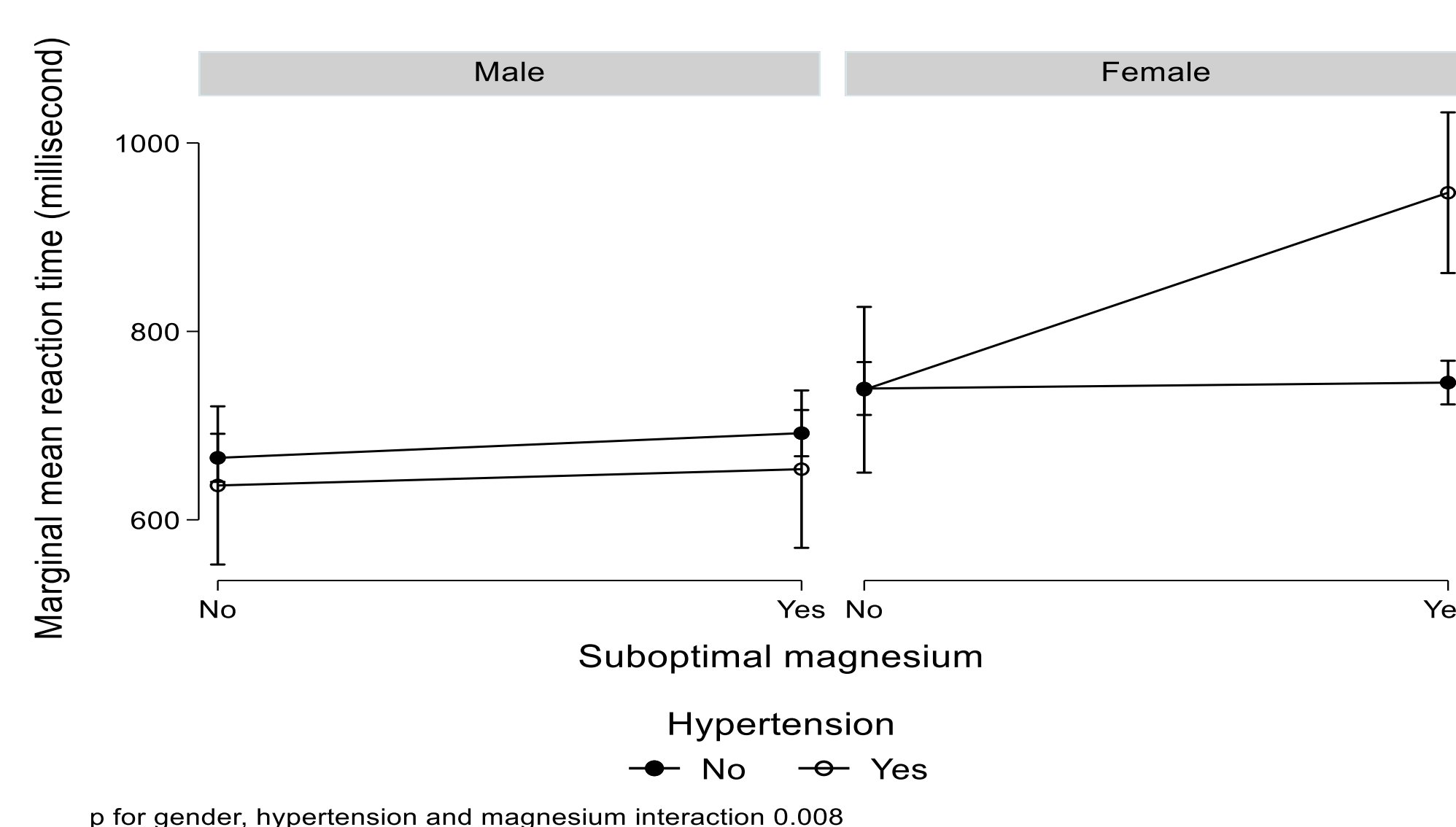


Figure 2 Interaction between magnesium, hypertension, and gender in relation to cognition

Although the three-way interaction between gender, suboptimal magnesium and diabetes was not statistically significant ($p = 0.173$), women with suboptimal magnesium and diabetes had the highest MRT (Figure 3).

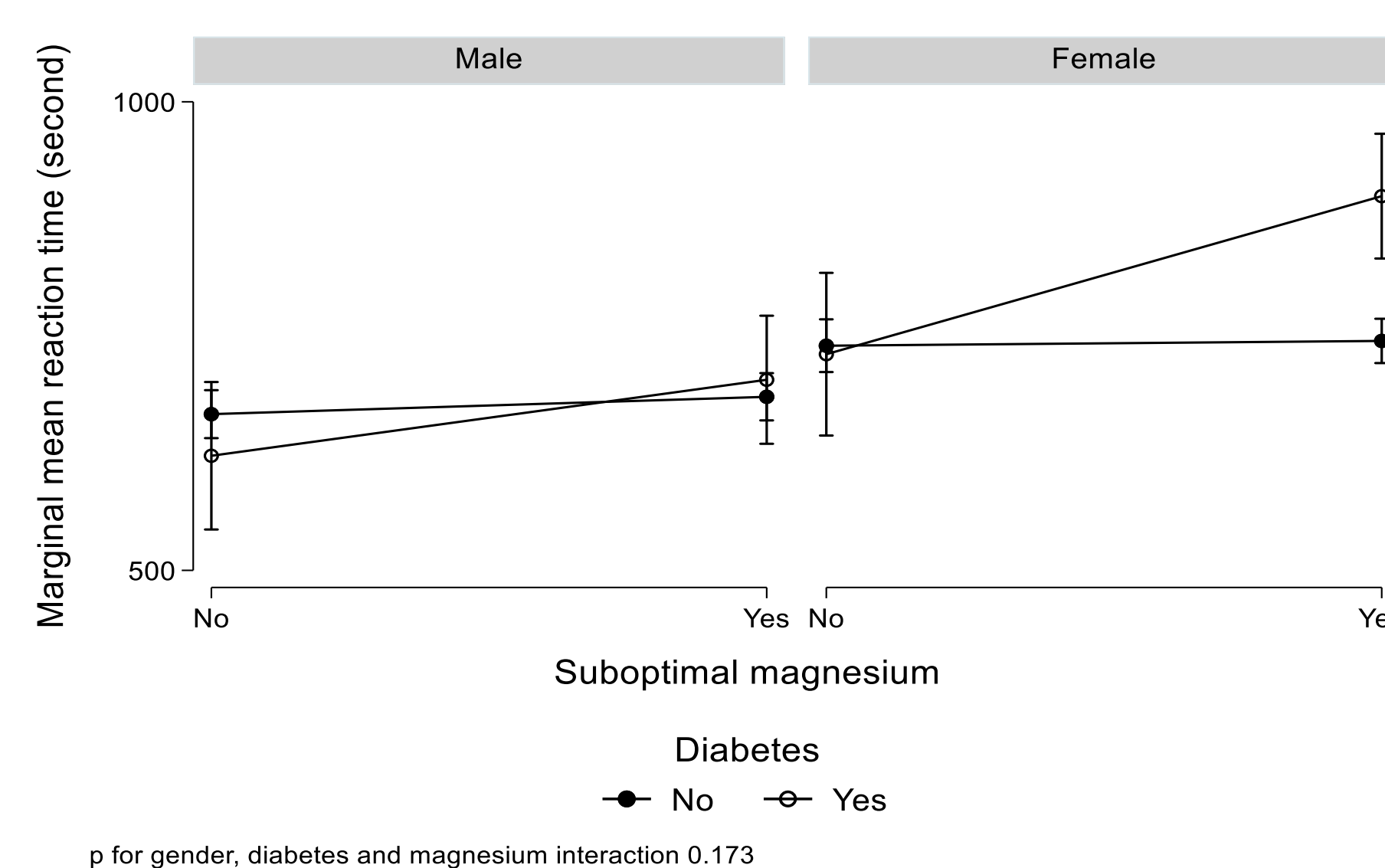


Figure 3 Interaction between magnesium, diabetes, and gender in relation to cognition Values represent marginal mean (SD) of mean reaction time derived from linear regression. Model adjusted for age, sex, BMI, education, smoking, physical activity, hypertension, diabetes, medication use for diabetes and hypertension.

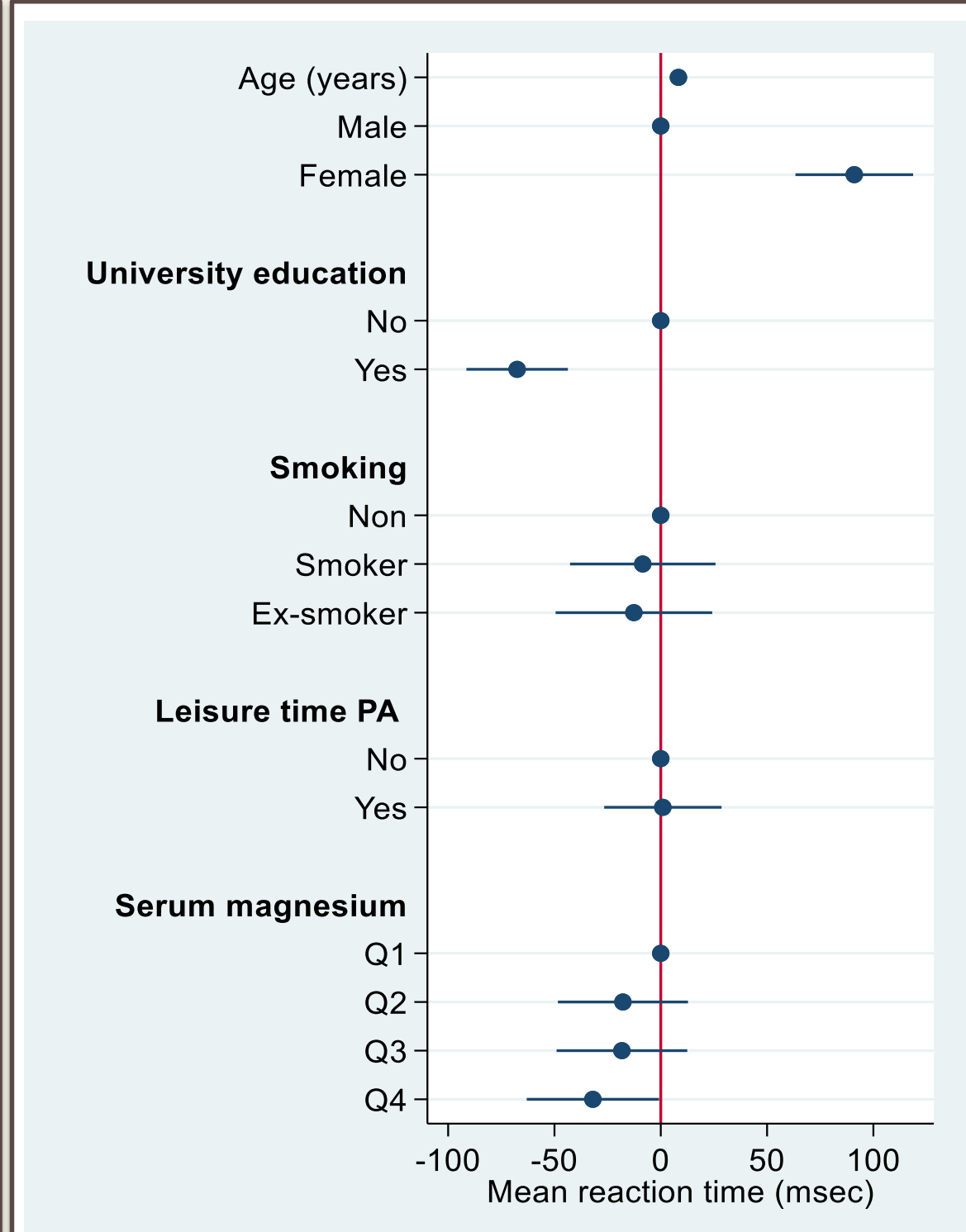


Figure 1 Association between sociodemographic factors, lifestyle, magnesium and mean reaction time Values were regression coefficients (95%CI) for MRT adjusting for all the variables in the figure.

METHODOLOGY

Data from 1000 Qatari participants aged ≥ 20 years attending the Qatar Biobank Study were analyzed using STATA 15. Chi-squared test was used for comparing differences between groups for categorical variable, while ANOVA was used for continuous variables. For cognitive function, a computer-based self-administered touch screen test comprising 60 tasks was used for MRT. While for serum magnesium it was assessed by an automated colorimetric method. Subclinical magnesium deficiency was characterized as serum magnesium < 0.85 mmol/L. A set of multivariable linear regression models were used to assess the association between serum magnesium and MRT.

CONCLUSION

There was a positive association between serum magnesium and cognitive function. Low magnesium levels were associated with a longer MRT. Women with diabetes or hypertension are affected the greatest by low magnesium levels. There results were consistent with other researches, but further longitudinal studies and interventional trials are needed.

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