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Magnesium status correlates with health and quality of life

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Key words

magnesium status – hematocrit and age corrected whole blood Mg – SF-36 questionnaire – correlations

Abstract. The higher the magnesium levels, the better the quality of life and the health status. Conversely, the lower the status, the worse a person feels. Current data shows, for the first time, that the magnesium levels are positively correlated with the assessment of personal health and quality of life. People with average and above-average supply of magnesium perform better in all areas investigated by us, compared to people with below-average magnesium status. This applies to all categories evaluated, and the relationship is statistically significant for most of those categories.

Introduction

Magnesium supplements are widely used in Austria and Germany. This leads to the assumption that users may experience a benefit by using magnesium. These health benefits can be explained by the multiple fundamental functions of the mineral magnesium in the body. Magnesium is known to be involved in the proper functioning of the cardiovascular, endocrine, nervous, osteoarticular, and digestive systems. It acts as cofactor and activator of more than 300 enzymes. It activates ATP-dependent processes in mitochondrial energy metabolism, is involved in the signal transmission and the release of hormones and neurotransmitters, and stabilizes membranes at the neuromuscular conduction. By ensuring the proper functioning of these processes, the magnesium status should theoretically influence the perception of health and quality of life of a person. Following up this assumption, we investigated, from already existing data, possible correlations between the magnesium status and parameters indicating health status and quality of life.

Material and methods

We present a retrospective statistical analysis of data collected in the years 2012 – 2014. From a total of 81 people (33

men, 48 women, age 16 – 90 years, mean age 45.7), laboratory data for magnesium (full blood analysis and hematocrit correlated values) were available and compared with parameters of internationally validated SF-36 questionnaires to assess health status and quality of life. All participants were informed about the aim of the study according to the Helsinki Charter [1] and had given written consent at the time of the investigation.

Statistical analysis was performed using IBM SPSS Statistics 20th.

Laboratory analysis

Analyses of all the blood samples were conducted by the same laboratory (GanzImmun Diagnostics AG, Mainz, Germany). The tests were performed in whole blood, comprising both plasma magnesium and magnesium from erythrocytes. Magnesium is concentrated up to 70% in the erythrocytes.

To allow a comparison of data we additionally evaluated the so called “hematocrit correlated magnesium values”. This value sets the mineral status in relation to the erythroid cell mass (hematocrit) to exclude increased Mg values just by an increase of the number of erythrocytes, while at the same time their intracellular concentration might be average or even reduced.

Since hematocrit is age- and sex-dependent, the validity of the laboratory value increases if put in further relation to gender- and age-specific averages. The “hematocrit correlated magnesium value” of a person indicates the deviation in percent from the average value to be expected in his/her age group and sex. The statistical median for magnesium was collected from more than 3,000 blood samples.

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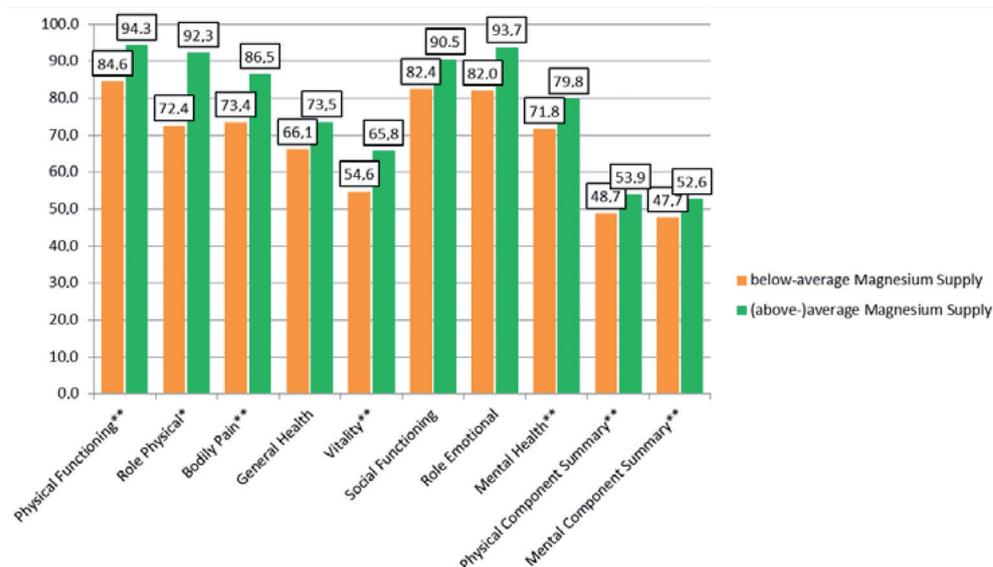


Figure 1. The results of the individual categories of the SF-36 in individuals with below-average supply of magnesium compared to individuals with above-average supply of magnesium. *Difference stat. highly significant ($p < 0.01$); **Difference stat. significant ($p < 0.05$).

SF-36 questionnaire

The SF-36 is an internationally used questionnaire for scientific comparative studies. It is comprised of 36 questions in 8 categories of health, emotional, psychological, and social functions. Two totals, the PCS (physical component summary) and the MCS (mental component summary), summarize the results of physical and psychical categories.

The PSC (physical component summary) is based on the four subscales physical functioning, role physical, bodily pain, and general health. A high score always indicates good physical health. The MCS (mental component summary) takes the four subscales for vitality, social functioning, role emotional, and mental health into account. A high value indicates good psychical health.

The SF-36 allows a comparison between different groups, comparison of a study group to a standard group and the follow-up of a cohort over a time-line. In this evaluation we compared a group with average and above-average magnesium status ($n = 39$) to a group of below-average magnesium status ($n = 42$). The high magnesium status group was also compared to the German standard population.

Results

The results show a clear and unambiguous direction: The magnesium levels correlate positively in all 10 categories of quality of life and health. That is, the higher the magnesium levels in whole blood or hematocrit-correlated magnesium levels, the better the quality of life in all categories. For bodily pain and vitality, this relation is statistically significant ($p < 0.05$). For physical functioning, role physical, and general health scores it is even highly significant ($p < 0.01$).

Therefore it is not surprising that people with (above-) average magnesium levels (hematocrit-correlated magnesium values ≥ 0) in all 10 SF-36 categories score significantly higher in health and quality of life than people with below-average magnesium levels (hematocrit-correlated magnesium values < 0). The physical role is highly significantly better in well-supplied people than in the under-supplied ($p < 0.01$). Physical functioning, bodily pain, vitality, mental health, physical and mental component summary are significantly better ($p < 0.05$) (Figure 1).

Even in comparison with the German standard group (same age, same sex), people with an average and above-average magnesium supply are up front. In all areas of quality of life and health status they achieved statistically significant or highly significantly better results than the standard group (Figure 2).

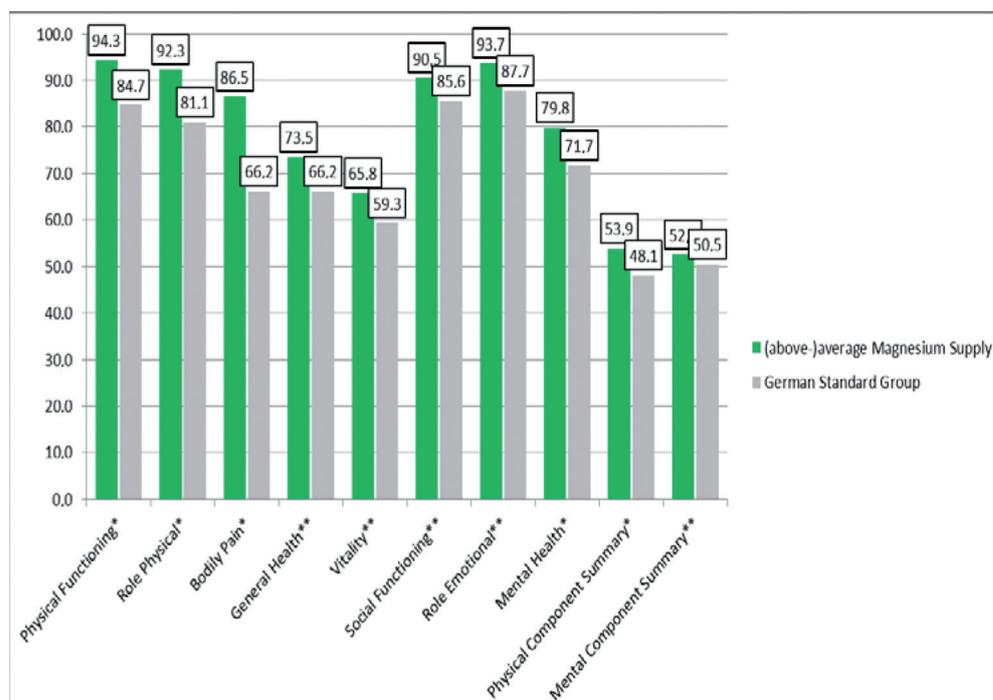


Figure 2. The results of the individual categories of the SF-36 in individuals with average and above-average supply of magnesium in comparison to the same age, same-sex German standard group *Difference stat. highly significant ($p < 0.01$); **Difference stat. significant ($p < 0.05$).

Discussion

Given the central role of magnesium in metabolism, the magnesium status may affect physical and psychological wellbeing of persons otherwise considered healthy. The positive reaction of people to magnesium supplements indicates that the magnesium levels could be linked to health and quality of life.

While hypomagnesaemia with clinical symptoms is rarely observed compared to other micronutrients, a suboptimal magnesium status might already exert a down regulation of physical and psychological function [2, 3, 4, 5].

Previous research showed involvement of magnesium in stress resilience and work performance under stress [6, 7]. Magnesium administration influences heart rate, ventilation, oxygen uptake, and carbon dioxide production during submaximal work [8] and seems to be related to testosterone bioactivity [9]. Low magnesium levels are related to obesity [10], and are a risk factor for hypertension [12] and diabetes [13]. The inflammation marker C-reactive protein reacts to magnesium [14] and links the mineral to cardiovascular processes. Furthermore, a

low magnesium status is observed in some patients with migraine and depression [11] and other diseases.

The evaluation of our data showed significant, positive correlations. A preclinical low magnesium status results in a detectable deterioration of factors predicting health status and quality of life. On the other hand, a higher magnesium status influences health and quality of life in a positive way. The findings might be substantiated in the future as more data is made available.

Conclusion

Our data showed, for the first time, a positive and statistically significant correlation between magnesium status of a person and recognized parameters measuring health and quality of life. The higher the magnesium levels, the better the quality of life and the health status. Conversely, the lower the status, the worse a person perceives health and quality of life.

A regular magnesium supplementation resulting in higher magnesium levels clearly has measurable impacts on health and quality of life of people.

Conflict of interest

There is no conflict of interest in this publication.

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