



Dietary and Clinical Assessment of Magnesium Status Among Women of Urban Bangalore

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Abstract- Magnesium is a vital mineral responsible for muscle and nerve activity, heart rhythm, bone strength, and energy metabolism. The symptoms of deficiency of magnesium include fatigue, muscle cramps, numbness, dizziness, joint pain, and lowered immunity. In spite of its significant role, a large percentage of the population in both developed and developing country suffers from magnesium deficiency. Women during periods of hormonal imbalance are at higher risk of magnesium deficiency. But there is a lack of data on magnesium status across different age groups, gender and geographical areas. So, the present study aimed at assessing the magnesium status of women in urban Bangalore. A questionnaire consisting of questions on general information, dietary intake, clinical symptoms of magnesium deficiency was used for collecting data. Women aged 40 to 65 years across five regions of Bangalore—North, South, East, West, and Central were included in the study after taking written informed consent (N=500). Magnesium intake was assessed using 24 hour dietary recall method. Clinical assessment was done keeping in mind the specific signs and symptoms of Mg deficiency as reported by the subjects. Dietary assessment revealed that average intake of magnesium was below the Recommended Dietary Allowance (RDA). Magnesium deficiency ranged from 2.2 per cent to 13.8 per cent below RDA values. There is a wide variation in the prevalence of magnesium specific deficiency symptoms. 2.3 per cent subjects suffer from dizziness and 58.4 per cent of subjects suffer from hair loss. Nearly, half of the subjects suffered from hair loss, muscle cramps, and frequent joint pain. Biochemical assessment is needed to validate the results.

Keywords- 24 hour dietary recall, magnesium specific clinical assessment, muscle cramps, hair loss, frequent joint pain.

I. Introduction

Magnesium is an essential micronutrient, which is necessary for carrying out several biochemical and physiological reactions necessary for maintaining health. Some of these reactions include energy metabolism, ATP production, glycolysis, nerve conduction, muscle contraction, and prevention of cramping and hyperexcitability of muscles.

A major part of body's magnesium content (60 per cent) is stored in bones. Magnesium plays an essential role in mineralization and structural integrity of bones. Magnesium acts as a cofactor in more than 300 enzyme catalyzed reactions involved in DNA and



RNA synthesis. Magnesium also has a critical role in electrolyte balance, normal cardiac and neuromuscular activity, immunity, reduction of oxidative stress. Thus magnesium plays a critical role in health (Gröber et al., 2015)[1].

Magnesium deficiency is known as hypomagnesemia. Inadequate dietary intake of magnesium fails to meet physiological need for magnesium. Long term deficiency is known to be associated with diabetes, cardiovascular diseases, and osteoporosis. The symptoms of deficiency are varied and severity of the symptoms increases with increase in deficiency. Mild stages of deficiency result in fatigue, muscle cramps, nausea and weakness. In moderate deficiency, neurological disturbances such as tremors, mood disturbances, and irritability are seen. It can also affect cardiovascular system resulting in irregular heartbeat, high blood pressure and arrhythmias. Severe deficiency can result in calcium and magnesium imbalances.

Research has shown that nearly 60 to 70 percent of the adult population consume suboptimal levels of magnesium. Studies have clearly shown that lower dietary intake is the main reason for magnesium deficiency. Frequent consumption of highly processed foods along with lack of magnesium-rich sources like green leafy vegetables, legumes, whole grains, nuts, and seeds in the diet can lead to magnesium deficiency. The authors emphasize that nearly 50 per cent of people in developed countries consume less than the recommended magnesium intake. The study opines that increasing awareness about consumption of magnesium-rich foods can help in preventing long-term health consequences like cardiovascular disease, insulin resistance, and inflammation(Workinger, Doyle, and Bortz (2018)[2]. A narrative review by Mazza et al. (2025)[3] explores the differential effects of magnesium deficiency on men and women. Puberty, pregnancy and menopause are important physiological stages marked by hormonal changes. The authors opine that women are at a higher risk of magnesium deficiency due to the hormonal fluctuations.

Literature review indicates that there is a lack of data on magnesium status, particularly across different age groups, gender and geographical areas. The present study aims to address this gap by assessing dietary magnesium intake among women residing in Urban Bangalore.

II. Methodology

Research tool:

The questionnaire consisting of data on general information such as age, occupation, family composition, health history, dietary habits, dietary intake and clinical signs was used for the study.

Assessment of magnesium status

Assessment of magnesium status is clinically challenging because only 1% of the body's Mg is in extracellular fluid and the remaining is in bones and cells. So although, serum magnesium is simple and inexpensive method, it is not a good indicator of magnesium status. Other methods such as magnesium load test, bone or muscle biopsy are invasive and time consuming, so dietary method was used.



Dietary assessment was done using 24-hour dietary recall. The dietary intake was calculated using National Institute of Nutrition, food composition table (Longvah et al 2017[4] and compared with recommended dietary allowances for Indians (ICMR-NIN, 2020) [5]

Clinical assessment was done by preparing an exhaustive list of signs and symptoms of magnesium deficiency. This includes, muscle cramps, fatigue, anxiety, irritability, mood swings, numbness, insomnia, heart palpitations, constipation, muscle weakness, high blood pressure, dizziness, hair loss, unusual stress, joint pain, muscle stiffness, muscle twitches and frequent infections. Subject's perception of the symptoms was noted

Selection of the subjects:

Women in the age group of 40 to 65 years residing in the four regions of Bengaluru-Central, South, East, West, and North were selected by purposive sampling. 100 subjects from each region totalling to 500 were included in the study. Women with serious health conditions were excluded from the study. Written informed consent was taken from each subject.

Location of the study:

100 subjects each were selected from North:(RT nagar, Yelahanka, Hebbal, Sahakar Nagar),, South (Jayanagar, JP nagar , Banashankari, BTM layout, Bannerghatta),, East (Indiranagar, KR puram, CV Ramanagar, Marathalli.),, West (Rajajinagar, Malleshwaram, Yeshwantpur, Magadi road). and Central Bangalore (Majestic, Shantinagar, Richmond road, Vasanth nagar) by purposive sampling. So total of 500 subjects participated in the study.

Data collection was done by interviewer administered questionnaire method and was analysed using suitable statistical tools.

III. Results and Discussion

Background information of the subjects: The demographic information of the subjects is given in Table 1'

Table 1: Background information of the subjects.

Category	Sub-category	Frequency (%)
Age	40–60 years (Late Adulthood)	85
	Above 60 years (Elderly)	15
Family Size	Up to 4 members	44
	5–6 members	45
	Above 6 members	11
Occupation	Working women (Employed)	47



	Non-working women (Not gainfully employed)	53
Annual Income	Lower class (Less than 1,40,628 LPA)	6
	Upper lower class (1,40,628 to 3,51,264 LPA)	37
	Lower middle class (3,51,276 to 4,68,372 LPA)	41
	Upper middle class (4,68,372 to 9,36,744 LPA)	16

Table 1 indicates that majority of the subjects were in their late adulthood with a family of less than six members and belonged to lower class. More than half of the women were not gainfully employed.

Dietary Assessment of the subjects: The results of 24 hour dietary recall are given in table 2.

Table-02: Dietary magnesium intake of subjects in comparison to the recommended

Nutrient	RDA value	Average dietary daily magnesium intake (mg)				
		Central	North	South	East	West
Magnesium	370 mg	307	297	318	293.4	280
Nutrient Inadequacy		-5.5	-8.6	-2.2	-9.8	-13.8

Subject's dietary magnesium intake as assessed by 24 hour dietary recall indicates that the subjects did not meet their daily magnesium requirement and the magnesium inadequacy ranged from 2.2 per cent to 13.8 per cent in different regions of Bangalore. The results of the present study are in agreement with similar study by Agarwal and Rana (2020)[6]. In their study they showed that magnesium intake was 8.07 per cent below the RDA in patients as well as their attendants of outpatients (OPD) visiting for Diabetes, Obesity & Thyroid Center in Gwalior, Madhya Pradesh.

Several scientific studies have reported widespread magnesium deficiency throughout the world. According to estimates 56 to 68 per cent of Americans consume suboptimal level of magnesium (Moshfegh et al (2005)[7], King et al 2005)[8]. In their study on chronic latent magnesium deficiency in apparently healthy students, Hermes Sales et al (2014)[9] have shown that about 42 per cent of young university students suffer from primary Mg deficiency.

A number of factors have contributed to low dietary magnesium intake. Increase in consumption of processed foods which generally lack magnesium (unless fortified), commonly consumed staple foods are low in magnesium, cooking and boiling reduces magnesium content in foods, vitamin D deficiency, some antibiotics, pesticides, alcohol, smoking adversely affect absorption of magnesium by the gastro intestinal tract. In addition, indiscriminate use of fertilizers has depleted the magnesium content



of soil. Monoculture in agriculture has reduced diet diversity adversely affecting intake of several micronutrients including magnesium. Purification of water leading to demineralised water is also responsible for depletion of magnesium in water. Research has shown that aging can reduce absorption of magnesium by nearly 30 per cent (Schwalfenberg and Genuis, 2017)[10].

Magnesium Focussed Clinical Assessment of the Subjects:

The signs and symptoms of magnesium deficiency as reported by the subjects have been shown in Table 3.

Table 3: Magnesium Focussed Clinical Assessment of the Subjects

Signs and Symptoms	Central Bangalore N=100 (%)	North Bangalore N=100 (%)	South Bangalore N=100 (%)	East Bangalore N=100 (%)	West Bangalore N=100 (%)	Bangalore (All Region) N=500(%) Average
Muscle cramp/ Spasms	19	76	54	57	74	56
Fatigue / Lack of energy	29	10	27	68	46	36
Increased Anxiety, irritability, mood swings	32	21	21	87	76	47.4
Frequent headache, Migraine	48	5	62	59	46	44
Numbness /Tingling sensation in hands or feet	14	4	13	71	28	26
Difficulty in sleeping or Insomnia	32	12	18	87	36	37
Heart palpitations/ irregular heartbeats	13	36	11	16	3	15.8
Frequent constipation/ digestive issues	16	10	10	64	50	30
Frequent muscle weakness	8	45	58	23	41	35



Diagnosed with High Blood pressure	26	55	69	78	36	52.8
Dizziness/ often lightheaded	10	5	14	12	33	14.8
Hairloss	47	63	47	66	69	58.4
Unusually stressed/ overwhelmed	26	12	39	78	65	44
Osteoporosis / weak bones	7	85	28	45	52	43.4
Frequent joint pain/ stiffness	10	72	78	69	59	57.6
Frequent infections / poor immunity	12	2	23	20	19	15.2
Involuntary muscle twitches	9	8	32	6	27	16.4

The table 3 shows that women suffered from various symptoms of magnesium deficiency. The prevalence varies from 2.3 per cent for dizziness to 58.4 per cent in case of hair loss, and 56 per cent of the subjects suffered from muscle cramps. So, overall subjects did report several symptoms of magnesium deficiency.

Studies have shown positive effect of higher magnesium intake on bone mineral density in case of men as well as women including postmenopausal women (Ryder et al (2005)[11], Aydin et al (2010)[12]. A study by Zhang et al (2022)[13] on association between Mg intake and sleep quality has concluded that higher Mg intake was associated with better quality and duration of sleep particularly among the participants without depressive disorders.

Effect of magnesium intake and blood pressure control among hypertensive patients was studied by Patel et al (2024)[14] and they have concluded that 24 hour higher urinary magnesium excretion is correlated with good blood pressure control when compared to patients with poor blood pressure control. They have also shown that flaxseeds can be used as an adjuvant to drug therapy for better regulation of blood pressure.

Several studies have linked magnesium deficiency to muscle cramps, migraine headache, metabolic syndrome, diabetes, renal calculi, and hypertension. Increasing dietary magnesium and supplementation has proved to be beneficial in some cases. It is to be noted that many of the symptoms of deficiency are also associated with other micronutrients such as calcium, iron, vitamin D etc. It is necessary to address deficiency of other micronutrients along with magnesium deficiency.



V. Conclusion

Although the concept of magnesium deficiency appears to be new, the deficiency is widespread and often goes unrecognised. Modern lifestyle factors along with depletion of magnesium in soil and water are contributing to its low dietary intake. In the present study, Urban Bangalore women in late adulthood (40 to 60 years) were found to consume slightly less magnesium (-2.2 to -13.8 per cent) when compared to their recommended dietary intake. However half of them suffered from symptoms such as muscle cramps, high BP, frequent joint pain, stiffness, hair loss etc. There is a need to validate the findings with biochemical data of their magnesium status. Further the data needs to be interpreted in the context of demographic factors such as age, occupation, gender, socio economic status, dietary habits to gain a better understanding.

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