

MAGNESIUM: AMERICA'S LOST MINERAL

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Magnesium deficiency among U.S. adults is unprecedented and widespread. According to the National Center for Health Statistics, 68% of US adults consume less than the recommended daily allowance (RDA) of magnesium, and 19% consume less than 50% of the RDA.¹

A large segment of the U.S. population may have chronic latent magnesium deficiency that has been linked to conditions such as heart disease, diabetes, high blood pressure (hypertension), premenstrual syndrome (PMS), and psychiatric disorders...among a staggering list of conditions.

Additionally, magnesium deficiency is so prevalent among critically ill patients that physicians are encouraged to test serum magnesium levels in all critically ill patients.² A study conducted at the Intensive Care Unit of Los Angeles County/University of Southern California Medical Center determined that 65% of critically ill patients were magnesium-deficient.³

Why are so many of us deficient in magnesium? One reason is that many illnesses (both acute and chronic) trigger magnesium wasting (a rapid depletion of magnesium). Magnesium is lost more rapidly than it can be replaced. Another main reason is that the highly processed modern American diet has been stripped of essential magnesium. Although it might be possible for food manufacturers to fortify foods with magnesium, factors such as bioavailability, stability, and taste on the final product all have to be considered. Furthermore, the modern trend of utilizing water softeners and water purifiers has completely stripped magnesium out of the drinking water supply—so much so that bottled water companies are now selling magnesium-fortified water in an effort to replenish magnesium in the U.S. drinking water supply.

TABLE 1: PROGRESSIVE DECLINE OF DIETARY MAGNESIUM CONSUMPTION [MAGNESIUM TRACE ELEMENTS 10: 162-28, 1997]	
Years	Magnesium Mg / day
1900-08	475-500
1909-13	415-435
1925-29	385-398
1935-39	360-375
1947-49	358-370
1957-59	340-360
1965-76	300-340
1978-85	225-318
1990-2002	175-225

MAGNESIUM DEFICIENCY AND HEART DISEASE RISK

Hundreds of published studies have established a strong link between heart disease and magnesium deficiency. Given that 68% of U.S. adults consume less than the RDA of magnesium, it has been strongly suggested that the U.S. mortality rate due to heart disease is linked to the steady decline of dietary magnesium intake.

One important study concluded that adults who consumed less than the RDA of magnesium were 1.48 to 1.75 times more likely to have elevated C-reactive protein (CRP) than those who consumed above the RDA of magnesium. According to the American Heart Association, high CRP levels are a known inflammatory marker, and have proven to be a consistent indicator of increased heart disease risk.⁴

Magnesium deficiency can cause many types of heart disease in all stages of life. Low serum magnesium levels have been found in patients with symptomatic mitral valve prolapse, and magnesium supplementation has shown to be helpful in improving symptoms and outcome.⁵ Low magnesium levels may contribute to atherosclerosis and acute thrombosis.⁶ And magnesium supplementation has been proposed as a method of reducing the risk of sudden death—particularly in populations where sudden death is more frequent due to magnesium-deficient water supplies.⁷

Furthermore, magnesium deficiency is also strongly associated with diseases that dramatically increase the risk of heart disease; namely, diabetes, insulin resistance, and high blood pressure.

MAGNESIUM AND DIABETES

Low serum magnesium levels have been strongly associated with insulin resistance and type 2 diabetes.⁸ Studies have shown that diabetic patients typically test low in serum magnesium levels, and that chronic magnesium supplementation has been helpful in stabilizing and maintaining proper glucose levels, especially in elderly diabetics.⁹

Magnesium deficiency has also been associated with insulin resistance in obese children, primarily due to their highly processed, magnesium-deficient diet. A study examining obese children found that “in addition to not eating enough foods that have a lot of magnesium, obese children might also have problems using magnesium from the foods they eat. Extra body fat can prevent the body’s cells from using magnesium to break down carbohydrates.”¹⁰ Chronic magnesium supplementation is recommended to prevent the development of type 2 diabetes in obese children.¹¹

Furthermore, an interesting study in the journal *Hypertension* found eating a high-fructose diet increases magnesium deficiency, and that magnesium deficiency plays a more significant role in insulin resistance than the high intake of fructose.¹²

MAGNESIUM AND HYPERTENSION

It is well documented that magnesium deficiency is linked to elevated blood pressure (essential hypertension)¹³. A study in the journal *Hypertension* concluded that oral magnesium supplementation might be effective as a non-pharmacological treatment for essential hypertension.¹⁴ In order to reduce blood pressure and maintain healthy limits, high magnesium intake is recommended as a lifelong lifestyle change.¹⁵ This cannot be accomplished with ordinary magnesium supplements.

MAGNESIUM AND CHRONIC CONDITIONS

Magnesium deficiency is a culprit in many chronic conditions, and is the most under-diagnosed electrolyte abnormality in clinical practice today. It is suggested that routine magnesium testing can materially enhance the care and health outcome of the patient.¹⁶

MAGNESIUM DEFICIENCY PLAYS A ROLE IN THE FOLLOWING CHRONIC CONDITIONS...

AGING

Aging is considered a risk factor for magnesium deficiency, since magnesium absorbability declines with age. Magnesium deficiency is much more prevalent in elderly who live in institutionalized settings than among independent seniors. Oral magnesium supplementation is encouraged to help prevent cardiovascular disease, high blood pressure, diabetes, stroke, and sudden death in the elderly population, especially chronically ill seniors.¹⁷

ALCOHOLISM

Chronic alcoholic consumption causes extreme renal magnesium wasting, which means that the body dumps magnesium at an accelerated rate, causing rapid depletion. Alcohol is the most notorious of all drugs with regards to accelerated magnesium wasting. Alcohol-related magnesium wasting may result in alcohol-induced hypertension, stroke, or heart attack.¹⁸ Therefore, magnesium supplementation has been recommended as a prophylactic to prevent the risk of sudden death in alcoholics.

ATTENTION DEFICIT DISORDER

One study found that magnesium supplementation decreases hyperactivity in children with attention deficit disorder. Therefore, magnesium supplementation may be a useful therapy in the management of attention deficit disorder, irrespective of other emotional disorders.¹⁹

ASTHMA

High magnesium intake is associated with high lung function. Consequently, magnesium deficiency is associated with decreased lung function, asthma, and airflow obstruction. Increased magnesium intake has been shown to improve lung function and reduce reports of wheezing.^{20, 21}

AUTISM

Vitamin B-6 (pyroxidine) taken in combination with magnesium has been shown to benefit 40% of patients with autism, possibly by an effect on dopamine metabolism. Symptoms such as noise stress, agitation, and bedwetting are reduced.²²

CHRONIC FATIGUE SYNDROME

Low serum magnesium levels are reported in patients with chronic fatigue syndrome (CFS). CFS patients treated with magnesium reported improved energy levels, better emotional state, and less pain.²³

INFLAMMATORY BOWEL DISEASE

Magnesium deficiency is a frequent complication of inflammatory bowel disease (IBD). It occurs in up to 88% of IBD patients. Oral magnesium supplementation above 700 mg/day is recommended, depending on the severity of magnesium malabsorption in the IBD patient.²⁴

MENTAL HEALTH

High levels of stress in acutely ill psychiatric patients lead to magnesium deficiency. Magnesium deficiency can escalate acute symptoms of hallucinations, anxiety, and fear in patients with mental disorders such as schizophrenia, bipolar disorder, and Alzheimer's disease.²⁵ Magnesium supplementation may be useful in reducing psychiatric symptoms during acute mental illness.

MIGRAINE

Up to 50% of patients experiencing an acute migraine attack have lowered levels of ionized magnesium. Because of its safety profile, oral magnesium supplementation can be recommended to a majority of migraine sufferers. Refractory patients can sometimes benefit from intravenous infusions of magnesium sulfate.²⁶ High-dose oral magnesium may be effective in warding off migraines as well. One study showed that migraine attack frequency was reduced by 41.6% in those who participated in chronic magnesium supplementation. The need for medications to alleviate migraines was also reduced.²⁷

OSTEOPOROSIS

Magnesium is an essential mineral for bone health. Magnesium and calcium work synergistically. While calcium supplementation is highly encouraged—and even overly promoted—in our U.S. diet, magnesium supplementation has not been given adequate attention. Magnesium deficiency may cause poor absorption of calcium, since magnesium regulates active calcium transport. In a two-year study of menopausal women, it was shown that magnesium therapy prevents fractures and increases bone density significantly.²⁸ In addition, decreased serum magnesium levels have been found in postmenopausal patients with osteoporosis. Magnesium testing can be used effectively to help identify a woman's risk of osteoporosis. Thus, standard magnesium testing is encouraged for all postmenopausal women.²⁹

PERIODIC LIMB MOVEMENT DURING SLEEP (PLMS)

Patients who experience insomnia due to periodic limb movement during sleep (PLMS) may benefit from magnesium supplementation. PLMS patients who followed magnesium supplementation therapy woke up less often, and were able to sleep better than those who didn't take magnesium.³⁰

PERIODONTITIS

Magnesium deficiency may be associated with periodontitis (gum disease), and periodontal health may be improved by taking magnesium supplementation. Study participants taking magnesium supplementation showed less gum and tooth loss than those who didn't supplement.³¹

PREGNANCY

Magnesium supplementation during pregnancy has been associated with "significantly fewer maternal hospitalizations, a reduction in preterm delivery, and less frequent referral of the newborn to the neonatal intensive care unit. Magnesium supplementation during pregnancy is suggested to have a significant influence on fetal and maternal morbidity, both before and after delivery."³² Additionally, magnesium deficiency may be responsible for spasms of umbilical and placental vasculature—a sign of pre-eclampsia. Pre-eclampsia can be a life-threatening condition that produces extreme hypertension and seizures in the mother, occurring primarily in the third trimester. Intravenous therapy with magnesium is a viable treatment for managing pre-eclampsia.³³

It has also been suggested that sudden infant death syndrome (SIDS) may be associated with magnesium deficiency found in the newborn. Further studies are required to determine if magnesium supplementation by the mother during pregnancy, and subsequent magnesium supplementation for the newborn during the first year of life, are effective therapies in preventing SIDS.³⁴

PREMENSTRUAL SYNDROME (PMS)

Women with premenstrual syndrome tend to have low serum magnesium levels; therefore, it has been found that magnesium supplementation taken one week before menstruation may alleviate PMS-related mood swings. In addition, a study in *The Journal of Women's Health* found that 200 mg a day of magnesium reduced PMS fluid retention, breast tenderness and bloating by 40 percent.³⁵

STRESS

Stress—whether it's emotional (anxiety, panic, depression) or physical (exertion or trauma)—is a known factor in magnesium depletion. Stress, combined with magnesium deficiency, further increases the risk of heart disease, sudden death heart attack, stroke, and hypertension. In addition, excessively high intakes of dietary fat and calcium (from a poor diet), combined with stress, can actually accelerate the process of magnesium depletion. A magnesium supplement is strongly encouraged in cases of chronic stress to protect against cardiovascular disease, hypertension, stroke, and sudden death.³⁶

STROKE

Magnesium deficiency is a known risk factor for stroke. It has been found that diets rich in potassium, magnesium, and cereal fiber may reduce the incidence of stroke, especially in hypertensive men.³⁷

SUDDEN DEATH

Substantial studies link magnesium deficiency with sudden death. In populations that have low magnesium-deficient drinking water, sudden death rates increase. Magnesium supplementation has been proposed as a possible method of reducing the risk of sudden death in the general U.S. population. Suggested ways of supplementing magnesium include public education to change dietary habits, addition of magnesium to community water supplies, fortification of foods, and oral supplementation.³⁸

CITED SOURCES

- ¹ Journal of the American College of Nutrition, Vol. 24, No. 3, 166-171 (2005).
Dietary Magnesium and C-reactive Protein Levels. Dana E. King, MD, Arch G. Mainous, III, PhD, Mark E. Geesey, MS and Robert F. Woolson, PhD.
<http://www.jacn.org/cgi/content/abstract/24/3/166>
- ² Am J Med. 1975 Jun; 58(6): 837-46. Magnesium deficiency and cardiac disorders.
Iseri LT, Freed J, Bures AR.
http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=806229&dopt=Abstract
- ³ Crit Care Med. 1985 Jan; 13(1): 19-21. Magnesium deficiency in a medical ICU population. Ryzen E, Wagers PW, Singer FR, Rude RK.
http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=3965244&dopt=Citation
- ⁴ "Inflammation, Heart Disease and Stroke: The Role of C-Reactive Protein." American Heart Association.
<http://www.americanheart.org/presenter.jhtml?identifier=4648>
- ⁵ Am J Cardiol. 1997 Mar 15; 79(6): 768-72. Clinical symptoms of mitral valve prolapse are related to hypomagnesemia and attenuated by magnesium supplementation.
Lichodziejewska B, Klos J, Rezler J, Grudzka K, Dluzniwska M, Budaj A, Ceremuzynski L.
http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=9070556&dopt=Abstract
- ⁶ Am Heart J. 1998 Sep; 136(3): 480-90. Is low magnesium concentration a risk factor for coronary heart disease?
http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=9736141&dopt=MEDLINE
- ⁷ Am Heart J. 1992 Aug; 124(2): 544-9. Magnesium deficiency and sudden death.
Eisenberg MJ.
http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=1636608&dopt=Citation
- ⁸ Am J Hypertens. 1997 Mar; 10(3): 346-55. Hypertension, diabetes mellitus, and insulin resistance: the role of intracellular magnesium. Paolisso G, Barbagallo M.
http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=9056694&dopt=Citation
- ⁹ Diabetes Care, Vol 12, Issue 4 265-269. Improved insulin response and action by chronic magnesium administration in aged NIDDM subjects. G Paolisso, S Sgambato, G Pizza, N Passariello, M Varricchio and F D'Onofrio
<http://care.diabetesjournals.org/cgi/content/abstract/12/4/265>
- ¹⁰ "Is A Lack of Magnesium Related to Type 2 Diabetes in Obese Children?" American Diabetes Association
<http://www.diabetes.org/diabetes-research/summaries/huerta-magnesium.jsp>

-
- ¹¹ Diabetes Care. 2005 May;28(5):1175-81. Magnesium deficiency is associated with insulin resistance in obese children. Huerta MG, Roemmich JN, Kington ML, Bovbjerg VE, Weltman AL, Holmes VF, Patrie JT, Rogol AD, Nadler JL.
http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?db=pubmed&cmd=Retrieve&dopt=AbstractPlus&list_uids=15855585&query_hl=3&itool=pubmed_docsum
- ¹² Hypertension, Vol 23, 1036-1039, American Heart Association, Dietary magnesium prevents fructose-induced insulin insensitivity in rats. TW Balon, A Jasman, S Scott, WP Meehan, RK Rude and JL Nadler.
<http://hyper.ahajournals.org/cgi/content/abstract/hypertensionaha;23/6/1036>
- ¹³ Science, Vol 223, Issue 4642, 1315-1317. Magnesium deficiency and hypertension: correlation between magnesium-deficient diets and microcirculatory changes in situ. BM Altura, BT Altura, A Gebrewold, H Ising, and T Gunther.
<http://www.sciencemag.org/cgi/content/abstract/223/4642/1315>
- ¹⁴ Hypertension, Vol 13, 227-232. Oral magnesium supplementation in patients with essential hypertension. T Motoyama, H Sano and H Fukuzaki.
<http://hyper.ahajournals.org/cgi/content/abstract/hypertensionaha;13/3/227>
- ¹⁵ THypertension. 1998;32:260-265. Effects of Magnesium Supplementation in Hypertensive Patients. Yuhei Kawano; Hiroaki Matsuoka; Shuichi Takishita; ; Teruo Omae.
<http://hyper.ahajournals.org/cgi/content/abstract/hypertensionaha;32/2/260>
- ¹⁶ Magnesium. 1987;6(1):1-4. Routine serum magnesium determination--a continuing unrecognized need. Whang R.
http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=3821170&dopt=Citation
- ¹⁷ Magnes Res. 1998 Mar; 11(1):25-42. Magnesium status and ageing: an update. Durlach J, Bac P, Durlach V, Rayssiguier Y, Bara M, Guet-Bara A.
http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=9595547&dopt=Citation
- ¹⁸ Dietary Reference Intakes for Calcium, Phosphorus, Magnesium, Vitamin D, and Fluoride (1997). Institute of Medicine. The National Academies Press.
<http://www.nap.edu/books/0309063507/html/193.html>
- ¹⁹ Ann Acad Med Stetin. 1998;44:297-314. The effect of deficiency of selected bioelements on hyperactivity in children with certain specified mental disorders. Starobrat-Hermelin B. Szczecinie.
http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=9857546&dopt=Abstract
- ²⁰ Lancet. 1994 Aug 6;344(8919):357-62. Dietary magnesium, lung function, wheezing, and airway hyperreactivity in a random adult population sample. Britton J, Pavord I, Richards K, Wisniewski A, Knox A, Lewis S, Tattersfield A, Weiss S.

http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=7914305

²¹ Magnesium. 1988;7(4):173-87. Magnesium and the lungs. Mathew R, Altura BM.
http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=3072451&dopt=Citation

²² Magnes Trace Elem. 1991-1992;10(2-4):287-301. Magnesium, stress and neuropsychiatric disorders. Galland L. Great Smokies Diagnostic Laboratory, Asheville, N.C.
http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?db=pubmed&cmd=Retrieve&dopt=AbstractPlus&list_uids=1844561&query_hl=6&itool=pubmed_docsum

²³ Lancet. 1991 Mar 30;337(8744):757-60. Red blood cell magnesium and chronic fatigue syndrome. Cox IM, Campbell MJ, Dowson D.
http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=1672392&dopt=Abstract

²⁴ Magnesium. 1988;7(2):78-83. Magnesium and inflammatory bowel disease. Galland L.
http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=3294519&dopt=Abstract

²⁵ Neuropsychobiology. 1990;23(2):79-81. Magnesium, schizophrenia and manic-depressive disease. Kirov GK, Tsachev KN.
http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=2077436&dopt=Abstract

²⁶ Clin Neurosci. 1998;5(1):24-7. Role of magnesium in the pathogenesis and treatment of migraines. Mauskop A, Altura BM.
http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=9523054&dopt=Abstract

²⁷ Cephalalgia. 1996 Jun;16(4):257-63. Prophylaxis of migraine with oral magnesium: results from a prospective, multi-center, placebo-controlled and double-blind randomized study. Peikert A, Wilimzig C, Kohne-Volland R.
http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=8792038&dopt=Citation

²⁸ Nutr Rev. 1995 Mar;53(3):71-4. Magnesium supplementation and osteoporosis. Sojka JE, Weaver CM.
http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=7770187&dopt=Citation

²⁹ Magnesium. 1989;8(2):106-9. Preliminary report of decreased serum magnesium in postmenopausal osteoporosis. Reginster JY, Strause L, Deroisy R, Lecart MP, Saltman P, Franchimont P.
http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=2755212&dopt=Citation

-
- ³⁰ Sleep. 1998 Aug 1;21(5):501-5. Magnesium therapy for periodic leg movements-related insomnia and restless legs syndrome: an open pilot study. Hornyak M, Voderholzer U, Hohagen F, Berger M, Riemann D.
http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&list_uids=9703590&dopt=Citation
- ³¹ J Dent Res 84(10):937-941, 2005. Magnesium Deficiency is Associated with Periodontal Disease. P. Meisel, C. Schwahn, J. Luedemann, U. John, H.K. Kroemer, and T. Kocher
<http://jdr.iadrjournals.org/cgi/content/abstract/84/10/937>
- ³² Br J Obstet Gynaecol. 1988 Feb;95(2):120-5. Magnesium supplementation in pregnancy. A double-blind study. Spatling L, Spatling G.
http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=3349001&dopt=Citation
- ³³ Science, Vol 221, Issue 4608, 376-378. Magnesium deficiency-induced spasms of umbilical vessels: relation to preeclampsia, hypertension, growth retardation BM Altura, BT Altura, and A Carella.
<http://www.sciencemag.org/cgi/content/abstract/221/4608/376>
- ³⁴ Magnes Res. 1991 Sep-Dec;4(3-4):137-52. Magnesium and thermoregulation. I. Newborn and infant. Is sudden infant death syndrome a magnesium-dependent disease of the transition from chemical to physical thermoregulation? Durlach J, Durlach V, Rayssiguier Y, Ricquier D, Gubern M, Bertin R, Bara M, Guet-Bara A, Olive G, Mettey R.
http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?db=pubmed&cmd=Retrieve&dopt=AbstractPlus&list_uids=1799550&query_hl=10&itool=pubmed_docsum
- ³⁵ Obstetrics & Gynecology 1991;78:177-181. Oral magnesium successfully relieves premenstrual mood changes. F Facchinetti, P Borella, G Sances, L Fioroni, RE Nappi, and AR Genazzani.
<http://www.greenjournal.org/cgi/content/abstract/78/2/177>
- ³⁶ Journal of the American College of Nutrition, Vol 13, Issue 5 429-446. Consequences of magnesium deficiency on the enhancement of stress reactions; preventive and therapeutic implications (a review). M. S. Seelig.
<http://intl.jacn.org/cgi/content/abstract/13/5/429>
- ³⁷ Circulation. 1998;98:1198-1204. Intake of Potassium, Magnesium, Calcium, and Fiber and Risk of Stroke Among US Men. A. Ascherio, MD, DrPH; E. B. Rimm, ScD; M. A. Hernán, MD, MPH; E. L. Giovannucci, MD, ScD; I. Kawachi, MD, DrPH; M. J. Stampfer, MD, DrPH; ; W. C. Willett, MD, DrPH.
<http://circ.ahajournals.org/cgi/content/abstract/98/12/1198>
- ³⁸ Am Heart J. 1992 Aug;124(2):544-9. Magnesium deficiency and sudden death. Eisenberg MJ.
http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=1636608&dopt=Citation