

The Magnificent Effect of Magnesium to Human Health: A Critical Review

Dr. Qais Faryadi

Faculty of Science and Technology
Department of Computer Science
Universiti Sains Islam Malaysia
USIM

Abstract

Magnesium is one of the most neglected mineral in human body. Magnesium is responsible for the activation of more than 300 enzymes in the body. It assists to maintain muscle and nerve function in human body. People with magnesium deficiency are always tired, irritable, nervous, stiffness in the muscles and difficult to concentrate. Magnesium deficiency is actually linked to various pathological conditions. Magnesium is one of the most essential mineral in human body. This paper investigates the effectiveness of magnesium chloride to human health. It is an effort to facilitate a wise option to those who suffering from many chronic pains and wish to change their quality of life for the better. This assessment investigates the benefits of magnesium chloride to our health such as to our bones, energy, heart, stroke, muscular system, dental health, diabetes, emotion, calcification, stress, depression, anxiety, and asthma. As thus, magnesium, deficiency disrupts the biochemical function in the human body especially the nervous system.

Introduction

This appraisal investigates the effect of magnesium on the human health. Study indicates that there is a linkage between magnesium deficiency and chronic joint pains as magnesium deficiency causes muscle tension and spasm (Freeman, 1999). Study also asserts that magnesium efficiency can reduce depression, irritability; anxiety and tension (Community Pharmacy, 2003). As thus, the case for magnesium is loud and clear. This forgotten but extremely crucial mineral plays an important role in assisting human body to convert food into energy thus, helping human body to function properly (Raloff, 1997). Study denotes that magnesium is not only an important component in a healthy and strong bone construction; it also helps the nervous system and the hearth rhythm to function smoothly. Research further designates that those with low level of magnesium need more oxygen and energy, therefore get tired more quickly (Bliss, 2004). Evidence suggests that magnesium has an important function in many biochemical and physiological process, which directly effects human Lung function, asthma management, joint pain, smoothening of muscle function, neuromuscular excitability, immune function, inflammation, and oxidative stress (Kazaks, 2006). Evidence further signifies that magnesium balances calcium and easily regulates blood pressure. Magnesium also metabolizes energy and helps in muscle contraction as well as bone mineralization (Miller, 2005). Study indicates that magnesium is responsible for the activation of more than 300 enzymes in the body. Most of these enzymes are involve in energy metabolism (Schrader, 1999).

Literature Review

Magnesium is one of the most neglected mineral in human body. It is crucial for a healthy and lasting life. Magnesium is responsible for the activation of more than 300 enzymes in the body. It assists to maintain muscle and nerve function in human body. Magnesium helps human hearth rhythm to function at normal rate and supports a healthy immune system. Research indicates that magnesium helps regulate blood sugar levels and helps blood pressure to function normally. The role of magnesium according to the studies is loud and clear. It prevents and manages hypertension, cardiovascular disease, most importantly diabetes, and joint pains (Rude, 1998). (Vormann, 2003). According to Dr. Dean Carolyn, 2007, magnesium helps to produce and then transport energy to human body. It also helps to transmit nerve signals and assist the muscles to relax. Magnesium helps to activate enzymes as thus, helping in digestion and absorption. Magnesium also helps in utilization of proteins, carbohydrate and fats. Since magnesium is one of the most needed mineral in human body, its deficiency dangerously affects every function of the body.

According to Sircus, 2007, magnesium is the most important mineral, which regulates and smoothens human cells. It also maintains and balances the electrical signals in the body. Our muscles need magnesium to function smoothly. Magnesium is also essential for the formation of bones and teeth. “*Magnesium deficiency certainly qualifies as a principal cause of disease. No matter what we do with our hearts, postures, or medical treatments, there is simply nothing we can do to adequately enhance our state of health when magnesium supplies are less than adequate in our bodies*” says Sircus (2007). Researchers profess that magnesium deficiency can cause many problems such as back pain, neck pain and joints pains. In this study those participants who used magnesium improved their chronic lower back pain by 49% reduction (Lukaczer, 2008). As such this initiative will seek to research, critically evaluate the linkage between magnesium and joints pain among the Malaysian adult population. As such, magnesium deficiency dangerously affects every system of human body. Magnesium deficiency is one of the major factor in many sever illness such as heart attack, heart disease, asthma, anxiety, depression, fatigue, diabetes, migraine and panic attack.

As thus, magnesium deficiency is a serious condition in which there is an insufficient amount of magnesium in the body to help the proper function of various organs in the body. People with magnesium deficiency are always tired, irritable, nervous, stiffness in the muscles and difficult to concentrate. Research further claims that magnesium deficiency is actually linked to various pathological conditions. Magnesium is one of the most essential mineral in human body. It is an intracellular ion and works as a cofactor for more than 300 enzymatic reactions (Manuel, et.al, 2009). Study further shows that magnesium (deep-sea water) indicates the possibility that it can improve obesity and diabetes. It also helps to increase the glucose disposal from human body. Magnesium in fact, is an antidiabetic and anti-obesity, says Yun, et. al. (2009).

Magnesium and Bones

An estimated 60 to 65 percent of magnesium is located in our teeth and bones with the remainder residing in other parts of the body, including muscles and body fluids. A research paper presented by Dr. Barnett, an outstanding bone surgeon, at the Annual Texas Medical Association Meeting in Dallas (May 6, 1952) indicated that people in Deaf Smith County, Texas, had a lower incidence of tooth decay and faster healing of broken bones compared to Dallas County residents. It was noted that magnesium levels of Deaf Smith County residents were five times higher as compared with those of Dallas County residents. Dr. Barnett further observed that the diet of Deaf Smith County residents contained plenty of magnesium, vitamin C and protein.

Magnesium and Energy

This almost forgotten but extremely crucial mineral plays an important role in assisting the human body convert food into energy thus, helping the body to function properly (Raloff, 1997). Magnesium activates ATP (adenosine triphosphate) which is a vital energy storage molecule in the body. In short, without magnesium there will be neither life nor movement. According to Dr. Carolyn Dean (2007), magnesium helps in the production and transportation of energy in our bodies. It also helps to transmit nerve signals and assists the muscles to relax. People with low levels of magnesium are quickly tired and need more oxygen and energy (Bliss, 2004). Magnesium is also needed in energy metabolism and helps in muscle contraction (Miller, 2005).

Magnesium and the Heart

Research indicates that magnesium helps to regulate blood sugar levels and blood pressure. Magnesium prevents and manages hypertension and cardiovascular disease (Rude, 1998; Vormann, 2003). According to these two studies, after magnesium was introduced to patients for about five weeks, symptoms of chest pain, anxiety, palpitation, low energy, faintness and breathing difficulties were considerably reduced. Another study showed that taking 625 milligrams of magnesium daily in the diet reduced hypertension in high blood pressure groups (Montoyama, 1989). A double-blind placebo-controlled study indicated that individuals taking 411 to 548 milligrams of magnesium in their daily diet improved their systolic and diastolic blood pressure significantly (Itoh, 1997). Leading researchers in magnesium reported that around 70 to 80 percent of participants in their research had borderline hypertension and depressed blood-ionized magnesium levels (Altura, 1995). In a similar research, it was found that about 60 percent of 141 participants with critical symptoms of Mitral Valve Prolapse had magnesium deficiency, compared with only 5 percent in the control group.

<http://www.magnesiumdirect.com/pubstudies.aspx> , (*Mitral Valve Prolapse is a disorder where the mitral valve of the heart fails to completely close off one of the chambers in the heart during contraction.*)

Magnesium and Stroke

Stroke occurs when the blood flow into the brain is blocked. The blockage is caused either by blood clot or a burst blood vessel. A stroke can cause death, paralysis, loss of memory or speech retardation. Magnesium helps blood flow in the body. Thus, a diet high in magnesium may prevent the risk of a stroke. Studies conducted in three hospitals in New York showed that about 98 stroke patients showed signs of significant magnesium-ion deficiency. The stroke patients also showed high calcium to magnesium ratio, indicating an increased vascular tone and cerebral vessel spasm (Yang, 1998). A study conducted in Taiwan showed that a high level of magnesium in Taiwanese drinking water was correlated with a lower incidence of stroke (He, 2006).

Magnesium and the Muscular System

Our muscles need magnesium to function smoothly. "*Magnesium deficiency certainly qualifies as a principal cause of disease. No matter what we do with our hearts, postures, or medical treatments, there is simply nothing we can do to adequately enhance our state of health when magnesium supplies are less than adequate in our bodies*" says Mark Sircus (2007). Magnesium deficiency can cause many problems such as back pain, neck pain and joint pain. In a study, participants who used magnesium reduced their chronic lower back pain by 49% (Lukaczer, 2008). There is a link between magnesium deficiency and chronic joint pain since magnesium deficiency causes muscle tension and spasm (Freeman, 1999).

Magnesium and Dental Health

Study by Rodale & Taub, (1971) tested the content of magnesium and calcium in extracted teeth of seven subjects who received magnesium compounds. The results indicated that participants who took magnesium experienced fewer cavities compared with those who did not. The study further concluded that calcium by itself did not prevent caries and that it required stabilization by magnesium. In cases of magnesium deficiency, calcium tended to aggravate the situation. A study published in the *Journal of the Southern California Dental Association* in December 1963 reported that refined food in the diet of rats increased the incidence of caries. In this study, the researchers compared the effect of refined white flour and whole-wheat flour on the rats. Whole-wheat flour contained 113mg of magnesium while white flour contained only 25mg. of magnesium (per meal). When the researchers substituted the wheat flour with white flour, thereby depriving the rats of a large magnesium source, the rats suffered more caries. A similar study was conducted on humans on April 29, 1961 (Rodale, 1961), and published in *Nature (London)*. In this research 200 participants ranging from five to 56 years of age, who were given alkaline phosphate for three years, had a reduction in the number of surface cavities. Upon further investigation, it was found that it was magnesium in the phosphate compound – and not phosphate itself – that hardened the surface of the teeth and reduced the cavities.

Magnesium and Electrolyte

Magnesium is crucial for the maintenance of the electrical balance in the body. It also helps to regulate metabolism in the cells. Too much calcium without an adequate amount of magnesium irritates the nerve cells in the brain and results in repeated electrical impulses being sent. This creates energy loss and death of the cells. According to Mark Sircus (2007), magnesium is the most important mineral for cellular function. It also maintains and balances the electrical signals in the body.

Magnesium and Diabetes

Research has shown that magnesium regulates sugar levels in the blood, preventing it from rising uncontrollably. In investigations on three groups i.e. 85,000 women in Harvard's Nurses Health, 43,000 men in its Health Professionals Follow-Up Study and 40,000 women in the Iowa Women's Health Study, sufficient intake (300-400 mg per day, according to body weight) of magnesium in the food was found to decrease the likelihood of developing Type 2 diabetes. In these studies, participants with lower magnesium intake showed signs of diabetes because a considerable amount of magnesium was lost in the urine (Altura, 1997). Magnesium might even resolve the problems of obesity and diabetes by helping to increase glucose metabolism in the body. In fact, magnesium is an anti-diabetic and anti-obesity mineral, says Yun, et al. (2009).

Magnesium and Emotion

Mark Sircus in his book *Transdermal Therapy* says that, "*Magnesium is essential in regulating the central nervous system excitability thus magnesium deficiency may cause aggressive behavior, depression or suicide.*"

Magnesium calms the brain and people do not need to become severely deficient in magnesium for the brain to become hyperactive." Sircus (2007) continues to stress that "Magnesium is the second most abundant intracellular and the fourth most abundant cation (*positively charged ion*) in the body. It is an essential trans membrane and intracellular modulator of cellular electrical activity. As such, its deficiency in the body is nothing short of disastrous for cell life. Yet, this fact is not widely known." Studies also postulate that magnesium can reduce depression, irritability, anxiety and tension (Community Pharmacy, 2003). In a study of 500 depressed participants, Dr. R.H. Cox and Dr. Shealy found that most of the participants were magnesium deficient. The study concluded that clinics should use magnesium as a therapy for those who were suffering from chronic depression (Cox, 1996).

Magnesium and Calcification

Magnesium is crucial for regulating the amount of calcium in the blood and in the cells of the body. Magnesium controls how much calcium should be available in the cells for the necessary electrical transmissions. Once calcium does its job, magnesium immediately intervenes and stops excess calcium from causing damage to the cells by way of calcification and hyper-excitability. Calcification in the cells causes many diseases such as heart disease, high blood pressure, asthma and headache. In this regard, magnesium is a natural calcium channel blocker. We cannot ignore the importance of calcium and magnesium in our bodies because these two minerals always induce a reaction from each other. The growth of human cells, cell division and intermediary metabolism need magnesium. These processes can be compromised if there are excessive amounts of calcium in the body.

Magnesium and Stress

Magnesium is an important mineral and is a constituent for hundreds of enzymes in the body. It is a crucial mineral for relieving stress. According to Dr. Leo Galland, a stressed person depletes magnesium from his/her body. (Dr. Leo Galland Integrated Medicine: <http://www.healthy.net>) Magnesium relaxes muscles, rejuvenates cells and tissues. Magnesium protects the arteries, vessels and veins from high blood pressure caused by daily stress. It helps our kidneys, hearts, brains, adrenal and nervous systems to function well. Magnesium clearly eliminates stress and calms down our central nervous system. When a person is in a stressful situation, the level of adrenalin (a stress hormone) is increased, and this causes the blood pressure to go up too. When we are mentally and physically under stress, magnesium is released from blood cells and directly enters the blood plasma before finally exiting through the urine (<http://www.healthy.net/>). As can be seen from the discussion above, the body is deprived of magnesium during severe stress. The more stressed you are, the more magnesium is lost, and when the magnesium level gets lower, the stress level gets higher. This will result in a downward spiraling of health. In addition, in a stressful situation, the level of adrenalin in the body increases, thus increasing the likelihood of losing magnesium from the cells. Our bodies need magnesium to burn sugar to increase energy. Magnesium re-energizes the body and helps the body to calm down immediately.

Magnesium and Depression

Magnesium deficiency disrupts the biochemical function in the human body especially the nervous system. Studies (George Eby Research Institute, 2006) indicate that magnesium – rather than pharmaceuticals – is the best treatment for patients suffering from major depression. Magnesium is involved in hundreds of biochemical reactions in the body (Bliss, 2004). It is safe and has no side effects. Magnesium boosts our energy and helps us to relax and function better. Magnesium is the second most common mineral for the control of human nervous and muscle contraction (Sircus, 2007). A study by Brar et al. (2009) found that stress hormones depleted magnesium and caused damage to the body. However, patients had been known to recover from major depression using magnesium for treatment. This mineral helped participants to recover from traumatic brain injuries, headaches, suicidal thoughts, anxiety and postpartum depression (Eby & Eby, 2006). Considering the varied functions of magnesium, it is not surprising, therefore, that its depletion can lead to a nervous breakdown, including major depression. Magnesium is considered by researchers as the most effective natural antidepressant. See what Eby & Eby, 2006) says: *"Magnesium deficiency is well known to produce neuropathologies. Only 16% of the magnesium found in whole wheat remains in refined flour, and magnesium has been removed from most drinking water supplies, setting a stage for human magnesium deficiency."*

Magnesium regulates the flow of calcium ions in neuronal calcium channels, thus helping to regulate neuronal nitric oxide production. In magnesium deficiency, neuronal requirements for magnesium may not be met, causing neuronal damage which could manifest as depression.

Magnesium treatment is hypothesized to be effective in treating major depression resulting from intraneuronal magnesium deficits. These magnesium ion neuronal deficits may be induced by stress hormones, excessive dietary calcium as well as dietary deficiencies of magnesium. Eby and Eby, (2006) reported that *“rapid recovery (less than 7 days) from major depression was achieved using 125-300 mg of magnesium (as glycinate and taurinate) with each meal and at bedtime. Dietary deficiencies of magnesium, coupled with excess calcium and stress, may cause many cases of other related symptoms including agitation, anxiety, irritability, confusion, asthenia, sleeplessness, headache, delirium, hallucinations and hyper-excitability, with each of these having been previously documented.*

The possibility that magnesium deficiency is the cause of most major depression and related mental health problems including IQ loss and addiction is enormously important to public health. As such, this is a subject recommended for immediate further study.”

Magnesium and Anxiety Treatment

Anxiety is triggered by the body's response to exhaustion, mental stress or emotion. The body reacts to the fight or flight response. According to Dr. Carolyn Dean (2007), magnesium is a possible solution to treating anxiety or depression. Shower your depleted body with magnesium chloride and you may immediately feel the relief. It is cheap, easy to use and does not promote suicidal tendencies. Studies indicate that many of the disorders or health problems such as allergies, chemical sensitivities, anxiety and psychiatric disorders, aorta strength, asthma, Attention Deficit Disorder, calcification of soft tissues including heart valve and diabetes are all related to magnesium deficiencies (Yang, 1998). "Depression and anxiety are much related and I think magnesium helps reduce the same phenomena in the brain. I would always recommend that people use a nutritional approach to depression before actually using antidepressants because mostly they don't work well," says Dr. Carolyn Dean.

Dr. Michael B. Schachter M.D., F.A.C.A.M. (1996) has this to say: "Magnesium deficiency can cause anxiety, insomnia, and other mental illness. Magnesium is an extremely important and valuable mineral, whose value for good health is just being recognized by conventional physicians. Virtually all biochemical reactions in the body are mediated through enzyme systems. An enzyme system generally consists of three parts. They are a specific protein molecule, another smaller organic compound, which is often a vitamin, such as pyridoxine or vitamin B6, and finally a charged mineral, such as zinc, copper, manganese or magnesium.

Magnesium is a critical co-factor in more than 300 enzymatic reactions in the human body. Each mineral when dissolved in fluids has a characteristic electrical charge, called its valance. Minerals with a charge of plus 1, or univalent cations, include sodium and potassium. Minerals with a charge of plus 2, or divalent cations, include copper, zinc, manganese and magnesium. Potassium and magnesium are the most abundant cations found within the cells of the body with magnesium being the most abundant divalent cation." According to Dr. Natasha Turner, N.D, (Naturopathic Doctor) "Magnesium eases anxiety, improves sleep and stabilizes mood. Individuals with anxiety have been found to have lower levels of magnesium. This may be linked to the fact that a magnesium deficiency causes the release of adrenalin. Also, other studies have found that magnesium supplements reduce the release and effect of stress hormones on the heart, which is an indirect measure of the mineral's effect on the brain."

In his latest column, "Magnesium: The Stress Reliever", Dr Leo Galland called magnesium the "anti-stress mineral," that aids in relaxing nerves, relieving tension, assisting digestion, activating the metabolism of enzymes, protein and carbohydrate metabolism. Magnesium also modulates the electrical potential across all cell membranes. Magnesium is important in the production and transfer of energy, in muscle contraction, relaxation and in nerve functions. It also keeps vertebrae in their proper position, induces restful sleep, purifies and purges body tissues (combats acids, toxins, gases, impurities, and neutralizes poisons), and lowers fever. Magnesium is nature's Tranquilizer. It has a calming and wonderful effect on the nervous system. Essentially, the cure for anxiety disorder is simple. Take magnesium, magnesium and magnesium. The wonderful news is that anxiety can be treated fully by consuming sufficient quantities of magnesium to relax all tensed muscles.

Magnesium and Asthma

As mentioned in the beginning of the chapter, asthma is a chronic lung disease characterized by inflamed, swollen and narrowed airways, making breathing difficult. Magnesium in fact promotes the opposite response by relaxing the muscles and making breathing easier. As such, sufficient intake of magnesium decreases asthma attacks and bronchial reactivity, while aiding proper lung functions.

Recent studies indicate that magnesium that is either inhaled or introduced intravenously has proven to be highly effective in controlling asthma (Alexandra, 2006). According to the above research there is a direct relationship between asthma and magnesium. Sufficient intake of magnesium helps children with asthma problems and reduces the severity of the disease compared to children with magnesium deficiency. The above study further showed that intravenous magnesium assisted patients in relaxing their muscles as well as acted as a large airway bronchodilator. Another study (Noppen et al., 2002) suggests that oral intake of enough magnesium is highly beneficial in treating asthma and other reactive airway diseases. On the other hand, low dietary consumption of magnesium is related to impaired lung function, bronchial hyperactivity and wheezing. Magnesium benefits asthmatic patients by easing their airways, inhibiting the contraction of the bronchial tube, and smoothening of their muscles (Hill et al., 1997).

A study by Gustafson (1996) found that magnesium caused bronchodilatation (the dilatation of the airways in the lungs due to the relaxation of surrounding muscles). The study concluded that the higher intake of magnesium was responsible for the reduced bronchial reaction in asthma. The above studies indicate the importance of magnesium in controlling an asthma attack. It is worth mentioning that eating a healthy diet is equally important. Following a strict diet can prevent allergies, which cause inflammation in the large air tube. Certain foods can cause an allergic reaction, triggering an asthma attack. Hence, maintaining an asthmatic diet diary can be useful. A diet that includes garlic, onion, fish and food rich in vitamin C makes the mucus thinner, thus making breathing easier. (<http://www.asthmadiet.info>)

The Link between Magnesium and Heart Disease

Magnesium plays an important role in lowering blood pressure. Magnesium relaxes blood vessels and is thus necessary for normal blood pressure. Magnesium is also needed for balancing the electrolytes, sodium, potassium, magnesium and calcium in the body. Without a balance of magnesium and potassium in our bodies, we cannot maintain normal blood pressure. Magnesium is also necessary for maintaining the normal structure of blood vessels and to ensure that they function normally. Researchers have found that obesity in the abdominal region is another cause of heart disease (Seelig and Rosanoff, 2003). According to recent investigations (Seelig, 2003), magnesium is vital for regulating blood sugar and regulating blood pressure. Magnesium deficiency slows down cells communication and thus results in cell excitability. Magnesium also helps muscles and nerves function properly and thus keep the heart rhythm steady. Magnesium also helps to boost the immune system (Laurie, 2010).

Although medical science may not recognize the importance of magnesium in regulating heart functions, some doctors have, in fact, been prescribing magnesium for heart problems since the 1930s. (Mark, Dean, 2007) The importance of magnesium was observed to manage heart attack. Intravenous magnesium reduced the risk of heart attack by more than half. As thus, magnesium should be given to the patients as soon as possible after the heart attack. Magnesium helps to reduce damage to heart muscles as well as reduces hypertension or arrhythmia. This is because magnesium helps to dilate blood vessels and stops spasm in the heart muscle, and in the vessel walls. Magnesium is responsible for controlling the action of calcium; otherwise, there will be an increase in spasm. Magnesium also helps to break up blood clots (Dean, 2003).

Dr. Winifred Nayler of the Baker Medical Research Institute describes the process in Heart Journal (March, 1967) as an electrochemical process that takes places within each cell of the heart. On the outer surface of each heart tissue cell, there is a thin filament known as actin. The actin reaches with a kind of magnetic attraction toward the center of the cell shortening its length. The result of many cells shortening at one time is contraction of the muscle. And it is calcium, fed to the actin by the bloodstream that provides both the stimulus and the means by which the actin does its work. A shortage of calcium must inevitably result in a weakened heartbeat, which can be speeded up by drug stimulants but cannot be strengthened, as long as the calcium is deficient. Even this simple explanation, we believe, points out the folly of treating a weak heartbeat with drugs, at least until the ability to absorb calcium and the quantity of calcium in the diet have been checked and corrected. To continue our analogy, however, when you understand that it takes a spark plug to ignite your gasoline, that isn't the end of the story. It also takes ignition points to direct electrical energy to the right spark- plug at the right time. And as Dr. Nayler tells us, while calcium is fundamentally necessary to the heartbeat, calcium will not do what it is supposed to do unless it is controlled in its turn by a sufficient quantity of magnesium in the system.

The reason for this, Dr. Nayler tells us, is that it is necessary for the actin alternately to absorb and release calcium. If it could not do both, the heart would either contract and stay contracted or else refuse to contract at all. For the heart to keep contracting and relaxing alternately requires that it be a very busy living chemical laboratory. And it is magnesium that seems to be the key element that actually regulates the heartbeat. How does it do it? By providing the tiny positive electrical charge that repels calcium, pushing it to the opposite side of the individual cell and reversing the contraction that has just taken place. Throughout the body, magnesium seems to be the mineral of basic importance in controlling the manner in which electrical charges are utilized to induce the passage of materials in and out of cells. Nor is the heart the only portion of the circulatory system that is affected and, in effect, controlled by whether we obtain enough magnesium in our diets. (The Magnesium Web Site: MAGNESIUM ONLINE LIBRARY)

Magnesium helps people with Metabolic Syndrome X, " a condition which is growing in the US at an alarming rate, and is characterized as a single person having multiple major risk factors for heart disease: High blood sugar/Insulin resistant, high blood pressure, obesity, high cholesterol. Dr. Lawrence M. Resnick, MD, (2004) a practicing physician, researcher and professor of medicine at Cornell University Medical College, spent many years researching the role that the magnesium-calcium balance plays in human health. Their studies concluded that as the magnesium levels within cells fall, the calcium levels rise. The resulting magnesium-calcium ratio imbalance affects cells in such a way as to bring on Metabolic Syndrome X." Dr. Lawrence M. Resnick, MD, (2004). *Innovative Researcher in Hypertension Who Hypothesized Metabolic Syndrome Findings that Potentially Affected the Treatment of More than 47 Million Americans with the Condition.*

http://www.chabad.org/news/article_cdo/aid/137308/jewish/Lawrence-M-Resnick-MD.htm

Magnesium and Diabetes

The main problem of diabetes 1 and 2 is the absence of insulin or cells not responding to insulin, even if insulin is present. So the body gets no fuel and cannot function. Magnesium is a precious mineral which regulates the release and activities of insulin. According to Dr. Natasha Turner, N.D, "Magnesium is important to carbohydrate metabolism. It may influence the release and activity of insulin, the hormone that helps control blood glucose levels. Elevated blood glucose levels increase the loss of magnesium in the urine, which in turn lowers blood levels of magnesium. This explains why low blood levels of magnesium are seen in poorly controlled type 1 and type 2 diabetes. These low levels of the mineral may also contribute to hypertension commonly found with many diabetics."

The link between magnesium and diabetes is well known among researchers. The major cause of insulin resistant cells is the deficiency of magnesium in the body. When the pancreas releases insulin, magnesium ensures that the insulin receptor sites are clear for insulin to enter the cells with glucose (Jerry L., 2000). Magnesium is vital for all our cells to function. Without magnesium, hundreds of our body's enzymes will not work properly. Magnesium plays an important role in blood glucose regulation. Research has shown the actual effects of magnesium in people suffering from type 2 diabetes. Subjects who consumed large quantities of magnesium, especially from magnesium-rich food, did not develop Type 2 diabetes. Researchers examined around 39,000 subjects, mostly women with no history of diabetes, heart disease or cancer. Participants who had a higher intake of magnesium had a lower likelihood of developing Type 2 diabetes.

About 23.6 million people suffer from diabetes 2 in the USA alone, and this was one of the leading causes of death in 2006 (2007 USA National Diabetes Fact Sheet). Two studies conducted by researchers in the Harvard School of Public Health and Harvard Medical School found that magnesium was associated with the reduction of diabetes 2 among participants in 2004. The findings were published in the January 2004 issue of *Diabetes Care*. In these studies, magnesium is shown to have played a positive role in reducing the risk of diabetes 2 among the participants. It appears that men and women of all ages benefit from the intake of magnesium to reduce their risks of being afflicted with diabetes 2. A similar study also published in the *Journal of the American College of Nutrition*, has indicated that higher magnesium intake could reduce the risk of developing type 2 diabetes, because women with higher magnesium intake have been shown to have greater sensitivity to insulin. (<http://magnesiumrichfoods.com/67/magnesium-and-diabetes/>)

A study confirmed that people who are suffering from diabetes actually benefit from increasing the amount of magnesium in their diet (Salynn, 2003). The study further suggested that consuming magnesium rich food helps people in diabetes risk category to lower their risk of diabetes 2.

In her remarkable book *The Magnesium Miracle*, Dr Carolyn Dean MD, writes: "If magnesium is in short supply, sugar stays in the blood stream, and as it becomes elevated, symptoms of diabetes appear." In 1997, Dr. Resnick published an article in the *American Journal of Hypertension* in which he stated "A link between magnesium, diabetes mellitus, and hypertension seems established beyond reasonable doubt. The lower the level of magnesium, the stiffer are the blood vessels, and the higher the blood pressure, the greater the insulin resistance." "A consensus panel convened by the American Diabetes Association has recommended that all persons with diabetes who are at high risk for high blood pressure be tested and, if a problem is found, treated with a magnesium chloride supplement." (www.magnesiumdirect.com/diabetes.aspx).

Conclusion

Magnesium deficiency is one of the major factor in many sever illness such as chronic joint pains, heart attack, heart disease, asthma, anxiety, depression, fatigue, diabetes, migraine and panic attack. As thus, magnesium deficiency is a serious condition in which there is an insufficient amount of magnesium in the body to help the proper function of various organs in the body. People with magnesium deficiency are always tired, irritable, nervous, stiffness in the muscles and difficult to concentrate. Evidence suggests that magnesium has an important function in many biochemical and physiological process, which directly affects human Lung function, asthma management, joints pain, smoothening of muscle function, neuromuscular excitability, immune function, inflammation, and oxidative stress. Evidence further signifies that magnesium balances calcium and easily regulates blood pressure. Magnesium also metabolizes energy and helps in muscle contraction as well as bone mineralization. Study indicates that magnesium is responsible for the activation of more than 300 enzymes in the body. Most of these enzymes are involve in energy metabolism.

References

- Alexandra, G.K. (2006). The Relationship of Asthma, Magnesium Status and Inflammatory Responses is influenced by Gender and Body Mass Index. Dissertation, University of South Florida. Tampa.
- Altura, B.M., B.T. (1995). "Magnesium in Cardiovascular Biology." *Scientific American*, Science & Medicine, May/June 28-37.
- Bliss, R.M. (2004). Lack Energy? Maybe It's Your Magnesium Level. *Agricultural Research*. Vol. 52, Iss. 5; pg. 8.
- Brar, S. H., Manu, M. Peter, (2009). Magnesium as a Biodegradable and Bioabsorbable Material for Medical Implants. *JOM*, Vol. 61, Iss, 9, p. 31
- Cox RH, Shealy CN, Cady RK, Veehoff D, Burnett Awell M. Houston R, (1996). "Significant magnesium deficiency in depression." *J Neurol Orthop Med Surg*, vol 17, pp. 7-9,
- Dean C. (2007). *The Magnesium Mericle*. Ballantine Books, New York.
- Eby GA, Eby KL. (2006). Rapid recovery from major depression using magnesium treatment. *Med Hypotheses*. 67(2):362-70.
- Eby GA, Eby KL. (2010). Magnesium for treatment-resistant depression: a review and hypothesis. *Med Hypothesis*. 74(4):649-60.
- Freeman, M. (1999). J is For Joints. *Beauty counter*, p.6
- Gustafson, T. Boman, K. Sand Strom, T (1996) Skeletal Muscle Magnesium and Potassium in Asthmatic treated with oral beta2-agonists. *European Respiratory Journal*, P. 237-240
- Hill, J. Micklewright, S. Britton (1997). Investigation of the Effect of short-term change in dietary magnesium intake in Asthma. *European Respiratory Journal*. P. 2225-2229
- Itoh, K., Kawasaki, T., Nakamura, M. (1997). "The effects of high oral magnesium supplementation on blood pressure, serum lipids and related variables in apparently healthy Japanese subjects." *British Journal of Nutrition*, 78(5):737-50.
- Jerry L. Nadler, MD. (2000). Diabetes and Magnesium: The Emerging Role of Oral Magnesium Supplementation. *The Magnesium Report*, Clinical, Research, and Laboratory News for Cardiologists, Third Quarter.
- Kazak, G.A. (2006). the Relationship Asthma, Magnesium and Inflammatory Responses is Influenced by Gender and Body mass Index. Doctorate Thesis. University of California.
- Laurie Budgar. (2010). Natural Foods Merchandiser. *Boulder*:Vol. 31, Iss. 2; pg. 26.
- Lokaczer, M. (2008). Oh My Aching Back. *Natural food Merchandiser*, Vol, 29, issu, 9, p.40.

- Manuel, Harpreet S Brar, Manu O Platt, Malisa S. Peter I. Martin, Michele V. (2009). Magnesium as a Biodegradable and Bioabsorbable Material for Medical Implants. *JOM*. Vol. 61, Iss. 9; pg. 31,
- Miller, A. (2005). Corridor Consultations: nutrition. *Patient Care*. Vol. 16, Iss. 6; pg. 28,
- Montoyama, T., Sano, H., Fukuzaki, H.(1989). "Oral magnesium Supplements in patients with essential hypertension." *Hypertension*, 13(3):227-32
- Noppen M, Vanwaele L, Impens N (2002). Magnesium. *Alternative Medicine review Monographs*. P.251-260
- Raloff, J. (1997). The cost of too little magnesium. *Science News*. Vol. 151, Iss. 18; pg. 279,
- Rodale, Harald j. Taub, (1971). Magnesium: The nutrient that could change your life, PYRAMID BOOKS NEW YORK, New York State Department of Health;
- Rude, R.K. (1998). Magnesium Deficiency: A Cause of Heterogeneous disease in Humans. *J Bone Miner Res*.13, pp. 749.
- Salynn, S. (2003). Magnesium-Rich Foods Appear to Be Protective Regardless of Weight, Activity Level. *WebMD Health News*. www.webmd.com/diet/news/20031223/magnesium-lowers-type-2-diabetes-risk
- Schrader, J. (1999). A Double-Blind Randomized Placebo Controlled Trial of Magnesium Oxide for Alleviation of Chronic Low Back Pain. *Doctorate Thesis*. USA
- Sircus, M. (2007). *Transdermal Magnesium Therapy*. Paelos Books, New York.
- Vormann, J. (2003). Magnesium: Nutrition and Metabolism. *Molecular aspect of Medicine*. Vol. 23, pp.27.
- Yang C.Y. (1998). Calcium, magnesium, and nitrate in drinking water and gastric cancer mortality. *Jpn J Cancer Res*, 89 (2):124-30
- Yun, Hee Sun Hwang, Hyun Ah Kim, Sung Hak Lee, Jong Won, (2009). Anti-obesity and Antidiabetic Effects of Deep Sea Water on ob/ob Mice, *Marine Biotechnology*. Heidelberg: Vol. 11, Iss. 4; pg. 531