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The Association of Serum Mg Levels with Stroke and Its Comparison with Control Group

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Original Research Article

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Abstract: Stroke is a major health issue & cause of death also, leaving patients with serious disabilities & mental stress. The incidence of stroke is highest among diabetics and people with hypertension. Research is going on to find out the other risk factors which may be associated with stroke risk. Risk of stroke is associated with many minerals, as showed by the recent studies. Normal levels of the mineral could decrease the risk; Magnesium has beneficial effects on blood pressure and on diabetics [2]. It was reported by researchers at Stocklom's Karolinska Institute that for every 100 milligram increase in magnesium intake, the risk of developing type 2 diabetes is decreased & have beneficial effect on hypertension also. Find out the association of Serum Mg levels with Stroke and its comparison with control group. Find out the association of Serum Mg levels with Stroke and its comparison with control group. The present study was conducted in 150 control and 150 cases that were admitted & came for follow up under Internal Medicine & Super Specialty department (Neurology) OPD during interval of 1 year from March 2016 to August 2017. Out of 150 cases, 90 were Ischemic, 45 were hemorrhagic and 15 were TIA. 0ut of 150 cases, 85 were male and 65 were female [m>f]. Number cases were in the age group of 40-80 years. In our study, the serum magnesium level is lower in stroke patients who had stroke as compare to control group who did not have as compare to normal in case group. Hypomagnesaemia patients are prone to develop diabetes. Deficiency of magnesium is associated with in atherogenic alteration in blood lipid & hence more prone to Thrombotic/Haemorrhagic & TIA. The significant conclusion of this study is that low serum magnesium level is associated with acute neurological complication like ischemic or hemorrhagic stroke & if supplemented can prevent stoke of all types by 15%. Normal value 1.70 to 2.2 mg/dl or 0.85 to 1.10 mmol/L. Serum Mg level in stroke patients is ischemic stroke were (mean) 1.45 ± 0.41 hemorrhagic stroke group was 1.24 ± 0.32 & highest being in TIA followed Ischemic group & minimum in hemorrhagic group. Pair wise comparison to ischemic to hemorrhagic / TIA to hemorrhagic, TIA to Ischemic as shown in table but was non-significant in Ischemic to hemorrhagic but highly significant in TIA to hemorrhagic, & TIA Ischemic

Keywords: Serum, Magnesium & Stroke.

INTRODUCTION

Stroke is a devastating disorder and a very important cause of mortality and morbidity worldwide. Stroke is a major health issue because it is a major cause of death and also it leaves patients with serious disabilities. The incidence of stroke is highest among diabetics and people with hypertension. Research is going on to find out the other risk factors which may be associated with increase stroke risk [1].

Risk of stroke is associated with many minerals, as showed by the recent studies. Normal levels of the mineral could decrease the risk of stroke due to magnesium's beneficial effects on blood pressure and on diabetics. These finding is recently published in the American Journal of Epidemiology [2].

Serum Magnesium is the second most abundant intracellular after potassium and also a natural Calcium antagonist [6]. It was reported by researchers at Stocklom's Karolinska Institute that for every 100 milligram increase in magnesium intake, the risk of developing type 2 diabetes decreased & have beneficial effect on Hypertension [3].

Susanna Larsson and Alicia Wolk concluded in the Journal of Internal Medicine that while it is very early to recommend magnesium supplements can

prevent by increased consumption of magnesium rich food seems sensible [4] & beneficial.

Diet is also a very important factor on a person's risk of having a stroke and a connection has been already made between intake of sodium and hypertension. Conversely, more magnesium, potassium and calcium have been inversely linked to hypertension in some observational studies [5].

Some studies also support that magnesium reduces the risk of stroke possibly via an Anti-hypertensive mechanism [2]. So magnesium can prevent the person even from having stroke where hypertension is main treatable risk factor & hence it should be included in daily diet. Green leafy vegetables, meats, starches, grains and nut, and milk are the dietary sources of magnesium.

RDA of magnesium for women is 320 mg/day and for men is 420 mg/day [2]. Low magnesium intake is associated with increased mortality from IHD, stroke, & T2 DM. Magnesium deficiency triggers vasoconstriction, increases vascular endothelial injury and leads]to atherosclerosis, which is a modifiable risk factor for stroke[6].

On the other hand diets supplemented with magnesium have been shown to prevent the development of atherosclerosis by inhibiting lipid accumulation in the vessel wall [3]. Hence this study is taken up to know the association of serum magnesium levels in control group & patients with cerebrovascular accidents.

OBJECTIVES

To study the association of serum magnesium levels in Non-diabetic patients with cerebrovascular accident which are under treatment at IMCHRC and its comparison with patients without stroke and diabetes.

Objectives

Find out the association of Serum Mg levels with Stroke and its comparison with control group.

MATERIALS & METHODS

Control Group: Patient attending medical dept. In medical wards ho did not have diabetes & stroke were taken as control. Sample size 150 total patients of stroke & 150 as control to match age & sex.

Investigations details

- Serum magnesium
- Serum electrolytes
- Complete blood count
- CT Brain
- Renal Function test
- Thyroid profile
- Lipid Profile
- Fasting blood Sugar
- 2 hour postprandial blood sugar
- HbA1C

After detail Clinical History presenting complaint total duration of hypertension was recorded weakness or suggestive of stroke family history of hypertension CVA was also noted diagnosis was confirmed by initial CT brain or delayed CT brain were first CT scan was normal. 2ml venous sample was collected & Serum Mg was estimates by CALMAGITE method, & result was noted.

Exclusion

- Critically ill patient with multiple
- Age below 18
- Pregnant women critical ill patient
- Patient suffering from malignancies
- Patient on immunosuppressant's
- Patient on Antacids containing Mg
- Patient of Diuretics Renal Failure, Thyroid disorder epilepsy, Alcohol abuse
- Stroke due to trauma
- Control exclusion criteria with no history of stroke diabetes were included

Inclusion

- Both Genders
- Age 40-80 years
- Non-Diabetics
- CVA occurring within 72 hours.

Patient attending IMCHRC, Indore for weakness on either side who after intense investigation –routine & specific such as radiological imaging with CT who were found to be having haemorrhagic, Ischemic, & TI. Both genders in age group of 40 -80 were included.

Their blood samples collected venous blood was sent for quantitative measurement of Mg results with permission of ethical committee.

OBSERVATION AND RESULTS

In both the groups, the majority of the patients were in the age group: 61-70 years, followed by 51-60 years and then 71-80 years. There were 90 (60%) patients with ischemic stroke, 45 (30.0%) had hemorrhagic stroke and 15 (10%) patients had TIA. Majority of the patients in the case group had ischemic stroke.

Table-1: Comparison of serum magnesium level according to stroke

S. No.	One-way ANOVA test Mean SD E value P value	Mean ± SD	F Value	P Value	Pair	't' Value	P Value
1.	Ischemia	1.45 ±0.41	10.91	0.000*	Ischemic to Hemorrhagic	1.8	0.179, NS
2.	Hemorrhagic	1.24 ± 0.32			TIA to Hemorrhagic	4.67	0.000*
3.	TIA	2.15 ± 0.32			TIA to Ischemic	3.81	0.001*

* Significant

One-way ANOVA test applied. P value = 0.000, Highly significant

The above table shows the comparison of mean serum magnesium level in relation to type of stroke in the case group. The mean serum magnesium in the ischemic stroke group was 1.45 + 0.41, in the hemorrhagic stroke group it was 1.24 + 0.32 and in the TIA it was 2.15 + 0.32.

It was highest in the TIA group, followed by ischemic group and then by hemorrhagic group. The comparison of mean serum magnesium was found to be statistically significant (P<0.05), showing that the serum magnesium level is varying in relation to the type of stroke.

To find out the pair wise comparison, Post hoc Tukey test was applied

The pair wise comparison shows that the mean serum magnesium level in the pair ischemic to hemorrhagic was not significant (P>0.05), showing that the mean serum magnesium level was comparable, while it was found to be statistically significant in the pairs TIA to Hemorrhagic and TIA to Ischemic (P<0.05), showing a higher serum magnesium level in TIA in comparison to both the hemorrhagic and ischemic stroke.

DISCUSSION

Cerebrovascular accident is most common cause of mortality and morbidity. Cerebrovascular accident is major cause of mortality and morbidity in India after age of 60years.

Low serum magnesium level is associated with increased prevalence of acute neurological complication like stroke. In our study, we collected 50 control and 50 cases of cerebrovascular accident from the period of March 2016 to August 2017 which included 30 (60%) cases of Ischemic stroke, 15(30%) cases of Hemorrhagic stroke and 5(10%) cases of TIA. Our study included measurement of serum magnesium level and its association with cerebrovascular accidents and also with diabetes.

The present study evaluated the role of serum magnesium level in Stroke and TIA. Amighi *et al.* [5], studied low serum magnesium level and predicts neurological events in patient of advanced atherosclerosis and has shown increased predilection to stroke.

According to study done by Eminekoksaldi *et al*. trace elements like magnesium in serum and CSF composition showed significant low value in patient with stroke. In our study, the mean serum magnesium in the Ischemic stroke group was 1.45 ± 0.41, and in the hemorrhagic stroke group was 1.24 ± 0.32 and in the control group it was 2.40 ± 0.37. In our study also, serum magnesium level is found low in stroke patient (both hemorrhagic and Ischemic stroke) compared to control group. And the difference was statistically significant. Difference of magnesium level between the TIA and control group were not significant statistically.

Odom *et al.* studied role of magnesium sulfate level in case of cerebral vasospasm in patient presented to emergency with acute stroke whose serum magnesium level is low. In our study also, serum magnesium level is found low in stroke patient (both Hemorrhagic and Ischemic stroke) compared to control group.

One more study done in India by Kaur *et al*. [6] Showed serum magnesium levels significantly decreased in ischemic stroke, though hemorrhagic stroke patient as well as TIA also had magnesium deficiency. In our study also, serum magnesium level is found low in stroke patient (both hemorrhagic and ischemic stroke) compared to control group. IA patient also had low serum magnesium level compared to control group in our study but it was not statistically significant.

Cojocaru *et al.* [4], conducted a study on changes of serum magnesium in patients with acute

Ischemic stroke. Their results confirmed that there is a relationship between a low Mg concentration in serum at 48 hours after onset of ischemic stroke and the intensity of the neurological deficit. A decrease in the serum Mg concentration indicates the severity of the injury. A magnesium substitution therapy may be useful. In our study also the mean serum magnesium level in the Ischemic stroke group was 1.45 ± 0.41 and in the hemorrhagic stroke group was 1.24 ± 0.32. In our study also, serum magnesium level is found lower in stroke patient (both hemorrhagic and ischemic stroke) compare to TIA patients and compare to control group.

RESULTS

Serum Mg level in stroke patients is ischemic stroke were (mean) 1.45 ± 0.41 hemorrhagic stroke group was 1.24 ± 0.32 & highest being in TIA followed Ischemic group & minimum in hemorrhagic group.

Pair wise comparison to ischemic to hemorrhagic/TIA to hemorrhagic, TIA to Ischemic as shown in table but was non-significant in Ischemic to hemorrhagic but highly significant in TIA to hemorrhagic, & TIA Ischemic.

CONCLUSION

The present study was conducted in 150 control and 150 cases that were admitted & came for follow up under Internal Medicine & Super Specialty department (Neurology) OPD during interval of 1 year from March 2016 to August 2017. Out of 150 cases, 90 were Ischemic, 45 were hemorrhagic and 15 were TIA. 0ut of 150 cases, 85 were male and 65 were female [m>f]. Number cases were in the age group of 40-80 years.

In our study, the serum magnesium level found to be lower as compare to normal group are more deficient of Mg is associated with atherogenic alternation blood vessels & deranged lipid profile & hence more prone for TIA, Thrombotic & Hemorrhagic strokes in this study we conclude low serum Mg are associated with acute neurological complications like TIA, Ischemic & Hemorrhagic stroke & supplementation of Mg can prevent Ischemic Hemorrhagic stroke by 15% can also prevent morbidity & mortality to some extent & low Mg levels can be corrected by dietary or supplementation & Mg diet supplementation & further strokes can be prevented if Mg levels are within normal range.

The significant conclusion of this study is that low serum magnesium level is associated with acute neurological complication like ischemic or hemorrhagic stroke & if supplemented can prevent stoke of all types by 15%. In our study, there was significant low serum magnesium level noted in the patient who presented with stroke. Our study showed low magnesium value in stroke patients when compared to control.

Hence cerebrovascular accident is more seen in patient with low serum magnesium level. So, we can conclude that hypomagnesemic patients are prone to stroke and correction of magnesium is advisable especially in patients who have one or more risk factors to develop stroke.

In our study, the serum magnesium level is lower in stroke patients as compare to control group. Hypomagnesaemic patients are prone to develop stroke. Deficiency of magnesium results in atherogenic alteration in blood vessels & dislipidemia which makes them more prone for stroke. Normal value 1.70 to 2.2 mg/dl or 0.85 to 1.10 mmol/L.

Mg is supplemented & kept within normal range can prevent stroke of all types by 15% & hence may also prevent morbidity & mortality also. The significant conclusion of this study is that low serum magnesium level is associated with acute neurological complication like ischemic or hemorrhagic stroke. Even in patients if Mg is supplemented can prevent further stoke also this can be done by adding MG rich diet or as supplementation element.

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