

Study of relation of serum magnesium with complications in type 2 diabetes mellitus

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Abstract

Background: It is well established that both micro and macro vascular complications of type 2 diabetes mellitus add significantly to the morbidity and mortality of the disease. Their prevention and early detection is of the utmost importance to reduce the burden on patients health as well as on the health system. Apart from conventional methods, newer techniques like measurement of serum magnesium can help in their detection and its prevention. **Aim:** To study the relation of serum magnesium with complications of type 2 diabetes mellitus. **Materials & Methods:** It was an observational prospective study including 80 patients of diagnosed cases of type 2 diabetes mellitus. We divided the study subject according to presence of a complication and compared serum magnesium levels in respective complications. **Results:** Out of 80 study subjects, 16 (20%) subjects had retinopathy. Out of them 15 (93%) subjects had hypomagnesaemia. 5 (6%) subjects had nephropathy, out of which 4 (80%) had hypomagnesaemia. 4 (5%) patients had diabetic ketoacidosis or hyperosmolar hyperglycaemic non ketotic coma, out of which 3 (60%) had hypomagnesaemia. 55 (68%) patients did not have any complications, out of which only 12 (21%) had hypomagnesaemia. **Conclusion:** Hypomagnesaemia correlated with the presence of complications in type 2 diabetes mellitus.

Key Words: Type 2 diabetes mellitus, hypomagnesaemia, retinopathy, nephropathy, diabetic ketoacidosis, hyperosmolar hyperglycaemic non ketotic coma.

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INTRODUCTION

“Diabetes mellitus (DM) refers to a group of common metabolic disorders that share the phenotype of hyperglycaemia¹.” 90 to 95% of all diagnosed cases of diabetes are of type 2 DM². The prevalence of diabetes is hastily increasing all over the globe at an distressing rate³. The global prevalence of DM in adults over 18 years has climbed from 4.7% in 1980 to 8.5% in 2014⁴.

Not so long ago, India had more diabetics than any other country in the world, according to the International Diabetes Foundation⁵. Different studies on migrant Indians across the globe have shown that Asian Indians have an elevated risk for developing type 2 DM and metabolic abnormalities related to it compared to other ethnicities.^{6,7} Significant morbidity and mortality among diabetic population is caused by not only microvascular but also macrovascular complications.⁸ The prevalence of coronary artery disease was 21.4% among diabetic subjects compared to 9.1% in population with normal glucose tolerance.⁹ The prevalence of peripheral vascular disease (PVD) was 6.3% among diabetic patients compared to 2.7% in non-diabetic subjects¹⁰, and these figures are lower than the prevalence reported in western populations.¹¹ Diabetes is a major cause of catastrophic complications like blindness, renal failure, heart attacks and limb amputations. Development of complications of type 2 DM is a multifactorial process. It is influenced by duration of DM, control of blood sugar levels, associated

co morbidities, lifestyle. Many other known and unknown factors contribute to development of complications. Magnesium seems to play an important role in the pathophysiology of type 2 DM. As duration of type 2 DM goes on increasing, the increase in pathology of DM leads to further hypomagnesaemia⁽¹²⁾. The increased duration of DM is also associated with the increase in both micro and macro vascular complications of DM. The correlation of serum magnesium levels and complications of diabetes mellitus are not yet studied as extensively as compared to magnesium's role in pathology of type 2 diabetes mellitus. So its role in the complications of type 2 DM needs to be given further attendance.

MATERIALS AND METHODS

Sample size – 80

Duration of study – January 2018 to June 2019.

All cases taken for the study were evaluated as follows:

- Type 2 diabetic patients attending OPD and IPD under department of general medicine of Bharati Vidyapeeth Sangli during study period were included in this study.
- They were screened for complications of type 2 diabetes mellitus.
- Serum magnesium was measured in each of these patients.
- Serum magnesium <1.7 mg/dl were considered as having hypomagnesaemia.
- Serum magnesium levels were compared in patients having different complications of type 2 diabetes mellitus.

Inclusion Criteria:

Diagnosed Type 2 diabetes mellitus patients aged 18 and above and of both sexes. Patients willing to give informed written consent.

Exclusion Criteria:

Type 1 diabetes mellitus patients. Alcoholic type 2 diabetes mellitus patients. Chronic diarrhea and malabsorption in patients with type 2 diabetes mellitus. Diuretics and magnesium based antacids use in patients with type 2 diabetes mellitus. Type 2 diabetes mellitus patients with chronic renal failure and on dialysis and pyelonephritis.

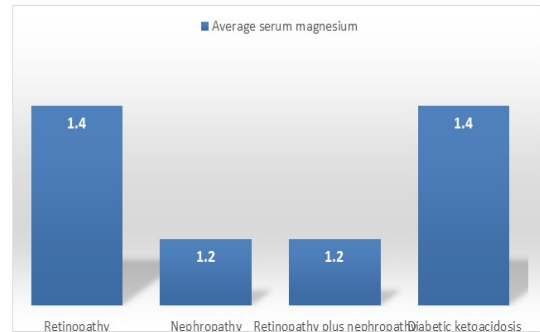
Ethical Aspect

The approval and clearance on ethical and operational aspects from the Institutional Ethical Committee was procured prior to conduction of this study with Registration as BV (DU) MCandH/Sangli/ IEC/363/19.

OBSERVATION AND RESULTS

Table 1: Average serum magnesium in different complications of type 2 DM

Complications	Average serum magnesium
Retinopathy	1.4
Nephropathy	1.2
Retinopathy plus nephropathy	1.2
Diabetic ketoacidosis	1.4



Graph 1. Distribution of average serum magnesium levels in different complications of type 2 DM

Table 2: Association of complications of type 2 DM with serum magnesium levels

Complications	Sr. Mg < 1.7	Sr. Mg > 1.7	Total
Retinopathy	15	01	16
Nephropathy	04	01	05
DKA	03	01	04
No Complications	12	43	55
Total	34	46	80
Chi Sq. Value = 31.43		P Value = 0.00000069	
Significant (Association Present)			

In the present study, serum magnesium levels were calculated in different complications of type 2 DM. A strong association was present between complications of diabetes and lower magnesium levels. (p value= 0.00000069)

DISCUSSION

The present hospital based observational prospective study was conducted for a period of 18 months from January 2018 to June 2019. A total of 80 patients of type 2 DM who came to outpatient and inpatient department of general medicine during study period time were included in this study. These patients were investigated for serum magnesium at the time of first contact. Patients were evaluated for presence of complications of type 2 diabetes mellitus.

Commonly seen complications of type 2 diabetes mellitus are diabetic retinopathy, diabetic nephropathy and lower limb amputations. Diabetic ketoacidosis and hyperosmolar coma are also seen in some cases of type 2 diabetes mellitus. The development complications is dependent on the various factors like duration of type 2

diabetes mellitus, glycaemic control, microvascular and macrovascular involvement, associated factors like obesity, hypertension, addictions if any.

In this the study, commonly seen complication of type 2 diabetes mellitus were retinopathy and nephropathy. A few cases showed diabetic ketoacidosis as a complication. The percentage of only retinopathy in this study was 15%. 6.25% was the percentage of retinopathy in present study. the percentage of both retinopathy and nephropathy was 7.5%. The percentage of diabetic ketoacidosis was 5%. The statistical comparison between hypomagnesaemia and complications of type 2 diabetes mellitus displayed a strong association with a 'p value' of 0.00000069. Whether the complications are a cause or effect of hypomagnesaemia is not well understood and needs further studies regarding the same. The previous studies which are in agreement with our findings are Bherwani S *et al.*¹², Sharma A *et al.*¹³, Kundu D *et al.*¹⁴, Kumar P, Bhargava S *et al.*¹⁵, Ceriello *et al.*¹⁶

CONCLUSION

Hypomagnesaemia correlated with the presence of complications in type 2 diabetes mellitus.

LIMITATIONS

These findings necessitate further validation due to the limitations of present study viz. relatively smaller sample size, single centre study and no long term follow up was taken. Therefore further multicentric studies involving bigger sample size and long term follow up may provide more information on the role of magnesium in complications of type 2 diabetes mellitus and its management.

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