Journal of Cardiovascular Disease Research
ISSN: 0975-3583,0976-2833 VOL 16, ISSUE 12, 2025

PREVALENCE OF HYPOMAGNESEMIA AND ASSOCIATION OF HYPOMAGNESEMIA WITH GLYAEMIC CONTROL IN PATIENTS WITH TYPE-2 DIABETES MELLITUS

Dr. Priyanka Sharma[1], Dr. A. K.Singhal[2], Dr. (Maj Gen) T.K. Saha[3], Dr. Rati Mathur[4]

First Author- Dr. Priyanka Sharma, PhD Scholar, Department of Biochemistry, Amrita School of Medicine, Faridabad
Second Author- Dr. A. K.Singhal, Associate Professor, Department of Biochemistry, Amrita School of Medicine, Faridabad
Third Author- Dr. (Maj Gen) T.K. Saha, Professor and Head, Department of Biochemistry, Amrita School of Medicine, Faridabad
Fourth Author- Dr. Rati Mathur, Senior Professor, Department of Biochemistry, SMS Medical College, Jaipur

Corresponding Author- Dr. Priyanka Sharma, email- drprisha1991@gmail.com

Abstract

Introduction- Diabetes is a major public health epidemic having high morbidity due to complications. There have been studies regarding the association of serum magnesium with glycaemic control in diabetes but they are few and inconclusive.

Aim- To find the prevalence of Magnesium in patients of type 2 diabetes mellitus and assess association of glycaemic control in diabetes with hypomagnesemia.

Methodology-Cross sectional observational study was carried on 150 Type 2 DM attending the OPD, casualty or admitted in various wards of SMS Medical College and Research Centre, Jaipur.

Results- Out of 150 Diabetes cases 39 cases (26%) have hypomagnesemia. The hypomagnesemia group and normo-magnesemia group was comparable on parameter of age and sex distribution. In present study we found that mean HBA1C was significantly higher in hypomagnesemia group as compared to normo- magnesemia group.

Conclusion- The prevalence of hypomagnesaemia in Indian Diabetic patients is high. Hypomagnesaemia was positively associated with poor glycaemic control.

Keywords- Diabetes, glycaemic control, hypomagnesemia.

Introduction-Type 2 diabetes makes 90% of diabetes cases. Its worldwide prevalence may be 439 million by 2030. According to the International Diabetes Federation and WHO, its prevalence is 10% and over 19% of world's diabetics are Indians.[1,2]

Magnesium (Mg) is the fourth most abundant cation in the human body and plays a key role in many fundamental biological processes including metabolism and DNA synthesis. Mg deficiency has been shown to cause endothelial cell dysfunction, inflammation, and oxidative stress, which are major contributors to atherosclerosis. [3]

Mg has received considerable attention for its potential role in improving insulin sensitivity and preventing diabetes and its complications. However, results are inconsistent among the studies. There is substantial evidence of associations between hypomagnesemia and various complications of Type 2 DM such as neuropathy, retinopathy, foot ulcers, and albuminuria. Observations in Caucasian diabetics have linked hypomagnesemia as being an additional risk factor for the development of diabetic complications, but this correlation was not observed in black African diabetics. Hypomagnesemia has been reported in 25%–38% of type 2 diabetic and to be associated with increased morbidity and mortality. However, most reports are inconclusive. Hence, hypomagnesemia in diabetes is frequently overlooked. [4, 5,6]

This study was performed to find association of serum Mg with diabetic control on Indian population.

Aim - To find the prevalence of Magnesium in patients of type 2 diabetes mellitus and assess association of glycaemic control in diabetes with hypomagnesemia.

Materials and Methods-Cross sectional Observational study was carried on 150 Type 2 DM attending the OPD, casualty or admitted in various wards of SMS Medical College and Research Centre, Jaipur.

Statistical Analysis:

Statistical analysis was performed using SPSS 18.0 (SPSS Inc., Chicago, IL, USA). Descriptive statistics for numeric variables as mean ± standard deviation and median (minimum-maximum) and categorical structure of data was expressed as numbers and percentages.

Inclusion Criteria:

- Patients diagnosed with Diabetes Mellitus type 2 .
- Age 18 years to 75 years

Exclusion Criteria:

1. Chronic Diarrhea
2. Malabsorption
3. Patients on Diuretics
4. Patients with Renal Faliure
5. Patients receiving magnesium supplements or magnesium containing antacid
6. Pregnant females

Results-

Table 1: Age categorisation of cases as per Magnesium status

Parameter		Magnesium Status						P Value
		Low		Normal		Total		
		No.	%	No.	%	No.	%	
Age Category	<50 Years	6	22.2	21	77.8	27	18.0%	.711
	50-59 Years	10	23.3	33	76.7	43	28.7%	
	>=60 Years	23	28.7	57	71.3	80	53.3%	
	Total	39	26.0	111	74.0	150	100.0 %	

Above table shows that the hypomagnesemia group and normo-magnesemia group was comparable on parameter of age distribution.

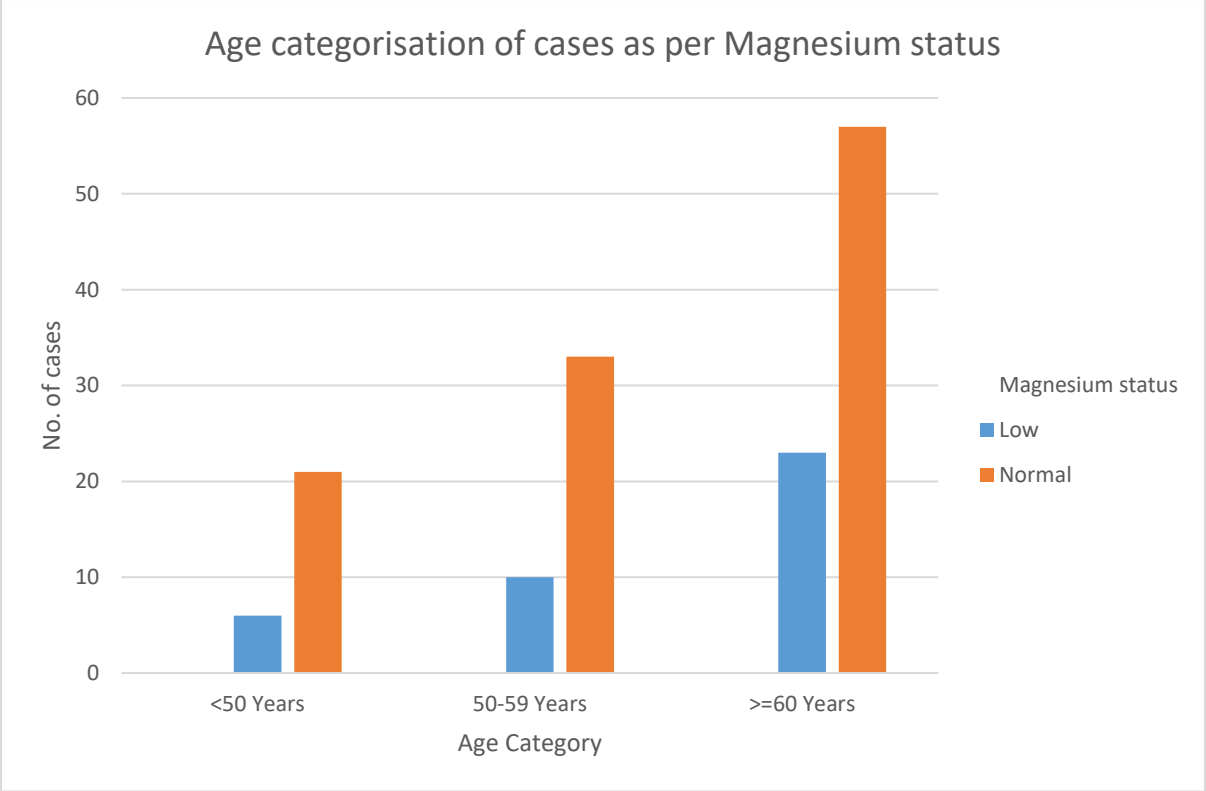


Table 2: Gender profile of cases as per Magnesium status

Parameter		Magnesium Status						P Value
		Low		Normal		Total		
		No.	%	No.	%	No.	%	
Gender	Female	3	13.0	20	87.0	23	15.3%	.124
	Male	36	28.3	91	71.7	127	84.7%	
	Total	39	26.0	111	74.0	150	100.0 %	

Above table shows that out of 39 cases in hypomagnesemia group 36 cases belonged to male sex and 3 cases belonged to female sex whereas out of 111 cases in normal magnesium level group 91 cases belonged to male sex and 20 cases belonged to female sex and the two groups were comparable on parameter of sex distribution.

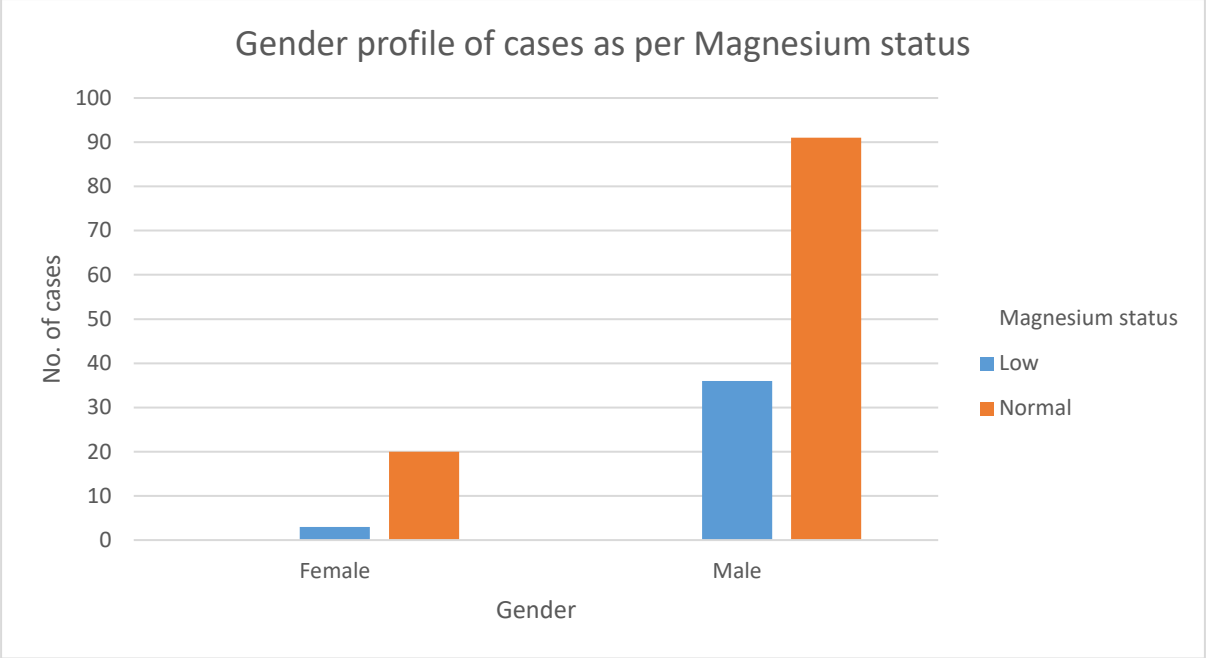


Table 3: Hypertension profile of cases as per Magnesium status

Parameter		Magnesium Status						P Value
		Low		Normal		Total		
		No.	%	No.	%	No.	%	
Hypertension	No	9	9.2	89	90.8	98	65.3%	<.001
	Yes	30	57.7	22	42.3	52	34.7%	
	Total	39	26.0	111	74.0	150	100.0 %	

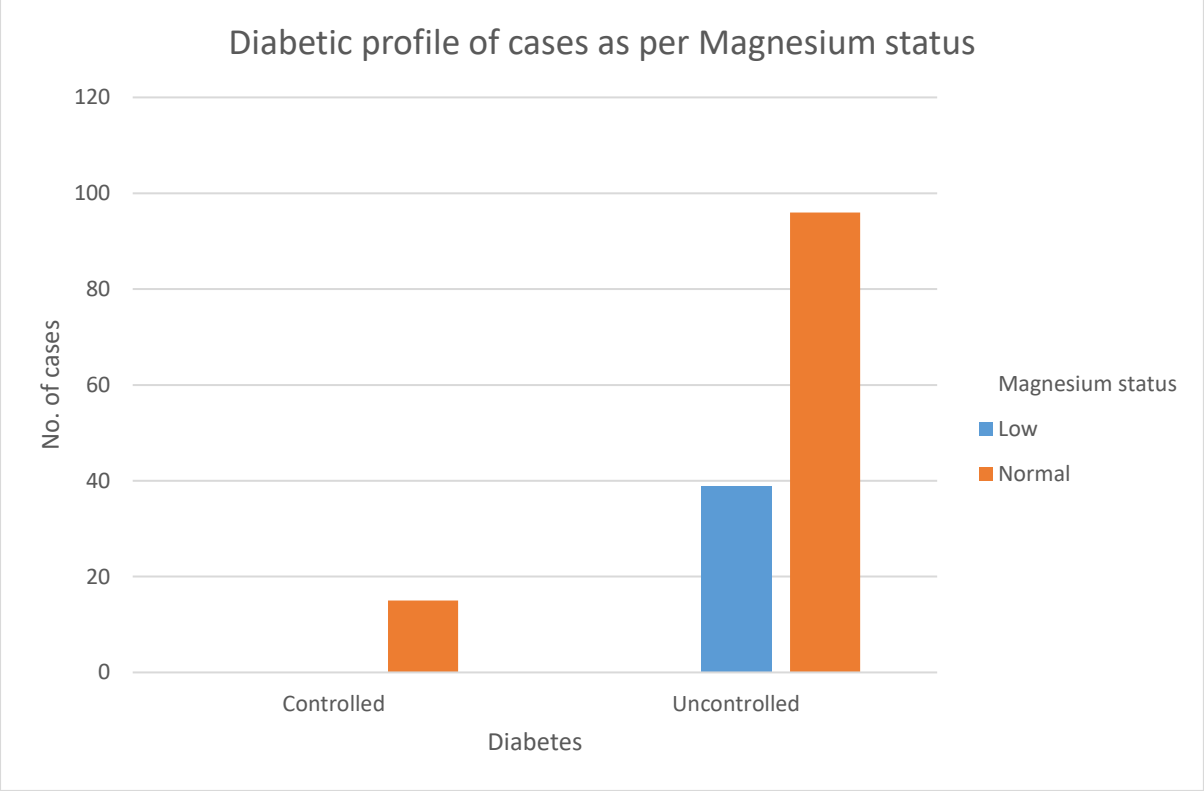
Above table shows that prevalence of hypertension was significantly higher in hypomagnesemia group as compared to normo- magnesemia group(76.9% versus 19.8% respectively).

Table 4: Glycemic control profile of cases as per Magnesium status

Parameter		Magnesium Status						P Value
		Low		Normal		Total		
		No.	%	No.	%	No.	%	
Diabetes	Controlled (HBA1C<7)	0	.0	15	100.0	15	10.0%	0.016

	Uncontrolled (HBA1C≥7)	39	28.9	96	71.1	135	90.0%	
	Total	39	26.0	111	74.0	150	100.0 %	

Above table shows that prevalence of uncontrolled Diabetes was significantly higher in hypomagnesemia group as compared to normo- magnesemia group(100% versus 86.5% respectively).



Discussion- The incidence of Type 2 diabetes is rising worldwide over the past decade. The incidence of hypomagnesemia is higher in individuals with type 2 diabetes as compared to healthy. [7] Pham et al.,[7] in their study found that overall prevalence of hypomagnesemia in type 2 diabetes mellitus ranges from 13.5 to 47.7%. In our study, we found that 26% of diabetic patients had hypomagnesemia. In the study conducted by Ram Kumar S et al [8] the prevalence of hypomagnesemia in type 2 diabetes mellitus was 19.1% and in study conducted by

Mohammed et al. in North Kerala the prevalence of hypomagnesemia among participants with type 2 diabetes was 15.7%.[9] The higher prevalence obtained in this study might be due to larger sample size in our study compared to above mentioned studies.

In present study we found that mean HBA1C was significantly higher in hypomagnesemia group as compared to normo- magnesemia group.Similarly Rao and Shariff et al. (2015)[10] , Arpaci D et al.(2015) [11]and Moradiya K, Muley et al.(2021)[12] in their study found that mean HBA1C was significantly higher in hypomagnesemia group as compared to normo-magnesemia group which is in agreement with results of present study.

Wahid *et al*.[13] and Kumar *et al.*[14] reported significant difference in HbA1c values of diabetics with low and normal magnesium levels.($P < 0.0001$). Hence, there is a significant negative correlation of magnesium levels with HbA1c, however, the effect of Mg supplementation on glycemic control and bringing down HbA1c toward optimal remains to be seen which may be a topic for future research.

Conclusion-The prevalence of hypomagnesaemia in Indian Diabetic patients is high. Hypomagnesaemia was positively associated with poor glycaemic control. Periodic magnesium level testing and effective magnesium replacement therapy are recommended to help control diabetes and minimize the risk of long-term complications. A larger prospective study is required to observe the effect of magnesium deficiency on clinical outcomes.

References

1.Saeedi P, Petersohn I, Salpea P, Malanda B, Karuranga S, Unwin N, et al. IDF Diabetes Atlas Committee. Global and regional diabetes prevalence estimates for 2019 and projections for 2030 and 2045: Results from the International Diabetes Federation Diabetes Atlas, 9th edition. Diabetes Res Clin Pract. 2019 Nov;157:107843. doi: 10.1016/j.diabres.2019.107843. Epub 2019 Sep 10. PMID: 31518657.

2. Sun H, Saeedi P, Karuranga S, Pinkepank M, Ogurtsova K, Duncan BB, Stein C, et al. IDF Diabetes Atlas: Global, regional and country-level diabetes prevalence estimates for 2021 and projections for 2045. Diabetes Res Clin Pract. 2022 Jan;183:109119. doi: 10.1016/j.diabres.2021.109119. Epub 2021 Dec 6. Erratum in: Diabetes Res Clin Pract. 2023

Oct;204:110945. doi: 10.1016/j.diabres.2023.110945. PMID: 34879977; PMCID: PMC11057359.

3. Al Alawi AM, Majoni SW, Falhammar H. Magnesium and Human Health: Perspectives and Research Directions. Int J Endocrinol. 2018 Apr 16;2018:9041694. doi: 10.1155/2018/9041694. PMID: 29849626; PMCID: PMC5926493.

4. *Erasmus RT, Olukoga AO, Alanamu RA, Adewoye HO, Bojuwoye B. Plasma magnesium and retinopathy in black African diabetics. Trop Geogr Med. 1989;41:234–7.* [PubMed] [Google Scholar]

5.*Kao WH, Folsom AR, Nieto FJ, Mo JP, Watson RL. Serum and dietary magnesium and the risk for type 2 diabetes mellitus: The atherosclerosis risk in communities study. Arch Intern Med. 1999;159:2151–9. doi: 10.1001/archinte.159.18.2151.*

6. Kumar P, Bhargava S, Agarwal PK, Garg A, Khosla A. Association of serum magnesium with type 2 diabetes mellitus and diabetic retinopathy. J Family Med Prim Care. 2019 May;8(5):1671-1677. doi: 10.4103/jfmpc.jfmpc_83_19. PMID: 31198735; PMCID: PMC655911.

7. Pham PC, Pham PM, Pham SV, et al. Hypomagnesemia in patients with type 2 diabetes. Clin J Am Soc Nephrol 2007;2(2):366–373.

8. S RK, KG SK, RG. Hypomagnesemia in Patients with Type 2 Diabetes Mellitus. J Assoc Physicians India 2024;72(7):25–28.

9. Mohammed B. Hypomagnesaemia in diabetes. J Med Sci Clin Res 2017;05(2):18192–18198.

10. Rao and Shariff: Serum Magnesium Levels in Type 2 Diabetic Patients with Microalbuminuria and Normoalbuminuria. International Journal of Scientific Study | July 2015 | Vol 3 | Issue 4.

11.Arpaci D, Tocoglu AG, Ergenc H, Korkmaz S, Ucar A, Tamer A. Associations of serum Magnesium levels with diabetes mellitus and diabetic complications. Hippokratia. 2015 Apr-Jun;19(2):153-7. PMID: 27418765; PMCID: PMC4938107.

12. Moradiya K, Muley A. A study of serum magnesium level in type 2 diabetes mellitus and its association with glycemic control and its complications. Int J Non-Commun Dis. 2021;6(1):34–7.

13. Wahid A, Verma GC, Meena CP, Pathan AR. Study of serum magnesium level in patients with type 2 diabetes mellitus and it's correlation with glycosylated hemoglobin and diabetic complications Int J Adv Med. 2017;4:311–6

14. Kumar P, Bhargava S, Agarwal PK, Garg A, Khosla A. Association of serum magnesium with type 2 diabetes mellitus and diabetic retinopathy J Family Med Prim Care. 2019;8:1671–7.