

**Original Research Article****Role of magnesium in pre diabetes**

Dr. K. Sumathi, Dr. A. Mary Chandrika

Sree Balaji Medical College and Hospital, Chennai, Tamil Nadu, India

**\*Corresponding author**

Dr. A. Mary Chandrika

Email: [dr\\_marychandrika@yahoo.com](mailto:dr_marychandrika@yahoo.com)

**Abstract:** Magnesium is the fourth most abundant mineral in the body and an essential mineral in many cellular functions and metabolic processes. The link between diabetes mellitus and magnesium deficiency is known. Evidence suggests magnesium plays a vital role in reducing cardiovascular risks and is involved in the pathogenesis of diabetes. Studies have shown that both mean plasma and intracellular free magnesium levels are lower in patients with diabetes than in the general population. Magnesium supplementation improves insulin sensitivity. This case-control study was done after getting Ethical clearance from the institution. It consisted of 20 cases of pre-diabetes and 20 ages matched healthy non diabetics as control group attending outpatient department of Sree Balaji Medical College and Hospital, Chennai, Tamil Nadu. This study was undertaken to evaluate the serum magnesium level in patients with pre diabetes and compare it with age matched controls. After obtaining informed consent from the subjects, venous blood samples were collected by standard aseptic techniques. Serum was separated; Fasting blood sugar, post prandial blood sugar and magnesium level were estimated.

**Keywords:** Magnesium, insulin resistance, pre diabetes.

**INTRODUCTION:**

Magnesium is essential in regulation of many cellular processes and metabolic functions. Magnesium supplementation improves insulin sensitivity.

**OBJECTIVE OF THE STUDY:**

To identify the serum magnesium level in patients with pre diabetes and compare it with age matched controls. The link between diabetes mellitus and magnesium deficiency is known.

**MATERIALS AND METHODS:**

This case-control study was done after getting Ethical clearance from the institution. It consisted of 20 cases of pre-diabetes and 20 ages matched healthy non diabetics as control group attending outpatient department of Sree Balaji Medical College and

Hospital, Chennai, Tamil Nadu. This study was undertaken to evaluate the serum magnesium level in patients with pre diabetes and compare it with age matched controls. After obtaining informed consent from the subjects, venous blood samples were collected by standard aseptic techniques. Serum was separated; Fasting blood sugar, post prandial blood sugar and magnesium level were estimated. Blood sugar was measured by GOD-POD method and magnesium was measured by Xylo blue method in Mindray autoanalyzer. Data analysed using SPSS package.

**INCLUSION CRITERIA:**

Case group – pre diabetes patients with age group 20-30 years. Control group – Healthy non diabetics of age group 20-30 years without any medical illness.

**RESULTS:****Fig/ Tab-1 show the study data.**

SL. NO		N	PRE DIABETIC CASES	NON DIABETIC CONTROL	P- VALUE	CONFIDENCE INTERVAL
1.	FBS mg/dl	20	108.55±5	87.5±5	-	-
2.	PPBS mg/dl	20	146.95±5	120±5	-	-
3.	SERUM MAGNESIUM mg/dl	20	1.49±0.2	1.84±0.2	<0.001	95%

Serum magnesium level is found to be lower  $1.49 \pm 0.2$  [ $<1.6$ mg/dl ] in cases with pre diabetes than the non diabetic control whose serum magnesium level is  $1.84 \pm 0.2$ mg/dl. The study showed statistically significant p-value  $<0.001$  and confidence interval 95%.

#### DISCUSSION:

Type 2 diabetes mellitus is associated with hypomagnesaemia [1], and incidence rates of 12–47% is been reported [2]. Hypomagnesaemia is defined as serum magnesium concentrations  $\leq 1.6$  mg/dL in the general population [3, 4]. Hereditary factors, poor dietary intake, autonomic dysfunction, altered insulin metabolism, glomerular hyper filtration, osmotic diuresis, hypophosphataemia and hypokalaemia may all contribute to hypomagnesaemia in diabetic patients [2]. In epidemiological studies, an inverse correlation between magnesium intake and the risk of developing diabetes mellitus was found [5–7]. In two other large prospective studies—the Nurses' Health Study (NHS) initiated in 1976 and the Health Professionals Follow-up Study (HPFS), which began in 1986—an inverse correlation between magnesium intake and the risk of developing T2DM was observed for women as well as for men [6]. It has been suggested that magnesium regulates cellular glucose metabolism directly because it serves as an important co-factor for various enzymes and acts as a second messenger for insulin [8, 9]. It was seen that insulin enhances intracellular magnesium uptake [11] and this mediates diverse effects ascribed to insulin [8]. Also, hypomagnesaemia may induce altered cellular glucose transport, reduced pancreatic insulin secretion, defective post-receptor insulin signaling and altered insulin–insulin receptor interactions and thus aggravate insulin resistance [12].

By this study it is seen that hypo magnesia is prevalent among patients with pre diabetes which may mediate progression to established type 2 diabetes mellitus.

#### CONCLUSION:

Dietary supplementation of at least magnesium may be beneficial in pre-diabetic patients in improving insulin resistance. Daily magnesium administration may play a role in pre-diabetic subjects, but further studies are needed to establish its definitive role.

#### REFERENCES:

1. Simmons D, Joshi S, Shaw J; Hypomagnesaemia is associated with diabetes: Not pre-diabetes, obesity or the metabolic syndrome. *Diabetes Res Clin Pract* 2010; 87:261-266.
2. Pham PC, Pham PM, Pham SV, Miller JM, Pham PTT; Hypomagnesemia in patients with type 2 diabetes. *Clin J Am Soc Nephrol* 2007; 2(2):366-373.

3. McNair PETER, Christensen MS, Christiansen C, Madsbad S, Transbøl IB; Renal hypomagnesaemia in human diabetes mellitus: its relation to glucose homeostasis. *Eur J Clin Invest* 1982; 12(1):81-85.
4. Pham PC, Pham PM, Pham PA, Pham SV, Pham HV, Miller JM, *et al.*; Lower serum magnesium levels are associated with more rapid decline of renal function in patients with diabetes mellitus type 2. *Clin Nephrol* 2005; 63(6):429-436.
5. Kao WH, Folsom AR, Nieto FJ, Mo JP, Watson RL, Brancati FL; Serum and dietary magnesium and the risk for type 2 diabetes mellitus: the Atherosclerosis Risk in Communities Study. *Arch Intern Med* 1999; 159(18):2151-2159.
6. Lopez-Ridaura R, Willett WC, Rimm EB; Magnesium intake and risk of type 2 diabetes in men and women. *Diabetes Care* 2004; 27:134-140.
7. Song Y, Manson JE, Buring JE, Liu S; Dietary magnesium intake in relation to plasma insulin levels and risk of type 2 diabetes in women. *Diabetes Care* 2004; 27(1):59-65.
8. Aikawa JK; Magnesium: Its Biological Significance. Boca Raton, FL: CRC Press; 1981.
9. Paolisso G, Sgambato S, Gambardella A, Pizza G, Tesouro P, Varricchio M *et al.*; Daily magnesium supplements improve glucose handling in elderly subjects. *Am J Clin Nutr* 1992; 55(6):1161-1167.
10. Jahn-Dechent W, Ketteler M; Magnesium basics. *Clin Kidney J* 2012; 5 Suppl 1:i3-i14.
11. Hwang DL, Yen CF, Nadler J; Insulin increases intracellular magnesium transport in human platelets. *J Clin Endocrinol Metab* 1993; 76:549-553.
12. Saris NE, Mervaala E, Karppanen H, Khawaja JA, Lewenstam A; An update on physiological, clinical and analytical aspects. *Clin Chim Acta* 2000; 294(1):1-26.