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## **Magnesium levels in Individuals with Various Kidney Diseases, Infected with *Neisseria gonorrhoea***

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Magnesium was detected in the human plasma of individuals (n = 20) with various kidney diseases and having gonorrhoea. The values were relatively higher than those of controls (n = 20) (individuals without kidney diseases and without infection with *Neisseria gonorrhoea* or any other venereal disease). Two of the individuals within the control group had plasma magnesium concentrations below 0.9 mg per 100 mL. The other eighteen individuals had values within the range of 0.9-1.9 mg per 100 mL. None of the infected patients with kidney disease had plasma magnesium concentration below 0.9 mg per 100 mL. All infected females with kidney diseases had plasma magnesium concentration above 1.9 mg per 100 mL. Of the total infected males, with various kidney diseases, 35% had plasma magnesium concentrations above 1.9 mg per 100 mL. In spite of the fact that gonococcal infection affects the upper renal tract, there seems to be no significant effect of such infection on plasma hypermagnesemia in individuals with certain kidney diseases. Hypermagnesemia could therefore still be a problem in patients with gonococcal infection accompanied with renal diseases.

**Key words:** Magnesium, *Neisseria gonorrhoea*, kidney diseases, human plasma, hypermagnesemia, gonorrhoea, plasma magnesium concentration

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## INTRODUCTION

Gonorrhoea, a venereal disease caused by *Neisseria gonorrhoea* causes inflammation of both male and female genitalia. The gonococcus can attack intact epithelia, does not penetrate deeply into the tissues and ascends by surface continuity. The disease exists either in an acute or chronic form and affects the urinary bladder and upper renal tract<sup>[1]</sup>. Frequent and burning micturition is an important symptom of gonorrhoea in adults<sup>[2]</sup>.

Magnesium ion ( $Mg^{2+}$ ) has an ionic radius half that of Potassium ion ( $K^+$ ), is present in biological fluids and acts as catalyst in the phosphorylation of Glucose<sup>[3,4]</sup>. It plays a role in the release of acetylcholine, enzyme activation, ribonucleic and deoxyribonucleic reaction, amino acid activation and protein synthesis<sup>[5]</sup>. It is normally absorbed into the body from the GUT after diet. The kidney seems to be an important organ in its excretion<sup>[6]</sup>. Chronic infection with *Neisseria gonorrhoea* affects the upper renal tract and urinary bladder. Hypermagnesemia in plasma has been observed as an important problem in renal failure<sup>[7]</sup>. This study was designed to determine magnesium levels in individuals having renal diseases with chronic *Neisseria gonorrhoea* infection

## MATERIALS AND METHODS

**Subjects:** The test subjects consist of twenty individuals with various kidney diseases diagnosed medically as having gonorrhoea at the Special Treatment Clinic of the department of Medical Microbiology and Parasitology, University College Hospital, Ibadan, Nigeria. Symptoms observed in the subjects ranged from burning micturition to mucopurulent discharges from the urinogenitals. The control group consisted of twenty individuals with no history of gonococcal infection or any other venereal disease and without any form of kidney disease.

**Blood Sample Collection:** About 5 mL of venous blood samples were collected using syringes, from the arms of the subjects, into heparinized blood containers. Plasma was separated after centrifugation at 3,000 rpm for 10 min. Blood collection was done between 10 am and 11 am for uniformity of samples. Plasma samples were stored at  $-20^{\circ}C$  until they were analysed for magnesium.

**Magnesium content analysis:** Magnesium content of plasma samples were analysed using the atomic absorption spectrophotometry method<sup>[8]</sup>.

## RESULTS

The magnesium concentration in normal human plasma should be of the range 0.9-1.9 mg per 100 mL (Table 1).

Table 1: WHO Reference value ranges in the normal human plasma. (University College Hospital, Ibadan, Nigeria)

Parameter	Reference range
$Mg^{2+}$ (mg per 100 mL)	0.9-1.9
$PO_4^{2-}$ (mg per 100 mL)	2-4
Glucose (mg per 100 mL)	45-90
Total Protein (mg $mL^{-1}$ )	58-80

Table 2: Plasma Magnesium concentration in normal controls (Individuals without kidney disease and without *Neisseria gonorrhoea* infection)

Age	Sex	Magnesium conc (mg per 100 mL)
24	F	1.42
36	M	1.69
35	F	1.15
48	M	0.80
25	M	1.39
26	M	1.74
40	F	1.20
25	F	1.90
50	F	1.42
40	F	1.13
35	M	1.90
35	F	0.75
26	F	1.33
40	F	1.47
39	F	1.44
33	F	1.42
50	F	1.08
40	M	1.81
39	M	0.9
40	F	1.80

Key: M = Male; F = Female

Two of the patients (without kidney diseases and without *Neisseria gonorrhoea* infection) within the normal control group had plasma magnesium concentrations below 0.9 mg per 100 mL. The values were 0.80 mg per 100 mL and 0.75 mg per 100 mL respectively. The other eighteen individuals had plasma magnesium concentrations within the range of 0.9-1.9 mg per 100 mL (Table 2).

None of the infected patients with kidney disease had plasma magnesium concentration below 0.9 mg per 100 mL. All the infected females with kidney diseases had plasma magnesium concentrations above 1.9 mg per 100 mL. Of the total infected males, with various kidney diseases, 35% had plasma magnesium concentrations above 1.9 mg per 100 mL (Table 3).

The only infected patient with renal failure had plasma magnesium concentration above 1.9 mg per 100 mL. Seventy one percent of infected patients with Nephrotic syndrome had plasma magnesium concentrations above 1.9 mg per 100 mL. Seventy five percent of infected patients with chronic nephrosis had plasma magnesium concentration above 1.9 mg per 100 mL. Fifty percent of infected patients with nephrosis had plasma magnesium concentrations above 1.9 mg per 100 mL (that is, the only female patient with nephrosis had plasma magnesium

Table 3: Plasma magnesium concentrations in patients with various kidney diseases, infected with *Neisseria gonorrhoea*

Diagnosis	Age	Sex	Magnesium conc. (mg per 100 mL)
Chronic renal failure	39	M	2.19
Nephrotic syndrome	42	M	3.40
Nephrotic syndrome	29	F	2.50
Nephrotic syndrome	40	F	2.40
Chronic nephrosis	39	M	1.20
Chronic nephrosis	38	M	2.40
Chronic nephrosis	30	M	2.53
Chronic nephrosis	28	F	2.00
Chronic nephrosis	50	F	5.60
Chronic nephrosis	40	M	2.00
Chronic nephrosis	21	F	3.10
Chronic nephrosis	40	M	0.90
Nephrotic syndrome	45	M	7.50
Nephrotic syndrome	40	M	1.60
Nephrotic syndrome	27	M	2.40
Nephrotic syndrome	18	M	1.30
Nephrosis	32	F	3.40
Nephrosis	15	M	1.20
Renal failure	36	F	4.10
Acute renal failure	28	F	3.21

Key: M = Male; F = Female.

concentration above 1.9 mg per 100 mL). Both infected females with renal failure had plasma magnesium concentrations above 1.9 mg per 100 mL (Table 3).

### DISCUSSION

Magnesium was detected in the human plasma of individuals with various kidney diseases, infected with *Neisseria gonorrhoea* and in that of the controls (individuals without kidney diseases and without infection with *Neisseria gonorrhoea*). According to Rose<sup>[7]</sup>, magnesium constitutes 0.73% (meq L<sup>-1</sup>) of total plasma cation. Most of the magnesium, of the body is in the cells, where the concentration is about twenty times as great as in the plasma<sup>[9]</sup>. Two individuals within the normal control group had plasma magnesium concentration below the value range of that of the normal human plasma. Magnesium is largely intracellular, magnesium depletion accompanies loss of cell potassium and is occasionally seen due to prolonged postoperative secretion loss<sup>[9]</sup>. Hypomagnesemia of any cause can lead to K<sup>+</sup> depletion and hypokalemia. Increased urinary excretion is the primary source of K<sup>+</sup> loss<sup>[7]</sup>. The enhancement of neuromuscular irritability that gives rise to tetany is sometimes caused by low plasma magnesium ion concentration<sup>[9]</sup>. However, raised plasma magnesium levels are consistently found in chronic nephritis with renal failure<sup>[9]</sup>.

Magnesium and calcium play a role in the release of acetylcholine, enzyme activation, ribonucleic and deoxyribonucleic reaction, amino acid activation and protein synthesis. The mean value of plasma magnesium is approximately 1.5 mg dL<sup>-1</sup><sup>[8,10]</sup>. Hyperglycemia in plasma have been observed in patients with acute and chronic renal failure<sup>[11]</sup>.

Gonorrhoea affects the urinary bladder and upper renal tract<sup>[1]</sup>. Frequent and burning micturition is an important symptom of gonorrhoea in adults<sup>[2]</sup>. Though the kidney plays an important role in the maintenance of serum magnesium within the normal range<sup>[12]</sup>, an average of 162 mg of magnesium can be detected in the urine of a man with unregulated diet within a 24 h period.

In spite of the fact that Gonococcal infection affects the upper renal tract, there seems to be no significant effect of such infection on plasma hypermagnesemia in individuals with certain kidney diseases. Hypermagnesemia in plasma could therefore still be an important problem in patients with renal diseases accompanied with gonococcal infection.

### REFERENCES

1. Prescott, L.M., J.P. Harley and D.A. Klein, 2002. *Microbiology*. McGraw Hill Book Company. Boston, New York, Sydney, Toronto.
2. Topozada, H.K. and M.K. Topozada, 1969. *Gynaecology*. Almaaref Establishment, Alexandria. Galal Hazzi and Co.
3. Lowry, O.H., J.V. Passonneau, F.X. Hasselberger and D.W. Schulz, 1964. Effect of Ischemia on known substrates and cofactors of the glycolytic pathway in brain. *J. Biol. Chem.*, 239: 18-20.
4. West, E.S. and W.R. Todd, 1961. *Textbook of Biochemistry*. The Macmillan Company, New York.
5. Bolarin, D.M., 1997. *A handbook of Clinical Chemistry*. Nelson Publishers Limited. Lagos, Nigeria.
6. Seelig, M.S. and A.R. Berger, 1974. Range of normal serum magnesium values. *New Eng. J. Med.* 290: 974-975.
7. Rose, B.D., 1977. *Clinical Physiology of Acid-Base and Electrolyte Disorders*. McGraw Hill Book Company. New York.
8. Olatunbosun, D.A., F.A. Adeniyi and B.K. Adadevoh, 1974. Effects of Oral Contraceptives on serum magnesium levels. *Intl. J. Fert.*, 19: 224-226.
9. Baron, D.N. 1963. *Essentials of Chemical Pathology*. The English University Press Ltd. London.
10. Olatunbosun, D.A., F.A. Adeniyi and B.K. Adadevoh, 1975. Serum calcium, phosphorus and magnesium levels in pregnant and non-pregnant Nigerians. *Br. J. Obst. Gynaecol.*, 82: 40-43.
11. Coburn, J.W., M.M. Popoutzer, S.G. Massry and C.R. Kleeman, 1969. The physicochemical state and renal handling of divalent ions in chronic renal failure. *Arch. Intl. Med.*, 124: 302.
12. Wacker, W.E.C. and B.L. Vallee, 1958. Magnesium metabolism. *New Eng. J.*, 259: 431-438.