

Dedication

To

The light that illuminates our path to
success...Fathers.

To.....

Those who taught us to stand no
matter how circumstances change...

Mothers.

To.....

Everyone his knowledge lights up
others mind.

Ali Mahjoub.

Acknowledgment

Praise to *Allah* how given us the health strength and patience to conduct this study. Sincere gratitude goes to our supervisor Dr. Nassr Eldin M.A Shrif indebted to all staff of clinical chemistry department in Sudan University for useful advises and encouragement. We would like also to express our appreciation and gratitude to all of the laboratory staff in Khartoum hospital for their help .Very special thank to Sudanese chronic renal failure patients how allow us to take blood sample for this study. Last special thank to all friends for their helps.

Abstract

- Descriptive cross-sectional study was conducted in the Renal Center for Kidney Dialysis, Khartoum state, The aim of the present study is to assessment the plasma zinc and magnesium levels among haemodialysis patients (before and after haemodialysis) with controls (age & sex &duration of dialysis).
- A total of 40 individual with chronic renal failure were enrolled in this study, in addition to 20 healthy volunteers' subjects as a control group. Method: atomic absorption spectroscopy device was used for measurement of zinc. spectrophotometric assay was used calcium estimation, then data were analyzed by Statistical (SPSS version 16) computer software.
- The results of the present study showed a significant increase in the mean of zinc level in hemodialysis patients before dialysis(4.5 ± 1.19) when compared with control group (0.95 ± 0.17) and significant decreased after dialysis (4.03 ± 0.99) with (P -value < 0.001).
- Result of magnesium indicated significant increased when compared mean of hemodialysis patients before and post dialysis (2.08 ± 0.12), (2.09 ± 0.16), (1.8 ± 0.35) when compared with control group respectively with (P -value < 0.001).

In this study there was no correlation between zinc and age ($r = 0.012$, p .value = 0.34)& duration of dialysis ($r = 0.009$, p .value = 0.93).

Also there was no correlation between magnesium and age ($r = 0.057$, p .value = 0.033)& duration of dialysis ($r = 0.187$, p .value = 0.098).

- In Conclusions plasma zinc and magnesium levels are significantly increased in hemodialysis patients than in controls. No significant difference in plasma magnesium level between pre

and post hemodialysis and significantly decreased zinc level between after hemodialysis patients.

مستخلص البحث

هذه دراسة وصفية مقطعة أجريت في مركز غسيل الكلى بالخرطوم. الغرض من هذه الدراسة هو تقويم مستوى كل من الزنك والمغنيسيوم في البلازما لدى المرضى الخاضعين لغسيل الكلى.

شارك في هذه الدراسة 40 مريضا يقومون بعمل غسيل كلوي بشكل منتظم وكذلك 20 من الأصحاء كمجموعة ضابطة. وقد تم قياس الزنك بواسطة جهاز الإمتصاص الذري للزنك وجهاز المطياف الضوئي للمغنيسيوم وتم تحليل البيانات عن طريق برنامج التحليل الإحصائي النسخة 16.

النتائج: وجد زيادة ملحوظة في مستوى الزنك في بلازما المرضى قبل الغسيل (4.5 ± 4.5 مقارنة بمجموعة الأصحاء (0.95 ± 0.17). وكذلك وجد انخفاض واضح في (الزنك بعد الغسيل (4.03 ± 0.99).

وكذلك هنالك زيادة في مستوى المغنيسيوم في مرضى الغسيل الكلوي قبل وبعد (0.16 ± 2.09 ، (0.12 ± 2.08) الغسيل على التوالي مقارنة بالمجموعة الضابطة (0.35 ± 1.8).

لم يكن هنالك إرتباط بين مستوى الزنك والعمر ($r = 0.012$, $p.value = 0.34$ ومدة الغسيل ($r = 0.009$, $p.value = 0.93$)).

وكذلك ليس هنالك إرتباط بين مستوى المغنيسيوم والعمر

($r = 0.187$, $p.value = 0.098$).

ومدة الغسيل ($r = 0.057$, $p.value = 0.033$)

الخلاصة:

نستخلص من هذه الدراسة أن مستوى الزنك والمغنيسيوم يزيد في مرضى الغسيل الكلوي .

مستوى الزنك يتأثر بعد الغسيل في مجموعة المرضى بالنقصان.

Contents

Topic title	Page No
Dedication	I
Acknowledgements	II
Abstract	III
مستخلص البحث	IV
List of content	V- VIII
List of abbreviations	IX
List of table	X
List of figure	XI

Chapter one **Introduction and Literature Review**

No	Text	Page
1	Introduction	1
1.1	The zinc	4
1.1.1	Chemistry of zinc	4
1.1.2	Dietary sources of zinc	4
1.1.3	Absorption, transport, metabolism and excretion of zinc	4
1.1.4	Interactions with iron and copper	6
1.1.5	Functions of zinc	6
1.1.6	The Recommended daily allowance (RDA)	7
1.1.7	Deficiency of zinc	7
1.1.7.1	Effects on growth	7
1.1.7.2	Acrodermatitis enteropathica	7
1.1.7.3	Parental Nutrition	8
1.1.7.4	Infectious disease	8
1.1.8	Subclinical effects of zinc deficiency	8
1.1.8.1	Immune function	8
1.1.8.2	Hormones	9
1.1.8.3	Neurological effects	9
1.1.9	Zinc toxicity	9
1.1.10	Reference intervals	10
1.2	The magnesium	10
1.2.1	Foods provide magnesium	11
1.2.2	Dietary Reference Intakes for magnesium	13
1.2.3	Magnesium deficiency occur in	15
1.2.4	Signs of magnesium deficiency	15
1.2.5	The health risk of too much magnesium	17

1.2.6	Signs of excess magnesium	18
1.2.7	Reference intervals	18
1.3	Chronic renal failure	19
1.3.1	Causes of chronic renal failure	19
1.3.2	Majority of cases progressive kidney damage is the result of a chronic disease	20
1.3.2.1	Diabetes	20
1.3.2.2	Hypertension (high blood pressure)	20
1.3.2.3	Obstructed urine flow	20
1.3.2.4	Kidney diseases	21
1.3.2.5	Kidney artery stenosis	21
1.3.2.6	Certain toxins	21
1.3.2.7	Fetal developmental problem	21
1.3.2.8	Systemic lupus erythematosis	21
1.3.2.9	Malaria and yellow fever	21
1.3.2.10	Some medications	21
1.3.2.11	Illegal drug abuse	21
1.3.2.12	Injury	21
1.4	Dialysis	21
1.4.1	Haemodialysis	22
1.5	Rationale	23
1.6	Objectives of the research	24

Chapter two Materials and Methods		
No	Text	Page

2. 1	Materials	25
2.1.1	Study approach	25
2.1.2	Study design	25
2.1.3	Study area	25
2.1.4	Study population	25
2.1.5	Study size	25
2.1.6	Study period	25
2.1.7	Sampling	25
2.1.8	Selection criteria	25
2.1.8. 1	Inclusion criteria	25
2.1.8.2	Exclusion criteria	26
2.1.9	Collection of blood	26
2.1.10	Tools of data collection and Data collection technique	26
2.2	Method	26
2.2.1	The estimation of zinc	26
2.2.1.1	principle of atomic absorption spectroscopy	26
2.2.1.2	Procedure	27
2.2.1.3	Standard atomic absorption conditions for zinc	28
2.2.1.4	Standard flame emission conditions for zinc	28
2.2.1.5	Advantages of atomic absorption spectroscopy	28
2.2.1.6	Dis advantages of atomic absorption spectroscopy	28
2.2.2	The estimation of magnesium	28
2.2.2.1	Principle of Enzymatic method	28
2.2.2.2	Procedure	29
2.3	Ethical consideration	29
2.4	Statistical analysis	29

	Chapter three
--	----------------------

3	Results	30
Chapter four Discussion		
4. Discussion		37
5. Conclusion		39
6. Recommendations		40
Appendices		
	Appendix one	47
	Appendix two	48
References		
	References	41

List of abbreviations		
abbreviation s	Means	Page
AI	Adequate Intake	7
AE	Acrodermatitis enteropathica	8
CKD	Chronic kidney disease	1
DNA	Deoxy ribonucleic acid	7
Da	Dalton	5
DV	Daily Value	12
DRI s	Dietary Reference Intakes	13
FDA	The Food and Drug Administration	12
GFR	Glomerular filtration rate	19
HDF	Hemodiafiltration	22
HD	Hemodialysis	1
(IGF)-I	Insulin-like growth factors	9
Mg	Milligrams	12
MTF1	Metal-regulatory transcription factor 1	5
Mt	Metallothionein	5
NSAIDs	Non-steroidal anti-inflammatory drugs	21
PD	Peritoneal dialysis	22
pm	Picometers	28
RNA	Ribonucleic acid	7
RDA	Recommended Daily Allowance	7
SPSS	Statistical package for social sciences	29
UL	Upper Intake Levels	13
US	United States	14

List of table		
No	Text	Page
1.1	The Recommended daily allowance	7
1.2	Selected food sources of magnesium	11
1.3	Recommended Dietary Allowances for magnesium for children and adult	13
1.4	Recommended Adequate Intake for magnesium for infants	14
1.5	Common and important magnesium/drug interactions	16
1.6	Tolerable Upper Intake Levels for supplemental magnesium for children and adults	18
3.1	Characteristics of hemodialysis patients and control	31
3.2	Effect of dialysis on magnesium and zinc levels	32

List of figure		
No	Text	Page
1.1	Metabolism of zinc	6
3.2	Correlation between plasma zinc level and duration of dialysis (in years)	3 3
3.3	Correlation between plasma magnesium level and duration of dialysis (in years)	3 4
3.4	Correlation between plasma zinc level and age (in years)	3 5
3.5	Correlation between magnesium plasma level and age (in years)	3 6