

## **Acknowledgements**

Thanks are the first and last to (Allah) who enabled me to conduct this study by the grace of him gave me strength and patience.

I would like to express my deep and sincere gratitude and appreciation to my supervisor:

**Dr. Nassr Eldin M. A. Shrif** for his encouragement, supervision, time, patience, effort, critical comment and invaluable sound advice and careful guidance.

My thanks extended to laboratory staff of Radio Isotope Centre of Khartoum for their kind help.

It is pleasure to acknowledge the volunteer who were enrolled in this study, without them this work could not have been done.

Finally I would like to thank everybody who positively contributed in finalizing this thesis.

## Content

Topic		Page
Dedication		I
Acknowledgement		II
Content		III
List of tables		VII
List of figures		VIII
Abstract (English)		IX
Abstract (Arabic)		XI
<b>Chapter one : Introduction</b>		
1.1	Introduction	1
1.2	Rationale	2
1.3	Objectives	3
<b>Chapter two: Literature Review</b>		
2.1	Breast cancer	4
2.1.1	Signs and symptoms	5
2.1.2	Risk factors	7
2.1.2.1	Life style	7
2.1.2.2	Genetics	8

2.1.2.3	Medical conditions	<b>8</b>
2.1.3	Path physiology of breast tumors	<b>9</b>
2.1.4	Diagnosis of breast tumors	<b>10</b>
2.1.5	Classification f breast tumors	<b>11</b>
2.1.6	Prevention of breast tumors	<b>13</b>
2.1.7	Screening of breast tumors	<b>14</b>
2.1.8	Management of breast tumors	<b>16</b>
2.1.8.1	Surgery	<b>16</b>
2.1.8.2	Medication	<b>16</b>
2.1.8.3	Radiation	<b>18</b>
2.1.9	Prognosis of breast tumors	<b>19</b>
2.1.9.1	Prognostic factors	<b>19</b>
2.1.9.2	Psychological aspects	<b>21</b>
2.1.9.3	Epidemiology of breast tumors	<b>22</b>
2.1	Copper	<b>23</b>
2.2.1	Health Effects of copper	<b>23</b>
2.2.2	Absorption, Transport, and Excretion	<b>24</b>
2.2.3	Deficiency of copper	<b>24</b>
2.2.4	Toxicity	<b>25</b>
2.2.5	Laboratory Evaluation of Copper Status	<b>25</b>

2.2.6	Relationship between breast cancer and copper	<b>25</b>
2.3	Zinc	<b>25</b>
2.3.1	Health Effects of zinc	<b>25</b>
2.3.2	Absorption, Transport, and Excretion	<b>26</b>
2.3.3	Deficiency	<b>26</b>
2.3.4.	Toxicity	<b>27</b>
2.3.5	Laboratory Evaluation of Zinc Status	<b>27</b>
2.3.6	Relationship between Zinc and breast tumors	<b>27</b>
<b>Chapter three: Materials and Methods</b>		
3.1	Study approach and design	<b>29</b>
3.2	Study area and period	<b>29</b>
3.3	Target population and sample size	<b>29</b>
3.4	Selection criteria	<b>29</b>
3.4.1	Inclusion criteria	<b>29</b>
3.4.2	Exclusion criteria	<b>29</b>
3.5	Ethical consideration	<b>29</b>
3.6	Data collection and analysis	<b>29</b>
3.6.1	Interview with questionnaire	<b>29</b>
3.6.2	Blood sample collection	<b>30</b>

3.7	Biochemical measurements and instruments used	<b>30</b>
3.7.1	Estimation of copper	<b>30</b>
3.7.2	Estimation of zinc	<b>30</b>
3.8	Quality control	<b>31</b>
3.9	Statistical analysis	<b>31</b>
<b>Chapter four : Result and analysis</b>		
4.1	Result and analysis	<b>32</b>
<b>Chapter five : Discussion, Conclusion and Recommendations</b>		
5.1	Discussion	<b>40</b>
5.2	Conclusion	<b>42</b>
5.3	Recommendations	<b>43</b>
<b>References</b>		<b>44</b>
<b>Appendix</b>		

## List of tables

<b>Table</b>	<b>Page</b>
Table (4-1) comparison of means of age in the test group and control group.	<b>33</b>
Table (4-2) Comparison of means of plasma levels of copper and zinc (mg/L) of the breast cancer patients (test group) and control group.	<b>34</b>
Table (4-3) Comparison of means of plasma levels of copper and zinc (mg/L) of the breast cancer patients according to types of breast cancer.	<b>35</b>

## List of figures

<b>Figure</b>	<b>Page</b>
Figure (4-1) A scatter plot shows the relationship between plasma level of copper (mg/L) and age.	36
Figure (4-2) A scatter plot shows the relationship between plasma level of zinc (mg/L) and age.	37
Figure (4-3) A scatter plot shows the relationship between plasma level of copper (mg/L) and duration of tumor.	38
Figure (4-4) A scatter plot shows the relationship between plasma level of zinc (mg/L) and duration of breast tumor.	39

## ABSTRACT

A case control study conducted during the period from March to June 2014 to evaluate plasma levels of copper and zinc in breast tumors patients in Radio Isotope centre of Khartoum.

50 breast tumor patients were selected as test group and 35 as control group. Age matched. Blood specimens were collected from both groups, and the plasma levels of copper and zinc were determined using Atomic absorption spectrophotometer.

The means and standard deviation of the plasma copper and zinc were calculated. T-test was used for comparison (significant level was set at  $p \leq 0.05$ ) using SPSS 17.0.

The result of this study indicated significant reduction in the means of plasma levels of copper and zinc in test group ( $0.593 \pm 0.141$  mg/L), ( $0.439 \pm 0.143$  mg/L) when compared to control group ( $0.809 \pm 0.135$  mg/L), ( $0.687 \pm 0.104$  mg/L), ( $p=0.000$ ) ( $P=0.007$ ) respectively.

The result of this study showed significant reduction of the means of the plasma levels of copper and zinc in malignant breast cancer patients ( $0.579 \pm 0.134$  mg/L), ( $0.406 \pm 0.234$  mg/L) when compared to patients with benign breast tumor ( $0.740 \pm 0.127$  mg/L), ( $0.752 \pm 0.139$  mg/L) ( $P = 0.000$ ), ( $p=0.000$ ) respectively.

There were positive but insignificant correlation between plasma levels of copper and zinc with age ( $r = 0.069$ ,  $P$  value  $= 0.717$ ), ( $r = 0.028$ ,  $P$  value  $= 0.847$ ) respectively.

Also showed negative but insignificant correlation between plasma levels of copper and zinc with duration of tumor ( $r = -0.04$ ,  $P$  value  $= 0.764$ ), ( $r = -0.063$ ,  $P$  value  $= 0.664$ ) respectively.

Conclusion: The means of the plasma levels of copper and zinc are significantly decreased in patients with breast tumor when compared to healthy control women. And the means of plasma levels of copper and zinc are significantly decreased in patients with malignant breast tumor when compared to patients with benign breast tumor.

Age has a positive but insignificant correlation with plasma levels of copper and zinc.



Duration of breast tumor have negative but insignificant correlation with plasma levels of copper and zinc.

## المستخلص

اجريت هذه الدراسة المقطعية في الفترة ما بين مارس إلى يونيو 2014 لتقييم مستويات البلازما من النحاس والزنك في مرضى أورام الثدي في مركز النظائر المشعة الخرطوم .

تم اختيار 50 مريضا بورم الثدي كمجموعة اختبار و 35 اصحاء. العمر متطابق. تم جمع عينات الدم من كلتا المجموعتين، وتم تحديد مستويات البلازما من النحاس والزنك باستخدام مطياف الامتصاص الذري .

حسب المتوسط والانحراف المعياري لمستوى البلازما من النحاس والزنك. تم استخدام اختبار-T للمقارنة (تم تعيين مستوى  $P \geq 0.05$ ) باستخدام SPSS 17.0.

أشارت نتائج هذه الدراسة انخفاض كبير في متوسط مستويات البلازما من النحاس والزنك في مجموعة الاختبار ( $0.141 \pm 0.593$  ملج/لتر) (  $0.439 \pm 0.143$  ملج / لتر) مقارنة بالمجموعة الضابطة ( $0.809 \pm 0.135$  ملج/لتر)، (  $0.687 \pm 0.104$  ملج / لتر)، (  $P = 0.007$ ) (  $P = 0.000$ ) على التوالي .

أظهرت نتائج هذه الدراسة انخفاض كبير في متوسط مستويات البلازما من النحاس والزنك في مرضى سرطان الثدي الخبيث ( $0.134 \pm 0.579$  ملج / لتر)، (  $0.234 \pm 0.406$  ملج/لتر) بالمقارنة مع المرضى الذين يعانون من ورم حميد الثدي ( $0.127 \pm 0.740$  ملج / لتر)، (  $0.139 \pm 0.752$  ملج / لتر) (  $P = 0.000$ ) (  $P = 0.000$ ) على التوالي .

كانت هناك علاقة إيجابية ولكن غير ذات اهمية بين مستويات البلازما من النحاس والزنك مع تقدم العمر (  $r = 0.069$ ،  $P = 0.717$ )، (  $r = 0.028$ ،  $P = 0.847$ ) على التوالي .

أظهرت أيضا علاقة سلبية ولكن غير ذات اهمية بين مستويات البلازما من النحاس والزنك مع مدة الورم (  $r = -0.04$ ،  $P = 0.764$ ) (  $r = -0.063$ ،  $P = 0.664$ ) على التوالي .

الاستنتاج: متوسط مستويات البلازما من النحاس والزنك منخفضان بشكل ملحوظ في المرضى الذين يعانون من ورم الثدي بالمقارنة مع النساء الأصحاء. ومتوسط مستويات البلازما من النحاس والزنك منخفضان بشكل ملحوظ في المرضى الذين يعانون من ورم الثدي الخبيث بالمقارنة مع المرضى الذين يعانون من ورم الثدي الحميد .

العمر له علاقة إيجابية ولكن غير ذات اهمية مستويات البلازما من النحاس والزنك .

مدة ورم الثدي لها علاقة سلبية ولكن غير ذات اهمية مع مستويات البلازما من النحاس والزنك.