



Antioxidant Minerals in Cervical Neoplasia

U. Singh, Preeti Kumar and R.K. Singh*

Department of Obstetrics and Gynaecology, K.G's Medical College, Lucknow 226 003, U.P.

***Department of Biochemistry, K.G's Medical College, Lucknow 226 003, U.P. India**

ABSTRACT

The study of antioxidant minerals viz. copper (Cu) and manganese (Mn) was conducted in 142 patients in Queen Mary's Hospital in collaboration with the Department of Biochemistry, King George's Medical College, Lucknow. The mean serum copper levels (SCuI) in 40 patients who served as control group was $84.9 \pm 21.9 \mu\text{g/dl}$ and mean serum Mn level (SMnI) $0.1206 \pm 0.0066 \mu\text{g/dl}$. As compared to the control group, the mean serum copper levels (SCuI) in 102 patients of cervical neoplasia was found to increase to $126 \pm \mu\text{g/dl}$ ($p < 0.0001$). This increase in serum copper level showed a linear positive association with the advancement of disease. The mean serum manganese level $0.056 \pm 0.0179 \mu\text{g/dl}$ ($p < 0.0001$) was found to decrease in the study group as compared to control group. This decrease in serum Mn level showed a linear negative association with the advancement of disease.

However, further studies on sera biochemistry of antioxidant minerals are required to establish a definite correlation of these elements in cervical neoplasia, as it is only a preliminary study pointing some correlation in the etiopathogenesis of this disease process.

Key words: *Cervical neoplasia, Etiopathogenesis, Antioxidant minerals and Cytosolic SOD.*

INTRODUCTION

The female genital tract particularly the uterine cervix is one of the commonest site for primary malignant disease, which is considered to be a preventable disease.

Extensive researches on antioxidant minerals e.g. Cu, Zn and Mn have been under study in various malignant processes (Sood et al., 1976). The levels of Cu, Zn and Mn may indicate the activity of mitochondrial and cytosolic superoxide dismutase (SOD) because mitochondrial SOD is Mn dependent and cytosolic SOD is Cu and Zn dependent. SOD is a natural enzyme and is an important scavenger of 'free radicals' which are thought to be the initiators and promoters of the malignant process (Diplock, 1991). The present preliminary study was conducted to find out if there is any correlation between levels of antioxidant minerals and cervical neoplasia.

MATERIAL AND METHODS

The study was conducted in Queen Mary's Hospital in Collaboration with the Department of Biochemistry, King George's Medical College, Lucknow, U.P., India.

Cases were divided as:

- (a) Control group (n) = 40
(b) Study group (n) = 102

Cervical dysplasia - 10

Carcinoma Cx (cervix)

- I - 16
II - 24
III - 46
IV - 4

Recurrence - 2

Control group comprised of 40 healthy females with normal pelvic examination, the hanging drop preparation and vaginal smear negative for the pathogens, normal cervical cytology and no high risk factor present for cervical neoplasia.

5 cc of venous blood was drawn from the patients and subjected to analysis for serum, Cu and Mn level by atomic absorption. Spectrophotometer – Perkin Elmer Instrument setting.

RESULTS

The mean SCul and SMnl in the control and study group have been tabulated in table I.

It shows that the mean SCul in control group was 84.9 ± 21.9 $\mu\text{g/dl}$ and in study group the mean level of SCul was found to increase to 126.0 ± 27.2 $\mu\text{g/dl}$ which is statistically significant.

Table 2 shows that SCul shows a linear positive association with the advancement of disease process.

Table 3 depicts the mean value of SMnl in control group and study group. SMnl levels in control group were found to be 0.1206 ± 0.0418 $\mu\text{g/dl}$ and in study group 0.0500 ± 0.0179 $\mu\text{g/dl}$. This decrease was statistically significant.

Table 4 shows the SMnl in various stages of cervix neoplasia as compared to control group. The mean values of Mn were found in decreasing trend as the disease advances which showed the linear negative association of Mn with cervix neoplasia.

Table 1. Serum Copper Level in Different Groups.

S.No.	Groups	No. Of Patients	Serum Level ($\mu\text{gm/dl}$)			S.E. of mean
			Range	Mean	S.D.	
1	Control	40	52-126	84.9	± 21.9	3.5
2	High Risk	47	52-126	90.9	± 21.2	3.1
3	Cervical Neoplasia	102	80-198	126	± 27.2	2.7

p 0.20 (Control vs. high risk cases)
 0.0000 (Control vs. cervical neoplasia cases)
 0.00001 (High risk vs. cervical neoplasia cases)

Table 2. Serum Copper in Control and Various Stages of Cervical Neoplasia.

S.No.	Groups	No. Of Patients	Serum Level ($\mu\text{gm/dl}$)			S.E. of mean
			Range	Mean	S.D.	
1	Control	40	52-126	84.9	± 21.9	3.5
2	Dysplasia	10	80-116	100.0	± 12.4	3.9
3	Stage I	16	80-126	106.2	± 22.4	5.6
4	Stage II	24	80-144	113.1	± 21.5	4.4
5	Stage III	46	116-184	140.4	± 18.9	2.8
6	Stage IV	4	122-198	156.0	± 31.4	16
7	Recurrence	2	157-196	176.3	± 27.6	20

p 0.0079 (Control vs. Dysplasia)
 0.0031 (Control vs. Stage I)
 0.0000 (Control vs. Stage II)
 0.0021 (Control vs. Stage III)
 0.14 (Control vs. Recurrence)

Table 3. Serum Manganese Level in Different Groups.

S.No.	Groups	No. Of Patients	Serum Level ($\mu\text{gm/dl}$)			S.E. of mean
			Range	Mean	S.D.	
1	Control	40	0.052-0.224	0.1206	± 0.418	0.0066
2	High Risk	47	0.052-0.208	0.113	± 0.348	0.0051
3	Cervical Neoplasia	102	0.02-0.112	0.05	± 0.179	0.0018

p 0.27 (Control vs. high risk cases)
 0.0000 (Control vs. cervical neoplasia cases)
 0.0000 (High risk vs. cervical neoplasia cases)

Table 4. Serum Manganese Level in Control and Various Stages of Cervical Neoplasia.

S.No.	Groups	No. Of Patients	Serum Level (gm/dl)			S.E. of mean
			Range	Mean	S.D.	
1	Control	40	0.052-0.225	0.1206	± 0.0418	0.0066
2	Dysplasia	10	0.048-0.112	0.0704	± 0.0180	0.0057
3	Stage I	16	0.040-0.100	0.0665	± 0.0148	0.0037
4	Stage II	24	0.036-0.072	0.0544	± 0.0129	0.0026
5	Stage III	46	0.024-0.056	0.0393	± 0.0104	0.0015
6	Stage IV	4	0.20-0.048	0.035	± 0.0119	0.0060
7	Recurrence	2	0.032-0.36	0.034	± 0.0028	0.0020

p 0.0000 (Control vs. Dysplasia)
 0.0000 (Control vs. Stage I)
 0.0000 (Control vs. Stage II)
 0.0000 (Control vs. Stage III)
 0.0000 (Control vs. Recurrence)

DISCUSSION

In the present study, the mean SCul in control group of 40 patients ranged from 52-126 $\mu\text{g/dl}$ with the mean value 84.9 $\mu\text{gm/dl}$ which were similar to the studies conducted by Ehud J. Margoloth, 1987 and Hames A.P. et al., 1982.

The mean SCul in cases of cervix neoplasia was 126 $\mu\text{g/dl}$ (Range 80-198 $\mu\text{g/dl}$) which was significantly higher as compared to control group. The mean value of copper showed a linear positive association with the advancement of disease. In dysplasia SCul was 100.90 $\mu\text{g/dl}$ (SEM 3.9), carcinoma cervix stage I 1.06.2 $\mu\text{gm/dl}$ (SEM 5.6), in stage II 113.1 $\mu\text{gm/dl}$ (SEM 4.4), in stage III 140.4 $\mu\text{g/dl}$ (SEM 2.8) and stage IV 156 $\mu\text{g/dl}$ (SEM 16). All these values were found to be statistically significant when compared with control (study was similar to findings to Sood RH, 1976 and Hames A.P. et al., 1982). In dysplasia, the mean value of serum manganese was 0.0704 $\mu\text{gm/dl}$ (SEM 0.0057), in carcinoma cervix stage I 0.0665 $\mu\text{g/dl}$ (SEM 0.0037), in stage II 0.0544 $\mu\text{g/dl}$ (SEM 0.0026), in stage III 0.0393 $\mu\text{g/dl}$ (SEM 0.0015), in stage IV 0.0350 $\mu\text{g/dl}$ (SEM 0.0060) and in cases of recurrence 0.0340 $\mu\text{g/dl}$ (SEM 0.0020). These decreased values were statistically significant when compared to control. The decreased levels of Mn reflect the decreased to control activity of mitochondrial superoxide dismutase and increased SCul reflect the increased cytosolic SOD.

It is assumed that some imbalance between mitochondrial and cytosolic SOD occurs which may be responsible for the decreased defense mechanism. It is also evident that free radicals are generated in mitochondrial and electron transport chain, so there is depletion in Mn levels as more superoxide has to be scavenged by the Mn SOD (Diplock, 1991).

Thus the control of the initiation of free radical mediated intercellular damage depends on the presence of these enzymes, in turn the activity of these enzymes depend on the nutritional availability of the so called antioxidant minerals, manganese, Cu, Zn and Se. any deficiency in these nutrients may thus lower the level of the defense mechanism so that disease process will be initiated.

Thus it is concluded from this preliminary study that there is some correlation of trace elements Cu, Mn with cervical neoplasia but it is too early to state that whether these elements can be added in the list of diagnostic procedures of such disease process. However, further studies of tissue and sera biochemistry of such elements are required to establish a definite correlation of these antioxidant minerals with the disease process.

REFERENCES

- Birdi, A., Gupta, S. and Gambhin, S.S. 1983. Serum copper in carcinoma cervix uteri as an indicator of successful radiotherapy. *J. Surg. Oncol.*, 22: 193-6.
- Diplock, A.T. 1991. Antioxidant nutrients and disease prevention. An overview. *Am. J. Clin. Nutr.*, 53: 1985-1935.
- Diplock, A.T. 1990. Mineral insufficiency and cancer. *Med Oncol. Tumor. Pharmacother.* 7: 193-98.
- Ehud, J. and Margolioth, et al. 1987. *Am. J. Obstet. Gynecol.*, 157: 93-6.
- Margolioth, E.J. Schenker, J.G. and Chevion, M. 1983. Copper and zinc levels in normal and malignant tissues. *Cancer*: 52: 868-72.

Corresponding Author: Dr. Uma Singh, Department of Obstetrics and Gynaecology, K.G's Medical College, Lucknow – 226 003, U.P. India