

## Original Research Article

# Role of zinc in acne: a study of 77 patients

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### ABSTRACT

**Background:** Acne vulgaris is a chronic inflammatory disease of pilosebaceous unit occurring in adolescent age group. Though not life threatening it can cause physical and psychological scars which can produce social problems in house, school and office. It is a multifactorial disease. Many treatment options are available, but not optimal. Zinc was found to be effective in pustular acne in a patient with acrodermatitis enteropathica. Hence a study on the level serum zinc in acne patients and the effect of zinc on acne is worthwhile. The aim was estimation of serum zinc level in acne patients and correlation of serum zinc level and improvement of acne.

**Methods:** Pre-treatment serum zinc level was estimated in acne and non-acne patients. Acne patients were given oral zinc 220 mg two times a day and control group was given placebo. Post treatment serum zinc levels were estimated and the serum zinc level and improvement of acne was correlated.

**Results:** Study subjects attained average serum zinc level of 5.829 µg/ml from 1.33 µg/ml. 59.5% patients on zinc therapy showed more than 50% improvement in acne severity. 10.6% showed >75%, 48.9% showed 50-75%, 36.1% showed 25-50% and 4.25% patients showed less than 25% improvement.

**Conclusions:** Statistically significant low levels of zinc were not observed in acne. Oral zinc sulphate 220 mg two times a day raised serum level to 5.82 µg/ml Exponential response in acne was noticed as serum zinc level was raised. Inflammatory lesions showed better response than comedo. Oral zinc has definite role in treatment of acne.

**Keywords:** Acne, Acne vulgaris, Zinc, Serum zinc

### INTRODUCTION

Acne vulgaris is a chronic inflammatory disease of pilosebaceous unit occurring in the adolescent age group.<sup>1,2</sup> Approximately 85% of the population of 15-18 years of age have some degree of this disorder.<sup>3</sup>

Acne is rarely life threatening, but its cosmetic effects leave scars –both physical and psychological that can be life long.<sup>4</sup> It can cause social problems in house, at school and at work.<sup>4</sup>

Acne is a multifactorial disease depending on genetic predisposition, endocrine factors, keratinisation pattern of

follicular epithelium, colonisation of sebaceous follicle and inflammatory response of the host.<sup>5</sup>

Treatment of acne is far from optimal. Treatment of acne is still a perplexing problem.<sup>6</sup> The various pathogenetic mechanisms direct to different approaches to therapy-methods of reducing sebum production, reducing pilosebaceous duct blockage, reducing bacterial colonisation and modifying inflammation in the host.<sup>7</sup> Topical therapy with benzoyl peroxide, antibiotics, vit A acid, sulfur, salicylic acid and systemic agents like oral antibiotics, 13, cis-retinoic acid, oestrogens, antiandrogens, are tried with varying results. Each one has its own advantages and disadvantages.<sup>8</sup>

The striking effect of zinc on severe pustular acne in a patient with acrodermatitis enteropathica aroused interest in zinc in acne.<sup>9</sup>

Zinc is anti-inflammatory. Zinc stabilises macromolecules and biological membranes. It influences migration rate and phagocytic activity of macrophages interfering with dynamics of inflammatory process.<sup>10</sup>

Elevated levels of zinc in vitro as well as in vivo affects various functions of cells.<sup>11</sup> Functional immobilisation, inactivation, paralysis of cell wall were proposed for such an inhibitory effect of zinc. This effect is demonstrated so far on mast cells, platelets, macrophages, polymorphonuclear cells and spermatozoa.<sup>11</sup> Action on cell membranes has shown that mast cells are inhibited from releasing histamine and could modify inflammatory state.<sup>11</sup>

Zinc adversely affect neutrophil chemotaxis and complement activation.<sup>12</sup>

Do patients with acne have zinc deficiency or can zinc modify acne is a question that has not yet been settled.

**Aim of the study**

- Estimation of serum zinc level in acne patients.
- Correlation of serum zinc level attained and improvement in acne.

**METHODS**

Total of 100 patients with a clinical diagnosis of acne vulgaris attending dermatology out-patient department of medical college, Kottayam were enrolled for the study.

**Inclusion criteria**

Inclusion criteria were those patients having minimum number of 15 lesions; those who were not on any treatment four weeks prior to the onset of trial.

**Exclusion criteria**

Exclusion criteria were those patients with any systemic illness; those on systemic steroids; pregnant patients.

After obtaining consent, fasting blood samples were collected from 100 patients and serum was freezeed and stored. Blood samples were collected after 12 weeks of treatment from 50 patients in the treatment group. Serum from fifty patients without acne was also collected.

Serum was later analysed using Perkin Elmer atomic absorption spectrophotometer model 4000AAS.

**Counting of lesions**

Different types of lesions on well-defined areas of face were counted.

Each type of lesion was given a severity index. Definition of individual lesion and the severity index given to each type of lesion are shown in Table 1.

**Table 1: Showing type of lesion and severity index.**

Type	Definition	Severity index
<b>Comedone</b>	Horny follicular plugs with insipient inflammatory change(black head)and pin head sized superficial shiny follicular papules	0.5
<b>Papule</b>	Independent infiltrated solid elevation of less than 1 cm	1.0
<b>Pustules</b>	Circumscribed collection of free pus of more that 2 mm size	2.0
<b>Infiltrate</b>	Nodules and infiltrate of more than 10 mm in diameter and coalescent papules when cannot be counted separately	3.0
<b>Cyst</b>	Lesions where infiltrates have broken down and formed a cyst	4.0

Severity of disease in each patient was calculated multiplying the total number of each type of lesion with the allotted severity index and adding each sum to get a total score which corresponded to the total severity of the disease.

Patients in treatment group were given 220 mg zinc two times a day orally after food. The second group was given placebo (vit B complex tablets) in similar capsules.

Patients were followed up at 3<sup>rd</sup>, 6<sup>th</sup>, 9<sup>th</sup> and 12<sup>th</sup> weeks after starting treatment. Each time lesions were counted and severity index score was calculated.

All patients were asked for any untoward effects.

Results were analysed using student ‘t’ test. The mean and standard error of the mean were used.

**RESULTS**

Thirty male and 17 females completed study in treatment group. Twenty males and ten females completed in placebo group. Age of patients ranged from 14-23 years for males with average 18.8 yrs. Age of females ranged from 16-21 years with average of 19.6 years. In the Placebo group age ranged from 14-22 years for males with average 20.75 and females 16-23 years with average 17.6 years.

**Severity of disease**

At the beginning average total score was 60 in treated group (61.63 in males and 58.29 in females). In placebo group initial score was 46.6.

Reduction in severity in treated group and placebo group after 3, 6, 9 and 12 weeks are shown in Table 2.

Maximum reduction in score was observed in 3-6 wks. After that reduction was minimal. Mean severity index in treatment group fell to 24.89 from 60 and in placebo group it fell from 46.6 to 37.15.

Four out of 27 patients in placebo group showed worsening while in treated group, none showed worsening.

**Table 2: Showing reduction in severity index at 3, 6, 9, 12 weeks of treatment.**

Weeks	Treatment group					Control group				
	0	3	6	9	12	0	3	6	9	12
Severity	60	40.4	32.4	27.5	24.8	46.6	37.4	33.9	36.2	37.1

**Table 3: Percentage of improvement at the end of treatment with zinc.**

Improvement	>75%	50-75%	25-50%	<25%	Total
No. of patients	5	23	17	2	47
% of patients	10.6	48.9	36.1	4.25	100

Five (10.6%) patients in treated group had more than 75% improvement, 23 (48.9%) had 50-75% and 17 (36.17%) had 25-50% improvement respectively. Two (4.25%) had less than 25% improvement (Table 3).

There was significant improvement (60.9% reduction) in pustular lesions after 12 weeks of treatment. Comedones showed only 23.18% reduction.

**Serum zinc level**

S zinc level in acne patients at the beginning was 0.24-0.29 µg/ml with a mean 1.33 µg/ml while in control

group, mean serum zinc level was 1.29 µg/ml (0.92-2.28 µg/ml).

Only 4/77 patients had S zinc level below 0.7 µg/ml

After 12 weeks treatment, S zinc level ranged from 1.496 to 22.15 µg/ml with a mean of 5.82 µg/ml.

Serum zinc level and degree of response to therapy was correlated.

Mean reduction in severity index at various levels of serum zinc is shown in Table 5.

**Table 4: Mean serum zinc level in acne patients and controls.**

S zinc level in acne patients	SD	S zinc level in normal	SD
1.33 µg/ml	0.492	1.29 µg/ml	0.389

**Table 5: Mean reduction in severity index at different levels of serum zinc.**

S Zinc level µg/ml	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	11-12	12-13	13-14	22- 23
Reduction in count	32.5	32	32.7	29.2	33.8	21.8	31.3	42	42	14	82	48.5	67
No. of pts	01	04	13	10	05	04	03	01	02	01	01	01	01

Those who attained higher S zinc levels showed greater reduction in severity index.

**DISCUSSION**

Out of 100 selected cases, 77 completed study-47 in treatment group and 30 in placebo group. Three patients in treatment group could not attend clinic as per schedule. Twenty patients in placebo group lost to follow up probably because of lack of clinical response.

Age ranged from 14-25 years with an average of 19 yrs.

**S zinc level**

Mean S zinc level in acne patients was 1.33 µg/ml in treatment group while in control it was 1.29 µg/ml. Zinc level in acne patients in this study was not below that of normal controls or normal zinc level reported by other workers. Valquist et al found in untreated acne patients S zinc level was 0.923 µg/ml which was similar to healthy controls-0.9 µg/ml.<sup>13</sup>

Michaelsson observed initial S Zinc level was 0.863 µg/ml for boys and 0.832 µg/ml for girls.<sup>14</sup> Low serum

zinc level in acne patients was reported by Ghorpade et al who observed 0.58 and 0.81 µg/ml in acne patients and normal controls respectively.<sup>15</sup> Michaelsson also noticed in acne Gr III and IV patients low initial S zinc level of 0.89 µg/ml while in controls 0.962 µg/ml.<sup>14</sup>

In this study only 4/77 had serum zinc level below 0.70 µg/ml which is reported as lower limit of normal range.

#### **Post treatment serum zinc level**

Mean serum zinc level in treated group raised to 5.829 µg/ml from 1.33 µg/ml after treatment for 12 weeks in the present study.

Weissman found that mean S zinc level increased from 0.923 µg/ml to 1.255 µg/ml in 4 wks and to 1.17 µg/ml after 12 weeks of treatment with oral zinc.<sup>11</sup>

There was no further significant increase after 4 wks.

Ghorpad et al found that S zinc level rose to 0.781 µg/ml after 12 weeks of treatment from 0.581 µg/ml. Orris et al observed an increase by 50% in zinc treated group.<sup>16</sup>

Serum zinc level attained in our patients was significantly higher than in other studies.

Placebo treated patients showed no rise in serum zinc level. 1.19 µg/ml was the initial value while 1.33 µg/ml was the level after 12 wks.

#### **Correlation of initial serum zinc level and severity of acne**

Those with normal S zinc level had lower severity of score than those with low S zinc level who had a higher severity score. In treatment group mean severity index at the beginning was 60 in those with normal zinc level. Mean initial acne score was 78.87 with S zinc level of 0.472 µg/ml.

Michaelsson observed that mean score was 63.9 who had normal serum zinc level.<sup>14</sup> Ghorpade et al observed high initial severity index of 138 in those with low S zinc.<sup>15</sup>

#### **Response to treatment**

220 mg zinc twice a day orally for 3 months gave better results than placebo.

After 12 weeks of treatment 59.5% patients on zinc therapy showed more than 50% improvement in acne severity. 10.6% showed >75%, 48.9% showed 50-75%, 36.1% showed 25-50% and 4.25% patients showed less than 25% improvement. None had worsening while on zinc.

Verma et al found that in a group of 35 males and 25 females 41.37% showed 75% improvement 10.3% showed >50% and 6.85% showed 25% improvement with

oral zinc 600 mg/day for 12 weeks. 0.6.8% showed worsening.<sup>17</sup>

In another study by Ghorpade in 46 pts with 220 mg oral Zinc three times a day, 17.35% showed 61-80%, 67.3% showed 31.6% and 4.35% showed 30% improvement. 04.35% showed no significant change while 6.5% had worsening.<sup>15</sup>

Fall in severity score was 30% after 3 weeks, 40% after 6 weeks, 46% after 9 weeks and 55.45% after 12 weeks in the present study.

#### **Post treatment serum zinc level and severity of acne**

As mean S zinc level raised to 5.82 µg/ml mean acne severity score came down to 24.8 from pre-treatment score of 60. It was also observed that there was an exponential increase in improvement as the serum level of S zinc level increased. All 29 patients who attained S zinc level of 4 µg/ml had 50% or more improvement which was clinically observable.

Ghorpade et al also found that increase in S zinc level resulted in considerable clinical improvement.<sup>15</sup> Weissman et al also made a similar observation.<sup>11</sup>

A difference in response of inflamed and non inflamed lesions (comedones) was observed in this study with oral zinc. Reduction of 60.17% in inflammatory lesions was seen where as in comedones it was only 32.73%.

Ghorpade et al observed mean reduction of 55.46% in inflammatory lesions while non-inflammatory lesions (comedones) showed only 15.4 reduction.<sup>15</sup>

Verma et al observed 75-100% reduction in papules, pustules and infiltrated lesions in 12 weeks of treatment with zinc.<sup>17</sup>

#### **CONCLUSION**

In 77 acne patients pre-treatment serum zinc level ranged from 1.29–1.33 µg/ml.

Subnormal level of serum zinc was found only in 5% of acne patients. Those with low serum zinc had initial higher acne score of 78.8. Treatment with oral zinc 200 mg two times a day increased serum zinc level to an average level of 5.82 µg/ml. Mean severity score came down to 24.8 from 60 in treated group. Inflammatory lesions showed 60% reduction in severity while comedones reduced by only 23%. After 12 weeks of treatment with oral zinc 10.6% showed >75% improvement while 48.9% showed 50-75%, 36.1% showed 25-50% and 4.4% showed <25% improvement. 59.5% of patients showed >50% improvement which was clinically appreciable. Percentage of improvement in acne was directly proportional to the level of serum zinc level attained. 50% of patients were satisfied by the treatment

response. It could be concluded that increase in serum zinc level can improve acne. Response to treatment was more evident in inflammatory lesions. Oral zinc treatment with 220 mg two times a day can increase serum zinc level to appreciable levels.

Low serum zinc did not have a statistically significant association with acne vulgaris.

Oral zinc treatment can increase serum zinc level and raised serum zinc level cause response in acne severity. Oral zinc definitely has a role in treatment of acne particularly inflammatory lesions. Placebo has no role in controlling acne.

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