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Assessment of Serum Zinc level in Sudanese Patients with Chronic Tonsillitis Infection in Khartoum State

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Abstract
Background: *Tonsillitis is a disorder in which the tonsils are inflamed (sore and swollen). It is a type of pharyngitis. The factors that contribute in tonsillitis primarily revolve around the immune system. Zinc play a key role in the integrity of the immune system. Tonsils and zinc have major role in immunity and recent studies have provided evidence that the tonsils produce T lymphocytes.*
Objective: *The aim of this to evaluate the effect of serum zinc level on patients with chronic tonsillitis. And to correlate the effect of the age, duration of chronic tonsillitis infection on serum zinc level.*
Materials and Method: *This study was performed in Khartoum state at Al Doha E.N.T Specialized Hospital, during the period from February to June 2017.50 samples were collected from patients suffering from recurrent tonsillitis as test group. In addition to other 50 samples from healthy volunteer sex and age matched as control group. The patient sample were collected from al Doha ENT specialized hospital. The levels of serum zinc elements were determined in both groups by atomic absorption spectroscopy*
Result: *The levels of serum zinc were significantly lower in the recurrent tonsillitis group when compared with reference group (0.225 ± 0.081 mg/l versus 0.78± 0.21mg/l respectively) ($p \leq 0.05$) .Where as there was no statistically significant difference in the mean serum zinc between gender (male, female) in study group (0.23 ± 0.079 mg/l versus 0.21 ±0.08 mg/l) ($p = o.36$) , our study observed insignificant week positive correlation between zinc level(mg/l) and age in patient with recurrent tonsillitis ($r=0.024$, $P= 0.86$). Also insignificant weak negative correlation between zinc level (mg/l) and duration , recurrence of recurrent tonsillitis ($r= -0.016$,$P= 0.910$). ($r=-0.076$, $p=0.59$) respectively.*
Conclusion: *This study revealed that low serum zinc level depresses various subsets of immunity and predisposes the individual to recurrent and chronic tonsillitis infection.*
Keywords: *Chronic tonsillitis, infection, serum Zinc, Immune System.*

Introduction

Tonsillitis is inflammation of the tonsils, typically of rapid onset. It is a type of pharyngitis[(1)]. Symptoms include sore throat, fever, enlargement of the tonsils, trouble swallowing, and large lymph nodes around the neck.

Tonsillitis is most commonly caused by a viral infection, with about 5% to 40% of cases caused by a bacterial infection [2]. When caused by the bacterium group A streptococcus, it is referred to as strep throat[3]. Rarely bacteria such as Neisseria gonorrhea, Corynebacterium diphtheria, or Haemophilus influenza may be the cause. Typically the infection is spread between people through the air [3]. The most common way to treat it is with anti-inflammatory drugs such as ibuprofen, or if bacterial in origin, antibiotics, e.g. amoxicillin and azithromycin. Often severe and/or recurrent tonsillitis is treated by tonsillectomy[4].Recent studies have provided evidence that the tonsils produce T lymphocytes, also known as T-cells, in a manner similar to, but different from the way the thymus does [5]. Zinc too has a unique role in thymus dependent "T" cell mediated immune response. In addition to combining with thymic hormone to form the biologically active thymic hormone molecule[6], even a mild reduction of circulating zinc levels is associated with reduced T cell production of certain critical proteins called cytokines which regulate immune response and act as growth factors for the immune system[3]. Zinc is an essential trace element for humans , animals, plants and microorganisms[6]. It is fundamental for human health. It is crucial for growth and brain development and helps fight dangerous infections. Zinc is indispensable for life and plays a very important role in the essential functions. Zinc is found in nearly 300 specific enzymes [7]. A sufficient intake of zinc is important as it supports the body in immune function, Protein synthesis, Wound healing, DNA synthesis, Cell division,Normal growth and development during pregnancy, childhood, and adolescence, Tasting and smelling. Severe zinc deficiency depresses immune function[7], and even mild to moderate degrees of zinc deficiency can impair macrophage and neutrophil functions, natural killer cell activity, and complement activity [8].The body requires zinc to develop and activate T-lymphocytes [8,9]. Individuals with low zinc levels have reduced lymphocyte proliferation response to mitogens and other adverse alterations in immunity that is corrected by zinc supplem-entation[10,11]. These alterations in immune function explain why low zinc status is associated with increased susceptibility to infections[12,13].

Since there are no large reports available in the literature about the effects of zinc on recurrent and chronic tonsillitis, but recently few numbers of researches were directed to study the role of serum zinc in patients with recurrent and chronic tonsillitis. Since there is strong relation between serum zinc level and the patients immunity, especially for infection and recurrent inflammation. Hence this study is designed to highlight the relationship between serum zinc level and chronic tonsillitis.

Material and Method

Study population: A case- control hospital base study was done in the patients who attended the outpatient department of E.N.T hospital in Khartoum state with chronic tonsillitis infection were selected for this study in the period from February to July 2017. 50 cases (males and females) in the age group of 4-30 years were included in this group. The control group consisted of 50 ages and sex matched healthy individuals (age range 4-30 years) with normal physical examination and laboratory findings. None of them had a history of recurrent infection.

Inclusion criteria

Patients suffering from recurrent tonsillitis (5 or more attacks of sore throat or acute tonsillitis per year for more than 2 consecutive years. 3 or more attacks of sore throat or acute tonsillitis per year for more than 3 consecutive years).

Exclusion Criteria

Patients with diabetes, Immunodeficiency disorders, History of any micronutrient supplement containing zinc in the recent past excluded from the study.

Data collection and clinical examination

Each site used a standardized questionnaire which collected the demographic and symptom

information assessed in this study. Clinical examinations done by clinicians in above mentioned hospital. Each subject underwent thorough Ear nose and Throat examination, neck examination for enlarged Jugulodigastric lymph nodes, along with complete general physical and systemic examination.

Control subjects also underwent complete Ear, Nose, Throat and neck examination. The tonsils and oropharynx was examined for any active infection. Controls having on-going infection were excluded from the study

Sample collection

Subjects who met the criteria inclusion were then included in the study and their serum zinc level was estimated. 2 ml of venous blood was drawn from the cubital vein, collected in a plain metal free glass bottles. The blood samples were allowed to coagulate for 2 hours and after centrifugation at 5000 RPM for 10 min the serum was separated and preserved in a frozen state at 2–8°C until analysis.

Measurement of zinc

Serum zinc estimation was performed by atomic absorption spectrometry (AAS) method with Zeeman background correction (Z-2000 instrument, Hitachi, Japan). Certified reference material of human serum (Seronorm Trace Elements, Serum Level 1, 0903106, Sero AS, Norway) was used to test the accuracy of methods, in the Laboratory of National Center for Research.

Quality control

Sample representing the normal and pathological level of serum zinc, was used for assessment of the quality control .Result ±2SD of the target values of the control sera were accepted.

Statistical analysis

Data was analyzed by computer software, by using SPSS program manual master sheet. The mean and standard deviation of zinc level was obtained, and the T- test was used for the comparison of zinc levels between the test and control group, and the mean difference is significant at $p \leq 0.05$, Correlation(r) between zinc level with age, duration , recurrent of tonsillitis is considered to be statistically significant at $P \leq 0.05$.

Results

The study population comprised of 100 subjects, 50 patients with chronic tonsillitis as test group, with age (14.9 ± 6.5 years), in addition to 50 control group healthy volunteers, age and gender matched. In the present study, male account 44% (n=22), while female account 56% (n=28) from the test group.

Table (1) and figure (1) shows baseline characteristic of study group between patients and control group, which presented the mean of zinc in mg/l in study group patients with chronic tonsillitis infection and control group. (0.225 ± 0.081 mg/l) versus (0.788 ± 0.2166 mg/dl).and shows significant decrease in the mean of serum in the study group when compared with their control group. ($P \leq 0.05$).

As illustrated in table (2), there is no statistical significant difference in the mean serum zinc level between male and female in the study ((0.23 ± 0.079 mg/l versus 0.21 ±0.08 mg/l respectively), (p = o.36).

As shown in table (3), there is insignificant correlation between serum zinc level and age ($r = 0.024$, $p \geq 0.87$), and week negative correlation with both duration of tonsillitis infection ($r = -0.016$, $p \geq 0.91$), and recurrent tonslitis infection. ($r = -0.076$, $p \geq 0.6$) in the study group.

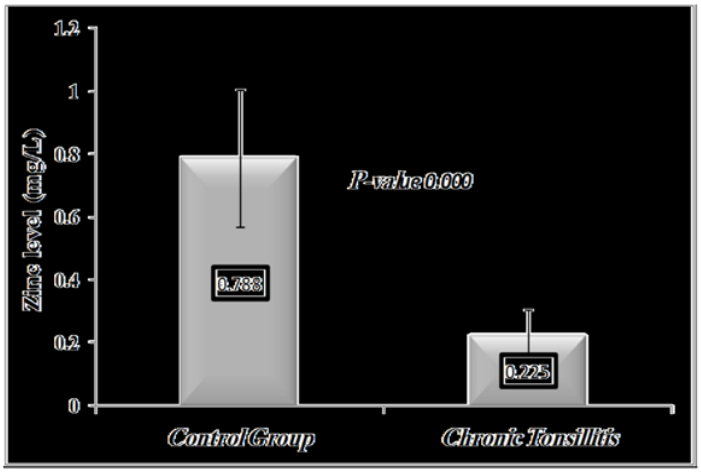

Figure (1): show A descriptive bar plot show zinc level (mg/l)in study group and control group

Table (1): comparison of serum Zinc level in the study group with their control

Groups	N	Mean±SD	p
Test group	50	0.225±0.08	
Control group	50	0.788±0.22	0.000

The difference is significant at P ≤ 0.05

Table (2): Show the mean and standard deviation of Serum zinc (mg/L) in the study group according to gender

Compared parameter	Gender	Frequency	Mean±SD	Sig(p)
Zinc level mg\dl	Male	22	0.23±0.079	0.366
	Female	28	0.21±0.082	

Table (3): show the correlation between serum zinc level and age, duration, recurrent of tonsillitis in the study group

Parameter	Statistic	Age	Duration	Recurrent of Tonsilitis
Zinc level mg\dl	Person correlation	0.024	-0.016	-0.076
	Significant (two tail)	0.867	0.910	0.599

Correlation is significant at p ≤ 0.05

Discussion

The determination of trace elements in the blood is of increasing interest in many clinical and research laboratories, due to their role in maintenance of health and development of optimal physiological function.. Zinc is a structural and functional element, and zinc deficiency may be associated with an increased risk for arthritis diseases, especially recurrent and chronic infection.

In this study there was high statistically difference in the mean serum zinc levels between the study group and their control group. Serum zinc level is significantly decreased in the test group when compared with reference one. Which accord with the study performed by Małgorzata Michalska *etal* (2016) [9]. The critical nature of zinc interaction with immune component, particularly the T-cell in the development of defense against potential pathogens continues to be at cutting edge of current research on how nutrient affect immune response. These study show that zinc is essential for normal human immune function, deficiency of which can lead to lowered immunity and recurrent infections especially of tonsillitis [5]. Furthermore the study illustrated no statistically difference in mean serum zinc level when compared between gender (male, female), which agree with the result obtained by Karthik Shamanna *et al (*2014)[5]. They found mean serum zinc levels among males in the study group was 68.55 µg/100ml and for females it was 66.86 µg/100ml. Statistically there was no difference in mean serum zinc levels among males and females (p = 0.773).

The current data demonstrated that there is a insignificant week positive correlation between zinc (mg/l) and age of patients in the study group, this result agree with the result observed by Sinha and Gabrieli 1970 [14] . Who analyzed serum zinc levels in 200 apparently healthy volunteers (100 males, 100 females) to establish their normal range. The serum zinc data obtained were analyzed for sex, race, and age. They found the values for zinc were 70 to 180 µgm /100ml, with a mean of 120±22 µgm/100ml. Men had a mean of 121±18 µgm/100ml and women 118±21 µgm/100ml. same trend was observed for age and race distribution also. They concluded that no statistical difference in mean values of serum zinc was observed between sex, race and age group. It is evident from the observations of various studies and from our study that age and sex does not significantly influence the serum zinc levels.

The present study illustrated insignificant weak negative correlation between zinc level (mg/l) and both the duration of tonsillitis infection, and the recurrent tonsillitis infection. Which is similar to the observation made by Bondestam M. et al [15] in their study on serum zinc levels in patients with undue susceptibility to infections, and low serum zinc level depresses various subsets of immunity and predisposes the individual to recurrent infections [16]. Some of the authors hypothesized that since zinc deficiency increases the susceptibility of an individual to infection, oral zinc supplementation may improve the immune status and thus reduces the frequency of infection.

Conclusion

From the results of this study it is concluded that, low serum zinc level is potent factor for the development of recurrent and chronic tonsillitis infection.

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