

Zinc Status in Children with Bronchial Asthma

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Received: 05th February, 2022; Revised: 12th April, 2022; Accepted: 28th May, 2022; Available Online: 25th June, 2022

ABSTRACT

Background: Asthma is a chronic inflammatory condition of the lung resulting in episodic airflow obstruction resulting from chronic inflammation of the conducting zone of the airways. Zinc, an essential dietary metallic, shows different parts in the leading routes and partially underwrites numerous organic enzymes' construction and purpose. It also controls ion trailers applicable to pulmonary illnesses.

Objectives: Difference in serum zinc level in asthmatic kids and the non-asthmatic kids according to the period and harshness of asthma.

Methods: A total of 200 children aged 1–12 years enrolled in this case-control study. Children were categorized into two groups, the first group included 100 patients with asthma, and the second group was the control group that included 100 healthy Children. Age and sex-matched children. Serum zinc was measured from the collected blood samples using APEL/SPECTROPHOTOMETER for both asthmatic patients and control group.

Results: A total of 59 patients (59%) were males and 41 patients (41%) were females for patients with asthma. Low serum zinc in asthmatic children (64.22 µg/dL). There is a significant difference in serum zinc between asthmatic and non-asthmatic collection, also significant differences according to severity and period of asthma.

Conclusion: Level of serum zinc is low in asthmatic kids, and differs according to severity, period of asthma in steroid usage

Keywords: Bronchial Asthma, Children, Zinc.

International Journal of Drug Delivery Technology (2022); DOI: 10.25258/ijddt.12.2.69

How to cite this article: Al-Tufaily Y, Hussein QN, Hussein KF. Zinc Status in Children with Bronchial Asthma. International Journal of Drug Delivery Technology. 2022;12(2):851-854.

Source of support: Nil.

Conflict of interest: None

INTRODUCTION

Asthma is a chronic inflammatory condition of the lung resulting in episodic airflow obstruction.¹ Asthma is a chronic inflammation of the airways “bronchi and bronchioles”, resulting in augmented contractibility of the close smooth muscles.² Leads to of shortness of breath and Wheezing. The narrowing is classically rescindable with or without management. Infrequently the airways modification.^{2,3} Wheezing with viral infections is the utmost communal appearance of asthma in initial life. Preschool children have a sporadic illness design and are often healthy between occurrences.

Wheezing is related to respiratory syncytial virus (RSV) in infancy, chiefly those episodes needful hospitalization, and elevate the danger of recurring wheezing and asthma.⁴ Numerous studies have confirmed that greater consumption of fish or fish oil throughout gestation related to a decreased atopic illness up to age 6 years, zinc with a lower danger of wheeze developing up to age 5 years.⁵⁻⁷ Children born later in big families are predictable to have a lower danger of asthma

than children born first, due to contact with their big brothers' infections.⁸ Infection can damage the airway epithelium, induce inflammation and stimulate both an immune reaction and airway hyper responsiveness.⁹ The diagnosis of asthma by will-power of recurrent incidents of airflow obstacle that are at smallest partly rescindable or airway hyper-responsiveness while eliminating other diagnoses, the diagnosis of asthma in young children is grounded on child history, examination and their reply to management.¹⁰ Zinc levels little in the serum, hair and sputum of children with asthma.¹¹ Selenium and zinc are vital components of antioxidant enzymes and are necessary to prevent the creation of the free activists that thought to exacerbate asthma.¹² The study aims to find variance in serum zinc level in asthmatic kids and non-asthmatic kids according to the period and harshness of asthma.

METHOD

A total of 200 children with age range of 1 to 12 years were enrolled in this case-control study conducted at Babil Gynecology and Children's Teaching Hospital in Hila, Iraq

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from July 2018 to January 2019. Children were categorized in two groups, the 1st group included 100 patients with asthma, and the 2nd group is the control group which included 100 healthy children. We choose age and sex matched children. Exclusion criteria: include chronic disease like (liver and kidney), malnutrition, and mixed cases of asthma and pneumonia. History was taken from children guardians for elevated body temperature, cough, difficult breathing, other respiratory symptoms, associated systemic symptoms, duration of symptoms, previous history of medical seek, medical conditions as liver, kidney or sickle cell disease, drug history, personal history of others atopic conditions, family history of asthma and atopy, history of emergency department visits or hospitalizations and history of sensitization to the specific allergen. Physical examination was done for vital signs, signs of respiratory distress, auscultatory findings, other associated physical findings and oxygen saturation. All children were sent for serum zinc. Verbal consent was obtained from child guardians. Asthma is diagnosed by the presence of recurring episodes of airflow obstruction that is responsive to bronchodilators and or steroids while excluding another diagnosis. By evaluating asthma severity, depending on patient's current symptom frequency.¹ "2 mL of venous blood is withdrawn slowly from the median cubital vein using 5 mL syringe with a gauge 23" needle". The reserved blood is released in gel tube and then put the tube in the centrifuge for 3 minutes to separate serum from blood. After that, the name was labeled and transferred to laboratory for analysis. Serum zinc was measured from the collected blood samples using APEL/SPECTROPHOTOMETER for both asthmatic patients and control group. Statistical analysis by SPSS 22, frequency and percentage, mean and SD. Chi-square was used for evaluating the connotation between variables. P-value fewer or equal to 0.05 is reflected significantly.

RESULTS

Two hundred children were evaluated in this case control study, 100 children with asthma and 100 healthy children as a control group. The 59 patients (59%) were males and 41 patients (41%) were females for patients with asthma. (64) Asthmatic patients (64%) between 1 to 5 years and 31 of them (31%) between 6 to 9 years old, while 5 (5%) between 10 to 12 years old (Table 1).

The mean of zinc is inferior in asthmatic children in contrast to controls. There is a significant difference in serum zinc values between the asthmatic and control group (Table 2).

Age equal and more than 4 years have lesser mean serum zinc than those with period of 1 (72.34 µg/dL), 2 (65.19 µg/dL) and 3 years (60.23 µg/dL), as shown in Table 3.

The mean serum zinc level was lesser in severely asthmatic children in comparison to mild (69.21 µg/dL) and moderate (60.95 µg/dL) asthmatic and there were significant differences mean of serum zinc according to mild, moderate and severe asthma (p < 0.001), as shown in Table 4.

Also, the study shows that the 16 (16%) of asthmatic children used low-medium dose inhaled steroids and 84 (84%) did not use steroids. Mean serum zinc was meaningfully lesser

in those used steroids than those not used it (65.90 µg/dL) and p-value > 0.001, that is considered statistically significant, as shown in Table 5.

The study show the mean serum zinc was lesser in those with the occurrence of charges per year of more than eight (59.11 µg/dL) in comparison with those with frequency of lower than seven (72.21 µg/dL) and there were significant differences in the values of serum zinc (p < 0.001) as shown in Table 6.

Table 1: Distribution of age and gender.

Age groups (years)	Patients			Control		
	No and %	Male	Female	No and %	Male	Female
1-5	64 (64%)	36	28	(%64)64	36	28
6-9	31 (31%)	21	10	(%31)31	21	10
10-12	5 (5%)	2	3	5(5%)	2	3
Total	100	59	41	100	59	41

Table 2: Distribution of Serum zinc levels

Groups	Serum zinc level (µg/dL)		p-value
	Mean ± SD		
Asthmatic (n=100)	64.22 ± 9.87		> 0.001
Control (n=100)	77.17 ± 10.23		

Table 3: Relationship between serum zinc and occurrence of asthma

Asthma duration (years)	No.	Zinc level	
		M ± SD	p-value
1	27	72.34 ± 9.76	> 0.001
2	20	65.19 ± 9.10	
3	13	60.23 ± 4.57	
≥4	40	59.54 ± 7.94	
Total	100	64.24 ± 9.87	

p-value ≤ 0.05 (significant).

Table 4: Association between serum zinc and severity of asthma

Asthma classification	No. of the patients	Serum zinc level (µg/dL)	
		Mean ± SD	p-value
Mild	50	69.21 ± 9.98	>0.001
Moderate	35	60.95 ± 7.42	
Severe	15	55.20 ± 1.99	
Total	100	64.21 ± 9.87	

p-value ≤ 0.05 (significant).

Table 5: Association between serum zinc and steroid use.

Use of inhaled steroid	No. of the patients	Serum zinc level (µg/dL)	
		Mean ± SD	p-value
Yes	16 (16%)	55.39 ± 1.99	>0.001
No	84 (84%)	65.90 ± 9.88	

P-value ≤ 0.05 (significant).

Table 6: Association between serum zinc and attacks of wheeze.

Attacks of wheezing /year	No. of the patients	Serum zinc level (µg/dL)	
		Mean ± SD	p-value
Group 1 ≤7	39	72.21 ± 10.28	> 0.001
Group 2 ≥8	61	59.11 ± 5.08	

p-value ≤ 0.05 (significant).

DISCUSSION

In current study, male is more disposed to for childhood asthma, this result was well-matched with other studies finished by Nasir NA *et al.*¹³ (67.7% asthmatic children were males and 32.2% were females with a male to female ratio of 2.1:1) and Szefer SJ *et al.*¹² Also, the study shows that the mean serum zinc concentration (64.22) in asthmatic patients was lower than that in control group (77.170), a significant difference in serum zinc between asthmatic and control, this result was compatible with other studies like that done by Ermis B *et al.* in Turkey¹⁴ (There were statistical differences in serum zinc, copper and ceruloplasmin levels between control and cases $p < 0.001$) and Önvural B. in turkey¹⁵ (the zinc content of serum was found to be significantly lower in asthmatic patients than in control individuals ($p < 0.01$)). This study shows a significant difference between the duration of asthma in years and serum zinc level ($p < 0.001$), which is explained by increased severity and increased use of steroids. The mean zinc lessening in children with severe asthma as in other revisions like Kakarash TA *et al.* in Iraq¹⁶ (there is a significant difference in the serum zinc relative to the severity of asthma and Khanbabaee G *et al.* in Iran¹⁷ (There was a significant association between the zinc level and severity of asthma $p < 0.001$), also show same results and this studies support our study. The mean zinc was lesser in child use steroid than not use steroid which reflects statistically meaning due to increase urinary elimination of zinc and dropping serum zinc level by steroid,¹⁸ numerous studies presented mean serum zinc level was lesser in children using steroids associated to non-users, like Yilmaz EA. *et al.*¹⁹ and Agin K.H.,²⁰ and this result goes with our study, but in difference with the discovery of AbdulWahab A. *et al.*²¹ who state that no association between serum zinc and the usage of steroid treatment in asthmatic patients. The study shows a significant difference ($p < 0.001$) in serum zinc level concerning the frequency of wheezing attacks per year. This is explained by the increasing severity of asthma that lead to low zinc level, this result in contrast to studying done by Razi CH *et al.*²² (negative correlation between the serum level of Zn and the number of Wheezing per year)

CONCLUSIONS

The level of serum zinc is low in asthmatic kids, and differs according to severity, period of asthma in steroid usage

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