



Short Report:

Study of Plasma Ascorbic Acid Levels in Wheezing Children

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Abstract:

Background: Reactive Oxygen species induced bronchial abnormalities may have important consequences in asthma, the main symptom being wheezing specially in children. Vitamin C is an important antioxidant known to quench the reactive oxygen species. A beneficial effect of fresh fruit consumption on lung function has been observed in several studies. Plasma levels Vitamin C was determined in relation to wheezing symptoms in cross sectional study. **Methods:** In a cross sectional blood samples of 50 patients attending pediatrics OPD, having wheezing and shortness of breath were analyzed for plasma Ascorbic acid level and compared with healthy controls of same age and sex. **Results:** The total number of 50 wheezing children were in the age group of 2 to 12 years with similar age matched controls. It was observed that the plasma ascorbic acid concentration in the wheezing children (0.43 – 0.12 mg/dl) was significantly decreased as compared to the normal controls (0.75 – 0.18 mg/dl) $P < 0.001$. The highly significant low levels of plasma ascorbic acid level in wheezing children was irrespective of sex and severity of symptoms. However the ascorbic acid levels were at the lower side in female and with severe symptoms. **Conclusions:** Plasma Ascorbic acid levels were significantly, decreased in the process of scavenging the reactive oxygen species. Ascorbic acid directly neutralizes free radical and protects the bronchial tissue from oxidative injury, so it can be concluded that the consumption of fruit rich in vitamin C may reduce wheezing symptoms in children.

Key Words: Wheezing; Asthma; Reactive oxygen species; Ascorbic acid

Introduction:

Wheezing, the most common symptom of Asthma is usually described as a musical sound that is usually heard when child takes a breath out and sometimes also when he breaths in. This sound is caused by an obstruction to the regular flow of air from the lungs and is usually caused by inflammation resulting due to free radicals. Airway inflammation is important characteristics of asthma and the metabolism of oxygen radical is enhanced in symptomatic asthma in relation to clinical disease activity.¹ Eosinophils, alveolar macrophages and neutrophils

from asthmatic patients produce more oxygen species than do those from normal subject.²

Vitamin C is a potent antioxidant known to protect from oxidative injury. Loading cells with vitamin C reduces oxidative cell death, inhibits Fas ligand induced apoptosis and confers genomic protection through the quenching of intracellular reactive oxygen species.³

Consuming fruits rich in Vitamin C may reduce wheezing symptoms in childhood.⁴ Ascorbic acid is the most abundant water soluble antioxidant in lung tissue that directly neutralizes free radicals and is a part of Glutathione peroxidase pathway for repairing oxidative damage to the lipid membrane.⁵ In our present study we tried to find out plasma Ascorbic acid level in wheezing children which reflect their alveolar level.⁶

Materials and Methods:

Present study was carried out in Dept. of Biochemistry. Blood samples of 50 (26 males, 24 females) children who came to pediatrics OPD with wheezing and shortness of breath were included in the study. Blood sample was collected and analyzed for plasma Ascorbic acid level photometrically using Backeman's spectrophotometer.⁷ Out of total 50 children 18 were having severe symptoms. Equal number of healthy age and sex matched controls (28 males, 22 females) were selected for comparison.

Results:

The total number of 50 wheezing children were in the age group of 2 to 12 years with similar age matched controls. It was observed that the plasma ascorbic acid concentration in the wheezing children (0.43 ± 0.12 mg/dl) was significantly low as compared to the normal controls (0.75 ± 0.18 mg/dl) $P < 0.001$. The highly significant low levels of plasma ascorbic acid level in wheezing children was irrespective of sex and severity of symptoms.

Normal controls (n=50)	Wheezing children(n=50)
0.75±0.18	0.43±0.12*
*p<0.001	

Table 2: Sex wise distribution of plasma Ascorbic acid level in wheezing children in mg/dl

Sex	Normal control	Wheezing children
Male	0.78±0.21	0.44±0.10*
Female	0.73±0.19	0.42±0.13*

*p<0.001

Table 3: Severity wise Distribution of Plasma ascorbic acid level in wheezing children in mg/dl.

Severity	Normal controls	Wheezing children
Mild	0.75±0.18	0.44±0.17*
Severe		0.42±0.09*

*p<0.001

Discussion:

Wheezing and shortness of breath are main symptoms of bronchial asthma.⁸ Asthmatics showed increased superoxide generation from leucocytes, as well as increased lipid peroxidation product, indicating increased oxidative stress.² Ascorbic acid an important antioxidant which directly neutralizes free radical, thus it is continuously utilized to maintain the redox state of lung in asthma.⁵ Hatch et al⁹ suggested that ascorbic acid is the major antioxidant substance present in the airway surface lining of the lung, and may protect against endogenous as well as exogenous oxidants. Our present finding of low ascorbic acid in wheezing children could be attributed to its normal physiological function, elevated utilization to overcome continuous generation of oxidant radical and also to neutralize the exogenous oxidant. It has been suggested that ascorbic acid deficiency may be either an underlying factor in the pathophysiology of asthma or a response to asthmatic airways inflammation.¹⁰ Our findings of low ascorbic acid in wheezing children is in agreement with the earlier reports of Akinkube et al¹¹ who attributed such kind of lowering in ascorbic acid level in plasma to its normal physiological function i.e., its utilization in the maintenance of defense mechanism, tissue integrity and replacement and healing process. Destruction of respiratory mucous membrane during common cold and resulting reduction of the tissue ascorbic acid, may further delay in the healing of mucous membrane surface leading to prolonged symptoms of asthma.¹² The study of Kalayci O et al¹³ shows that antioxidant vitamins are decreased in the sera of asthmatic patients even during the asymptomatic periods of the disease, and thus this decrease is not totally dependent on the increased oxidative stress as reflected by lipid peroxidation products. Based on this findings, it can be suggested that to some extent decrease in the level of ascorbic acid may be due to increase utilization for the formation of Prostaglandin E2, a bronchodilator and not solely due to scavenging of free radicals.¹⁴ Vitamin C may have protective effect on the airway hyper reactivity in some patients with exercise induced asthma. Important role of ascorbic acid in the maintenance of pulmonary function has been reported by McNally et al¹⁵ who showed that administration of ascorbic acid caused pulmonary dilation and urinary excretion of the vitamin during the acute episode of asthma was significantly reduced. This would suggest that, during the asthmatic episodes, ascorbic acid was being actively metabolized probably at the bronchial mucosal surface, thus reducing the plasma ascorbic acid content. It has been also found that consumption of citrus fruit rich in vitamin C has a protective role in wheezing children.⁴ Thus the continuous supply of vitamin C to the wheezing children might be considered helpful.

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