



Original Article

Effects of Supplementation of Vitamin A on Some Aspects of Lung Functions in Elderly Women of a Rural Area of Bangladesh

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Abstract

The study was carried out to observe the changes in lung functions in the elderly women both before and two months after supplementation of vitamin A. For this purpose, a total number of 30 apparently healthy elderly female subjects with age ranging from 40-60 years were selected from a rural area of Bangladesh. They were studied both before and two months after supplementation of vitamin A at a dose of 10,000 IU daily. Sex matched 30 apparently healthy adult subjects with age ranging from 25-40 years were taken as control. Pulmonary functions were assessed by measuring FVC, FEV₁, FEV₁/FVC% and PEFR by VM1 ventilometer on standing position.

The mean measured pulmonary variables such as FVC, FEV₁, FEV₁/FVC% and PEFR were lower than those of their predicted values both in the experimental and control groups. The mean measured values of all the pulmonary variables were significantly lower in the elderly subjects compared with those of the younger age group. Again, the FVC, FEV₁, FEV₁/FVC% and PEFR were significantly increased in the same group of subjects after supplementation of vitamin A. But not up to the level of those of younger subjects.

The result of the study reveals that pulmonary functions become lower in the elderly subject's improvement of which occurs after supplementation of vitamin A. These lower pulmonary functions in the elderly subjects of the present study group is likely to be due to low dietary intake of vitamin A as pulmonary functions were improved after supplementation of vitamin A.

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Introduction

Normal lung function gradually declines as a consequence of age. This decrease in lung function usually associated with presence of respiratory symptoms¹. Reduction in lung function in the

elderly people may occur due to disturbances in the balance of oxidants and antioxidants in the lung¹. Elderly individuals are particularly vulnerable to low levels of antioxidant vitamins as exposure to free radicals is increased with advancing age². Antioxidant vitamins, such as,

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vitamin A, C, and E may have some role in preventing the reduction of lung function in elderly peoples^{2,3}.

Lung functions can be assessed by measuring FVC, FEV₁, FEV₁/FVC% and PEFR^{4,5}. Different workers studied FVC, FEV₁, FEV₁/FVC% and PEFR in healthy subjects and observed lower values of all these in the elderly subjects in comparison to young adults^{6,10}. Again, some workers studied these pulmonary variables after taking vitamin A and observed significantly increased values of all these in the elderly subjects^{1,2,3,11,12,13}.

Exposures to free radicals are more in the elderly people and the pulmonary diseases are important causes of disability and death in old age. Imbalance between oxidants and antioxidants in the lung causes oxidative damage to lung tissue. Green vegetables and different fruits containing antioxidant vitamins (Vit. A, C and E) are abundant in our country. Different antioxidant vitamin preparations are also available. Though some peoples are taking antioxidant vitamins for different reasons, there is no available data in our country regarding any changes in lung function in the elderly people after supplementation of antioxidant vitamin like vitamin A. Therefore, the present work has been designed to study the lung functions by measuring FVC, FEV₁, FEV₁/FVC% and PEFR in the elderly female subjects both before and two months after supplementation of vitamin A.

Materials and Methods

In the present work, total numbers of 30 apparently healthy elderly female subjects with age ranging from 40-60 years were studied. All the subjects belonged to low socioeconomic class and residing in a rural area of Bangladesh. Sex matched 30 apparently healthy adult subjects with age ranging from 25-40 years were selected for control from the same area.

Subjects suffering from respiratory tract diseases, heart failure, renal failure and diabetes mellitus

were excluded from the study. All the subjects were non-smokers and were likely to be free from air pollution.

The subjects were divided into two groups. Group A (control) consisted of 30 apparently healthy adult subjects and Group B (experimental) consisted of 30 apparently healthy elderly subjects. The experimental subjects were studied both before and two months after supplementation of vitamin A at a dose of 10,000 IU/day.

The pulmonary variables such as FVC, FEV₁, FEV₁/FVC% and PEFR were measured by VMI ventilometer in standing position. Statistical analysis were done by using unpaired Student's 't' test between two groups and paired Student's 't' test within same group.

Results

The mean of age, height, weight and body surface area of both control and experimental subjects are shown in table -I. The results of pulmonary function tests were expressed as mean measured and predicted values with standard error and percentage of deviation from predicted values (Table II & III). The mean measured FVC, FEV₁, FEV₁/FVC% and PEFR were significantly lower (P<0.001) in group B₁ than those group A. Again, the mean measured values of all these pulmonary variables were significantly increased (P<0.001) in group B₂ than those of group B₁, but not up to the values of group A.

Discussion

In the present study, the mean measured values of FVC, FEV₁, FEV₁/FVC% and PEFR both in control and experimental group before supplementation of vitamin A were almost similar to those reported by other workers of our country and also of regional countries^{6,9,10,14}. However, all these values were slightly lower than those of western countries^{7,15}. Moreover, all the mean measured values of pulmonary variables in the present study were also lower than those of their predicted values. It has been suggested that poor

nutritional status lead to poor growth of muscles and development of lungs and consequently decreased pulmonary volumes and capacities¹⁶. The subjects of the present study belonged to low socioeconomic class and, therefore, are most likely to have poor nutrition.

The mean measured FVC, FEV₁, FEV₁/FVC% and PEFR were significantly lower ($P < 0.001$) in the elderly subjects (experimental group) before supplementation of vitamin A than those of control group. These findings are in agreement with those reported by some other workers of different countries^{8, 9, 10, 16}. Again, the lower values of all these pulmonary variables were significantly increased ($P < 0.001$) after supplementation of vitamin A in the same group of elderly subjects. In consistent with the present findings, some workers of different countries also made similar observations^{11, 12, 13, 18}.

Different investigators made various suggestions about the causes of decreased lung function in elderly people. It has been suggested that the lung exists in an oxygen-rich environment delicately balanced between the toxic effects of oxidants and the protective effects of various antioxidants, and disequilibrium in this balance of oxidants and antioxidants can initiate a series of pathophysiologic events in the lung, which might cause progressive loss of pulmonary function^{1, 3}. It has also been suggested that elderly individuals are particularly vulnerable to reduced lung function as exposure to free radicals are increased with advancing age². Tobacco smoking,

respiratory tract infections in early life, diet containing low fruits, vegetables, fish and meat, air pollution, accumulation of free peroxide radicals during the process of aging, oxidation of alpha antitrypsin also suggested as important causes of decreased lung function in elderly people^{1, 17}. Again, improvement of lung functions in the elderly people after supplementation of vitamin A might be due to scavenging of endogenous and / or environmental oxidants by vitamin A^{1, 3}. On the other hand, some investigators suggested that vitamin A supplementation might help to improve lung function by preventing free radical-induced lipid per oxidation and also by help in repairing of damaged lung tissues through the synthesis of collagen¹³. Again, it has been suggested that beta-carotene is a quencher of singlet oxygen and react directly with the peroxy radical involved in lipid per oxidation of lung tissue¹³.

In the present study, the lower pulmonary volumes and capacities in the elderly subjects is likely to be due to low dietary intake of vitamin A as all the subjects of this study group had poor knowledge about food values of various dietary constituents and were of low socioeconomic class. This is further supported by the evidence that after supplementation of vitamin A pulmonary functions were increased in this group of subject. However, we cannot comment on other suggestions made by different investigators, as we have not studied them.

Table-I: The mean age, height, weight and body surface area in different age groups of subjects.

Group	n	Age (Year)	Height (cm)	Weight (Kg)	Body surface area (m ²)
A (control)	30	32 (25-40)	153 (140-162)	46 (36-58)	1.43 (1.25-1.62)
B (Experimental)	30	52 (40-60)	149 (140-162)	47 (38-58)	1.40 (1.28-1.60)

n = total number of subjects

Figure in parenthesis indicate ranges

Table-II: The mean (\pm SE) of measured and predicted values and their percent deviations from predicted values of FVC and FEV₁ in different groups.

Group	FVC			FEV ₁		
	Measured value L/min	Predicted value L/min	% Deviation from predicted value	Measured value L/min	Predicted value L/min	% Deviation from predicted value
A	2.68 \pm 0.07	3.25 \pm 0.07	-18	2.19 \pm 0.06	2.85 \pm 0.05	-23
B ₁	1.93 \pm 0.04***	2.47 \pm 0.04	-22	1.46 \pm 0.04***	2.20 \pm 0.03	-34
B ₂	2.01 \pm 0.03***	2.47 \pm 0.04	-18	1.58 \pm 0.03***	2.20 \pm 0.03	-28

*** Significant (P<0.001)

Group A = Control (Healthy adult subjects)

Group B₁ = Experimental (Healthy elderly subjects) before supplementation of vit AGroup B₂ = Experimental (Healthy elderly subjects) after supplementation of vit A**Table-III:** The mean (\pm SE) of measured and predicted values and their percent deviation from predicted values of FEV₁/FVC% and PEFR in different groups.

Group	FEV ₁ /FVC%			PEFR		
	Measured value L/min	Predicted value L/min	% Deviation from predicted value	Measured value L/min	Predicted value L/min	% Deviation from predicted value
A	81 \pm 0.50	87 \pm 0.37	-7	390 \pm 5.90	476 \pm 2.12	-18
B ₁	77 \pm 1.29***	89 \pm 0.51	-14	302 \pm 5.29***	380 \pm 2.41	-21
B ₂	80 \pm 1.07***	89 \pm 0.51	-11	324 \pm 5.43***	380 \pm 2.41	-16

*** Significant (P<0.001)

Group A = Control (Healthy adult subjects)

Group B₁ = Experimental (Healthy elderly subjects) before supplementation of vit AGroup B₂ = Experimental (Healthy elderly subjects) after supplementation of vit. A**References:**

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