

## Variation in Vitamin E Levels between Day and Night Shift Nursing Staff of Indoor Patient Wards

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### Abstract

**Context:** The only staffs that are present always in any hospital, with or without the presence of other staff, are the nursing staff. Obviously, nursing staff are the backbones of hospitals. To perform duties properly, they should maintain physical and mental wellbeing, because any deterioration of their health would, in turn, affect the health of the patients they are attending to. So, assessment of the health of nursing staff is essential. **Aims:** Assessment of health of nursing staff can be done in many ways, for example, by measurement of status of the important antioxidant, vitamin E. So, aim of the work described here was to evaluate whether there was any change in serum vitamin E levels in nursing staff of different shifts, and if so, to determine the degree of significance in the change. **Settings and Design:** The study included sixteen nursing staff from the day shift, and age and sex-matched sixteen staff from the night shift, from the indoor patient departments. **Methods and Material:** Serum vitamin E levels were assayed in all subjects. **Statistical analysis used:** Comparison of two groups was undertaken using SPSS. **Results:** Serum vitamin E levels were significantly decreased in night shift nursing staff with respect to those of day shift. **Conclusions:** The results suggest that decrease of vitamin E levels in serum may be related to night shift duty and stress. Vitamin E may be considered as a useful biomarker of antioxidant status in night shift duty and stress, and can help in monitoring and possible remedial strategy.

**Keywords:** Nursing staff; stress; vitamin E.

### Introduction

Nursing staff are the backbone of hospitals who are present always, regardless of the presence or absence of other staff. Naturally, the health of the nursing staff affects their performance and therefore, indirectly, the health of the patients they attend to. Health of the staff can be assessed in various ways, and vitamin E is a very important parameter in this regard.

Of many components, vitamin E has commanded the most interest because of its availability, overall health impact and central role in preventing oxidation at the cellular level [1]. Oxidative stress can result from or be enhanced by a large variety of conditions including strenuous physical activities. While many enzymes and compounds are involved in protecting cells from the adverse effects of oxidative stress, vitamin E occupies an important and unique position in the overall antioxidant defense [2]. Vitamin E, a potent peroxyl radical scavenger, is a chain-breaking antioxidant that prevents the propagation of free radical damage in biological membranes [3].

Some studies have showed unequivocal or no significant relationship between vitamin E levels and oxidative stress [4,5]. Also there is a paucity of data available in the literature regarding serum vitamin E levels in nursing staff, particularly from

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our country. So, the aim of the work described here was to evaluate whether oxidative stress was accompanied by change in serum vitamin E levels, and if so, to determine the degree of significance in the change.

### Subjects and Methods

Duration of the present study was nine months. Before enrollment of the subjects, all the participants gave their written consent to take part in this investigation. The study included sixteen nursing staff from the day shift, and age and sex-matched sixteen staff from the night shift, from the indoor patient departments. Complete history and physical examination of all subjects were undertaken. Exclusion criteria included smokers, those suffering from systemic or other diseases affecting immune system or any malignancy, febrile illness, kidney and liver dysfunction, participants who had cholestasis, unusual dietary habits, acute or chronic infections and malabsorptive syndromes. Lastly, subjects having oral supplements or drugs-containing vitamin E during the past six months and topical application of vitamin E during the preceding one month were excluded. The study was approved by the Institutional Ethical Committee.

Venous blood sample were collected from all subjects. All samples were coded and assayed in a blind fashion by an investigator who was unaware of the participant's group. Serum vitamin E levels were assayed using Hahim and Schuttringer's method [6]. Comparison of the groups was undertaken. Statistical analysis of data was performed using SPSS (Statistical Package for Social Sciences) software version 20 (IBM, New York, USA), and inferences were drawn. A value of  $p < 0.05$  was considered to be statistically significant.

### Results

The age of patients ranged from 31 to 57 years.

Confidence interval: The mean of Group One minus Group Two equals 121.00 95% confidence interval of this difference: From 27.34 to 214.66 Intermediate values used in calculations:

$$t = 2.6385$$

$$df = 30$$

$$\text{standard error of difference} = 45.860$$

Serum vitamin E levels were significantly decreased in group two with respect to those of group one.

**Table 1:** Serum levels of vitamin E (in micrograms/dl) in the subjects

| Group | One<br>(day shift) | Two<br>(night shift) |
|-------|--------------------|----------------------|
| Mean  | 1284.00            | 1163.00              |
| SD    | 149.00             | 107.00               |
| SEM   | 37.25              | 26.75                |
| N     | 16                 | 16                   |

Serum vitamin E levels were significantly decreased in group two with respect to those of group one.

### Discussion

Stressful stimuli can disrupt the physiological homeostasis, and inability to cope with such aversive inputs has widespread deleterious effects on the biological system [7].

Exposure to such stressors can evoke responses like anorexia, hypertension, etc [8].

Obviously, stress affects the performance of humans. Free radicals are produced in the central nervous system during restraint stress, and the free radicals might be responsible for such stress-induced behavior [9]. Stress itself causes neurotoxic damage through reactive radical species and in this way could affect synaptic plasticity and dendritic morphology [10]. A causal relationship has been found between cellular oxidative stress, regulation of anxiety and emotional stress [11].

As free radicals are scavenged by antioxidants, the role of antioxidants like vitamin E are important in stress pathophysiology. The major function, if not the only function, of vitamin E, is that of a peroxyl radical scavenger. The importance of this function is to maintain the integrity of long-chain polyunsaturated fatty acids in the membranes of cells and thus maintain their bioactivity [12]. Tocopherol then breaks and terminates the chain (and is itself converted to tocopheroxyl radical, which is relatively stable), thus breaking the chain reaction. The tocopheroxyl radical reacts with another peroxyl radical to form inactive products [13]. Vitamin E has been shown to be beneficial by its antioxidant role in various diseases [14,15].

Levels of vitamin E might be important in stress, and therefore indirectly, in performance. In our study serum vitamin E levels were significantly decreased in nurses and staff of night shift (group two) with respect to those of day shift (group one).

Restraint stress has been found to reduce levels of antioxidants like superoxide dismutase and catalase and increase levels of free radical-induced lipid peroxidation products like

malondialdehyde [16,17]. It is well documented that antioxidants can remove the reactive oxygen species and reactive nitrogen species through scavenging radicals and suppressing the oxidative stress pathway, which further protect against neuronal damage caused oxidative or nitrosative stress sources in the brain, hopefully resulting in remission of depression or anxiety symptoms [18].

We hypothesized that due to increased stress at night, the nurses and staff of night shift had decreased antioxidant levels compared to their counterpart staff of day shift.

This study has limitations that must be considered. The number of subjects in the study groups was not large. Thus, care must be taken in extrapolating the present findings to other populations. Hence, results of our study might not reflect the true picture of the population as a whole. Probably, a multicentric study on a larger population would be better in revealing the actual statistics. Also, subjects were taking a number of medications (other than those mentioned in our exclusion criteria) for various reasons not related to our study. However, these drugs do not affect serum vitamin E levels.

Despite these limitations, we believe that our study points towards using vitamin E as an important, promising antioxidant marker for stress. As our findings point to a decrease in the antioxidant vitamin E, the problem of oxidative stress in night shift should also be further investigated in a larger number of patients, and other markers of oxidative stress and antioxidants should be assessed.

The results of our study suggest that depletion of vitamin E levels in serum may be related to night shift duty and stress. Vitamin E may be considered as a helpful biomarker of antioxidant status in night shift duty and stress and might be used for monitoring and possible remedial strategy measures.

## Conclusion

The results of our study suggest that depletion of vitamin E levels in serum may be related to night shift duty and stress. Vitamin E may be considered as a helpful biomarker of antioxidant status in night shift duty and stress and might be used for monitoring and possible remedial strategy measures.

## Key Messages

Assessment of health of nursing staff is essential. Serum vitamin E was assayed and found significantly decreased in sixteen nursing staff from day shift compared to night shift. This may be related to stress. Vitamin E may be a useful biomarker of antioxidant status for night shift duty and stress.

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