

**Original research article:**

## Physical fitness and DHEA levels in normal ageing

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### ABSTRACT

**BACKGROUND:** The function of the hormone DHEA in biological aging has been proved through numerous studies. Its levels are also affected by factors like gender, physical activity etc<sup>1</sup>. Studies have shown that the levels of hormone DHEA increases in response to exercise in healthy individuals<sup>2</sup>. Hence, physical fitness may have an effect on levels of DHEA and many other aspects of aging.

**AIM:** To assess the physical fitness level and estimate the levels of DHEA in subjects of the same age group

**MATERIALS AND METHODS:** A cross sectional comparative study of ninety healthy male participants between 70 to 80 years of age was done. They were divided into two groups based on their physical fitness levels assessed by means of - The Senior Fitness Test Items. The total study population consisting of 90 samples were divided into two groups based on physical fitness - Group I (physically active or fit - 57 subjects) and Group II (physically inactive - 33 subjects). Serum levels of DHEA were estimated for all the participants by ELISA method.

**RESULTS:** The mean serum DHEA levels of both the groups were compared. A decrease was observed in the mean serum DHEA levels in Group II individuals ( $74.4 \pm 26$ ) compared with Group I individuals ( $150.9 \pm 37$ ) difference was statistically significant at p value  $<0.05$ .

**CONCLUSION:** Elderly subjects who were physically active (Group I) had significantly higher levels of serum DHEA compared to subjects of the same age group.

**KEYWORDS:** DHEA- Dehydroepiandrosterone sulphate

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### INTRODUCTION

DHEA (DEHYDROEPIANDROSTERONE) is a steroid hormone, primarily of adrenal source, and is observed in comparatively high amounts in circulation. It is a major source from which the sex steroids are synthesized. Hence DHEAS is called "The Mother Steroid". A progressive decrease in circulating levels of DHEA with age has long been recognized, with peak levels occurring between the third and fourth decades of life and decreasing progressively thereafter by about 90% over the age of 85. The decline in circulating DHEA levels occurring with aging has been linked to the gradually increasing prevalence of atherosclerosis, obesity, and diabetes in elderly individuals<sup>3</sup>.

Normal blood levels of DHEA sulfate can differ by sex and age {table 1}. DHEA is present as free and sulphated form (DHEA-S) in the plasma. DHEA-S is a stable compound and so, operates as the chief source of DHEA.

The function of DHEAS in biological aging has been proved through numerous studies. DHEA and DHEAS – has many intrinsic effects like anti aging, anti obesity, anti atherogenic and neuroprotective effects. Though DHEAS levels peak at around 25 years of age and starts declining with increase in age, it is subject to wide inter-individual variations<sup>4</sup>. Its levels are also affected by factors like gender, physical activity etc. Studies have shown that the levels of hormone DHEA

increases in response to exercise in healthy individuals<sup>5</sup>. Recent analysis has shown that both higher levels of DHEA and physical fitness offers a protective influence on vascular endothelium in older individuals who do not have any other known risk factors<sup>6</sup>.

Throughout history, the importance of physical fitness has been acknowledged as an important component of life, along with work, play, and social, religious, and cultural activities. The early Greeks knew the importance of a sound body and a sound mind. Hippocrates, the father of medicine, inferred that all parts of the body if used in moderation develop and age slowly, but if they are left unused they become defective in growth, susceptible to disease and age quickly. A person who is physically fit has an enhanced functional capacity which allows for a good quality of life. Physical fitness is defined as *having the physiologic capacity to perform normal everyday activities safely and independently without undue fatigue*<sup>7</sup>.

Physical activity enhances antioxidant levels, reduces oxidative stress and improves the vascular endothelial function. With this background, the present study was undertaken taken in an effort to investigate whether physical fitness has an effect on DHEA-S levels in normal aged individuals.

#### **MATERIALS AND METHODS**

After the institutional ethical approval the present study was conducted in the Department of Physiology, Kilpauk Medical College, Chennai. After obtaining informed consent, ninety healthy male subjects aged between 70 and 80 years were selected randomly from the urban population of Chennai city. Subjects with a history of hypercholesterolemia, Type 2 Diabetes, Ischemic heart disease, Major cardiac arrhythmia (atrial fibrillation, second degree heart block), valvular heart disease excluding mild valvular insufficiency,

cerebrovascular accidents, chronic respiratory illness, neurological disease, thyroid disease or other endocrine disorders, psychiatric illness and substance abuse were excluded from the study.

We explained the scope and details of the study to the subjects. The subjects underwent routine clinical examination and biochemical tests to satisfy the selection criteria. The selected subjects underwent tests for assessment of physical fitness as per - The Senior Fitness Test Items (International Council for Active Aging). (fig 1)

Based on the performance of the subjects in the tests they were divided into two groups

- i) Group I (physically active or fit - 57 subjects)
- ii) Group II (physically inactive - 33 subjects)

Fasting blood samples of all the ninety subjects were obtained for estimation of DHEA-S. Fasting blood samples were obtained under strict aseptic precautions, by venepuncture of the antecubital vein. The serum was separated and stored in the deep freezer at -20<sup>0</sup> C. The serum levels of DHEA-S was measured using ELISA kits viz. serum Dehydroepiandrosterone sulphate estimation supplied by Cal biotech Inc (California).

Study Design : Cross sectional study

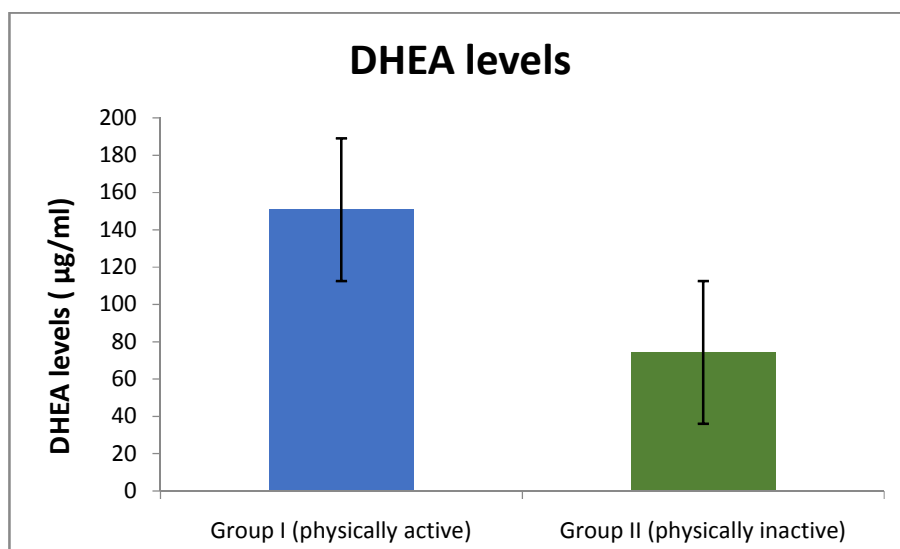
Statistical analysis: The parameters that were measured in this study were recorded and statistically analyzed using Microsoft office Excel and SPSS 7.0. Statistical analysis was done using unpaired t test. Significance level was fixed at  $p < 0.05$ .

#### **RESULTS**

The total study population consisting of 90 samples were divided into two groups based on physical fitness. The mean serum DHEA levels of both the groups were compared.

In our study a decrease in the mean serum DHEA levels was observed in the physically inactive (Group II) individuals ( $74.4 \pm 26$ ) compared with

the physically active Group I individuals ( $150.9 \pm 37$ ) difference was statistically significant at p value  $<0.05$ . (graph 1)



Graph 1: comparison of DHEA levels ( $\mu\text{g/dl}$ ) in the physically active (Group I) physically inactive (Group II).

## DISCUSSION

In our study population of 90 urban dwelling elderly men (mean age  $74 \pm 3$  years), we observed that higher levels of physical fitness were associated with significantly higher DHEA-S levels. Our finding, that serum DHEA-S levels were significantly higher in physically active individuals was consistent with previous studies like that of Ravaglia *et al*<sup>11</sup> whodescribed that, the older men with higher functional fitness had the maximum levels of DHEA, and persons with reduced functional fitness had minimum levels of DHEA. This is also evidenced by studies of Carla H. van Gils and Petra H.M. Peeters, et al that higher degrees of physical activity are strongly related to high levels of DHEA. Along these lines, DHEAS owns a favourable interrelation with physical fitness<sup>12</sup>.

The study of Straub et al, reported a positive association between physical activity and plasma levels of DHEAS in women with peripheral

obesity. Thus, the effect of physical activity on DHEAS levels is unclear and further data are required to unravel the role of DHEAS in relation to physical activity<sup>13</sup>.

Our study also gives emphasis to the importance of regular physical activity in elderly individuals. Inculcating a healthy lifestyle comprising of routine physical activities such as walking, gardening and household jobs can create an avenue for improved physical and mental wellbeing. Furthermore, in our study physical activity was only measured at one point in time, which may not be the etiologically most relevant period. Another limitation of the physical activity data is the lack of information on the duration and frequency of occupational activity. From the results of our study, it can be documented that regular physical activity has a favourable effect on improving the levels of DHEA which in turn has various beneficial effects. The present study highlights the favourable effect of physical fitness in elderly individuals. This study

might be a forerunner for further interventional supplementation can be investigated. studies where the effects of DHEA

<b>Age</b>	<b>Male (µg/dL)</b>	<b>Female (µg/dL)</b>
<b>20-24 y</b>	<b>211.0-492.0</b>	<b>148.0-407.0</b>
<b>25-34 y</b>	<b>160.0-449.0</b>	<b>98.8-340.0</b>
<b>35-44 y</b>	<b>88.9-427.0</b>	<b>60.9-337.0</b>
<b>45-54 y</b>	<b>44.3-331.0</b>	<b>35.4-256.0</b>
<b>55-64 y</b>	<b>51.7-295.0</b>	<b>18.9-205.0</b>
<b>65-74 y</b>	<b>33.6-249.0</b>	<b>9.4-246.0</b>
<b>&gt;74 y</b>	<b>16.2-123.0</b>	<b>12.0-154.0</b>

Table 1: Typical normal ranges of DHEA for males and females (Guber HA, Farag AF et al 2006).

	Group I	Group II	
	Mean		P value
DHEA levels (µg/dL)	150.9 ± 37	74.4 ± 26	0.00* (approx.)

\*highly significant

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Table 2: DHEA levels (µg/dl) in the physically active (Group I) physically inactive (Group II).

**Normal Range of Scores - Men**

	60-64	65-69	70-74	75-79	80-84	85-89	90-94
Chair stand (no. of stands)	14- 19	12 - 18	12 - 17	11 - 17	10 - 15	8 - 14	7 - 12
Arm Curl (no. of reps)	16- 22	15 - 21	14 - 21	13 - 19	13 - 19	11 - 17	10 - 14
6-Min Walk (no. of yds)	610 - 735	560 - 700	545 - 680	470 - 640	445 - 605	380 - 570	305 - 500
2-Min Step (no. of steps)	87 - 115	86 - 116	80 - 110	73 - 109	71 - 103	59 - 91	52 - 86
Chair Sit-&-Reach (inches +/-)	-2.5 - +4.0	-3.0 - +3.0	-3.5 - +2.5	-4.0 - +2.0	-5.5 - +1.5	-5.5 - +0.5	-6.5 - -0.5
Back Scratch (inches +/-)	-6.5 - +0.0	-7.5 - -1.0	-8.0 - -1.0	-9.0 - -2.0	-9.5 - -2.0	-10.0 - -3.0	-10.5 - -4.0
8-Ft Up-&-Go (seconds)	5.6 - 3.8	5.7 - 4.3	6.0 - 4.2	7.2 - 4.6	7.6 - 5.2	8.9 - 5.3	10.0 - 6.2

Fig 1: Normal range of scores for men. Those scoring above this range would be considered above average for their age and those below the range as below average. Rikli, R. & Jones, C.J. (2001). Senior Fitness Test Manual. Champaign, IL: Human Kinetics<sup>10</sup>

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