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RESEARCH ARTICLE

ALTERATION IN TEMPORAL PATTERNS OF LIPID PEROXIDATION PRODUCTS AND ANTIOXIDANTS DURING DISTURBED SLEEP IN SPRINTERS

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The present study aims to investigate the alteration in temporal patterns of lipid peroxidation products and antioxidants disturbed sleep in sprinters around 20 sprinters as subjects of same age group (18 to 25) were selected Ten sprinters were kept as control group (Group I) and 10 sprinters were allowed for a (24 hrs) disturbed sleep (Group II). At the end of experimental period of one night. Minimal amounts (5ml) of the blood were collected at 4 hrs time intervals (00:00, 04:00, 08:00, 12:00, 16:00, 20:00 hrs). The selected biochemical variables adopted to assay was tested. The values obtained were plotted against different time period in 'cosinorwin' programme. The characteristics of temporal patterns such as acrophase, amplitude, mesor, r- values and P-value were also obtained from "cosinorwin" software programme. The characteristics of the temporal patterns of acrophase, amplitude, mesor and r-value of all parameters studied were found to be desynchronized in group II which may be due to altered sleep patterns.

Key words: Circadian Rhythms, Sprinters, Speed, Strength, Oxidant, Antioxidants, SCN, Disturbed Sleep, Temporal Patterns.

INTRODUCTION

The endogenous circadian rhythm governs most aspects of physiological, behavioral and biochemical processes in mammals including body temperature levels, endocrine functions and cytological processes including cell divisions (Ebling, 1996; Gillette and Tischkau, 1999). The suprachaismatic nucleus (SCN) constitutes the circadian pacemaker in mammals including humans (Mrosovsky, 1996). The intrinsic pacemaker activity of the SCN is autonomous in nature and is entrained to the 24 hrs period by environmental factors of which the light dark cycles are most effective (Tischkau *et al.,* 2002). The catalase of rat brain peaks in early photo phase (Agapito *et al.,* 1999). The circadian variation of SOD in blood (Luo *et al.,* 1997). In the present study, the authors have carried out experiments on the influence of disturbed sleep on the temporal patterns of TBARS and enzymatic antioxidants such as Alteration in Temporal patterns of lipid peroxidation products and Antioxident during disturbed sleep in sprinters SOD and CAT sprinters.

MATERIAL AND METHODOLOGY

Twenty male sprinters volunteers to be the subjects who are all practicing sprinting events regularly from the Department of Physical Education and sports science, Annamalai University were selected for this study. Their age ranged between 18 to 25 years. Ten sprinters were kept as control group (Group I) and 10 sprinters were allowed for a one night disturbed sleep (Group II).

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At the end of experimental period of one night. Minimal amount (5ml) of the blood were collected at 4h time intervals (00:00, 04:00, 08:00, 12:00, 16:00, 20:00 hrs). The selected biochemical variables adopted to assay of test (1). Thiobarbituric acid reactive substances (TBARS-Plasma) (Nichans and Samuelson, 1972), (2). Superoxide distmutase (SOD-Erythrocytes) (Kakkar *et al.,* 1984) and (3). Catalase (CAT- Erythrocyte) (Sinha *et al.,* 1972). The values obtained were plotted against different time period in 'cosinorwin' programme. The characteristics of temporal rhythm such as acrophase, amplitude, mesor and r-values were also obtained from "cosinorwin" software programme.

RESULTS

Lipid peroxidation products and antioxidants

Thiobarbituric acid Reactive Substances (TBARS)

The rhythmic characteristics (Acrophase, amplitude, mesor and r-value) indicating detectable rhythmicity or non significant rhythmic variations of all the groups. The acrophase, amplitude, mesor and r-value of TBARS in control group I (normal sleep) and experimental group II (disturbed sleep) in sprinters. The Temporal patterns of TBARS revealed a disturbed rhymicity in group II sprinters. The acrophase of TBARS was found to be at 21:48 hrs (group I) and at 19:53 hrs (group II). Mesor values were increased. Acrophase was advanced in group II (disturbed sleep sprinters) as compared with control (normal sleep sprinter).

Superoxide Distmutase (SOD)

The acrophase, amplitude, mesor and r – value of SOD in control groups I (normal sleep) and experimental group II

Sl. No.	Bio-chemical variables	Solution of Tests
1.	Thioborbituric acid reactive substance (TBARS)	(Plasma) Nichans and Samuelson (1972)
2.	Superoxide distrutase (SOD)	(Erythrocytes) Kakkar *et al.,* (1984)
3.	Catalase (CAT)	(Erythrocyto) Sinha *et al.,* (1972)

Table 1. TBARS

Characteristics of temporal patterns	Group-I	Group-II
Acrophase	-33°(21:48)	-61° (19:53)
Mesor	3.0	3.8
Amplitude	0.2	1.3
'r' value	0.37	-0.42

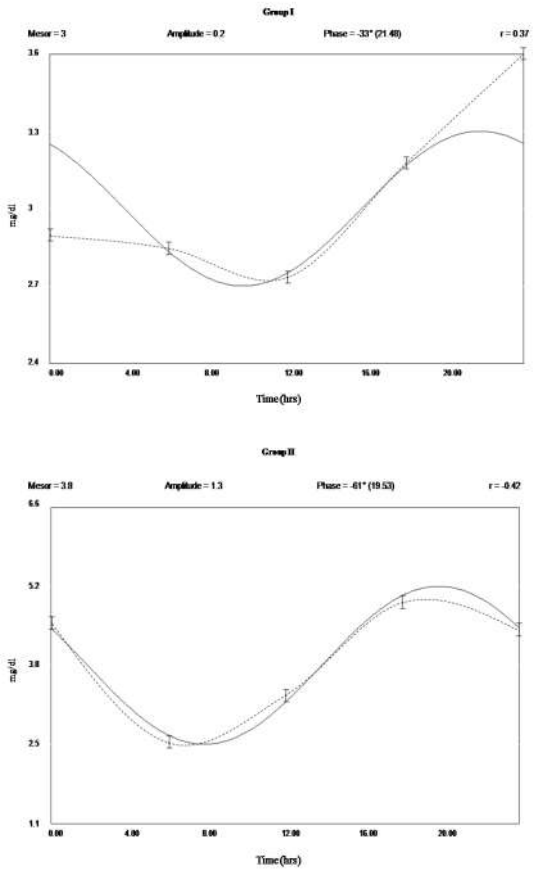

Fig. 1. Thiobarbituric acid reactive substances

(disturbed sleep) in sprinters. The temporal patterns of SOD revealed a disturbed rhymicity in group II sprinters. The acrophase of SOD was found to be at 17:2 hrs (group I) and at 19:27 hrs (group II). Mesor values were decreased. Acrophase was delayed in group II (disturbed sleep sprinters) as compared with control (normal sleep sprinter).

Catalase (CAT)

The acrophase, amplitude, mesor and r – value of Catalase in control groups I (normal sleep) and experimental group II (disturbed sleep) in sprinters. The temporal patterns of Catalase revealed a disturbed rhymicity in group II sprinters. The acrophase of Catalase was found to be at 20:25 hrs (group I) and at 23:12 hrs (group II). Mesor values were decreased. Acrophase was delayed in group II (disturbed sleep sprinters) as compared with control (normal sleep sprinter).

DISCUSSION

The biochemical parameters chosen for this study showed marked fluctuations over a 24 hrs period. The circadian patterns of the TBARS (Rajakrishnan *et al.,* 1999) depends on the nature of diurnal rhythms of (i) Lipid Peroxidation Enzymes (ii) SOD and Catalase in serum. In our study, peak time of TBARS was found to be at 17:92 hrs in normal individuals corroborating our previous results (Manoharan *et al.,* 2005) and malondialdehyde, the main end product of lipid peroxidation was found to be maximum at 21:00 hrs (Rajakrishnan *et al.,* 1999). The acrophase of TBARS rhythm were shown at 19:53 hrs in group II sprinters. Temporal variation of plasma SOD and malondialdehyde in healthy subjects have been investigated (Luo *et al.,* 1997). In the experiment, SOD rhythms in groups I and II, showed the maximal activities at found at 17:2 hrs and 19:27 hrs respectively. Further altered rhythms of lipid peroxidation (TBARS) and antioxidants (CAT and SOD) in group II sprinters are due to alter light-dark cycle. Decreased mesor values of SOD and catalase were found in group II; this could be due to over utilization of these enzymatic antioxidants to scavenge the products of lipid peroxidation (Rajakrishnan *et al.,* 1999). However further research is needed to know

Table 2. Superoxide Distmutase

Characteristics of temporal patterns	Group-I	Group-II
Acrophase	255°(17:2)	-68°(19:27)
Mesor	2.7	2.2
Amplitude	0.1	1.3
'r' value	-0.8	-0.61

the precise mechanisms by which night shift work alters biochemical circadian function by taking a large population studies and different shift workers.

CONCLUSION

The temporal patterns of TBARS revealed a disturbed rhymicity in group II sprinters. The acrophase of TBARS was found to be at 21:48 hrs (group I) and at 19:53 hrs (group II). Mesor values were increased. Acrophase was 1.95 hrs advanced in group II (disturbed sleep sprinters) as compared with control (normal sleep

Table 3. Catalase

Characteristics of temporal patterns	Group-I	Group-II
Acrophase	- 53°(20:25)	- 12°(23:12)
Mesor	4.9	5.3
Amplitude	0.6	1.9
'r' value	-0.11	0.92

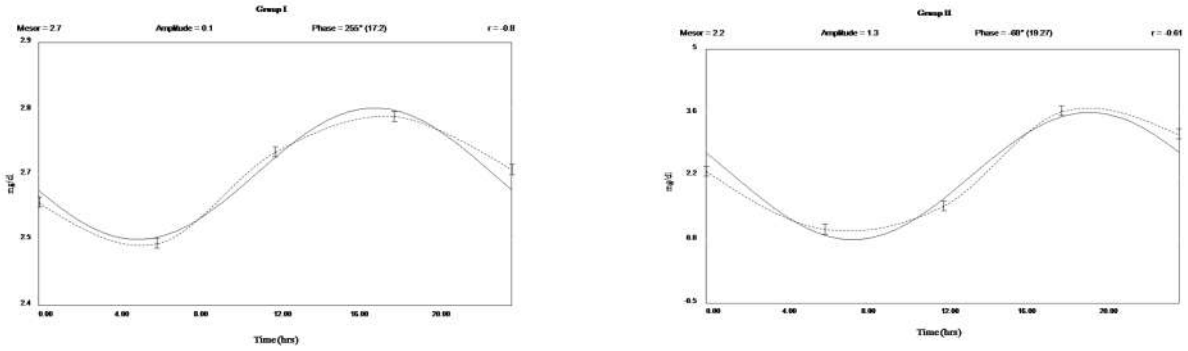

Fig. 2. Superoxide distmutase

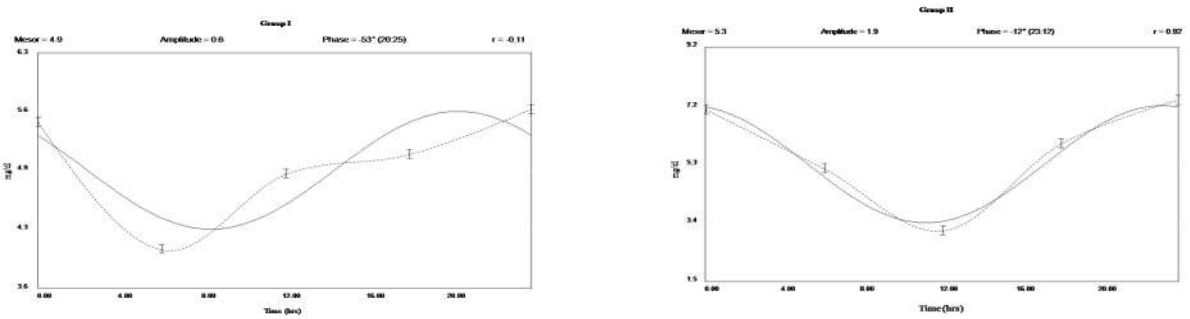

Fig. 3. Catalase

sprinter). The temporal patterns of SOD revealed a disturbed rhymicity in group II sprinters. The acrophase of SOD was found to be at 17:2 hrs (group I) and at 19:27 hrs (group II). Mesor values were decreased. Acrophase was 2.07 hrs delayed in group II (disturbed sleep sprinters) as compared with control (normal sleep sprinter). The temporal patterns of Catalase revealed a disturbed rhymicity in group II sprinters. The acrophase of Catalase was found to be at 20:25 hrs (group I) and at 23:12 hrs (group II). Mesor values were decreased. Acrophase was 2.87 hrs delayed in group II (disturbed sleep sprinters) as compared with control (normal sleep sprinter).

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