

Impact of lifestyle and environment on melatonin hormone in relation to oxidative stress

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ABSTRACT

Background: Melatonin hormone secretion affected by the type and conditions of sleep. Its act as antioxidant and has a major role in different biochemical process in human body. The aim of the present study is that to determine the effect of lifestyle (time of sleep, exposure to sunlight, and physical activity) on melatonin levels and oxidative stress markers in groups which differ in their lifestyle and activity. **Materials and Methods:** Three groups participate in the study; Group 1 consists of 30 volunteers selected from an agricultural rural community, Group 2 includes 30 volunteers selected from army forces works at a checkpoint, and Group 3 includes 30 volunteers from medical staff (doctors and nurses) in Al-Yarmok Teaching Hospital. Blood was drawing from all volunteers in the morning (8:00–10:00 AM). Melatonin levels and oxidative stress markers were measured. **Results:** Melatonin hormone level shows significant increase ($P > 0.05$) in rural environment when compared to other studied environment. The mean of glutathione significantly increase ($P > 0.05$) in Group 1 when compared to both Groups 2 and 3, but there was no significant difference between Groups 2 and 3. Serum malondialdehyde significantly increases in Group 3 when compared to other studied groups ($P > 0.05$). **Conclusions:** The difference in lifestyle was effected on melatonin level which acts as antioxidant and also on oxidative stress markers. Melatonin levels increase in the subjects who lived in the rural environment which exposure to sunlight and exert more effort due to their work in agriculture as compared to subjects who work in army in checkpoint and the two populations more than the 3rd group which include medical staff who work at night shift.

KEY WORDS: Free radical, Lifestyle, Melatonin, Oxidative stress, Sleep

INTRODUCTION

Lifestyle in medicine referred as the way of life used by different population, nations, people, and groups and is created in specific geographical, cultural, and region. Lifestyle consists of the characteristics of inhabitants of a part in a class by itself time and place. It includes the day behaviors and functions of individuals in trade, mundane activities, sleeping essence, satire, and congress.^[1] In crisp decades, continuance style as a suited factor of toughness is more caught by researchers. According to the WHO, 60% of dear factors to desolate health and action of all one born day are correlated to the development.^[2] Large percentage from people in the world follows an unhealthy lifestyle. Hence, they encounter several

disorders, disability, illness, and even death. Disorders such as metabolic issues, cardiovascular infections, diabetes mellitus, hypertension, and heftiness savagery can be caused by an unfortunate way of life. The connection among way of life and general well-being ought to be exceptionally considered.^[1] Today, unique changes have happened in the life surprisingly. Rest issue, undesirable eating regimen, smoking, liquor expending, sedate manhandle, stress, etc., are the introductions of an unfortunate way of life that they are utilized as a predominant type of way of life.^[3]

The way of waking in the day when it is light and dozing around evening time when it is dim is a sound conduct for human life. The main consideration in human resting is controlled by presentation to light or to obscurity. Introduction to light improved a nerve reaction from the retina in the eye to a locale in the mind called the hypothalamus. There is a unique

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focus called the suprachiasmatic core nucleus (SCN) produced signs to different parts of the cerebrum that control hormones, body temperature and different initiates that assume a part in influencing us to feel drowsy or wide alert. The SCN go about as a clock which managed the body movement. When presented to the main light every day, the check in the SCN starts performing capacities like raising body temperature and discharging animating hormones like cortisol. The SCN additionally defers the arrival of different hormones like melatonin, which is related with rest beginning, until numerous hours after the fact when haziness arrives.^[4]

Melatonin is a hormone blended by the pineal organ from serotonin (from tryptophan) and its discharging empower in dimness so likewise called, "hormone of obscurity." Melatonin supplies a circadian and regular flag to the vertebrates.^[5] Melatonin has demonstrated a decent impact in treating resting disarranges in neurodevelopment challenges kids.^[6] Patients with circadian mood rest issue can be utilized oral melatonin to help entrain (naturally synchronize in the right stage) to the ecological light-dim cycle. Melatonin diminishes rest beginning idleness to subjects with postponed rest stage issue than in subjects sleep deprivation.^[7] There are various things that impact melatonin creation such as anxiety, presentation to characteristic light amid the day, introduction to light around evening time (regularly from TV, telephones, PCs, and timekeepers), and working a night move, travel and time zone changes (otherwise called fly slack), absence of rest (i.e., guardians up during that time with a baby/tyke). Hence, the need in the resting hour it could be exceptionally destructive, thus harming because of the need in melatonin levels. Hence, the absence of rest expands the danger of growth, discouragement, diabetes, coronary illness, endocrine issue, and not working admirably in the day.^[8] At this point when melatonin levels are diminish at night, they ought to be sending signal of desire to sleep in the night. When the level of melatonin decreases, the body will feel sleepy and want to sleep during the day.^[9]

Melatonin is also an antioxidant which affected on immune system and subjects mood. There are many functions for melatonin hormone. It has major role in preventing depression, and seasonal affective disorder contributes to pain relief (as fibromyalgia), prevent and remove the cancer cells, and lowering the effect of estrogen on tumor growth. Hence, melatonin is suggested by physicians who are supporting patients who have tumor, particularly bosom growth.^[10] Melatonin was found to be an immediate free radical scrounger. Notwithstanding its capacity to kill some free radicals and responsive oxygen and nitrogen species (include H_2O_2 , NO, and

ONOO O*), it improves a few antioxidative proteins that expansion its action as a cancer prevention agent, where melatonin interfaces with the hurtful hydroxyl radical with a rate consistent identical to that of other exceedingly productive hydroxyl radical scroungers. Other than that melatonin kills hydrogen peroxide, singlet oxygen, peroxy nitrite anion, nitric oxide, and hypochlorous corrosive. Hence, melatonin has been broadly utilized as a defensive operator against a wide assortment of procedures and specialists that harm tissues through free radical instruments.^[11]

Aim of the Work

This work was designed to study the consequence of lifestyle (hour of sleep, exposure to sunlight and artificial light, and physical activity) on melatonin hormone levels and a number of oxidative stress markers.

MATERIALS AND METHODS

Subjects

Three groups participate in the study; Group 1 consists of 30 volunteers selected from an agricultural rural community obtained from Nu'maniyah/Wasit (180 km south of Baghdad), Group 2 includes 30 volunteers selected from army forces works at a checkpoint, and Group 3 includes 30 volunteers from medical staff (doctors and nurses) in Al-Yarmok Teaching Hospital.

All 90 volunteers of the three groups who participated in this study were asked if they went to collaborated. The age range was from 18 years. All groups were age matched. The questionnaire included height, weight, type of work, lifestyle, exposure to sunlight and artificial light, hour of sleeping, and time of sleeping. Volunteers with sleeping trouble were excluded.

Blood Sampling

10 mls of blood were took from each individual, serum was isolated and kept at (-20°C) until assay day. Melatonin was measured quantitatively using ELISA kit (CUSABIO, China). Glutathione (GSH) levels were measured according to Julius *et al.* method.^[12] Thiobarbituric acid reactive substances (TBARSs) and malondialdehyde (MDA) levels were determined spectrophotometrically according to Zeb and Ullah methods.^[13]

Statistical Analysis

Statistical analysis of data was performed by statistical analysis system-version 9.1). $P < 0.05$ was considered statistically significant.

RESULTS

The characteristics of all subjects that contributed in the study show in Table 1.

A total of 90 volunteers divided into three groups, Group 1 (30) rural areas working in agriculture, Group 2 (30) selected from armed forces, and Group 3, the medical staffs (doctor and nurses) were concluded in this study.

There was no significant difference between male and female in all clinical parameters when compare according to gender of volunteers, [Table 2].

As shown in Table 3, a significant difference in melatonin level between Groups 2 and 3 as compared to Group 1, but there was no significant difference when compared Group 2 with Group 3.

As shown in Table 3, significant differences in GSH and TBARS levels in both Groups 2 and 3 as compared to control, as well as, a significant difference in MDA levels was reported in both Groups 2 and 3 when compared to control group.

Because age range is not wide, there is no significant difference between the studied parameters, as shown in Table 4.

There was a significant correlation between melatonin hormone and TBARS as shown in Table 5 and Figure 1.

DISCUSSION

The current study design to assess the effect of lifestyle, time of sleep, exposure to light and the difference in environment on the melatonin hormone and oxidative

stress parameters levels. Melatonin hormone shows significant increase in the subject who lived in rural environment (Group 1) when compare to people who live in the city and work in the army (Group 2) in checkpoint, as well as, melatonin hormone levels slightly increase in Group 2 when compared to the medical staff (Group 3) who found lower melatonin levels among other groups, this is may be due to the exposure to sunlight (Group 1), but other groups are more susceptible to artificial light, especially Group 3.

People are customized to be outside while the sun is sparkling and home in bed around evening time. Melatonin is created amid the dull hours and stops on optic presentation to light. It is a key for controlling the body's natural clock capacities. It additionally assumes an essential part in countering disease, irritation, malignancy, and auto-resistance. At long last, melatonin restrained UVR-fortify skin harm.^[14]

Recent study proposes that introduction to room light amid rest interference is related to bringing down melatonin levels by given some help by confirming showing that presentation to light during the evening hinder the melatonin emission by the pineal organ.^[15] A laboratory ponders have exhibited the capacity of light around evening time to smother melatonin levels, the power of light that utilized as a part of examination varies from the room light so the force of room light might be influence melatonin discharge. Hence, the power of the light utilized amid the night for lighting straightforwardly identified with the convergence

Table 1: The volunteer's characteristics

The characteristics of all subjects	No	Mean	SD	SE	Minimum	Maximum
Weight	90	75.61	12.62	1.33	49.00	110.00
Length	90	168.00	8.43	0.88	150.00	187.00
BMI	90	26.58	2.38	0.25	20.81	35.11
Melatonin	90	12.60	5.47	0.57	3.20	27.90
GSH	90	78.72	17.17	1.81	32.03	118.00
TBARS	90	6.23	0.85	0.08	4.58	8.20
MDA	90	5.71	0.95	0.10	3.62	8.60

TBARS: Thiobarbituric acid reactive substances, MDA: Malondialdehyde, GSH: Glutathione, BMI: Body mass index

Table 2: The comparison between clinical parameters according to gender

Gender	No	Melatonin	GSH	TBARS	MDA
Male	58	13.26±5.18	78.80±16.08	6.24±0.86	5.62±0.96
Female	32	11.41±5.86	78.56±19.26	6.21±0.83	5.88±0.91
P	90	0.12	0.94	0.86	0.22

TBARS: Thiobarbituric acid reactive substances, MDA: Malondialdehyde, GSH: Glutathione

Table 3: The means of clinical parameters in all groups

Groups	No	Melatonin	GSH	TBARS	MDA
Group 1	30	16.87±6.60 ^a	87.16±15.37 ^a	5.77±0.66 ^b	5.42±0.92 ^b
Group 2	30	11.40±3.11 ^b	77.30±16.62 ^b	6.57±0.80 ^a	5.76±1.00 ^{ab}
Group 3	30	9.54±2.96 ^b	71.70±16.30 ^b	6.34±0.87 ^a	5.94±0.88 ^a
P	90	<0.0001	0.001	0.0005	0.10

The different letters mean a significant difference in parameters between groups. TBARS: Thiobarbituric acid reactive substances, MDA: Malondialdehyde, GSH: Glutathione

Table 4: The comparison between study subjects according to their age

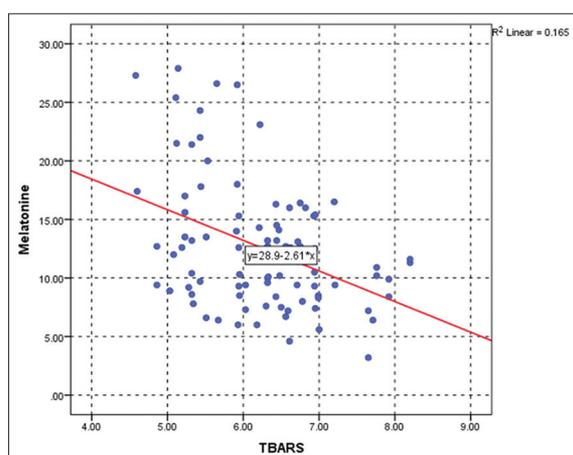
Age	No	Melatonin	GSH	TBARS	MDA
18.5–24.9	19	11.78±5.25	76.77±19.92	6.11±0.77	5.75±0.90
25–29.9	66	12.91±5.68	79.09±16.61	6.24±0.87	5.68±0.99]
30≤	5	11.60±3.45	81.20±16.22	6.46±0.89	5.95±0.42
P	90	0.67	0.82	0.68	0.82

TBARS: Thiobarbituric acid reactive substances, MDA: Malondialdehyde, GSH: Glutathione

Table 5: The correlations between parameters

Parameters	Melatonin	GSH	TBARS	MDA
BMI				
Pearson correlation	0.056	0.044	0.156	0.009
Sig. (2-tailed)	0.598	0.681	0.143	0.930
Melatonin				
Pearson correlation		0.183	-0.406**	-0.039
Sig. (2-tailed)		0.085	0.000	0.716
GSH				
Pearson correlation			-0.011	-0.040
Sig. (2-tailed)			0.919	0.711
TBARS				
Pearson correlation				0.076
Sig. (2-tailed)				0.479

TBARS: Thiobarbituric acid reactive substances, MDA: Malondialdehyde, GSH: Glutathione. **0.0406

**Figure 1:** The correlation between melatonin hormone and thiobarbituric acid reactive substances

of melatonin discharge.^[16] The impact of light on melatonin level is less amid rest, when eyelids are shut, albeit light transmittance amid rest is few yet stays successful at levels of melatonin.^[17]

The difference in melatonin hormone levels between Group (1) and the remaining groups may be due to the number of hours of sleep in which the individuals in the Group (1) get more sleep hours than the other groups. Melatonin levels start to increment in the mid-to-late night, and still high amid the night, and after that decrease in the early morning hours. People who have enough time to sleep can increase the curve of melatonin concentration.^[18] Maxwell suggested that melatonin production is first triggered in the evening, but the hormone continues to be released throughout the hours of night that follows (the conventional sleeping period). Levels of melatonin continue to

secreted during sleep and then drop with the breaking daylight and its production is suppressed until the next evening.^[19]

When comparing between the studied groups according to their physical activity, Group 1 was more active than the others because they work as farmers and this work requires a dedicated effort with the other groups and this could be one of the variables that effected on the data. The effect of physical activity may be mediated by higher melatonin levels but data are limited. Few studies have evaluated the relation between the physical activity and melatonin. Physical activity may increase melatonin levels, resulting in decreased estrogen production, improved fat metabolism, and reduced the risk of cancer.^[20]

The present study also shown a significant difference in the oxidative stress markers between Group 1 when compared to both Groups 2 and 3. Free radicals are very reactive and unstable molecular fragments that have an unpaired electron and they can produce new free radicals by methods for chain responses. Free radical additionally made harmed biochemical macromolecule such as protein, lipids, and nucleic corrosive. There are a few systems to kill their belongings of them are wholesome and endogenous enzymatic cell reinforcement barriers that for the most part hold the generation of free radicals and counteract oxidant push and along these lines forestall tissue harm.^[21]

Then again, melatonin is an effective, endogenously created forager of reactive oxygen species (ROS), especially the hydroxyl radical. Different ROS that

melatonin searches incorporate hydrogen peroxide, nitric oxide, peroxyxynitrite anion, hypochlorous corrosive, and singlet oxygen.^[22] Besides, melatonin builds the viability of different cancer prevention agents, for example, superoxide dismutase, GSH peroxidase, and catalase. Melatonin may assume an essential part in killing poisonous species incorporate H₂O₂, NO, and ONOO O*.^[23]

Melatonin has defensive impacts against bright and ionizing radiation and may likewise animate or actuate DNA repair forms.^[24]

Kanlikama and Baysal recorded that free radical molecules are very harmful when their levels are increased. In study for obstructive sleep apnea syndrome (OSAS), the level of free radical was significantly increased in the process of hypoxia desaturation and oxygenation. Most of the studies of this process have detect that the free radicals and proinflammatory molecule produced as a result of hypoxia and oxygenation are responsible for health problem as cardiovascular and cognitive disorders in OSAS patients.^[25]

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