

# Evaluating the effect of sleep quality and chronotype differences on erectile dysfunction

A. GUREL<sup>1</sup>, B. ELMAAGAC<sup>2</sup>, S. ONER<sup>2</sup>

<sup>1</sup>Department of Urology, Afyonkarahisar Health Science University, Afyonkarahisar, Turkey

<sup>2</sup>Department of Urology, Eskisehir Yunus Emre State Hospital, Eskisehir, Turkey

**Abstract. – OBJECTIVE:** Erectile dysfunction (ED) refers to an inability to achieve or maintain a firm penile erection sufficient for satisfactory sexual intercourse. Insufficient, irregular sleep and sleep disorders adversely affect human health, including sexual function. Significant differences between biological rhythms (chronotypes) have been reported. In the present study we examine the effect of sleep quality and chronotype differences on ED patients and a control group.

**PATIENTS AND METHODS:** The study included 69 patients who presented with ED and 64 healthy controls. The respondents completed a sociodemographic data form, and disease severity in the ED group was measured using the International Index of Erectile Function (IIEF). The participants were further administered the Hospital Anxiety and Depression Scale (HADS), Insomnia Severity Index (ISI), Pittsburgh Sleep Quality Index (PSQI) and Morningness-Eveningness Questionnaire (MEQ), and the scale scores were compared statistically between the patient and control groups.

**RESULTS:** There was no difference in the age, body mass index (BMI), alcohol use and smoking of the ED and healthy control groups, while the IIEF score was significantly lower in the ED group than in the control group. The PSQI subscale scores other than for sleep duration subscale, the PSQI global score and the HADS score were higher in the ED group than in the control group, while there was no difference between the groups in the MEQ and ISI scores. The IIEF score was correlated with the PSQI and HADS scores, and the PSQI score with the ISI and HADS scores.

**CONCLUSIONS:** It would be useful to evaluate sleep quality in addition to anxiety and depression while evaluating patients with ED. Our study found no relationship between chronotype differences and ED.

*Key Words:*

Erectile dysfunction, Sleep quality, Chronotype.

## Introduction

Erectile dysfunction (ED) refers to the inability to achieve or maintain a firm penile erection sufficient for satisfactory sexual intercourse<sup>1</sup>. It affects 52% of men aged 40-70 years<sup>2</sup>. Erection requires the coordination of psychological, endocrine, vascular, and neurological systems<sup>3</sup>. ED can be attributed to several psychogenic, psychiatric, neurogenic, endocrine, and arteriogenic factors<sup>4-6</sup>. Sleep is a behavioral and physiological state that is essential for human life, and a link between sleep disorders and many diseases has been reported<sup>7</sup>. Circadian rhythm (CR) describes a natural biological process that regulates the sleep-wake cycle and repeats every 24 hours in humans<sup>8</sup>. Synchronization of the circadian clock with day and night is critical for the control of cellular and physiological homeostasis<sup>9</sup>. It is believed that diseases that cause sleep disorders, such as anxiety and depression, cause also ED as a psychological outcome, although ED can also result from homeostatic imbalance and changes in hormonal production associated with poor sleep<sup>10</sup>. A relationship has been reported between sleep quality and ED<sup>11</sup>, although the mechanisms responsible for the impact of sleep disorders on ED are yet to be clarified<sup>12</sup>.

Biological rhythms have recently gained prominence in studies explaining both psychiatric disorders and disorders of general medical conditions associated with psychiatric disorders. Biological rhythms (chronotypes) are typically examined under three main types: morning type, evening type and intermediate type, and there are significant differences between the types. Morning-type individuals go to bed early and wake up early and have less variety in their sleeping hours than evening types. Evening-type individuals have greater difficulty in coping with stress and experience more anxiety, depression, and

somatic symptoms<sup>13-15</sup>. Chronotype differences have been previously studied in terms of their relationships with various diseases<sup>16,17</sup>. To the best of our knowledge there is no such study in the literature. The present study examines the effect on ED of sleep quality and chronotype differences.

## Patients and Methods

### *Study Population and Data Collection*

69 patients with ED and 64 age-matched healthy controls were included in the study. All of the participants were above the age of 18 years. The participants were first asked to complete the Obstructive Sleep Apnea Screening questionnaire, and those with a score of  $\geq 3$  were excluded from the study due to suspected obstructive sleep apnea, and were referred to the relevant specialist. Participants with diabetes mellitus, hypertension, coronary artery disease, congestive heart failure, any major central nervous system disorder, cognitive impairment, obstructive sleep apnea or psychiatric comorbidity, and those on antidepressants, were excluded from the study. The respondents' body weight and height were taken for the calculation of body mass index (BMI). The disease duration, drug use and clinical examination results were recorded.

### *Measurements*

#### *International Index of Erectile Function (IIEF)*

This form consists of 15 questions and is used for the diagnosis of erectile dysfunction and for the evaluation of response to treatment. Questions 1-5 and 15 evaluate erectile function. The reliability and validity study of the scale for the Turkish context was performed<sup>18</sup>.

#### *Morningness-Eveningness Questionnaire (MEQ)*

The Italian version<sup>19</sup> of the MEQ comprises 19 items, of which five are open-ended and 14 are multiple choice. The participants, among other factors, are requested to indicate their preferred times for going to bed and getting up, as well as their ideal times for physical and mental activity. The scores of each item are totaled to produce a total score within the range of 16 (extreme eveningness) to 86 (extreme morningness). According to the MEQ cut-off scores, a total score higher than 58 indicates a morning type while scores lower than 42 indicate an evening type<sup>20</sup>.

#### *Pittsburgh Sleep Quality Index (PSQI)*

This questionnaire is used to make a subjective assessment of sleep quality over the preceding month. The questionnaire consists of 19 questions inquiring about various sleep habits. The questions yield "component" scores in the range of 0-3 points, with more points indicating greater difficulty. The seven component scores are totaled to obtain a final score in the 0-21-point range. A total score of  $\geq 5$  denotes poor sleep quality with good reliability and validity<sup>21</sup>.

#### *Insomnia Severity Index (ISI)*

The ISI consists of seven questions about the perceived effect of sleep disturbance on the respondent during the preceding 2 weeks. The total score ranges from 0 to 28, with scores of  $< 7$  considered normal, 8-14 subclinical insomnia, 15-21 clinical insomnia and 22-28 severe insomnia<sup>22</sup>.

#### *Hospital Anxiety and Depression Scale (HADS)*

This scale was developed and validated by Zigmond and Snaith<sup>23</sup>, and features anxiety and depression subscales. In the 14-item self-report instrument, the items are rated on a 4-point Likert-type scale and is intended to provide a rapid assessment of patients with physical disease for depressive symptoms and anxiety.

### *Statistical Analysis*

All statistical analyses were performed using the SPSS Statistics (Version 20.0., IBM Corp., Armonk, NY, USA) software package program. Continuous variables were expressed as means  $\pm$  SD, and Student's *t*-tests and a Mann-Whitney U test were used to compare the means between two groups. For categorical variables, a Chi-square test was used to test the differences between groups. Spearman's correlation was used to identify any correlation between IIEF and the other scales scores.  $p < 0.05$  was set as the level of significance.

## Results

The median age was 48 (25) years in the patient group and 44.50 (26) years in the control group. There was no statistical age difference between the groups ( $p = 0.66$ ). The body mass index (BMI) was  $27.34 \pm 4.21$  (18.52-37.42) in the patient group and  $27.11 \pm 3.62$  (18.52-35.51) in the control group, with no statistical difference between the

**Table I.** Demographic features.

		Erectile dysfunction N: 69	Control N: 64	p
Median age (IR)		48 (25)	44.50 (26)	.0660 <sup>a</sup>
BMI (mean±SD)		27.34 ± 4.21	27.11 ± 3.62	.734 <sup>b</sup>
Disease duration, month (mean ± SD)		15.35 ± 13.12		
Drug use for E.D n (%)	None	48 (69.6%)		
	Sildenafil	12 (17.4%)		
	Tadalafil	9 (13%)		
Smoking n (%)	Yes	30 (43.5%)	20 (31.3%)	.157 <sup>c</sup>
	No	39 (56.5%)	44 (68.7%)	
Alcohol consumption n (%)	Yes	10 (14.5%)	18 (28.1%)	.059 <sup>c</sup>
	No	59 (85.5%)	46 (71.9%)	
IIEF Median (IR)		14 (8)	27 (4)	<.001 <sup>a</sup>

<sup>a</sup>Mann-Whitney U test was performed. <sup>b</sup>Student's *t*-test was performed. <sup>c</sup>Chi-squared test was performed. IIEF: International Index of Erectile Function Question; BMI: Body Mass Index; IR: Interquartile Range; SD: Standard Deviation.

groups ( $p=0.734$ ). The erectile dysfunction (ED) group had a mean disease duration of  $15.35\pm 13.12$  (1-60) months. In the patient group, 12 (17.4%) patients were using sildenafil and nine (13%) were using tadalafil for the treatment of ED, while 48 (69.6%) patients were not receiving any medical treatment. There was no statistical difference in smoking ( $p=0.157$ ) and alcohol use ( $p=0.59$ ) between the groups. The median IIEF was 14 (8) in the ED group and 27 (4) in the control group. There was a statistically highly significant difference in IIEF between the groups ( $p<0.001$ ) (Table I).

The PSQI global score and the HADS-Anxiety and HADS-Depression scale scores were statistically different between the patient and control groups ( $p<0.001$ ,  $p=0.001$ ,  $p=0.003$ , respectively).

There was no statistical difference in the MEQ or ISI scores of the groups ( $p=0.412$ ,  $p=0.735$ , respectively). Considering the components of the PSQI scale, a statistically significant difference was found in the scores on subjective sleep quality, sleep latency, habitual sleep efficiency, sleep disturbances, use of sleeping medication and daytime dysfunction between the patient and control groups ( $p<0.001$ ,  $p<0.001$ ,  $p<0.001$ ,  $p<0.001$ ,  $p=0.012$ ,  $p<0.001$ , respectively). Among the PSQI components, only sleep duration did not differ statistically between the patient and control groups ( $p=0.705$ ) (Table II).

Examining the correlations between IIEF and MEQ, PSQI global score, and the ISI, HADS-Anxiety and HADS-Depression scores revealed a statistically significant correlation be-

**Table II.** MEQ, PSQI, ISI and HADS scores (mean ± SD).

	Erectile dysfunction N: 69	Control N: 64	t/z	p
MEQ	54.20 ± 8.07	55.78 ± 13.53	-.824 <sup>a</sup>	.412
PSQI Global score median (IR)	7 (9)	3 (4)	-4.701 <sup>b</sup>	<.001
PSQI Subjective sleep quality median (IR)	1 (1)	0 (1)	-4.834 <sup>b</sup>	<.001
PSQI Sleep latency	1 (3)	0 (1)	-5.088 <sup>b</sup>	<.001
PSQI Sleep duration	1 (1)	1 (1)	-.379 <sup>b</sup>	.705
PSQI Habitual Sleep efficiency	1 (2)	0 (1)	-3.576 <sup>b</sup>	<.001
PSQI Sleep disturbance	1 (2)	1 (1)	-4.624 <sup>b</sup>	<.001
PSQI Use of sleep medication	0 (0)	0 (0)	-2.501 <sup>b</sup>	.012
PSQI Daytime dysfunction	2 (2)	1 (1)	-4.240 <sup>b</sup>	<.001
Mid-sleep time	3.30 (2.35)	3 (1.92)	-1.223 <sup>b</sup>	.221
ISI	6 (9)	6.5 (8)	-.339 <sup>b</sup>	.735
HADS-A	8 (6)	4.5 (5)	-3.436 <sup>b</sup>	.001 <sup>b</sup>
HADS-D	7 (4)	4 (4)	-2.950 <sup>b</sup>	.003 <sup>b</sup>

<sup>a</sup>Student's *t*-test was performed. <sup>b</sup>Mann-Whitney U test was performed. MEQ: Morningness-Eveningness Questionnaire; PSQI: Pittsburgh Sleep Quality Index; ISI: Insomnia Severity Index; HADS-A: Hospital Anxiety and Depression Scale Anxiety Subscale; HADS-D: Hospital Anxiety and Depression Scale Depression Subscale.

tween IIEF and PSQI ( $r=-0.395$ ,  $p<0.001$ ), between IIEF and HADS-Anxiety scores ( $r=-0.309$ ,  $p<0.001$ ), and between IIEF and HADS-Depression scores ( $r=-0.282$ ,  $p=0.001$ ). There was also a statistically significant correlation between PSQI and ISI ( $r=0.600$ ,  $p<0.001$ ), between PSQI and HADS-Anxiety score ( $r=0.640$ ,  $p<0.001$ ), and between PSQI and HADS-Depression score ( $r=0.429$ ,  $p<0.001$ ) (Table III).

## Discussion

This study identified differences in the scores on the Pittsburgh sleep quality scale, Pittsburgh subscales, and hospital anxiety and depression scales between the ED patients and the healthy control group, regardless of sleep duration. No difference was identified in the chronotypes when the ED patients and healthy controls were compared.

A relationship between sleep disorders and ED has been previously reported in various studies<sup>24,25</sup>. Sleep disorders were reported to cause a significant decrease in testosterone in men by acting on the pituitary-gonadal axis<sup>26</sup>. Similarly, a significant decrease was reported in serum LH and testosterone levels of patients with obstructive sleep apnea, which might cause ED<sup>27</sup>. A limited number of studies using the PSQI have reported a relationship between ED and sleep quality<sup>11,28,29</sup>. The study by Rodriguez et al<sup>30</sup> on sleep quality and ED reported that sleep quality played an important role in ED, regardless of sleep duration. Our study found that sleep quality

played a significant role in ED in a comparison of ED patients with healthy controls, regardless of sleep duration.

Comorbid anxiety and depression are common in men with ED<sup>31,32</sup>. The HADS is a self-report questionnaire that is designed for the rapid screening for anxiety and depressive mood in patients with conditions other than psychiatric disorders<sup>33</sup>. Previous studies<sup>34</sup> have reported that HADS reveals the states of depression and anxiety in ED patients. Our study found depression and anxiety to be associated with ED, consistent with literature.

Seehuus and Pigeon<sup>28</sup> reported a relationship between ED and ISI, and Kalejaiye et al<sup>24</sup> reported a higher insomnia severity score in obstructive sleep apnea patients with ED. We found no relationship between ISI and ED; this may be due to the exclusion of obstructive sleep apnea patients in the study. People with the morning type as a chronotype go to bed early and wake up early and have less variation in their sleeping hours. Evening-type people go to bed late and get up late. Experiencing greater variations in sleeping hours, evening types tend to have more difficulty in coping with stress, and experience more anxiety, depression, and somatic symptoms<sup>13-15</sup>. Rodriguez et al<sup>30</sup> found that men who worked night shifts, and men who worked in shifts, experience poorer erectile function than men who work during the day and reported that this was due to changes in the circadian rhythm. Piffer et al<sup>35</sup> reported that evening types experience higher sexual activity later in the day than morning types. Our study found no correlation between

**Table III.** Pearson and spearman correlation coefficients.

		1	2	3	4	5	6
1. IIEF	r						
	p	1.00					
2. MEQ	r	-.130	1.00				
	v	.135					
3. PSQI-G	r	<b>-.395</b>	-.123	1.00			
	p	<b>&lt; .001</b>	.160				
4. ISI	r	-.080	.023	<b>.600</b>			
	p	.361	.797	<b>&lt; .001</b>	1.00		
5. HADS-A	r	<b>-.309</b>	<b>-.284</b>	<b>.640</b>	<b>.361</b>	1.00	
	p	<b>&lt; .001</b>	<b>.001</b>	<b>&lt; .001</b>	<b>&lt; .001</b>		
6. HADS-D	r	<b>-.282</b>	.022	<b>.429</b>	<b>.254</b>	<b>.568</b>	1.00
	p	<b>.001</b>	.801	<b>&lt; .001</b>	<b>.003</b>	<b>&lt; .001</b>	

IIEF: International Index of Erectile Function Question; MEQ: Morningness-Eveningness Questionnaire; PSQI-G: Pittsburgh Sleep Quality Index Global Score; ISI: Insomnia Severity Index; HADS-A: Hospital Anxiety and Depression Scale Anxiety Subscale; HADS-D: Hospital Anxiety and Depression Scale Depression Subscale.



chronotypes and ED. Although it is believed that evening types encounter symptoms such as anxiety and depression more frequently, and that disruptions to the circadian rhythm may predispose to ED, it should be considered that sexual activity may be higher in this type when compared to the morning type. We do not believe this affects erection, being a lifestyle choice of the evening and morning types, and it is not caused by a necessity such as working in shifts.

There have been limited studies examining the effect of chronotype differences on sexual health. To the best of our knowledge, there has been no study to date investigating the ED and chronotype relationship, and in this sense, our study can be considered important as the first to examine such an association. This study has some limitations, including its cross-sectional design, the low number of patients and the use of self-reported scales. Self-report forms may occasionally be functional but may fail to assess the general situation as they tend to reflect the respondents' current state.

## Conclusions

The management of diseases such as ED that affect both the patient and the patients' partner should not focus only on the disease. It is extremely important to consider possible underlying sleep disorders or psychiatric conditions. In this disease, which affects quality of life, taking an integrated approach to patients and identifying any accompanying problems are as important as treating the urological disease.

---

### Conflict of Interest

The Authors declare that they have no conflict of interests.

---

### Acknowledgements

The authors are grateful to all those who participated in this study

---

### Ethics Approval

The Ethical Committee of Afyonkarahisar Health Science University approved the study (2011-KAEK-2\_2022/19). The study was carried out in accordance with the Helsinki Declaration.

---

### Informed Consent

Informed consent was obtained from each participant.

---

### Authors' Contribution

A.G. and B.E. designed the study; B.E. and S.O. recruited the participants; A.G., B.E. and S.O. participated in the data collection; A.G. performed the statistical analysis; A.G., B.E. and S.O. interpreted the data; A.G. drafted the first manuscript; and all authors critically reviewed the paper.

---

### Data Availability

The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

---

### Informed Consent

Patient consent forms were provided.

---

### Funding

No funding was received for this research.

---

### ORCID ID

G. Abdullah: 0000-0003-3112-448X; B. Elmağaç: 0000-0001-5853-0256; S. Öner: 0000-0002-0954-0914.

## References

- 1) Muneer A, Kalsi J, Nazareth I, Arya M. Erectile dysfunction. *BMJ* 2014; 348: g129.
- 2) Feldman HA, Goldstein I, Hatzichristou DG, Krane RJ, McKinlay JB. Impotence and its medical and psychosocial correlates: results of the Massachusetts Male Aging Study. *J Urol* 1994; 151: 54-61.
- 3) Prieto D. Physiological regulation of penile arteries and veins. *Int J Impot Res* 2008; 20: 17-29.
- 4) Shamloul R, Ghanem H. Erectile dysfunction. *Lancet* 2013; 381: 153-165.
- 5) Barbosa FT, Silva MP, Fontes LES, Pachito DV, Melnik T, Riera R. Non-invasive positive airway pressure therapy for improving erectile dysfunction in men with obstructive sleep apnoea. *Cochrane Database Syst Rev* 2021; 9: CD013169.
- 6) Moon KH, Park SY, Kim YW. Obesity and Erectile Dysfunction: From Bench to Clinical Implication. *World J Mens Health* 2019; 37: 138-147.
- 7) Besedovsky L, Lange T, Haack M. The Sleep-Immune Crosstalk in Health and Disease. *Physiol Rev* 2019; 99: 1325-1380.
- 8) Zee PC, Manthena P. The brain's master circadian clock: implications and opportunities for therapy of sleep disorders. *Sleep Med Rev* 2007; 11: 59-70.
- 9) Masri S, Sassone-Corsi P. The emerging link between cancer, metabolism, and circadian rhythms. *Nat Med* 2018; 24: 1795-1803.

- 10) Andersen ML, Martins PJ, D'Almeida V, Bignotto M, Tufik S. Endocrinological and catecholaminergic alterations during sleep deprivation and recovery in male rats. *J Sleep Res* 2005; 14: 83-90.
- 11) Cheng QS, Liu T, Huang HB, Peng YF, Jiang SC, Mei XB. Association between personal basic information, sleep quality, mental disorders and erectile function: a cross-sectional study among 334 Chinese outpatients. *Andrologia* 2017; 49.
- 12) Andersen ML, Tufik S. The Association Between Sleep Disturbances and Erectile Dysfunction During the COVID-19 Pandemic. *Sex Med Rev* 2022; 10: 263-270.
- 13) Taylor BJ, Hasler BP. Chronotype and Mental Health: Recent Advances. *Curr Psychiatry Rep* 2018; 20: 59.
- 14) Merikanto I, Lahti T, Kronholm E, Peltonen M, Laatikainen T, Vartiainen E, Salomaa V, Partonen T. Evening types are prone to depression. *Chronobiol Int* 2013; 30: 719-725.
- 15) Azad-Marzabadi E, Amiri S. Morningness-eveningness and emotion dysregulation incremental validity in predicting social anxiety dimensions. *Int J Gen Med* 2017; 10: 275-279.
- 16) Kanagarajan K, Gou K, Antinora C, Buyukkurt A, Crescenzi O, Beaulieu S, Storch KF, Mantere O. Morningness-Eveningness questionnaire in bipolar disorder. *Psychiatry Res* 2018; 262: 102-107.
- 17) Onen E, Onen S. Evidence for the Association between Chronotype and Lifelong Premature Ejaculation. *Urol Int* 2022; 106: 1033-1040.
- 18) Akkus E, Kadioglu A, Esen A, Doran S, Ergen A, Anafarta K, Hattat H; Turkish Erectile Dysfunction Prevalence Study Group. Prevalence and correlates of erectile dysfunction in Turkey: a population-based study. *Eur Urol* 2002; 41: 298-304.
- 19) Mecacci L, Zani A. Morningness-eveningness preferences and sleep-waking diary data of morning and evening types in student and worker samples. *Ergonomics* 1983; 26: 1147-1153.
- 20) Horne JA, Ostberg O. A self-assessment questionnaire to determine morningness-eveningness in human circadian rhythms. *Int J Chronobiol* 1976; 4: 97-110.
- 21) Dudysová D, Malá I, Mladá K, Saifutdinova E, Koprivova J, Sos P. Structural and construct validity of the Czech version of the Pittsburgh Sleep Quality Index in chronic insomnia. *Neuro Endocrinol Lett.* 2017; 38: 67-73.
- 22) Chahoud M, Chahine R, Salameh P, Sauleau EA. Reliability, factor analysis and internal consistency calculation of the Insomnia Severity Index (ISI) in French and in English among Lebanese adolescents. *eNeurologicalSci* 2017; 7: 9-14.
- 23) Zigmond AS, Snaith RP. The hospital anxiety and depression scale. *Acta Psychiatr Scand* 1983; 67: 361-370.
- 24) Kalejaiye O, Raheem AA, Moubasher A, Capece M, McNeillis S, Muneer A, Christopher AN, Garaffa G, Ralph DJ. Sleep disorders in patients with erectile dysfunction. *BJU Int* 2017; 120: 855-860.
- 25) Jankowski JT, Seftel AD, Strohl KP. Erectile dysfunction and sleep related disorders. *J Urol* 2008; 179: 837-841.
- 26) Luboshitzky R, Zabari Z, Shen-Orr Z, Herer P, Lavie P. Disruption of the nocturnal testosterone rhythm by sleep fragmentation in normal men. *J Clin Endocrinol Metab* 2001; 86: 1134-1139.
- 27) Luboshitzky R, Aviv A, Hefetz A, Herer P, Shen-Orr Z, Lavie L, Lavie P. Decreased pituitary-gonadal secretion in men with obstructive sleep apnea. *J Clin Endocrinol Metab* 2002; 87: 3394-3398.
- 28) Seehuus M, Pigeon W. The sleep and sex survey: Relationships between sexual function and sleep. *J Psychosom Res* 2018; 112: 59-65.
- 29) Smith L, Grabovac I, Veronese N, Soysal P, Isik AT, Stubbs B, Yang L, Jackson SE. Sleep Quality, Duration, and Associated Sexual Function at Older Age: Findings from the English Longitudinal Study of Ageing. *J Sex Med* 2019; 16: 427-433.
- 30) Rodriguez KM, Kohn TP, Kohn JR, Sigalos JT, Kirby EW, Pickett SM, Pastuszak AW, Lipshultz LI. Shift Work Sleep Disorder and Night Shift Work Significantly Impair Erectile Function. *J Sex Med* 2020; 17: 1687-1693.
- 31) Sooriyamoorthy T, Leslie SW. Erectile Dysfunction. 2022. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing.
- 32) Yang Y, Song Y, Lu Y, Xu Y, Liu L, Liu X. Associations between erectile dysfunction and psychological disorders (depression and anxiety): A cross-sectional study in a Chinese population. *Andrologia.* 2019; 51: e13395.
- 33) Annunziata MA, Muzzatti B, Bidoli E, Flaiban C, Bomben F, Piccinin M, Gipponi KM, Mariutti G, Busato S, Mella S. Hospital Anxiety and Depression Scale (HADS) accuracy in cancer patients. *Support Care Cancer* 2020; 28: 3921-3926.
- 34) Pakpour AH, Rahnama P, Saberi H, Saffari M, Rahimi-Movaghar V, Burri A, Hajiaghababaei M. The relationship between anxiety, depression and religious coping strategies and erectile dysfunction in Iranian patients with spinal cord injury. *Spinal Cord* 2016; 54: 1053-1057.
- 35) Piffer D. Sleep patterns and sexual selection: An evolutionary approach. *Mankind Quarterly* 2010; 50: 361-375.