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ORIGINAL ARTICLE

Chronotype pattern and quality of life among university students in Saudi Arabia: a cross-sectional study

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ABSTRACT

Objective: This study aimed to evaluate the chronotype pattern and its relationship to the quality of life of Saudi Arabian university students.

Methods: A cross-sectional study was conducted in Jeddah, Saudi Arabia, from January 2023 to August 2024, to assess the chronotype pattern and its association with quality of life among 453 undergraduate university students. The 19-item morningness-eveningness questionnaire was used to assess an individual's chronotype, while the validated Arabic version of the 26-item World Health Organization Quality of Life-BREF was used to measure the quality of life (QoL).

Results: The study included 453 participants, with an average age of 22 years (±2). Most participants were female (77%), single (90%), were from medical colleges (36.6%), were enrolled in public universities (79%), and belonged to the western region (58.7%). Furthermore, 72% of the participants studied were classified as intermediate. The participants' WHO quality of life score was 87 (±17), with 93.8% reporting good QoL. There was a statistically significant relationship between chronotype pattern and quality of life (p-value < 0.05). The multivariate regression analysis revealed that only having a chronic illness was negatively associated with good quality of life (β = 0.228, CI = 0.091: 0.573, p-value < 0.05).

Conclusion: Saudi university students were most likely to exhibit the intermediate chronotype pattern. There was a significant association between intermediate chronotype and high quality of life.

Keywords: Chronotype, quality of life, sleep pattern, university students, Saudi Arabia.

Introduction

The term "chronotype" refers to the subjective preferred timing of various activities and behaviors throughout the day. It is primarily based on the body's innate preference for a particular sleep-wake pattern [1]. Humans have three major chronotypes: morning types, also known as "larks," who prefer to sleep late at night and wake up late in the morning; evening types, also known as "owls," and intermediate types, who fall somewhere in the middle [2].

A chronotype is a cognitive representation of the various physiological processes associated with a circadian cycle, which is defined as physiological, psychological, and behavioral changes that occur on a 24-hour cycle [3]. As a result, many living things, including animals, plants, and bacteria, are affected by these natural processes, which are primarily influenced by light and dark [4].

A person's chronotype refers to their tendency to sleep at a specific time within 24 hours. However, they are primarily divided into two types. Evening, which is the most busy and alert time of day due to the delayed sleep phase, and morningness, which is most alert and active in the morning after a long period of sleep [5]. People usually have some flexibility in their sleep schedule. However, sleep habits differ by age; many older people prefer an advanced sleep period, adolescents prefer a

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sleep latency period, and prepubescent children prefer an advanced sleep period [6].

Generally, humans are diurnal creatures, meaning they are awake during the day [7]. According to an Australian study of paramedics, those with an evening chronotype are less happy, have worse mental health, and have worse sleep than people with a morning chronotype [8]. Evening chronotype was also associated with depressive moods in nurses and firefighters [9].

A variety of factors can have a positive or negative impact on an individual's quality of life, which is typically defined as a person's competence, security, and ability to participate in or live life to the fullest [10]. Quality of life refers to a person's overall well-being in several areas, including physical, psychological, social, and environmental health [11,12].

Income, education, health, the environment, and social stability all contribute to one's quality of life (QoL) [13]. People's quality of life is heavily influenced by how they sleep. Sleep disruption is a complex health issue that is lowering the quality of life for many people around the world. Several studies have found that getting a good night's sleep can help improve life satisfaction, well-being, happiness, and subjective health, ultimately improving quality of life [14]. Quality of life has a significant impact on the overall performance of university students [10]. This study aimed to examine chronotype patterns and their relationship to quality of life among Saudi university students.

Subjects and Methods

This cross-sectional study was conducted in Jeddah, Saudi Arabia, from January 2023 to August 2024, to assess the chronotype pattern and its association with quality of life among undergraduate university students. The inclusion criteria were university students aged 18 years and older, both sexes, attending medical and non-medical colleges, as well as private and public universities. Students with known sleep disorders, those taking medications, or those with disorders that significantly affect their sleep rhythm, as well as those working shifts that require a specific time for sleep, such as night shifts or early morning shifts, were all excluded.

The sample size was calculated using the Epi-Info CDC software calculator, and 453 undergraduate university students were included.

The participants were recruited using the snowball sampling technique, which involved the researchers identifying a small group of initial participants and asking them to recruit other participants they knew who met the inclusion criteria. Participants were informed about the study's purpose, assured of data confidentiality before providing informed consent, and instructed to scan a QR code to access the Google Form, which was configured to accept only one response per participant, excluding incomplete submissions from the final analysis.

The questionnaire included the following four sections. General characteristics of the studied patients including age, sex, marital status, college (medical/non-medical), university (public/private), residence, and status of chronic illness. The 19-item Morningness-Eveningness

Table 1. *General characteristics of the participants (n = 453).*

		Frequency (*N*)	Percentage (%)
Age (Years)	Mean ± SD	22 ± 2	
	Median (minimum-maximum)	(18-25)	
Sex	Male	104	23
	Female	349	77
Marital status	Single	406	90
	Married	38	8
	Divorced	3	0.7
	Widowed	6	1.3
College	Medical	166	36.6
	Non-medical	287	63.4
University	Public	358	79
	Private	95	21
Residence	North	94	20.8
	South	46	10.2
	East	47	10.4
	West	266	58.7
Having a chronic illness	Present	44	9.7
	Absent	409	90.3

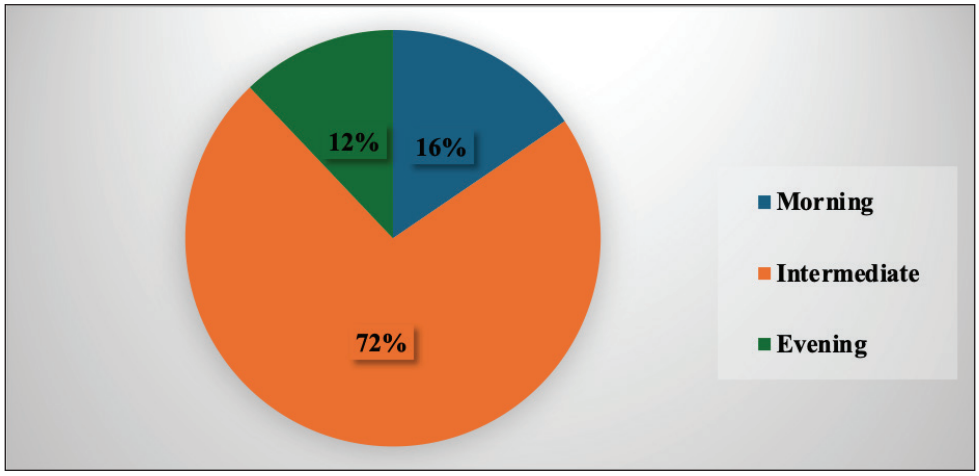

Figure 1. *Classification of the participants as regards the chronotype.*

Questionnaire by Horne and Östberg [15] assesses chronotype, categorizing individuals as morning, evening, or intermediate types. It was translated into Arabic through forward and backward translation, reviewed for accuracy, and piloted with 15 participants [16]. For analysis, participants were grouped into three categories: morning, intermediate, and evening.

The validated Arabic version of the 26-item World Health Organization quality of life-BREF [17], which is a tool for measuring QoL along four dimensions including physical health, psychological health, social relationships, and environmental health. The higher scores indicated a good QOL and vice versa. The cut-off ≥60 was used to identify the "good" QOL and <60 to identify the "poor" QOL categories as determined in a previous study among the adult population [18].

The data were analyzed using IBM Statistical Package for Social Sciences software (version 22). Cronbach's alpha was calculated for the translated scales, and a value greater than 0.7 was considered acceptable. Descriptive statistics for categorical variables included frequencies and percentages, while numerical variables were represented by mean ± SD, median, and range. An Exact Fisher's test was used to determine the relationship between chronotype patterns and type category quality among the study participants. A multivariate regression analysis of the factors influencing quality of life among the study participants was conducted. Statistical significance was defined as a p-value < 0.05 with a 95% confidence level. Tables and figures were used to present the data.

Results

The study included 453 participants, with an average age of 22 years (±2), ranging from 18 to 25 years. Most participants were females (77%). As regards marital status, 90% of the participants were single. Regarding academic background, 36.6% were from medical colleges. Most participants (79%) were enrolled in public universities, and 58.7% belonged to the Western region. Only 9.7% of the participants reported having a chronic illness (Table 1).

Table 2. *WHOQOL scores among the participants (n = 453).*

	Mean ± SD	Median (minimum-maximum)
The overall quality of life	4 ± 1	4 (1-5)
Overall general health	4 ± 1	4 (1-5)
Physical health domain	60 ± 18	61 (7.1-100)
Psychological health domain	56 ± 19	58 (0-100)
Social relationships domain	65 ± 24	67 (0-100)
Environmental health domain	58 ± 20	59 (0-100)
The total score of the WHO Quality of Life	87 ± 17	89 (36-125)
Quality of Life (*n*, %)	Good	425 (93.8)
	Poor	28 (6.2)

It was shown that 72% of the participants studied fell into the intermediate category (Figure 1).

The WHO quality-of-life assessment yielded mean scores (±SD) of 4 (±1) for overall quality of life and general health. The physical health domain had a mean score of 60 (±18), while the psychological health domain scored slightly lower, at 56 (±19). Social relationships had the highest mean score of 65 (±24), followed by environmental health with 58 (±20). The participants had an overall WHO quality of life score of 87 (±17). By categorizing the QOL into "Good" and "Poor", the majority (93.8%) reported a good QOL (Table 2).

The relationship between chronotype classification (morning, intermediate, and evening types) and quality of life, measured as "Poor" or "Good," revealed that among

Table 3. *The relationship between chronotype classification and quality of life (n = 453).*

		Chronotype classification			*p*-value
		Morning	Intermediate	Evening	
Quality of life	Poor	9 (12.9)	15 (4.6)	4 (7.3)	0.034*
	Good	61 (87.1)	313 (95.4)	51 (92.7)	
Total		70 (100)	328 (100)	55 (100)	

**p*-value is statistically significant, Exact Fisher's test.

Table 4. *Multivariate regression analysis of the factors affecting quality of life among the participants (n = 453).*

Independent variables	B	S.E.	Wald	df	*p*-value	Exp(B)	95% C.I. for EXP(B)	
							Lower	Upper
Age	-0.082	0.108	0.574	1	0.449	0.922	0.746	1.138
Sex	-0.580	0.575	1.017	1	0.313	0.560	0.181	1.728
Marital status	-0.455	0.346	1.727	1	0.189	0.634	0.322	1.251
College	0.429	0.285	2.277	1	0.131	1.536	0.880	2.684
University	0.629	0.560	1.264	1	0.261	1.876	0.627	5.619
Residence	0.118	0.163	0.525	1	0.469	1.125	0.818	1.548
Chronic illness	-1.479	0.470	9.890	1	0.002*	0.228	0.091	0.573
Chronotype	-0.042	0.028	2.282	1	0.131	0.959	0.907	1.013

**p*-value is statistically significant.

those with a morning chronotype, 9 individuals (12.9%) reported poor quality of life. Similarly, 15 people (4.6%) with an intermediate chronotype reported a low quality of life. In the evening chronotype group, 4 people (7.3%) reported a low quality of life (Table 3).

The multivariate regression analysis revealed that only having a chronic illness was negatively associated with good quality of life ($\beta = 0.228$, CI = 0.091: 0.573, p-value < 0.05) (Table 4).

Discussion

The majority of participants demonstrated an intermediate chronotype pattern (neither distinctly "morning" nor "evening"), which is considered the most human-like behavior. Individuals with an intermediate chronotype have natural sleep-wake preferences that fall somewhere between the two extremes: morning "larks" and evening "owls". These people do not have a strong preference for waking up early and feeling most alert in the morning or staying up late and performing better in the evening [19]. The intermediate pattern of chronotype is widely preferred because it offers individuals a broad range of daytime and evening time that allows them to function well in the modern community [20].

University programs include a variety of activities like classes, study sessions, and extracurricular activities that occur at different times throughout the day. The intermediate pattern allowed students to adopt their activities either in the morning or evening with the least tiredness and relatively good quality. Moreover, this pattern was associated with a balanced energy level all over the day for these students [20]. Moreover, sleep quality was associated with intermediate sleep patterns more than the other extreme patterns of morning and evening, and this contributes to good academic attendance and achievement [21].

A study reported similar findings, observing that the intermediate chronotype was the most common in the Korean population [22]. Sun et al. [21] found that the intermediate pattern was the most common among medical students in China, while Walsh et al. [23] found the same among young adults. It was also consistent with Sato et al.'s [20] study of Russian, Polish, Japanese, and Australian medical students in their first and second years of university.

The study found a significant association between having an intermediate chronotype and having a good overall quality of life (p-value < 0.05). This was in line with the findings of Suh et al. [24] among Korean adults, Ota et al. [25] among Japanese nursing students, and Arastoo et al. [26] among Iranian university students. The study measured quality of life across four domains including physical health, psychological health, social relationships, and environmental health. Aside from the well-balanced wake-sleep cycle, the intermediate chronotype was associated with optimal hormonal regulation in the body, such as cortisol levels and melatonin secretion [27]. Cortisol and melatonin are important hormones for maintaining health and well-being [28].

The intermediate chronotype maintains a consistent rhythm for rest and functioning during the day. This, in

turn, promotes mood and emotional stability, and reduces irritability, anxiety, and depression. Improved memory, better focus, and enhanced decision-making were also associated with this pattern of the wake-sleep cycle. These factors are influencing the psychological health of individuals [29] and reducing the risk of mental disorders [30].

On the level of social relations, the intermediate chronotype allows more time for engaging in social activities and positive interactions with the surrounding people. On the other hand, the good psychological effects of this pattern provide individuals with capabilities for positive social engagement. Both improved psychological health and strong social interactions allow individuals to tolerate any external factors that could compromise environmental health [31].

The primary limitation of this study was its cross-sectional design. While appropriate for the study's purpose, this design limited the ability to determine temporal relationships between chronotype patterns and quality of life. Furthermore, data collected at a single point in time cannot be used to assess population changes or detect long-term trends. Non-probability sampling might have made it difficult to conclude about the general population.

Conclusion

The Saudi university students were most likely to exhibit the intermediate chronotype pattern. The majority of the students enjoyed an excellent quality of life. There was a statistically significant link between intermediate chronotype and high quality of life. Universities and healthcare providers should raise awareness about chronotypes and their impact on students' well-being. Programs supporting intermediate chronotypes, including time management and sleep hygiene workshops, should be implemented. Further research on factors affecting students' quality of life is needed.

List of abbreviation

QoL Quality of life

Conflict of interest

The authors declare that there is no conflict of interest regarding the publication of this article.

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Consent to participate

Informed consent was obtained from all the participants.

Ethical approval

Ethical approval was obtained from Institutional Review Board of Dr. Soliman Fakeeh Hospital via reference number 296/2022. Dated: April 2022.

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