CLINICAL & BASIC RESEARCH

Distribution of Chronotypes among a Sample of Iraqi Kurdish Medical Students

Awring M. Raoof, Yasin A. Asaad, *Tariq S. Al-Hadithi

توزع نوع البيولوجيا الزمنية لدى عينة من طلاب الطب الكرد العراقيين

اورنك معروف رؤوف، ياسين أحمد أسعد، طارق سلمان الحديثي

ABSTRACT: *Objectives:* The aim of this study was to assess the distribution of chronotypes in a sample of Iraqi Kurdish medical students. ***Methods:*** A descriptive cross-sectional study was conducted at the Hawler Medical University College of Medicine in Erbil City, Iraq, between 1ˢᵗ January and 31ˢᵗ March 2013. A total of 580 students were given the reduced version of the Horne and Ostberg Morningness-Eveningness Questionnaire (MEQr), a close-ended self-administered questionnaire. ***Results:*** Of the 580 students, 130 (22.4%) were male and 450 (77.6%) were female. The mean age ± standard deviation was 20.3 ± 1.45 years, with a range of 17–24 years. Most of the students (52.6%) were in the intermediate class, followed by morning type (24.1%) and evening type (23.3%). Significant gender differences were detected in the proportion of morning, intermediate and evening types (P <0.001). The mean scores for the female students were 14.8 ± 2.2 and the mean scores for the male students were 14.6 ± 7.3, with no statistically significant differences (P = 0.45). ***Conclusion:*** Students in the College of Medicine were mostly classified as intermediate types. The morning type was more common among this student population, particularly male students, than has been reported in similar age groups in some Western countries. There was a significant gender difference in the proportion of MEQr types.

Keywords: Chronobiology Phenomena; Circadian Rhythm; Sleep; Iraq.

الملخص: الهدف: كان الهدف من هذه الدراسة تقييم توزع نوع البيولوجيا الزمنية لدى عينة من طلاب الطب الكرد العراقيين. **الطريقة:** أجريت دراسة مقطعية وصفية في كلية الطب من جامعة هولير الطبية في مدينة أربيل بين 1 يناير و 31 مارس 2013. تم إعطاء مجموع 580 طالباً الإصدار المختصر لاستبيان Horne and Ostberg، الذي هو استبيان مغلق النهاية و ذاتي الإكمال. **النتائج:** من مجموع 580 طالباً، 130 (22.4%) كانوا ذكورا و 450 (77.6%) كانوا من الإناث. كان معدل عمرهم 20.3 ± 1.45 سنة، و تراوحت أعمارهم بين 17 إلى 24 عاما. كان معظم الطلاب من نوع المتوسط (52.6%)، يليها النوع الصباحي (24.1%) و النوع المسائي (23.3%). تم الكشف عن فرق مهم بين الجنسين في نسبة أنواع الصباحية، المتوسطة، والمسائية (0.001< P). كان معدل الدرجات للطلاب الإناث (14.8 ± 2.2)، و معدل الدرجات للطلاب الذكور (14.6 ± 7.3) مع عدم وجود فروق ذات دلالة إحصائية بين معدل الدرجات (0.45 = P). **الخلاصة:** يصنف الطلاب في كلية الطب في الغالب من النوع المتوسط. كان النوع الصباحي أكثر شيوعا عند هذا الجمع من الطلاب، و بالأخص الطلاب الذكور، بالمقارنة مع دراسات أخرى في الدول الغربية. كان هناك فرق مهم بين الجنسين في نسبة نوع MEQr.

مفتاح الكلمات: ظواهر علم البيولوجيا الزمني؛ الإيقاع اليومي؛ النوم؛ العراق.

Advances in Knowledge

- *This study found that this sample of Iraqi Kurdish medical students were mostly classified as intermediate circadian types.*
- *Kurdish Iraqi college students, particularly males, were more often classified as morning types than similar groups in some Western countries.*
- *Female Kurdish Iraqi students were significantly more oriented towards the evening type than male students.*

Application to Patient Care

- *The chronotype studies performed on this sample of college students cannot be generalised to the rest of the Iraqi population. However, clinicians need to take into consideration chronotype behavioural variations when treating disorders in young adults, for example in complaints of generalised weakness, fatigue and even tension headaches.*

THE TERM CHRONOTYPE, OR morning/evening preference, is used to describe individual differences in sleeping-waking patterns that most clearly explain variations in the rhythmic expression of biological or behavioural patterns.[1] Individuals who go to sleep early, get up early and feel and perform better in the morning are classified as morning types, whereas individuals who go to bed late, wake up late and perform better in the afternoon are classified as evening types.[2] Humans

Department of Community Medicine, Hawler Medical University, Erbil, Iraq
Corresponding Author e-mail: tariq.hadithi@hmu.edu.iq

show large inter-individual differences in their behaviours and activities within a 24-hour day. This is most obvious in their preferred timings of sleeping and wakefulness, with extreme morning and evening types often called 'larks' and 'owls', respectively. Sleep and wake times show a near-Gaussian distribution in a given population, with extreme early types waking up when extreme late types fall asleep. This distribution is predominantly based on differences in individuals' circadian clocks.[3]

Systematic investigations of individual circadian rhythm preferences have been stimulated by the publication of the Horne and Ostberg Morningness-Eveningness Questionnaire (MEQ).[4] The MEQ is the most widely used subjective tool for identifying individual chronotypes and the physiological variations of circadian rhythms in diverse cultures.[3,5,6] However, the MEQ has been criticised for its excessive length (19 questions); thus, a reduced version (MEQr) with just five questions was developed.[7]

Many Western studies have assessed the chronotypes of college-aged students.[5,8] However, such studies are scarce in the Middle East,[6,9] with no comparable studies investigating the chronotypes of young people in the Kurdistan regions of Iraq. Students of other population groups are more frequently included in research on circadian typology. The current study chose a sample of Kurdish students because this ethnic group has had fewer constraints to social synchronisers, for example work schedules, and can express with greater freedom their circadian rhythmic preferences.[10] The aim of this study, therefore, was to assess the distribution of chronotypes in a sample of Iraqi Kurdish medical students in Erbil, the main city of the Iraqi Kurdistan region.

Methods

This cross-sectional study was conducted in the Hawler Medical University College of Medicine, Erbil, Iraq, between 1 January and 31 March 2013. The total number of medical students for the academic year 2012–13 was 900, with a male to female ratio of 0.58:1. A random student sample was selected and the sample size was calculated to detect a prevalence of 26.9% evening types according to a Saudi study,[6] with a confidence interval (CI) of 95% and a precision of 10%. The estimated sample size was 484 out of 900 students. A target sample of 580 students was chosen to account for non-response.[11] Students at all academic levels were recruited using a systematic random sampling technique, whereby every third name on the class list was skipped. Participation in the study was anonymous and voluntary.

The reduced version of the Horne and Ostberg MEQ was used.[7] This version has been validated and shown to successfully identify human circadian typology.[12,13] The MEQr was independently translated into the Kurdish language by four different lecturers from the Department of English of the Faculty of Education at Salahaddin University, Hawler, Iraq. The translations were then reviewed in collaboration with the investigators and translators from the Department of Kurdish Language and Literature of the Faculty of Education of Salahaddin University. Any differences in translation were expressed in joint statements. Following this, a pilot study was performed on a group of 20 subjects in order to evaluate the comprehensiveness of the questionnaire. The questionnaire was adapted according to the findings, distributed to the selected students at the end of each class session and collected the day after.

The five questions on the MEQr established the chronotypes within a score range of 4–25. These questions determined each individual's preferred time to wake up; preferred time to go to bed; the hour of the day when they felt their "best"; the extent of their tiredness within the first half hour after waking in the morning, and what circadian type each respondent considered themselves to be. In this study, a simpler classification was used which included three behavioural categories: morning type (score 18–25), intermediate type (score 12–17) and evening type (score 4–11). This simpler classification has been used previously.[5,6,9,14] Information was also collected regarding the students' gender.

The data was transferred to the Statistical Package for the Social Sciences (SPSS), Version 18 (IBM, Corp., Chicago, Illinois, USA). Pearson's Chi-squared test and the Z-test were used for the analysis of gender and circadian typology results. The student's t-test and analysis of variance (ANOVA) accompanied by *post-hoc* tests were used to analyse gender and mean scores in respect to the MEQr items.

The study was approved by the Research Ethics Committee of the Hawler Medical University College of Medicine.

Results

Of the 580 students, 130 (22.4%) were male and 450 (77.6%) were female. The mean age ± SD was 20.3 ± 1.45 years, ranging from 17–24 years.

Although the distribution of the MEQr scores (range = 5–22, mean ± standard deviation [SD] = 14.2 ± 3.8) did not show skewness (value = 0.15, error = 0.10) or kurtosis (value = 0.63, error = 0.20), it was
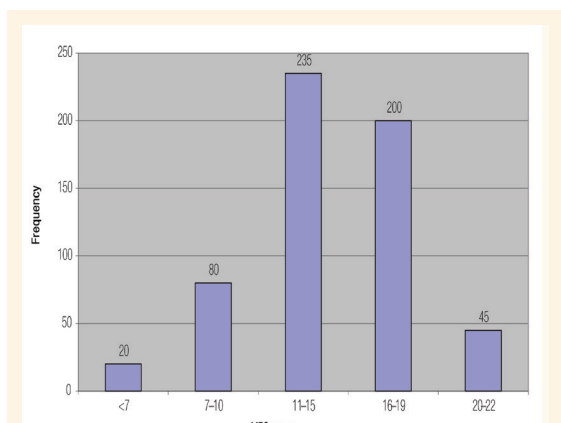
Figure 1: Frequency distribution of the MEQr scores among a sample of Kurdish medical students (N = 580).

MEQr = reduced version of the Horne and Ostberg Morningness-Eveningness Questionnaire.

significantly different from the normal curve (Z = 2.37, P <0.001) [Figure 1].

A total of 24.3% of the participants were classified as morning types, 52.6% were intermediate type sand 23.1% were evening types. Significant gender differences were detected in the proportion of morning, intermediate and evening types (Chi-squared = 13.80, *P* = 0.001). Female students showed a tendency towards eveningness (26.4%) while male students had a tendency towards morningness (30.8%) [Table 1]. There was no statistically significant difference between the mean scores of the behavioural categories in respect to gender after using ANOVA (F = 0.54, *P* = 0.45) [Table 2].

Table 3 displays the mean, SD and number of subjects in each group according to age and gender. In order to study gender differences in more detail, the MEQr questionnaire items were analysed with the Z-test. There were no significant differences in any of the following items: time getting out of bed (Z = -1.38 , *P* = 0.16); feeling refreshed during the first half hour of the morning (Z = -1.62, *P* = 0.10); feeling tired in the evening and needing to sleep (Z = -1.50, *P* = 0.13); feeling their "best" during the day (Z = -1.6, *P* = 0.09), and which circadian typology the respondent considered themselves to be (Z = - 0.08, *P* = 0.93). ANOVA was also used to analyse the age differences in respect to mean scores, considering age as an independent variable. Age differences were statistically significant (F = 7.89, *P* <0.001) and the age-gender interaction was highly significant (F = 21.98, *P* <0.001). The multiple *post-hoc* comparisons among the different age groups revealed differences in the 17–18 (P = 0.02), 18–19 (*P* = 0.001) and 19–20 age groups (*P* = 0.003).

Table 1: Distribution of the studied sample of Kurdish medical students according to circadian type and gender (N = 580)

Circadian type	Students n (%)		
	Total	Male	Female
Morning	141 (24.3)	40 (30.8)	101 (22.4)
Intermediate	305 (52.6)	75 (57.7)	230 (51.1)
Evening	134 (23.1)	15 (11.5)	119 (26.4)
Total	580 (100.0)	130 (100.0)	450 (100.0)

Gender variation was significant according to Pearson's Chi-squared = 13.80 and P <0.001.

Discussion

This study showed that 24.3% of the subjects were morning types, 52.6% were intermediate types and 23.1% were evening types. A Saudi Arabian study reported a lower figure for morning types (18.2%) and similar figures of 54.9% and 26.9% for both 'neither' (intermediate) types and evening types, respectively.[6]

Studies in Western countries have reported lower figures for morningness, with an overall proportion of 20% and 15% in Spain,[15,16] 9% in Italy,[17] 15.6% for males and 20.3% for females in Germany,[18] and 5.9% for males and 9.7% for females in the USA.[13] In contrast with those findings, the Saudi Arabian investigators postulated that, as the majority of their population was Muslim, waking up each day for dawn prayers might explain the higher prevalence of morningness among their participants.[6] It is worth noting that both the Saudi Arabian and Iraqi populations have similar religious beliefs and cultural traditions, which may explain the similar findings.

Most participants in the current study were intermediate types (52.6%), which is in agreement with the circadian typology reported in Western

Table 2: Distribution of the studied sample of Kurdish medical students by mean MEQr scores and range (N = 580)

Circadian type	Students Mean ± SD (range)		
	Total	Male	Female
Morning	13.9 ± 2.7 (18–22)	11.7 ± 2.6 (19–22)	14.8 ± 2.3 (18–22)
Intermediate	14.8 ± 4.0 (12–16)	15.8 ± 4.2 (12–16)	14.5 ± 3.9 (13–16)
Evening	13.1 ± 4.0 (5–11)	14.7 ± 7.4 (5–11)	13.1 ± 3.5 (6–11)
Total	14.2 ± 3.8 (5–22)	14.5 ± 4.7 (5–22)	14.2 ± 3.6 (6–22)

MEQr = reduced version of the Horne and Ostberg Morningness-Eveningness Questionnaire; SD = standard deviation.

Table 3: Mean MEQr scores, standard deviation and number of Kurdish medical students as a function of their age and gender (N = 580)

Age in years	Students					
	Female		Male		Total	
	n	Mean ± SD	n	Mean ± SD	n	Mean ± SD
17	5	0 ± 11.0	5	12.0 ± 0	10	11.3 ± 0
18	45	3.8 ± 16.1	5	19.0 ± 0	50	16.4 ± 3.7
19	55	4.1 ± 15.3	10	17 ± 1.05	65	15.6 ± 3.8
20	211	3.3 ± 13	20	13 ± 2.4	231	13.5 ± 3.2
21	89	3.5 ± 13.7	30	12.6 ± 5.07	119	13.4 ± 3.9
22	20	0.7 ± 15	30	15.8 ± 4.6	50	15 ± 3.6
23	10	4.7 ± 14.5	25	14.6 ± 6.1	35	14.5 ± 5.7
24	10	3.6 ± 15.5	5	15 ± 0	15	15.3 ± 2.9
Totals	445	3.6 ± 14.2	130	14.5 ± 4.7	580	14.2 ± 3.8

MEQr = reduced version of the Horne and Ostberg Morningness-Eveningness Questionnaire; SD = standard deviation.

countries: an overall proportion of 61% and 59.6% in Spain,[15,16] 69.1% in Italy,[17] 55.5% for males and 58.9% for females in Germany,[18] and 63.7% for males and 61.6% for females in the USA.[13] The figures reported in Western countries on eveningness were as follows: an overall proportion of 19% and 24% in Spain,[15,16] 21.9% in Italy,[17] 28.9% for males and 20.8% for females in Germany,[18] and 30.4% for males and 28.6% for females in the USA.[13] Once again, these findings are similar to those of the current study (23.1%). The mean MEQr scores obtained in this study were lower than those obtained in the USA,[13] France,[19] Spain[20] and Taiwan.[21] Variations in culture and ethnicity could be responsible for disparities in morning/evening preferences, in addition to sampling variations in age range and gender distributions.

As for gender differences, the current study revealed significant variations in circadian distribution, with male students displaying morningness significantly more often than female students, who exhibited greater eveningness. However, there was no gender difference in the mean scores. The findings of other studies on the effect of gender on chronotypes have been inconsistent. The Saudia Arabian study revealed no gender differences in the frequency of any category of chronotypes or in the mean scores.[6] In Western countries, some investigators have reported a higher proportion of morningness in females while others have found no gender differences.[16,18,22] Regarding gender differences in the mean scores, while some researchers did not find significant differences between male and female participants,[15,23] others did when using larger samples.[16,24] These results underscore the need for further and more detailed investigation regarding gender and circadian typology.

There have been reports that personality characteristics are affected by the morningness-eveningness pattern. Morning types were found to be more conscientious and have higher self-esteem and internal *locus* of control than evening types.[25] In contrast, evening types have been reported to have irregular sleeping patterns.[25-27] Irregular nocturnal sleeping patterns and increased daytime sleepiness have been found to be associated with lower academic performance in medical students.[28,29] Educators and college authorities need to encourage students to control their sleeping patterns through orientation sessions.

One of the methodological limitations of this study was that a cross-sectional design is not the most appropriate method to test for a direct relationship between factors. This means that further controlled studies are needed to test these relationships. The validity of results gathered from self-reported questionnaires is another limitation to be considered when interpreting the results of this study. In addition, chronotype studies performed with college students cannot be generalised to the rest of the population. As the study was only done on Kurdish students, the findings of this study cannot be generalised to all medical students in Iraq, or to the Iraqi population in general. These findings are limited to Kurdish Iraqi medical students. Finally, various other aspects such as lifestyle habits, social/gender demands, family schedules, academic performance, or psychological and physical issues have not been considered in this study. However, despite these limitations, this study provides useful baseline data on the age differences, gender variations and distribution of chronotypes among a sample of college students.

Conclusion

In this study investigating the chronotypes of a sample of Kurdish medical students, most were classified as intermediate types. However, the morning type was more common, particularly among males, than has been reported in similar age groups in some Western studies. As determined by the MEQr scores, chronotypology differed significantly according to gender. In the light of these findings, future studies are recommended to determine circadian typology and to identify factors that influence circadian typology among different age groups and populations.

References

1. Daan S, Beersma DG, Borbély AA. Timing of human sleep: Recovery process gated by a circadian pacemaker. Am J Physiol 1984; 246:R161–78.

2. Kerkhof GA. Inter-individual differences in the human circadian system: A review. Biol Psychol 1985; 20:83–112. doi: 10.1016/0301-0511(85)90019-5.

3. Roenneberg T, Kuehnle T, Juda M, Kantermann T, Allebrandt K, Gordijn M, et al. Epidemiology of the human circadian clock. Sleep Med Rev 2007; 11:429–38. doi: 10.1016/j.smrv.2007.07.005.

4. Horne JA, Ostberg O. A self-assessment questionnaire to determine morningness-eveningness in human circadian rhythms. Int J Chronobiol 1976; 4:97–110.

5. Laberge L, Carrier J, Lespérance P, Lambert C, Vitaro F, Tremblay RE, et al. Sleep and circadian phase characteristics of adolescent and young adult males in a naturalistic summer time condition. Chronobiol Int 2000; 17:489–501. doi: 10.1081/CBI-100101059.

6. BaHammam AS, Almistehi W, Albatli A, AlShaya S. Distribution of chronotypes in a large sample of young adult Saudis. Ann Saudi Med 2011; 31:183–6. doi: 10.4103/0256-4947.78207.

7. Adan A, Almirall H. Horne and Östberg morningness-eveningness questionnaire: A reduced scale. Pers Individ Dif 1991; 12:241–53. doi: 10.1016/0191-8869(91)90110-W.

8. Randler C. Morningness-eveningness comparison in adolescents from different countries around the world. Chronobiol Int 2008; 25:1017–28. doi: 10.1080/07420520802551519.

9. BaHammam A. Assessment of sleep patterns, daytime sleepiness, and chronotype during Ramadan in fasting and nonfasting individuals. Saudi Med J 2005; 26:616–22.

10. Kim S, Dueker GL, Hasher L, Goldstein D. Children's time of day preference: Age, gender and ethnic differences. Pers Indiv Dif 2002; 33:1083–90. doi: 10.1016/S0191-8869(01)00214-8.

11. Naing L, Winn T, Rusli BN. Practical issues in calculating the sample size for prevalence studies. Arch Orofacial Sci 2006; 1:9–14.

12. Natale V, Esposito MJ, Martoni M, Fabbri M. Validity of the reduced version of the Morningness-Eveningness Questionnaire. Sleep Biol Rhythms 2006; 4:72–4. doi: 10.1111/j.1479-8425.2006.00192.x.

13. Chelminski I, Petros TV, Plaud JJ, Ferraro FR. Psychometric properties of the reduced Horne and Ostberg questionnaire. Pers Indiv Dif 2000; 29:469–78. doi: 10.1016/S0191-8869(99)00208-1.

14. Taillard J, Philip P, Bioulac B. Morningness/eveningness and the need for sleep. J Sleep Res 1999; 8:291–5. doi: 10.1046/j.1365-2869.1999.00176.x.

15. Adan A, Almirall H. Adaptation and standardization of a Spanish version of the Morningness-Eveningness Questionnaire: Individual differences. Pers Indiv Dif 1990; 11:1123–30. doi: 10.1016/0191-8869(90)90023-K.

16. Adan A, Natale V. Gender differences in morningness-eveningness preference. Chronobiol Int 2002; 19:709–20.

17. Fabbri M, Antonietti A, Giorgetti M, Tonetti L, Natale V. Circadian typology and style of thinking differences. Learn Individ Differ 2007; 17:175–80. doi: 10.1016/j.lindif.2007.05.002.

18. Lehnkering H, Siegmund R. Influence of chronotype, season, and sex of subject on sleep behavior of young adults. Chronobiol Int 2007; 24:875–88. doi: 10.1080/07420520701648259.

19. Caci H, Robert P, Dossios C, Boyer P. [Morningness-Eveningness for Children Scale: Psychometric properties and month of birth effect]. Encephale 2005; 31:56–64. doi: 10.1016/S0013-7006(05)82372-3.

20. Adan A, Caci H, Prat G. Reliability of the Spanish version of the Composite Scale of Morningness. Eur Psychiatry 2005; 20:503–9. doi: 10.1016/j.eurpsy.2005.01.003.

21. Gau SS, Soong WT, Merikangas KR. Correlates of sleep-wake patterns among children and young adolescents in Taiwan. Sleep 2004; 27:512–19.

22. Reyner LA, Horne JA, Reyner A. Gender- and age-related differences in sleep determined by home-recorded sleep logs and actimetry from 400 adults. Sleep 1995; 18:127–34.

23. Caci H, Nadalet L, Staccini P, Myquel M, Boyer P. Psychometric properties of the French version of the Composite Scale of Morningness in adults. Eur Psychiatry 1999; 14:284–90. doi: 10.1016/S0924-9338(99)00169-8.

24. Randler C. Gender differences in morningness–eveningness assessed by self-report questionnaires: A meta-analysis. Pers Indiv Dif 2007; 43:1667–75. doi: 10.1016/j.paid.2007.05.004.

25. Jackson LA, Gerard DA. Diurnal types, the "big five" personality factors, and other personal characteristics. J Soc Behav Pers 1996; 11:273–84.

26. Park YM, Matsumoto K, Seo YJ, Shinkoda H, Park KP. Sleep in relation to age, sex, and chronotype in Japanese workers. Percept Mot Skills 1998; 87:199–215. doi: 10.2466/pms.1998.87.1.199.

27. Roenneberg T, Wirz-Justice A, Merrow M. Life between clocks: Daily temporal patterns of human chronotypes. J Biol Rhythms 2003; 18:80–90. doi: 10.1177/0748730402239679.

28. Medeiros ALD, Mendes DBF, Lima PF, Araujo JF. The relationships between sleep-wake cycle and academic performance in medical students. Biol Rhythm Res 2001; 32:263–70. doi: 10.1076/brhm.32.2.263.1359.

29. BaHammam AS, Alaseem AM, Alzakri AA, Almeneessier AS, Sharif MM. The relationship between sleep and wake habits and academic performance in medical students: A cross-sectional study. BMC Med Educ 2012; 12:61. doi: 10.1186/1472-6920-12-61.