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ORIGINAL ARTICLE

An Investigation of the Relationship Between the Chronotypes of Mothers Who Had Normal Delivery and Various Characteristics of Theirs and Their Babies

Normal Doğum Yapan Annelerin Kronotipleri ile Kendilerinin ve Bebeklerinin Çeşitli Özellikleri Arasındaki İlişkinin İncelenmesi

[1]Eda Baytaş, [2]Dilek Erdem, [3]Hacı Bayram Yılmaz

[1]Siirt Üniversitesi, Beden Eğitimi ve Spor Yüksekokulu, Beden Eğitimi ve Spor Eğitimi Anabilim Dalı, Siirt, Türkiye.
[2]Alanya Alaaddin Keykubat Üniversitesi, Tıp Fakültesi, Kadın Hastalıkları ve Doğum Anabilim Dalı. Kadın Doğum ve Jinekoloji, Alanya, Türkiye.
[3]Centre for Healthcare Education Research and Innovation, Institute of Education in Healthcare and Medical Sciences, University of Aberdeen, United Kingdom.

Correspondence

Dilek Erdem, Kestel Mahallesi, Üniversite Caddesi, No:80 PK:07425 Alanya/ ANTALYA

E-Mail: dilek.erdem@alanya.edu.tr

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ABSTRACT

Introduction: Biological changes in human metabolism due to daylight and heat are expressed as circadian rhythm, and its classification according to individuals and their genetic differences is called chronotype. In recent years, there has been an increase in studies examining the relationship between circadian rhythm and birth.
Purpose: This study's first aim was to investigate the relationship between the chronotypes of mothers and time of birth, season, meridians in which they were born, and the gender of their babies. Its second aim was to examine the relationship between the birth times and chronotypes of pregnant women and the time of their deliveries.
Method: The study was conducted among women presented to Alanya Training and Research Hospital Gynecology and Obstetrics Polyclinic between 01.02.2022 and 31.03.2022. The study included 147 women remembering the date and time of delivery. Participants were selected among the mothers who gave a normal birth, did not have labor induction, whose birth started with spontaneous contractions, and had a healthy pregnancy. A questionnaire form including sociodemographic characteristics, obstetric information, and Horne and Östberg's Morningness-Eveningness scale was applied face to face. One-way ANOVA, Chi-Square, and logistic regression analyses were employed to analyze the data.
Results: The chronotypes of the participants revealed that 45 women (30.6%) were morning type, 90 women were intermediate type (61.2%), and 12 women were evening type (8.2%). No difference was found between the chronotype scores of the mothers and the birth hours of their babies (p= .324). There was no difference between mothers' chronotype scores and birth meridians (p= .842). In addition, no significant relationship was found between the mothers' own birth hours and the birth hours of their babies (p= .050).
Conclusion: There was no relationship between birth time, season, gender, birth meridian, and chronotype. The limitation of the study may be related to the recall bias, the effect of confounding factors, and the sample size. However, we think it is an interesting field in terms of providing a different perspective on the differences in performance and mood of people with further studies regarding chronotype.

Keywords: Chronotype, morningness, eveningness, time of birth, meridian of birth.

ÖZ

Giriş: İnsan metabolizmasının karanlık ve ısıya bağlı olarak gösterdiği biyolojik değişikliklere sirkadiyen ritim, bireysel ve genetik farklılıklara göre sınıflandırılması kronotip olarak ifade edilmektedir. Son yıllarda sirkadiyen ritim ile doğum arasındaki ilişkiyi inceleyen çalışmalarda artış görülmektedir.
Amaç: Bu çalışmanın amacı annelerin kronotipleri ile annenin doğum saati, mevsimi, meridyeni ve bebeklerinin cinsiyetleri arasındaki ilişkiyi araştırmaktır. İkincil amacımız gebelerin kendi doğum saatleri ve kronotipleri ile yaptıkları doğumların saatleri arasındaki ilişkiyi incelemektir.
Yöntem: Araştırma 01.02.2022- 31.03.2022 tarihleri arasında Alanya Eğitim Araştırma Hastanesi Kadın Hastalıkları ve Doğum Polikliniğine başvuran kadınlar arasında yapılmıştır. Doğum tarihini, saatini hatırlayan, doğumu spontan kasılmalarla başlayan, doğum indüksiyonu yapılmayan, sezeryan olmayan ve sağlıklı bir gebelik geçiren 147 kadın çalışmaya dahil edilmiştir. Katılımcılara sosyodemografik özellikleri, obstetrik bilgileri ve Horne ve Östberg'in Sabahçıl-Akşamcıl ölçeğini içeren anket formu yüz yüze şekilde uygulanmıştır. Verilerin analizinde Oneway ANOVA, Ki-KARE ve lojistik regresyon analizleri kullanılmıştır.
Bulgular: Çalışmaya katılanların kronotipleri sabahçıl tip 45 kadın (%30.6), ara tip 90 kadın (%61.2), akşamcıl tip 12 kadın (%8.2) olarak belirlenmiştir. Annelerin kronotip puanları ile bebeklerinin doğum saatleri arasında yapılan analizde fark bulunamamıştır (p= .324). Annelerin kronotip puanları ile doğum meridyenleri arasında da fark saptanmamıştır (p= .842). Annelerin kendi doğum saatleri ile bebeklerinin doğum saatleri arasında eşitlik saptanmıştır (p= .050).
Sonuç: Çalışma sonuçlarında doğum saati, mevsim, cinsiyet, doğum meridyeni ile kronotip arasında ilişki bulunamamıştır. Çalışmanın sınırlılığı hatırlama yanlılığı, kafa karıştırıcı faktörlerin etkisi ve örneklem büyüklüğü ile ilgili olabilir. Ancak kronotip ile çalışmaların ve bilginin artışı ile kişilerin performans ve duygu durum konusundaki farklılıklarına farklı bir bakış açısı sunması açısından ilgi çekici bir alan olduğunu düşünmekteyiz.

Anahtar Kelimeler: Kronotip, sabahçıl-akşamcıl, doğum saati, doğum meridyeni.

Introduction

The circadian rhythm is a 24-hour cycle of biological rhythmic activity alternating with darkness and temperature, which is controlled by the suprachiasmatic nucleus (SCN) in the anterior hypothalamus and the pineal gland in the midbrain. Circadian rhythm may affect the wake-sleep cycle, body temperature, cognitive performance, endocrine system, and mood with cognitive, psychological

and physiological variables (1–3). The cycle of variables such as heart rate, hormone level and body temperature take place in a 24-hour period (4). The biological changes in metabolism due to darkness and heat during the 24-hour are described as circadian or diurnal rhythm. In addition, circadian rhythm might be affected by factors such as heredity, gender, age, and environment (5).

Circadian rhythm is described as chronotypes according to individual differences (6). Chronotypes can be classified as morning and evening types according to their genetic and physiological characteristics (2). According to the differences in the circadian rhythm, there are three different chronotypes: morning, intermediate and evening. Morning types wake up early and reach the highest level of mental capacity before noon; early morning is the time when the individuals feel the best. Evening types have irregular sleep, go to bed and wake up late, and mental capacities peak 12 hours after awakening (7,8). The term lark is used for morning type and the term owl is expressed for evening type (2,9).

Chronotypes can be affected by individual factors such as age, gender, and heredity, environmental factors such as the light-dark cycle encountered during birth, the latitude and altitude of the place of residence, and the individual's exposure to light (10). Melatonin is a hormone secreted from the pineal gland, which remains at low levels during the day, increases rapidly in the evening, and reaches its peak at night (11). While light is the most important factor for the environmental adaptation of the central nervous system, food consumption, activity, exercise, and external melatonin affect the circadian system (12).

Considering the increasing frequency of shift work, traveling by plane between time zones and untimely eating, many pregnant women may be exposed to adverse environmental conditions. Such suboptimal conditions may influence the fetus. Therefore, environmental light and circadian rhythms should be reckoned during pregnancy (13). The human body is designed for vaginal delivery under normal conditions (14). Studies in the literature show that birth is a factor affecting the function of the adult circadian system (15–17). Some studies report that factors such as sunrise, sunset and day length significantly affect the chronotype of children and adolescents (18,19). Therefore, there is a need for studies investigating how the exposure time of newborns to light affects the chronotype (20). The literature shows that people with depression, bipolar disorder, anxiety, addiction, sleep and eating disorders are evening chronotype and sleep late (21). It has been observed that many variables can affect individuals' circadian rhythms and chronotypes, and people can have various disorders according to their chronotypes. Although there are studies investigating the duration of exposure to light, such as the season and the meridian in which individuals were born, there are no studies investigating the relationship between birth hours and chronotype. We aimed to determine the relationship between the chronotypes of mothers who had normal birth and their own birth time. In addition, the relationship between mothers' chronotypes and birth meridians, birth season, and time of birth was investigated.

Method

Research Model

This study was designed using the relational survey model, one of the quantitative research methods. This model is aimed to determine the degree and/or strength of the co-variation between two or more variables (22). Ethics committee approval was obtained from Alanya Alaaddin Keykubat University Health Sciences Ethics Committee (dated 26.01.2022, number 01-05). A written consent form was obtained from the participants. This research was conducted following the rules of publication and research ethics. For clarity, the questionnaire was filled in by face-to-face interview method. This study was carried out among patients admitted to Alanya Alaaddin Keykubat University Training and Research Hospital Gynecology Outpatient Clinic. The number of participants in this study was limited to 147 people since the number of patients who met the criteria for inclusion in the study was low and the number of women who remembered the time of birth and birth was low.

Sample

The research sample consisted of 147 women born and gave birth in Turkey with normal spontaneous labor and not induced for any reason. Inclusion criteria for the study: Women who voluntarily agreed to participate in the study, who gave birth with spontaneous contractions without induction of intervention due to any obstetric reason and who did not have any maternal or fetal obstetric problems during pregnancy (i.e., hypertension, fetal distress, polyhydramnios), and who had normal delivery were included in the study. Exclusion criteria from the study: Women who gave birth by induction and deliveries, who had planned cesarean section, who gave birth before 37 weeks and who had maternal or fetal obstetric problems during pregnancy (i.e., hypertension, fetal distress, polyhydramnios) second twin or breech deliveries were not included in the study.

Data Collection

Data were collected through a structured questionnaire. In the form, the participants were asked about the city where they were born, the city where they gave birth, the age of the mother, their own birth time, the number of previous pregnancies, the when time they gave birth, the babies' date of birth (day/month/year), gender of the babies (18), and the 'Morningness and Eveningness Questionnaire' was filled out. The Morningness and Eveningness Test was developed by Horne and Östberg (1976) to determine

individuals' chronotypes of individuals, and it was adapted into Turkish by Pünduk, Gül and Ercan (2005). Permission to use the questionnaire form has been obtained. The test is a Likert-type scale consisting of 19 questions in total. Participants scored points for each question based on the answer they marked. Questions 3-9 and 13-16 are scored between 1-4 points; Questions 1, 2, 10, 17 and 18 are scored between 1-5 points; Questions 11 and 19 are scored between 0-6, and Question 12 is scored between 0-5 points (9). The questionnaire is between 16-86 points; low scores show evening, and high scores show morning types (23). According to the total score, individuals are classified into three different circadian rhythm types. "Morning type" has 59-86 points, "Intermediate type" has 42-58 points, and "Evening type" has 16-41 points. The Cronbach's alpha coefficients of the scale were 0.785 and 0.812 (9).

Statistical analysis

The months when participants were born were grouped according to the seasons by dividing them into twelve groups and then into four groups in Excel. Birth times are divided into three groups (01:00- 08:59, 09:00- 16:59, 17:00- 24:59), and birth meridians are divided into three groups (27-33.50; 33.51-39.50; 39). .51- 45.50). After the research data were transferred to the SPSS program, descriptive statistical analyses were performed. Skewness and kurtosis values were evaluated to determine whether the data showed a normal distribution (24). One-way ANOVA and Chi-Square analyses were used to determine the relationship between the variables, and logistic regression analyses were used to create the model. p <0.05 was accepted as statistically significant.

Results

37.4% of the participants in the study are housewives. 39.5% are civil officers and 23.1% are private sector employees. 37.2% of the babies were born in spring, 26.2% in summer, 17.9% in autumn and 18.6% in winter. There were 45 people with morning type, 90 with intermediate type, and 12 with evening type. The highest number of births occurred between 09:00 and 16:59 hours. It is seen that the highest number of baby girls are born between 01:00 and 08:59 hours, and the most birth rates for boys are between 09:00 and 16:59 hours (Table 1).

In Table 2, the relationship between the chronotype scores of mothers and the time they when were born was examined. No significant correlation was found between mothers' chronotype scores and delivery hours (p> 0.05). There is no significant relationship between the mothers' chronotype scores and their babies' birth time (p> 0.05). When the participants in the study were grouped according to their birth meridians, it was found that 106 mothers were born in the 27.00°-33.50° meridians, 26 were born in 33.51°-39.50° meridians, and 15 were born in the 39.51°-45.50° meridians. There is no significant relationship between chronotype scores of mothers and their birth meridian (p> 0.05).

Table 1. Demographic Characteristics of the Participants

		Number of people (n)	Percent (%)
Occupation	Housewife	55	37.4
	Civil Officer	58	39.5
	Private sector	34	23.1
	Total	147	100.0
Chronotype of mothers	Morning type	45	30.6
	intermediate type	90	61.2
	Evening type	12	8.2
	Total	147	100.0
Birth season of babies	Winter	27	18.6
	Spring	54	37.2
	Summer	38	26.2
	Autumn	26	17.9
	Total	145	100.0
The birth time of babies	01:00 - 08:59	51	34.7
	09:00 - 16:59	52	35.4
	17:00 - 24:59	44	29.9
	Total	147	100.0
01:00-08:59	Female	30	58.8
	Male	20	39.2
09:00-16:59	Female	25	48.1
	Male	27	51.9
17:00-24:59	Female	21	47.7
	Male	23	52.3
	Total	146	100.0

Table 2. The Relationship Between Mothers' Chronotype and Birth Hours

The birth time of mothers	01:00-08:59 (n=69) X ± SD	09:00-16:59 (n=40) X ± SD	17:00-24:59 (n=38) X ± SD	Total (n=147) X ± SD	p
Chronotype score	54.54 ± 8.52	53.33 ± 7.94	52.68 ± 8.67	53.75 ± 8.39	.502
The birth time of babies	**01:00-08:59 (n=51) X ± SD**	**09:00-16:59 (n=52) X ± SD**	**17:00-24:59 (n=44) X ± SD**	**Total (n=147) X ± SD**	
Chronotype score	52.35 ± 7.06	54.75 ± 9.25	54.18 ± 8.71	53.75 ± 8.39	.324
Birth meridian of babies	**27.00 ° -33.50 ° (n=106) X ± SD**	**33.51 ° -39.50 ° (n=26) X ± SD**	**39.51 ° -45.50 ° (n=15) X ± SD**	**Total (n=147) X ± SD**	
chronotype score	53.81 ± 7.85	54.15 ± 10.18	52.60 ± 9.22	53.75± 8.39	.842

Table 3. The Relationship Between Mothers' Chronotypes and Birth Seasons

Seasons	Winter X ± SD	Spring X ± SD	Summer X ± SD	Autumn X ± SD	Total (n=147) X ± SD	p

Chronotype score	53.50 ±8.19	51.66 ± 8.67	55.33 ±8.81	55.39 ± 7.42	53.75± 8.39	.145

Table 4. The Relationship Between Mothers' Own Birth Time and Their Babies' Birth Time

Mother birth time / Babies birth time	01:00-08:59		09:00-16:59		17:00-24:59		TOTAL		p
	n %		n %		n %		n %		
01:00-08:59	25	49.0	22	42.3	22	50	69	46.9	.050
09:00-16:59	8	15.7	21	40.4	11th	25	40	27.2	
17:00-24:59	18	35.3	9	17.3	11th	25	38	25.9	
Total	51	100	52	100	44	100	147	100	

Table 5. The Relationship Between Birth Meridians and Birth Hours of Babies

Meridian/ birth time	01:00-08:59 n %		09:00-16:59 n %		17:00-24:59 n %		TOTAL n %		p
27.00°-33.50°	35	70	45	86.5	33	75	113	77.4	.190
33.51°-39.50°	11th	22	7	13.5	9	20.5	27	18.5	
39.51°-45.50°	4	8	0	0.0	2	4.5	6	4.1	
Total	50	100	52	100	44	100	146	100	

Table 6. The Relationship Between the Birth Seasons of the Babies and their Gender

Season/ Gender	baby girl N %		Baby boy N %		TOTAL N %		p
Winter	13	17.1	14	20.3	27	18.6	.864
Spring	27	35.5	27	39.1	54	37.2	
Summer	21	27.6	17	24.6	38	26.2	
Autumn	15	19.7	11th	15.9	26	17.9	
Total	76	one hund-red	69	one hund-red	145	one hund-red	

Table 7. The Relationship Between Gender and Birth Hours of Babies

Gender of babies/ Birth time of babies	01:00-08:59 n %		09:00-16:59 n %		17:00-24:59 n %		TOTAL n %		p
Female	30	60.0	25	48.1	21	47.7	76	52.1	.382
Male	20	40.0	27	51.9	23	52.3	70	47.9	
Total	50	100	52	100	44	100	146	100	

Table 8. Do the Gender of the Babies Born Differentiate According to the Chronotype Scores of the Mothers?

Variable	β	SH (β)	Wald χ2	p
Constant	-0.51	1.08	0.22	.640
Gender	0.01	0.02	0.16	.690

There was no significant relationship between the mothers' chronotype and the babies' birth seasons ($p > 0.05$) (Table 3).

There was no significant relationship between mothers' birth time and babies' birth time ($p > .05$). However, the differences between the groups were approaching the significance level. The mothers born between 01:00-08:59 is highly likely to deliver their babies between 01:00-08:59 (Table 4).

There is no significant relationship between the meridians where babies are born and the time of birth ($p > .05$). The number of babies born between 27.00°-33.50° meridians is 113 (77.4%). The number of babies born between 33.51°- 39.50° meridians is 27 (18.5%), and the number of babies born between 39.51°- 45.50° meridians is 6 (4.1%) (Table 5).

The number of female babies born in the winter months is 13 (17.1%), and the number of male babies is 14 (20.3%). 27 (35.5%) female babies and 27 (39.1%) male babies were born in spring; 21 (276%) female and 17 (24.6%) male babies were born in summer. The number of female babies born in the autumn is 15 (19.7%) and the number of male babies is 11 (15.9%). The gender of the babies does not differ according to the seasons in which the babies are born ($p> 0.05$). The highest number of births occurred in the spring season (Table 6).

Of the babies born between 01:00 and 08:59, 30 (60.0%) were female and 20 (40.0%) were male; Of the babies born between 09:00-16:59, 25 (48.1%) were female and 27 (51.9%) were male; Of the babies born between 17:00-24:59, 21 (47.7%) were female and 23 (52.3%) were male. There is no significant relationship between the sexes and the time of birth ($p> 0.05$) (Table 7).

Logistic regression analysis was performed to evaluate whether mothers' chronotype scores were predictive of the gender of the babies. The babies' genders do not differ according to the mothers' Chrono scores ($p> 0.05$) (Table 8).

Discussion and Conclusion

This study investigated the relationship between the chronotypes of mothers who had normal births and their birth hours. In addition, the relationship between the chronotype of the mothers and the birth time of their babies and theirs, their birth seasons and birth meridians were investigated. Pregnancy is a complex and time-dependent event consisting of stages including implantation, decidualization, placentation, and birth (25). In the literature, there are studies showing that the season of birth can affect birth weight, puberty (26), survival at birth, the lifetime risk of disease, and life expectancy (27,28). There are studies reporting that exposure to light affects DNA methylation in neuronal development genes (29). Transcriptional changes in single-cell RNA sequence have been reported in mouse visual cortices under light stimulation (30). It is thought that factors such as birth season, birth time, and photoperiod have important effects on human life. It is observed that pregnant women who gave birth prematurely tend to be the evening type (31). Pregnant women who gave birth prematurely were not included in our study. It is

recommended to investigate this issue in future studies.

People born in autumn-winter tend to be morning-type because they are more exposed to darkness, while individuals born in spring-summer tend to be evening-type because they are exposed to more light (21). Births during the long photoperiod were associated with the evening type, and births during the short photoperiod were associated with the morning type (32). Contrary to the studies in the literature, no relationship was found between the mothers' birth hours, birth seasons, birth meridians and chronotype. The sample size of our study is relatively smaller than other studies. Mongrain et al. (2006b) conducted their studies on 1591 people (15) and Natale et al. (2002) on3709 people (16). We believe that sample size affects our study results.

It is known that the number of births changes according to the seasons, but the reason for this is still not understood. In a study conducted in Italy, Spain and Denmark, it was found that the highest number of births occurred in summer (33). In a study investigating the circadian rhythm of normal births in the northern region of Türkiye, it was reported that the highest number of births occurred in July, and the least number of births occurred in March (34). In our study, we found that the highest number of births occurred in spring (37.2%). While we have similar findings to the studies in Türkiye, our results do not show a similarity with international studies. Different results from countries with different meridian intervals are expected.

It has been reported that labor follows a 24-hour cycle and the highest contractions occur at 00:00 (35). It has been shown that contractions mostly start between midnight and 06:00 in preterm births (36). 34.6% of the births in the north of Türkiye were between 08:00 and 16:00, 38.2% were between 16:01-00:00, and 27.2% were between 00:01-07-59 (34). In our study, it was determined that 35.4% of the deliveries occurred between 09:00 - 16:59, 34.7% between 01:00 - 08:59, and 29.9% between 17:00 - 24:59. Our findings are similar to the data of the northern region. Additionally, in our study, most female babies are born between 01:00 and 08:59 hours, and most male babies are born between 09:00 and 16:59 hours. However, no study has been found in the literature to make comparisons by gender. In another study, it was determined that preterm births started between 00:00 and 06:00. We found that the mothers born between 01:00-08:59 group are highly likely to have their babies born between 01:00-08:59 hours.

As a result, in this study, the relationship between the chronotypes of mothers and their birth time and their babies was examined, and no significant relationship was found. However, we think the mothers' birth times may affect their children's birth times and chronotypes when the research is conducted with larger sample size.

Limitations of the research

Since this study included deliveries without induction, the sample group was limited. For this reason, we think future studies should be conducted retrospectively, facilitating access to more data. In addition, we recommend conducting studies about chronotype and the relationship between exposure to light during birth, birth time, birth season and miscarriage, cancer and diseases in larger populations.

Use of Results in Practice

A desired level of relationship was not found between birth time and chronotype. However, if this study is repeated in larger sample groups, considering other studies in the literature, it might be recommended to consider the mother's chronotype and delivery time when determining the time of cesarean delivery. At work, shift arrangements can be made according to chronotypes. Sleeping hours and training arrangements can be made by considering the birth time of the babies, the birth meridian and the birth season factors.

Conflict of Interest

There is no conflict of interest.

Declaration of Interest Statement

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