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Chronotype and Lifestyle Schedule in Healthy Rural Population in South-Eastern Region of Chhattisgarh

Esha Sauraj [a] and Razia Sultana [b*]

[a] Gracious College of Pharmacy, Abhanpur, Belbhata, Raipur, C.G., India.
[b] Shri Kuleshwar Mahadev Government College GobraNawapara Raipur CG., India.

Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

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ABSTRACT

Chronotype is morningness and eveningness preference of humans. The human biological clock is primarily entrained by sunlight but can show the highly flexible phase-shifting capacity of the biological clock allows a person to adjust to new time zones, shift work, temperature changes, seasonal changes, job schedules, social obligations, and other urgent activities. The aim of the current study was to identify the chronotype of interior rural residents who have limited access to electricity. 2117 healthy subjects (aged between 6 to 75 years) willingly participated in the study. All the subjects were provided with biographical information sheets. Chronotype was subjectively assessed using Horne and Östberg questionnaire [1].Result revealed predominant morningness in the studied population. Evening-types more exposed to nighttime artificial light as well as screen time. In addition, body surface area (BSA) of evening-types was also significantly higher than that in other chronotypes. Further the sleeping and waking hours significantly delayed in evening-type as

**Corresponding author: Email: ishasauraj@gmail.com;*

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compared to morning-type and intermediate-type, irrespective of work days and free days. Present study provides insights to the chronotype of rural populations living under semi-modernized conditions. Absence of light at nights, limited screen time, and less facility of electricity could be a reason for predominant morningness among the population. Further eveningtypes with higher BSA are seems to be more susceptible to disturbed sleep-wake pattern.

Keywords: Chronotype; morningness-eveningness; sleep-wake pattern.

1. INTRODUCTION

Chronotype is the body's natural predilection for a particular sleep-wake schedule. It functions in tandem with circadian rhythm, or internal 24-hour clock, and is regulated by heredity [2]. Understanding Chronotype can help increase productivity, enhance energy levels during the day, and optimize your sleep routine. Chronotype is genetically determined but is flexible and also entrained by social and environmental factors. Countries like the United States have a typical distribution of chronotypes: 25% morning types, 50% intermediate types, and 25% evening types [3], though, morningness is more common in tropical countries, where the distribution is skewed. Seasonal variations, occupation, social and cultural characteristics, ageing, and lifestyle factors all have an impact on similar changes in Chronotype [4]. Geographical differences are the main factor influencing the spread of Chronotypes. It is well recognized that evening types are more suited to a nighttime lifestyle and shift work than morning types, as our society grows more dependent on nightlife and shift work in a 24/7 environment [5]. In order to change social and professional behaviours and attain optimal productivity, fewer errors, increased sleep quality, and a higher quality of life, study on changes in sleep-wake preferences may be helpful [6].

The rural population of Gariyaband district Chhattisgarh is tribal belt. Study on interior rural area with less supply of electricity could provide invaluable data to understand the impact of lifestyle schedule associated with chronotype. The present study aimed to document chronotype in rural of Chhattisgarh region.

2. MATERIALS AND METHODS

Selection of the subjects and situation: 2117 healthy subjects (aged between 6 to 75 years) randomly selected and willingly participated in the study. The subjects were living in a captured area in Village-Dugli, Kauwabhara, Tehsil-Sihawa Nagari, District-Dhamtari, district-Gariyaband. Because the land was captured no electricity was supplied to the area. Therefore the population has very little electricity facility. The young subjects found to use mobile phone and are literate. The subjects were in free living condition and had a normal sleep (subjectively assessed) during the data collection period. All the subjects were provided their written consent for the study. The data were collected by non-invasive method. Chronotype and other parameters were subjectively assessed using Horne and Östberg questionnaire [1] and Biographical inventories.

I) Biographical information

Subjects were provided with a Biographic Data Sheet. The biographic data sheet included different fields, such as name, gender, age, date of birth, height, weight, marital status, number of children, educational qualifications, address, blood group, and other health- and habit-related items.

II) Horne and Östberg questionnaire

Horne-Östberg inventory [1] is widely used [7,8,9] to determine morning-evening preference (popularly known as chronotype). This inventory (MEQ) was used to ascertain the extent of morningness and eveningness in each subject. The MEQ consisted of seven multiple choice questions. The subjects were asked to put a tick-mark on the most appropriate answer. They were told to feel free and comfortable and to provide the investigator with the honest answers. The respondents were reminded not to ponder on each question, but to give their first response that occurs to them spontaneously as fast as possible. After the completion of the session they were advised to recheck and make sure that they have not missed any field of query.

Data analysis: The data were analysed by statistical techniques, namely ANOVA followed by Duncan's multiple-range test and Pearson correlation were determined by using statistical software, SPSS (Ver. 10.0).

3. RESULTS

3.1 Descriptive Analysis of Chronotype and Lifestyle Schedule

Out of 2117 subjects 78% of subjects were found to be morning-types, 21% were found to be intermediate-type and 1% where found to be evening-type (Fig. 1). The average BSA and BMI of the studied subjects were 1.32±0.01 and 19.83±0.11 respectively. The current study recorded 1.31±0.01 hours of screen time and 5.03±0.02 hours of artificial light use after sunset. The clock hours for breakfast, lunch, and dinner were 8.41±0.04, 13.47±0.03, and 20.03±0.03, respectively. The average wake times during work days and free days were 6.01±0.02 and 6.64±0.03 respectively (Table 1).

3.2 Chronotype and Lifestyle Factors

The present study documented significant correlations between Chronotype and lifestyle factors. Wake time during work days and free days, BSA, Breakfast, lunch, and dinner times, artificial light duration and screen time were found to be negatively associated with Chronotype score whereas sleep time during work days and free days were found to be positively associated with Chronotype score (Table 2).

The result of ANOVA depicted significant difference in Artificial light duration, Screen time, Lunch time, Breakfast time, BSA, Wake time (in work days), Sleep time (in work days), Wake time (in free days), Sleep time (in free days) as function of Chronotype (Table 3). Duncan's multiple range test revealed that evening type subjects are more exposed to evening time artificial lights and have significantly higher screen time as compared to morning types and neither types. Their BSA is also significantly higher as compared to other groups. Sleep time and wake times of evening types, irrespective of free days and work days, are significantly in later hours as compared to morning types and intermediate types. In addition, although there is no significant difference documented in breakfast and dinner times, lunch time of evening type subjects is significantly in later hours as compared to other groups (Figs. 2-9).

4. DISCUSSION

The present study was performed in rural area where most of the people are from tribal belt and have very little electricity facility. They are literate and use mobile phones. They could easily reach nearby towns for education, transport and medical facilities. We found that most of the subjects were morning-types gets early in the morning and sleeps at around 20:00 clock hours. Chronotype is a well studied phenomenon in west and is been also studied by eastern researchers from a decade. This study documented most of studied subjects falls into morning-type category followed by intermediate-type and evening-type. Cultural norms and societal expectations around sleep and work schedules might be more influential in rural area. Industrialization and urbanization, often more prevalent in temperate regions, can lead to lifestyle changes that favor evening-type

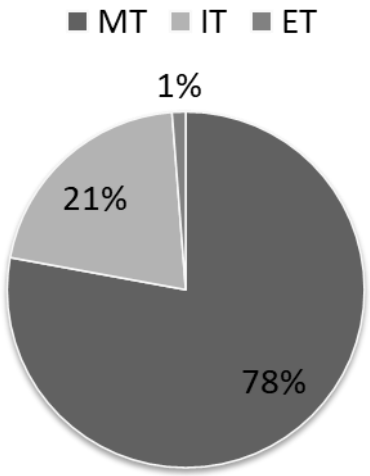

Fig. 1. Frequency as function of Chronotype where MT = 78% (N=1649); IT = 21% (N=442) and ET = 1% (N = 26), from descriptive analysis

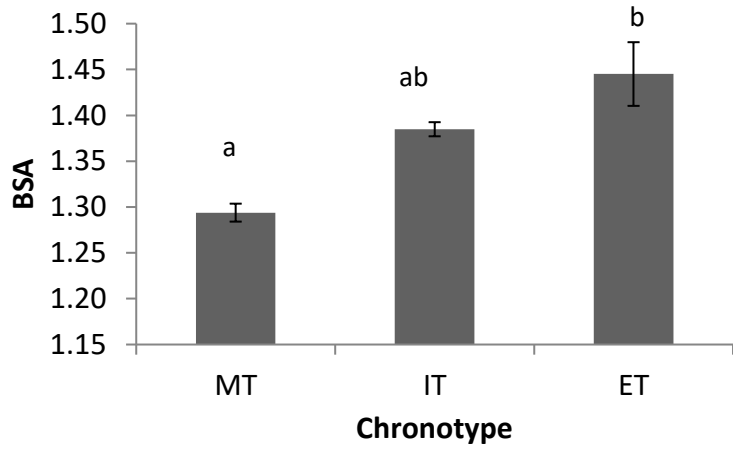

Fig. 2. Average BSA as function of Chronotype where MT = Morning type; IT = Intermediate type and ET = Evening type. Factor- Chronotype, df-2; F =12.96, p<0.001, from ANOVA

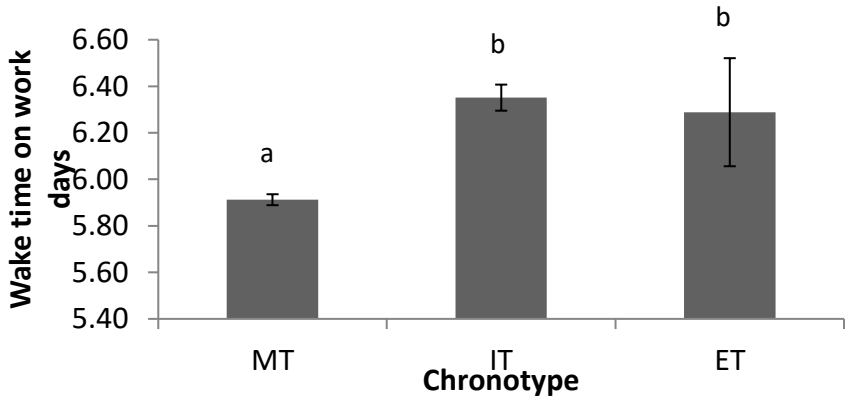

Fig. 3. Average wake time on work days as function of Chronotype where MT = Morning type; IT = Intermediate type and ET = Evening type. Factor- Chronotype, df 2; F = 34.00, p<0.001, from ANOVA

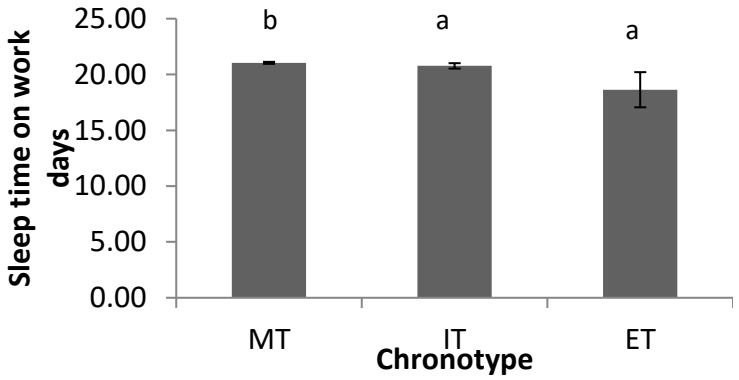

Fig. 4. Average sleep time on work days as function of Chronotype where MT = Morning type; IT = Intermediate type and ET = Evening type. Factor- Chronotype, df- 2; F = 5.06, p=0.01, from ANOVA

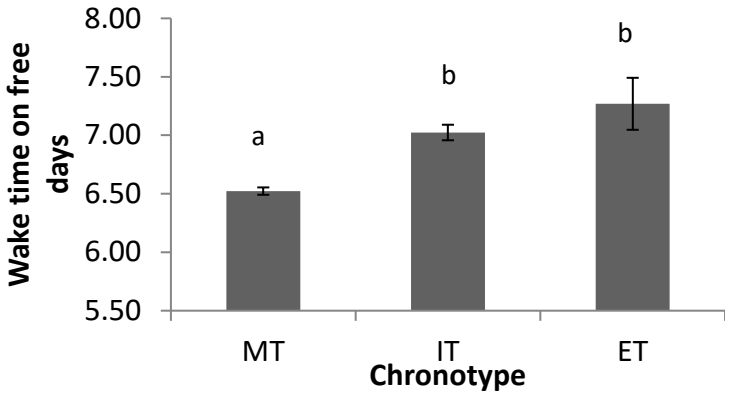

Fig. 5. Average wake time on free days as function of Chronotype where MT = Morning type; IT = Intermediate type and ET = Evening type. Factor- Chronotype, df-2, F = 28.73, p<0.001, from ANOVA

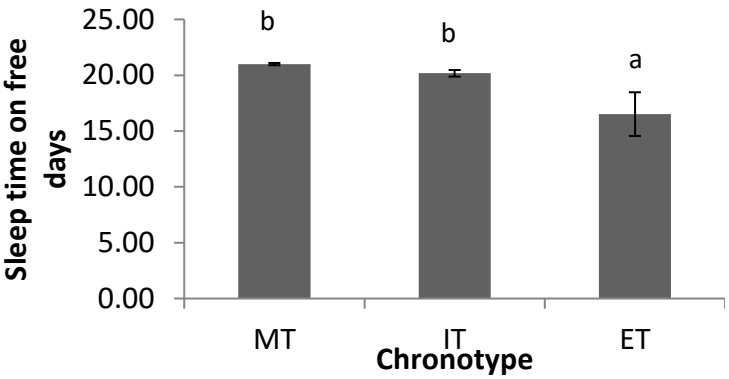

Fig. 6. Average sleep time on free days as function of Chronotype where MT = Morning type; IT = Intermediate type and ET = Evening type. Factor- Chronotype, df-2; F = 16.14, p<0.001, from ANOVA

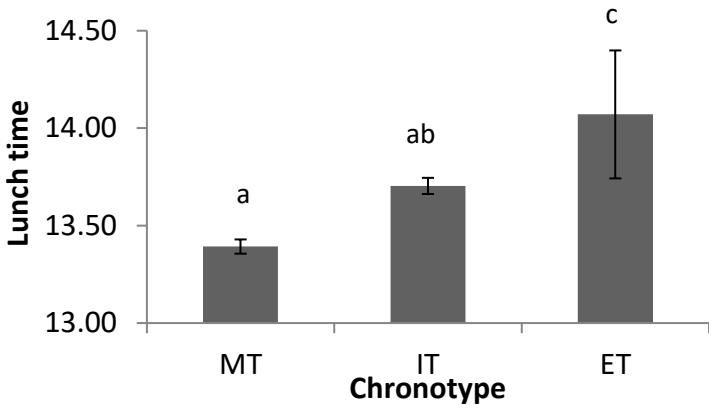

Fig. 7. Average lunch time as function of Chronotype where MT = Morning type; IT = Intermediate type and ET = Evening type. Factor- Chronotype, df-2; F = 11.38, p<0.001, from ANOVA

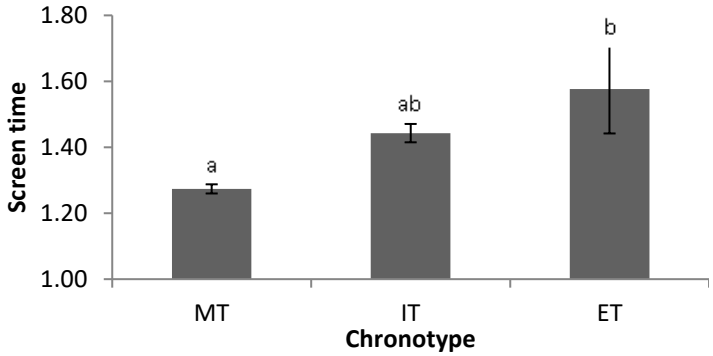

Fig. 8. Average screen time as function of Chronotype where MT = Morning type; IT = Intermediate type and ET = Evening type. Factor- Chronotype, df-2; F = 18.21, p<0.001, from ANOVA

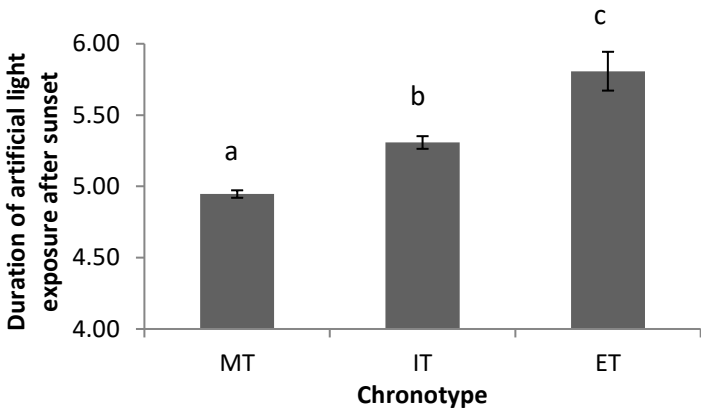

Fig. 9. Average duration of artificial light exposure after sunset as function of Chronotype where MT = Morning type; IT = Intermediate type and ET = Evening type. Factor- Chronotype, df-2; F = 28.58, p<0.001, from ANOVA

Table 1. This table shows descriptive statistics as function Lifestyle schedule

Factor- Lifestyle shedule	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean	
					Lower Bound	Upper Bound
Artificial light duration	2117	5.03	1.05	0.02	4.99	5.08
Screen time	2117	1.31	0.57	0.01	1.29	1.34
Dinner time	2117	20.03	1.44	0.03	19.97	20.09
Lunch time	2117	13.47	1.39	0.03	13.41	13.52
Breakfast time	2117	8.41	1.65	0.04	8.34	8.48
Age	2117	16.14	7.15	0.16	15.84	16.45
BSA	2117	1.32	0.36	0.01	1.30	1.33
BMI	2117	19.83	4.92	0.11	19.62	20.04
Wake time (in work days)	2117	6.01	1.02	0.02	5.96	6.05
Sleep time (in work days)	2117	20.96	4.07	0.09	20.78	21.13
Wake time (in free days)	2117	6.64	1.32	0.03	6.58	6.69
Sleep time (in free days)	2117	20.77	4.73	0.10	20.57	20.97

Table 2. Significant correlations in BSA, Wake time and sleep time on work days and free days, breakfast, lunch and dinner times, screen time, and exposure to artificial light duration with chronotype

	Chronotype score		
	Pearson Correlation	**Sig. (2-tailed)**	**N**
BSA	-.204**	0	2117
Wake time (in work days)	-.235**	0	2117
Sleep time (in work days)	.063**	0.003	2117
Wake time (in free days)	-.252**	0	2117
Sleep time (in free days)	.115**	0	2117
Breakfast time	-.136**	0	2117
Lunch time	-.125**	0	2117
Dinner time	-.136**	0	2117
Screen time	-.209**	0	2117
Artificial light duration	-.286**	0	2117

***. Correlation is significant at the 0.01 level (2-tailed).*
**. Correlation is significant at the 0.05 level (2-tailed).*

Table 3. Significant difference in artificial light duration, screen time, lunch time, breakfast time, BSA, Wake time and sleep times during work days and free days

		Sum of Squares	df	Mean Square	F	Sig.
Artificial light duration	Between Groups	61.40977	2	30.70488	28.58583	0.00
	Within Groups	2270.71	2114	1.074129		
	Total	2332.119	2116			
Screen time	Between Groups	11.79984	2	5.899922	18.20913	0.00
	Within Groups	684.9551	2114	0.324009		
	Total	696.7549	2116			
Lunch time	Between Groups	43.35314	2	21.67657	11.37836	0.00
	Within Groups	4027.316	2114	1.905069		
	Total	4070.669	2116			
Breakfast time	Between Groups	45.75865	2	22.87933	8.470832	0.00
	Within Groups	5709.816	2114	2.700954		
	Total	5755.575	2116			
BSA	Between Groups	3.350282	2	1.675141	12.95967	0.00
	Within Groups	273.2514	2114	0.129258		
	Total	276.6017	2116			
Wake time (in work days)	Between Groups	69.148	2	34.574	34.00173	0.00
	Within Groups	2149.58	2114	1.016831		
	Total	2218.728	2116			
Sleep time (in work days)	Between Groups	167.3311	2	83.66557	5.063164	0.01
	Within Groups	34932.51	2114	16.52436		
	Total	35099.84	2116			
Wake time (in free days)	Between Groups	98.14357	2	49.07178	28.73497	0.00
	Within Groups	3610.156	2114	1.707737		
	Total	3708.3	2116			
Sleep time (in free days)	Between Groups	712.9762	2	356.4881	16.14411	0.00
	Within Groups	46680.54	2114	22.08162		
	Total	47393.51	2116			

individuals [10]. Previous studies documented that artificial light is frequently less prevalent in rural locations, particularly at night. This may result in a more synchronisation with the light-and-dark circadian rhythm [11]. Research has shown that jobs in rural areas, such farming and construction, frequently require early morning or late night work schedules. This may have an impact on when you wake up and go to sleep [5]. Moreover, physical labour is a common part of rural living, which may affect energy levels and sleep habits. The chronotypes of rural and urban populations differ, and this could have an impact on mental, physical, and sleep health consequences [12].

The morningness and eveningness also correlated significantly with lifestyle schedules. They have mobile phones, the screen time is at around 1.5 hour that signifies that they have control on mobile usage and not addicted. In addition significantly higher exposure of artificial light and higher screen time among evening-types depicts that they may be spending their nighttimes mostly on screen. Evening-type individuals naturally tend to have later sleep-wake cycles. Their peak alertness often occurs later in the day, making them more likely to engage in screen-based activities during the evening and night. Many social and entertainment activities, heavily reliant on digital devices, occur in the evening. Evening-type people are more likely to participate in these activities, leading to increased screen time (Kortesoja et al., 2007). If evening types are unable to match their sleep pattern to their innate preferences, they may be more vulnerable to sleep disorders including delayed sleep-wake phase disorder (DSWPD) [13]. Those who are evening types and live in remote locations may feel lonely or unfit if they are forced to follow the early bedtime customs. Even while night owls might be more productive at work, they might have difficulties if their job schedule necessitates them to be active throughout the day [14].

The body surface area was also higher among evening-types followed by intermediate-type and morning-types respectively. They also sleep and wake at later hours in workdays as well as on free days. Melatonin, a hormone linked to sleep-wake cycles, also influences metabolism. Evening-type individuals might have different melatonin profiles, which could potentially impact metabolic rate and, consequently, BSA [15]. The stress hormone cortisol has the ability to affect sleep-wake cycles. Higher BSA individuals may have varying cortisol levels, which may affect their chronotype [16]. Further eveningtypea are more susceptible for cardiometabolic risk [17,18].

5. CONCLUSION

The present study highlighted the chronotype in rural population having less exposure to artificial lights and screen time. Morningness is predominant in the population. Evening-types in the group have delay sleeping hours, more screen time and more exposure to artificial light. In addition they are more susceptible to higher metabolic rate marked by higher BSA that could disturb sleep-wake pattern.

Human chronotype may bring several social advantages, such as better shift work ability among evening-types, nighttime alertness, improved quality of life in our 24x7 societies, and better utilization of resources. Present study provides insights to the chronotype of rural populations living under semi-modernized conditions.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

We hereby declare that generative AI technologies such as basic version of Google Gemini and Quillbot (free basic version) have been used during writing or editing of manuscripts.

Details of the AI usage are given below:

1. Gemini Apps, Prompted BSA in evening type, date-August 21 at 8:13 PM
2. Gemini Apps, Prompted eveningtypes in rural area, date- August 21 at 8:10 PM
3. Gemini Apps, Prompted chronotype in rural population, date- August 21 at 8:02 PM

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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