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Research Article

## FREQUENCY OF DIFFERENT CHRONOTYPE PATTERNS AMONG MEDICAL STUDENTS AND ITS RELATION WITH STUDENT PERFORMANCE

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**Abstract:**

*An individual's Chronotype, i.e. natural sleep time preference, determines that individual's periods of alertness and wakefulness during the 24-hour day. Extremes of chronotype variations can cause a person difficulty in participating in normal academic or social activities if their preferred periods of sleep and wakefulness/alertness do not coincide with these scheduled activities. Numerous studies have also co-related different chronotype patterns with higher risks of developing health impairing behaviours and mental disorders. Hence, finding the prevalence of different chronotypes is important as extreme patterns can be considered as a risk factor for imbalances in health and daily life. This research also seeks to explore whether there was any appreciable difference in academic performance across the spectrum of chronotype patterns and observe any significant differences across genders and age.*

**Material and Methods:** *A descriptive, cross sectional survey was conducted in which 384 medical students (MBBS, BDS and DPT), selected by convenience sampling, filled out the pre validated and internationally used Morningness-Eveningness Questionnaire (Horne & Ostberg, 1976), comprising 19 questions with a scoring key that grades individuals into morning, evening or intermediate types. Certain student demographics were also collected. First year medical students were excluded as percentage scored in last professional examination was taken as the criteria for student performance. Statistical data, thus obtained was analyzed using SPSS version 23.*

**Results:** *Out of 384 students, 220 were females (57.29%) and 164 were males (42.71%) aged 19-26 years, with a mean age of 21.72 with SD 1.27. Out of these 384 students, 91 fell in the evening category (23.7%), 59 were in the morning category (15.4%) while 234 were in the intermediate category (60.9%). Females had a higher percentage of evening types (26.8%) as compared to males (18.9%), however this was found to be insignificant by Chi-square test. Age classes also didn't seem to have significant difference of chronotype frequencies. However, some association was observed between academic performance and chronotypes.*

**Conclusion:** *Medical students showed a higher percentage of the evening chronotype than the general population, and a lesser percentage of morning types. However, more than half lie in the Intermediate category, which is also a greater proportion as compared to the general population. Further research is required to thoroughly study the association between student performance and chronotype.*

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**INTRODUCTION:**

The word chronotype itself is a behavioral manifestation of underlying circadian rhythms of myriad physical process. A person's chronotype is the propensity for the individual to sleep at a particular time during 24-hour period. These people are divided into three main categories, morningness also called as Larks, eveningness also called as Night owls and the third category called the intermediates [1] Morningness denotes the chronotype in which the person wakes up early in the morning, is more alert and productive during the day time and retires to sleep early. While the eveningness denotes the chronotype in which a person wakes up relatively late, is active at a later stage of the day and retires to sleep late [2] The majority of the population however falls into intermediate categories that lies between complete morningness and complete eveningness [3] Previous researchers have also documented the relationship between sleep quality and academic performance. However further studies have shown a high prevalence of sleep problems among college students.[4] Medical students are known to sleep a total of six hours/day on average in contrast to the eight hours observed in other groups.[5]

Various factors such as the overuse of the internet and social media, sleep medications, and coffee intake are known to have a drastic impact on sleep pattern. Furthermore, sleep can be profoundly altered by different medical conditions including depression, obstructive sleep apnea, idiopathic hypersomnia, and chronic sleep deprivation. [6] It is also known that individual difference of morningness-eveningness is based on the intrinsic biological rhythm. In addition, differences between morning and evening people are found in their daily fluctuation of core, peak melatonin as well as their cortisol awakening levels [7] Since numerous studies have reported the association or relation between chronotype and factors such as cardiovascular distress [8], depression [9][10], frequency of spinal diseases[11], patterns of learning approaches [12], reaction to stress [13], performance in school[12], knowledge of the prevalence rates might be useful in better assessing these problems, and may present further insight with regards to the frequency.

This research aims to determine the different chronotypes among medical students, and assess its gender distribution. Although many such studies have been conducted in different parts of the world, not many have been conducted in Pakistan. Hence, this survey study may be useful for future researches or studies, especially those conducted in Pakistan, that require information regarding the prevalence of different chronotypes. Additionally, it is hoped that this research might prove useful

while planning academic or workplace activities and determining their optimal time period, by providing insight about the natural awakesness or alertness to be expected among a group or population at a given time period. Also, since there are an increasing number of people working at hours that would be traditionally considered as odd or unusual, knowledge of individual chronotype might help people to sync their work patterns with their biological clocks. [11]

**METHODOLOGY:**

A descriptive cross-sectional study conducted in medical colleges of Rawalpindi/Islamabad. The study was conducted during three months from 17th July to 6th September 2019. The study was conducted among medical students of both genders studying in various medical colleges of Rawalpindi/Islamabad. 1<sup>st</sup> year students were excluded as they did not fulfill the criteria for measuring academic performance, for which percentage in last annual exams was taken. A consent form was made to be filled by the participants beforehand. We assured the participants of confidentiality and anonymity. Students were free to whether participate in research and the research was approved by the ERC of the institute. Non probability convenience sampling was employed and questionnaires were distributed among medical students which were filled. A pre validated 19 questions MORNINGNESS EVENINGNESS QUESTIONNAIRE (MEQ) by Horne JA and Ostberg O. 1976 was used along with a section on demographic profile [14]. It has its own scoring key and the final composite score of one response is categorized into a behavioral group corresponding to the response's final score, based on the questionnaires own scale. Data analysis was done using IBM SPSS Statistics Version 23. Chi square test was performed to see any significance between gender, academic performance and age class groups. Sample size was calculated by WHO sample size calculator. The sample was chosen to detect a prevalence of 50%, confidence interval of 95% and precision of 5%. It was calculated to be 385

**RESULTS:**

All the 384 responses were completely filled. Out of them 220 were females (57.29%) and 164 were males (42.71%) aged 19-26 years, with a mean age of 21.72 with SD 1.27.

Figure 1.1 demonstrates the frequencies of chronotypes. A total of 91 participants were evening types (23.7%), 59 were morning types (15.4%) while 234 were in the intermediate category (60.9%).

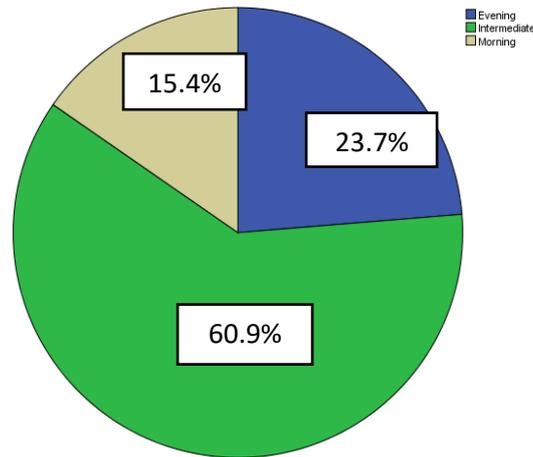


Figure 1.1

Table 1.1 demonstrates the gender differences in tabular form. Female had a higher percentage of evening types (26.8%) as compared to males (18.9%), however this was found to be insignificant by Chi-square test (p value=0.056)

GENDER	MORNING TYPE	INTERMEDIATE	EVENING TYPE	TOTAL
Male	30	103	31	164
Female	29	131	60	220

Table 1.1

Table 1.2 demonstrates the relationship between the student performance and the chronotypes and the results were found to be significant according to chi square (p value=0.036)

CHRONOTYPES	STUDENT PERFORMANCE		
	BELOW AVERAGE	AVERAGE	ABOVE AVERAGE
MORNING TYPE	11.4%	67.1%	21.5%
INTERMEDIATE TYPE	29.0%	58.1%	12.9%
EVENING TYPE	24.7%	60.6%	14.7%

Table 1.2

Figure 1.3 displays the chronotype distribution with ages. The ages ranged from 18 to 26 and for the sake of simplicity were grouped into three age classes, ages 18-20, ages 21-23 and ages 24-26.

CHRONOTYPE	AGE 18-20	AGE 21-23	AGE 24-26	TOTAL
MORNING TYPE	12	43	4	59
INTERMEDIATE TYPE	39	183	12	234
EVENING TYPE	14	71	6	91
TOTAL	65	297	22	384

Figure 1.3

No significant differences were observed on Chi Square (p value=0.89)

**DISCUSSION:**

This research aimed to find the distribution of the different chronotypes in a population of medical students and to evaluate whether this distribution had significant variations among gender, academic performance and age class groups. As regards the overall prevalence of the three major chronotype groups among our student population, the results were fairly predictable in the sense that the majority of students displayed an intermediate chronotype, while the frequency of the evening chronotype, i.e. the number of “night owls,” was also fairly consistent with the findings of similar researches performed on medical students in the past. [15][16] However, the frequency of the morning chronotype, i.e. the number of “morning larks” identified by our study, was noticeably smaller when compared to a similar study in Karachi, Pakistan that had employed the use of the same Morningness-Eveningness Questionnaire [16], though our findings are much similar to the results of a survey from Saudi Arabia, that had a much larger sample of medical students [15]. This difference might be explained by institution specific and campus specific factors, such as the prevalent student culture and campus life. And, as will be discussed later, morning chronotype did not correspond to better academic performance in our research. Neither did an evening chronotype seem to adversely affect academic performance. These factors might have facilitated or acted as an incentive for the adoption of habits and daily routines that influence a change in the overall chronotype distribution towards a trend of moving away from morning category to intermediate and evening categories.

Other researches have noted the gradual decrease in Eveningness chronotype frequency and a gradual increase in Morningness chronotype as adulthood progresses. [17][18]. As Eveningness has been associated with many adverse conditions [19][20][21] and may be detrimental to health and well-being, we believe that the increasing frequency of the Evening chronotype among medical students warrants efforts to raise awareness and promote healthier sleeping habits.

With regards to variations across genders, we found that a larger percentage of females (27.3%) were of evening type as compared to males (18.9%), however this difference came across as statistically insignificant ( $p=0.056$ ). Other researches have produced mixed and sometimes inconsistent results [22][23][24]. Some have concluded a higher likelihood of the evening chronotype in males as compared to females, whom they have found to be more disposed to displaying Morningness as compared to males, albeit the relation is weak [3][15][22]. Other studies have matched our finding in reporting that

differences across genders are not significant [18][25][27]. Our understanding is that any correlation between gender and chronotype, if any, is weak and only demonstrable in a very large sample.

With regards to age classes, we did not find any significant observable differences. However, our age range was quite narrow (18-26 years) and all of our sample can be classified as post-adolescent, young adults, hence the shift towards increased Eveningness that follows puberty, through adolescent phase, and which peaks at around the age of 20 [10][9], is not observable in our sample. The next major shift in chronotype frequencies is observed to occur at around 50 years of age and involves a gradual shift back to Morningness and a decrease in Eveningness.[17][18]. The chronotype frequencies have been found to remain largely stable in the adulthood years. We would in the future like to expand on the differences in sleep-wake time awareness and change of habits related to bedtime, between students in their early years, middle years and final years and look for any patterns.

The interesting and unusual result of our research was related to academic performance, where chronotype distribution was found to have played a significant role. Evening types displayed a better academic performance than morning types, with a greater percentage of evening types falling in the “good academic performance” range than morning types. This finding is opposed to that of a research conducted on medical students in Sudan which found that that morning types performed better than evening types. A research conducted in Karachi found that while a student’s chronotype may not have any direct relation with his/her academic performance, it may influence academic performance indirectly since it found a significant relation between study approach (deep learning approach and surface learning approach) and chronotype, and the different study approaches are known to affect academic performance and outcomes [16]. Another study in Germany found better academic performance for morning types but in cognitive ability, it found the evening types leading the morning types [27]. On the basis of these findings, a possible explanation for our results might be that the examination systems of the medical colleges from which our samples were drawn might be structured in such a way that evening types, on account of their student approaches or different cognitive abilities as compared to morning types [16][27], might find an inherent advantage. Further research is required to study academic performance outcomes and its correlation to chronotypes. One limitation of our study was that percentage scored in last annual examination was grouped into three ordinal

categories and served as the only parameter for measuring academic performance. We would like to further expand on our work by adopting a quantitative measure of academic performance rather than a qualitative one and factor in other measures of performance, like cumulative score across all academic years. An accurate analysis can be performed by employing equal number of “morning larks” and “evening owls.”

Our study was also limited to medical colleges situated in the twin cities of Islamabad and Rawalpindi and as such it might not be perfectly representative of medical colleges all across the country.

### CONCLUSION:

Medical students in our study showed a majority of intermediate type chronotype, with very few being morning larks. A sizeable number were evening types or night owls. Differences in chronotype distribution across genders were shown to be not significant, while there was some significance in academic performances across the chronotypes group which will require further study. No significant differences in chronotype were also noted in the range of ages of our study population

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