

A Cross Sectional Study of Morningness-eveningness Preferences and Its Associated Factors Among Medical Students

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Abstract

Individual differences in diurnal preferences and circadian rhythms are viewed as an interesting dimension of human personality. The impact of health-related behaviours and sociodemographic profile to diurnal preferences of an individual is acknowledged but is relatively understudied. Our study aims to estimate the distribution of morningness- eveningness and their prevalence among medical students and analyse their correlation with health-related behaviours including smoking, alcohol consumption, physical activity and electronic device addiction. A cross-sectional study was conducted from April 2020 to May 2020 in Melaka-Manipal Medical College (MMMC). Self-reported data was obtained using online questionnaire that has been distributed to students (n=174). The questionnaire consist of 5 sections including socio-demographic profile, smoking, alcohol consumption, physical activity, electronic device addiction and morningness eveningness questionnaire. The morningness eveningness prevalence was determined by calculating the score of each participants and classifying them into 5 groups which are definite morning, moderate morning, intermediate, definite evening and moderate evening. Data analysis was done using Epi Info (version 7.2.2.6), level of significance was set at $P < 0.05$ and statistical test used was Chi Square test. High prevalence of intermediate preferences was found among the students with significant correlation to age, alcohol consumption and addiction to electronic device. We found higher prevalence of intermediate pattern in age group ≤ 23 years (76.47%) old and > 23 years old (60.00%). There is slightly higher morningness (13.45%) prevalence in the earlier group compare to eveningness (10.08%) meanwhile the morningness and eveningness prevalence is equal (20.00%) in later group. The students who consumed alcohol were more intermediate type (68.09%). Students who consume alcohol (19.15%) have higher eveningness preference compare to those who don't drink alcohol (4.72%) meanwhile those who don't drink alcohol (22.83%) have higher morningness preferences compare to those who drink alcohol (12.77%). Student who are addicted to electronic device were also more intermediate type (81.05%). Students who are addicted to electronic device (8.42%) have higher eveningness preference compare to those who are not addicted (7.86%) meanwhile those who are not addicted to electronic device (31.65%) have higher morningness preferences compare to those who are addicted (10.53%).

Keywords

Morningness-Eveningness, Medical Students, Cross Sectional Study, Circadian Rhythm, Smoking, Alcohol, Smartphone Addiction

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1. Introduction

One's circadian rhythm is also known as biological cycle. Humans along with other mammals are seen to be genetically programmed to function based on a 24-hour cycle time frame. [1] A circadian timing system helps to coordinate various biological behavioral functions, with respect to each other and also the external environment which an individual is at. The circadian timing of mammals is controlled by the central pacemaker (also known as biological clock) which is located at the suprachiasmatic nuclei of the hypothalamus. The momentous of the circadian timing system is optimum functioning of the body. In case the rhythm has been altered or vanishes completely performance, will be suboptimal, which can be manifested and seen as reduced adaptation to stress and also illness. [2, 3, 4] Measurements of circadian rhythm require multitudes of task such as measuring the core body temperature or hormonal fluctuations and it also includes invasive procedures which can be regarded as time-consuming. Thus, to handle this, a set of questionnaires were devised to generate an estimate. Horne Ostberg Morningness-Eveningness Questionnaire (MEQ) consists of 19 questions which assesses individual preference to perform various types of activities in a day. It will then classify people according into 3 types which are morning-type (M-type), neither-type (N-type) or the evening-type (E-type) individuals. [1] Morningness-eveningness is often defined as diurnal preferences, the sleep-wake pattern for activity as well as alertness level in the morning and evening of each person. In our study, we define morningness as preference to do daily activities in the morning, while eveningness as preference to do daily activities in the evening [5, 6] This is in accordance to a study which describes 'Early larks' to refer to individuals who show an extreme position towards morningness. On the other hand, the term 'night owls' is used to refer to individuals who show an extreme position towards eveningness. [7]

Morningness-eveningness indicates the sleep-wake pattern of circadian typology [8] In 1996, a research has shown that the morning chronotype and evening chronotype are caused by a 2.1 hour difference of the endogenous clock. Variations that can be seen in tandem to behavior as well as sleep/wake schedules. [35] There was a study about effects of sleep deprivation and morningness-eveningness trait in risk taking back in 2007 showed that low Morningness traits such as waking up late and late bed times, have exhibited high scores on traits like impulsiveness and novelty-seeking [20, 21, 22]. Concludingly, it suggested that Morning people are very unlikely related to greater risk-taking as sleep deprivation significantly reduces self-reported and behavioural acceptance to engage in high-risk activities during uncertain

conditions regardless of chronotype involved. [23]

The prevalence of morningness-eveningness in the human population according to Horne and Ostberg classification revealed that majority of the designated human population was ticked off as morning oriented people in comparison to a smaller section of population who were more inclined towards the evening type with some notable factors affecting morningness-eveningness being relatively gender, age, nationality, electronic device usage and health impairing behaviours such as smoking.

A study on the relationship between smartphone addiction regardless of any other factors with morningness-eveningness was done in Germany in 2014 revealing that adolescents that were smartphone addicted were evening people with factors like gender, sleep duration or age factor did not signify in smartphone addiction scales. [30] Another study involving medical student's academic achievement was done in Sudan in the year 2017. [31] Interesting results popped up where the study showed sleep duration on weekdays was longer in the excellent students with, while it was longer on weekends among the average students. [31] The average-grade medical students wake up later during the weekends than the excellent-grade students with a high significant difference. [31] It was concluded that average medical students was more evening oriented whereas excellent students were morning oriented, with no gender differences. [31] Planning activities based on morningness-eveningness could improve academic performance among medical students in the long run. [31]

Different cross sectional survey was conducted among 5497 medical students on sleep quality while controlling associate variables. [36] Morningness-eveningness, sleep quality and lifestyle were measured and the results revealed that 'intermediate' type of students and 'morning' type of students had lower possibility of substandard sleep quality compared to 'evening' type of students. [36]

A study including of 617 adults as subject had done a questionnaire on on sleep habits and the quality of sleep, and the Epworth Sleepiness Scale [27] Eveningness was associated with a greater need for sleep, less time in bed during the week which build up a sleep debt. [27]

A study had been carried out in japan including 800 female students as subject had done a questionnaire on sleep habits, regularity of meal intake and meal amount, and style of alcohol and cigarette consumption. [18] The results show that students who had breakfast at regular times showed significantly higher Morningness-Eveningness scores than those who ate at irregular times. [18]

161 medical students were included in a study where

depressive symptoms are independently associated with “eveningness” in medical students. [29] These results should be confirmed by future studies involving a larger number of subjects. [29] A study of 2565 Hungarian high school students has shown that morningness was significantly associated with a lower likelihood of smoking and alcohol use, and also with a lower level of physical inactivity. [24]

A study of 345 undergraduate medical students indicated that morning types yield to be profound learners while evening types tend to be surface learners. [25] Although morning or evening types did not vary the scholastic performances but profound learners had way better scholastic achievements than the surface learners. In deciding scholastic achievement, morningness-eveningness and learning strategy relation was significant. The study manifested that morningness-eveningness seems to have an affect on scholastic achievement not straightforwardly but by implication through learning strategy. [25]

MAHSA University conducted a study where morningness-eveningness levels were assessed in relation to student’s cognitive level. [32] This study was done on 2nd year students of Batch 8 MAHSA by distributing questionnaires and crossword puzzles. [32] The results indicated that 32.12% were evening type students whereas 9.49% of them were morning type. [32] The remaining 58.39% of the students did not side towards morning or evening. [32] It was also said that being morning-type or evening-type was not related to their cognitive level as majority of students were morning type people who performed better concluding that the cognitive level was higher in morning compared to evening students. [32]

The objective of this cross sectional study was to determine the morningness-eveningness preferences of undergraduate medical students and to investigate its association with gender, age, nationality, electronic device usage and health impairing behaviour. The research hypothesis for the research is morningness eveningness preferences of an individual is affected by factors such as gender, age, nationality, electronic device usage and health impairing behaviour.

2. Methodology

2.1. Study Design, Setting, Time and Population

A cross sectional was conducted in Melaka Manipal Medical College (MMMC), a private academy situated in Malaysia from March 2020 to April 2020. MMMC has 3 courses, Foundation in science (FIS), Dentistry (BDS), Medicine

(MBBS). In MBBS, there are a total of 10 semesters, where 1 to 5 semesters are carried out in the campus India while 6-10 semesters are conducted in the Malaysia campus. There are 2 campuses in Malaysia, Melaka campus and Muar campus, Johor State. In our study, we included students of semester 6, 7, 8, 9, and 10 in the Melaka Campus and Muar campus of the MBBS program. There were approximately 600 students in Malaysia campuses.

2.2. Sampling Size

Based on the previous research that had been conducted on the Year 2 medical students of MAHSA University, Malaysia [22], 32.12% of the students are of the evening type. We used “Epi Info” version 7.0 for sample size calculation. With population size of 600, expected frequency of 32.1% and precision error of 7%, and confidence level of 95%, we calculated the minimum sample size was 133.

We allowed non-response of 20% and calculation is as below:-

$$\begin{aligned} n_{\text{final}} &= n_{\text{calculated}} / (1 - \% \text{ of non respondent}) \\ &= 133 / (1 - 0.2) \\ &= 166 \end{aligned}$$

2.3. Sampling Method

The sampling method used was purposive non-probability sampling. Melaka Manipal Medical College students in semester 6 & 7 of the MBBS program in the Muar campus and students in semester 8, 9 and 10 of the MBBS program in the Melaka campus were selected to participate in this study. The inclusion criteria included MBBS students from Melaka Manipal Medical College who provided consent to participate in this study. For those who did not consent or failed to complete all the questions asked were excluded.

2.4. Data Collection

Data was collected by the distribution of online questionnaire to the undergraduate medical students of Melaka Manipal Medical College (MMMC) in Melaka and Muar campuses. The study was regarding morningness-eveningness preference among medical students as the dependent variable. The independent variables were age, gender, ethnicity, nationality, health impairing behavior, electronic devices usage and physical activity.

The questionnaire survey was divided into 2 sections. The first section included informed consent and sociodemographic profile along with questions on health impairing behavior, electronic device usage and physical activity. The second section was about self-assessment

morningness-eveningness questionnaire (MEQ).

In sociodemographic profile, the participants had to fill in their age, gender, ethnicity and nationality.

Health impairing behavior was assessed with questions regarding smoking and alcohol consumption. Questions related to smoking were “Do you smoke?” and “During the last 12 months, how many cigarettes a day do you smoke?”. Response options were yes or no, and 10 cigarettes or less, 11-20 cigarettes, 21-30 cigarettes, more than 30 cigarettes. For alcohol consumption, questions like “Have you consumed alcohol?” and “During the last 12 months, how often did you usually have any kind of drink containing alcohol?” were asked. Response options were yes or no, and everyday, twice a week, once a week, 2 to 3 times a month alcohol consumption.

Electronic devices usage was assessed with few questions. The phrasing of the questions were “How many electronic devices do you have with in your bedroom?” with response options one, two, three and more than three devices; “How much time of listed electronic devices used in the last hour before bedtime?” with response options 5-30 minutes, 30-60 minutes, more than 60 minutes, not used any device; “Which electronic devices used in the last hour before bedtime?” with response options smartphone, PC games, MP3 player, television, others; “Do you consider yourself addicted to electronic devices?” with response options yes or no.

Individual physical activity was assessed by 2 questions

which were “Do you exercise?” and “During the last 12 months, how often did you exercise?”. Response options were yes or no, and everyday, twice a week, once a week, 2 to 3 times a week.

Morningness-eveningness preference among medical students was assessed using a self-assessment morningness-eveningness questionnaire (MEQ) source from researchers James A. Horne and Olove Östberg (1976). [1] Briefly, 19 questions were asked and allowed for choice and score will be given accordingly. Scores for all 19 questions will be added together. Score between 16-30 indicated “definite evening” type. Score between 31-41 indicated “moderate evening” type. Score between 42-58 indicated “intermediate” type. Score between 59-69 indicated “moderate morning” type. Score between 70-86 indicated “definite morning” type.

2.5. Data Processing and Data Analysis

Data collected was fed into Microsoft Excel and analysed using Epi Info version 7.0. Qualitative variables like gender, ethnicity, nationality, health impairing behavior, electronic devices usage and physical activity, the frequency and percentage were calculated. For quantitative data such as age and morningness-eveningness preference, the range, mean, median, standard deviation along with interquartile range were calculated.

Level of significance $P = 0.05$.

Following statistical test was used in our study:

Table 1. Independent and dependent variables with statistical test.

Independent variable	Dependent variable	Statistical test
Age	Morningness-eveningness preference	Chi square
Gender	Morningness-eveningness preference	Chi square
Ethnicity	Morningness-eveningness preference	Chi square
Nationality	Morningness-eveningness preference	Chi square
Health impairing behavior (smoking and alcohol consumption)	Morningness-eveningness preference	Chi square
Electronic devices usage	Morningness-eveningness preference	Chi square
Physical activity	Morningness-eveningness preference	Chi square

2.6. Ethical Consideration

Participants were made aware that their involvement in this designated study was entirely voluntary and participants had right to withdraw if they did not want to participate. It was also confirmed that informed consent was fully obtained from participants before participating in the study. Details of the participant such as name and roll number were not disclosed during the study and remained confidential. Approvals were given for this study by the Research Ethics Committee, Faculty of Medicine, Melaka Manipal Medical College.

3. Results

Table 2. Sociodemographic characteristics among undergraduate medical students (n=174).

Variables	n (%)
Age	
≤ 23	119 (68.39%)
> 23	55 (31.61%)
Mean (SD)	23.052
Gender	
Male	61 (35.06%)
Female	113 (64.94%)
Ethnicity	
Malay	72 (41.38%)
Chinese	34 (9.54%)

Variables	n (%)
India	55 (31.68%)
Others	13 (7.47%)
Nationality	
Malaysian	169 (97.13%)
Foreigner	5 (2.87%)
Semester	
Sem-7	95 (54.60%)
Sem-8	37 (21.26%)
Sem-9	19 (10.92%)
Sem-10	23 (13.22%)

A set of questionnaires consisting of 34 questions were distributed to the medical students in the selected private college (Melaka Manipal Medical College) using Google form. A total of 174 responses were received by our side. Table 2 shows the sociodemographic characteristics of the participants in our study. Of those who responded, the 119 (68.39%) from the total participants were in the age group of 23 or less than 23 years of age, and 55 participants (31.61%) are older than 23 years of age, giving the mean age of 23.052. Besides that, most of the responses were noted to be females (64.95%), leaving a total of 61 responses to be that of males (35.06%). In terms of ethnicity and religion, the highest response group came from the Malay community (41.38%), the Indian community (31.68%) was the second highest ethnicity that responded in our study, followed by the Chinese community (9.54%) and others (7.47%). Whereas for nationality, 169 (97.13%) of the participants are Malaysian with 5 (2.87%) foreigners. A large proportion of the participants were from the semester seven students (54.60%) and the remaining were from the semester 8 (21.26%), semester 9 (10.92%) and semester 10 (13.22%).

Table 3. Health impairing behavior and physical activity among undergraduate medical students (n=174).

Variables	n (%)
Smoking status	
Smoker	15 (8.62%)
Non smoker	169 (91.38%)
Number of cigarette (n=15)	
≤10 cigarettes	12 (80%)
11-20 cigarettes	2 (13.33%)
21-30 cigarettes	1 (6.67%)
Alcohol consumption	
Yes	47 (27.01%)
No	127 (72.99%)
Frequency of consumption (n=47)	
Everyday	1 (2.13%)
Twice a week	5 (10.64%)
Once a week	7 (14.89%)
2 to 3 times a month	34 (72.34%)
Exercise	
Exercise	121 (69.54%)
No exercise	53 (30.46%)
Frequency of exercise (n=120)	
Everyday	35 (28.93%)
Twice a week	39 (32.23%)
Once a week	16 (13.22%)
2 to 3 times a month	31 (25.62%)

Table 3 shows the health impairing behavior and physical activity among undergraduate medical students. Health impairing behavior was divided into smoking and alcohol consumption. The smoking status among undergraduate medical students, 8.62% were smokers and 91.38% were non-smokers. Among the smokers, 80% smoked 10 cigarettes or less, 13.33% smoked 11-20 cigarettes and 6.67% smoked 21-30 cigarettes in a day. Among the undergraduate medical students, the higher percentage of 72.99% did not consume alcohol while 27.01% consumed alcohol. As for the frequency of alcohol consumption, 2.13% consumed alcohol everyday, 10.64% consumed alcohol twice a week, 14.89% consumed alcohol once a week while 72.34% consumed alcohol 2 to 3 times a month only. 69.54% exercise while 30.46% did not exercise among the undergraduate medical students. Among the students who exercise, 28.93% exercise everyday, 32.23% exercise twice a week, 13.22% exercise once a week and 25.62% exercise 2 to 3 times a month only.

Table 4. Electronic devices usage among undergraduate medical students (n=174).

Variables	n (%)
Number of electronic devices	
1 device	16 (9.20%)
2 devices	62 (35.63%)
3 devices	61 (35.06%)
More than 3 devices	35 (20.11%)
Duration of usage	
30-60 minutes	102 (58.62%)
> 60 minutes	63 (36.21%)
Not used	9 (5.17%)
Electronic device used	
Smart phone	154 (88.51%)
PC game	3 (1.72%)
MP3 player	4 (2.30%)
Television	5 (2.87%)
Others	8 (4.60%)
Addiction status	
Addicted	95 (54.60%)
Not addicted	79 (45.40%)

Table 4 shows the electronic devices usage among undergraduate medical students. Among the 174 participants in the study, all the participants use electronic devices. 9.20% of the participants use 1 electronic device, 35.63% use 2 electronic devices, 35.06% use 3 electronic devices and 20.11% of the participants use more than 3 electronic devices. When asked about electronic device usage, 58.62% of the participants use electronic devices for 30 to 60 minutes before going to sleep, while 36.21% of the participants use electronic devices for more than 60 minutes before going to sleep and 5.17% of the participants do not use electronic devices before going to sleep. For what electronic device that was used in the last hour before bedtime, 88.51% of the

participants answered they use a smart phone, 1.72% of the participants answered they play PC games, 2.30% of the participants answered they use an MP3 player, while 2.87% of the participants answered they watch television and 4.60% of the participants answered they use other electronic devices in the last hour before bedtime. The participants were also asked about their addiction status towards electronic device usage. 54.60% of the participants are addicted to electronic devices while 45.40% of the participants are not addicted to electronic devices.

Table 5. Morningness-Eveningness among undergraduate medical students (n=174).

Variables	n (%)
Morningness-eveningness	
Definite morning	3 (1.72%)
Moderate morning	31 (17.82%)
Intermediate	125 (71.84%)
Moderate evening	13 (7.47%)
Definite evening	2 (1.15%)

Table 5 shows the prevalence of morningness-eveningness

Table 6. Association between demographic characteristics, health impairing behaviour, exercise and morningness-eveningness among undergraduate medical students.

Independent variables	Morningness n (%)	Intermediate n (%)	Eveningness n (%)	X ²	P value
Gender					
Female	26 (23.01%)	75 (66.37%)	12 (10.62%)	3.919	0.141 ^b
Male	9 (14.75%)	49 (80.33%)	3 (4.92%)		
Age					
≤23	16 (13.45%)	91 (76.47%)	12 (10.08%)	-	0.006 ^a
>23	3 (5.45%)	33 (60.00%)	3 (5.45%)		
Ethnicity					
Malay	15 (20.83%)	54 (75.00%)	3 (4.17%)		
Chinese	9 (26.47%)	22 (64.71%)	3 (8.82%)	-	0.465 ^a
Indian	9 (16.36%)	7 (12.73%)	7 (12.73%)		
Others	2 (15.38%)	9 (69.23%)	2 (15.38%)		
Nationality					
Malaysian	35 (20.71%)	119 (70.41%)	15 (8.62%)	-	-
International student	0 (0%)	5 (100%)	0 (0%)		
Semester					
Semester 7	12 (12.63%)	71 (74.74%)	12 (12.63%)		
Semester 8	12 (32.43%)	23 (62.16%)	2 (5.41%)	-	0.075 ^a
Semester 9	1 (5.26%)	13 (68.42%)	1 (5.26%)		
Semester 10	0 (0.00%)	17 (73.91%)	0 (0.00%)		
Smoking					
Smoker	2 (13.33%)	11 (73.33%)	2 (13.33%)	-	0.808 ^b
Non-smoker	33 (20.75%)	113 (71.07%)	13 (8.18%)		
Drinking alcohol					
Yes	6 (12.77%)	32 (68.09%)	9 (19.15%)	-	0.006 ^b
No	29 (22.83%)	92 (72.44%)	6 (4.72%)		
Exercise					
Yes	27 (23.31%)	87 (71.90%)	7 (5.79%)	-	0.118 ^a
No	8 (15.09%)	37 (69.81%)	8 (15.09%)		
Smartphone addiction					
Addicted	10 (10.53%)	77 (81.05%)	8 (8.42%)		0.002 ^b
Not addicted	25 (31.65%)	47 (59.49%)	7 (7.86%)		

^aFisher Exact test; ^bChi-square test

Table 6 describes the association between sociodemographic profiles, health impairing behaviours, exercise and smartphone addiction in relation with prevalence of morningness-eveningness among undergraduate medical

among undergraduate medical students. It is widely categorised into five types which are definite morning, moderate morning, intermediate, moderate evening and definite evening. This classification was entirely done based on the morningness-eveningness scoring system. It was quite evident according to the results that the vast majority of the medical students were pretty much one sided on prevalence that 71.84% were having an intermediate morningness-eveningness pattern. Then, there were the interpretations of the two extremes which were the morning categories and the evening categories. For morning category, 17.82% of students were having moderate morning prevalence whereas only a mere 1.72% were definite morning prevalence. On the other side, 7.47% of students were of moderate evening type and 1.15% of students were definite evening type which is the lowest percentage count in the whole prevalence category. During the final interpretation it was recategorized into three categories which were relatively morning, evening and intermediate.

students. The prevalence was recategorized into three categories which were namely morningness, eveningness and intermediate. According to our study based on gender, it was found that females were more morning type compared to

males and also higher in evening type compared to males. On the other side, males were found to be more in the intermediate type. The findings were significant with ($\chi^2=3.919$, p -value=0.141). Based on age, it was likely that students under age 23 and above 23 both were more intermediate type than morning type or evening type. However, values were not significant (p -value 0.006) according to Fisher Exact test. For ethnicity, the Malay race is the most morning type compared to all other races, whereas the Malay race also makes up the most of intermediate type compared to the other races. The Indian race was the most in the evening type. However, values were not significant (p -value=0.465). According to nationality, the interpretation was not proper only 5 international students were involved with all of them showing intermediate type of prevalence whereas Malaysian students were predominantly intermediate type followed by morning type and finally evening type. Next, the students who is in semester 7, 10 were found to be more in intermediate type compared to the other types (p -value=0.075, not significant). In advance, people who smoke tend to be more intermediate type and people who do not smoke also tend to be more in the intermediate type. (p -value=0.808, value not significant) Furthermore, alcohol consumers were more in intermediate type compared to the other 2 types while non-alcohol consumers tend to be more in intermediate type and lesser in eveningness (p -value=0.006, value is significant). People who exercise were more in intermediate and morningness than eveningness while people who do not exercise seems to be more intermediate type than both the other types (p -values=0.118, not significant). For those who are addicted and not addicted to smartphone, they are more of intermediate. Those who are addicted to smartphone have higher intermediate preferences than those who are not addicted to smartphone. Morningness preference is also higher in participants who are not addicted to smartphone. Eveningness preference is higher in participants who are addicted to smartphone. This shows strong association between addiction to electronic device and morningness eveningness preferences. (p -values= 0.002, significant)

4. Discussion

A cross sectional study was done among undergraduate medical students in Melaka Manipal Medical College (MMMC), Malaysia to determine the prevalence of morningness-eveningness and the factors associated with it. In our study, it was found that 71.84% among the undergraduate medical students are in the intermediate morningness-eveningness pattern. 17.82% of the students are in moderate morning pattern while 1.72% of the students are in definite morning pattern. As for the evening pattern, 7.47%

of the students are in moderate evening whereas only 1.15% of the students are having definite evening pattern. In a cross sectional study done among 400 students of Islamic Azad University of Qom, 38.5% of the students were in evening pattern, 34.3% in intermediate pattern and 27.3% were in morning pattern. [8] Previous cross sectional study was also done among 2742 Indian school students of age between 8 to 23 years. 62.73% were in the intermediate pattern, 35.34% were in the morning pattern and 1.93% were in the evening pattern among the studied population. [9] A mail survey was conducted in New Zealand among 5000 adults of age between 30 to 49 years. With the total of 2526 respondents, 49.76% of the population were having morning pattern preference (10.20% were definite morning and 39.56% were moderate morning). 44.62% of the population were in the intermediate pattern while 5.62% were having evening pattern preference (0.67% were definite evening and 4.95% were moderate evening). [33]

This study shows that the significantly associated factors with the outcome of morningness-eveningness are namely age, alcohol consumption and smartphone addiction. Starting off with age, it is distributed into two categories which are <23 years of age and >23 years of age. Students in both group are mostly intermediate type. In many countries, research has been done using various morningness evening tools that shows significant correlation between age and ME prevalence. Younger children have higher morningness prevalence, while teenagers and adolescents display a shift towards eveningness preference. This pattern is seen to be followed by a tendency to shift back towards morningness preference at the end of adolescence and at the start of adulthood. [10, 11, 12, 13, 14] Older people have strong morningness preferences relatively in age group 50+[15] In a separate test-retest sample of 114 Chinese aged 18-40 years old, a significant correlation between age and MEQ was also found in the consistent with evidence for an increase in morningness over this period. [15] Result of our study shows that in our setting, the population has more intermediate prevalence followed by eveningness then morningness. Study shows that during adolescence there is a well-known progressive tendency to evening preference. [27] The discrepancy in ME preference between the age group might possibly be related to the difference in daily schedule demands by the individuals in both age group. Next, alcohol consumption is another factor which is significantly associated with the prevalence of morningness-eveningness. Students who consumed alcohol were more evening type significantly whereas students who did not consume any alcohol were either the morning type or intermediate type with the intermediate type of students outnumbering the morning students. A study among students aged 18-29 in

Japan, showed that students who regularly consumes alcohol and smoke cigarettes showed significantly low ME scores which sided towards the evening type and higher UHSI scores which translates to unhealthy sleep than those who did not have this habits. [26] In our study setting, there is no significant correlation between ME preference and cigarette smoking. But a study done in Oxfordshire village shows that cigarette smokers have significantly shorter sleep duration than non-smokers. [26] There are some evidence in study that shows individuals with eveningness preference tends to have shorter amount of sleep. [27] Morningness pattern has been shown to act as protective factors against health impairing behaviours such as smoking and alcohol consumption. [24, 25] Morningness pattern has also been reported to have lower physical inactivity, less time playing the internet and less time spent watching the television. [24, 25] Eveningness pattern has been associated with higher amount alcohol consumption and smoking. [26, 27, 28] Besides that, a study shows that depressive symptoms are independently associated with eveningness. [29]

Moreover, the other significant factor associated with the morningness-eveningness prevalence is smartphone addiction. Students who were addicted to smartphones were more evening type and intermediate type whereas the students who were not addicted to smartphones were of morning type. Students who were addicted to smartphones were more of evening type and intermediate type whereas the students who were not addicted to smartphones were of morning type. One study which was done previously was the relationships between smartphone addiction, age, gender and prevalence of morningness-eveningness among adolescents in Germany in the year 2016. [30] The interesting result of this study was teenagers addicted to smartphones were more evening oriented than those adolescents who were not addicted to their smartphones. [30] A study in Budapest involving high school and vocational school students reveals that morningness preference acts as a protective factor meanwhile eveningness preference is a risk factor for smoking, alcohol use and physical inactivity. [28] Thus, adolescents with morningness preference are less likely to have tried smoking, smoked cigarette for the last 30 days, or smoking daily. They also lower alcohol consumption and less amount of time spent watching television or playing the Internet.[28] In our study, there were also a few factors associated with the prevalence of morningness-eveningness which was not significant. The factors which were not significant are gender, ethnicity, nationality, semester, smoking habits and exercise. Gender is closely associated with smartphone addiction where girls are more addicted than boys. [14] Results were not significant in terms of ethnicity when comparisons were done between Maori and non-Maori descent people. [33] The

other factor which was not significant here was the gender. [33] The significant result here was only the association of age with prevalence as participants aged from 30-34 years old were very much likely to be evening type and very less likely to be morning type than those aged 45-49 years. [33] With regards to gender, variable findings are seen with some studies showing no difference in ME preferences meanwhile there are studies which shows that females have more morningness preferences meanwhile male have higher eveningness preferences. [1, 14] A study has shown that as the age increase, there is a progressive incline towards morningness preferences, however, over the age of 40, man are likely to have higher morningness prevalence than women were. [16] Two studies involving adolescents have found difference between gender and the prevalence of ME but they were contradicting to one another. One study reported higher morningness in girls, while the other reported higher morningness in boys. [17, 18] These changes were suggested as part of pubertal development and due to the differences in sexual hormones production. [19] Thus, we are interested to know if there is a strong association between ME prevalence with gender and age in our setting.

Throughout the study, we faced with a couple of limitations as well. The semester 6 students were unable to participate in our study as they have not joined yet. Furthermore, the study design chosen for this research is the cross-sectional study design which is a single examination or cross section of the population at one point of time. This becomes a drawback because we are unable to observe the change in a person's preference of morningness or eveningness over time. Apart from that, one of the independent variable investigated in our study is smartphone addiction. Only one question was included in the questionnaire to assess this characteristic and it was not from any validated questionnaire.

Based on the study carried out, there are a few recommendations suggested for this study as well as future studies. The first recommendation is that a larger sample size be used. It would be ideal if students in the preclinical years be included as well in the study and not just the clinical year students. This will help create a more representative sample based on the population chosen which in this case the medical students of Melaka Manipal Medical College is. Furthermore, a validated questionnaire should be used to assess the smartphone addiction of an individual. Apart from that, other variables such as satisfaction of life or the different personality types of individuals is said to affect the morningness eveningness preference of an individual. However, these variables are not included in this study. Hence, in future studies, these variables should be investigated as well. In the study we conducted, those that consume alcohol as well as those that are addicted to

smartphones are evening-type people. In the future, an in depth study can be conducted among the medical students to investigate these associations further. In doing so, we can raise awareness as well as come up with preventive measures to curb smartphone addiction and alcohol consumption by altering the morningness eveningness preference of an individual. In doing so, the quality of life of an individual can be further increased.

5. Conclusion

Although this study has limitations, it has helped improving the knowledge of age, alcohol consumption, and addiction to electronic device in relation to ME prevalence among students.

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