

IMPACT OF DIGITAL MEDIA ON SLEEP PATTERN DISTURBANCE IN MEDICAL AND NURSING STUDENTS

Misurya Ishita¹, Singh Kuldeep²

¹MBBS 3rd Year (6th Sem) student, All India Institute of Medical Sciences, Jodhpur, Rajasthan-342005

²Additional Professor and Head in Pediatrics, All India Institute of Medical Sciences, Jodhpur,
Rajasthan-342005

Abstract: *The rising impact of social media on the private and working lives of health care professionals has made researchers and health care institutions study and rethink the concept and content of medical professionalism in the digital age. Exposure of humans of radio frequency electromagnetic field (EMF) both during receiving and transmitting the signals has amplifies public and scientific debate about possible adverse effects on human health. The study was designed to study the type, extent and duration of use of various digital technology including computer, television, mobile phones and social media among medical students and to investigate whether there are associations between use of mobile phone and social media and impact on sleep and occurrence of sleep disturbances in a prospective cohort of young adult health professional students. The prospective cohort study was conducted in medical and nursing students of AIIMS Jodhpur. The hundred medical students were grouped as cases Group A: Subjects who use mobile phones less than 1 hour per day (n=11), Group B: Subjects who use mobile phones 1-2 hours per day (n= 26 Group C: Subjects who use mobile phones more than 2 hours per day (n= 63). The major areas included in the survey were Questionnaire enquiring about details of digital media, Questionnaire about day time sleepiness (Epworth scale) and their sleep quality and pattern were examined by Pittsburgh sleep quality Index (PSQI). Students using mobile phone for >2hours/day may cause sleep deprivation and day sleepiness affecting cognitive and learning disabilities.*

I. Introduction

The digital media is considered to be the most disruptive technology of the time which has made our life simple on one hand but created challenges in using the same in a mature and productive manner on the other hand. We now have access to information on any topic or query at the click of a button. Information Technology (IT) has also broadened our scope of thinking, availability of multiple resources and rapid communication options at our disposal. The modern technologies have created more opportunity for prompt research and availability of armamentarium of gadgets expedited the process of research. The flip side of these innovations is the impact it has on transforming our lifestyle to a great extent with heavy dependence on them affecting our health physically as well as mentally. The Generation X and Baby Boomers have seen these technology being introduced during their lifetime and have grown up with them

giving them sufficient time to mature with alongside the technology. On the other hand, the Generation Y (Born after 1980s) was born with these technologies and the gadgets appeared to be of everyday use to them. The effects of these technologies are now being apparently seen on physical health, aggression, anxiety, depression and poor scholastic performance. One of the most invisible effects is attributed to the sleep disturbances associated with use of these digital devices which further increased the risk of physical and mental problems (1). It has also been reported that sleep disturbances among adults and adolescents are closely associated with various lifestyle habits such as drinking alcohol, smoking, eating fast foods and participating less in extra-curricular activities (2). Among the lifestyle habits of adolescents, the use of mobile phones is one of the most common means of communication. Because of the quick development and widespread use of smart phones and their vast effect on communication and interactions, it becomes imperative to study possible negative health effects of mobile phone exposure (3). Many studies have reported mobile phone use to be associated with health problems and adverse sleep patterns. Lourghran et al reported the adverse effects of electromagnetic fields emitted by mobile phones on sleep electroencephalograms (4). It has also been shown that exposure to mobile phone emissions at night time could have an effect on melatonin production [5]. Saxena et al in their effort to document harmful effects of electro-magnetic field (EMF) among medical students concluded of the negative influence with evening use of mobile phones on sleep (6). Information and Communication Technology (ICT) has percolated deeply into our culture. Most deeply affected are the young adults. It has become a topic of intense research among contemporary scientists and is frequently a part of post-doctoral research of many of this biomedical scientist's community. There is scarcity of data on use of digital and social media and its impact on sleep among medical students. Therefore, it is high time we document and demonstrate the effects of digital and social media use among students studying health professional courses and its effect on sleep and its disorders. This will help us evolving in hygiene related to good practices for sleep. Moreover, since this segment of population will be the future healthcare provider for the society, they need to be alerted to the lurking danger posed by these modern gadgets. In this study, we propose to examine the relationship between sleep disturbances and digital media including the mobile phone usage, and identify the vulnerable risk groups among the subjects examined.



Figure 1

II. FUNCTION OF SLEEP

When we sleep, we are at rest, but our brains are not. They are active, and their activity is essential to almost all of the body's business: to the consolidation of memories, to learning, to cognitive development, to psychiatric health, to healthy immune function, and to bodily growth and repair.^{3, 4} Sleep researchers recognize the importance of two fundamental dimensions of sleep adequacy: sleep quantity (total sleep time) and sleep quality. These dimensions cover several attributes of sleep: total sleep time, adversely affected by late bedtimes, early waking, and sleep onset latency (delay between bedtime and falling asleep); and sleep quality, including nighttime wakings, nightmares, disturbed sleep-wake transitions, and irregular bedtimes. The first system to suffer from inadequate sleep appears to be executive function, or the brain's ability to plan, organize activities, and pay attention.⁵⁻⁸ Other research has shown that inadequacies in sleep quantity or quality among children and adolescents are associated with significant impairments in immune function, the regulation of metabolism (thereby creating an association between sleep and obesity and diabetes),⁹ creativity and memory, accidents and injuries, school failure, and behavior.¹⁴ The causality between poor sleep and many of these outcomes probably runs in both directions. A study focusing on sleep and behavior problems, however, presented evidence that a large part of the association can be explained by the effect of poor sleep upon behavior problems. Some of the studies have assessed randomly assigned sleep restriction to isolate the causal effects of sleep, and have verified that it is sleep that causes problems in, for example, executive function.⁶ Results such as these verify at least some causal role of poor sleep in the etiology of such problems. One of the striking findings of research in this area is how important even relatively small sleep impairments can be. One recent study found that an ongoing sleep deficit of just one hour per day over three days can result in significant degradation in neurobehavioral function. Another found that a difference of just 25 minutes per night of sleep duration was associated

with changes in school performance among adolescents. While there is still much research that needs to be done to fully understand the functions of sleep, there is no question that adequate sleep is essential to proper development and to good physical and mental health.

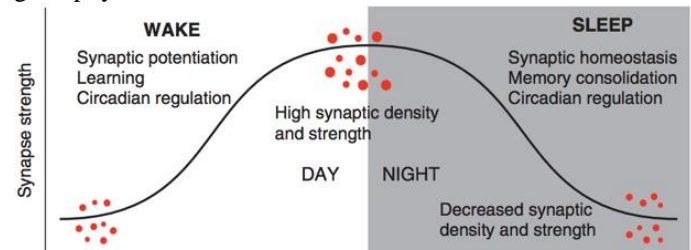


Figure 2

III. IMPACT OF MEDIA ON SLEEP

Many parents believe that their own experience with the media when they were children is a good guide for managing their children's media use today. Yet major changes over the last 25 years in the format, fungibility, extent, location and content of today's media have been so profound that the experience of a generation ago is in fact a poor guide to appropriate practice today.

- The past 25 years have seen the rise of the Internet (use of the Web, e-mail, chat rooms, instant-messaging) and video games (computer games, console games, and Internet-based games). These kinds of media format have made media use not only more attractive, but more immediate and emotionally salient. The interactivity of these forms enhances engagement and leads to a corresponding increase in alertness hormones, and reduces the ability to disengage from the activity in a timely and self-directed manner.
- The rise of DVDs and digital video recorders (DVRs, e.g., TiVo) represents a major advance in the time fungibility of media use. Such "time-shifting" makes it possible to extend television viewing late into the night. Other forms of media such as Internet use and cell phones are inherently fungible as well.
- For the most part, the average number of hours spent watching television among children over age five has changed little in the past generation. By contrast, television and video/DVD viewing among very young children has increased dramatically.²⁰⁻²² The average age of beginning to regularly watch television, which had been almost 3 years old in 1961, has now declined to just 9 months old. There has also been a considerable increase in the **extent** of other forms of media use, including Internet use and games, nonexistent a generation ago, and also phone use, which has ballooned with cell phones, cheaper phone rates, and text messaging. All told, children age eight and over were found in 2005 to consume an average of an additional hour of media content per day compared to 1999; and an average

of one-fourth (26%) of their media use time was spent “media multitasking,” or using more than one medium at a time.

- The reduction in prices of electronics has made it possible for many children to have a television, computer, or private phone in their own bedroom. While not entirely new, this change in the **location** of media use has over the past 25 years made it possible for children’s media use to be increasingly outside the ambit of parental monitoring.
- In the past generation there has been a gradual but objectively measurable shift in the **content** of television and movies—including those targeted at and frequently watched by children—which have become more conflictual and violent, more sexualized, and more commercialized. At the same time, there has been an increase in the development of content specifically for the very youngest children, some of it designed explicitly to help children calm down and transition to sleep at the end of the day.

Several theoretical explanations have been advanced in the literature to explain why media use might have an impact on the amount and quality of sleep that children receive:

Media use of all kinds might directly displace sleep. Several authors have pointed out that media use such as Internet, electronic games and phone use has an unstructured time profile, with no defined beginning or ending time. Television viewing has a defined endpoint when a show ends, but producers are energetic in their efforts to retain viewers for a subsequent show. As such, it is argued, media use of all types is likely to bring about time displacements, especially of sleep.³⁵⁻³⁷ This theoretical reasoning suggests not only that media use could affect the total amount of sleep, but also that it would adversely affect sleep quality by fostering irregular bedtime.

Media use that involves excitement, suspense, drama, and conflict may be too exciting for children, especially at bedtime. Viewing exciting or violent content—whether actual or implied—is known to be associated with physiological changes consistent with increased stress and arousal hormones.^{38, 39} Young children may be particularly susceptible to these effects.³⁸ Because secretion of these hormones is associated with increased delay of sleep and poor sleep quality,^{3, 40} it is likely that viewing exciting or dramatic content delays sleep onset and reduces sleep quality.³⁷ Beyond direct physiological effects, viewing frightening, conflictual, or violent content may produce nightmares and associated night wakings, a significant contributor to poor sleep quality.^{37, 41-43} These reactions are not limited to frankly violent adult fare, but include seemingly innocent children’s programs and the television news as well.

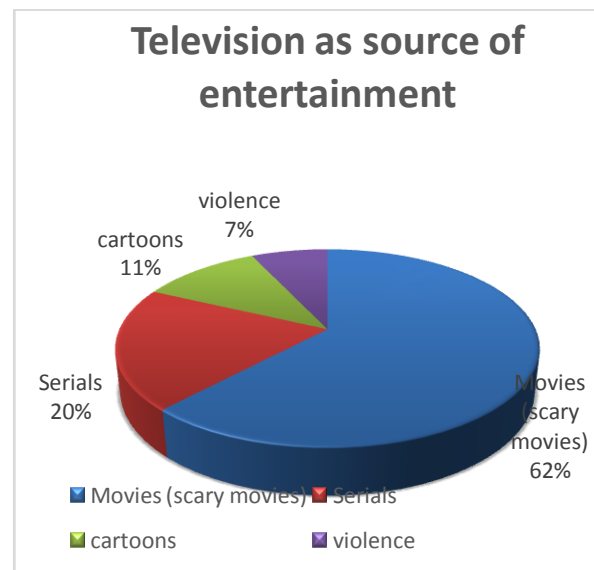


Figure 3

Physical activity, which promotes good sleep, can be displaced by media use. Because good sleep is fostered by physical activity, it has been hypothesized that part of the effect of media use on sleep quantity and quality operates through a displacement of physical activity.

THE CYCLE OF SLEEP

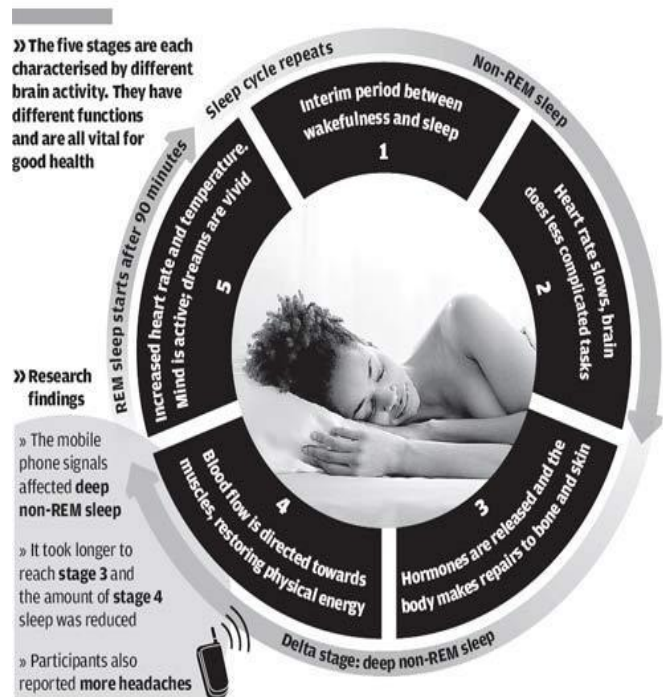


Figure 4

While plausible, this mechanism is not well supported by evidence on media use and physical activity. The evidence that media use displaces physical activity is quite thin in cross-sectional studies, and a randomized trial of a television-reduction protocol among 9-year-olds found an effect on television viewing but no effect on physical activity.

IV. CONSEQUENCES OF SLEEP DEPRIVATION

| Emotion | Cognition | Physiology and Health |
|--|---|---|
| Increased: | Impaired: | Increased risk of: |
| <ul style="list-style-type: none"> • Fluctuations in mood • Depression and psychosis • Irritability • Impulsivity • Frustration • Risk-taking • Stimulant use (e.g. caffeine) • Sedative use (e.g. alcohol) • Illegal drug use • Dissociated mental processing | <ul style="list-style-type: none"> • Cognitive performance • Ability to multi-task • Memory • Attention • Concentration • Communication • Decision-making • Creativity • Productivity • Motor performance | <ul style="list-style-type: none"> • Drowsiness • Micro-sleeps • Unintended sleep • Sensations of pain & cold • Cancer • Metabolic abnormalities • Diabetes II • Cardiovascular disease • Reduced immunity • Altered endocrine function |

It is important to recognize that the causes and consequences of chronic sleep loss in adolescents are often closely intertwined in complex ways, further exacerbating the situation. For example, alcohol consumption can lead to insufficient and poor-quality sleep and subsequent daytime sleepiness. In turn, chronic sleep loss has been linked to an increased risk of alcohol and drug use. Similarly, compensatory oversleep behavior on weekends provides some temporary relief from sleepiness generated by insufficient sleep on weekdays, but it also leads to disrupted sleep-wake cycles, exacerbation of the normal adolescent circadian phase delay, and perpetuation of compromised weekday alertness. Moreover, consequences such as poor judgment, lack of motivation, and inattention and affective dysregulation resulting from sleep loss, as well as the effect of insufficient sleep on decision-making skills, further compound the potential negative effects in adolescents. In particular, higher level cognitive "executive functions," for which adolescence is a critical period of evolution, are selectively affected by sleep loss.

Sleep Loss and Depression, Mood Disturbances, and Suicidal Ideation

It has long been recognized that mood disorders (especially major depressive disorder) in clinical samples of adults exhibit a bidirectional relationship with sleep disturbances, and the presence of sleep problems has been shown to both increase the relative risk of developing depression⁹⁰ and to be a predictor of relapse. Similar findings have emerged in the child and adolescent population, particularly with regard to an association between insomnia (difficulty initiating and/or maintaining sleep) and clinically diagnosed depression. Recent studies have shown that addressing insomnia will greatly improve treatment of depression. Although studies examining sleep architecture in depressed adolescents have not consistently replicated differences in polysomnographic findings in depressed adults (i.e., increased REM sleep, decreased REM onset latency), there may be other sleep electroencephalographic markers, such as sleep spindle activity and cyclic alternating patterns, that have more relevance for the adolescent population.

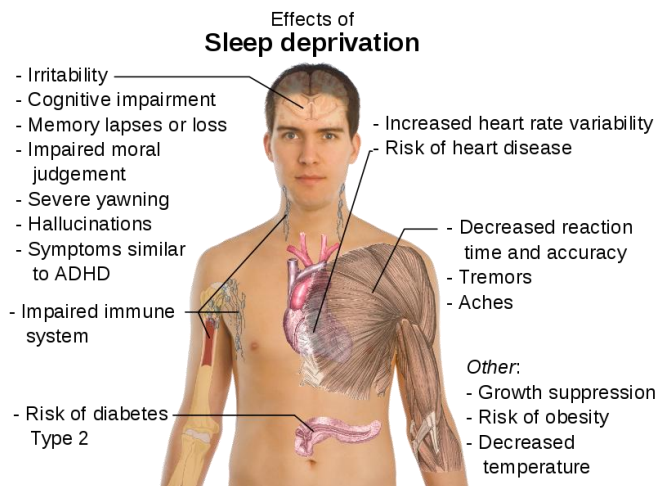


Figure 5

V. METHODOLOGY

1. Setting: Tertiary academic institution in Western Rajasthan
2. Design of Study: Prospective Cohort consisting of medical students.
3. Sample size: This survey was performed on a convenient sample 100 subjects.
4. Approval from Institute's Ethics Committee: Permission was obtained from the Ethics Committee of the Institute before embarking on the project.
5. Selection of Volunteers: Undergraduate medical students of the college were requested to voluntarily participate in the survey after explaining them the purpose of the study. The students were requested not to enter any identifiable information into the questionnaire. Confidentiality of the information was assured.
6. Inclusion criteria: The medical, nursing students who are not undergoing any course exams within 2 weeks of the study and who give their informed and written consent to participate voluntarily.
7. Exclusion criteria: those who do not give consent or are having any exam in next 2 weeks.
8. Classification of Subjects into Groups. Subjects were divided into 3 groups based on their usage of mobile phones and/or digital media:
 - Group A: Subjects who use mobile phones less than 1 hour per day
 - Group B: Subjects who use mobile phones 1-2 hours per day
 - Group C: Subjects who use mobile phones more than 2 hours per day
9. The major areas that were included in the survey will be:
 - Personal Data : Age, Gender, year of study and educational status
 - Few questions regarding life style at Hostel
 - Questionnaire enquiring about details of digital media.
 - Questionnaire about day time sleepiness (Epworth Scale)

- Questionnaire about Sleep quality assessment using Pittsburgh Sleep Quality Assessment- PSQI
10. Data Analysis: Data entered in Excel sheet, imported into SPSS Software ver. 17.0 and statistical analysis will be performed including descriptive and correlation analysis. Mann Whitney U Test used for comparative analysis and Student t test were used for analyzing descriptive variables

VI. IMPLICATION OF THE STUDY

- Examining the relationship between sleep disturbances and digital and social media usage.
- Identifying risk groups among the screened subjects.
- May act a pilot project for extended studies on impact of media on lifestyle of the students undergoing health professional courses

VII. CONCLUSION

Questionnaire 1

In this study, the questionnaire that enquired about details of digital media revealed that 62% population watch TV for 3-6 hours in a day usually between 6-8pm. About 45 % of population use laptop/TV as a sleeping aid. Therefore it is considered as preferred activity in most of the population of hundred students.

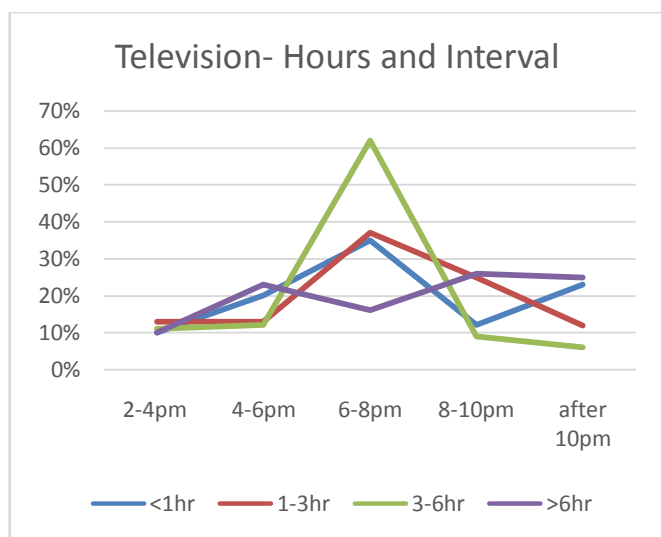


Figure 6

Maximum (about 25%) of students who watch TV for >6hrs a day spend time watching TV after 10pm.

However use of computer games as a source of entertainment is seen only in apx 20% of population mostly among males. Since it is not a preferred activity in hostel it's contribution in sleep disturbance among students is insignificant.

Internet surfing was found to be most widely used recreational activity among subjects. According to the study approximately 66% students engage in internet for 3-6 hours maximally for the use of chatting (42%) and entertainment (26%).

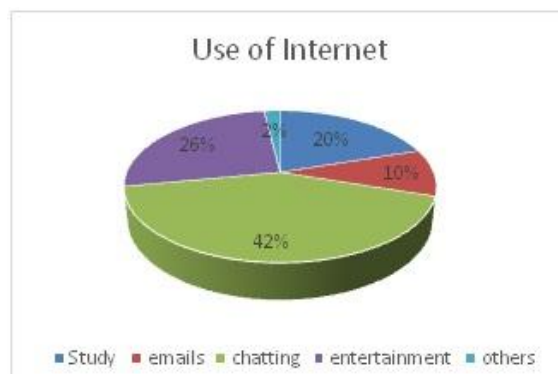


Figure 7

To find extent of mobile phone usage our study also divided population in the groups of 3:-

- Group A: Subjects who use mobile phones less than 1 hour per day
- Group B: Subjects who use mobile phones 1-2 hours per day
- Group C: Subjects who use mobile phones more than 2 hours per day

Nearly 100% of participants owned a mobile phone for basic purpose of keeping contact and use of internet for either study or entertainment. Since the medium of internet usage was their mobile phone the duration of internet usage and mobile phone coincided and was found to be >3hours in a day. Hence major part of population belonged to Group C. Facebook was found to be one of the most popular social networking sites. However other application such as WhatsApp and Instagram were also frequently used.

Epworth sleepiness scale

The Epworth sleepiness scale is used for subjective measure of patient's sleepiness. According to the study about 24% (maximum) of students had chance of dozing while sitting and reading and least during sitting or talking and in car while in traffic. After analyzing the score about 42% population belonged to Grade 2 with an average amount day time sleepiness, followed by Grade 1. Only 10% of population belonged to Grade 4 in sleepiness scale requiring medical attention.

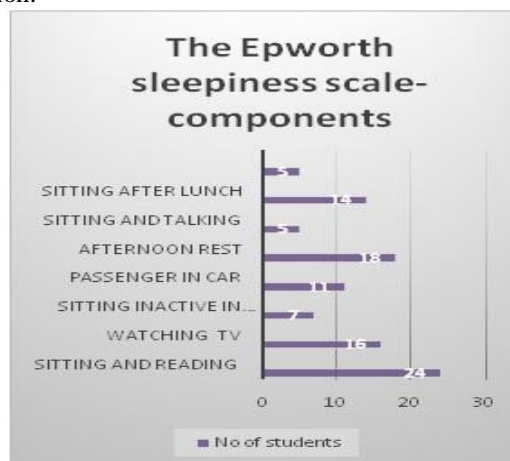


Figure 8

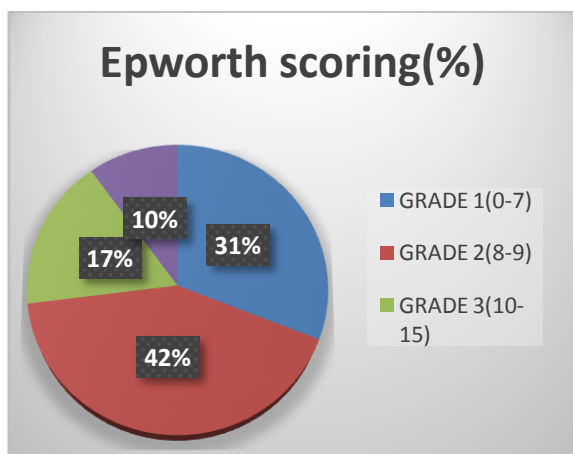


Figure 9

Interpretation of grades:

| | | |
|---------|-------|---|
| Grade 1 | 0-7 | It is unlikely that you are abnormally sleepy |
| Grade 2 | 8-9 | You have an average amount of daytime sleepiness |
| Grade 3 | 10-15 | You may be excessively sleepy depending on the situation. You may want to consider seeking medical attention. |
| Grade 4 | 16-24 | You are excessively sleepy and should consider seeking medical attention. |

Scoring:-

| | |
|---------------------------|-----|
| No chance of dozing | = 0 |
| Slight chance of dozing | =1 |
| Moderate chance of dozing | = 2 |
| High chance of dozing | =3 |

VIII. DISCUSSION

Sleep loss among the students poses a serious risk to the physical and emotional health, academic success, and safety of our nation's youth. The prevalence and effects of insufficient sleep may be further magnified in high-risk adolescents. Pediatricians have the opportunity to make significant inroads into addressing the health risk that sleep loss presents through screening and health education efforts. Many of the factors that have been shown to contribute significantly to the current "epidemic" of insufficient sleep in teenagers, such as electronic media use, caffeine consumption, and early school start times, are potentially modifiable and, as such, are important intervention points in anticipatory guidance in the clinical setting. On the local and national levels, pediatricians need to advocate for educational, administrative, and health policies that promote healthy sleep and reduce the risk factors for sleep loss in adolescents.

The study "mobile phone usage and sleep pattern disturbance among medical students of Himalayan Institute of medical sciences published in Indian journal of physiology

By revealed that about 57% of students used mobile phone for >2hours and out of which 2/3rd used them in evening hours. A Study on the Japanese adolescents also reported a high number of adolescent girls (89.7%) were using mobile daily leading to insomnia. Therefore late hours and extended forms of digital media for various purposes may cause emotional and cognitive arousal in pre sleep period that leads to poor quality of sleep and insomnia. The questionnaire based study was conducted in 100 students of All India Institute of Medical sciences, Jodhpur including medical and nursing students. MBBS (n=45) Nursing (n= 55). In our study we found that 62% watch TV around 6-8pm hrs. Also, 45% of students use laptop/TV as sleeping aid. However use of computer games as a source of entertainment is seen only in apx 20% of population mostly among males. Since it is not a preferred activity in hostel it's contribution in sleep disturbance among students is insignificant.

Internet surfing was found to be most widely used recreational activity among subjects. According to the study approximately 66% students engage in internet for 3-6 hours maximally for the use of chatting and entertainment.

To find extent of mobile phone usage our study also divided population in the groups of 3:-

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The score analysis of Epworth sleepiness scale revealed about 24% (maximum) of students had chance of dozing while "sitting and reading" and least during "sitting or talking" and "In car while in traffic". After analyzing the score about 42% population belonged to Grade 2 with an average amount day time sleepiness, followed by Grade 1. Only 10% of population belonged to Grade 4 in sleepiness scale requiring medical attention. The population using mobile phone or any digital media for >2hours a day (specifically (around 6hours), mostly after 10pm had increased chances of dozing during daytime especially while attending lectures or afternoon rest due to cognitive arousal before sleep causing insufficient sleep during night hours.

IX. LIMITATIONS

Due to operational constraints Quantification & staging of melatonin level could not be studied in the participants.

Since the research work is in its initial phase, the results of Pittsburgh sleep quality index (PSQI) using SPSS software could not be analyzed. However the questionnaire has been distributed to all the hundred participants.

X. FUTURE SCOPE

The study will be extended to population of 300 students. The data of Pittsburgh sleep quality Index (PSQI) questionnaire will be interpreted to measure the quality and patterns of sleep in adults which will further help to differentiate “poor” from “good” sleep quality by measuring 7 components mentioned in the questionnaire. The study may act as a pilot project for extended studies on impact of media on lifestyle of the students undergoing health professional courses.

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