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A cross-sectional study of screen exposure time and its effects on sleep quality & mental health of medical undergraduates

Zoya Kazi[1], Faraj Shaikh[2], P. S. Chawla[3]

ABSTRACT

Background

As large portions of the youth population (15–24 year olds) are gaining access to computer technology it is crucial to determine the role exposure to screens has on the quality of sleep and overall mental well-being of youth. Especially if this effect compounds with the generalised stressors present in the lifestyle of medical undergraduates.

Methods

The present study was conducted by administering a semi-structured questionnaire to undergraduates of a tertiary care medical college. The questionnaire included their socio-demographic profile, questions on-screen exposure, sleep quality and mental well-being using the Questionnaire for Screen Time of Adolescents (QueST)[1], Sleep Quality Scale (SQS)[2] and Warwick-Edinburgh Mental Well-being Scale (WEMWBS)[3]. The average screen time was calculated and the responses for SQS and WEMWBS were scored. Chi-square was used to test statistical significance and to obtain an association between screen exposure time, sleep quality and mental well-being.

Results

A total of 251 participants were included in the study, ranging from the ages of 18 to 26 years. A gradual increase in the screen exposure time was observed from 1st year to Interns. The mean screen exposure time was found to be 535.26 minutes (8h 54min). Females showed lower mental well-being as compared to males in the same year. Higher incidence of sleep problems was observed in Final year students. A significant association between Sleep Quality Scale scores and screen exposure time (p-value = 0.03) and a unidirectional relation (p-value = 0.04) between Sleep Quality Scale scores and Non-recreational Screen Exposure Time.The participants with lower screen exposure time showed lesser acute sleep problems (p-value= 0.03; p-value=0.0006, respectively). A higher screen exposure time for recreational purposes showed a unidirectional relation (p-value= 0.04) with occurrence of acute sleep problems, in individuals who already had a higher screen exposure time than the mean of the group. Significant association was found between participants having lower WEMWBS scores and lower Non-recreational Screen Exposure time (p-value= 0.04). A unidirectional association (p-value= 0.02) was observed between lower WEMWBS scores and lower Recreational Screen Exposure Time. In those with higher WEMWBS scores significant findings were seen in relation to both recreational and non-recreational screen exposure times (p-value= 0.04 and p-value= 0.04, respectively).

Conclusions

High screen exposure time was observed in the sample population with a steady increase from 1st year to Interns. Significant disparities were observed in the mental well-being of female and male participants of the study. The Final year students reported a marked increase in acute sleep problems. The study participants with higher screen exposure were observed to have better mental well-being but were also seen to have more acute sleep problems. Despite the better mental well-being observed, it was noted that acute sleep problems in turn affect the mental well-being of an individual and thus reduction of screen time is recommended.

Keywords screen exposure time, sleep quality, mental health, mental well-being, medical undergraduates

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INTRODUCTION

Digital development is an important tool utilised in creating global connectivity since the inception of telecommunication technology. These efforts are only furthered by the introduction of computer technology globally.As of 2022, 75% of 15 to 24-year-olds are reported to be online as compared to the 65% figure for the rest of the world's population[4].With such large swathes of the youth population gaining access to computer technology, it is imperative to assess whether the risks to public health associated with rampant increase in access to this technology outweigh the benefits.Sleep quality is defined as one's satisfaction with the sleep experience, integrating aspects of sleep initiation, sleep maintenance, sleep quantity, and refreshment upon awakening[5].Thus sleep quality not only helps determine the quantity of sleep an individual gets, but also helps account for disturbances in sleep and satisfaction with sleep, giving a better view of the problems that might slip through the cracks when merely considering hours spent sleeping.Mental health is a state of mental well-being that enables people to cope with the stresses of life, realise their abilities, learn well and work well, and contribute to their community. It is a marker that indicates the degree of difficulty or distress a person faces[6].A severe disturbance in either of the above factors can cause impairments in a person's ability to function and contribute to the community.Multiple studies have been conducted on this topic in the recent past to assess the validity and implications of these problems on the community. Although, many of these studies have focused on children who have had access to these screens during their formative years, this particular study intends to focus upon the effects of prolonged screen exposure on the mental well-being and sleep quality of medical undergraduate students as it is understood that several unique stressors present in their lives be they related to academics, psychosocial or environmental factors are already known to affect their life quality as compared to their peers in the same age group[7-9]. It is also of note to mention that the sleep quality and mental well-being of today's medical undergraduates may have significant implications on their decision making skills and instincts in emergency situations, directly affecting the quality of care provided by them in the future.

OBJECTIVES

1. To study the socio-demographic profile of the study participants.
2. To estimate the screen exposure time among them.
3. To determine the effects of screen exposure time on their sleep quality & mental health.
4. To suggest recommendations based on the study findings.

METHODS

The present study was conducted amongst the undergraduate students of a tertiary care medical college. On receiving Institutional Ethics approval, a semi-structured questionnaire was prepared. It was self-administered to 750 participants, out of which 251 (Response Rate = 33.46%) completely filled responses with due consent of the participants were used as data. Incomplete responses were not accounted for in the research data used for the evaluation of the study.

The questionnaire required participants to fill their socio-demographic details and the responses to Questionnaire for Screen Time of Adolescents (QueST), Sleep Quality Scale (SQS) and Warwick-Edinburgh Mental Well-being Scale (WEMWBS) to ascertain their screen exposure time, sleep quality and mental well-being, respectively. Any forms with incomplete information were excluded from the study.

The QueST measures screen time across five constructs: studying, working/internship-related activities, watching videos, playing games, using social media/chat applications .The QueST proved to be fair to excellent for measuring different screen time constructs, it demonstrates satisfactory content validity attested by the experts and adolescents[1].The data collected from QueST was utilised to calculate the recreational as well as non-recreational screen time of participants alongside their total screen exposure time in a day.The SQS consists of 28 items that evaluate sleep in six domains of quality: daytime symptoms, restoration after sleep, problems initiating and maintaining sleep, difficulty waking, and sleep satisfaction.

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The SQS uses a four-point 0 to 3, Likert-type scale indicating the frequency of the participants' sleep behaviours with scores ranging from 0 to 84 where higher scores denote more acute sleep problems. Concurrent validity was identified by the significant correlation of SQS with the Pittsburgh Sleep Quality Index. The developed SQS was therefore confirmed to be a valid and reliable instrument for the comprehensive assessment of sleep quality[2]. The SQS does not assign a cut-off score thus, the mean score of the collected data was calculated and utilised as the cut-off score to assess the reported data.

The WEMWBS aims to capture a wide conception of well-being, including affective-emotional aspects, cognitive-evaluative dimensions and psychological functioning. The scale is scored by summing responses to each item on a 1 to 5 Likert Scale. The minimum scale score being 14 and the maximum being 70 where higher scores denote higher level of mental well-being WEMWBS shows high levels of internal consistency and reliability against accepted criteria.[3]. The WEMWBS does not have a cut-off score thus, the mean score was calculated and used as a cut-off score for assessment.

The data collected was compiled into tables and graphs for analysis. Chi square was used to test statistical significance and to obtain association between screen exposure time, sleep quality and mental well-being, and a linear relationship was drawn between Sleep Quality and Mental Well-being.

RESULTS

Demography

The form was mailed to 750 students of which 251 students filled the form completely. Out of the total participants, 50.2% were male [Figure 1], ranging from the ages of 18 to 26 years. The respondents were— studying in 1st, 2nd, 3rd and Final medical professional years, along with Interns. 2nd year students made up a major fraction (104, 41.43%) and Interns were the minority (19, 7.5%) of the respondents [Figure 2].

Figure 1: Gender-wise distribution of study participants

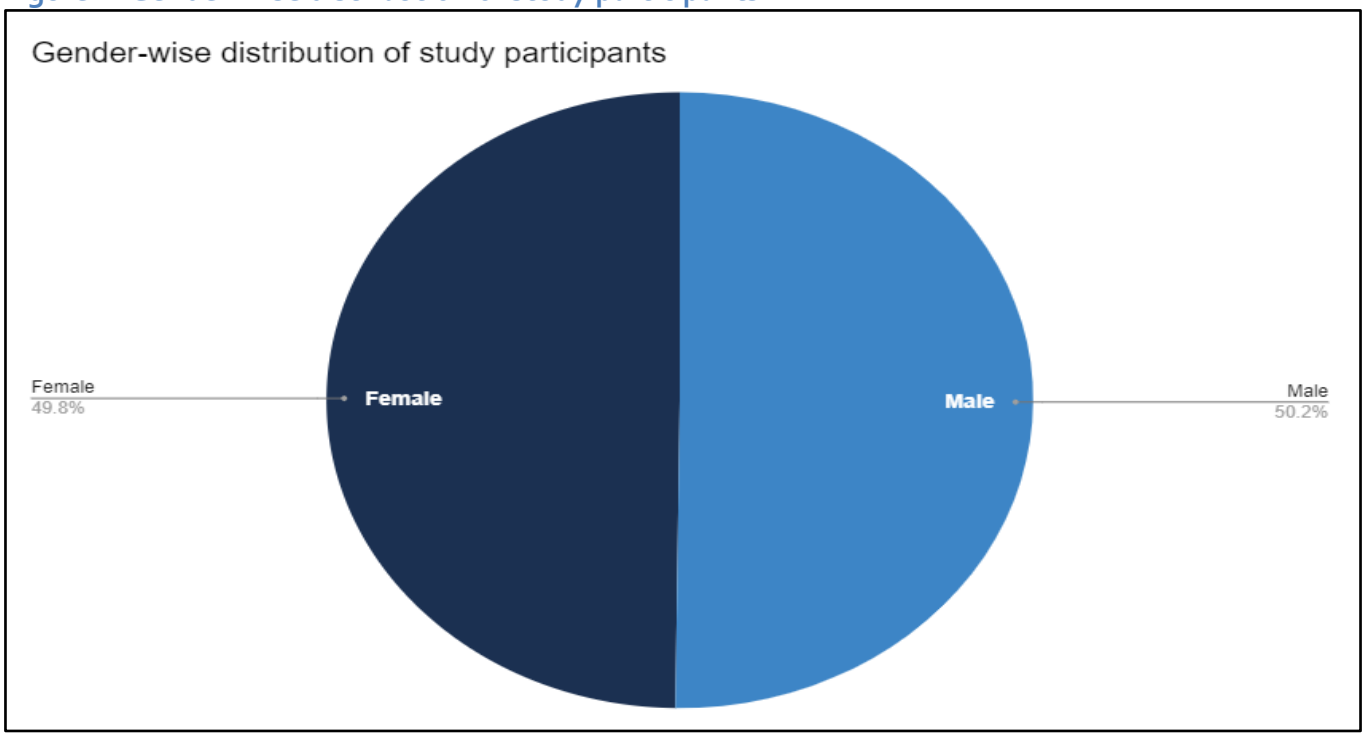

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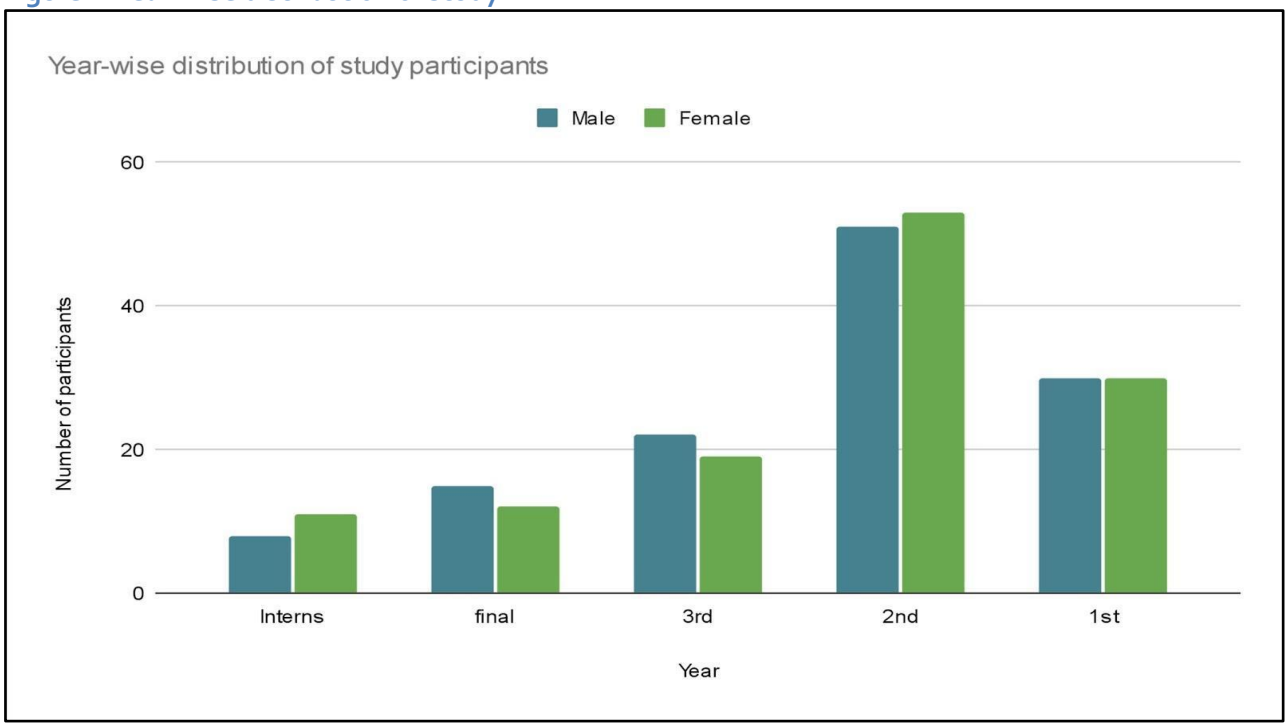
Figure 2:Year-wise distribution of study



Screen Exposure

The screen exposure time is seen to rise through the years with the minimum average of screen exposure time observed amongst 1st year students (462.15 minutes or 7h 27min) and the maximum observed in interns (645.79 minutes or 10h 45min). The observed distribution of screen time across the five constructs that QueST measures was plotted. It showed an increase in screen time for studying and internship/work related purposes (non-recreational) from 1st year to Interns. Time spent watching videos and on social media is seen to be maximum amongst students of 2nd and 3rd year [Figure No. 3].The mean screen exposure time among all the study participants was found to be 535.26 minutes (8h 54min) [Figure No. 4].

Figure 3:Distribution of screen time across the five constructs of QueST

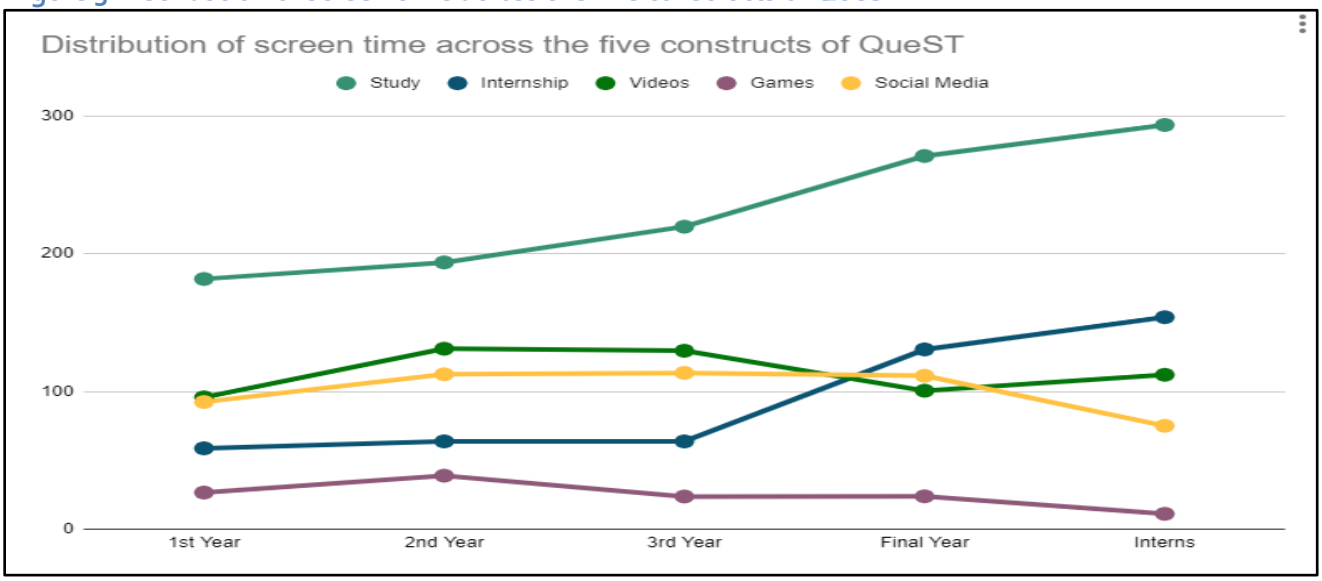


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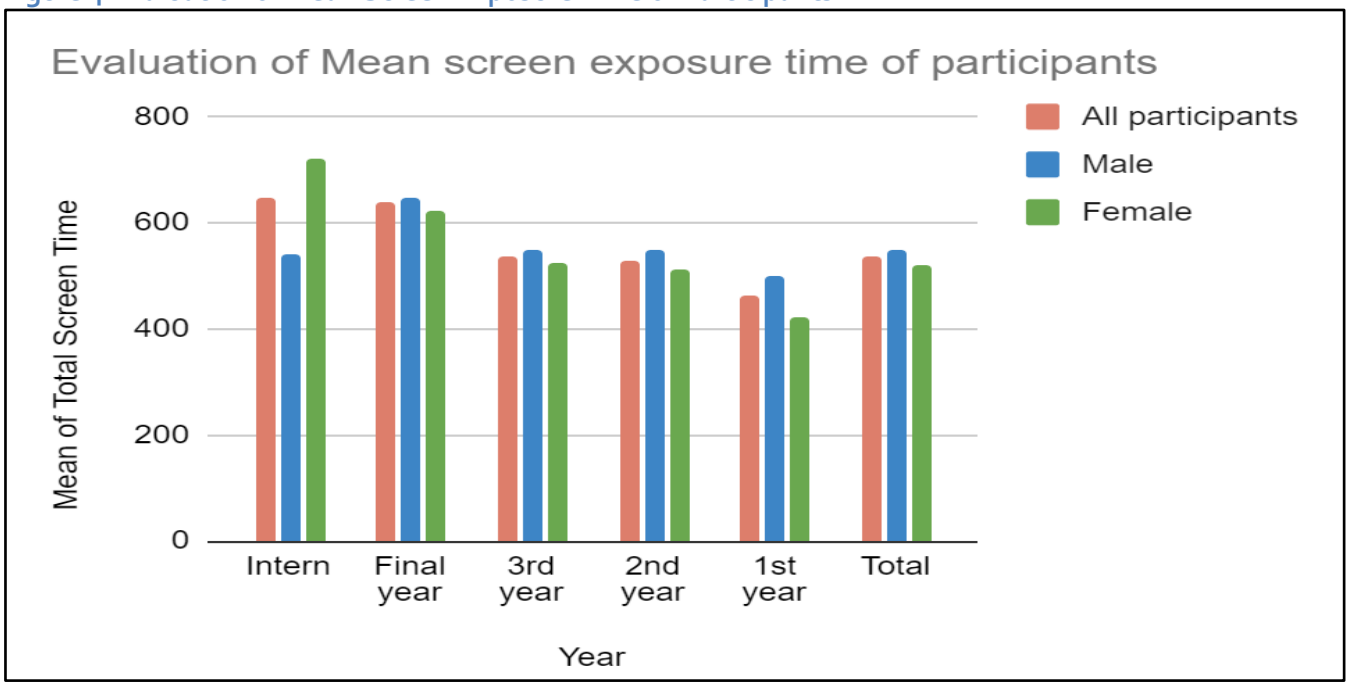
Figure 4:Evaluation of Mean Screen Exposure Time of Participants.

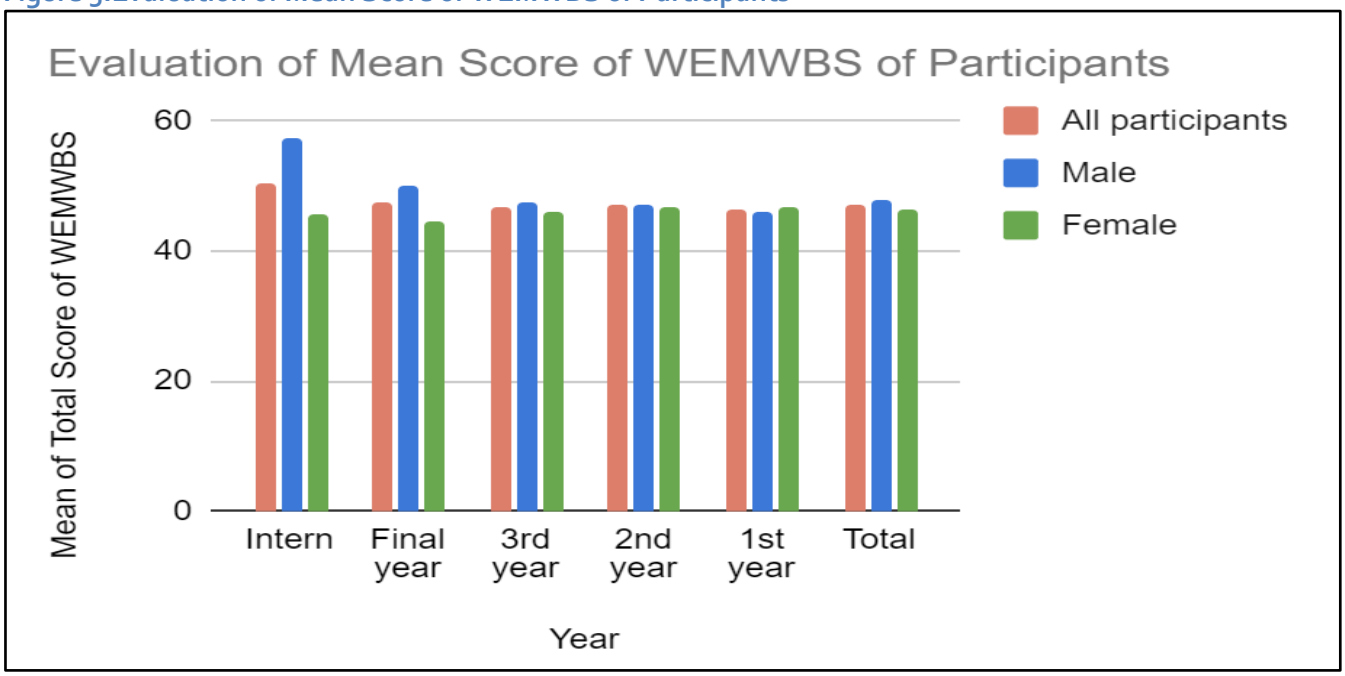


Considering the mean screen time as the cut-off score, the participants were divided based on their exposure to screens into groups who spent more than the mean of the sample group and those who spent less time. This revealed that 104 (41.43%) of the participants had screen exposure time above the mean of the sample group [Table 1].

Mental Well-being

The Mental Well-being of participants didn't show major variation through the years but there was a disparity observed based on gender with females across the board showing lower scores compared to their male counterparts in the same professional year [Figure No. 5].

Figure 5:Evaluation of Mean Score of WEMWBS of Participants



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On dividing the sample group based on whether they fall above or below the mean score of the group, it was noticed that there was almost an even split but with the slight majority of 126 participants (50.2%) falling below the mean score [Table 1]. The group was assessed by comparing their SQS scores to the mean and it was found that the majority of the students (56%) fell below the mean score, meaning they had less acute sleep problems compared to the group at large [Table 1].

Table 1:Evaluation of Total Screen Exposure Time, Mean Score of WEMWBS and SQS Score of Participants

		Evaluation of Total screen time of Participants (Mean score as **535.26 minutes**)			Evaluation of WEMWBS Score of Participants (Mean score as **47.096**)			Evaluation of SQS Score of Participants (Mean score as **34.29**)		
		Male	Female	All participants	Male	Female	All participants	Male	Female	All participants
Intern	Above mean	3	7	10	7	4	11	3	4	7
	Below mean	5	4	9	1	7	8	5	7	12
Final year	Above mean	9	6	15	11	5	16	6	9	15
	Below mean	6	6	12	8	3	11	9	3	12
3rd year	Above mean	11	11	22	10	8	18	4	8	12
	Below mean	11	8	19	12	11	23	18	11	29
2nd year	Above mean	21	17	38	27	25	52	20	27	47
	Below mean	30	36	66	24	28	52	31	26	57
1st year	Above mean	10	9	19	14	14	28	16	13	29
	Below mean	19	22	41	16	16	32	14	17	31
Total Participants	Above mean	55	49	104	69	56	125	49	61	110
	Below mean	71	76	147	57	69	126	77	64	141

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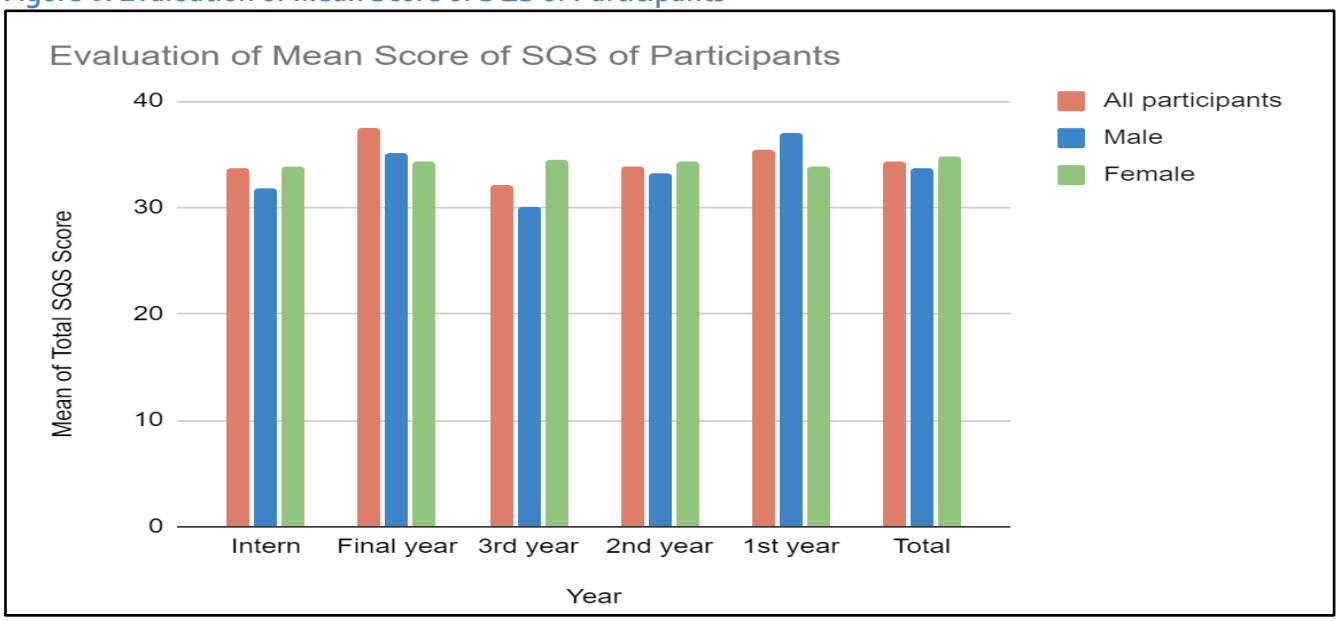
Sleep Quality

The Sleep Quality of the sample group showed little variation except for higher sleep quality scores (which imply more acute sleep problems) observed in students of the final year along with a generally higher score observed in female students as compared to males in the same professional year [Figure No. 6].

Figure 6: Evaluation of Mean Score of SQS of Participants



EVALUATION

The participants were categorised into groups depending upon their SQS score. These groups were evaluated by drawing an association based on chi square between screen exposure time and SQS score. A significant association (p-value = 0.03) was seen between SQS and Screen Exposure Time. A unidirectional association (p-value = 0.04) was found between SQS score and Non-recreational Screen Exposure Time, implying higher incidence of non-recreational screen time has adverse effect on sleep quality [**Table 2-3**].

Table 2:Association between mean Screen exposure time and Sleep Quality Score

	Sleep Quality			Statistical Values		
Mean Screen Time	Below Mean Score	Above Mean Score	Total Participants	p-value (1-tail)	p-value (2-tail)	Odds ratio
Above mean	54	50	104	0.019	0.03	1.70
Below Mean	57	90	147			

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Table 3: Association between Non-recreational Screen exposure time and Sleep Quality Score

	Sleep Quality			Statistical Values		
Non-recreational screen time	Below Mean Score	Above Mean Score	Total Participants	p-value (1-tail)	p-value (2-tail)	Odds ratio
Above Mean	48	45	93	0.04	0.08	1.56
Below mean	64	94	158			

On further evaluation of the association of SQS score of the participants with the categories of screen time extrapolated from the QueST, the following findings were elucidated: the participants with lower screen exposure time irrespective of the category were shown to have lesser acute sleep problems (p-value = 0.03; p-value =0.0006). A unidirectional association (p-value = 0.04) was established between higher recreational screen exposure time and the occurrence of acute sleep problems **[Table 4a-b]**.

Table No.4a Association between Screen Exposure Time and Sleep Quality Score of Participants Below Mean Cut-off Score

		SQS Score		Statistical Values		
Screen Exposure Time		Above Mean Score	Total	p-value (1-tail)	p-value (2-tail)	Odds ratio
Recreational Screen Usage	Below Mean	67	112	0.044	0.088	0.67
	Above Mean	45	112			
Non-Recreational Screen Usage	Below Mean	64	112	0.108	0.217	0.75
	Above Mean	48	112			

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Table No.4b Association between Screen Exposure Time and Sleep Quality Score of Participants Above Mean Cut-off Score

		SQS Score		Statistical Values		
Screen Exposure Time		Above Mean Score	Total	p-value (1-tail)	p-value (2-tail)	Odds ratio
Recreational Screen Usage	Below Mean	67	112	0.044	0.088	0.67
	Above Mean	45	112			
Non-Recreational Screen Usage	Below Mean	64	112	0.108	0.217	0.75
	Above Mean	48	112			

Similarly, the WEMWBS scores of the participants were grouped into those with higher scores than the mean, and those with lower. These groups drawn on the basis of WEMWBS scores were evaluated with their screen exposure time. A significant association (p-value= 0.04) between participants having lower WEMWBS scores and lower Non-recreational Screen Exposure time was observed. There was also a unidirectional (p-value = 0.02) association between participants having lower WEMWBS scores and lower Recreational Screen Exposure time. On drawing similar associations between higher WEMWBS scores, significant findings were derived with both recreational (p-value = 0.04) and non-recreational (p-value = 0.04) screen exposure time **[Table 5a-b]**.

Table No. 5a Association between Screen Exposure Time and WEMWBS Score of Participants Below Mean Cut-off Score

		WEMWBS Score		Statistical Values		
Screen Exposure Time		Below Mean Score	Total	p-value (1-tail)	p-value (2-tail)	Odds ratio
Recreational Screen Usage	Below Mean	76	126	0.029	0.058	0.65
	Above Mean	50	126			
Non-Recreational Screen Usage	Below Mean	77	126	0.020	0.041	0.63
	Above Mean	49	126			

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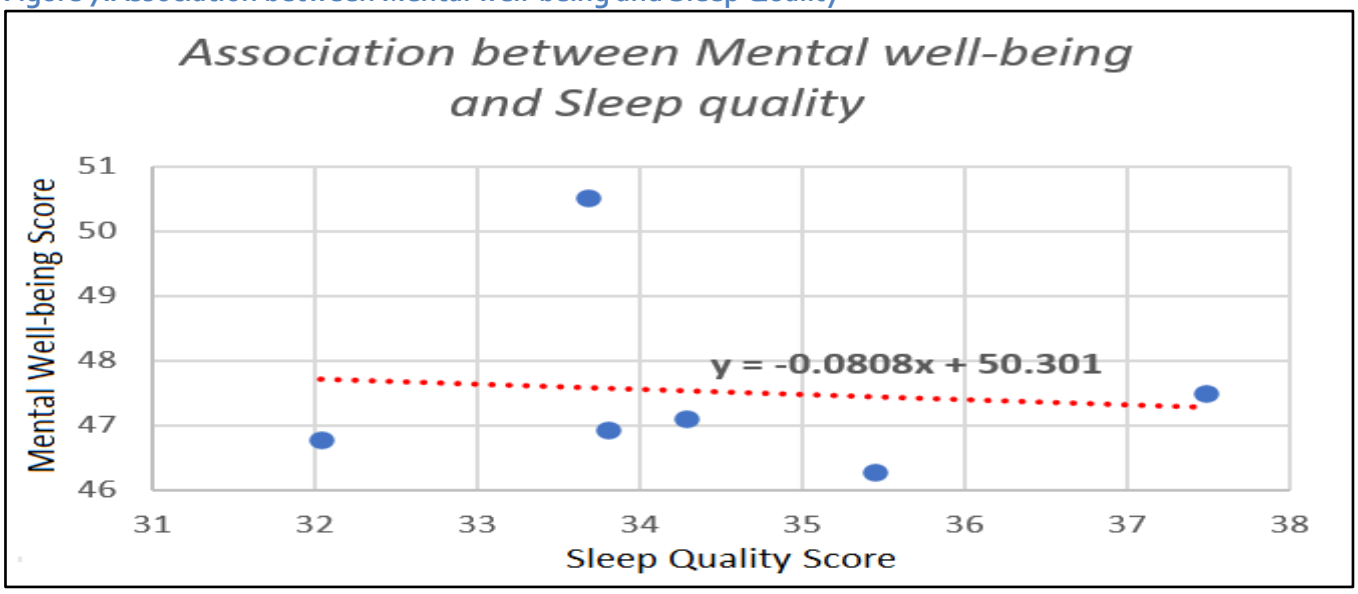
Table No. 5b Association between Screen Exposure Time and WEMWBS Score of Participants Above Mean Cut-off Score

		WEMWBS Score		Statistical Values		
Screen Exposure Time		Above Mean Score	Total	p-value (1-tail)	p-value (2-tail)	Odds ratio
Recreational Screen Usage	Below Mean	76	125	0.024	0.048	0.64
	Above Mean	49	125			
Non-Recreational Screen Usage	Below Mean	82	125	0.002	0.004	0.47
	Above Mean	43	125			

A linear relationship drawn between Sleep Quality Scores and Mental Well-being scores of the sample population yielded a linear trend line of the equation **y = -0.0808x + 50.301** where SQS score is an independent variable (x) and WEMWBS score is a dependent variable (y). From the above equation, we can infer that the WEMWBS score and in turn, mental well-being is dependent upon the SQS score; thus, the equation can be interpreted as the mental well-being is negatively affected by an increase in acute sleep problems [Figure No. 7].

Figure 7:Association between Mental well-being and Sleep Quality



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Discussion

This study was able to find an association between the prevalence of high screen exposure time of its participants and the incidence of acute sleep problems in them. A similar study by Barika D. et al concluded a significant association between screen exposure time and sleep quality. They reported the most common effects of excessive screen exposure to be headaches, fatigue, mood swings, irritability, lethargy, watery eyes, dry eyes, and palpitations[10]. It was observed that female students tended to have lower mental well-being and a higher incidence of acute sleep problems. These findings were supported by and in line with the study conducted by Ragab E. et al on stress and its correlation with medical students, which found that female medical students were more significantly stressed due to academics than males[11]. Final year students were found to have the highest incidence of acute sleep problems among the cohort. This can be associated with an increase in the perceived stressors of the Final year of medical education. In a study conducted amongst medical undergraduates in Tamil Nadu, R. Anuradha et al found that Final year students are reported to be under the highest perceived stress levels as compared to students in any other year. Amongst these, academic stressors were found to be the most important reason for increased stress[7]. It was found that increased use of screens for work, studying and internship-related activities was associated with a higher incidence of acute sleep problems. In their study on associations between changes in screen time and mental health outcomes in adolescents, Babic M. et al found that recreational screen time was negatively associated with mental health, whereas non-recreational screen time had no association with mental health. They also found a varying effect of high screen exposure time on mental health outcomes.[12]It was found that participants with high Screen Exposure Time had better Mental Well-Being, but more incidence of acute sleep problems. A reduction in overall Sleep Quality caused by high Screen Exposure Time can be detrimental to Mental Well-being. Neophytou E. et al, in their study, found that an increase in screen time is associated with lowered self-esteem and increased incidence and severity of mental health issues[13]. It was seen in a study conducted by Tao S. et al that poor sleep quality plays a significant role in increasing the risk of mental health problems.[14] It should be taken into consideration that sleep quality and mental well being are not solely dependent on screen exposure but may be affected by academic, social stressors and every individual's personal ability to cope with them.

Limitations

This cross-sectional study was conducted among the medical students of a tertiary-care medical college in an urban area, thus the demographic variation seen among the students is limited. The questionnaire was self-administered, thus there is a likelihood of under-reporting and recall bias in the collected information. The QueST does not take into account the distribution of time spent on screens throughout the day and thus no comment can be made about the effect of screen usage right before bedtime, in this particular study. The SQS and WEMWBS do not separately account for underlying sleep pathologies and psychiatric conditions that could affect a person's ability to achieve sleep satisfaction and mental well-being, respectively thus, the part played by these factors in the results cannot be fully ascertained. A future study with a larger scope could address the above variables and adjust to account for them as well as explore if there is consistency in the findings of this study with a larger variation in demography.

Conclusion

The screen exposure time of the sample population at large was found to be exceedingly high, which only showed a steady increase from 1st year students to Interns. There were significant disparities observed in the mental well-being of female and male participants of the study, with female students showing a consistently lower level of mental well-being than their male peers studying in the same year. The Final year students reported a markedly high incidence of acute sleep problems as compared to the rest of their peers, this can be attributed to the generalised stressors of the Final year curriculum. The study participants with higher screen exposure time were contradictingly observed to have better mental well-being (higher scores of WEMWBS) but at the same time, they were also seen to have more acute sleep problems. Despite the better mental well-being observed in these students with high screen exposure times, it has to be noted that acute sleep problems were seen to have adverse effects on the mental well-being of an individual. The WHO provides certain

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guidelines for the restriction of usage of screens for children up to 5 years of age, similar recommendations for adolescents and young adults could be a useful step in improving outcomes in digital health.[15]

Recommendations

1. Minimise the overall screen exposure time throughout the day.
2. To make a conscious effort to reduce screen usage for recreational activities and to supplement the use of screens with physical and social activitie

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