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RESEARCH ARTICLE

DETERMINING PATTERN OF SMARTPHONE USAGE AND ASSOCIATION OF ACADEMIC STRESS WITH SLEEP QUALITY OF FIRST-YEAR MEDICAL UNDERGRADUATE STUDENTS - A CROSS-SECTIONAL STUDY

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Abstract

Introduction: Medical students, encounter considerable stress during prolonged study periods,especially during their exams, and together with excessive smartphone usage for studies and social networking are vulnerable to lack of sleep. Humans require adequate sleep to survive, as it greatly influences one's capacity for productive and effective daily performance. According to several studies, sleep-deprived students may experience headaches, muscle aches, sweating, palpitations,insomnia, nightmares, difficulties falling asleep, etc.

Methods: Methods for gathering data included a pre-structured &pre-designed questionnaire for Smartphone Usage, Perceived Academic Stress (PAS) Scale & Pittsburgh Sleep Quality Index (PSQI). Surveyed 184 first-year medical students of U.P.U.M.S., Saifai, Etawah.

Results: Out of 184 students (116 male and 68 female) the Screen time of Smartphones exceeds 3 hours in 44.6% (82) students, 168 students (91.3%) used their smartphone after 10 pm and 51 students (27.7%) students reported difficulty in eyes or refractive error due to smartphone usage. 86 students (46.7%) think smartphone usage has a negative impact on their sleep quality. The Mean±Standard Deviation of the Perceived Academic Stress (PAS) Scale for all Subjects was 60.11 ± 11.29(>60 is High Academic Stress and that of Global PSQI Scores was 9.15 ± 0.58 (>5 associated with poor sleep quality). The association between the variables was determined by analysis of variance that is the value of significance or the p-value was p = 0.0001.

Conclusion: The findings of this study led us to the significant association between academic stress with sleep quality. There is high academic stress among the studentsand the pattern of their smartphone usage has a negative impact on their sleep quality.

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Introduction:-

Medical studentsencounterconsiderable stress during prolonged study periods,especially during their exams,and together with excessive smartphone usage for studies and social networking are vulnerable to lack of sleep.

Many university students claim that their sleep is poor because of their exams, which has an adverse effect on both their academic performance and mental health.It has been demonstrated that perceived stress, somatic discomfort, and sleep issues all rise during exam times. Ahrberg et al. in 2012 were the first to study and examine the impact of exam stress on sleep quality by discovering that medical students' sleep quality decreases during exam times and that bad sleep are linked to subpar academic performance.[1]

A person's health may be negatively impacted by high exam anxiety levels, which can also lead to severe psychosomatic and physical symptoms. According to several studies, sleep-deprived students may experience headaches, muscle aches, sweating, and palpitations. Insomnia, nightmares, difficulties falling asleep, and frequent awakenings are all symptoms of sleep issues. Students who stay up late into the night feel physically and emotionally exhausted. They also use more sleeping drugs and anti-anxiety medications.[2]

The fear of failing the exam causes sleep-related issues and poor sleep quality. Sleep is a brief period of unconsciousness that aids in body relaxation and is a dynamic process of cellular renewal that energizes the entire body.[3]

Currently, smartphone usage is one of the most crucial environmental elements that may impact the quality of your sleep.Furthermore, poor sleep quality is associated with an increased risk of physical, mental, and sleep disorders. It is also related to lifestyle habits including excessive use of smartphones.Moreover, many studies show the impact of sleep durationand effectiveness on non-communicable disorders like diabetes.[4]

Humans require adequate sleep to survive, as it greatly influences one's capacity for productive and effective daily performance. Students who experience chronic sleep deprivation, associated tiredness, and daytime deficits are a severe threat to scholastic success and well-being anda crucial public health concern.

The financial and social implications of sleep disorders are significant. Many intellectual abilities, including memory, attentiveness, and responsiveness—which are critical in daily activities—are compromised by insufficient sleep. The homeostasis of a person's bodily functions is impacted by lack of sleep. Several studies provide evidence that poor sleep quality is a risk factor for mortality.[5]

Long-term stress may have unforeseen effects on one's health, performance in school, competency, and manners. There have also been reports of other negative effects like fear, melancholy, helplessness, incompetence, and other emotions. In Indian medical colleges, suicides and suicide attempts are frequently noted as a problem.[6]

Instead of spending valuable time with their families, students are spending more time on chatting messenger apps like WhatsApp. Many students are dependent on it and are unable to stop chit-chatting, answering, or exchanging thoughts or information all the time. Additionally, it is detrimental to the student’s academic performance. It promotes grammatical errors, poor sentence structure, and skipping lectures. It destroys students' lavish time spent developing their careers.[7]

The purpose of this study was to determine the pattern of smartphone usage&association of academic stress withthe sleep quality of first-year Medical Students.

Materials And Methods:-

A total of 184 out of 199students of first-year undergraduate medical students of Uttar Pradesh University of Medical Sciences, Saifai, Etawah district participated in thiscross-sectional study based on their experience in the past month.

Inclusion criteria:
(i) Those who agreed to take part in the study**(ii)**They were using smartphone devices.

Exclusion criteria:
(i) Previously diagnosed with any sleep disorder with or without treatment.

Data collection:
Methods for gathering data included a pre-structured &pre-designed questionnaire for student particulars &smartphone Usage along with the PerceivedAcademic Stress (PAS) Scale by Bedewy and Gabriel instruments consisting of 18 items& Pittsburgh Sleep Quality Index (PSQI).[8,9]

Data analysis:
SPSS version 28 was used for statistical analysis. One-way analysis of variance was used to examine the statistical significance of the differences between the groups (ANOVA). A P-value less than 0.05 were chosen as the threshold for statistical significance.

Ethical Clearance:
The study was approved by the ethical committee of U.P.U.M.S., Saifai, Etawah. Before enrolling each participant in the study, we made sure they understood the study and gave their consent. No personal information was revealed.

Results:-

All 199 First Year Medical Students studying at U.P.U.M.S., Saifaiwere sent the Google form of the study and were requested to be part of it; but only 184 students fulfilled the inclusion and exclusion criteria, completed their forms, and gave their consents for the study. So, a total of 184 healthy students participated in this study, out of which there were116 males (63%) and 68 females (37%). The mean age of the students was 21.02± 1.86 years.

The pattern of Smart Phone Usage
Out of 184 first-year medical undergraduate students, who were part of this study 28.3% (52) students are using a smartphone for more than 5 years, 84.2 % (155) students use smartphones in general for more than 3 hours, 48.9 % (90) students use smartphones more than 1 hour for audio calls & listening music only, whereas the actual screen time exceeds 3 hours in 44.6% (82) students. 168 students (91.3%) used smartphones after 10 pm and 13.6 % (25 students) have access to unlimited internet packs or Wi-Fi. 51 students (27.7%) students reported difficulty in their eyes or refractive error due to smartphone usage.

Students use their smartphones mainly for the purpose of studies (89.1%), social media networking (75.5%), audio calls (69.6%), listening to music (69.5%), browsing the internet (53.3%), video calls (46.2%), online shopping (42.4%), using camera (38.6%) and playing video games (16.8%). 52 students have a habit of keeping their smartphones next to them while sleeping (28.3 %) and 86 students (46.7%) think their smartphone usage has a negative impact on their sleep quality.

89 students (48.4%) frequently use their smartphones after they go to their bed to fall asleep, and 99 students (53.8%) use their smartphones between 10pm to 6 am for 1 to 3 hours. 60 students (32.6%) usually keep their notification alert on and sleep of 50.5 % was abrupted by the notification alerts.

Table 1 shows smartphone usage among students, Table 2 shows the Level of Perceived Academic Stress (PAS) Scale (adapted by Bedewy and Gabriel questionnaire) based on the grade of academic stress where scores were given based on the Likert scale as given in Bedewy and Gabriel's study and results were obtained accordingly; whereas Table 3 shows the same among male and female students.[8]

Table 4 shows scores obtained from the Pittsburgh Sleep Quality Index (PSQI) by the students which were classified into 7 components. The questions of PSQI were scaled and scores were aggregated as per the PSQI research study whereas Table 5 shows the same among male and female students.[9]

Table 1:- Smart Phone Usage among Students.

Variable	Frequency	Percentage (%)
1. For how many years have you been using smartphones?		

<1 year	12	6.5
1-3 years	66	35.9
3-5 years	54	29.3
>5 years	52	28.3
2. On average how many hours a day do you use your smartphone for any purpose?		
<3 hours	29	15.8
3-5 hours	106	57.6
5-8 hours	45	24.5
>8 hours	4	2.1
3. On average how many hours a day do you use your smartphone for audio calls & listening to music only?		
<1 hour	94	51.1
1-3 hours	76	41.3
3-5 hours	11	6
>5 hours	3	1.6
4. On average what is your actual screen time? (Total smartphone usage time minus time duration spent on audio calls/ listening to music)		
<1 hour	19	10.3
1-3 hours	83	45.1
3-5 hours	67	36.4
>5 hours	15	8.2
5. Do you use your smartphone after 10 pm?		
Yes	168	91.3
No	16	8.7
6. What type of Internet Pack do you use?		
Limited Data (e.g., Per day 2 GB data pack)	159	86.4
Unlimited Data(e.g.,Wi-Fi or no per day restriction of data usage)	25	13.6
7. Do you have any refractive error or any difficulty in your eyes due to smartphone usage?		
Yes	51	27.7
No	133	72.3
8. For which of the following purposes do you mainly use your smartphone? (Multiple Choice Answers)		
Social Media Networking	139	75.5
Audio Calls	128	69.6
Video Calls	85	46.2
Listening to Music	127	69.5
Studies	164	89.1
Browsing the Internet	98	53.3
Online Shopping	78	42.4
Playing Video Games	31	16.8
Using Camera	71	38.6
9. Where do you usually keep your smartphone before sleeping?		
Next to you	52	28.3
Far from you	132	71.7
10. Do you think your smartphone usage has a negative impact on your sleep quality?		
Yes	86	46.7
No	98	53.3
11. Do you frequently use your smartphone after you go to your bed to fall asleep?		
Yes	89	48.4%
No	95	51.6%
12. Between 10 pm to 6 am, how many hours at night do you spend on your smartphone on average?		
<1 hour	76	41.3%
1-3 hours	99	53.8%
3-5 hours	6	3.3%

>5 hours	3	1.6%
13. Do you usually turn off the notifications of your Smartphone before going to sleep?		
Yes	124	67.4%
No	60	32.6%
14. Do you think notifications alert abrupt your sleep when you go to sleep?		
Yes	93	50.5%
No	91	49.5%
15. On average how frequently your sleep was disturbed due to your smartphone in the past month?		
Never	27	14.7%
Rarely	72	39.1%
Sometimes	74	40.2%
Often	4	2.2%
Always	7	3.8%

Table 2:- Level of Perceived Academic Stress (PAS) Scale (adapted by Bedewy and Gabriel).

Category	Range (18 to 90)	Frequency	Percentage (Rounded off)
Very High	75<	18	10%
High	60-75	74	40%
Moderate	45-59	80	43.5%
Low	30-44	11	6%
Very Low	<30	1	0.5%
Total Studied Population =		184	100%

Table 3:- Mean Perceived Academic Stress (PAS) Scale (adapted by Bedewy and Gabriel).

Subjects	Number of Subjects	Mean ± Standard DeviationPerceived AcademicStress (PAS) Scale
Male	**116**	**59.50± 11.44**
Female	**68**	**61.17± 10.94**

Mean ± Standard Deviation of Perceived Academic Stress (PAS) Scale for all Subjects = 60.11± 11.29

The instrument used in this study was the result of adaptation and modification of the Bedewy and Gabriel instruments consisting of 18 items.

Table 4:- Obtained Scores of Pittsburgh Sleep Quality Index (PSQI).

Component Number	Name of Components	Mean Scores (0 to 3 for each component)
1	Subjective Sleep Quality	**1.59**
2	Sleep Latency	**1.98**
3	Sleep Duration	**1.68**
4	Habitual Sleep Efficiency	**1.54**
5	Sleep Disturbances	**1.42**
6	Use of Sleeping Medication	**0.13**
7	Daytime Dysfunction	**0.81**
Mean Global PSQI Scores (Sum of all PSQI Components; 0 to 21) =		**9.15**

Mean Global PSQI Scores ± Standard Deviation = 9.15 ± 0.58

The scores of PSQI were obtained and component scores were added based on the Pittsburgh Sleep Quality Index (PSQI) which is a self-rated questionnaire that assesses sleep quality and disturbances over a 1-month time interval.[8,9]

Table 5:- Mean Pittsburgh Sleep Quality Index (PSQI) in Male and Female Students.

Gender of Subjects	Number of Subjects	Mean ± Standard Deviation Global PSQI Scores(0 to 21)	*Number of Students with Global PSQI	Percentage of Students with Global PSQI

			scores > 5	scores > 5
Male	**116**	**8.67 ± 0.60**	**89**	**76.72**
Female	**68**	**9.41 ± 0.69**	**54**	**79.41**
*Total Number of Students withGlobal PSQI scores > 5			**143**	--
Total Percentage of Students withGlobal PSQI scores > 5			--	**78.06**

*Note: For PSQI, Pittsburgh Sleep Quality Index
Minimum score = 0 (better) and maximum score = 3 (worse) for each PSQI component.
Minimum score = 0 (better) and maximum score = 21 (worse) for Global PSQI Scores.
Total >5 associated with poor sleep quality.

The duly filled google form data was analyzed by IBM SPSS version 28 software and examined by ANOVA for the statistical significance of the differences between the groups.

The association between the variables was determined by analysis of variance that is the value of significance or the p-value was **p = 0.0001**(Where p=0.05 or p<0.05 means it is Significant)

Discussion:-

Medical students take admission after a cut-throat competition for their entrance examination in India. Their mental health and sleep are already disturbed during the entrance exam preparation. As the students enter their Medical Colleges, they aspire to continue a healthy routine but in the very first year of their college, their academic stress levels are increased; as we can see in this study the Mean ± Standard Deviation of Perceived Academic Stress (PAS) Scale for all Subjects is 60.11 ± 11.29 where a score of more than 60 contributes to high academic stress. Out of 184 students, 18 students (10%) have very high academic stress, 74 students have high academic stress and 80 students have moderate academic stress which is an alarming situation.

The medical education system has long been criticized as being extremely competitive, stressful, and exhaustive.More female students (Mean± S.D. PAS scale Score 61.17 ± 10.94) perceived academic stress compared to male students (Mean± S.D. PAS scale Score 59.50 ± 11.44), various other studies conducted by Krishnappa K et al, Kumari et al have also found similar results of increased perseverance of stress among female students.[6,10]

Along with the academic stressors, excessive usage of smartphones, especially during night hours, is revealed by this study; 62% of the 184 students sleep usually after 12 am and 34.2 % take sleep for less than 6 hours. The college begins at 9 am and 11.4 % of these students wake up after 9 am. 28.3% (52) of the 184 first-year medical undergraduate students who took part in this study have been using smartphones for more than five years, 84.2% (155) of them use them regularly for longer than three hours, and 48.9% (90) of them only use them for audio calls and listening to music, while 44.6% (82) of them actually spend more than three hours per day viewing screens. After 10 pm, 168 students (91.3%) used their smartphones, and 25 students (13.6%) had access to Wi-Fi or unlimited data plans. Due to smartphone use, 51 students (27.7%) experienced eye discomfort or refractive error. Studying is the top reason students use their smartphones, followed by social media (75.5%), audio calls (69.6%), music listening (69.5%), internet browsing (53.3%), video calls (46.2%), online shopping (42.4%), using the camera (38.6%), and video games (16.8%). While sleeping, 52 students (28.3%) practice having their smartphones close by and 86 students (46.7%) believe this negatively affects the quality of their sleep.It clearly depicts that smartphone usage has a major role in disturbing sleeping and waking up time, which results in low attendance and poor academic performance.

The PSQI scores were obtained and aggregated into 7 components as per the given scale by Buysse DJ et al[9] in their Psychiatry research. The 7 components were compiled into a score of 0 to 3 and the mean scores obtained were 1.59 in subjective sleep quality, 1.98 for sleep latency, 1.68 for sleep duration, and 1.54 in Habitual Sleep Efficiency, 1.42 for sleep disturbances, 0.13 for using a sleeping medication, 0.81 for daytime dysfunction. The Mean Global PSQI Scores ± Standard Deviation was 9.15 ± 0.58 where the score is between 0 to 21 (better to worse) and a score of >5 is associated with poor sleep quality.So, there is no doubt the sleep quality of these medical students is poor especially that of first-year students as agreed by a study conducted by Corrêa CD et al.[11]

Conclusion:-

We live in an era where smartphones are not only used for calling but also foran alarm clock, calculator, shopping, and gaming and now with rising in competitive examination applications, Studying can also be done on smartphones. In this study we have observed that 89.1% of the students use their phone for their studies, 91.3 % of students use it after 10 pm,26.6 % of the students use it for more than 5 hours a day, and 99 students (53.8%) use their smartphonesbetween 10pm to 6 am for 1 to 3 hours.So, this is very clear that excessive usage of smartphones is done especially during night hours,and disturbs their sleep cycle as well as sleep quality. Which leads to either skipping morning classes or attending classes with poor concentration. When this vicious cycle of disturbed sleep continues over time it creates academic stress.It's very important to address these issues as treating doctors with good mental health will improve overall healthcare services.

Recommendation:-

Institutions can include mandatory in-person monthly studentcounselling by assigning professional student counsellors. Periodic assessment of mental health and Stress management strategies like promoting yoga and physical exercises can be incorporatedinto the curriculum. Clinical postings should be limited to college hours only. Students should be encouraged to improve their smartphone usage and bedtime habits.Students' feedback about the academic curriculum, teaching, and extra-curricular activities should be taken which can help resolve the problems regarding academic stress and sleep quality.

Limitations of the Study

For a first-year medical undergraduate stressors other than academic stressors may also have a role in their sleep quality. Additionally, the generalizability of a cross-sectional study with a sample from just one institute is constrained. Results from a multicentric longitudinal study would be more precise.

Relevance of the Study

Academic stress has always been a part of Medical Studies. It is often discussed but rarely prioritized and with time it has been normalized by everyone. This study brings out the critical situation of smartphone dependency, excessive academic stress, and its impact on the sleep quality of first-year medical undergraduates. The study findings add to the available evidence in similar studies and a baseline for further multi-centric research. The findings also help in decision making and taking appropriate steps by the relevant authorities to cope-up the current situation of the students.

Figures of this Research Study:

Fig. 1:- Age Distribution of first-year medical Students who were part of this study.

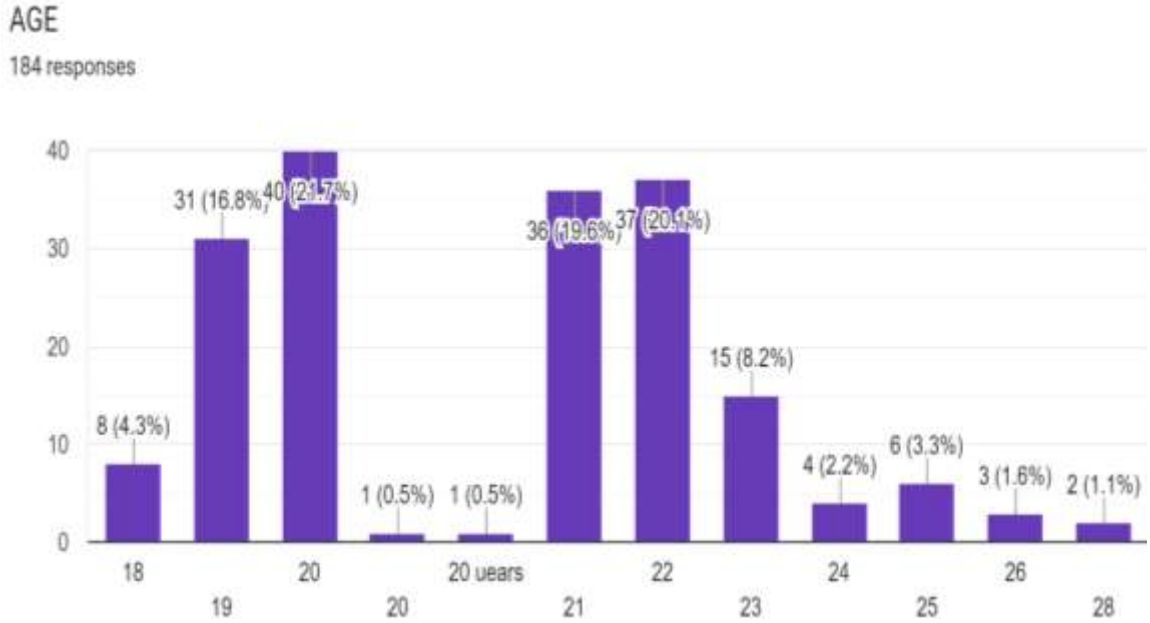


Fig. 2:- Gender Distribution of the first-year medical Students who were part of this study.

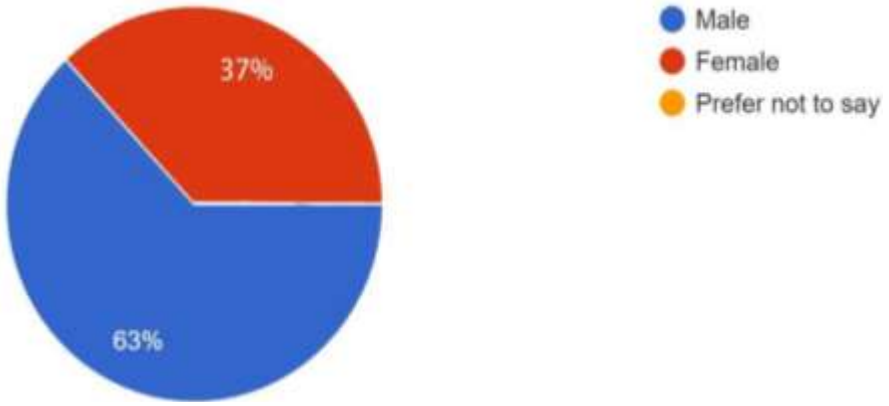


Fig. 3:- Students who were either previously diagnosed with any sleep disorder or taking any medication to improve their sleep quality.

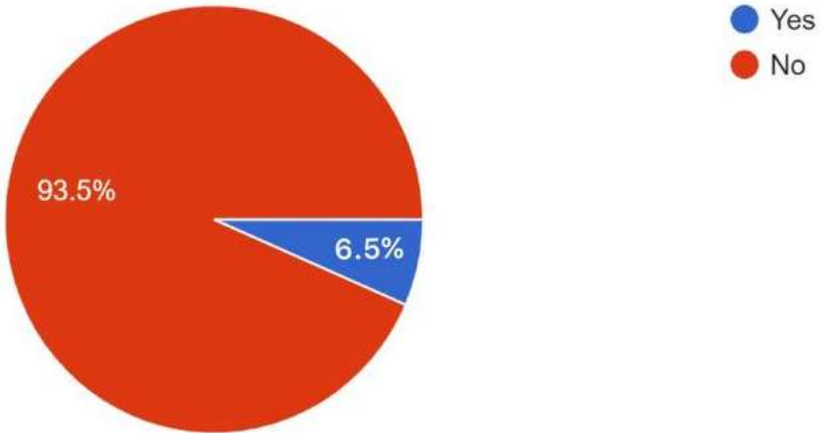
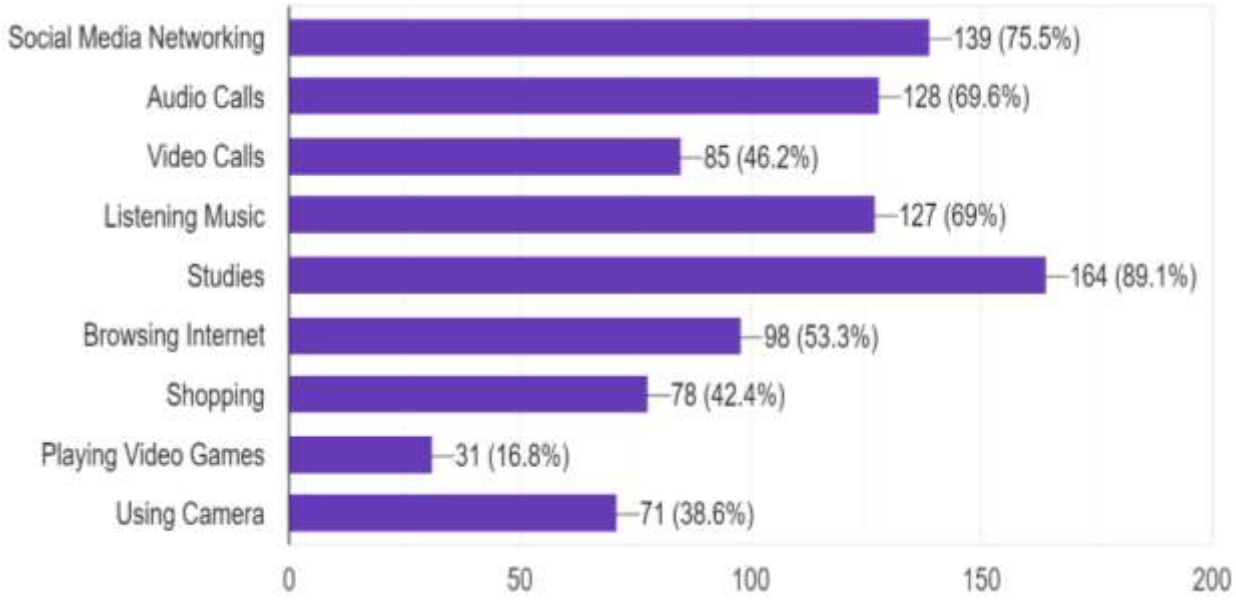


Fig. 4:- Main purposes of the students for using their smartphones.



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Conflict of interest:
None declared.

Ethical approval:
The study was approved by the Institutional Ethics Committee.

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