



THE PREVALENCE OF TECHNOLOGY (INTERNET) ADDICTION AMONG THE SCHOOL GOING ADOLESCENTS (10-19 YEARS) - A SCHOOL BASED CROSS SECTIONAL STUDY

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ABSTRACT

Introduction: Adolescence (10–19 years) represents the transition between childhood and adulthood; the expectations and choices made during adolescence have a significant impact not only on current health practices and well-being but also on their health as adults. Similar to most addictive behaviors, adolescents are more vulnerable to technology addiction because of its easy availability, their limited capacity for self-regulation and increased risk of peer pressure and experimentation.¹⁻³ Excessive use of the Technology has become one of the leading challenges of the modern society and causes both physical and mental impairment in adolescents. Adolescents with technology addiction often have physical symptoms, social skills deficit, sleeping disorders and sedentary behaviors forming important risk factors for non-communicable diseases (NCDs)^{3,4} and have deleterious effects on their family, social, academic or work environments.⁵⁻⁷ Technology addiction is defined as a psychological state of dependency on the use of a technology to such a degree that the following typical behavioral addiction symptoms may arise: 1) salience-the technology dominates a user's thoughts and behaviors; 2) withdrawal-negative emotions arise if a person cannot use the technology; 3) conflict-the use of the technology conflicts with other tasks, which impairs normal functioning; 4) relapse and reinstatement-a user is unable to voluntarily reduce the use of the technology; 5) tolerance-a person has to use the technology to a larger extent to produce thrill; and 6) mood modification-using the technology offers thrill and relief, and results in mood changes.⁸ Objectives of the study was to determine the prevalence of technology (internet) addiction among school going adolescents (10-19 years).

Method of study: This school based cross-sectional observational study was carried out at selected school settings from February 2023 to November 2023 in city of Jamnagar, Gujarat. 429 students from 10 to 19 years were enrolled after their and parental informed consent in the study. They were screened for technology addiction by using Internet addiction test-Adolescent scale. The study also examined the comparison among various adolescent stages and between public and private schools students and also provided knowledge on health impacts due to internet addiction.

Result: The present study included total of 429 students of which 216 were from public and 213 students were from private schools. Considering gender distribution 56% were males and 44% were females. The mean age of study population was 14.5 years. 173, 188 and 68 students belonged to early, middle and late adolescent stage groups respectively. Out of 216 public school students 85, 101 and 30 were early, middle and late adolescents and out of 213 private schools students 88, 87 and 38 were early, middle and late adolescents. Considering Internet Addiction, 42% had mild, 27.5% had moderate and 0.5% had severe addiction. Majority had mild internet addiction. Maximum mild addiction was in early Adolescents while severe addiction seen more in late adolescents (1.5%). Mild and moderate internet addiction was more among public school students. While severe addiction was more in private school students. Mild Addiction was more in females while moderate addiction was more in males. All physical problems were more in severe internet addiction. The mean time of physical activity was 37 minutes. Maximum physical activities were done by Early adolescents. Instagram is most common application used and the most common purpose of application use was entertainment. Mean duration of using technology was 1.9 hours. 218 (50.8%) students use internet during bed time while use of technology by parents was seen in 247 students (57.6%).

Conclusion: The study evaluated technology(internet) addiction among 429 students. 70% had internet addiction. Males and private school students were more addicted to technology (p value->0.05). All physical problems were associated with addiction (p value-<0.05). Thus this study throws light on an important growing health issue affecting adolescents that deserves serious attention from parents, schools, and policymakers and follow treatment techniques for Internet addiction.

INTRODUCTION

1.1 Background

Internet is being integrated as a part of day-to-day life because the usage of the Internet has been growing explosively worldwide.

It has dramatically changed the current communication scenario, and there has been a considerable increase in the number of Internet users worldwide in the last decade. With the advancement in media and technologies, Internet has emerged

as an effective tool in eliminating human geographical barriers.

Currently, technologies like-mobile, tablets, internet are frequently used by people to meet day to day needs. Internet have made our living easier and now, one cannot imagine life without technologies. Mobile phones and internet help in facilitating communication among people. Social networking through mobile phones and internet are common in today's world, young population being the most commonly affected ones 9.

With the availability and mobility of new media, Internet addiction (IA) has emerged as a potential problem in young people which refers to excessive computer use that interferes with their daily life.

The revolution in computer technology and communication through the Internet play a pivotal role in today's culture and has affected individuals of different ages. In the present scenario, Internet and computer technology are considered as the most effective tool and has been influential in all areas of science, business, education, culture, politics, etc.10

One of the major problems that the Internet has created is virtual addiction or addiction to the global web world, which has harmful psychological and behavioral effects on the user.11

Adolescents may have limited coping skills, and the Internet is a convenient and available way for them to try to deal with the tension.12

Another reason is the ability to express one's true self, which can be particularly attractive to an adolescent dealing with identity development and self concept issues. Adolescents may be much more willing to engage in the bullying or harassing of others, gain access to pornography, be exposed to sexual behaviors, and find opportunities to be rebellious toward authority figures.13

It has been reported that nearly half of adolescents who are using the Internet do so in their homes and with a broadband connection. Accessing the Internet at school or a friend's house are other popular places to get online.14

People's dependency on the Internet has increased over the past years, and it has been found that adolescents are the most adopting and adapting to the Internet compared to other age groups.

Over the past few years, several studies have been conducted on factors affecting adolescent Internet addiction. According to the literature, many negative mental health issues such as depression, anxiety, psychoticism, and somatization are associated with IA.15

Adolescence is the period of physical, intellectual, emotional, and social change from childhood to adulthood. During this period of development, adolescents are greatly influenced by various factors both internal and external to their social

environments.16 External factors such as changes in economic status or peer pressure can impact the decisions made by adolescents during this phase.17

Internal factors include the developmental needs of an adolescent that are influenced by their interactions with their parents and other significant adults in their lives for example teachers. The impact of these internal and external factors is seen in the patterns of adolescent well-being and behavior exhibited by the adolescent during this period.18

Adolescence is a critical stage in the development of an individual, as they begin to explore their identity and become more independent from their parents.19,20 During this phase, adolescents experience conflicting emotions, such as excitement at gaining independence coupled with uncertainty and fear about the future.19 These complex emotions result from a combination of biological and psychological changes that prepare them for adulthood.21 Along with these changes, there is also a shift in psychological perspective as the adolescent views the world from a cognitive standpoint rather than from a more concrete perspective of childhood.22

Adolescents are more likely to be at risk of mental health disorders as well as becoming addicted to various substances due to the increased levels of impulsivity and cognitive development occurring during this period.23

Literature shows a difference in early and middle adolescents' cognitive and psychological development and how they interact with their families and peers.22 Early adolescents appear to employ more emotion-focused coping techniques than older adolescents, who in turn employ more problem-focused coping techniques.24 Therefore, when studying adolescent Internet addiction, it is crucial to examine the various developmental stages individually, considering the unique cognitive, psychological, and coping differences between early and middle adolescents, as they interact with their families and peers.

Definition

Internet addiction is defined as a psychological state of dependency on the use of internet to such a degree that the following typical behavioral addiction symptoms may arise :

1. **salience** - the technology dominates a user's thoughts and behaviors
2. **withdrawal** - negative emotions arise if a person cannot use the technology
3. **conflict** - the use of the technology conflicts with other tasks, which impairs normal functioning
4. **relapse and reinstatement** - a user is unable to voluntarily reduce the use of the technology
5. **tolerance** - a person has to use the technology to a larger extent to produce thrill
6. **mood modification** - using the technology offers thrill and relief, and results in mood changes.

Though there is no standard definition for "Internet addiction", the attempt of Shaw & Black (2008) to define "Internet

addiction” as – “an excessive or poorly controlled pre-occupations, urges or behaviors related to use of internet and computers, that is significantly impairing and distressing”.²⁵

Another way of defining Internet addiction is – a habitual and compulsive way of indulgence with Internet deviating from meeting the life’s different issues.²⁶

Internet addiction is labeled, when the use is beyond the control and causing harm or impairment. There may be certain warning signs of Internet addiction, like – abnormally excessive use of technology (internet or mobile).⁹

Individuals addicted to Internet are very much preoccupied with their gadgets and can’t stay without them.²⁷

Often these people are unable to separate from these gadgets and feel worried, irritable and desperate, when they forget to take them along. They may experience like - the cell phone is ringing or beeping or vibrating. Adolescents with poor coping skills, often find it difficult to deal with day to day minor issues and engage with mobile or internet to distract themselves from the stressful situations.²⁸

Frequent use of this maladaptive avoidance behavior is a potential risk factor of internet addiction. Adolescents addicted to technology, often get socially isolated.²⁵

As research into Internet addiction continued, checklists were developed whereby data could be collected from willing, self-reporting respondents about their patterns of Internet use. In 1998, Internet Addiction Diagnostic Questionnaire first screening tool was developed by Young which was a simply yes/no question used for online survey, telephonic interviews, self assessment.⁸

To assess the disorder, Dr. Young’s internet addiction test (IAT), the first validated measure of internet addiction can be used.^{8,29}

Diagnostic criteria for internet addiction proposed by Dr. Young are as follows⁸:

1. One is preoccupied with the internet use (thinks about previous online activity or anticipate next online session)
2. One needs to use the Internet with increased amounts of time in order to achieve satisfaction
3. One has made unsuccessful efforts to control, cut back, or stop Internet use
4. One is restless, moody, depressed, or irritable when attempting to cut down or stop Internet use
5. One has stayed online longer than originally intended.
6. One has jeopardized or risked the loss of a significant relationship, job, educational or career opportunity because of the internet
7. One has told lies to family members, therapist, or others to conceal the extent of involvement with the internet
8. One uses the internet as a way of escaping from problems or of relieving a dysphoric mood (e.g., feelings of helplessness, guilt, anxiety, depression).
9. A major portion of the day is spent on the internet

(excluding the time spent in school).

If 5 or 6 of the above points mentioned are true then it is essential that help is sought and that a mental health professional is consulted.³⁰

Effects of Addiction to Internet

Internet has allowed for a lot of improvements and advancements in our lives. It has helped make jobs easier, resources more accessible, and communication easier, among many other things. Internet has also led to important advancements in the safety and healthcare industry. Without internet many of the things we do today wouldn’t be possible.

While the benefits of internet should not be ignored, it is important to acknowledge the negative effects internet has had affect our sleeping habits, communication and relationships, mental health, and physical health. It often distracts us from important things and tasks and decreases the time we spend with face-to-face interaction.

Many can say that the rise of internet use has also made people more dependent. While internet has made a lot of things more easy and simple, people may find it hard to go without it from time to time.

Some of the problems caused by internet addiction can include:

- Mood changes
- Poor mental health
- Poor physical health: Headache, Neck pain, Poor hygiene, Weight gain, Eye problems
- Problems processing information and problem-solving
- Sleep problems
- Lack of social interaction and social skills
- Problems at work, school, or in relationships

Although there are common symptoms of internet addiction, it can look very different from person to person.

What Does Too Much Screen Time Do To Your Brain?

On a neurological level, internet addiction operates similarly to chemical addictions, in that expectation followed by reward leads the brain to release dopamine and other feel-good chemicals.

This reward might be winning a level of a video game, or getting “likes” on a picture.

Over time, a person begins to crave this dopamine release and often requires increasing stimulus to get the same effect.

While chemical addictions often have a magnified effect by blocking the re-uptake of these feel-good chemicals so that they stay in the brain longer and more powerfully, researchers are finding that the inconsistent rewards often associated with behavioral addictions like gambling and video games also increase the flood of dopamine.

(i.e., taking a hit of marijuana will consistently yield a “reward”

in the brain, while a person doesn't know when they will beat a video game level or get a "like." This not-knowing increases the intensity of the physiological response to reward.)

According to the National Institute on Drug Abuse, too much screen time can cause changes to the brain and affect brain development specifically, the cortex which is an area of the brain that processes information.

The ABCD study revealed that adolescents who used screens for more than 7 hours a day had a thinner cortex than those who used screens less.

Too much screen time has also been associated with a higher risk of developing mental health disorders, such as depression or anxiety.

Technology use, specifically social media use and increased screen time among teens, can lead to mental health problems and worsen already present mental health disorders.

Studies suggest that social media use can be associated with problems such as depression, anxiety, low self-esteem, and affected concentration.

Internet use among young children and teens can also impact their future relationships and their emotional development.

Excess amounts of screen time use among young people also usually mean less time for human interaction. A person with internet addiction often isolates themselves and spends a lot of time alone or in their room.

Some people may turn to electronics as a way to cope with mental health conditions. They may use it as an "escape" or as a way to feel better. However, doing so in excessive ways can quickly become unhealthy and make matters worse for a person's physical and mental health.

While internet has advanced many aspects of education, many acknowledge that there are negative effects the internet has had on education.

Some of these negative effects can include:

- Increased distractions and decreased attention span
- Decreased social skills and interaction
- Higher costs
- Made it easier to cheat

Internet can also create a learning curve, making it harder for some students and teachers to learn and navigate as opposed to more traditional ways of educating.

1.2 Rationale

There is limited evidence on internet addiction among adolescents in low and middle income countries. The effect of internet addiction on brain has shown to be same as drug addiction. This study would reflect out the internet addiction in adolescents which would be of great significance to health

professionals for guiding adolescents and parents as well as health care administration in policy formation. This study would help to draw a thin line between the adverse outcomes and benefits of technology. It will be used as a reference by other researchers.

Negative impact of technology: Despite the fact the utilization of tech-contraptions and administrations has explored various types of positive effects, they have short lived. In the case of long run it affects the people.

Digital activities are making youth strong in technical skills but in practical life, they become weak. It takes away young masses from the reality to the imagery world.³¹

Due to spending excess time on internet, it is actually refraining them from outside activities. Their attraction towards violent games creates noteworthy impact in their mind. The more they use gadgets, they more becomes crazy about those gadgets and distracting themselves from study.

Importance of this study is actually understating the reason behind conducting this research. In the era of technological advancement, people are getting addicted to internet especially youth. Youth or students are mainly affected by the overuse of technological gadgets.

As per stated by World Health Organization using smartphone, tablets and laptops are increasing addiction continuously. They are less concerned with their studies and career.³²

On the other hand, Swingle observed that discharged rays from smartphone are actually affecting human brains and eyes. Over talking through phones can hamper listening ability of human being.³³ From another perspective, it is seen that using smart phones is prohibiting them from going to field and play with others. Physically they become disabling as well as mentally. Due to lack of participation, they are unaware of team work and cooperation. They become easily irritated and they have no patience on anything. Both physically and mentally, they become deformed.

There is limited evidence on internet addiction among adolescents in low- and middle-income countries where 90% of global adolescents live. We aimed to investigate the prevalence and correlates of technology addiction (Internet) among school-going adolescents in Jamnagar.

Technologies like the Internet, gaming, mobile phones and television provide a platform for information, communication, education and entertainment.³⁴

Technology use has now become an integral behavior of everyone's life. However, the extent and pattern of technology use (excessive and inappropriate) can sometimes potentially harm the physical and mental health leading to social problems not only to the concerned individual but also to their families and communities.³⁵

Adolescence (10–19 years) represents the transition between childhood and adulthood; the expectations and choices made during adolescence have a significant impact not only on current health practices and well-being but also on their health as adults. Similar to most addictive behaviors, adolescents are more vulnerable to internet addiction because of its easy availability, their limited capacity for self-regulation and increased risk of peer pressure and experimentation.¹⁻³

Adolescents with internet addiction often have social skills deficit, oppositional symptoms and impulsivity with deleterious effects on their family, social, academic or work environments.⁵⁻⁷

Also, internet addiction among adolescents was found to be associated with loneliness, anxiety, depression, substance use disorders, psychiatric problems, sleeping disorders and sedentary behaviors, which are important risk factors for non-communicable diseases (NCDs).³⁻⁴

Thus, there is an urgent need to develop and strengthen programs on healthy behaviors for internet use among adolescents; however, they are currently hampered by the limited research in this area especially in low- and middle income countries where 90% of global adolescents live.³⁶

Even the evidence from available studies have limited utility because of sampling issues, small sample sizes, use of non standardized instruments and their restriction to one type of technology use.³⁷⁻³⁸

For a country like India, where adolescents aged 10–19 years constitute about 22% of the total population, technology addiction among adolescents assumes greater relevance.

Therefore, the current study was undertaken to provide a comprehensive assessment on prevalence and correlates of technology(internet) addiction among school-going adolescents in India for better understanding to develop appropriate interventions for internet addiction among adolescents.

Inclusion in diagnostic and statistical manual of mental disorders 5th edition(DSM 5) is not intended to diagnose the disorder based on criteria but give a standardized definition of the disorder to encourage further research in the prevalence, etiology, risk factors and psychopathology associated with the condition, to acknowledge the concern regarding seriousness of the issue and inclusion it in future edition of DSM 5.³⁹[57] This study may contribute to the importance of internet addiction in DSM-5. The study will throw some light on the symptoms of internet addiction which may help health professionals in screening the adolescents.

1.3 Aims and Objectives

Primary objective

- To determine the prevalence of technology(internet) addiction among school going adolescents (10-19 years) in Jamnagar city.

Secondary objectives

- To determine the prevalence of internet addiction in different stages of adolescents.
- To compare internet addiction between private and public school going adolescents.
- To improve the knowledge on health impacts due to technology addiction.

METHODOLOGY

3.1. Study Design: The research study was a school based quantitative research by using Questionnaire based descriptive Cross sectional observational survey design.

3.2. Study Setting: The settings where the study was conducted were in four randomly selected schools of Jamnagar city - two government and two private schools.

- Shri L.G.Haria School, Ranjit Nagar, Jamnagar
- Nand Vidya Niketan School, Jamnagar
- Vibhapar Government School, Jamnagar
- D.C.C. High School, Saat Rasta, Jamnagar

3.3. Study Period: The research work was carried out during academic year (2022-2023) from February 2023 to November 2023.

3.4. Study Population: The study population was school going adolescents from 10 to 19 years of age selected from four randomly selected schools (two government and 2 private) of Jamnagar city that were enrolled in the study.

3.5. Sampling Technique: A stratified sampling method was used to select four schools – two government and two private. The representative sample of 440 school-going adolescents from two government and two private schools of Jamnagar were selected randomly. All were given equal opportunity to participate in the study.

3.6. Sampling Procedures: The schools were selected by stratified method. The schools were stratified in two groups of government and private schools. The schools were given numbers and any two random numbers were selected from each group. Thus two government and two private schools were selected from the list of schools obtained from the education department using simple randomization through computer-generated and from number provided by an independent statistician. From each selected school, 110 students studying in the 6th to 12th grade were selected. The students were randomly but proportionately selected from 6th to 8th standard group, 9th to 10th standard group and 11th and 12th standard group representing each adolescent group (early, middle, late). Thus for the selection of representative number of students, the ratio of students in the respective groups were considered. Finally, proportional number of participants were selected by simple random sampling technique from each group. The researcher proceeded with the selection of the participants after meeting the inclusion criteria by providing an opportunity to pick up the folded paper from the box. Those who picked up the paper with tick mark were selected for the study. This was done till the desired proportionate number from a selected group was achieved. This way 110 students from each of four selected

schools was selected. Hence total of 440 students from four schools were selected.

3.7. Sample Size: For sample size calculation considering the prevalence of internet addiction based on literature search was 10.69%, the estimated sample size is calculated as follows; the formula used for calculation of sample size was

$$n = z^2 pq / L^2$$

where in z (at 95% confidence level) = 1.96

p (prevalence) = 10.69

q = (100-p) = 89.31

L = absolute error of 3%.

$$n = (1.96 * 1.96 * 10.7 * 89.3) / 3 * 3$$

So sample size (n) = 407.9 ~ 410

Based on the sampling framework, a minimum of 410 students was expected for the study with 95% confidence, 5% precision and 20% non-response.

3.8. Study Criteria:

Inclusion criteria : School-going adolescents aged 10-19 years of Jamnagar city willing to participate after getting consent from them and their parents.

Exclusion criteria : Adolescents not willing to participate in the study.

3.9. Source Of Data: The primary data was collected from the school going adolescents (10-19 years) from the selected schools of Jamnagar city while secondary data was from internet literature from previous studies, articles and online journals.

3.10. Recruitment

Data collection:

This study was the cross sectional observational study conducted with school adolescents. The survey was conducted in selected four schools of Jamnagar city out of which two were government and two were private schools.

Ethical approval for the study was taken prior to study from institutional ethical committee. The director of health and family welfare department was also informed about the study. The list of schools in Jamnagar was obtained from education department. The four schools were selected for the study as previously mentioned in sampling techniques. The primary written approval of principals of the four schools was taken prior to school visit. The purpose of the study was explained to the principal, teachers and other supportive staff from the school. 110 students were selected randomly from each school. Thus total of 440 students were selected. The selected students were told about the study and formal informed consent was taken from the students and their parents. However 6 students denied for the study leaving 434 students for the enrollment in the study.

The day for the study was decided for each school. However 5 students were absent on the assigned day. Thus only 429 students were finally enrolled in the study. The details of socio-

demographic profile were noted in the preformed structured proforma. Other details regarding disturbed sleep behavior (Trouble falling asleep, trouble staying sleep, difficult to wake up in morning, tiredness in morning, midnight use of internet after falling asleep), any health issues (headache, eye problems, bodyache) and physical activities were jotted down in proforma. Detailed primary technology related questions were put down including app most commonly used, duration of use per day, age at its first use, bed time use and parental use. Then the questionnaire regarding internet addiction was administered in groups to selected students of the selected schools through planned classroom sessions.

The researcher trained the research assistants so as to help in data collection process. The assistants were oriented on how to use the data collection tool and observe all necessary procedures.

3.11 Study Tools/Instruments:

The study used a battery of instruments/scales to assess internet addiction and a semi-structured questionnaire for socio-demographic details and other variables related to internet addiction.

The standard recommended guidelines of the study scales were adopted to define internet addiction.

The study instruments were translated into the local language (Gujarati) and back-translated for conceptual equivalence. The translated study instruments were revised to correct any ambiguities in comprehension; the study instrument for the main study was bilingual (English and Gujarati).

The questionnaires were translated into local language-Gujarati and a choice was given to the adolescents as to select whichever language they would be comfortable with.

To assess the internet addiction Internet addiction test-Adolescent questionnaire was used.

The preceding explanation, conveying of the understanding of the questionnaire and subsequent follow up with answering of their queries was done. To enhance consistency in administration, each question was read aloud one by one in local language Gujarati and whenever required clarifications were provided. Due care was taken to prevent the intentional alteration of responses while administering the questionnaire in groups. The questionnaires were checked for completeness during the submission.

The tool used for this study was administered with both open and close ended questions which were pre-coded for easy data entry and analysis. However, the questionnaire also had open ended questions, and students had the opportunity to present their views in a more detailed way rather than being limited to a yes or no format. Questionnaire contained dichotomous scale and various point scales.

3.12 Editing:

Editing of the questionnaire was done on the field immediately

after each session before proceeding to the next. This involved checking for completeness of the responses for each question. It also required checking that each question has an appropriate and complete response; and a response to the appropriate question. This was done to save time and avoid call backs to the respondents.

3.13 Coding:

Coding means assigning a numerical number to a response. A coding frame was made for each question. This facilitated data entry and analysis. The questionnaire was pre coded. Post coding was done after field for other specific responses and elaborate responses.

3.14 Data Analysis:

For Internet Addiction Test-Adolescents scale, the respondents with score 0–30 were classified as normal users, and those with a score above 30 were classified as addicted Internet users.

Score	Interpretation
0-30	Normal(N)
31-49	Mild internet addiction(MI)
50-79	Moderate internet addiction(MO)
80-100	Severe internet addiction(S)

Table 3: Interpretation of Internet Addiction

Data was collected using preset proforma. The collected data was entered in Microsoft excel sheet and analysis of Quantitative data was done with the help of computer software SPSS Version 26.0 and the study findings were presented using charts, graphs and tables in order to provide summarized and simplified picture about the outcome of the research study.. The data collected was coded and entered into SPSS software for cleaning / corrections as well as eliminating errors such as typing errors or outliers. Categorical variables were presented as frequencies and percentages. Continuous variables were presented as mean and standard deviation. Comparison of continuous data was done considering 95% significance level with p value less than 0.05.

3.15 Data Entry:

After field data collection, data entry followed. This required construction of master sheet into which data was exported from the questionnaires. The master sheet was constructed with the help of computer software SPSS Version 26.0.

3.16 Data Storage:

Data storage is critical for quality of data. The computer template and draft reports were stored on soft copies all of which had passwords known by the researcher only. This was done to avoid alterations by unauthorized people. Variety of soft copies provided a backup, in case of corrupted documentation

3.17 Data Cleaning:

Data cleaning was done for entered data to check for errors and omissions traceable in the field data tools. This ensured that quality data was presented and analyzed.

3.18 Quality Control Issues:

At the end of data collection day, the tools were checked for accuracy and consistency. The data that was collected was kept in a cabinet under lock and key to protect the study respondents and to ensure confidentiality of data collected. Data was coded, cleaned and double entered. At the conclusion of this research study, all completed questionnaires will be safely kept for a year after which were shredded and destroyed.

3.19 Ethical Consideration:

Confidentiality of individual participant information was ensured by use of unique identifiers and limiting access to the principle investigator and research assistants and by storing the completed questionnaires safely. Ethical committee clearance was taken from institutional review board of M. P. Shah Medical college, Jamnagar, Gujarat giving permission through the approval letter to conduct the study prior to the study.

RESULTS AND DISCUSSION

The total adolescents aged from 10 to 19 years selected from four selected schools enrolled in the study were 429.

MALE		FEMALE		TOTAL
N	%	N	%	
241	56	188	44	429 (100%)

Table 1: Gender wise Distribution of study participants

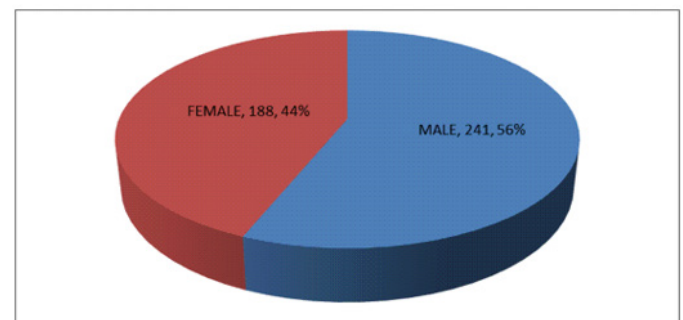


Figure 1: Gender wise Distribution of study participants

Total 429 students participated in the study. Among them 241(56%) were boys and 188(44%) were girls. There is no selection bias for gender of study participants.

STAGES OF ADOLESCENT	NUMBER(N)	PERCENTAGE(%)
Early	173	40.3
Middle	188	43.8
Late	68	15.9
TOTAL	429	100

Table 2: Adolescent staging wise Distribution of study participants

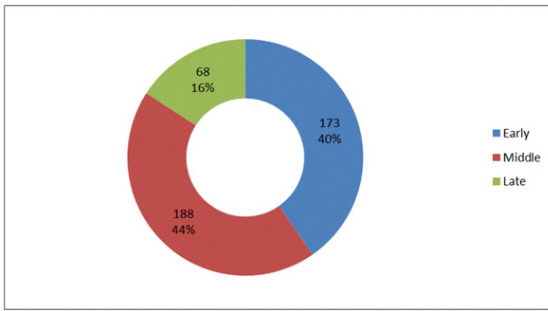


Figure 2: Adolescent staging wise Distribution of study participants

The adolescents are divided in three stages Early, Middle and Late. In this study adolescents from 10 to 19 years were enrolled. Out of 429 total participants 173 were Early Adolescents constituting 40% of the study population. The Middle Adolescents were 188 (44%) forming the largest study population and Late Adolescents were 68(16%) being the least in number.

STAGES OF ADOLESCENT	MALE	FEMALE	TOTAL
Early	104	69	173
Middle	101	87	188
Late	36	32	68
TOTAL	241	188	429

Table 3: Adolescent staging and gender wise Distribution of study participants

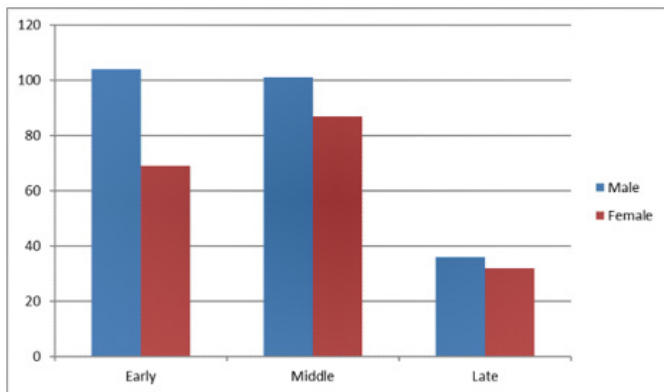


Figure 3: Adolescent staging and gender wise Distribution of study participants

The above table shows number of males and females in each adolescent stage group. Among Early adolescents 104 were males and 69 were females. Considering Middle adolescents 101 were males and 87 were females. From Late adolescents 36 were males and 32 were females.

TYPE OF SCHOOL	EARLY	MIDDLE	LATE	TOTAL
Public	85	101	30	216
Private	88	87	38	213
Total	173	188	68	429

Table 4: Public/Private School wise Distribution of study participants

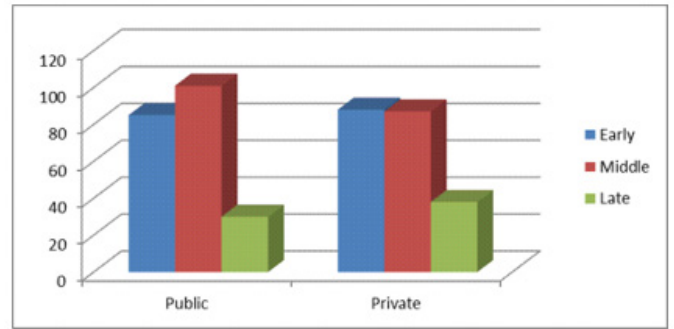


Figure 4: Public/Private School wise Distribution of study participants

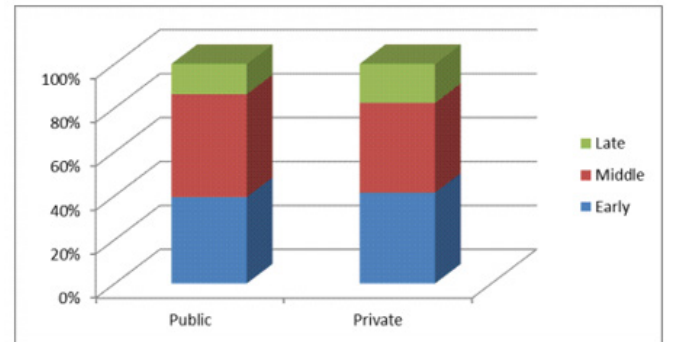


Figure 5: Public/Private School wise Distribution of study participants (in percentage)

The above table shows distribution of study participants as per type of school they study i.e. public/private in three stages of adolescent. 216 students were from public school from which 85 were Early adolescents, 101 were Middle adolescents and 30 were Late adolescents. 213 students were from private school of which 88 were Early adolescents, 87 were Middle adolescents and 38 were Late adolescents. Middle adolescents from public school form the largest study population while Late adolescents from public school forms smallest study population. While Middle adolescents from private schools form second large study population.

	EARLY	MIDDLE	LATE	TOTAL
NORMAL(N)	42	62	23	127
MILD ADDICTION(MI)	77	75	27	179
MODERATE ADDICTION(MO)	54	50	17	121
SEVERE ADDICTION(S)	0	1	1	2
TOTAL	173	188	68	429

Table 5: Internet Addiction wise Distribution of study participants

p=0.407, Chi square value = 3.99

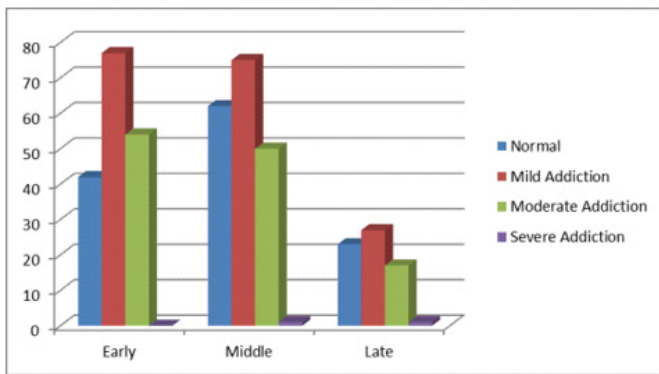


Figure 6: Internet Addiction wise Distribution of study participants as per Adolescent groups

Internet Addiction has been classified as Mild, Moderate and Severe depending on the scores obtained as per Internet addiction test – Adolescent scale. The above figure shows that among Early adolescents Mild Addiction was seen in 77 students forming the most common with Moderate Addiction in 54 students and no Severe Addiction was seen. Among Middle adolescents Mild Addiction was seen 75 in students, 50 students showed Moderate Addiction and 1 student showed Severe Addiction. Among Late adolescents Mild Addiction was seen 27 in students, 17 students showed Moderate Addiction and 1 student showed Severe Addiction. However 42 Early adolescents, 62 Middle adolescents and 23 Late adolescents were normal.

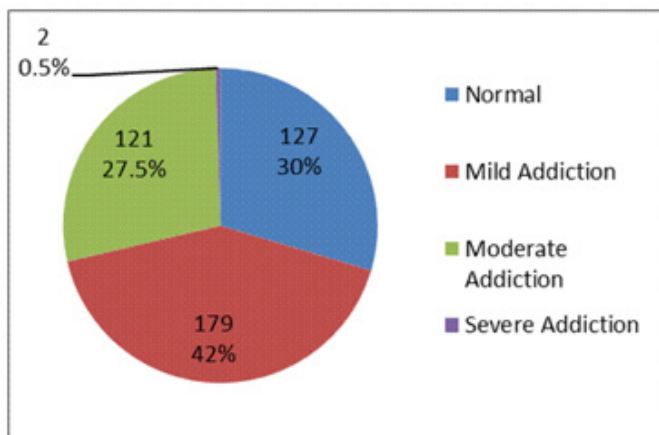


Figure 7: Internet Addiction wise Distribution of study participants

The above figure shows total number of students having different severity of internet Addiction depicting 127(30%) having No Addiction, 179 (42%) having Mild Addiction, 121 (27.5%) having Moderate Addiction and 2 (0.5%) having Severe Addiction.

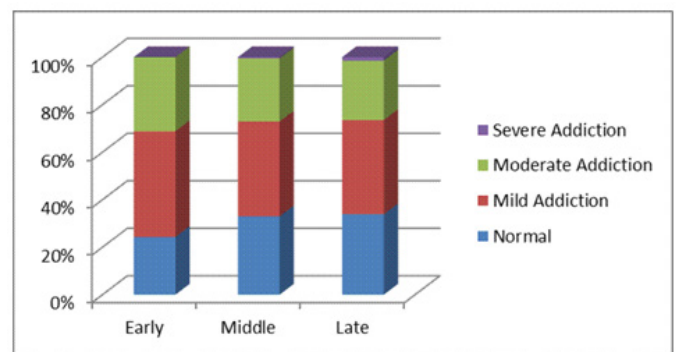


Figure 8: Internet Addiction wise Distribution of study participants in percentage

The above figure suggest the percentage of each addiction category among the given group of adolescent staging i.e. Early, Middle and Late. Considering Early adolescent group normal students forms 24.3% and Mild, Moderate and Severe Addiction forms 44.5%, 31.2% and 0% respectively. Considering Middle adolescent group normal students forms 32.9% and Mild, Moderate and Severe Addiction forms 39.9%, 26.7% and 0.5% respectively. Considering Late adolescent group normal students forms 33.8% and Mild, Moderate and Severe Addiction forms 39.7%, 25% and 1.5% respectively.

In a study⁴⁰ on young adolescents, it was found that about 74.5% were moderate (average) users and 0.7% were found to be addicts. In another study,⁴¹ the prevalence of IA among Greek students was 4.5% and at-risk population was 66.1%.

	INTERNET ADDICTION				TOTAL
	N	MI	MO	S	
PUBLIC	59	93	63	1	216
PRIVATE	68	86	58	1	213
TOTAL	127	179	121	2	429

Table 6: Public/Private School wise distribution of Internet Addiction

p=0.578, Chi square value = 1.094

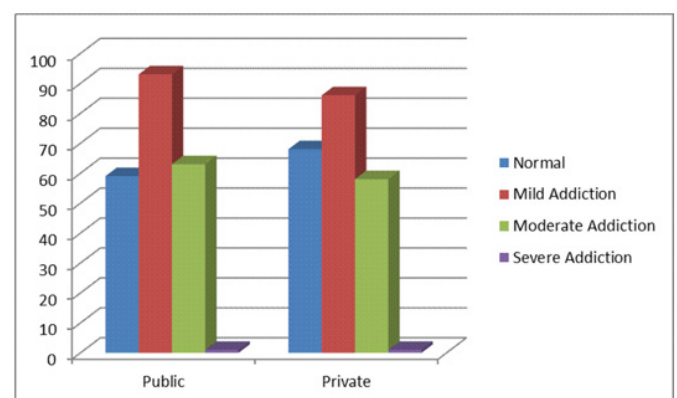


Figure 9: Public/Private School wise distribution of Internet Addiction

The above figure shows the different severity of Internet Addiction with regards to type of school (public/private). In

public schools the students having Mild Addiction were 93 (43.1% of public) being the highest followed by Moderate Addiction with 63 (29.2% of public) students. However only 1 (0.5% of public) student had Severe Addiction and 59 (27.3% of public) students were normal. In private schools the students having Mild Addiction were 86 (40.4% of private) being the highest followed by Moderate Addiction with 58 (27.2% of private) students. However only 1 (0.5% of private) student had Severe Addiction and 69 (32.4% of private) students were normal. Students with no addiction were more in private schools than in public schools. Both had equal students with severe Addiction. While students with Mild and Moderate Addiction were more in public schools than in private schools.

In N R Ramesh Masthi et al. study 60.95% of internet users studied in private schools and 39.05% in public schools ($z = 10.31, p < 0.001$). The overall prevalence of addiction was 19.96% among users with significantly higher rates of self reported addiction in private schools ($z = 3.47, p < 0.001$).⁴²

In Gauri Sharma et al. study there is significant difference between the scores of internet addiction among private and government school students.

	INTERNET ADDICTION				TOTAL
	N	MI	MO	S	
MALE	69	92	79	1	241
FEMALE	58	87	42	1	188
TOTAL	127	179	121	2	429

Table 7: Gender wise distribution of Internet Addiction $p=0.056$, Chi square value = 5.763

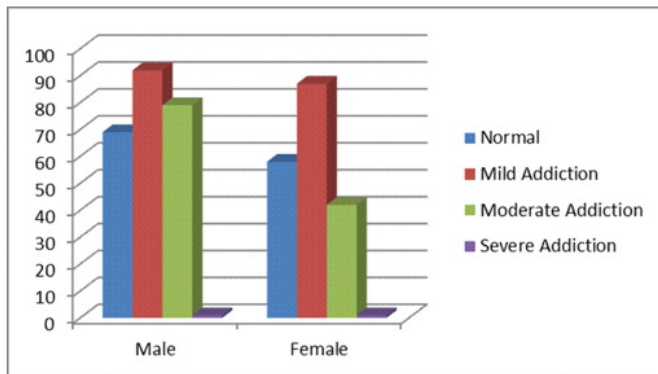


Figure 10: Gender wise distribution of Internet Addiction

The above figure shows internet addiction gender wise where it is seen that 92 (38.2%) males have Mild Addiction, 79 (32.8%) males have Moderate Addiction, 1 (0.4%) male has Severe Addiction with No Addiction in 69 (28.6%) males. Whereas in females 87 (46.3%) have Mild Addiction, 42 (22.3%) have Moderate Addiction and 1 (0.5%) has Severe Addiction with 58 (30.9%) females having No Addiction. This shows that No Addiction was more in females than in males. Mild Addiction was seen more in females than in males while Moderate Addiction was more in males than in females. However severe Addiction was almost same in both.

Shao et al’s study showed a statistically significant difference

in the internet addiction detection rates between male students (16%) and female students(8%). Similarly, in this research, the tendency of male participants to use the internet was found higher than female participants. However, this difference was not statistically significant ($p=0.473$).

Stages of adolescence	Headache		Total
	Yes	No	
Early	25	148	173
Middle	34	154	188
Late	6	62	68
Total	65	364	429

$\chi^2 = 3.443, df = 2, p = 0.178$

Stages of adolescence	Eye Problems		Total
	Yes	No	
Early	51	122	173
Middle	39	149	188
Late	6	62	68
Total	96	333	429

$\chi^2 = 12.5, df = 2, p = 0.002$

Stages of adolescence	Bodyache		Total
	Yes	No	
Early	32	141	173
Middle	20	168	188
Late	8	60	68
Total	60	369	429

$\chi^2 = 4.957, df = 2, p = 0.08$

Stages of adolescence	Sleep Problems		Total
	Yes	No	
Early	151	22	173
Middle	124	64	188
Late	39	29	68
Total	314	115	429

$\chi^2 = 31.217, df = 2, p = 0.000$

Table 8-11: Association of health problems with stages of adolescents

The above four tables shows that sleep problems and eye problems have association with stages of adolescent statistically with p value of < 0.05 .

	HEADACHE	EYE PROBLEMS	BODYACHE	SLEEP PROBLEMS
EARLY	25	51	32	151
MIDDLE	34	39	20	124
LATE	6	6	8	39
TOTAL	65	96	60	314

Table 12: Physical Problems wise Distribution of study participants

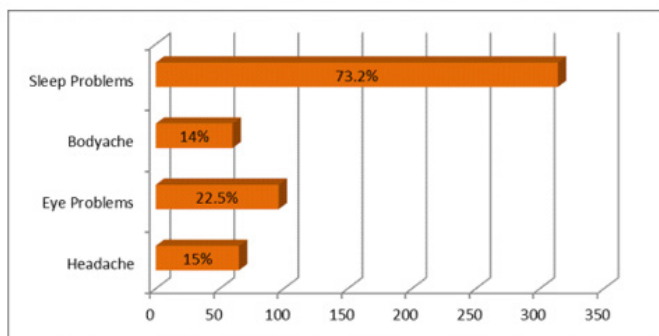


Figure 11: Physical Problems wise Distribution of study participants

The above figure shows that 314 students have Sleep Problems in form of the other forming 73.2%. Subsequently Eye Problems were also faced in 22.5% (96) students. Bodyache and Headache were seen in 60 (14%) and 65 (15%) students respectively.

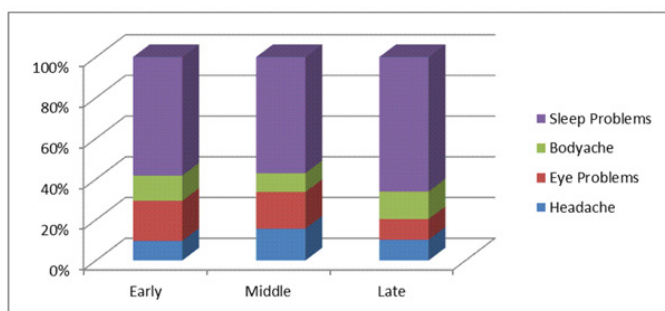


Figure 12: Physical Problems wise Distribution of study participants as Adolescent Groups

Considering each physical problems as per Adolescent staging groups, Sleep Problems were the highest in all groups. However following sleep problems, Eye Problems were more in Early and Middle Adolescent staging group while bodyache was more in Late Adolescent staging group.

	INTERNET ADDICTION				P-value
	N	MI	MO	S	
HEADACHE	19(15%)	28(16%)	18(15%)	0(0%)	p=0.969, Chi square value = 0.063
EYE PROBLEMS	12(10%)	48(29%)	34(28%)	2(100%)	p=0.001, Chi square value = 17.61
BODYACHE	13(10%)	19(11%)	27(23%)	1(50%)	p=0.003, Chi square value = 11.05
SLEEP PROBLEMS	87(69%)	113(63%)	110(91%)	2(100%)	p=0.00, Chi square value = 30.29

Table 13: Health Problems in study participants with Internet Addiction

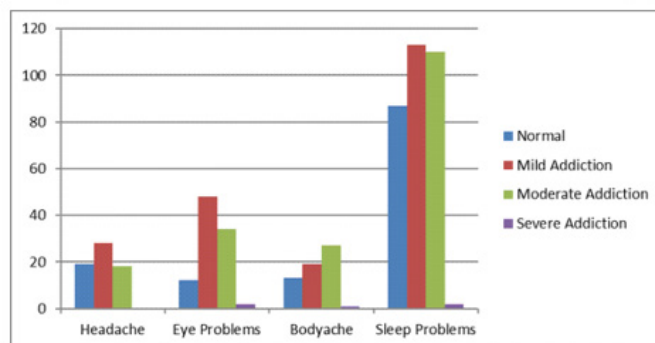


Figure 13: Health Problems in study participants with Internet Addiction

The above figure depicts different physical problems with respect to different severity of Internet Addiction. Headache was more among Mild Addiction having in 28 students (16% of mild addicts) followed by No Addiction (19 students, 15% of normal) and Moderate Addiction (18 students, 15% of moderate addicts). No headache in Severe Addiction. Eye Problems were more among Mild Addiction having in 48 students (29% of mild addicts) followed by Moderate Addiction (34 students, 28% of moderate addicts) and No Addiction (12 students, 10% of normal) and. All students with Severe Addiction had eye problems. Bodyache was more among Severe Addiction having in 1 student (50% of severe addicts) followed by Moderate Addiction (27 students, 23% of moderate addicts), Mild Addiction (19 students, 11% of mild addicts) and No Addiction (13 students, 10% of normal). Sleep Problems were more among Severe Addiction having in 2 students (100% of severe addicts) followed by Moderate Addiction (110 students, 91% of moderate addicts), No Addiction (87 students, 69% of normal) and Mild Addiction (113 students, 63% of mild addicts). Eye problems, Bodyache and Sleep problems were statistically significant.

In N R Ramesh Masthi et al. a total of 70.67% of the subjects had one or more physical symptoms, i.e. neck pain, tension, strain on eyes and fatigue of which 67.42% and 72.75% were from public and private schools, respectively.²⁸

	DOING PHYSICAL ACTIVITY	TOTAL	PERCENTAGE(%)
EARLY	157	173	90.8
MIDDLE	148	188	78.7
LATE	54	68	79.4

Table 14: Physical Activity wise Distribution of study participants

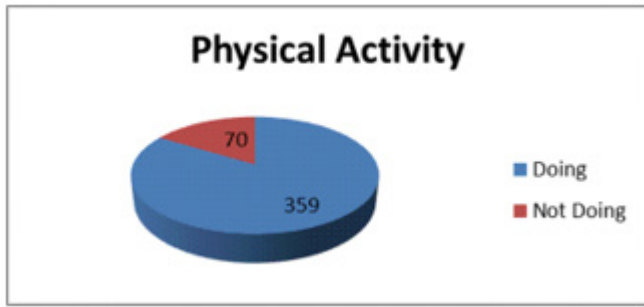


Figure 14: Physical Activity wise Distribution of study participants

The figure shows that 359 (83.7%) students were having physical activities in some or the other way while 70 (16.3%) students had sedentary life style. The mean time of physical activity is 0.6 hours (37 minutes).

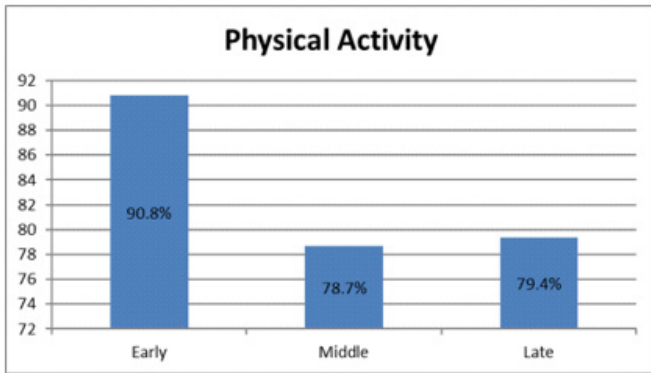


Figure 15: Physical Activity wise Distribution of study participants as per Adolescent Groups

The figure depicts that 90.8% Early adolescents did daily physical activities while Middle adolescent group had the least percentage of 78.7%.

	Number	Percentage(%)
Instagram	162	37.8
Youtube	157	36.6
Snapchat	37	8.6
Whatsapp	42	9.8
Others	31	7.2

Table 15: Most Common Used App wise Distribution of study participants

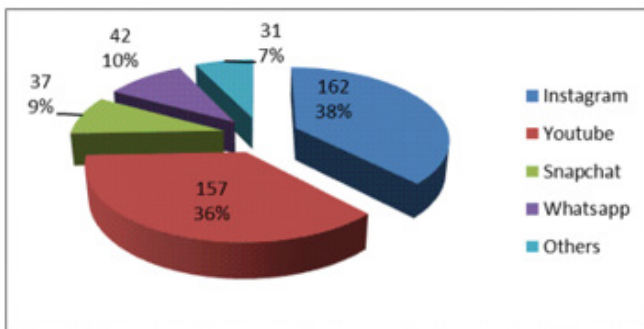


Figure 16: Most Common Used App wise Distribution of

study participants

The figure shows which application did the adolescents see the most often. It shows 162 (38%) students use Instagram most frequently and commonly followed by Youtube (157, 36%). 37 (9%) and 42 (10%) students use Snapchat and WhatsApp respectively.

N R Ramesh Masthi et al. study showed that the most commonly used applications were Internet gaming (69.23%) in Public schools and WhatsApp (61.15%) in Private schools.²⁸

	Number	Percentage(%)
Entertainment	277	64.6
Chatting	85	19.8
Study	41	9.6
Posting	17	4.0
Others	9	2.1

Table 16: Purpose of App used wise Distribution of study participants

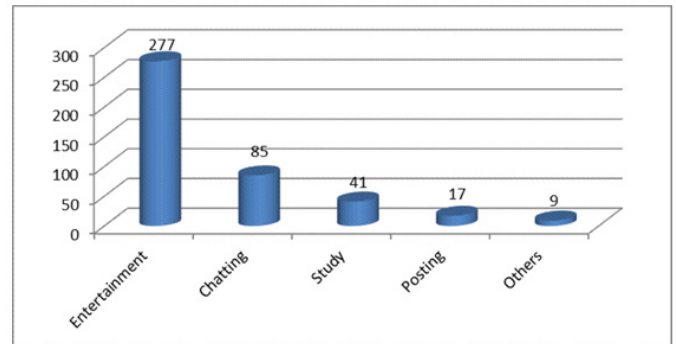


Figure 17: Purpose of App used wise Distribution of study participants

The figure shows that majority of them used applications for Entertainment forming the most common purpose of use of internet. 277 (64.6%) used internet for Entertainment, 85 (19.8%) used for Chatting and making new friends, 41 (9.6%) used for study purpose and 17 (4%) used for posting reels.

Mean duration of using internet among the study participants is 1.9 hours.

	Number(N)	Percentage(%)
Bedtime Use	218	50.8
Parental Use	247	57.6

Table 12: Bedtime Use and Parental Use wise Distribution of study participants

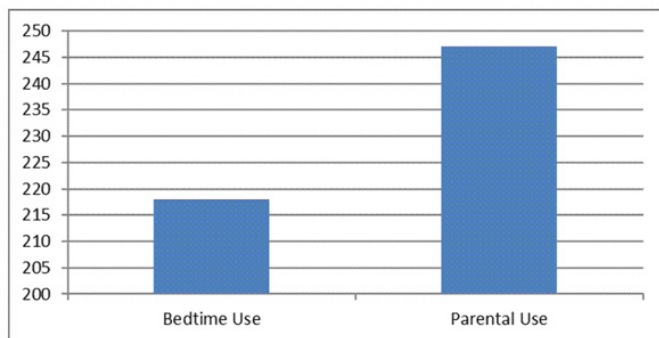


Figure 18: Bedtime Use and Parental Use wise Distribution of study participants

218 (50.8%) students use internet during bed time while use of internet by parents was in 247 (57.8%) students.

SUMMARY

- This study was conducted with 429 school going adolescents from age 10 years to 19 years selected from four different schools of which two were public and two were private schools. Out of 429 students 216 adolescents were from public schools and 213 were from private schools. 241 were males and 188 were females.
- The adolescence is divided into three stages Early, Middle and Late. In this study the total number of early, middle and late adolescents were 173, 188 and 68 respectively. Among early adolescents 104 were males and 69 were females. Among middle adolescents 101 were males and 87 were females. Among late adolescents 36 were males and 32 were females.
- As per adolescent staging, from 216 public students 85 were Early adolescents, 101 were Middle adolescents and 30 were Late adolescents. From 213 private students 88 were Early adolescents, 87 were Middle adolescents and 38 were Late adolescents.
- Internet addiction from public schools was seen in 157 students with Mild addiction in 93 (43%) students, Moderate addiction in 63 (29%) students and Severe in 1 (0.46%) student. However from private schools 145 students had internet addiction with Mild addiction in 86 (40%) students, Moderate addiction in 58 (27%) students and Severe in 1 (0.47%) student. So, Mild and Moderate Addiction was more among public school students. While Severe Addiction was more in private school students though statistically insignificant. ($p=0.578$, Chi square value = 1.094)
- Considering Internet Addiction as per gender Mild Addiction was seen more in females than in males while Moderate Addiction was more in males than in females. However severe Addiction was almost same in both. ($p=0.056$, Chi square value = 5.763)
- Considering each physical problems as per Adolescent staging groups, Sleep Problems were the highest in all groups. However following sleep problems, Eye Problems were more in Early and Middle Adolescent staging group while bodyache was more in Late Adolescent staging group. However from total headache cases headache was more among Middle adolescents. It also showed that from total

eye problems, sleep problems and bodyache cases all three physical problems were more among Early adolescents. However association of sleep and eye problems with adolescent staging was statistically significant whereas bodyache and headache were not.

- Internet Addiction: Headache was more among Mild Addiction having in 28 students (16%) followed by Moderate Addiction. No headache in Severe Addiction ($p=0.969$, Chi square value = 0.063). Eye Problems were more among Mild Addiction having in 48 students (29%) followed by Moderate Addiction. All students with Severe Addiction had eye problems ($p=0.001$, Chi square value = 17.61). Bodyache was more among Severe Addiction having in 1 student (50%) followed by Moderate Addiction ($p=0.003$, Chi square value = 11.05). Sleep Problems were more among Severe Addiction having in 2 students (100% of severe addicts) followed by Moderate Addiction ($p=0.00$, Chi square value = 30.29)
- 359 (83.7%) students were having physical activities in some or the other way while 70 (16.3%) students had sedentary life style. The mean time of physical activity is 0.6 hours (37 minutes). Maximum physical activities were done by Early adolescents (mainly in school) followed by Late and Middle adolescents.
- Instagram is most frequently and commonly used application by the adolescents followed by Youtube, Whatsapp and Snapchat. The most common purpose of application use was entertainment followed by chatting and making new friends, for study purpose and for posting reels. Mean duration of using internet among the study participants is 1.9 hours.
- 218 (50.8%) students use internet during bed time while use of internet by parents was seen in 247 (57.6%).

CONCLUSION

The study was done to determine the prevalence of internet addiction among the school going adolescents aged 10 to 19 years. Various variables like age, adolescent staging, gender etc. were taken into consideration.

Out of 429 students 302 were internet addicts including mild, moderate and severe accounting 70.4%. Mild and Moderate Addiction was more among public school students while internet addiction was more in females but moderate internet addiction was more in males though statistically insignificant. All physical problems were associated with any internet addiction. Eye problems, bodyache and sleep problems were statistically significant whereas association of adolescent staging with sleep and eye problems was statistically significant whereas bodyache and headache were not.

This study stresses internet addiction as important public health problem among adolescents. Internet addiction is associated with a variety of psychological and physical health problems and may impact the developing adolescent in a variety of domains. This study paves the way for future research into internet addiction and requires a multifaceted strategy that includes both the school and family settings for prevention and intervention.

POLICY IMPLICATIONS

This study stresses internet addiction as important public health problem among adolescents. Minimizing adolescent internet addiction requires a multifaceted strategy

- **National Policy Making:** An appropriate and systematic response would be to develop a national policy for internet and media literacy with a defined action plan at state and district levels. Such policy should recognize internet addiction as a major public health problem and use multi-level approaches within an integrated socio-ecological framework to address diverse risk factors at individual, family, peer and school levels to promote healthy behaviors among adolescents towards internet use.
- **Regulatory rules for university and government bodies:** They may put regulatory mechanisms in place that limit the usage of potentially addictive Internet applications particularly for those students risk for developing Internet addiction.
- **Health Education:** It helps in prevention of internet addiction in children and adolescents with specific risk factors that can be given by schools to educating them about the potential risks and the problematic engagement with specific online applications can bring about.
- **Awareness Programs:** They can be conducted at community and school level. The school environment may play a crucial role in teaching and creating awareness among students about the consequences of excessive Internet usage, as well as providing them with alternate activities and to ensure that adolescents get the necessary help and resources to reduce addictive Internet behaviors. This might include sponsoring technological education initiatives, putting in place rules governing Internet use in classrooms, and giving support services to parents who might want extra help in supervising their adolescents' online use. By addressing these issues, we can reduce Internet addiction among adolescents and promote healthy technology usage among the adolescents.
- **Parent Education:** parents play important role in identification of warning signs and in early interventions when needed. Screen time education and digital well being awareness to parents would help their children in preventing internet addiction.
- **Digital literacy** can be incorporated into school curricula. In fact, schools can also play an instrumental role in augmenting the digital literacy of families, especially parents, as parental awareness should be raised about the influence of their behavior in the context of healthy Internet use, along with the adoption of good digital literacy practices.
- **Clinicians** will benefit from the present study may aid them in developing targeted treatment approaches that benefit high-risk individuals by tailoring therapy according to their individual needs.
- **Inclusion in DSM 5:** The present research adds to the current pool of knowledge that substantiates the American Psychiatric Association's endeavours of including Internet Addiction in the upcoming version of the DSM.

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