
**“STUDY OF INTERNET ADDICTION AND ITS IMPACT ON
QUALITY OF SLEEP AND ACADEMIC PERFORMANCE IN HEALTH
SCIENCES STUDENTS – A CROSS SECTIONAL DESCRIPTIVE
STUDY”**

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ACRONYMS

AICA-S	Assessment of Internet and Computer game Addiction Scale
CGPA	Cumulative Grade Points Average
CIAS	Chen Internet Addiction Scale
CIUS	Compulsive Internet Use Scale
DLPFC	Dorsolateral Pre-frontal Cortex
DSM	Diagnostic and Statistical Manual
GD	Gaming Disorder
IA	Internet Addiction
IAT	Internet Addiction Test
ICD	International Classification of Diseases
IGA	Internet Gaming Disorder
IPS	Indian Psychiatric Society
PCC	Posterior Cingulate Cortex
WHO	World Health Organization

STUDY OF INTERNET ADDICTION AND ITS IMPACT ON QUALITY OF SLEEP AND ACADEMIC PERFORMANCE IN HEALTH SCIENCES STUDENTS—A CROSS SECTIONAL DESCRIPTIVE STUDY

ABSTRACT

INTRODUCTION: Internet has become an indispensable part of our daily life, especially among adolescents and youth and also is a classical entity known for igniting an addictive behaviour. Adolescents are more susceptible to it as they spend more time on online platforms. Its excessive use among health care professionals has become an alarming concern. This cross sectional study intends to find out the prevalence and the psychosocial comorbidities associated with Internet Addiction in health sciences professionals in India.

AIM OF THE STUDY: To estimate the prevalence of internet addiction, understand the impact of internet addiction on academic performance and quality of sleep among health profession undergraduates.

METHODS: A cross-sectional study conducted in a Medical College with 1067 students fulfilled the selection criteria in order to fill up the questionnaire. Young's IAT (Young's Internet Addiction Test) was used for assessment of addiction of Internet. PSQI (Pittsburgh Sleep Quality Index) scale was administered to assess the quality of sleep. Academic performance was assessed by assessment of percentage of marks in the recent university exam. Severity of Internet Addiction Scores obtained were correlated with PSQI scores to obtain Pearson coefficient using SPSS Version V27, 2020. Appropriate statistical tests were

used wherever required and Pvalues were obtained using fisher's exact test, student-t-test and Chi-square test.

RESULTS: Prevalence of Internet addiction among health sciences students was 81 % with majority of them falling under mild category (64%), moderate internet addiction by 16% and 1 % reported severe internet addiction. Only 19% of the students did not have internet addiction. Internet Addiction scores were found to be significantly higher in individuals with poor academic performance ($p < 0.05$). A significant correlation of Internet severity was found with poor sleep quality score ($r = 0.38$) which was found to be significant for those suffering from internet addiction ($p < 0.01$).

CONCLUSION: Internet addiction was noted to be significantly high among health sciences students with profound impact on their academic performances and sleep quality leading to various sleep disturbances. There is a need of an improvised questionnaire to get better understanding of internet use with respect to duration and purpose of using the internet. Additional tools are required to assess disorders of sleep arising due to internet addiction. Parameters such as sleep quality and academic performance should be taken into consideration requiring strict monitoring in this population. Stringent measures to be employed to prohibit misuse of Internet among students, also adequate awareness programs should be issued about propensity to develop internet addiction and educating students regarding healthy internet use.

TABLE OF CONTENTS

S. No.	SECTIONS	Page No.
1.	INTRODUCTION	1
2.	OBJECTIVES	2
3.	REVIEW OF LITERATURE	3-32
4	METHODOLOGY	33-37
5	RESULTS	38-56
6	DISCUSSION	57-75
7	CONCLUSION	76
8	SUMMARY	77-78
9	BIBLIOGRAPHY	79-97
10	ANNEXURE I – ETHICAL CLEARANCE CERTIFICATE	98
	ANNEXURE I – CONSENT FORMS	99-101
	ANNEXURE II – STUDY PROFORMA	102-104
	ANNEXURE III – TOOLS	105-107

LIST OF TABLES

S. No.	Tables	Page No.
1.	Comparison of 3 outstanding sets of descriptive criteria for addiction to internet utilizing elements from evaluation tools	8-10
2.	Demographic profile of the study sample	38
3.	Clinical profile of the study sample	40
4.	Distribution of severity of Internet Addiction as per Young's IAT Questionnaire	42
5.	Comparison of distribution of severity of Internet Addiction across different class of academic achievement	44
6.	Comparison of distribution of severity of Internet Addiction across gender	46
7.	Comparison of distribution of severity of Internet Addiction across gender	47
8.	Comparison of mean severity score of Internet Addiction across gender	48
9.	Comparison of mean severity score of Internet Addiction between participants with history of substance use and those without substance use in the study sample	49
10.	Comparison of mean severity score of Internet Addiction between participants with family history of psychiatric illness and those without family history of psychiatric illness	50
11.	Comparison of Internet Addiction among participants of different faculty	52
12.	Distribution of severity of Internet Addiction among varied sleep quality as per PSQI	53
13.	Comparison of mean severity score of Internet Addiction with quality of sleep	55
14.	Correlation between severity of Internet addiction and quality of sleep in overall sample	56

LIST OF FIGURES

Fig. No.	Figure	Page No.
1.	Factors Associated with Internet Addiction	22
2.	A conceptual model for the possible explanatory causal pathways between internet gaming addiction (IGA) and depression	25
3.	Distribution of Gender in respective faculty in the study sample	39
4.	Distribution of severity of Internet Addiction as per Young's IAT Questionnaire	42
5.	Comparison of distribution of severity of Internet Addiction across different class of academic achievement	45
6.	Comparison of distribution of severity of Internet Addiction across gender	48
7.	Distribution of participants with Internet Addiction with respect to substance use	49
8.	Distribution of participants with Internet Addiction with respect to family history of psychiatric illness	50
9.	Comparison of Internet Addiction score among participants of different faculty of health sciences	52
10.	Distribution of severity of Internet Addiction among varied sleep quality as per PSQI	53
11.	Comparison of mean severity score of Internet Addiction with quality of sleep	55
12.	Correlation between severity of Internet addiction and quality of sleep in overall sample	56

INTRODUCTION

The Internet has become an indispensable part of life. With the growth of the Internet use over the last two decades, a tremendous increase in its usage through huge perks of data being offered by broadband services and dysfunctions arising from the usage has been observed. In Indian context, 5% of youth in the age group of 18–25 years have addictive use of social networking sites and 24% have problematic usage of internet denoting youth being more affected.^{1,2} Health sciences students are subjected to long duration of rigorous training program. With excessive usage of internet along with exhaustive academic schedule and involvement in various activities are bound to have impact on health of these students. It has been noted that majority of them lose out at least one element of their lives, such as sleep, work, education, socializing with friends, family, and interaction with a partner.³ College students suffer derangements in their circadian rhythm because of the stressful academic environment, which gets exaggerated by habits such as browsing the Internet, resulting in poor sleep quality which often leads to poor academic performance. There is dearth of Indian literature in this field and this study has been attempted to assess the morbid use of internet & its impact on quality of sleep and academic performance among health sciences students at University campus.

OBJECTIVES

Primary objective:

- To assess prevalence of internet addiction among health sciences students.

Secondary objectives:

- To assess the impact of internet addiction on quality of sleep among these students.
- To assess the impact of internet addiction on academic performance among these students.

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REVIEW OF LITERATURE

The term “addiction” originates from the Latin word “addictus”, implying “excessively devoted to something with loss of ability to choose freely or slave”.⁴ Recently, the terminology addiction is revised to expand its horizon beyond substance dependence which now also includes non-substance-related behaviours leading to problems and impairments.⁵ Addiction to a substance and that to a behaviour hold similarities in their effects on physiology, emotions as well as behavioural patterns.⁶ First category, substance addiction, comprises direct effects on pleasure, utilising entities legal or illegal which are consumed into the body, which comprise of “drug use disorders” and “food-related disorders”.⁴ Second category, behavioural or procedural addiction includes an array of imaginably abnormal behaviours which result in individuals to mood- alternating events through which they seek pleasure and thus causing dependence.⁷

Proposed process or behavioural addictions include various modalities like exercise; shopping ; gaming; and other forms of Internet-facilitated behaviour for instance, online video games, socialization through social media platform, and seeking pleasures of erotic behaviour.⁵ In the span of last 15 years, Internet usage has been rampant: in modern community nearly 40% of the globe population has been reportedly online. Internet is a salient modality for schooling, communication, recreation, and knowledge and knowledge broadcast.⁸

The growth in Internet use paved way for emerging concerns about Problematic Internet Use (PIU), also variously termed as Internet addiction,⁹ pathological Internet use¹⁰ and Internet dependence.¹¹ PIU can be defined as “use of the Internet that creates psychological, social, and/or work difficulties in a person's

life”¹² Symptoms include preoccupation with the Internet, anxiety when offline or unable to use internet, hiding or lying about the extent of online usage, and real-life dysfunctions.¹³

The appropriate classification of Internet addiction remains to be a controversy. This was earlier classified as “impulse-control disorder” / “obsessive-compulsive disorder/ behaviour addiction”.¹⁴The addition of “Internet Gaming Disorder” in the index of the updated version of the “Diagnostic and Statistical Manual for Mental Disorders” (DSM-5) is welcoming & calls for farther research.¹⁵ The diagnostic criteria of “Internet Gaming Disorder” demonstrates the behaviour within the class of “Non-substance addictions” implying that Internet addiction could be one of the claimant for this class likewise “Pathological Gambling”.¹⁶Recently, “The World Health Organization (WHO)” also took a welcoming step in including “Game Disorder (GD)” in the final revision of the “International Classification of Diseases (ICD-11)”, recognising it as a separate diagnosis code.

MODELS OF INTERNET ADDICTION

There are 3 popular models of Internet Addiction widely known:

- A). “Griffiths components model”¹⁷
- B). “Young’s Internet Addiction Test (IAT)”¹⁸
- C). “Tao et al. Diagnostic Criteria”¹⁹

There are multiple other models and scales available, like the Compulsive Internet Use Scale²⁰, the Online Cognition Scale²¹ and the (gaming oriented) Problematic Online Gaming Questionnaire²², however the above mentioned are more popular thus being described in detail.

A). Griffiths components model¹⁷

“Griffiths”, also referred to as the “components model”^{17,23}, states that all forms of addiction comprise of six characteristic and universal elements “(i.e., salience, mood modification, tolerance, withdrawal, conflict, and relapse”.¹⁷ Griffiths additionally claims addictions are copious behaviours which stake pertinent fundamentals of biopsychosocial course with the “component criteria” arising from the territory of gambling formerly elaborated upon by Brown.²³ Post concomitant factor analysis, the criteria were thus, noted to adjust with the large sample data compiled with two renowned “Internet addiction scales (CIUS/AICA-S)” appropriately.²⁴

B). Young’s Internet Addiction Test (IAT)¹⁸

The second model, by Young derives the entrenched criteria for “pathological gambling” as an initiation and describes “Internet addiction as a failure of personal impulse control that does not involve external substances”.¹⁸ This failure is characterised by the subsequent set of criteria:

- (i) An engrossment with Internet,
- (ii) The requirement to utilise the Internet for prolonged duration,
- (iii) Futile efforts to stop the use of Internet,
- (iv) Mood alteration once attempting to halt or reduce Internet usage,
- (v) Remaining on-line more than expected,
- (vi) Endangerment of essential liaisons or opportunities arising subsequent to enormous usage of Internet,

(vii) Deceptive regarding usage of Internet,

(viii) utilising the Internet as a rescue from obstacles or probing to mitigate lousy mood situations.²⁵

Young's criteria account solely personal (non-work related) usage of Internet must be accounted for, which is when perceived to exist when an individual suggests appreciating 5 or more of aforementioned 8 criteria. Similar to Griffith's model, such criteria and the cut-off score could be considered as a straight conveyance of criteria for Problematic Gambling in DSM-5.¹⁵ Apart from substituting gambling behaviours with Internet behaviours, the solitary marked variation being DSM mentioning a twelve month duration, however Young doesn't limit any time period.

Young's conceptual model became famous by means of the elaborated 20-items IAT recommended in self-help book "Caught in the Net" published in 1998.²⁶ Widyanto and McMurrin²⁵ portrayed the IAT psychometrically utilizing factor analysis, later obtaining 6 factors in Young's IAT scale for their analysis :

(i) Saliency,

(ii) Excessive Internet use,

(iii) Neglect of work,

(iv) Anticipation,

(v) Lack of control, and

(vi) Neglect of social life.

While they agreed upon a limitation of Young's instrument that its prime origin of validity is face validity, it was basically concluded that the IAT is both reliable and a worthy measure to assess a subjective level of addiction to Internet.

C). "Tao et al. Diagnostic Criteria"¹⁹

The third model, Tao et al.¹⁹ evolved their diagnostic criteria for Internet Addiction by taking into account the clinical features of an enormous faction of patients from China believed to exhibit Internet Addiction, as described by psychiatrists. Following this path, and ruling-out patients harbouring affective disorder and/or psychotic disorders, Tao et al. came up with the subsequent criteria: "(a) "symptom criteria" (both should exist): preoccupation and withdrawal symptoms; (b) one or more of these criteria: (i) tolerance, (ii) persistent desire and/or futile efforts to control usage, (iii) continued practice despite of problems, (iv) lacking interest in alternate activities, (v) usage of the Internet to liberate or soothe dysphoric mood; (c) "clinically significant impairment criteria": functional impairments (reduced working, academic, social ability), including loss of a compelling relationship, career, educational or job opportunities. The criteria also included a "course criterion" (d): Duration of Internet Addiction should have existed for a period of more than three months, with a minimal of six hours of Internet use (non-business/non-academic) each day".¹⁹

The 3 sets of reviewed criteria for Internet Addiction contain some common entities (Table 1). All these sets of criteria eventually elaborate on losing of control over Internet usage; resulting in psychological, social, or professional clash/ obstacles (counting "excessive use"); and mental preoccupation. Other pertinent characters are

eccentrically specified among the 3 models: “mood management, tolerance, withdrawal, and craving/anticipation”.⁵

Table 1. Comparison of 3 outstanding sets of descriptive criteria for addiction to internet utilizing elements from evaluation tools⁵

	“Griffiths” ¹⁷	“Young” ¹⁸	“Tao et al.” ¹⁹
Saliency/ Preoccupation	“dominates their thinking process (preoccupations and cognitive distortions), feelings (cravings) and behaviour”	Feels preoccupied with the Internet on being offline or fantasize about being online?	“thinking about previous online activity”
(Negative) Mood management	“use of behaviours in way of producing a reliable and consistent shift in their mood situation as a coping action to feel better”	– “Do you block disturbing thoughts about life with soothing thoughts about Internet?” – “Apprehension about life in the absence of Internet would be mundane, vacant or bleak?”	“usage of internet to escape or relieve a dysphoric mood”
Tolerance	“increasing amounts of the certain activity required to achieve the former effects”	– “Finding out that you stay online longer than have intended?”	“marked increase in internet usage required to achieve satisfaction”
Withdrawal	“unpleasant feelings and/or physical effects occurring once the particular activity is discontinued or abruptly reduced”	– “Feel depressed, moody, or nervous when offline, which improves once back online?”	“characterised by a dysphoric mood, anxiety, irritability and boredom on prolonged period without internet activity”

<p>External consequences/conflict</p>	<p>“conflicts between the addict and individuals around them (interpersonal conflict) or from within the individual themselves (intrapsychic conflict) with respect to the particular activity”</p>	<ul style="list-style-type: none"> – “Does your work suffer (e.g., postponing things, not meeting deadlines, etc.) because of the amount of time you spend online?” – “Does your performance at job or productivity suffer because of the Internet?” – “Do you opt to spend more time online over going out with others?” – “Do you prefer excitement of using Internet over that of intimacy with your partner?” – “Neglect of household chores in order to employ increased duration online?” – “Losing sleep subsequent to late check-in on online platform ?” – “Do you opt to go through your mail account before any other task that you are required to perform?” – “Give away, shriek, or act irked when someone interrupts you during your 	<p>“loss of interests, previous hobbies or entertainment as a direct result of, and with the exception of, internet use” or “deception of actual costs/time of internet involvement to family members, therapist and others”</p> <p>“continued excessive use of internet despite of knowledge of having a persistent or recurrent physical or psychological problems likely caused secondary to or exacerbated by internet use”</p>
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		<p>online period?”</p> <p>– “Do other people in your life criticize you regarding your online duration employed?”</p>	
<p>Relapse/ control</p>	<p>“tendency for repeated reversions to earlier patterns of the particular activity to recur”</p>	<p>– “Attempt to cut down the amount of time you spend online and fail?”</p> <p>– “Finding yourself uttering “ Just a few more minutes” once logged-in?”</p>	<p>“constant desire and/or futile attempts to control, reduce or discontinue internet use”</p>
<p>Craving/ Anticipation</p>		<p>– “Do you find yourself anticipating when you reach online again?”</p>	<p>“anticipation about next online session” or “a strong desire for the internet”</p>
<p>Lying/ hiding</p>		<p>– “Do you become defensive or secretive when anyone enquires you about your involvements on online platform?”</p> <p>– “Try to hide about your duration of being online?”</p>	

Despite of the universal definition and criteria for diagnosis of Internet Addiction are constantly disputed upon & controversial, psychologists and psychiatrists have conceded upon & come forth for four components essential for the diagnosis^{27,28} :

I). “Enormous Internet use” (exclusively when associated with losing time or neglect of primitive affairs): striving for Internet use compulsively, increasing priority of Internet amongst personal morals of adolescent’s system;

II). “Symptoms of withdrawal”: mood fluctuations (abstinence withdrawal symptom) once Internet becomes non-existent (depression, anxiety and anger);

(III). “Tolerance”: obligation to contribute increased amount of time online, implied by the demand for heightened usage of the Internet to alleviate negative emotions; and

(IV). “Negative consequences”: inordinate involvement in usage of Internet, as opposed to negative psychosocial resultants; lack of prior hobbies and alternate source of entertainment resulting from such involvements; losing social relations, sport and educational opportunities resulting due to inappropriate use of Internet; discord and deceits associated with the usage the Internet; relapse: 1 deficient self-control in context to the usage of Internet.

SUBTYPES OF INTERNET ADDICTION

Internet addiction is a broad terminology comprising a wide variety of behaviours and impulse-control issues. Within the Internet Addiction phenomenon, five specific subtypes could be categorized ; after being noted that people classically end up addicted to a specific utilization which when operates as a spark for increased Internet usage.¹³

1. “Cyber-sexual addiction” — compulsive use of adult websites for cybersex and cyberporn.
2. “Cyber-relationship addiction” — over involvement in virtual relationship, more exclusive than real ones, involving family vulnerability (chat-rooms, social networks) and marital disputes
3. “Net compulsions”— obsessive online gambling, shopping, or virtual trading.
4. “Information overload”— compulsive web browsing or database searches.
5. “Computer addiction” — obsessive computer game playing (over involvement with pre-programed games).

ETIOPATHOGENESIS OF INTERNET ADDICTION

Different models have been put forth for the development and maintenance of Internet Addiction as follows:

- A). Cognitive- behavioural model of “Problematic Internet use”(PIU)¹⁰
- B). “Anonymity, Convenience and Escape” (ACE) model ²⁹
- C). “Access, Affordability, Anonymity (Triple-A) engine” ³⁰
- D). “Phases model of pathological Internet use” by Grohol³¹
- E). “A comprehensive model of the development and maintenance of Internet addiction” by Winkler &Dörsing³², considers socio-cultural aspects (e.g., demographic components, access to and approval of the Internet), biological predispositions (e.g., genetic aspects, anomalies in neurochemical mechanisms), psychological vulnerabilities (e.g., personality attributes, negative affects), and

exclusive aspects of Internet to demonstrate “excessive engagement in Internet activities”³²

❖ NEURO-BIOLOGICAL VULNERABILITIES

This is understood that addiction activates a sequence of sites in the brain linked with pleasure seeking behaviour, referred as the “reward centre” or “pleasure pathway” of human brain.^{33,34}

Once triggered, dopamine is released resulting in its increased levels, along with opiates and other neurochemical modulators. Over the period of time, the linked receptors could get affected, resulting in tolerance or the requirement for excessive stimulation of the reward centre to yield the “high” and the consequential peculiar behavioural patterns required to evade withdrawal. Internet use could also particularly result in dopamine release in the nucleus accumbens^{35,36}; one of the reward system of the brain precisely associated with other forms of addiction.³⁷

The rewarding nature of digital technology use can be exemplified through the following statement by a 21 year-old male on treatment for Internet Addiction: “I feel technology has brought so much joy into my life. No other activity relaxes me or stimulates me like technology. However, when depression hits, I tend to use technology as a way of retreating and isolating.”³⁸

❖ REINFORCEMENT/ REWARD

What is so rewarding about Internet and video gaming that leads to addiction? The theory behind it is that digital technology customers come across multiple strata of reward upon using different computer operations. The functioning of Internet is based upon “Variable Ratio Reinforcement Schedule (VRRS)”, like gambling.³⁹ Irrespective of the application (data browsing, social networking platforms

,pornography, message boards, chat rooms, video games, cloud applications and games, email etc.), such involvements revolve around unpredictable and variable reward frameworks. Reward appreciated is strengthened once associated with mood stimulating/triggering content. This can be commonly exemplified by video games (e.g. multiple social rewards, identification with a hero figure, enticing graphics), pornography (sexual fantasy and stimulation), dating sites (romantic fantasy), online poker (financial) and special interest chat rooms or messengers (sense of belongingness).⁴⁰

❖ BIOLOGICAL PREDISPOSITION

There has been increasing evidence regarding possibilities of genetic predisposition to addictive behaviours.^{41,42} The theory suggests that individuals with such propensity have inadequate sum of dopamine receptors or have an scarce amount of serotonin/dopamine¹², resulting in difficulty in recognizing pleasure in involvements which most people would find gratifying. To surge pleasure, such individuals are more inclined to seek more than average involvement in activities and behaviours which trigger a rise in dopamine, definitely experiencing them more reward but putting them at greater risk for addiction.³⁸

The possible addition of the below mentioned substances in the pathogenesis addictive behaviour in adolescents has been proposed, however has not yet been considered well. In extension to oxytocin,⁴³ there are the following prospective neuromodulators:

(i) “Melanocortin (-Melanocyte-stimulating hormone (-MSH)”: “Orellana et al.⁴⁴” put forth the importance of melanocortin in adolescents in giving rise to pathological addictions.

(ii) “Neurotensin” : is primarily associated with the modulation of dopamine signals resulting in pathological addictions; certain studies with the fortunate treatment to an extent with synthetic neurotensin⁴⁵ in addiction have also been reported.

(iii) “Orexin”: could be associated in emergence of disturbed sleep and resulting in addictive behaviour⁴⁶

(iv) “Substance P (neurokinin A)”: pathological addictions could be a resultant of derangement in the formulation of substance P in many forms; currently, the efficacy of neurokinin receptor activity modulation in treatment modality for addiction are being investigated upon and are in the pipeline for treatment assessment.^{47,48}

❖ GENETICS OF INTERNET ADDICTION

As opposed to different types of addictive behaviour (like gambling and psychoactive substance abuse), certain study focused upon the genetic prognosticator of Internet addiction. For instance, “in the initial twin study performed in 2014, the researchers evaluated 825 adolescents in China and demonstrated linkage with inherited factor in 58–66% of the population”⁴⁹ Furthermore, the investigators of “twin cohorts from the Netherlands (48% in 2016)⁵⁰, Australia (41% in 2016)⁵¹, and Germany (21–44% in 2017)⁵² put forth identical conclusions.” Thus, the presence of a genetic component giving rise to Internet Addiction was duly backed by twin studies for varied populations. But, certain genes which could be associated with inheritance pathways are still to be recognized.

There has been four pilot studies to verify the polymorph regions of five probable genes:

(i). “rs1800497 (dopamine D2 receptor gene (DRD2), Taq1A1 allele)” and “rs4680 (methionine variant of dopamine degradation enzyme catecholamine-o-methyltransferase (COMT) gene)”: minor alleles bond is related to dopamine reduced production “ (rs4680)” and reduced quantity of dopamine receptors in the area of prefrontal cortex “(rs1800497)” where pathological obsession to Internet games is observed.⁵³ The cited allele variants can also be related to the predilection to gambling, alcoholism and ADHD.

(ii) “rs25531 (serotonin transporter gene (SS-5HTTLPR), short allelic variants)” : “Lee et al.”⁵⁴ revealed that the gene can be related to pathological Internet addiction. Additionally other studies reported that the depicted genetic variants were additionally linked with vulnerability for depression—the most ubiquitous comorbidity among Internet-addicted individuals.⁵⁵

(iii) “rs1044396 (nicotinic acetylcholine receptor subunit alpha 4 (CHRNA4) gene)” : a study by “Montag et al.”⁵⁶ demonstrated linkage with the CC genotype of the polymorphism “rs1044396”, implying additional relation to addiction of nicotine and derangements in attention..

(iv) “rs2229910 (neurotrophic tyrosine kinase receptor type 3 (NTRK3) gene)”: Jeong et al.⁵⁷ aimed at a research evaluating 83 polymorph areas revealing statistically significant associations with solitary region: “rs2229910”. Supposedly, it is related to depressive disorders, obsessive-compulsive disorders, anxiety disorders, and psychologically-regulated nutrition disorders.⁴³

HOW INTERNET USE DISORDER IS DIFFERENT FROM SUBSTANCE USE DISORDER?

Although the above described literature suggests that Internet Use Disorder and Substance Use Disorder share to an extent some familiar underlying neurobiological pathologies, however, recent researches have recommended that differences prevail in brain activities the two types of patients.

È Han et al. announced that patients with alcohol dependence had predominant positive functional connections from the DLPFC to striatal areas while patients with Internet Gaming Disorder had predominant negative connections from the DLPFC to striatal areas.⁵⁸

È Additionally, Kim et al. argued that patients with Internet Gaming Disorder had reduced regional homogeneity from the PCC to inferior temporal cortex, as compared to alcohol dependence patients.⁵⁹

È Subsequently, utilizing EEG, Son et al. demonstrated that lower absolute beta power may be used for probable trait marker of Internet Gaming Disorder however, increased absolute power in the delta band could be a probable marker of alcohol dependence.⁶⁰

ASSESSMENT OF INTERNET ADDICTION

Various tools for assessment of addiction to Internet have been devised, but none came across as the “gold standard”.⁶¹

The most frequently used are ⁴ :

a). “Internet addiction test (IAT)”,⁶² : a self-report scale comprising of 20 items with rating severity of compulsive use, lacking control, consequences of negative origin and neglect of routine life. Likert scale derived, responses ranging 0 (“not at all”) to 5 (“always”), known to be reliable and valid, constitute adequate internal consistency (Cronbach’s α 0 .84). Scores between 40-69 are categorised as “possibly addicted users” and those with scores more than 69 are labelled as “addicted users”.⁶² It resulted from IDQI revised version, based upon an 8 item self-report questionnaire scored dichotomously and relying upon the diagnostic guidelines of “pathological gambling”:, tolerance, loss of control, preoccupation , withdrawal, negative consequences, staying online longer than anticipated , escapism and denial. The guidelines are assessed by yes or no questions; 8 in number; with grand score falling between 0-8. Scores > 5 are categorised as “pathological”.⁶²

b). “Young of the Internet Addiction Questionnaire (YDQI)”,¹⁸

c). “Chen’s Internet addiction scale (CIAS)”,⁶³ : is a self-report tool consisting of 26 items, Likert scale assessment on 4-points; rating five categories: compulsive use, withdrawal problems with interpersonal relationship, tolerance, and time management.^{17,19,27} Additionally, the tool evaluates online hours spent in a week and individualistic experience arising out of use of Internet. The scale has quite an adequate internal consistency with Cronbach’s α values ranging from .79 to .93 with respect to individual subscales.

d). “Internet addiction scale (IAS)”,⁶⁴ : scale is validated, based on amalgamation of “Young’s and Beard’s Internet addiction criteria”, comprising of loss of control, tolerance, preoccupation, withdrawal, overall impairment, deception, and escapism. It includes 20 items assessment based on a 4-point Likert scale with scores as: 48-52

suggestive of potential risk and 53-80 implying high risk of Internet addiction. Internal consistency of this scale has not been registered.⁶⁴

HOW COMMON IS INTERNET ADDICTION ?

❖ OVERVIEW OF INTERNET ADDICTION AMONG ADOLESCENTS

There are in total seven studies to have used Internet Addiction Test for Internet addiction evaluation in adolescents and children aged between 8 to 24 years⁶⁵⁻⁷¹ with sample size varying from 1,618 as per the study conducted by Lam L et.al., (2009)⁶⁹ to 17,599 participants in study by Cao et.al., (2011).⁶⁷ Despite of the same assessing tool applied in such researches, cut-offs have been varied, which have been used to delineate addiction or inordinate usage across the researches. As observed, various prevalence rates were substantially noted as per study conducted by R. Poli and E. Agrimi (2012) with Italian high school reporting 0.8% among its students which were taken into account to be as seriously addicted⁶⁶, and 20.3% (adolescents) while South Korean study conducted by Ha J et.al.,(2006) revealing 13.8% (children) classified to be addicted to Internet use.⁷¹

❖ OVERVIEW OF INTERNET ADDICTION AMONG ADULTS

In six research studies, “Young’s Internet Addiction Test”⁶² was used to evaluate Internet addiction in adults.⁷²⁻⁷⁷ The sample sizes varied from 1,034 participants as per study conducted by Canan F et.al.,(2012) in Turkey⁷³, while Internet users in Korea were 13,588 as reported by Whang et.al.,(2003).⁷⁶ Akin to IAT usage in sample of adolescent age group, adult samples utilised several cut-off criteria to delineate addiction to internet from behaviours of Internet usage non-pathological in nature. Reportedly, the IAT prevalence rates varied from 1.2% of

Internet users in US as per the study conducted by Morrison, C. M., & Gore, H. (2010)⁷⁵ to 9.7% among college students in Turkey (Canan F et.al., in 2012).⁷³

❖ OVERVIEW OF INTERNET ADDICTION AMONG STUDENTS OF HEALTH SCIENCES

Multiple studies have been done on health sciences students though predominantly belonging to medical fraternity. A study done in an Iranian medical college by Shadziet. al.,(2019) revealed prevalence of Problematic Internet Use to be 38.6 %⁷⁸ while a similar study in Iranian setting of similar category of students as per Ghamari F. et. al.,(2011) had reported a prevalence of PIU up to 30%.⁷⁹

Similar study done in Malaysia by Ching et.al., (in 2017) with a sample size of 426 medical students varying from first to final year revealed internet addiction to be 36.9% of the study sample according to IAT.⁸⁰

A cross-sectional study involving 316 medical students from Pakistan by ArslaanJavaeed et.al.,(2020) further enlightened upon the prevalence of Internet usage with (28.2%) medical students falling under the category of ‘severe addiction’ with only (0.9%) of the sample size not addicted to internet.⁸¹

Many studies have come forth across the country to touch upon the prevalence and rampant use of internet. Study involving sample size of 282 medical students from Maharashtra by Chaudhari et.al., (2015) observing prevalence of internet addiction among medical students to be 58.87% with 51.42% falling under mild category and 7.45% categorised as moderate severity as per IAT⁸² while another study from a similar setting in another medical college as per study conducted by Gedam et, al.,(2017) observed total prevalence of internet addiction to be 19.85%,

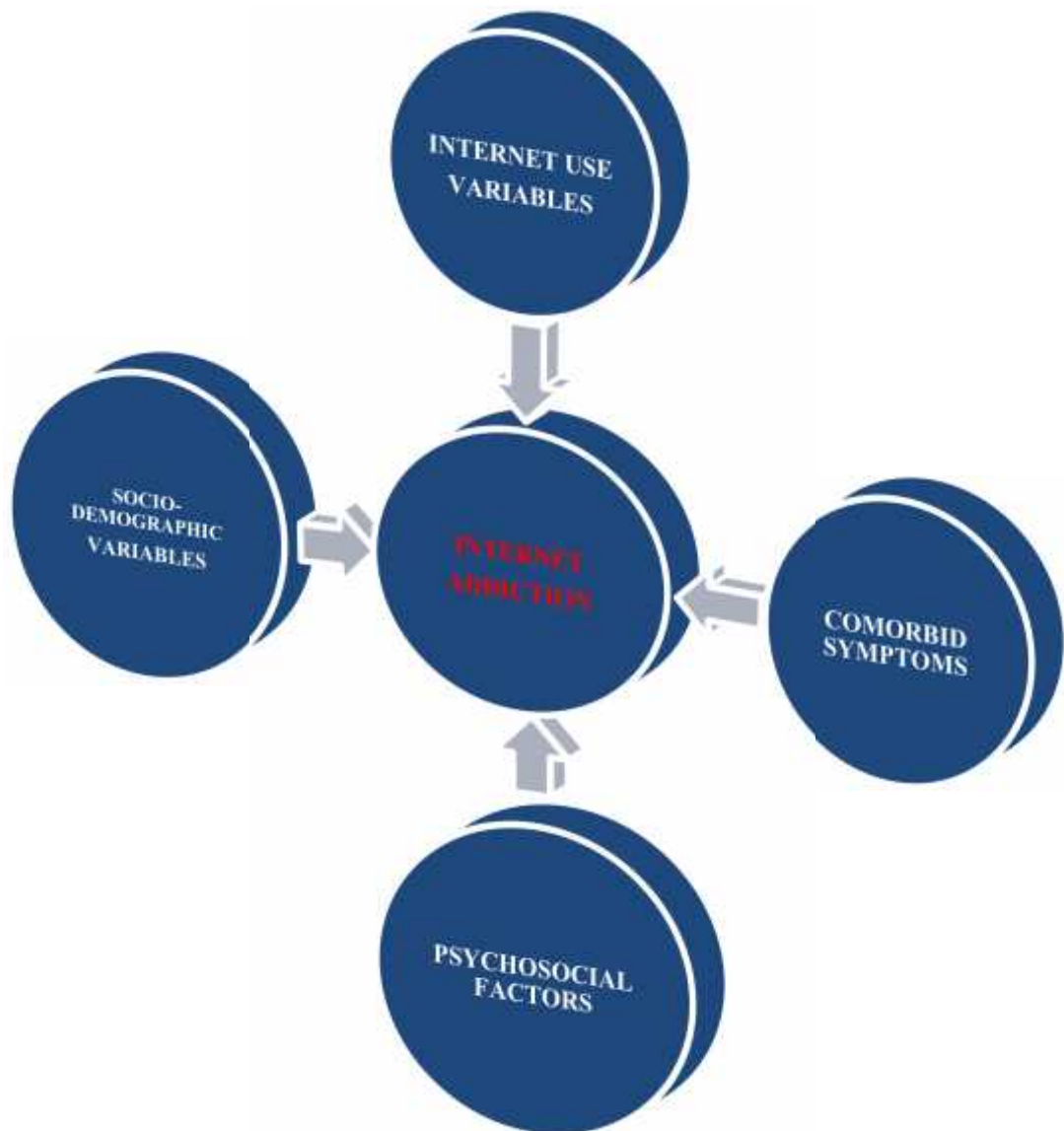
with moderate and severe addiction being 19.5% and 0.4%, respectively with study population of 846 health professional undergraduates from various faculties.⁸³

Studies from South India too revealed significant findings such as 61% of students from medical as well as dental faculties to be mildly addicted while 19.5% students moderately addicted among sample size of 900 students in a medical college of North Karnataka as per study conducted by BhushanS et, al., (2018)⁸⁴ while that of 64.4% as average users, 11.8% as possible addicts, 0.4% as addicts among the sample size of 211 in a medical college from Andhra Pradesh from a study by Srijampana, et, al., (2014).⁸⁵

Another cross-sectional study from Eastern part of India by Nath, K. et. al., (2016) reported 46.8% medical students at increased risk of Internet addiction from the sample size of 188 determining the increased risk equally across the country.⁸⁶

FACTORS ASSOCIATED WITH INTERNET ADDICTION

Fig. (1). Factors Associated with Internet Addiction (Kuss et. al.,)⁸



❖ SOCIODEMOGRAPHIC VARIABLES :

Multiple factors are reported to be linked with Internet addiction in adult population. In association with sociodemographic variables, it includes male gender^{73,75,87-92} younger age^{75,89}, city residence⁷⁷, single parent and re-structured family^{77,87}, being single⁸⁷, financial constraints, university level of education⁸⁹, as well as Asian ethnicity⁷⁴ were noted.

❖ INTERNET USE VARIABLES :

Numerous variables associated to Internet usage been reported to be linked with Internet addiction. These comprise of heightened duration spent online^{88,89,91,93}, early exposure to Internet⁷⁷, positive outcome expectancy, low refusal self-efficacy of Internet use^{91,94}, online procrastination and online flow⁹⁵. Additionally, multiple usage of various online functions has also been associated to Internet addiction which comprise of social applications^{75,88,96}, online gaming and other applications⁷⁵, and a plethora of online games and availability of experiences.⁹⁶

❖ PSYCHOSOCIAL FACTORS :

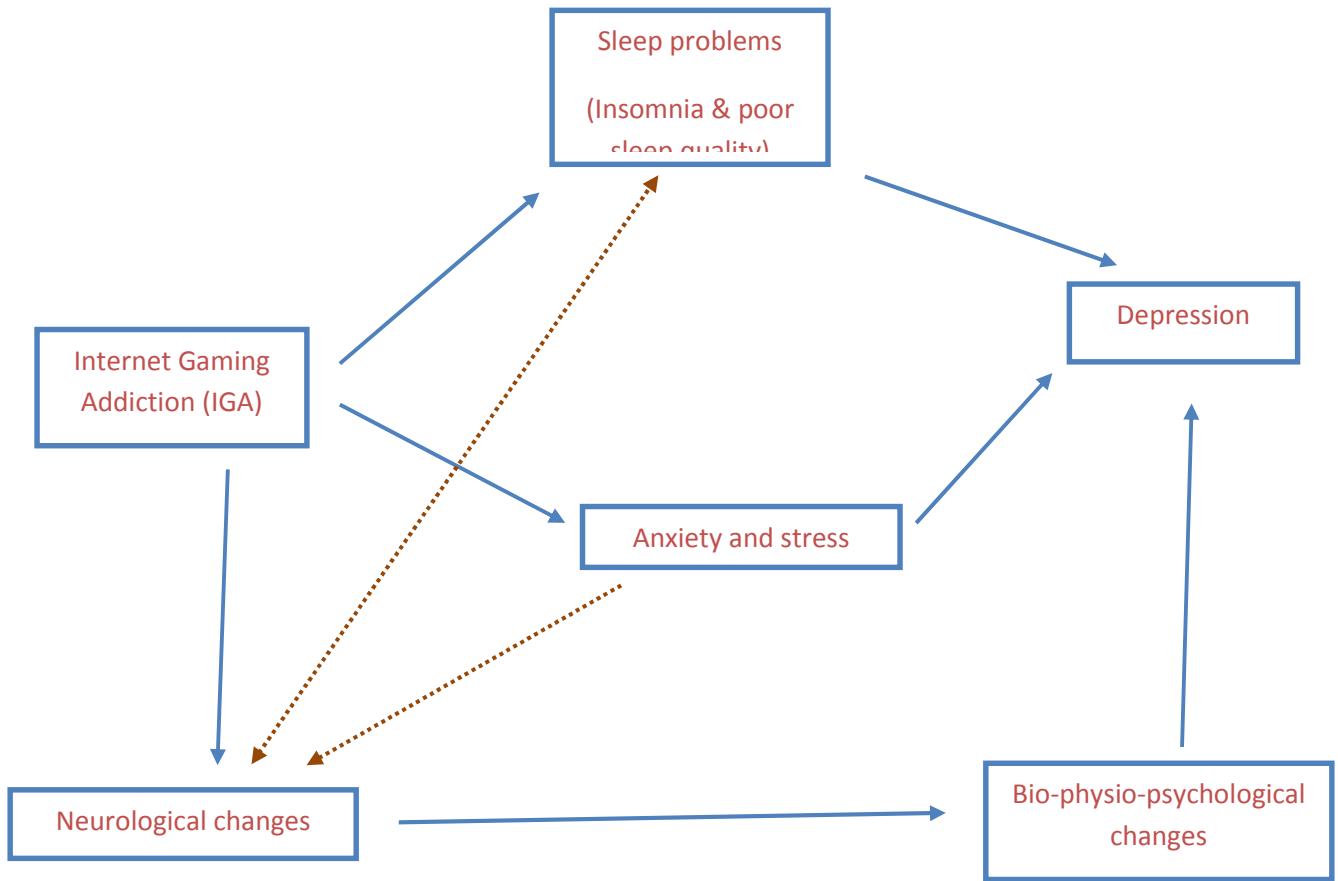
Multiple psychosocial aspects were reported to be linked with Internet addiction. Psychological variables consist of impulsivity^{91,97}, neuroticism^{92,96}, low agreeableness⁹⁶, low self-concept⁷⁴, escapism⁷⁶, loneliness⁷⁶, fun-seeking⁹⁸, and escape from negative emotion. Social factors include lower levels of academic performance satisfaction “(Lin et al., 2011; Huang et al., 2009)”, an insecure style of attachment⁹¹, appreciation of childhood maltreatment⁷⁴, low social support^{74,92}, lack of family love⁹⁰, feeling of homesickness⁷⁷, social support directly or indirectly through symptoms of depression by virtual means, and reduced actual social support directly and indirectly through symptoms of depression.⁹⁹ Subsequently, vulnerability to

interpersonal dangers and social behaviours⁷⁶ were observed to be maladjusted. Along with it, a statistically related behavioural factor to Internet addiction, i.e., a habit of skipping breakfast⁹² was also reported.

❖ COMORBID SYMPTOMS :

In context to comorbid symptoms, aspects which have been observed: depression^{75-77,90,91,99}, anxiety^{77,89}, harmful alcohol use⁹⁸, compulsivity⁷⁶, sleeping disorders⁸⁹, ADHD⁹⁷, hostility¹⁰⁰, dissociative episodes and depersonalisation⁷³, psychological issues and high general psychopathologies.^{74,89,92}

Fig. (2) “A conceptual model for the possible explanatory causal pathways between internet gaming addiction (IGA) and depression”¹⁰¹



Unidirectional →

Bidirectional ↔

Possible linkage -.->

Among various possible pathways potentially involving different risk factors, 3 major components put forth through this framework.¹⁰¹

È Firstly, it is hypothesised that Internet game addiction may lead to problems related to sleep, comprising insomnia, reduced duration of sleep and poor quality of sleep, and subsequently, result in depression.

È Secondly, Internet games addiction may give rise to anxiety and inordinate stress among gamers and thus becomes the acquiring scenarios for direct depression.¹⁰² This model also proposes that anxiety and stress cumulatively could also interact with problems related to sleep leading to depression.

È Thirdly, as proposed by observations from innumerable PIU related neuroimaging studies, there has been a firm probability through some bio-physio-psychological changes as a result of neurological alternations regarding linkage between Internet gaming addiction and depression.¹⁰³ Also, there could be a probable interactions among all 3 components proposed in this model.¹⁰¹

It has already been an evident fact that problems pertaining to sleep play a crucial role in the depression related pathophysiology.¹⁰⁴ The enormous amount of patients with bipolar depression or major depressive disorder reported to suffer severely from disturbed architecture of sleep.¹⁰⁵ A two-fold increased risk for depression was observed among that patients suffering from persistent insomnia in a recent meta-analysis of longitudinal studies examining the relationship between insomnia and depression.¹⁰⁶

INTERNET ADDICTION AND SLEEP

Internet addiction and sleep problems are frequent among adolescents and children and, and is a matter of parental burden.¹⁰⁷ As per study conducted by C.H. Ko, J.Y. Yen, C.F. Yen, et. al., (2005) nearly 20% of youth population has been reported to suffer from internet addiction¹⁰⁸, and nearly 45% of junior high and elementary students were found to encounter at least one form of sleep related problem by their parents as reported by Susan S.F. Gau et. al.,(2006).¹⁰⁹ Research conducted by Fineberget. al., (2013) revealed that addiction-associated sleep problems and addiction are prevalent, and add to a significant proportion of neurological and mental disorders.¹¹⁰As per L T Lam (2014), Internet game addiction has propensity to cause issues related to sleep, comprising insomnia, reduced duration of sleep and poor quality of sleep, and subsequently, resulting in other mental health problems.¹⁰¹

Sleep problems are referred to be complications or negative consequences of internet addiction, which has been backed by several evaluation measures of internet addiction, such as the “20-item version of the Internet Addiction Test”²⁵, “Chen Internet Addiction Scale (CIAS)”⁶³ and “Internet Use Survey”.¹¹¹

“Cain and Gradisar”¹¹² mentioned 3 probable pathways:

- (i) Displaced sleep due to media use;
- (ii) Amplified arousal problems due to media use; and
- (iii) Delays in the circadian rhythm due to bright light exposure

; Unlike aforementioned, Becker et. al.,(2014)¹¹³ argued a contextual and biopsychosocial model where sleep solely not the result of various elements, instead exhibited reciprocal relations with contextual , psychosocial and biological elements. However, converse possibility in which problems related to sleep causing overuse of internet and subsequently addiction is also proposed by Y.-L. Chen and S. Shur-Fen Gau (2016).¹⁰⁷

; A cohort study by Tavernier and Willoughby (2014)¹¹⁴ found that sleep problems indicated the increased time spent on social networking sites among young university students. However, the converse was not true: internet use did not predict the formation of sleep difficulties.

; A longitudinal study conducted by Y.-L. Chen and S. Shur-Fen Gau (2016) on 1253 children & adolescents studying in grades 3rd, 5th& 8th revealed that addiction to internet was linked with decreased duration of sleep at night, elevated requirement of sleep and anticipated deranged circadian cycle along with dyssomnias.¹⁰⁷

; Sleep quality has also been studied among university students.¹¹⁵⁻¹¹⁸ Such studies have indicated impairments in sleep quality, which are worse when it comes to medical undergraduates,¹¹⁹ who have a taxing academic schedule and responsibilities in various fields, all of which significantly impacting quality of sleep.¹²⁰⁻¹²²

; University students face circadian rhythm disturbances because of the stress of the academic environment,¹¹⁵ which is further increased by habits such as Internet surfing, watching television,¹¹⁶ and using alcohol and tobacco,¹¹⁷ which are common in this population.

; Research by Shadziet. al.,(2019) involving medical students with Problematic Internet Use prevalence of 30% revealed poor sleep quality prevalence of 40% in its sample size of 402 medical students thus strengthening the fact of effect of Internet addiction on sleep quality & disturbances.⁷⁸

❖ **ASSESSMENT TOOL FOR SLEEP QUALITY :**

Although several tools are available to measure the quality of sleep or sleep disturbances however, the one being commonly used is **Pittsburgh Sleep Quality Index(PSQI)**¹²³.

“Pittsburgh Sleep Quality Index” was devised with several goals: ¹²³

- (i). valid, reliable, and standardized measure of sleep quality;
- (ii) discrimination among those with “good” and “poor” sleep;
- (iii) an index which is easy to use on individuals and for clinicians and researchers to interpret; and
- (iv) a brief, clinically advantageous evaluation measure of various disturbances related to sleep which might affect sleep quality.

The PSQI consists of self-rated 19 questions to evaluate various components related to quality of sleep, comprising of assessments related to sleep duration and latency period and of the severity and frequency of sleep-related problems. All 19 items are categorised into 7 component scores, each weighted equally on 0-3 scale. The 7 component scores are then combined to yield a global PSQI score, which ranges from 0-21 with higher scores indicating worse sleep quality.¹²³

The 7 component scores of the PSQI has 0.83 reliability coefficient (Cronbach's α), which indicates internal consistency of a high degree. Global PSQI score > 5 provides a sensitive and specific measure of poor quality of sleep. Furthermore, a subject experiencing severe difficulties in at least two areas, or moderate difficulties in more than three areas it also indicated.¹²³

INTERNET ADDICTION AND ACADEMIC PERFORMANCE

Multiple research findings such as that of Mishra et. al., (2014) have demonstrated that the academic problems caused by Internet addiction comprise of missing classes, being late for classes, increased risk of receiving academic probation, and a general decline in study habits.¹²⁴ Research on age factors by Heo et. al., (2014) observed that college students between the age group of 19 to 24 were the most susceptible to addiction.¹²⁵

A number of researchers like Mishra et. al., (2014) have proposed that addiction to the Internet among college students is drastically comparable to addiction to drugs, alcohol, violence, lack of sleep, and nutrition deficiencies¹²⁴

Last few decades, numerous researches such as Schmidt and Van Der Linden (2015), Curcio G. et. al., (2006), have demonstrated that short sleep duration which are self-reported, late sleeping & rising hours, poor quality of sleep, and irregular sleep schedules are poorly associated with academic performance by students at varied academic levels and in various populations.^{3,118,126-133}

Majority of the studies like those conducted by Eliasson, A., Eliasson, A., King, J. et. al., (2002), BaHammam et. al., (2012) etc. formed the conclusion that subjects with

disturbed sleep or low sleep quality or are more predisposed to psychological conditions and academic slowness or failures.^{118,130,131,133,134}

According to BaHammam et. al., (2005) medical students are group of young individuals with academic commitments and lifestyle which can impact their sleep habits leading to sleep deprivation.¹³⁵ The continuous academic demand on this group of students may result in irregular sleep/wake patterns and poor quality of sleep, which may negatively impact academic performance.¹³⁶ Students and teachers tend to overlook the deleterious effect of sleep habits on academic performance.¹³⁷ Overall, the relationship between sleeping habits and the academic performance of medical students is insufficiently researched upon.¹³⁴

Similarly dental students & other health professional tend to observed problems related to sleep with possible impact on their academic performance as well as their psychosocial and physiological aspects.

Research to evaluate sleep quality among students of health sciences, in particular, and its impact on their academic performance is deficient.

Studies conducted on 900 medical students by BhushanS et, al., (2018) in Karnataka found that Internet Addiction had a statistically significant association with the poor academic performance among students.⁸⁴

A similar study conducted by ArslanJavaeed et.al.,(2020) in Pakistan on 316 medical students observed mild downhill correlation between internet addiction categories (no addiction, mild addiction, moderate addiction, and severe addiction) and academic performance social and interpersonal relationship.⁸¹

Similarly, a study done on Malaysian university students by NajmiHayatiUsman et. al., (2014) also revealed that internet addiction is associated with lower CGPA.¹³⁸

Since, there is inadequate research to throw light upon internet addiction among health sciences students belonging to different fields, this study is intended to draw some attention towards the existing Problematic Internet Use in this population. Similarly, studies have been reported about ill effects of internet addiction including poor sleep quality, disturbances in sleeping schedule. However, with field like health sciences involving erratic working hours, it becomes more important to understand the nature of sleep problems arising due to internet addiction. This study is a small effort to give an insight into sleep disturbances arising due to addiction to Internet. Moreover, internet addiction is equally responsible for impact on academic performances as observed in various studies. Due to unavailability of adequate literature, its impact on academic performances of health sciences students are not well understood and requires more research. Through this study, an additional effort has been made to draw conclusion regarding impact of internet addiction on academic performance of health sciences students.

MATERIALS AND METHODS

The study is designed as a cross-sectional epidemiological endeavour aimed at determining the prevalence of internet addiction among health sciences students.

Study design

- The study is a cross-sectional descriptive study.

Study period and duration

- The present one year study was done between 1st January 2019 and 31st December 2019.

Place

The site of sample collection was students attending lecture classes at KLE Academy of Higher Education and Research (KAHER) , Belagavi.

Source of data

- The present study comprised of students studying in various faculties of health sciences; MBBS, BDS, Physiotherapy at KLE Academy of Higher Education and Research (KAHER) attending lecture classes at the university during the course of study.

Sample size:

The sample size was calculated based on the prevalence rate of Internet addiction of 58.87% reported by a cross-sectional study conducted at a medical college in Maharashtra.⁸². Hence, the sample size was calculated with a confidence interval of 5% as follows

Here, 'p' = 58.87%, q = 41.13%, r = 5% of p = 387.4 ~ 400

Therefore, planned sample size = 400

Sampling procedure

- Purposive sampling method

Selection criteria

Inclusion Criteria

- Students of MBBS, BDS and Physiotherapy course studying at the Institute during the period of study.

Exclusion Criteria

- Students with history of substance abuse.
- Students with clinically established history of psychosis, anxiety and depression, undergoing treatment for the same.
- Students from 1st phase of respective faculties since they haven't undergone university examination.
- Students who did not consent and were unwilling to participate in the study.

Ethical Clearance:

Prior to commencement, the ethical clearance was obtained from Institutional Ethics Committee, Jawaharlal Nehru Medical College, Belagavi.

Informed Consent

The participants who fulfilled the selection criteria were explained about the nature of the study and a written informed consent was obtained before enrolment.

Procedure:

Written informed consent for participation in the study was taken from the participants after explaining about the study and its implications. On obtaining the consent, the participants were asked to provide information regarding existing co-morbid psychiatric illnesses or substance use disorders using self-reported questionnaire which was used as clinical profile of the students. Participants with clinically established psychiatric illnesses or substance use disorders who were undergoing treatment for the same as reported under clinical profile were excluded from the study.

Demographic details were obtained from all consenting participants. They were then subjected to self-report scale comprising of 20 items -Young's Internet Addiction Test Questionnaire¹⁸ to assess the severity of internet addiction.

To assess the quality of sleep, the Pittsburgh Sleep Quality Index (PSQI)¹²³

Scale was applied on all the participants, and Global PSQI score was obtained.

Participants were also asked to furnish the details of their academic performance as per the university criteria of marks obtained in recent university examination. Participants who were found to be positive on Young's Internet Addiction Test, their scores were compared with the scores obtained on PSQI and with the academic performance.

Tools:

“Young’s Internet Addiction Test”⁶²

IAT is a self-report scale comprising of 20 items with rating severity of compulsive use, lacking control, consequences of negative origin and neglect of routine life. Likert scale derived, responses ranging 0 (“not at all”) to 5 (“always”), known to be reliable and valid, constitute adequate internal consistency (Cronbach’s α 0.84). The questionnaire requires 5 to 10 minutes on self-administration.

The total score of IAT is the total sum of responses given by participants on 20 items. Each item ranges from 0-5 on a 5-point scale with maximum score of 100 points.

Total score is calculated by summing up the ratings on each item and is then interpreted as follows:

- 30 or below = normal level of internet usage
- 31- 49 = mild internet addiction
- 50 -79 = moderate internet addiction
- >80 = severe internet addiction

“Pittsburgh Sleep Quality Index (PSQI)”¹²³

The PSQI consists of self-rated 19 questions to evaluate various components related to quality of sleep, comprising of assessments related to sleep duration and latency period and of the severity and frequency of sleep-related problems. All 19 items are categorised into 7 component scores, each weighted equally on 0-3 scale.

The 7 component scores are then combined to yield a global PSQI score, which ranges from 0-21 with higher scores indicating worse sleep quality.¹²³

The 7 component scores of the PSQI has 0.83 reliability coefficient (Cronbach's α), which indicates internal consistency of a high degree. Global PSQI score > 5 provides a sensitive and specific measure of poor quality of sleep.

RESULTS

1080 participants following the inclusion criteria were approached for the study. Out of them, 18 had comorbid psychiatric illness and 5 did not consent for participation. Hence, 23 participants were excluded from the study, making the final sample size of 1067 participants belonging to the varied fields of health sciences.

Table 2: Demographic profile of the study sample (n=1067)

S. No.	VARIABLES		FREQUENCY(n)	PERCENTAGE
1.	Faculty	a). MBBS	482	45%
		b). BDS	392	37%
		c).Physiotherapy	193	18%
2.	Gender	a). Female	689	65%
		b). Male	378	35%
3.	Religion	a). Hindu	915	86%
		b). Muslim	59	6%
		c). Christianity	55	5%
		d). Sikh	7	1%
		e). Others	31	3%
4.	Domicile	a). Urban	992	93%
		b). Rural	75	7%

Table (2) shown above reveals following findings:

- Participants belonging from MBBS fraternity (45%) comprised the major proportion of the study population as compared to those belonging to BDS (32%) and Physiotherapy (18%). Females (65%) were slightly higher in number than males (35%).

- Major part of the study population practised Hindu religion (86%) while Muslim (6%), Christianity (5%), Sikhism (1%) and others (3%) were followed by the remaining others in the study population.
- A majority of the participants came from an urban background (93%).

Fig.3). Distribution of Gender in respective faculty in the study sample (n=1067)

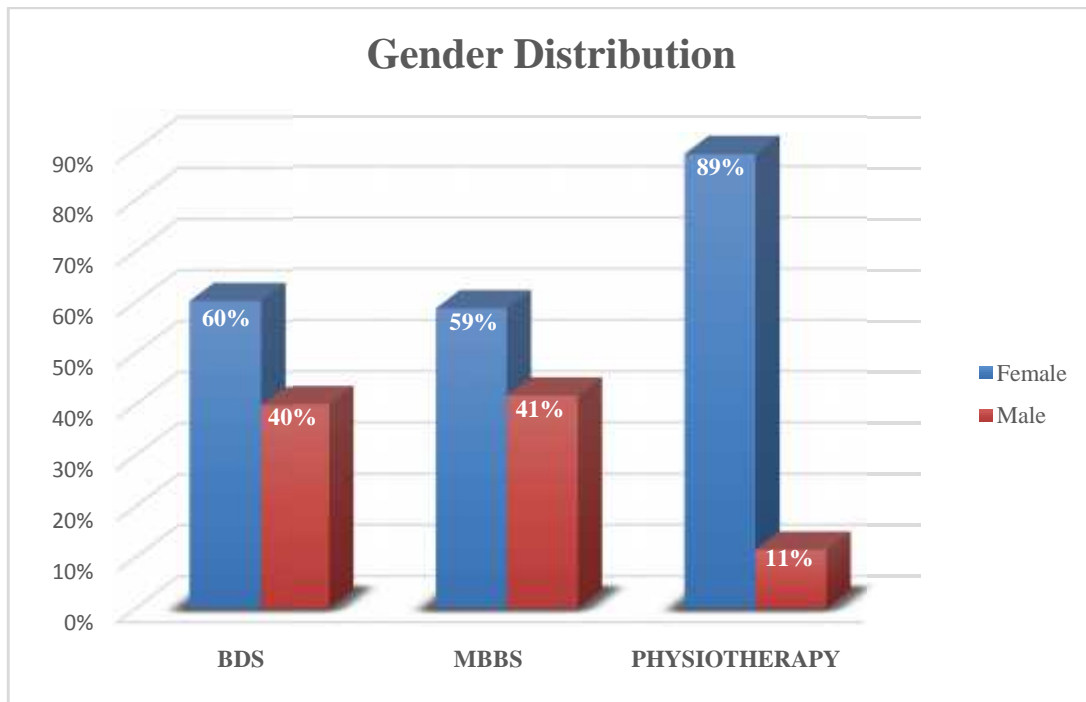


Fig. 3 depicts distribution of gender across different faculties with female population being predominant among all the 3 groups comprising major part of the study sample.

Table 3: Clinical profile of the study sample (n=1067)

S. No.	VARIABLES		FREQUENCY(n)	PERCENTAGE
1.	Physical comorbidities	Yes	115	11%
		No	952	89%
2.	H/o substance use	a). None	995	93.3%
		b). Alcohol (only)	50	4.7%
		c). Alcohol + smoking	13	1.2%
		d). Alcohol + smoking + cannabis	7	0.7%
		e). Cannabis (only)	2	0.2%
3.	Family History	a). Psychiatric illness		
		YES	64	6%
		NO	1003	94%
		b). Substance use		
		None	981	91.9%
		Smoking	27	2.5%
		Alcohol	13	1.2%
		Alcohol + smoking	11	1%
		Cannabis	2	0.7%
		Others	33	3.1%

Table (3) shown above reveals following findings:

- Majority of the study population did not have any co-morbid condition (89%) however, a small proportion (11%) had history of physical illness like PCOD, Hypo/ Hyperthyroidism, Psoriasis, Allergic rhinitis etc.

- There was a small proportion among study sample (6.7%) who had history of substance use though majority (93.3%) did not have any history.
- Predominant proportion of the study sample had no family history of psychiatric illness (94%), however 6% reported history of psychiatric illness like Schizophrenia, Depression, Anxiety disorder etc. among family members.
- Majority (91.9%) among the study sample did not report any substance abuse history in the family though 8.1% reported history of substance use such as smoking (2.5%) being the most common, alcohol, cannabis and others.

Table 4: Distribution of severity of Internet Addiction as per Young’s IAT Questionnaire in the study sample (n=1067)

SEVERITY OF INTERNET ADDICTION	FREQUENCY (n)	PERCENTAGE
Mild	688	64%
Moderate	169	16%
Severe	9	1%
Negative	201	19%
TOTAL	1067	100%

Fig. 4: Distribution of severity of Internet Addiction as per Young’s IAT Questionnaire in the study sample (corresponding to Table 4)

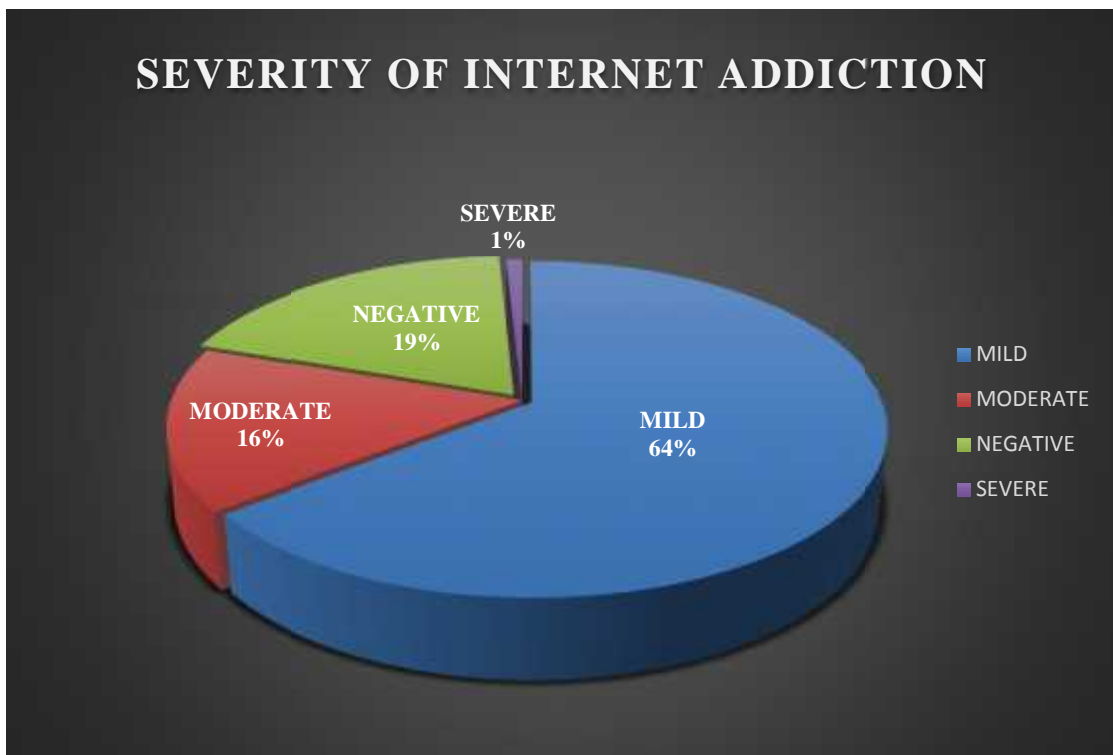


Table (4) and Fig. (4) Show a distribution of severity of Internet Addiction among health sciences students as per Young’s IAT Questionnaire. Among the total study

sample, maximum individuals had mild severity of Internet Addiction (64%). They were then followed by those with moderate addiction (16%). Individuals with severe addiction were least in number in the overall sample (1%).

There were also individuals who did not have Internet Addiction and were negative on IAT Scale comprising of 19% of the study sample.

PREVALENCE OF INTERNET ADDICTION = 100% -19 % (NEGATIVE SAMPLE SIZE) =**81%**

Table 5: Comparison of distribution of severity of Internet Addiction across different class of academic achievement in the study sample (n=1067)

SEVERITY OF INTERNET ADDICTION						
MARKS	MILD	MODERATE	NEGATIVE	SEVERE	TOTAL	IA SCORE (Mean±SD)
<50% (FAIL)	14 (1.3%)	3 (0.3%)	2 (0.2%)	2 (0.2%)	21 (2%)	40.7 ± 23.4
50% - 54.9% (PASS)	26 (2.4%)	11 (1%)	11 (1%)	1 (0.1%)	49 (4.6%)	36.1 ± 19.2
55% - 64.9% (II nd CLASS)	349 (32.7%)	100 (9.4%)	115 (10.8%)	4 (0.4%)	568 (53.2%)	32.9 ± 17.3
65% - 74.9% (I st CLASS)	283 (26.5%)	54 (5.1%)	71 (6.7%)	2 (0.2%)	410 (38.4%)	33.7 ± 15
_ > 75% (DISTINCTION)	16 (1.5%)	1 (0.1%)	2 (0.2%)	0 (0%)	19 (1.8%)	32.3 ± 10.9
TOTAL	688 (64.5%)	169 (15.8%)	201 (18.8%)	9 (0.8%)	1067 (100%)	33.5 ± 16.6

Table (5) Shown above highlights the distribution of severity of Internet Addiction across various categories of academic performance by the participants. Maximum individuals belonged to the category of IInd class category (53.2%) followed by Ist class (38.4%). It is also observed that majority of the study sample exhibit Mild Internet addiction (64.5%) and only a small proportion have Severe level of Internet Addiction (0.8%).

Fig. 5: Comparison of distribution of severity of Internet Addiction across different class of academic achievement in the study sample

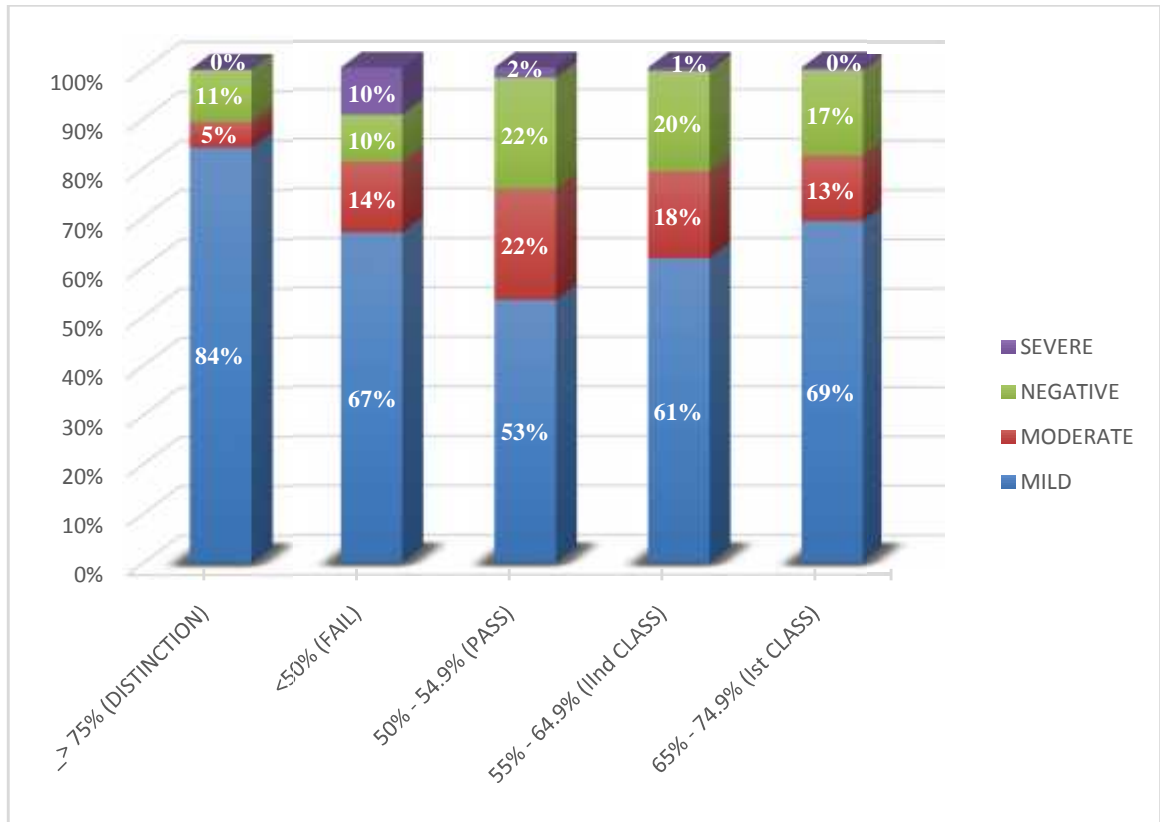


Fig. (5) Depicts distribution of severity across each category of Academic Performance. It is observed that apart from Mild Internet Severity being predominant across all the categories of Academic Performance, proportion of study sample exhibiting Moderate and Severe level of Internet Addiction increase as the academic performance decreases.

Table 6: Comparison of mean severity score of Internet Addiction across different class of academic achievement in the study sample (n=1067)

MARKS	IA SCORE (Mean±SD)	p VALUE
<50% (FAIL)	40.7 ± 23.4	0.019; (Fisher Exact Test)
50% - 54.9% (PASS)	36.1 ± 19.2	
55% - 64.9% (II nd CLASS)	32.9 ± 17.3	
65% - 74.9% (I st CLASS)	33.7 ± 15	
≥ 75% (DISTINCTION)	32.3 ± 10.9	

; Significant, p<0.05

Table (6) depicts average score of Internet Addiction as per Young’s IAT Questionnaire across each academic class performance. It was observed that participants who had poor academic performance scored more on Internet addiction scale.

The trend was towards statistical significance, with a p value of 0.019.

Table 7: Comparison of distribution of severity of Internet Addiction across gender in the study sample (n=1067)

GENDER	SEVERITY OF INTERNET ADDICTION				TOTAL	IA SCORE (Mean±SD)
	MILD	MODERATE	NEGATIVE	SEVERE		
Female	442 (41.4%)	101 (9.5%)	140 (13.1%)	6 (0.6%)	689 (64.6%)	32.9 ± 16.5
Male	246 (23.1%)	68 (6.4%)	61 (5.7%)	3 (0.3%)	378 (35.4%)	34.5 ± 16.7
TOTAL	688 (64.5%)	169 (15.8%)	201 (18.8%)	9 (0.8%)	1067 (100%)	33.5 ± 16.6

Table (7) depicts severity of Internet Addiction across gender. It was noted that average score in either of the class was similar.

Table 8: Comparison of mean severity score of Internet Addiction across gender in the study sample (n=1067)

GENDER	IA SCORE (Mean±SD)	p VALUE
Female	32.9 ± 16.5	0.14; (Student t-Test)
Male	34.5 ± 16.7	

; Significant, $p < 0.05$

Fig 6: Comparison of distribution of severity of Internet Addiction across gender in the study sample

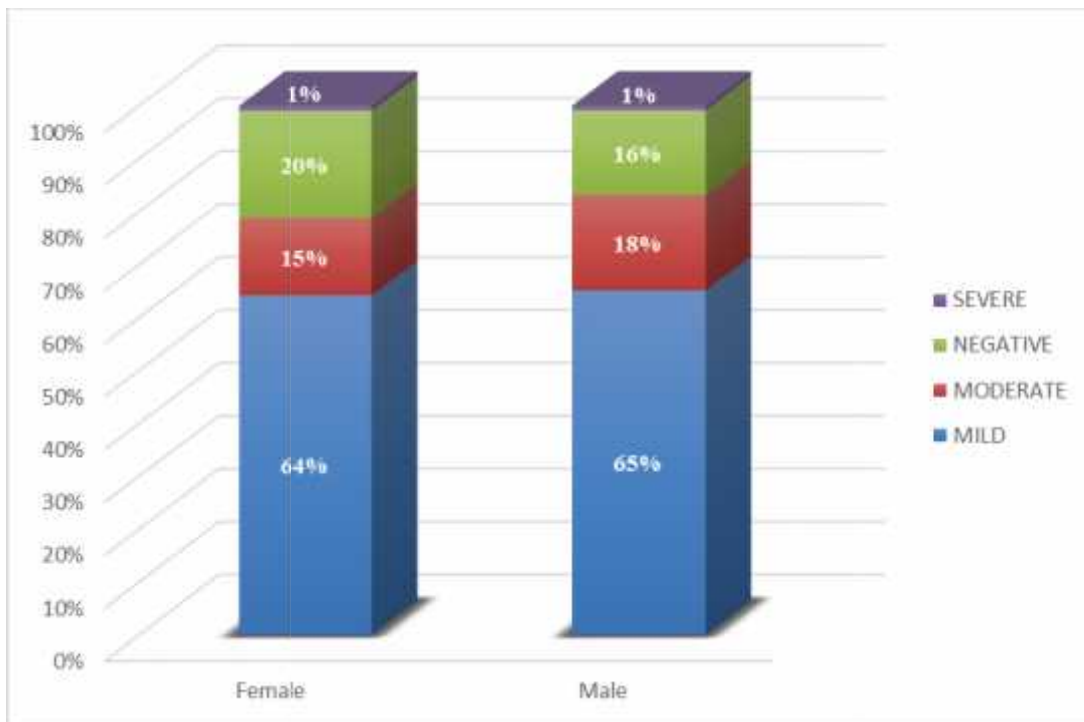


Table (8) and Figure (6) Show the comparison of severity of Internet Addiction across gender. A statistically insignificant difference was found ($p=0.14$) indicating that internet addiction is equally prevalent among males and females.

Table 9: Comparison of mean severity score of Internet Addiction between participants with history of substance use and those without substance use in the study sample

INTERNET ADDICTION	IA SCORE (Mean±SD)	p VALUE
Among participants with substance use	41.6 ±18.6	0.001; (Student t-Test)
Among participants without substance use	32.9 ±16.2	

; Significant, $p < 0.05$

Fig. 7: Distribution of participants with Internet Addiction with respect to substance use in the study sample

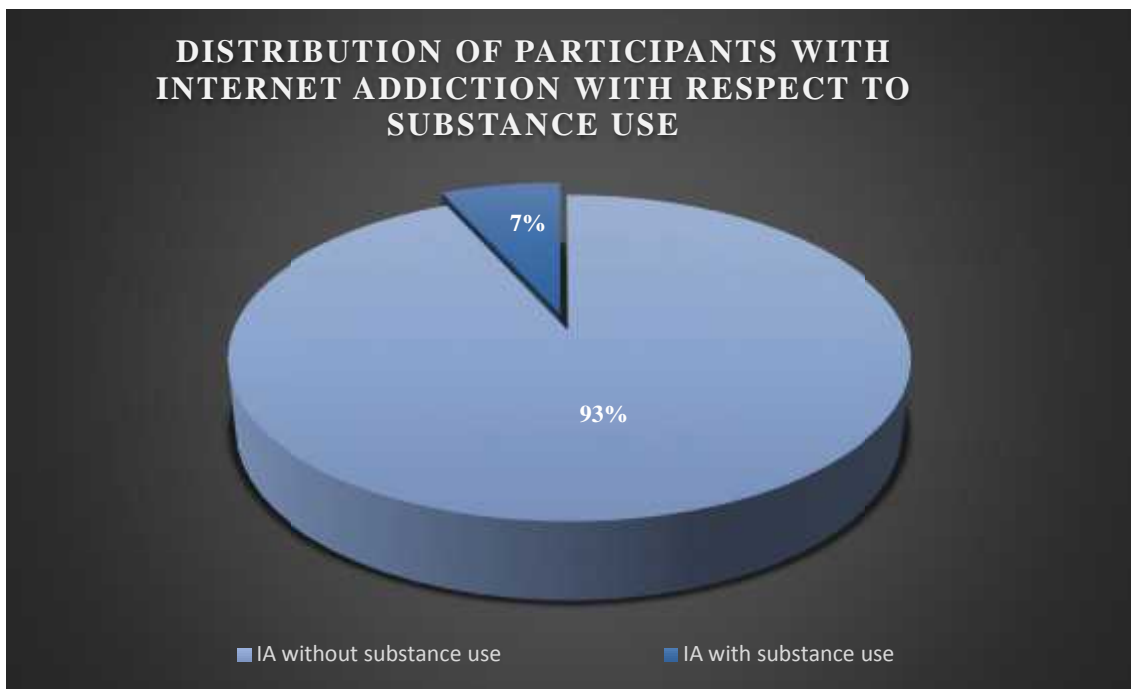


Table (9) and Fig. (7) Show the comparison between participants with Internet Addiction along with substance use (7%) with those who do not have any form of substance use though have internet addiction (93%). It is observed that those with IA as well as substance use have higher average IA score as compared to those with only IA and no substance use which turned out to be statistically significant ($p=0.00$).

Table 10: Comparison of mean severity score of Internet Addiction between participants with family history of psychiatric illness and those without family history of psychiatric illness in the study sample

INTERNET ADDICTION	IA SCORE (Mean±SD)	p VALUE
Among participants with family H/O psychiatric illness (including substance use)	36.45 ±17.62	0.05; (Student t-Test)
Among participants without family H/O psychiatric illness	33.17 ±16.45	

; Significant, p=<0.05

'Fig. 8: Distribution of participants with Internet Addiction with respect to family history of psychiatric illness in the study sample

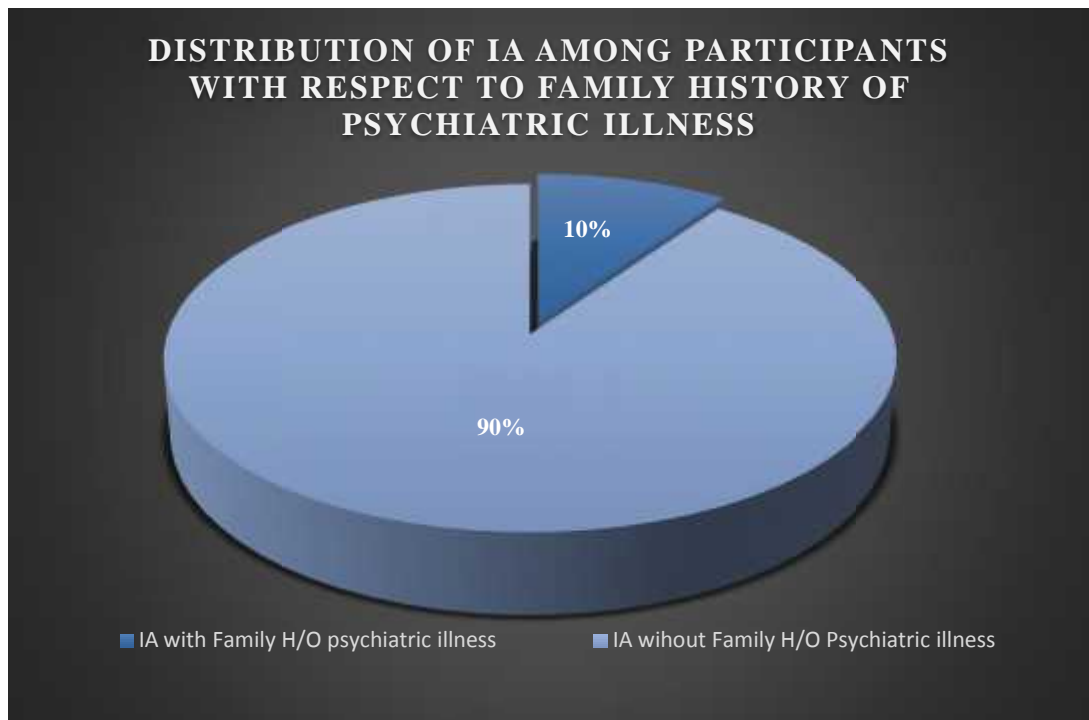


Table (10) and Fig. (8) Show the comparison between participants with Internet Addiction along with family history of psychiatric illness (including substance use)

(10%) with those who do not have any form of psychiatric illness in the family but themselves have internet addiction (90%). It is observed that those with IA as well as family history of psychiatric illness have higher average IA score as compared to those with only IA and no family history. A statistically insignificant difference was found ($p=0.05$) indicating that internet addiction is equally prevalent among those with or without any significant family history.

Table 11: Comparison of Internet Addiction among participants of different faculty in the study sample

FACULTY	FREQUENCY	IAT SCORE (Mean±SD)	p VALUE
MBBS	482	35.5±16.6	0.001; (one-way ANOVA)
BDS	392	32.8±16.5	
Physiotherapy	193	29.6±15.7	

; Significant, $p < 0.05$

Fig. 9: Comparison of Internet Addiction score among participants of different faculty of health sciences in the study sample

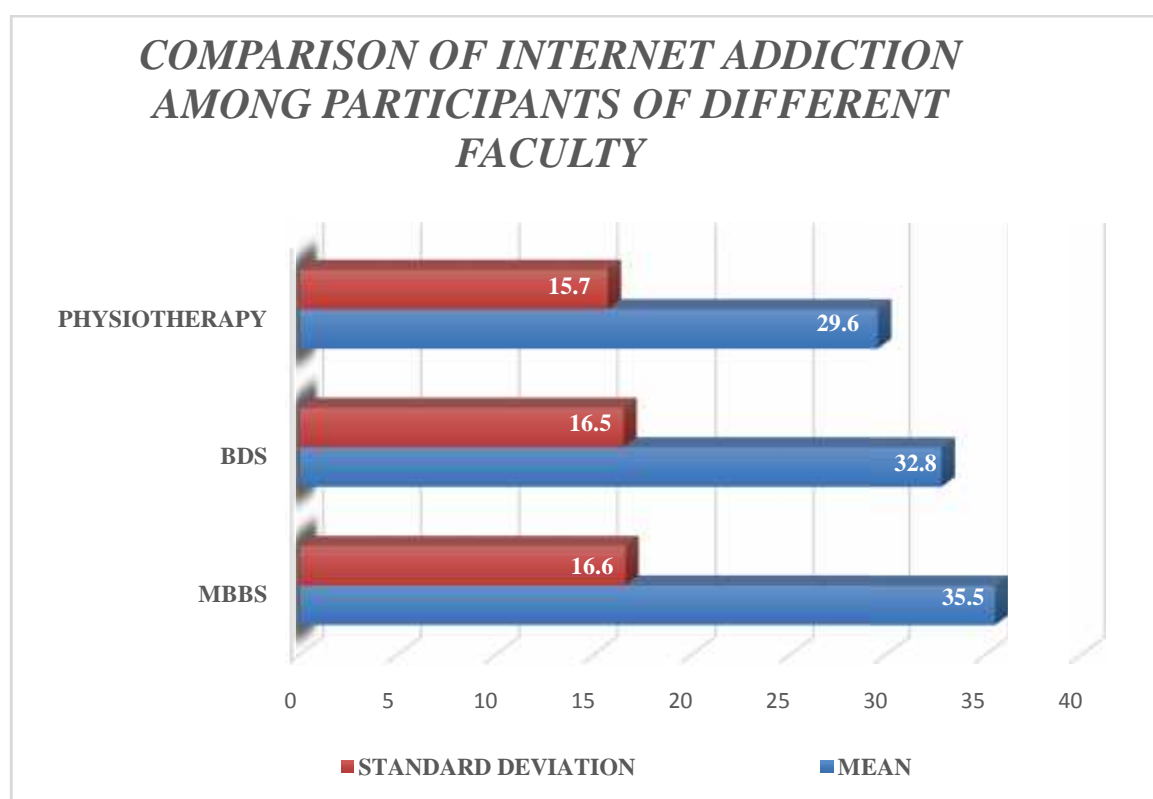


Table (11) and Fig. (9) Shown above reveal mean IAT score among MBBS participants to be slightly higher (35.5±16.6) than those among BDS (32.8±16.5) and Physiotherapy (29.6 ± 15.7). This result was found to be statistically significant ($p=0.0001$).

Table 12: Distribution of severity of Internet Addiction among varied sleep quality as per PSQI in the study sample (n=1067)

SLEEP QUALITY	SEVERITY OF INTERNET ADDICTION				TOTAL
	MILD	MODERATE	NEGATIVE	SEVERE	
Good	115 (10.8%)	9 (0.8%)	87 (8.2%)	0 (0%)	211 (19.8%)
Poor	573 (53.7%)	160 (15%)	114 (10.7%)	9 (0.8%)	856 (80.2%)
TOTAL	688 (64.5%)	169 (15.8%)	201 (18.8%)	9 (0.8%)	1067 (100%)

Fig. 10: Distribution of severity of Internet Addiction among varied sleep quality as per PSQI in the study sample (n=1067)

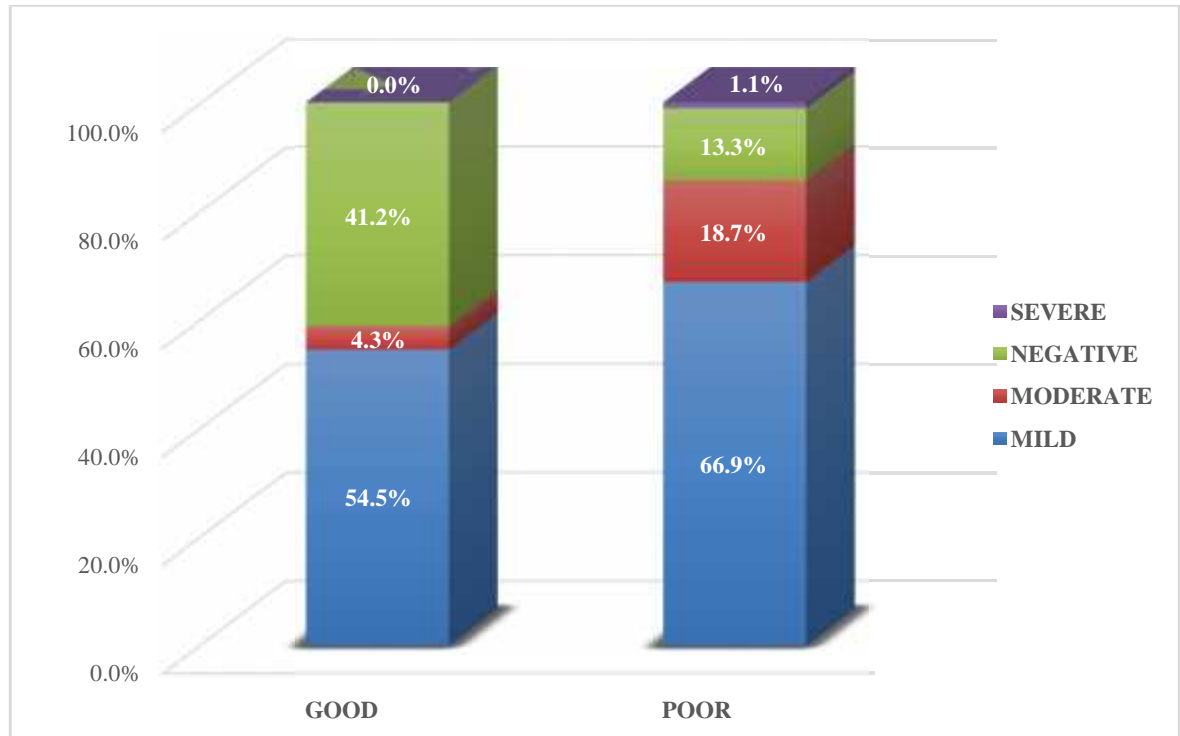


Table (12) and Fig. (10) Shown above depict severity of Internet addiction across varied sleep quality revealing predominantly poor sleep quality across the study population (80.2%). Additionally, it is observed that those with poor sleep quality had more severe internet addiction with more participants falling in the category of moderate (18.7%) and severe (1.1%) level of internet addiction as compared to those with good sleep quality. Also, majority of participants with good sleep quality did not have internet addiction as they were found negative (41.2 %) on IAT Scale.

Table 13: Comparison of mean severity score of Internet Addiction with quality of sleep in the study sample (n=1067)

SLEEP QUALITY (PSQI)	IA SCORE (Mean ± SD)	p VALUE
Good	24.3 ± 13.9	0.001; (Fisher Exact Test)
Poor	35.7 ± 16.4	

; Significant, p=<0.05

Fig. 11: Comparison of mean severity score of Internet Addiction with quality of sleep in the study sample (n=1067)

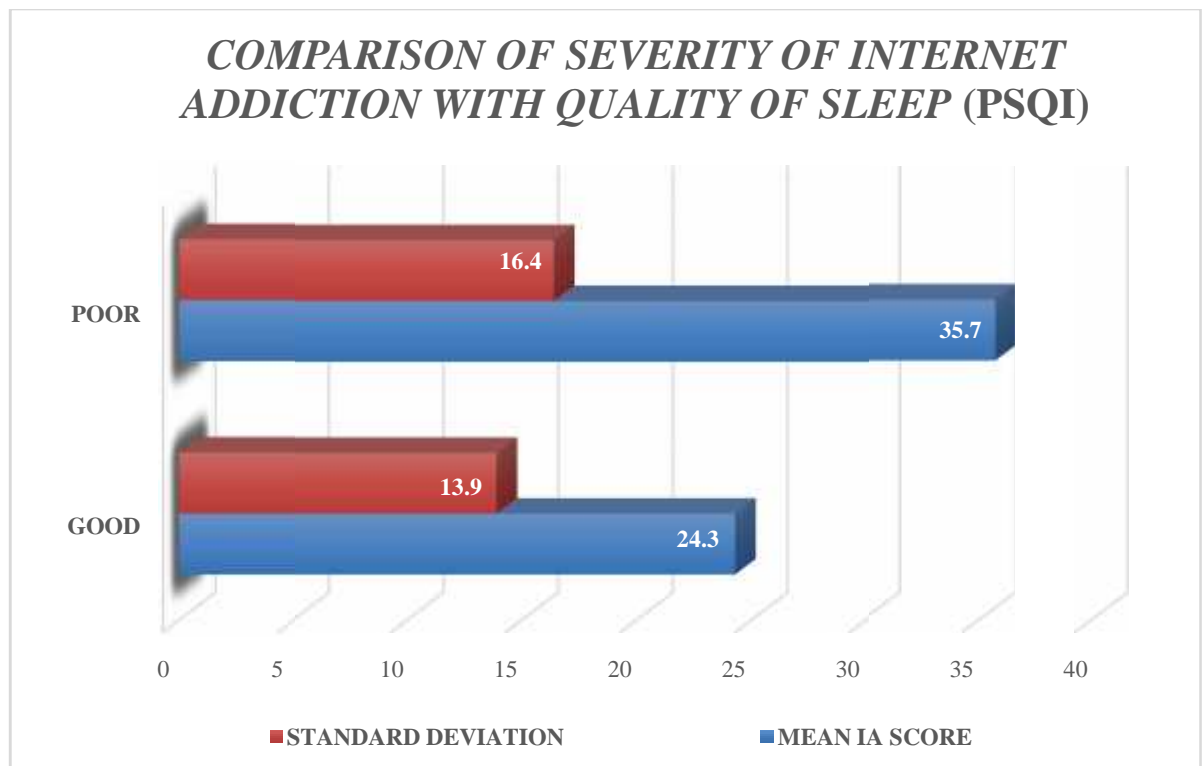


Table (13) and Fig. (11) Shown above reveal participants suffering from poor quality of sleep score higher on Internet Addiction Test as compared to those with good quality of sleep. A statistically significant difference was found (p=0.00) indicating that internet addiction is more prevalent among those with poor sleep quality than with individuals with good sleep quality.

Table 14 : Correlation between Internet addiction and quality of sleep in overall sample (n=1067)

No. of individuals	Pearson’s coefficient (r)	p value
1067	0.387	0.001*

; Significant, $p < 0.05$

Fig 12: Correlation between severity of Internet addiction and quality of sleep in overall sample (corresponding to Table 14)

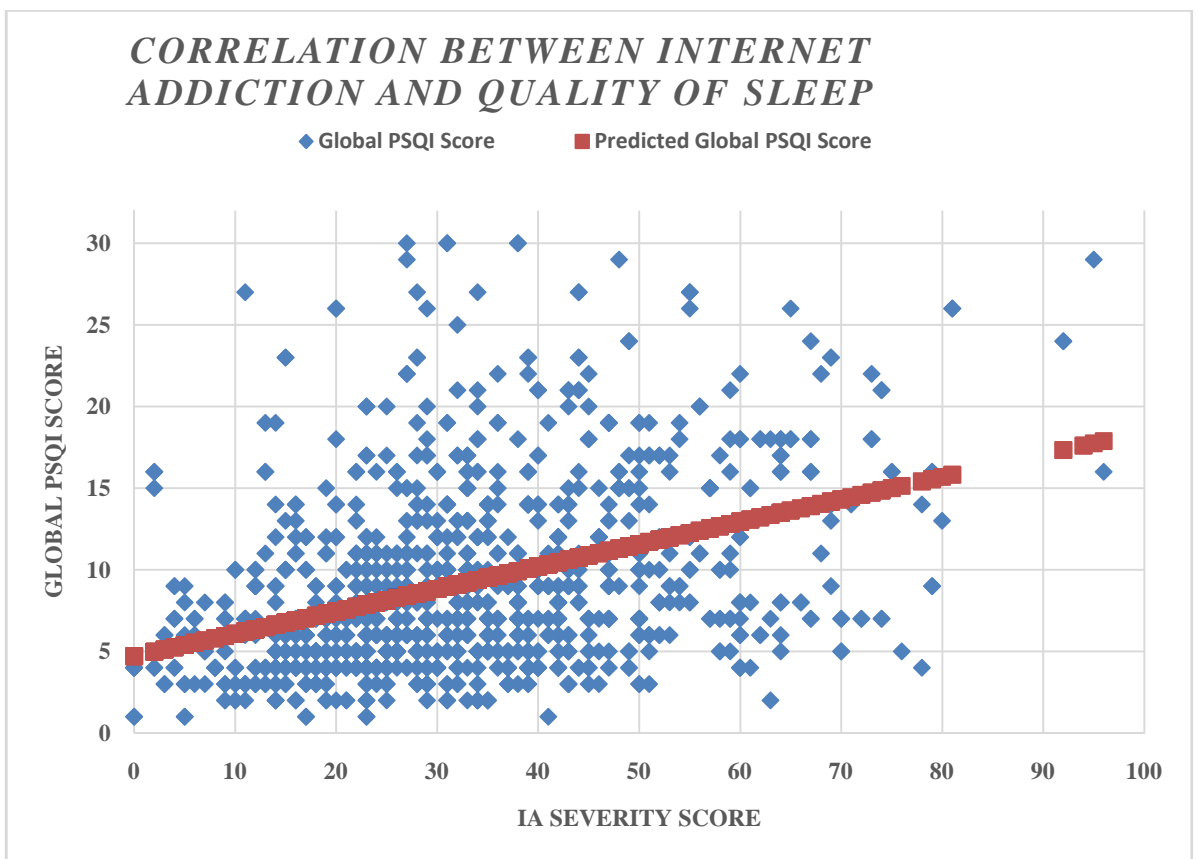


Table (14) and Fig. (12) Shown above reveal a weak positive correlation between Internet Addiction measured by using Young’s IAT Questionnaire and Sleep quality as measured by using PSQI among participants from various faculty of health sciences and the result was found to be statistically significant ($r=0.38$, $p=0.000$).

DISCUSSION

The study was done in a Medical College of North Karnataka with participants sampled from different faculties of health sciences in their respective phases studying at the college. Participants were approached during their respective lecture classes at different occasion for sample collection. Based on their availability during sample collection, participants were enrolled in the study. The primary aim of the study was to determine the prevalence of Internet Addiction among health sciences students. Attempt was also made to understand the impact of internet addiction on quality of sleep and academic performance of the participants. Correlation of severity of Internet Addiction with quality of sleep was also attempted to be studied.

The findings of the study are organized under the following headings of discussion.

1. Findings related to socio-demographic variables
2. Clinical profile of the study group
3. Distribution of Internet Addiction across study sample
4. Comparison of distribution of Internet Addiction across different class of academic achievement
5. Comparison of distribution of Internet Addiction across gender
6. Comparison of Internet Addiction across the 2 groups of participants with and without history of substance use
7. Comparison of Internet Addiction across the 2 groups of participants with and without family history of psychiatric illness
8. Comparison of Internet Addiction among participants of different faculty of health sciences
9. Comparison of mean severity score of Internet Addiction with quality of sleep
10. Correlation between Internet addiction and quality of sleep in overall sample

1). Socio-demographic variables

Faculty:Majority of the participants in the study belonged from MBBS faculty comprising of 45% of the study population followed by those from BDS (32%) and Physiotherapy (18%) out of 1067 participants of the study sample.(refer Table 2)

Previously done studies in this field relatively had a smaller sample size mostly focussing on MBBS faculty. Previously, study done by Shadzi MR et.al.,⁷⁸ in Iran was done on 402 undergraduate medical students. Another study done in Pakistan by Javaeed A et.al.,⁸¹ similarly had focused upon 316 medical students.

Mboya et.al.,¹⁴⁰ conducted a study on 500 medical and allied health sciences undergraduate students between the year 2018-2019 in Kenya consisting of students from various fields of health sciences such as that of Nursing, Diploma in health laboratories, in Occupation Therapy, Bachelor in Physiotherapy, in Prosthetics and Orthotics, Doctor of Medicine, Bachelor in Optometry and Diploma in HIV and AIDS care.

Similar cross-sectional study done in Nepal by Marahatta SB et.al.,¹⁴¹ comprised of undergraduate students from health sciences comprising of Bachelor in Public Health, Nursing, Medical lab and Technology and Pharmacy.

Even in Indian setting, previous studies did mainly involved MBBS & BDS participants. Study done by Chaudhari B et.al.,⁸² comprised of only 282 medical students. However, another study from Maharashtra by Gedam SR et.al.,⁸³ included 846 students belonging to MBBS, BDS and Nursing college. Another study from Karnataka by Bhushan S et.al.,⁸⁴ randomly selected 900 undergraduate students from Medical and dental college.

Another study done at Karnool Medical College by Subhaprada CS et. al.,¹⁴² also involved study mainly on 95 undergraduate students from 2nd phase MBBS. Similar study was done by Athulya G Asokan et. al.,¹⁴³ in Kerala on 381 MBBS students from first year to final year. Chaudhuri S et. al.,¹⁴⁴ from Kolkata performed study on 400 medical undergraduates on similar path as depicted in our study.

Gender:In this study population, females (65%) were slightly higher in number as compared to males (35%). In Indian setting, previously study done by Srijampana, et al.⁸⁵ also had female preponderance with 121 (57.2%) females and 90 (42.8%) were males. Study done by Chaudhari B et.al.,⁸² also revealed out of 282 students, 122 (43.26%) being male while 160 (56.74%) were females.

Domicile:A majority of the participants came from an urban background (93%) as compared to remaining 7% who hailed from rural background. However, Hamza A et.al.,¹⁴⁵ has revealed that use of Internet is equally prevalent in Rural as well as Urban background.

2). Clinical profile of the study group

H/O Substance Use : In the study population, it was noted that majority of the participants did not have any history of substance use (93%), however, our study showed comparable results with previous studies as 7% of the population did exhibit certain substance use like that of smoking, alcohol, cannabis and others.(refer Table 3)

A study done by Nemati Z et.al.,¹⁴⁶ done on 385 high school students revealed that 8.31% of the students were prone to abusing substances along with internet addiction indicating the potential burden.

Studies Rai et.al.,¹⁴⁷ revealed substance use among health sciences students for recreational purpose to combat stressful environment as a perpetuating and predisposing factor for addictive behaviour. The study revealed prevalence of alcohol consumption to be 7.1% , cannabis prevalence reported to be 1.5% which is comparable to our study.

However, certain studies have also demonstrated increased prevalence of substance use among health sciences students. Study conducted by Goelet. al.,¹⁴⁸ on Undergraduate and Post-graduate medical students revealed prevalence of alcohol among undergraduates to be around 16.6 % while 31.5 % among post-graduates indicating the existing problem which is commonly unaddressed.

Vulnerability for substance use is common among adolescents which is invariably the same age group of students of health sciences.^{74,92} Additional peer pressure, easy availability and accessibility of different forms of substances with lack of monitoring since most of them stay away from protected environment of their homes without any supervision could lead to added stress in an already existing stressful condition. It is possible that students require distractions to relieve the ongoing stressful situations with the use of Internet for the purpose of entertainment eventually falling in the trap of Internet addiction.^{147,148} Also it could be understood that students with substance use invariably have predisposition to Internet addiction due sleep disturbances, anxiety and depression leading to a vicious cycle which requires more attention.¹⁰¹

Family history of Psychiatric illness including substance addiction:

Predominant proportion of the study sample did not report of family history of psychiatric illness (94%), however 6% had family history of psychiatric illness like

Schizophrenia, Depression, Anxiety disorder etc. among family members. No study has been done to establish relation between family history of psychiatric illness with that of internet addiction, however loneliness⁷⁴ and poor family support⁷⁶ including lack of love⁹⁰ could be attributed to develop more time on internet and subsequently leading to internet addiction.

Majority (91.9%) among the study sample did not have any substance abuse history in the family though 8.1% did reported history of substance use like smoking (2.5%) being the most common, alcohol, cannabis and others.

Study done by Beison A, Rademacher DJ in the year 2017 revealed that family history of alcohol addiction could have an impact on problematic use of smartphones and thus internet addiction among the off-springs.¹⁴⁹

3). Distribution of Internet Addiction

The overall prevalence of Internet Addiction was found to be 81% in our study population. Among the total study sample, majority participants had mild level of Internet Addiction (64%) as per Young's Internet Addiction Questionnaire indicating average level of internet usage. They were then followed by those with moderate severity(16%). Individuals with severe addiction were least in number in the overall sample amounting for only 1%.

There were also individuals who did not have any Internet Addiction and were negative on IAT Scale comprising of 19% of the study sample.(refer Table 4 and Fig. 4)

Numerous studies have been done previously to depict prevalence of Internet addiction in different population, however data continue to remain insufficient with respect to population belonging to health sciences.

Shadzi MR et.al.,⁷⁸ performed study on 402 medical students in Iran and found the prevalence of PIU in the study to be around 38.6%. Similar study was done by Javaeed A et.al.,⁸¹ on 316 medical students in Pakistan and found out the prevalence to be 28.2% under the category of 'severe addiction' and most importantly only 0.9% students did not have internet addicted according to IAT Questionnaire.

Mboya et.al.,¹⁴⁰ conducted a study on 500 medical and allied health sciences undergraduate students in Kenya revealed overall prevalence of Internet addiction around 31% which consisted of higher prevalence of internet addiction among those using internet for social networking instead of use for academic purposes.

Study done in Nepal by Marahatta SB et.al.,¹⁴¹ comprising of 236 undergraduate students from health sciences also revealed 50.8% students suffered from mild addiction, 40.7% had moderate level while 1.3% had severe level of internet addiction.

There have been multiple Indian studies revealing the similar findings.

Chaudhari B et.al.,⁸² studied on 282 medical students and found the prevalence of internet addiction among them to be 58.87% (mild – 51.42%, moderate –7.45%). Similarly, study from Maharashtra by Gedam SR et.al.,⁸³ included 846 undergraduate students belonging to MBBS, BDS and Nursing college revealed the total prevalence of internet addiction to be 19.85%, with that of moderate and severe addiction being 19.5% and 0.4%, respectively.

Bhushan S et.al.,⁸⁴ did a study on 900 undergraduate students from Medical and dental college to reveal that 61% of students had mild addiction while 19.5%

students were moderately addicted to internet, however, 19.5% students were not addicted to Internet at all.

Another study done at Karnool Medical College by Subhaprada CS et. al.,¹⁴² involving 95 undergraduate students from 2nd phase MBBS also put forth prevalence of internet addiction as mild- 52.63%, moderate- 24.21%, while 23.16% students did not have any form of internet addiction and were reported normal.

ChaudhuriS et. al.,¹⁴⁴ from Kolkata with study on 400 medical undergraduates depicted prevalence of Internet addiction with majority of respondents (58.7%) under mild category while 15% also reported moderate level of internet addiction.

Athulya G Asokanet. al.,¹⁴³ from Kerala on conducting study on 381 MBBS students from first year to final year revealed prevalence of Internet addiction approximately 61.4% among the students. Out of them, 63.7% reported mild, 35.5% had moderate and 8 % reported severe level of internet addiction which is similar to the results found in our study.

Multiple studies reporting the prevalence of Internet addiction among health sciences students convey the burden of problem. It is a well-known fact that the field of health sciences involves rigorous curriculum demanding taxing work-hours along with numerous co-curricular activities. It is possible that students often tend to look out for portals to relive their ongoing anxiety and stress. Availability of companions belonging to the same age-group, residing together in hostels and sharing the same amount of work pressure often contribute to sharing some leisure time together with online activities as well as substance. Studies like Athulya G Asokanet. al.,¹⁴³ have mentioned that students living in hostels were noted to have more internet addiction as compared to those staying at home. The reason could be unmonitored usage in

hostel settings as compared to monitored environment of the house. Additionally, more students were noted to indulge in internet for non-academic purposes like that of chatting, socializing, online shopping and video-games, downloading multi-media files and pornography as compared to academic purposes which invariably leads to internet addiction as evidenced by different studies where more usage of internet for non-academic purposes have been depicted among internet addicted individuals.^{84,85,143}

4). Internet Addiction and academic achievement

Maximum individuals in the study sample belonged to the category of IInd class (53.2%) which was followed by Ist class (38.4%). It was also observed that majority of the study sample fell in Mild Internet addiction category (64.5%) and only a small proportion exhibited Severe level of Internet Addiction (0.8%).(refer Table 5)

It was also observed that apart from Mild Internet Severity being predominant across all the categories of academic performance, proportion of study sample exhibiting Moderate and Severe level of Internet Addiction increase with the decline in academic performance.

It was observed that participants who had poor academic performance scored more on Internet Addiction scale for instance, Fail category (40.7 ± 23.4 IAT Score) and Pass category (36.1 ± 19.2 IAT Score); which is statistical significance, with a p value of 0.019 indicating that academic performance decreases with severity of internet addiction. (refer Table 6 and Fig. 5)

Bhushan S et.al.,⁸⁴ revealed in a similar study with a sample size of 900 students , a statistically significant association ($p= 0.01$) with the poor academic

performance of the students with majority of the population falling in Internet addicted category those who had failed their recent university exams or had barely passed.

Study done at Karnool Medical College by Subhaprada CS et. al.,¹⁴² also revealed that academic performance of students without internet addiction was better as compared to those with internet addiction. A statistically significant association with $p < 0.05$ was established between internet addiction and poor academic performance.¹⁴²

Athulya G Asokanet. al.,¹⁴³ from Kerala on conducting study on 381 MBBS students from first year to final year revealed an additional result apart from prevalence which was poor academic performance among internet addicted students thus establishing negative impact of internet addiction however also emphasised upon various other influential factors on academic performance with internet addiction being one of them and not the sole determining factor.

Similar study was done by Javaeed A et.al.,⁸¹ on 316 medical students in Pakistan revealed that medical students scoring significantly poor in their exams ($p < .001$) which is similar to the results found in our study thus depicting the burden of internet addiction.

Health sciences require gruelling study hours to meet the basic requirements related to the field. Many students are involved in academic activities which need them to use internet. However, some many fall prey to social platforms, pornography, online video games and such activities which often end up with spending hours together on unproductive means. With the current market trend and competition, internet data are easily available at an inexpensive rate forcing an individual for

unlimited usage killing lot of time. Invariably, this leads to reduced attention on academic purposes and practices often resulting in poor performance. However, academic performance is dependent on multiple influential factors, one of them could be internet addiction which means other factors should not be ignored and thus requires a multidimensional approach.

5). Distribution of Internet Addiction across gender

It was noted that average IAT score of male (34.5 ± 16.7) was almost similar to that of female (32.9 ± 16.5) in the study sample.(refer Table 7 and 8)A statistically insignificant difference was found ($p=0.14$) indicating that internet addiction is equally prevalent among males and females in this study.(refer Fig.6)

Some of the studies in the past support this finding such as study done by Srijampana, et.al.,⁸⁵supported that susceptibility for internet addiction was nearly same between males and females among the study population.

Similarly, study done by Javaeed A et.al.,⁸¹in Pakistan also revealed statistically insignificant difference in IAT score and prevalence of internet addiction across gender.

However, some other previous studies have revealed some contradictory findings. Study done by Chaudhari B et.al.,⁸² on 282 students in Maharashtra revealed males being more addicted to internet as compared to females ($p = 0.00003$).

Another study from Maharashtra by Gedam SR et.al.,⁸³ on 846 undergraduate students also revealed a statistical significance associated with gender as an important factor for internet addiction ($p<0.05$)

On similar lines, study done by Athulya G Asokanet. al.,¹⁴³ from Kerala also revealed internet addiction was more prevalent among males with 79% of male participants reported to be addicted as compared to those of 56% female participants with the difference being statistically significant ($p = 0.001$).

Possible explanation for such variations could be prevalence of substance use, earlier being more common among males as compared to females, however now taking equal preponderance. Similar to substance use, internet usage with respect to young males when considered for purpose of recreational activities like video-gaming, pornography etc. are more commonly reported as compared to females.

Thus, more research is required in this field to throw light upon the actual burden of internet addiction across gender with special attention in the field of health sciences.

6). Internet Addiction and history of substance use

In the study sample, it was found that there was a small proportion of participants with Internet Addiction along with substance use (7%) however, majority of the sample size did not have any form of substance use though exhibited some level internet addiction (93%). It was observed that those with IA as well as substance use had higher average IA score as compared to those with only IA and no substance use.(refer Table 9)

This result turned out to be statistically significant ($p=0.00$) indicating that participants with existing substance use also had preponderance for internet addiction.(refer Fig. 7)

A study done by Nemati Z et.al.,¹⁴⁶ on 385 high school students revealed that 8.31% of the students were prone to abusing substances along with internet addiction emphasising the burden of substance use.

Another study done by Yen JY et.al.,⁹⁸ on 2,453 college students revealed that Internet addiction indeed was significantly associated ($p < 0.05$) with harmful alcohol use among college students thus, indicating the use of substance more frequent across the population with internet addiction.

This could be understood well with the fact that undergraduate students of health sciences invariably belong to adolescent age-group which has increased prevalence of substance use.^{74,92} Subsequent peer pressure, easy availability and accessibility of various substances in an unsupervised environment in an already stressful condition of gruelling working-hours of health sciences could lead to frequent usage of substance eventually falling prey to addiction. Additionally those with substance use invariably have propensity to fall for any form of addiction including internet.

Also it could be understood that students with substance use invariably have predisposition to Internet addiction due to sleep disturbances, anxiety and depression arising secondary to substance use leading to a vicious cycle which requires more attention.¹⁰¹

7). Internet Addiction and family history of psychiatric illness

A small proportion of participants in the study sample had Internet Addiction along with family history of psychiatric illness (including substance use) (10%) while those who do not have any form of psychiatric illness in the family but themselves

have internet addiction (90%) constituted the majority of study sample. It was observed that those with IA as well as family history of psychiatric illness had higher average IA score as compared to those with only IA and no family history. (refer Fig. 8)

Although, a statistically insignificant difference was found ($p=0.05$) indicating that internet addiction is equally prevalent among those with or without any significant family history.(refer Table 10)

There is dearth of study to establish relation between family history of psychiatric illness with that of internet addiction, however loneliness⁷⁴ and poor family support⁷⁶ including lack of love⁹⁰ could be attributed in individuals to spend more time on internet and subsequently leading to internet addiction.

A study done by Beison A, Rademacher DJ (2017) revealed that family history of alcohol addiction could have an impact on problematic use of smartphones and thus internet addiction among the children.¹⁴⁹ There was a statistically significant association ($p=0.03$) in ACPAT (Adapted Cell Phone Addiction Test) score and the degree of positive family history of alcohol dependence.

It could be understood that individuals with family history of psychiatric illness or substance addiction often resort to some form of escapism⁷⁶ in order to combat low social support^{74,92}, lack of family love⁹⁰ and care from family members seeking virtual support directly or indirectly to fill the void of reality. Internet and mobile phone usage has been noted to be high in such population¹⁴⁹ implying the mode of coping the stress by virtual means subsequently leading to excessive usage and landing with internet addiction. However, the current study could not establish the similar results thus requiring more research data on the topic.

8). Internet Addiction among participants of different faculty of health sciences

The mean IAT score among MBBS participants in the study sample were found to be slightly higher (35.5 ± 16.6) than those among BDS (32.8 ± 16.5) and Physiotherapy (29.6 ± 15.7) implying more internet addiction among students of MBBS as compared to those from BDS or Physiotherapy(refer Fig. 9) which was also found to be statistically significant ($p=0.0001$).(refer Table 11)

This is the first study to have taken steps to compare the burden of internet addiction across different fields of health sciences. There is unavailability of data to compare this finding due to dearth of research in this aspect. Further, research is expected to concur the findings mentioned above.

9). Internet Addiction and quality of sleep

Majority of study participants with Internet addiction predominantly had poor sleep (80.2%).(refer Table 12) Additionally, it was also observed that those with poor sleep quality had more severe internet addiction with more participants falling in the category of moderate (18.7%) and severe (1.1%) level of internet addiction as compared to those with good sleep quality. Also, majority of participants with good sleep quality did not have internet addiction as they were found negative (41.2 %) on IAT Scale.(refer Fig. 10 and 11)

Participants suffering from poor quality of sleep scored higher on IAT as compared to those with good quality of sleep.

A statistically significant difference was found ($p=0.00$) indicating that internet addiction is more prevalent among those with poor sleep quality than with individuals with good sleep quality.(refer Table 13)

A study done by Lawrence T. Lam¹⁰¹ in a systematic review revealed that results of four different studies- 2 from Taiwan^{150,151}, 1 from Korea⁷⁰ and 1 from Hong Kong¹⁵² indicated association of PIU with problems related to sleep such as short sleep duration, subjective insomnia and poor quality of sleep. The results also revealed that participants experiencing insomnia were approximately 1.5 times as acceptable to be categorised as a “Problematic Internet User” when compared to those without any sleep problems.¹⁰¹

Study performed by Shadzi MR et.al.,⁷⁸ also revealed higher prevalence of poor sleep quality among study participants to be around 40% which could be attributed to the higher prevalence of PIU turning out to be statistically significant ($p < 0.05$) which is similar to the findings of our study.

As per the studies discussed, it could be inferred that excessive usage of internet consumes unprecedented amount of time from the routine life of an individual often leading to disturbance in daily schedules which include sleep-wake hours. Late night log-ins are common among hostellers who often indulge in recreational activities after day-long working hours with the common belief of uninterrupted high-speed data for browsing often enticing to individuals landing in internet addiction. During the course of recreation, no time constraints are addressed leading to continued use till wee-hours which is followed by limited hours of effective sleep due to additional pressure of adherence to the routine schedule of the following day. This vicious cycle leads to disturbed circadian rhythm resulting in various sleep disturbances like insomnia, day-time sleepiness, hypersomnia etc. all leading to poor quality of sleep.

10). Correlation between Internet addiction and quality of sleep

The result in our study showed a weak positive correlation between Internet Addiction measured by using Young's IAT Questionnaire and Sleep quality as measured by using PSQI among participants from various faculty of health sciences and the result was found to be statistically significant ($r=0.38$, $p=0.000$). (refer Table 14 and Fig. 12)

Previous study done by Shadzi MR et.al.,⁷⁸ also took efforts to find total correlations between PIU and mental health problems including sleep quality was not statistically significant. However, the amount of correlation these variables highlighted that a noticeable proportion of the mental health problems and sleep quality experience cannot be explained by PIU alone, despite of the role of PIU leading to both mental health problems and poor sleep quality cannot be ignored completely.⁷⁸

This further indicates that there should be more factors which predict the coexistence of PIU, poor sleep quality and mental health problems.

❖ **Strengths of the study**

- There have been limited studies in the past regarding the prevalence of internet addiction among health sciences students. This study further adds to the literature with a large study sample which has not been attempted so far.
- Our study also helps to understand the impact of internet addiction on academic performance better by giving description regarding severity of internet addiction among various classes of academic performances in this study population adding further to the available literature.
- In comparison to the previous studies, our study also showed impact of internet addiction on quality of sleep ; given that study sample of health sciences participants are already known to have various sleep problems due to other factors. Internet addiction adds to the literature as another contributing factor among this population adding to the burden of an existing problem.
- Unlike previous studies, lacking significant correlation between Internet Addiction and quality of sleep, our study managed to depict weak positive correlation between the same which adds on to the existing literature, by highlighting the correlation of severity of internet addiction with sleep quality.

❖ **Limitations of the study**

- Firstly, it relied upon a self-assessment questionnaire for the assessment and no formal interview was conducted to confirm the clinical diagnosis of internet addiction. Thus, social desirability bias cannot be ruled out.
- Secondly, it was a cross-sectional study , thus the generalization of the result is limited only to college student population across the health sciences group.

- Further studies are required in India with larger population size in general setting and requires more focus on the multiple psychosocial comorbidities associated with internet addiction.
- In the present study, data regarding the purpose of Internet use is lacking thus, couldn't be differentiated if it was used solely for entertainment purpose (like online shopping, social media, video gaming, pornography etc.) or involved academic purposes as well. An observational, longitudinal study would be recommended for more information on the prevalence of addiction.
- Additionally, the current study only highlighted regarding the quality of sleep, it did not give insight into specific sleep related problems such as insomnia, hypersomnia etc. which requires further research.

❖ **Future directions**

This study opens us to an immediate need for stringent control over the internet use at institutional level. Further, there is a need of an improvised questionnaire which can provide us with a better understanding of internet usage in terms of duration and the purpose behind using the internet. Additionally, various psycho-social comorbidities exist determining the impact of internet addiction on academic performance and sleep quality, each variable factor needs special attention to establish the correlation between the same.

❖ **“IPS Recommendations For Screen Use”¹³⁹**

The Indian Psychiatric Society has come forth with “Recommendations For Screen Use” in keeping with objective to educate and create awareness regarding the rampant use of internet for different age groups. As per the recommendations, students should be addressed with Personal Digital- Time management tips based for adult population¹³⁹ in order to make them aware about the precautions to be taken while using internet to combat the hazardous effects of digital platforms and their usage.

❖ **Post Script : COVID-19 Scenario**

Ongoing pandemic has further strengthened the digital world. With need for social distancing and thus minimal person-to-person contact, virtual world has taken precedence in our day-to-day lives. A spike in internet usage with the availability of abundant broadband services at inexpensive rates has lured individuals to resort to digital platforms for unaccounted period. Virtual learning programs such as webinars, lectures along with other academic activities and work from home scenario have further emphasised the growing demand of internet and digital platforms. Thus, the effects of unprecedented use of internet among students and adult population become a matter of concern during pandemic and post-pandemic era. It has also been noted that addiction to online-gaming and social media platforms has significantly increased. Additionally, suicides have been reported once internet facilities were stopped implying the propensity of addiction and hazardous effects of the same. This further draws attention to the need for awareness regarding possibility of internet addiction in the changing world.

CONCLUSION

In a span of last decade, internet has claimed to be an integral part of our lifestyle. Internet use among health sciences students is not an unknown entity. Accessibility and acceptance of Internet use due to availability of high speed internet at lucrative rates might end up with Internet addiction.

Due to heightened use of Internet leading to addiction, many students exhibit various mental health problems including disturbed sleep. Thus, the crucial event to prevent rampant use of internet leading to addiction, subsequently causing sleep disturbances and invariably deteriorating academic performance take precedence.

Though there have been various studies and recommendations, internet addiction has not yet acquired a status of a psychiatric disorder officially as is still considered a part of Gaming disorder, but certainly requires more attention as a separate entity.

Appropriate screening tools are required to be applied for prompt assessment and control of Internet Addiction. There is a need for an improvised questionnaire to give better understanding of internet use with respect to duration and purpose of using the internet. Specific measures are required to cut-down misuse of internet. Internet addiction demands more attention and parameters such as sleep quality and academic performance should be taken into consideration while promoting awareness about propensity to develop internet addiction and educating students regarding healthy internet use.

SUMMARY

- This study was conducted on students attending lecture classes at KLE Academy of Higher Education and Research (KAHER) , Nehru Nagar, Belagavi. One thousand and sixty seven undergraduate students from different phases were assessed for prevalence of Internet addiction across various faculties of health sciences including MBBS, BDS and Physiotherapy. Attempts were further made to assess the impact of internet addiction on their academic performances and quality of sleep.
- The study depicted the prevalence of internet addiction to be around 81% with 64 % of the sample falling in the category of mild addiction, 16 % as moderate and 1 % exhibiting severe internet addiction. However, 19% of the study population did not show any form of internet addiction.
- Participants who scored less in their university exams suffered more with internet addiction indicating the deleterious effects of internet addiction on their academic performance and the results were statistically significant. This, however, does not prove internet addiction as the sole factor determining academic performance, other influential factors should also be considered.
- The study also emphasised the prevalence of poor sleep quality among internet addicted individuals with results being statistically significant indicating the burden of internet addiction on sleep disturbances invariably leading to innumerable mental health conditions.
- In COVID-19 scenario, need for understanding the purposeful usage of internet should be demarcated from the unprecedented usage and thus being at disposal to develop internet addiction.

- Efforts must be made in understanding purpose of internet usage giving rise to addiction among health sciences students. Additionally, internet addiction leading to sleep disturbances should not be ignored and detailed evaluation regarding types sleep disorders secondary to internet addiction taken up in near future.

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ANNEXURE I

ETHICAL CLEARANCE CERTIFICATE

	K.L.E. ACADEMY OF HIGHER EDUCATION AND RESEARCH (Deemed - to - be - University)	
	Accredited 'A' Grade by NAAC (2 nd Cycle)	Placed in Category 'A' by MHRD (GoI)
JAWAHARLAL NEHRU MEDICAL COLLEGE, NEHRU NAGAR, BELAGAVI-590010 (KARNATAKA-INDIA)		
Website: http://www.jnmc.edu E-Mail : dome@jnmc.edu	Phone: (+ 91-(0)831 Office : 2472550 Principal: 2471701 Fax No. +91 (0)831 - 2470759	
Ref: MDC/DOME/ 45		Date: 24/11/2018
To. REGNO: BQ0118001 PG student in Psychiatry, J.N.Medical College, BELAGAVI.		
Sub: Institutional Ethical Clearance for the study.		
<p>With reference to the above, we wish to inform you that your proposed research project titled "STUDY OF INTERNET ADDICTION AND ITS IMPACT ON QUALITY OF SLEEP AND ACADEMIC PERFORMANCE IN HEALTH SCIENCES STUDENTS – A DESCRIPTIVE STUDY", is ethical and justifiable. The proposed research project has been cleared by the JNMC Institutional Ethics Committee on Human Subjects Research.</p>		
 (Dr. Arathi Darshan) Member Secretary JNMC Institutional Ethics Committee on Human Subjects Research, J.N.Medical College, Belagavi.		 (Dr. Roopa M Bellad) Chairman, JNMC Institutional Ethics Committee on Human Subjects Research, J.N.Medical College, Belagavi.

ANNEXURE II

INFORMED CONSENT

“STUDY OF INTERNET ADDICTION AND ITS IMPACT ON QUALITY OF SLEEP AND ACADEMIC PERFORMANCE IN HEALTH SCIENCES STUDENTS – A CROSS SECTIONAL DESCRIPTIVE STUDY”

Principal Investigator (PI): REG NO: BQ0118001

Objective/Purpose of the study: You are being requested to be a subject in a cross-sectional study, the purpose of which is to study prevalence of Internet Addiction among health sciences students at KAHER, Belagavi conducted between 1st January 2019 and 31st December 2019, by REG NO: BQ0118001, a post-graduate student in the Department of Psychiatry at Jawaharlal Nehru Medical College, Belagavi, Karnataka.

You have been requested to participate in this study as you are a student studying at the university belong to the profession of health sciences. Therefore, the above study helps provide better knowledge regarding the burden of problem of internet addiction among health sciences professionals.

Procedure involved: If you agree to be a part of the study, the PI will interview you and take the details according to predesigned proforma.

Risks and benefits involved: There are no risks involved. During the period of study, the existence or development of any significant findings in terms of psychiatric disorders will be informed by the PI to you for the appropriate action.

Alternatives: Your participation in this study is a completely voluntary decision. If you do not want to be a part of the study, you may refuse for the and if you want to withdraw from the study for any reason, you may do so without any hesitation. Discontinuation from the study for any reason will not affect your current or future relationship with KAHER, Belagavi.

Privacy and confidentiality: The information provided by you will be known to the PI and the members of the research team. This information will remain confidential and will be disclosed to others only with your written permission or if required by the law.

Financial incentives for participation: You will not be paid/offered any gifts for participation in the research. There will not be any remuneration for participating in the research and you will not be reimbursed for any expenses, such as bus/train travelling /companion/assistant etc.

Authorization to publish results: When the results of the research are to be published or discussed in conferences by the PI, no information will be disclosed that will reveal your identity.

STATEMENT OF CONSENT

I have read and have completely understood the entire information given in the consent form, which explains all the details of the study, i.e, the purpose, procedure involved, risks & benefits, privacy & confidentiality, incentives and the authorization to publish the results of the study. I have voluntarily agreed to participate in the study. I may withdraw my participation for any reason or may be withdrawn by the investigator from the study for any reason at any time. I am not giving up any of my legal rights by signing this consent form. I will be given a copy of this consent form.

Signature of the participant with date: _____

Name of the participant: _____

Signature of the witness with date: _____

Name of the witness: _____

Signature of the Investigator with date: _____

ANNEXURE II

STUDY PROFORMA

“STUDY OF INTERNET ADDICTION AND ITS IMPACT ON QUALITY OF SLEEP AND ACADEMIC PERFORMANCE IN HEALTH SCIENCES STUDENTS – A CROSS SECTIONAL DESCRIPTIVE STUDY”

SOCIO-DEMOGRAPHIC PROFORMA

Roll No. :

Name:

Sex: Male/Fema

Age:

Faculty: MBBS

Phase: 1 /2 /3 /4

BDS

Physiotherapy

Pharmacy

Place :

(Urban/Rural)

Religion: Hindu /Muslim /Sikh /Christian /Others

Contact No. :

E-mail ID :

Physical Illness: Yes/No (e.g. Hypothyroidism /PCOD etc.)

If Yes please specify:

On any treatment: Yes/No

Name of medication:

Psychiatric illness: Yes/No

If Yes, please specify:

On any treatment: Yes/No

Name of medication:

Habits: (Smoking/ Alcohol/ Cannabis/ Others)

Hours of Physical Exercise (in a week) : range

Family H/O psychiatric illness: Yes/No

If Yes, please specify:

Family H/O addiction: Yes/ No

If Yes, please specify: (Alcohol/smoking/Cannabis/ Others)

Marks obtained in recent university exams:

- a). <50% (fail)
- b). 50.1-54.9 % (pass)
- c). 55-64.9% (IInd class)
- d). 65-74.9 % (Ist class)
- e). 75% (Distinction)

Application of Scales:

Young's Internet Addiction Test

Pittsburgh Sleep Quality Index

ANNEXURE III

TOOLS

YOUNG'S INTERNET ADDICTION TEST

Name _____

Male _____ Female _____

Age _____ Years Online _____ Do you use the Internet for work? _____ Yes
_____ No

This questionnaire consists of 20 statements. After reading each statement carefully, based upon the 5-point Likert scale, please select the response (0, 1, 2, 3, 4 or 5) which best describes you. If two choices seem to apply equally well, circle the choice that best represents how you are most of the time during the past month. Be sure to read all the statements carefully before making your choice. The statements refer to offline situations or actions unless otherwise specified.

0 = Not Applicable

1 = Rarely

2 = Occasionally

3 = Frequently

4 = Often

5 = Always

1. ___ How often do you find that you stay online longer than you intended?
2. ___ How often do you neglect household chores to spend more time online?
3. ___ How often do you prefer the excitement of the Internet to intimacy with your partner?

4. ___How often do you form new relationships with fellow online users?
5. ___How often do others in your life complain to you about the amount of time you spend online?
6. ___How often do your grades or school work suffer because of the amount of time you spend online?
7. ___How often do you check your email before something else that you need to do?
8. ___How often does your job performance or productivity suffer because of the Internet?
9. ___How often do you become defensive or secretive when anyone asks you what you do online?
10. ___How often do you block out disturbing thoughts about your life with soothing thoughts of the Internet?
11. ___How often do you find yourself anticipating when you will go online again?
12. ___How often do you fear that life without the Internet would be boring, empty, and joyless?
13. ___How often do you snap, yell, or act annoyed if someone bothers you while you are online?
14. ___How often do you lose sleep due to being online?
15. ___How often do you feel preoccupied with the Internet when off-line, or fantasize about being online?

16. ___How often do you find yourself saying "just a few more minutes" when online?

17. ___How often do you try to cut down the amount of time you spend online and fail?

18. ___How often do you try to hide how long you've been online?

19. ___How often do you choose to spend more time online over going out with others?

20. ___How often do you feel depressed, moody, or nervous when you are off-line, which goes away once you are back online?

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PA 16701

PITTSBURGH SLEEP QUALITY INDEX (PSQI)

INSTRUCTIONS: The following questions relate to your usual sleep habits during the past month only. Your answers should indicate the most accurate reply for the majority of days and nights in the past month. Please answer all questions.

1. During the past month, when have you usually gone to bed at night?
USUAL BED TIME _____
2. During the past month, how long (in minutes) has it usually take you to fall asleep each night?
NUMBER OF MINUTES _____
3. During the past month, when have you usually gotten up in the morning?
USUAL GETTING UP TIME _____
4. During the past month, how many hours of actual sleep did you get at night? (This may be different than the number of hours you spend in bed.)
HOURS OF SLEEP PER NIGHT _____

INSTRUCTIONS: For each of the remaining questions, check the one best response. Please answer all questions.

5. During the past month, how often have you had trouble sleeping because you...

	Not during the past month	Less than once a week	Once or twice a week	Three or more times a week
(a) ...cannot get to sleep within 30 minutes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(b) ...wake up in the middle of the night or early morning	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(c) ...have to get up to use the bathroom	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(d) ...cannot breathe comfortably	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(e) ...cough or snore loudly	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(f) ...feel too cold	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(g) ...feel too hot	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(h) ...had bad dreams	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(i) ...have pain	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(j) Other reason(s), please describe				

How often during the past month have you had trouble sleeping because of this?

	Very good	Fairly good	Fairly bad	very bad
6. During the past month, how would you rate your sleep quality overall?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Not during the past month	Less than once a week	Once or twice a week	Three or more times a week
7. During the past month, how often have you taken medicine (prescribed or "over the counter") to help you sleep?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. During the past month, how often have you had trouble staying awake while driving, eating meals, or engaging in social activity?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	No problem at all	Only a very slight problem	Somewhat of a problem	A very big problem
9. During the past month, how much of a problem has it been for you to keep up enough enthusiasm to get things done?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	No bed partner or roommate	Partner/ roommate in other room	Partner in same room, but not same bed	Partner in same bed
10. During the past month, how much of a problem has it been for you to keep up enough enthusiasm to get things done?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

If you have a roommate or bed partner, ask him/her how often in the past month you have had...

	Not during the past month	Less than once a week	Once or twice a week	Three or more times a week
(a) ...loud snoring	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(b) ...long pauses between breaths while asleep	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(c) ...legs twitching or jerking while you sleep	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(d) ...episodes of disorientation or confusion during sleep	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(e) Other restlessness while you sleep; please describe	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

SCORING INSTRUCTIONS FOR THE PITTSBURGH SLEEP QUALITY INDEX:

The Pittsburgh Sleep Quality Index (PSQI) contains 19 self-rated questions and 5 questions rated by the bed partner or roommate (if one is available). Only self-rated questions are included in the scoring. The 19 self-rated items are combined to form seven "component" scores, each of which has a range of 0-3 points. In all cases, a score of "0" indicates no difficulty, while a score of "3" indicates severe difficulty. The seven component scores are then added to yield one "global" score, with a range of 0-21 points, "0" indicating no difficulty and "21" indicating severe difficulties in all areas.

Scoring proceeds as follows:

Component 1: Subjective sleep quality

Examine question #6, and assign scores as follows:

Response	Component 1 score
"Very good"	0
"Fairly good"	1
"Fairly bad"	2
"Very bad"	3

Component 1 score: _____

Component 2: Sleep latency

1. Examine question #2, and assign scores as follows:

Response	Score
≤15 minutes	0
16-30 minutes	1
31-60 minutes	2
> 60 minutes	3

Question #2 score: _____

2. Examine question #5a, and assign scores as follows:

Response	Score
Not during the past month	0
Less than once a week	1
Once or twice a week	2
Three or more times a week	3

Question #5a score: _____

3. Add #2 score and #5a score

Sum of #2 and #5a: _____

4. Assign component 2 score as follows:

Sum of #2 and #5a	Component 2 score
0	0
1-2	1
3-4	2
5-6	3

Component 2 score: _____

Component 3: Sleep duration

Examine question #4, and assign scores as follows:

Response	Component 3 score
> 7 hours	0
6-7 hours	1
5-6 hours	2
< 5 hours	3

Component 3 score: _____

Component 4: Habitual sleep efficiency

1. Write the number of hours slept (question #4) here: _____

2. Calculate the number of hours spent in bed:

Getting up time (question #3): _____

Bedtime (question #1): _____

Number of hours spent in bed: _____

3. Calculate habitual sleep efficiency as follows:

(Number of hours slept/Number of hours spent in bed) X 100 = Habitual sleep efficiency (%)

(_____ / _____) X 100 = %

4. Assign component 4 score as follows:

Habitual sleep efficiency %	Component 4 score
> 85%	0
75-84%	1
65-74%	2
< 65%	3

Component 4 score: _____

Component 5: Step disturbances

1. Examine questions #5b-5j, and assign scores for each question as follows:

Response	Score
Not during the past month	0
Less than once a week	1
Once or twice a week	2
Three or more times a week	3
<i>5b score:</i>	_____
<i>5c score:</i>	_____
<i>5d score:</i>	_____
<i>5e score:</i>	_____
<i>5f score:</i>	_____
<i>5g score:</i>	_____
<i>5h score:</i>	_____
<i>5i score:</i>	_____
<i>5j score:</i>	_____

2. Add the scores for questions #5b-5j:

Sum of #5b-5j: _____

3. Assign component 5 score as follows:

Sum of #5b-5j	Component 5 score
0	0
1-9	1
10-18-4	2
19-27	3

Component 5 score: _____

Component 6: Use of sleeping medication

Examine question #7 and assign scores as follows:

Response	Component 6 score
Not during the past month	0
Less than once a week	1
Once or twice a week	2
Three or more times a week	3

Component 6 score: _____

Component 7: Daytime dysfunction

1. Examine question #8, and assign scores as follows:

Response	Score
Never	0
Once or twice	1
Once or twice each week	2
Three or more times each week	3

Question#8 score: _____

2. Examine question #9, and assign scores as follows:

Response	Score
No problem at all	0
Only a very slight problem	1
Somewhat of a problem	2
A very big problem	3

Question #9 score: _____

3. Add the scores for question #8 and #9:

Sum of #8 and #9: _____

4. Assign component 7 score as follows:

Sum of #8 and #9	Component 7 score
0	0
1-2	1
3-4	2
5-6	3

Component 7 score: _____

Global PSQI Score

Add the seven component scores together:

Global PSQI Score: _____