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# A Study on the Association between Internet Addiction and Its Impact on Cognitive Absorption in Young Adults

Areeshah Tariq, Sara Ansari, Shahira Zainab, Hafsa Akbar, Fatima Abid

**Abstract:**

**Objectives:** In today's digital era, Internet has become a basic necessity. With the prevalence of internet addiction of 11.3% among young adults, it is alarming to note the ramifications that comes with it. One of many, is the neurological abnormalities that may result in onset of cognitive deficits from young age. This study was conducted to see the association between Internet Addiction Disorders and the related neurocognitive deficits between young adults aged 18-26.

**Study design and setting:** This study was conducted by filling out 154 questionnaires, using random sampling techniques, from university students of Karachi, Pakistan.

**Methodology:** Data analysis was performed by IBM SPSS statistics v27. Mean and standard deviation were calculated for quantitative variables. Frequency and percentages were reported for qualitative variables. Chi-square/fisher exact test was applied to check association between qualitative variables. Our findings indicate that 98.4% participants use the Internet every day with a mean screen time of 5.42±2.47 hours. Six-item Cognitive Impairment Test (6CIT) and internet addiction test(IAT20) were used to assess cognitive impairment and internet addiction, respectively.

**Results:** The mean cognitive impairment and internet addiction test scores were 4.75±3.78 and 43.19±17.92, respectively, with 32.5% subjects exhibiting substantial cognitive impairment. Moreover, our research noted significant correlation of internet addiction with aggression, slowness with everyday tasks and headache.

**Conclusion:** Our study highlighted the grave reality of today's generation where excessive use of the Internet is turning Young Adults into addicts and causing neural abnormalities which results in behavioral changes, memory deficits, lack of concentration and poor reasoning.

**Keywords:** Cognitive Dysfunction, Internet Addiction Disorder, Media Exposure, Neurocognitive Disorders, Young Adult

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## INTRODUCTION

Delirium and dementia are closely related conditions that frequently cause cognitive deterioration in the elderly. Delirium is an abrupt confusion characterized by altered awareness, concentration problems, and cognitive deterioration. Whereas, dementia is characterized by a steady and progressive decline in previously learned cognitive abilities. Reportedly, it is estimated that about 50 million people are suffering from dementia worldwide and it is predicted to increase up to 3-folds by 2050.[1] In a previous study, it was predicted that Alzheimer's Disease and Related Dementia (ADRD) will significantly rise up to 4-6 folds by 2060 than that observed in 2014.[2] In a recent study, a positive significant correlation (p=0.394; p=0.004) was found between cognition in students and internet usage.[3] A strong relation was observed between the internet addiction and the right precentral gyrus as well as right superior parietal lobule.[4] Internet Addiction Disorder (IAD) refers to a variety of internet-related behavioral addictions. In people with Internet Gaming Disorder (IGD) and Internet Anxiety Disorder, EEG analysis can identify certain neurological abnormalities that are similar to those observed in drug addiction disorders.[5] "Internet addiction" refers to harmful internet-related activities that repeatedly changes the neural architecture and networking of the brain in charge of inhibitory processes and spontaneous behavior. People who have higher propensities to become internet addicts act as a transitional state between healthy and unhealthy

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states, eventually leading to a behavioral addictive illness.[4] The global proliferation of smartphones has led to a notable rise in internet accessibility. Globally, the count of Internet users has increased to 3.9 billion, with developing nations experiencing a significant rise in Internet usage from 7.7%to 43.4%, from 2005 to 2018. Additionally, over the last 20 years, there has been marked prevalence of internet addiction among children and teenagers,[6] where the prevalence in youth was found to be 11.3% in Pakistan.[7] Although internet addiction disorder has both genders under its grip, and majority being the youth, a huge portion of Internet Gaming Disorder is of young males.[5]

In this digital age, there is an increasing rate of phone usage seen in university students. An estimation of about to 2.32 billion people globally own Internet accessible smartphones. Problematic Smartphone Use (PSU) is defined as excessive dependency and inability to control its usage despite experiencing its negative impacts in life.[8] A study focusing on child's brain development also concluded that regular usage of screen time during developmental stages of a child will lead to increased neurodegeneration in later stages of life, possibly resulting in memory loss and early onset dementia.[9] Another study on children and adolescents revealed that children with increased Screen Media Activity (SMA), have increased rate of cortical thinning in their visual system.[10]

Emerging research indicates that excessive internet use is linked to structural changes in the brain's gray and white matter, which is compatible with the cognitive reserve theory of dementia. It suggests that a lack of cognitive stimulation, often characterized by simplistic online activities, may deplete neural resources, increasing the likelihood of cognitive decline and dementia. By engaging in more mentally demanding activities, individuals can build cognitive reserve, reduce risk of dementia and promote brain health.[2] Furthermore, mild cognitive impairment can be a precursor to dementia.[11] In addition, excessive screen time due to internet usage has been shown to be directly associated with anxiety, low mood, decreased cognition, and impaired social development, leading to dementia and delirium.[12] Engaging in regular physical activity and spiritual practices can enhance cognitive function and promote overall brain health. Additionally, various brain stimulation techniques, such as meditation, mindfulness, and cognitive training programs, certain pharmaceutical interventions, like neuroplasticity-enhancing drugs and cognitive enhancers, can also boost brain function and improve memory, attention, and processing speed.[13]

The impacts of unrestrained screen time resemble the manifestation of Mild Cognitive Impairment (MCI) which is observed in adults at onset of dementia. These can include lack of concentration, orientation difficulties and anterograde amnesia.[2] In the current digital age, the pervasive exposure of the younger generation to excessive screen time significantly raises the likelihood of developing internet addiction disorder. This addiction, coupled with an increasing rate of dementia and delirium symptoms in young adults, underscores the pressing need to address mental health concerns regarding neurocognitive functions. The study aims to shed light on detrimental impact of excessive screen time on mental health especially on neurocognitive functions of young adults. Additionally, it aims to raise awareness regarding the escalating rates of dementia and delirium among young adults, stemming from internet addiction.

The objectives of this study are to investigate the relationship between Neurocognitive Disorders (Dementia and Delirium) and internet addiction disorders in young adults aged between 18-26 years old. Operational definitions included in this research are: Delirium: is characterized by sudden onset of awareness and attention issues which deviates from usual cognitive state. At least one other cognitive problem is needed for diagnoses such as: disorientation, memory loss, impaired spatial perception or fluctuating mental status throughout the day.[3] Dementia: entails a progressive deterioration in cognitive function in multiple domains which includes: awareness of surroundings, memory, acquisition of new knowledge, linguistics skills, judgment and decision making.[14] internet addiction disorder: refers to an umbrella term for many addictive behaviors including internet gaming disorder and excessive social networking via smartphones which particularly affects adults and leads to psychosocial problems.[3]

## METHODOLOGY

This is a case control study conducted to see the correlation between dementia and delirium with internet addiction disorders among the young adults as simplistic online activities deplete neural resources hence, affecting cognitive decline and dementia. This research was approved by independent local review body of JSMU- institutional review board (IRB No.: JSMU/IRB/2024/920) and was conducted from 30th September, 2024 to 19th March, 2025. In this study, random sampling technique was used, where young adults aged 18-26 were recruited from universities and colleges of Karachi, Pakistan.

To calculate sample size we have used OpenEpi app.[12] While adding data in it we have used prevalence percentage of IAD which was 11.3% , measured in a research conducted on Pakistani population.[7]

Hence according to OpenEpi app our study sample size would be 154 taking 95% confidence level.

The study includes a total sample size of 154 participants, comprised of 77 individuals identified as internet addicts and 77 individual classified as non-internet addict

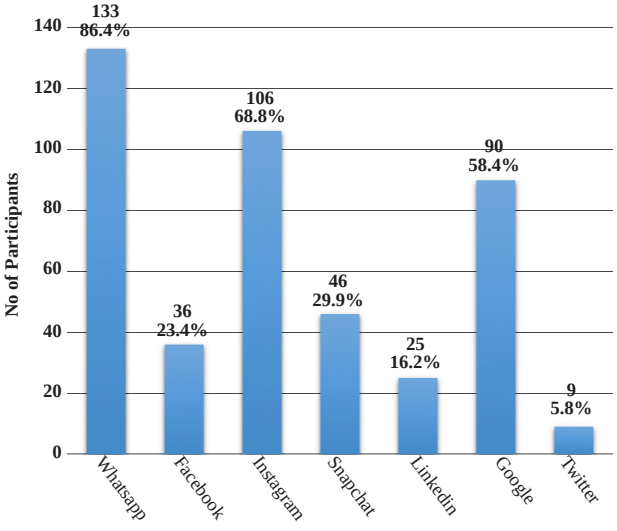
The data was selectively collected from Young Adults aged 18-26 years' old who were active and frequent internet users, spending atleast 4 hours per day online, (excluding work or

**Table-1:** Demographic profile of study participants (n=154)

| | n (%) |
|---|---|
| **Gender** | |
| Male | 23(14.9) |
| Female | 131(85.1) |
| **Age(years); mean ± std. dev** | 21.20±1.92 |
| **Age Group** | |
| 18-20 years | 52(33.8) |
| 21-23 years | 91(59.1) |
| 24-26 years | 11(7.1) |
| **Education Level** | |
| Intermediate | 12(7.8) |
| Graduate or above | 142(92.2) |
| **Socio-economic class** | |
| Upper class | 13(8.4) |
| Middle class | 141(91.6) |
| **Employment Status** | |
| Unemployed | 18(11.7) |
| Employed full-time | 4(2.6) |
| Employed part-time | 9(5.8) |
| Student | 123(79.9) |
| **Monthly Income** | |
| No income | 127(82.5) |
| =30,000 PKR | 17(11) |
| >30,000 PKR | 10(6.5) |

**Table-3:** Responses on six-item cognitive impairment test

| Description | n (%) |
|---|---|
| **1-What year is it?** | |
| Correct | 140(90.9) |
| Incorrect | 14(9.1) |
| **2-What month is it?** | |
| Correct | 133(86.4) |
| Incorrect | 21(13.6) |
| **3-About what time is it (within one hour)?** | |
| Correct | 140(90.9) |
| Incorrect | 14(9.1) |
| **4-Count backwards from 20-1** | |
| Correct | 146(94.8) |
| 1 error | 5(3.2) |
| More than one error | 3(1.9) |
| **5-Say the months of the year in reverse** | |
| Correct | 83(53.9) |
| 1 error | 41(26.6) |
| More than one error | 30(19.5) |
| **6-Repeat the address phrase asked in Q38** | |
| Correct | 60(39) |
| 1 error | 45(29.2) |
| 2 errors | 24(15.6) |
| 3 errors | 19(12.3) |
| 4 errors | 6(3.9) |




school-related activities), for entertainment, social media, online gaming, or other leisure activities.[8] This specific demographic is targeted to investigate the effects of internet addiction on young adults, a crucial age range for cognitive, social, and emotional development. By focusing on frequent and active internet users within this age range, we aim to gain a deeper understanding of the potential risks and consequences associated with excessive internet use. The Exclusion Criteria consists of participants aged less than 18 and greater than 26years old and Non-internet users.

After getting approval from the IRB questionnaire was distributed among participants via Google form and Paper sheets by the principal investigators and co-principal investigators. In the following research, Internet Usage was determined by Internet Addiction Test (IAT). It is a reliable and validated test made by Young for assessing internet addiction. Its validity has shown strong internal consistency (á = 0.90–0.93) and good test-retest reliability (r = 0.85) values.[15,6] It was previously validated in a Pakistani setting showing Cronbach alpha of .88, indicating excellent reliability.[7] Dementia in young adults will be assessed through Six- Item Cognitive Impairment Test (6-CIT). This test has 0.90 sensitivity and 1.00 specificity.[16]

Furthermore, SPSS version 27 will be used to analyze the data. The mean plus standard deviation will be computed for continuous variables. For categorical variables like gender, duration, and related characteristics, frequency and percentages will be computed. Any differences between the continuous variables, such as age, will be examined using the t-test. Any differences between the category variables will be examined using the chi square (÷2) test. If the P-

Table-2: Impact of screen time and internet usage on cognitive and behavioral health

| | **n (%)** |
|---|---|
| **Internet usage** | |
| Daily | 146(94.8) |
| Weekly | 2(1.3) |
| Monthly | 6(3.9) |
| **Daily screen time(hours); mean ± std. dev** | 5.42±2.47 |
| **Excessive Screen Time** | 44(28.6) |
| **Hyperactive state symptoms ever encountered after excessive screen time** | |
| Agitation | 43(27.9) |
| Delusion | 22(14.3) |
| Aggression | 47(30.5) |
| Hallucinations | 7(4.5) |
| **Hypoactive state symptoms ever encountered after excessive screen time** | |
| Lethargy | 63(40.9) |
| Slowness with everyday task | 79(51.3) |
| Excessive sleeping | 55(35.7) |
| Inattention | 51(33.1) |
| **Degree of headache** | |
| Extremely | 13(8.4) |
| Slightly | 56(36.4) |
| Normal | 28(18.2) |
| Not Really | 57(37) |
| **How much screen time affect sleep** | |
| Extremely | 17(11) |
| Slightly | 30(19.5) |
| Moderately | 40(26) |
| Neutral | 23(14.9) |
| A little | 44(28.6) |
| **Cognitive Impairment Test score; mean ± std. dev** | 4.75±3.78 |
| **Cognitive impairment** | |
| Significant (>8) | 50(32.5) |
| Normal (=7) | 104(67.5) |
| **Internet Addiction Test Score; mean ± std. dev** | 43.19±17.92 |
| **Internet addiction level** | |
| Normal (=30) | 39(25.3) |
| Mild (31-49) | 63(40.9) |
| Moderate (50-79) | 46(29.9) |
| Severe (=80) | 6(3.9) |

value is less than 0.05, it will be deemed statistically significant for comparison analysis.

Ethical considerations such as every participant was asked for their informed consent. During the interview, the person didn't experience any discomfort. The study's goals and objectives were explained to them. Additionally, they were made aware that participants are free to withdraw from the study at any point while it is underway and their privacy of their answers and personal data will be maintained.

## RESULTS

Data analysis was performed by IBM SPSS statistics v27. Mean and standard deviation were calculated for quantitative variables. Frequency and percentages were reported for qualitative variables. Chi-square/fisher exact test was applied

Table-4: Responses on internet addiction test

| | n (%) | | | | | | Mean ± std. dev |
|---|---|---|---|---|---|---|---|
| | 0 | 1 | 2 | 3 | 4 | 5 | |
| How often do you find that you stay online longer than you intended? | 5(3.2) | 17(11) | 29(18.8) | 25(16.2) | 50(32.5) | 28(18.2) | 3.18±1.39 |
| How often do you neglect household chores to spend more time online? | 11(7.1) | 36(23.4) | 34(22.1) | 33(21.4) | 30(19.5) | 10(6.5) | 2.42±1.38 |
| How often do you prefer the excitement of the Internet to intimacy with your partner? | 114(74) | 11(7.1) | 8(5.2) | 8(5.2) | 10(6.5) | 3(1.9) | 0.68±1.34 |
| How often do you form new relationships with fellow online users? | 47(30.5) | 67(43.5) | 10(6.5) | 9(5.8) | 15(9.7) | 6(3.9) | 1.32±1.41 |
| How often do others in your life complain to you about the amount of time you spend online? | 21(13.6) | 51(33.1) | 27(17.5) | 23(14.9) | 20(13) | 12(7.8) | 2.03±1.5 |
| How often do your grades or school work suffer because of the amount of time you spend online? | 18(11.7) | 53(34.4) | 25(16.2) | 25(16.2) | 17(11) | 16(10.4) | 2.11±1.53 |
| How often do you check your email before something else that you need to do? | 29(18.8) | 44(28.6) | 26(16.9) | 26(16.9) | 19(12.3) | 10(6.5) | 1.94±1.51 |
| How often does your job performance or productivity suffer because of the Internet? | 26(16.9) | 31(20.1) | 36(23.4) | 27(17.5) | 18(11.7) | 16(10.4) | 2.18±1.56 |
| How often do you become defensive or secretive when anyone asks you what you do online? | 40(26) | 55(35.7) | 18(11.7) | 22(14.3) | 9(5.8) | 10(6.5) | 1.57±1.48 |
| How often do you block out disturbing thoughts about your life with soothing thoughts of the Internet? | 13(8.4) | 28(18.2) | 29(18.8) | 32(20.8) | 25(16.2) | 27(17.5) | 2.7±1.57 |
| How often do you find yourself anticipating when you will go online again? | 16(10.4) | 37(24) | 30(19.5) | 31(20.1) | 26(16.9) | 14(9.1) | 2.36±1.49 |
| How often do you fear that life without the Internet would be boring, empty, and joyless? | 19(12.3) | 28(18.2) | 27(17.5) | 37(24) | 20(13) | 23(14.9) | 2.51±1.58 |
| How often do you snap, yell, or act annoyed if someone bothers you while you are online? | 25(16.2) | 48(31.2) | 17(11) | 30(19.5) | 24(15.6) | 10(6.5) | 2.06±1.54 |
| How often do you lose sleep due to being online? | 18(11.7) | 42(27.3) | 17(11) | 35(22.7) | 27(17.5) | 15(9.7) | 2.36±1.55 |
| How often do you feel preoccupied with the Internet when off-line, or fantasize about being online? | 24(15.6) | 45(29.2) | 24(15.6) | 27(17.5) | 24(15.6) | 10(6.5) | 2.07±1.51 |
| How often do you find yourself saying "just a few more minutes" when online? | 8(5.2) | 22(14.3) | 21(13.6) | 29(18.8) | 35(22.7) | 39(25.3) | 3.15±1.55 |
| How often do you try to cut down the amount of time you spend online and fail? | 16(10.4) | 26(16.9) | 28(18.2) | 31(20.1) | 36(23.4) | 17(11) | 2.62±1.53 |
| How often do you try to hide how long you've been online? | 29(18.8) | 54(35.1) | 17(11) | 21(13.6) | 20(13) | 13(8.4) | 1.92±1.59 |
| How often do you choose to spend more time online over going out with others? | 33(21.4) | 48(31.2) | 24(15.6) | 19(12.3) | 17(11) | 13(8.4) | 1.85±1.57 |
| How often do you feel depressed, moody, or nervous when you are off-line, which goes away once you are back online? | 21(13.6) | 53(34.4) | 23(14.9) | 23(14.9) | 21(13.6) | 13(8.4) | 2.05±1.53 |

Table-5: Association of internet addiction with demographic, screen time, cognitive and behavioral health

| | Internet addiction n (%) | | p-value |
|---|---|---|---|
| | Yes | No | |
| **Gender** | | | |
| Male | 16(13.9) | 7(17.9) | 0.541 |
| Female | 99(86.1) | 32(82.1) | |
| **Age Group** | | | |
| 18-20 years | 36(31.3) | 16(41) | 0.256 |
| 21-23 years | 72(62.6) | 19(48.7) | |
| 24-26 years | 7(6.1) | 4(10.3) | |
| **Education Level** | | | |
| Intermediate | 6(5.2) | 6(15.4) | 0.076 |
| Graduate or above | 109(94.8) | 33(84.6) | |
| **Socio-economic class** | | | |
| Upper Class | 10(8.7) | 3(7.7) | 1.000 |
| Middle Class | 105(91.3) | 36(92.3) | |
| **Employment Status** | | | |
| Unemployed | 11(9.6) | 7(17.9) | 0.533 |
| Employed full-time | 3(2.6) | 1(2.6) | |
| Employed part-time | 7(6.1) | 2(5.1) | |
| Student | 94(81.7) | 29(74.4) | |
| **Monthly Income** | | | |
| No income | 90(78.3) | 37(94.9) | 0.056 |
| =30,000 PKR | 16(13.9) | 1(2.6) | |
| >30,000 PKR | 9(7.8) | 1(2.6) | |
| **Excessive Screen Time** | | | |
| Yes | 36(31.3) | 8(20.5) | 0.197 |
| No | 79(68.7) | 31(79.5) | |
| **Hyperactive state symptoms ever encountered after excessive screen time** | | | |
| Agitation | 35(30.4) | 8(20.5) | 0.233 |
| Delusion | 16(13.9) | 6(15.4) | 0.820 |
| Aggression | 42(36.5) | 5(12.8) | 0.005* |
| Hallucinations | 6(5.2) | 1(2.6) | 0.680 |
| **Hypoactive state symptoms ever encountered after excessive screen time** | | | |
| Lethargy | 52(45.2) | 11(28.2) | 0.062 |
| Slowness with everyday task | 67(58.3) | 12(30.8) | 0.003* |
| Excessive sleeping | 44(38.3) | 11(28.2) | 0.257 |
| Inattention | 43(37.4) | 8(20.5) | 0.053 |
| **Degree of headache** | | | |
| Extremely | 10(8.7) | 3(7.7) | 0.003* |
| Slightly | 47(40.9) | 9(23.1) | |
| Normal | 25(21.7) | 3(7.7) | |
| Not Really | 33(28.7) | 24(61.5) | |
| **How much screen time affect sleep** | | | |
| Extremely | 13(11.3) | 4(10.3) | 0.174 |
| Slightly | 25(21.7) | 5(12.8) | |
| Moderately | 33(28.7) | 7(17.9) | |
| Neutral | 17(14.8) | 6(15.4) | |
| A little | 27(23.5) | 17(43.6) | |
| **Cognitive impairment** | | | |
| Significant (>8) | 43(37.4) | 7(17.9) | 0.025* |
| Normal (=7) | 72(62.6) | 32(82.1) | |

Chi-square/fisher exact test was applied. p-value=0.05 were considered as significant.

*Significant at 0.05 levels

Table-6: Odds for internet addictive participants

**PART-I**

| | Un-Adjusted | | Adjusted | |
|---|---|---|---|---|
| | **p-value** | **Odds (95% CI)** | **p-value** | **Odds (95% CI)** |
| **Gender** | | | | |
| Male | 0.542 | 0.739(0.279-1.956) | | |
| Female | | 1.000 | | |
| **Age Group** | | | | |
| 18-20 years | 0.718 | 1.286(0.329-5.021) | | |
| 21-23 years | 0.254 | 2.165(0.574-8.175) | | |
| 24-26 years | | 1.000 | | |
| **Education Level** | | | | |
| Intermediate | 0.050* | 0.303(0.091-1.002) | 0.096 | 0.302(0.074-1.238) |
| Graduate or above | | 1.000 | | 1.000 |
| **Socio-economic class** | | | | |
| Upper Class | 0.846 | 1.143(0.298-4.385) | | |
| Middle Class | | 1.000 | | |
| **Employment Status** | | | | |
| Unemployed | 0.170 | 0.485(0.172-1.365) | | |
| Employed full-time | 0.947 | 0.926(0.093-9.242) | | |
| Employed part-time | 0.926 | 1.080(0.212-5.487) | | |
| Student | | 1.000 | | |
| **Monthly Income** | | | | |
| No income | 0.222 | 0.270(0.033-2.210) | | |
| =30,000 PKR | 0.696 | 1.778(0.099-31.976) | | |
| >30,000 PKR | | 1.000 | | |
| **Excessive screen time** | | | | |
| Yes | 0.201 | 1.766(0.739-4.221) | | |
| No | | 1.000 | | |
| **Agitation ever encountered after excessive screen time** | | | | |
| Yes | 0.236 | 1.695(0.708-4.058) | | |
| No | | 1.000 | | |
| **Delusion ever encountered after excessive screen time** | | | | |
| Yes | 0.821 | 0.889(0.321-2.459) | | |
| No | | 1.000 | | |
| **Aggression ever encountered after excessive screen time** | | | | |
| Yes | 0.008* | 3.912(1.421-10.770) | 0.013* | 2.921(1.287-6.630) |
| No | | 1.000 | | 1.000 |
| **Hallucinations ever encountered after excessive screen time** | | | | |
| Yes | 0.501 | 2.092(0.244-17.939) | | |
| No | | 1.000 | | |
| **Lethargy ever encountered after excessive screen time** | | | | |
| Yes | 0.065 | 2.101(0.955-4.621) | | |
| No | | 1.000 | | |

to check association between qualitative variables. Odds were calculated using binary logistics regression. Odds were adjusted for variables found significant on uni-variate binary logistics regression. P-value =0.05 were considered as significant.

Total 154 young adults were included in the current study with a mean age of 21.20±1.92 years. The male to female ratio was 1:5.7, with the majority (59.1%) of participants aged 21 to 23 years. There were 92.2% of participants with a graduation or higher education level, 8.4% from the upper and 91.6% from the middle class of society. The majority (82.5%) of participants have no income. Detailed

PART-I

| | Un-Adjusted | | Adjusted | |
|---|---|---|---|---|
| | p-value | Odds (95% CI) | p-value | Odds (95% CI) |
| **Slowness with everyday task ever encountered after excessive screen time** | | | | |
| Yes | 0.004* | 3.141(1.448-6.813) | 0.010* | 2.921(1.287-6.630) |
| No | | 1.000 | | 1.000 |
| **Excessive sleeping ever encountered after excessive screen time** | | | | |
| Yes | 0.260 | 1.577(0.714-3.484) | | |
| No | | 1.000 | | |
| **Inattention ever encountered after excessive screen time** | | | | |
| Yes | 0.057 | 2.314(0.975-5.492) | | |
| No | | 1.000 | | |
| **Degree of headache** | | | | |
| Extremely | 0.213 | 2.424(0.602-9.764) | | |
| Slightly | 0.003* | 3.798(1.566-9.212) | | |
| Normal | 0.007* | 6.061(1.639-22.415) | | |
| Not Really | | 1.000 | | |
| **How much screen time affect sleep** | | | | |
| Extremely | 0.271 | 2.046(0.572-7.319) | | |
| Slightly | 0.048* | 3.148(1.011-9.803) | | |
| Moderately | 0.036* | 2.968(1.074-8.203) | | |
| Neutral | 0.307 | 1.784(0.587-5.419) | | |
| A little | | 1.000 | | |
| **Cognitive impairment** | | | | |
| Significant (>8) | 0.029* | 2.730(1.109-6.721) | 0.015* | 3.292(1.264-8.573) |
| Normal (=7) | | 1.000 | | 1.000 |

Binary logistic regression was applied.
p-value=0.05 were considered as significant.
*Significant at 0.05 levels.

demographic profiles of study participants are presented in Table-1.

Among 154 participants, 94.8% used the internet every day, with an average screen time of 5.42±2.47 hours. There were 28.6% of participants, found to have excessive screen use (more than 6hoursperday).

Table 2 shows that 27.9% of participants had agitation, 14.3% had delusion, 30.5% had aggression, 4.5% had hallucinations, 40.9% had lethargy, 51.3% had slowness with everyday tasks, 35.7% had excessive sleeping, and 33.1% had inattention symptoms as a result of excessive screen time.

WhatsApp was determined to be the most frequently used application, with 86.4% of participants indicating regular usage. Instagram is the second most popular platform, used by 68.8% of participants. Google is also frequently utilized, with 58.4% of interviewees reporting frequent use. In contrast, 23.4% of participants utilize Facebook, as showninFigure1. The Six-item Cognitive Impairment Test (6CIT) and Internet Addiction Test(IAT20) were used to assess cognitive impairment and internet addiction, respectively. Tables 3 and 4 give the responses to both instruments. The mean cognitive impairment and internet addiction test scores were 4.75±3.78 and 43.19±17.92, respectively, with 32.5% of subjects exhibiting substantial cognitive impairment. Table 1 shows that 40.9% of participants had mild, 29.9% had moderate, and 3.9% had severe internet addiction.

We found a significant association of internet addiction with aggression(p=0.005), Slowness with everyday tasks(p=0.003), Degree of headache(p=0.003) and Cognitive impairment(p=0.025). Detailed results of association are presented in Table-5. Males were shown to be less likely to develop internet addiction than females (OR=0.739, p=0.542). People aged 18–20 years (OR=1.286, p=0.718) and 21–23 years (OR=2.165, p=0.254) are more likely to develop internet addiction than people aged 24-26 years. Participants with excessive screen time were also more likely to be addicted to the internet than those who did not (OR=1.766, p=0.201). Participants with cognitive impairment were more likely to be addicted to the in ternet than those without (OR=2.730, p=0.029). Table 6 shows detailed results for unadjusted and adjusted odds, where aggression was associated with higher odds of internet addiction (AOR= 2.92, 95% CI: 1.29-6.63).

## DISCUSSION

This study aimed to assess the prevalence of internet addiction among young adults and its association with cognitive and behavioral impairments. From the past few years, the internet has conquered our lifestyles, dominating the way of communication, education and in various recreational activities. Despite its various advantages, excessive internet usage has led to its addiction in young adults. Internet addiction disorder consisting of social networking and internet gaming disorder, primarily using smart phones has shown increased rates of psychosocial issues in adults.[3]

In our study, participants with excessive screen time were probably addicted to the internet than those who did not (OR=1.766, p=0.201). Among 154 participants, 98.4% use the internet everyday with an average of 5.42±2.47 hours per day. The findings also indicate a high prevalence of daily internet usage among young adults, with a significant proportion of participants exhibiting symptoms of internet addiction. Notably, 40.9% of participants had mild level, 29.9% had moderate level, and 3.9% had severe level of internet addiction. A similar study also noted 16.8% prevalence of internet addiction.[17] These findings align with prior studies suggesting that internet addiction is becoming a more serious public health issue, particularly among young populations with frequent internet engagement. Similar findings were reported in previous studies too. A study done by Kandasamy et al. reported 6% of students being Internet addicts and 20% had the possibility of being addicted.[18] Moreover, a study conducted by Bhatia et al. also reported 24% moderate level internet addiction and 6% has severe level of internet addiction.[19] In a recent study, this problematic usage was divided into 3 categories namely, addictive consumption patterns, antisocial consumption patterns and adverse use patterns, which leads to deteriorating academic, social and professional functioning. Widespread usage has led to development of a new term: Nomophobia, which is characterized as compulsivity and prolonged smartphone use accompanied with anxiety when smartphones are inaccessible.[20]

A key finding of this study is the significant association of internet addiction and behavioral symptoms, including aggression (p=0.005), slowness in everyday tasks (p=0.003), and degree of headache (p=0.003). These results support existing literature that links excessive screen time and internet addiction to increased irritability, cognitive fatigue, and attention deficits. In a recent study, the greatest mean correlation was noted between internet addiction and aggression (r+=0.391), succeeded by depression, psychological health and self-esteem. It was also noted that problematic internet usage can lead to increased suicidal ideation and it is strongest in adolescents who show greater aggression levels.[21] Another study showed significant correlation between internet addiction and total aggression, where Internet Addicts showed significant association with its subtypes: physical aggression, hostility and indirect aggression. It was concluded that some internet activities like gaming, scrolling through videos etc. decreases the guilt for aggressive behaviors and decreases personal responsibility for such violent activities by providing extreme sensory and novel stimuli. Consequently, Internet overuse would reduce self-awareness, guilt and shame which contributes to aggressive behaviors.[22]

Slowness in everyday tasks and lethargic attitude stems from sedentary lifestyle. It was stated that over 2 hours of daily screen time was negatively related with misbalanced body composition, fitness and self-esteem. It is also reported that individuals with excessive screen time are less active physically and consume greater amounts of snacks which ultimately leads to obesity.[23,24] In another study, 40% of students preferred the internet over physical activities. Furthermore, this study also elaborated the various health concerns arising due to excessive Internet usage, among which headache accounted for about 24%. [19]

The mean cognitive impairment and internet addiction test scores were 4.75±3.78 and 43.19±17.92, respectively, with 32.5% of subjects exhibiting substantial cognitive impairment. Cognitive impairment was also significantly correlates with internet addiction (p=0.025), with individuals exhibiting cognitive deficits were seemingly Internet Addicts (OR=2.730, p=0.029). This finding is particularly concerning as it suggests a bidirectional relationship, where excessive internet use may contribute to cognitive decline while cognitive deficits may increase susceptibility to compulsive internet behaviors. According to a previous study, Internet Usage and cognition in students had significant association (ñ = 0.394; p = 0.004). Hence, it was deduced that internet addiction leads to abnormalities in the brain's white matter integrity in areas concerned with executive functioning, cognition, and making decisions. It was also reported that Internet Addicts were found to have decreased levels of dopamine transporters.[3] In another study, it was deduced that internet addiction has significant association with cognitive defects in inhibiting attention, motor activities, working memory due to dysfunction in the striatal region.[25] A recent study showed that internet addiction has led to abnormal changes in both white and gray matter of the brain, resulting in neurocognitive disorders from early ages, coupled with their spontaneous abnormal activity results in mediocre task performance. In our study, 14.3% reported about experiencing delusions and 4.5% reported to hallucinate. According to a study, Alzheimer's Disease and Related Dementias (ADRDs) include manifestations like retrograde, anterograde amnesia, delusions and hallucinations which help in progression of these disorders. ADRDs are gradual, progressive brain disorders which result in inattention, disorientation, poor concentration, affecting memory, reasoning and decision making abilities.[2]

The study also highlights gender and age-related differences

in internet addiction. Although males had a lower likelihood of developing internet addiction than females (OR=0.739, p=0.542), the association was not statistically significant. This contrasts with some previous studies that report higher internet addiction rates among males.[26] However, the sample in this study was predominantly female (85.1%), which may have influenced the observed gender differences. Young adults (18–23 years) showed greater levels of internet addiction than those aged 24–26 years, though the association was not statistically significant. This trend aligns with previous research indicating that younger individuals, particularly university students, are more susceptible to problematic internet use due to academic, social, and recreational online activities. A study in China included that 28.4% of the total online age group was the 10-29 years age group, among which college students made up to 21%.[27] Similarly, a recent study also concluded that younger population is more prone to become Internet Addicts than older as they spend more time online playing games, chatting with colleges and social media browsing. It was also observed that young adults choose to be online for hours to overcome loneliness and emotional distress which results in obsessive thoughts and compulsive behavior.[28] However, participants with excessive screen time reported a range of cognitive and behavioral disturbances as well, such as lethargy (40.9%), excessive sleeping (35.7%), and inattention (33.1%). These findings reinforce the negative implications of prolonged internet use, particularly its impact on mental well-being and daily functioning. It is due to overstimulation of the brain which results in fatigueness and excessive compensation sleeping leading to poor sleep quality. A previous study deduced that sleep disturbances due to excessive screen time is due to exposure of blue-green light which reduces melatonin levels hence, induce alertness and correlates with decreased physical activity thereby leading to poor sleep quality and abnormal circadian rhythm.[9]

The study has a number of limitations. First, its casual inference is limited by its case control design; while correlations are evident, it is unclear whether internet addiction leads to cognitive impairment or if pre-existing cognitive deficits predispose individuals to excessive internet use. Second, self-reported measures were used to assess internet addiction and cognitive impairment, which may introduce response biases. Third, the study sample was not gender-balanced, limiting generalizability across different demographic groups. Lastly, 6CIT is primarily validated for older adults. Its use in younger populations has limited validation, so results should be interpreted with caution.

Given the case-control design, casual inferences cannot be made. Observed associations may be influenced by potential confounders such as sleep quality, anxiety and socioeconomic stress, which could affect both exposure and outcome. In spite of these limitations, the study provides enlightening perspectives into the prevalence and impact of internet addiction among young adults. Future research should explore relationships between internet addiction and cognitive health longitudinally, incorporating objective measures of screen time and neurocognitive assessments. Given the significant associations found, targeted intervening steps such as digital detox programs, behavioral therapies, and educational campaigns may be valuable in mitigating the adverse effects of internet addiction.

## CONCLUSION

Long lasting screen exposure due to internet addiction created a negative impact on the young minds. Due to excessive screen gazing adolescents and young adults are at risk of cognitive impairment, emotional and behavioral disturbances even lacking attention with learning and memory disruption. Our study exposes the dark side of internet addiction which shows that it increases agitation, irritation, lethargy and sleep disturbances. Even 32% of the participants are facing cognitive decline. Our research warns us to become serious about screen time and internet addiction and awakens us toward the urgent need of less or responsible screen and internet usage.

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**Authors Contribution:**
**Areeshah Tariq:** lead the research, design work, data collection, wrote discussion and prepared manuscript
**Sara Ansari:** helped in synopsisand descussion writing, data collection and interpretation of data
**Shahira Zainab:** helped in synopsis, data collection and conclusion
**Hafsa Akbar:** helped in synopsis and data collection
**Fatima Abid:** supervised the research and analysis

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