

## Correlation Between Smartphone Overuse and Severity of Headache in Migraine Patients

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### Abstract

**Objectives:** To find out the correlation between smartphone overuse and the severity of headache in migraine patients

**Material & Methods:** This study aimed to investigate the correlation between smartphone overuse and migraine severity. Precise definitions were provided for migraine and mobile phone use. A Cross-Sectional design was used; Data from 100 patients aged 20-45 years, meeting inclusion criteria was collected from Neurology Outdoor of Services Hospital Lahore from March 13, 2021 to September 12, 2021. This data was collected via structured interviews, analysed using SPSS, and assessed using Pearson's Correlation coefficient.

**Results:** This study explored the link between smartphone overuse and migraine severity in 100 participants, predominantly aged 20 to 30 (81% female). The analysis indicated a weak positive correlation ( $R=0.2995$ ) between smartphone use and headache intensity (VAS 7.04), offering insights into age and gender variations in this association.

**Conclusions:** On the basis of this study we conclude there is a correlation between Smartphone overuse and severity of headache in Migraine patients

**Keywords:** Migraine, Smartphones, overuse, severity

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### Introduction

Headaches are a prevalent ailment, affecting approximately 95% of the general population at some point in their lives.<sup>1</sup> Among primary headaches, migraine ranks as the second most common type and stands as a leading contributor to disability within the spectrum of neurological disorders worldwide.<sup>2</sup> Globally, migraine's prevalence is estimated to be approximately 14.4%, although various studies have reported rates spanning from 2.6% to 21.7%.<sup>3,4</sup>

A significant proportion of migraine sufferers identify specific triggers for their headaches, with 75.9% of patients reporting such triggers.<sup>5,6</sup> One potential modern trigger is smartphone usage, which exposes users to bright, flickering lights that pulsate several times per second. A growing body of research has associated exposure to bright and general light as a migraine trigger.<sup>7</sup> Notably, Hougaard et al. conducted experiments successfully provoking migraine attacks using bright and flickering lights.<sup>8</sup> Additionally, a study in Poland found that prolonged and frequent phone calls were linked to more frequent and prolonged headaches.<sup>9</sup> Furthermore, research by Demerci et al. concluded that headache complaints among their patients correlated with the extent of smartphone usage.<sup>10</sup> As smartphones emit blue light radiation and their backlights are generally flickering in nature, they can have a possible impact in worsening of headaches. With the increasing use of smart

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phones in our personal and professional lives, the answer to this question is becoming more and more important.

The present research endeavours to investigate the correlation between heightened smartphone usage and migraine headaches in individuals seeking care at a tertiary hospital in Lahore.

## Material & Methods

The primary aim of this study was to explore the potential correlation between smartphone overuse and the severity of headaches in individuals diagnosed with migraine. Our underlying hypothesis proposed a significant association between excessive smartphone usage and the intensity of headaches experienced by migraine sufferers. To ensure precision in our research, we provided operational definitions for key terms. Migraine was precisely defined as a primary headache condition diagnosed by a Consultant Neurologist, adhering to the published criteria outlined in the International Classification of Headache Disorders, 3rd edition (ICHD-3). Meanwhile, mobile phone use was quantified using the Problematic Mobile Phone Use (PMPU) scale, which generates values ranging from 26 (indicating minimal use) to 130 (indicating excessive use). Furthermore, the severity of migraine was gauged using the Visual Analogue Scale (VAS), which assigns values between 0 (indicating no pain) and 10 (representing the most severe pain). This scale was applied to the patient's three most recent migraine episodes, and the resulting values were averaged to derive a score between 0 and 10.

In terms of research design, this study adopted a Cross-Sectional approach. Data collection took place in an outdoor setting at the Department of Neurology, SIMS/Services Hospital Lahore. The research spanned duration of six months, commencing from March 13, 2021, and concluding on September 12, 2021.

The sample size for this investigation comprised 100 patients. This sample size was calculated based on a 5% alpha error, 10% beta error, and an expected  $r$  value of 0.71513. Participants were selected using a Non-Probability Consecutive Sampling technique.

Inclusion criteria encompassed individuals of both genders, aged between 20 and 45, who had received a definitive diagnosis of migraine from a Consultant Neurologist based on the ICHD-3 criteria. Additionally, participants were required to own and actively use a smartphone and express a willingness to participate with informed consent.

Conversely, exclusion criteria were carefully designed to exclude individuals diagnosed with secondary headaches, those with co-existing psychiatric disorders, individuals currently undergoing prophylactic therapy for migraine, and those diagnosed with chronic migraine or medication overuse headaches. Data collection was initiated following the acquisition of informed consent from patients attending the Neurology outpatient department of SIMS/Services Hospital Lahore. Researchers conducted structured interviews with patients to complete the study questionnaire. This questionnaire covered a range of variables, including patterns of mobile phone usage, the degree of disability resulting from migraine headaches, and the perceived intensity of migraine episodes. To quantify smartphone use, the PMPU Scale was employed, producing scores spanning the entire spectrum. The intensity of pain experienced during migraine episodes was assessed through the VAS, with patients providing ratings for their three most recent episodes, and an average score was computed within the 0 to 10 range.

Subsequent to data collection, the dataset underwent rigorous analysis using SPSS Statistics for Windows version 20.0. Quantitative variables, such as age and VAS scores, were summarised using mean and standard deviation. Gender distribution was presented as frequency and percentage. To evaluate the degree of association between smartphone use and migraine headache severity, the Pearson's Correlation coefficient was calculated. This statistical approach allowed for a comprehensive exploration of the relationship between these variables within our carefully selected sample of migraine patients.

## Results

In this study, a total of 100 cases meeting the specified inclusion and exclusion criteria were enrolled to explore the potential correlation between smartphone overuse and the severity of headaches experienced by individuals diagnosed with migraine. The age distribution analysis revealed that the majority of participants, specifically 81% ( $n=81$ ), fell within the age range of 20 to 30 years, while 19% ( $n=19$ ) were aged between 31 and 45 years. The mean age was calculated as 26.6 years, with a standard deviation of 4.76. Regarding gender distribution, the study found that 29% ( $n=29$ ) of the participants were male, while the majority, comprising 71% ( $n=71$ ), were female. In terms of the mean Visual Analogue Scale (VAS) scores, which quantified the intensity of headache

pain, the calculated mean was 7.04, with a standard deviation of 1.01. Additionally, the mean score for problematic mobile phone use (PMPU), a measure of smartphone usage patterns, was determined to be 82.49, with a standard deviation of 24.34 (Table-1).

Each participants problematic mobile phone use (PMPU) and their corresponding Visual Analogue Scale (VAS) scores were collected as a part of the study questionnaire and noted. Using the corresponding PMPU and VAS scores of each participant and using the mean and standard deviation of the PMPU and VAS we were able to find out the correlation between smartphone overuse and the severity of headaches in migraine patients which was the primary goal of the investigation. The correlation analysis revealed an r value of 0.2995, indicating a technically positive correlation. However, the strength of this correlation was found to be weak, as evidenced by an R<sup>2</sup> (coefficient of determination) value of 0.0897. This result shows that there is a correlation between excessive use of mobile phone and severity of headaches in our study participants (higher PMPU scores corresponded with higher VAS scores in our study as determined by the positive value of Pearson Correlation Coefficient)

These findings collectively provide insight into the relationship between smartphone usage patterns and the severity of migraine headaches, shedding light on the nuances of this association within different age and gender groups.

**Table 1:** Correlation between smartphone overuse and severity of headache in migraine patients (n=100)

| PMPU  |       | VAS  |      |
|-------|-------|------|------|
| Mean  | SD    | Mean | SD   |
| 82.49 | 24.34 | 7.04 | 1.01 |

## Discussion

The ubiquitous integration of smartphones into daily life has fundamentally altered the way people communicate, access information, and navigate the modern world. With these devices serving as constant companions, the increased use of smartphones has inevitably shaped various aspects of our daily existence. Activities such as connecting with others, staying in touch with family and friends, and accessing the vast expanse of the internet are now seamlessly woven into the fabric of our lives through these portable devices. Given this pervasive influence, a pressing need has arisen to scrutinise the potential impact of smartphones on human health, which served as the impetus for our research. Our primary objective was to unravel the association

between heightened smartphone usage and the occurrence of migraine headaches in individuals seeking medical care at a tertiary hospital in Lahore. The rationale behind this inquiry was rooted in the recognition that if our findings indicated a correlation between increased smartphone use and exacerbated headache severity, behavioural interventions aimed at curbing excessive smartphone usage could be incorporated into migraine patient management strategies. The overarching goal was to enhance patient outcomes by alleviating headache intensity and reducing migraine-related disability. Our demographic analysis unveiled valuable insights into the characteristics of our study participants. The majority of our sample, a substantial 81% (n=81), belonged to the age bracket of 20-30 years, with the remaining 19% (n=19) falling between 31-45 years. The mean age, accompanied by a standard deviation, was computed at 26.6+4.76 years. Gender distribution indicated that 29% (n=29) of the participants were male, while the majority, comprising 71% (n=71), were female. Our investigation delved into the quantification of smartphone usage patterns through the calculation of the mean problematic mobile phone use (PMPU) score, which averaged at 82.49, with a standard deviation of 24.34. This measure offered valuable insights into the extent of smartphone dependence among our participants.

The crux of our study centred on establishing a correlation between smartphone overuse and the severity of migraine headaches. The correlation analysis revealed an R value of 0.2995, technically indicating a positive correlation between these factors. However, it's important to note that the strength of this correlation was relatively weak, as reflected in the R<sup>2</sup> (coefficient of determination) value of 0.0897. This suggests that while a connection exists, it is not particularly robust. In a similar 2019 study by Demir et al., smartphone overuse was observed to increase the frequency, intensity, and duration of headaches. This research also revealed a direct association between smartphone overuse and headache severity, as measured using the visual analogue scale.<sup>11</sup> The release of blue light from smartphones has been shown to disrupt sleep patterns and contribute to sleep problems,<sup>12</sup> a well-known trigger for headaches, including migraines.<sup>13</sup> People have also reported eye strain as a common migraine trigger<sup>14</sup> and smartphone use is a major cause of eye strain.<sup>15</sup> Moreover, a study published in March 2020 by Uttarwar et al. indicated that smartphone usage is linked to an increased need for acute medication and reduced responsiveness to medication in primary headaches, including migraines.<sup>16,17</sup>



A similar result was obtained from the study done by Butt et al<sup>18</sup> recently, these studies were able to establish the worsening of headaches in migraine patients with excessive smartphone use and suggests possible contributory factors towards it. These diverse findings underscore the intricate relationship between smartphone usage patterns and migraine headaches. They also emphasise the potential health effects of smartphone overuse, warranting further research and clinical exploration. On smartphone use and migraine, It has also been shown that excessive use of cell phones can aggravate psychological disorders such as anxiety, stress and depression<sup>19</sup> and these disorders often tend to worsen migraines,<sup>21</sup> so a confounding relation between them needs to be explored further and can add to our knowledge in this regard. These findings are not just limited to adults but similar worsening of migraines with smartphone use is seen in younger adults and adolescents as well.<sup>21</sup>

In light of our study's results and the collective body of evidence, it is evident that excessive smartphone use may have implications for human health and could contribute to headaches, including migraines. However, additional trials and research endeavours are imperative to validate and expand upon our findings, shedding more light on this multifaceted phenomenon.

## Conclusion

We concluded that there is a correlation between Smartphone overuse and severity of headache in Migraine patients. However, further local studies are required to validate our results.

## Conflict of Interest

*None*

## Funding source

*None*

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### **Authors Contribution**

**MAA:** Conceptualization of Project

**NF:** Data Collection

**GAA:** Literature Search

**MAA:** Statistical Analysis

**AT, MBW:** Drafting, Revision

**AT:** Writing of Manuscript