

# Prevalence of Rounded Shoulders in Smartphone Addicts and its Effect on Neck Disability

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**Abstract:** ***Background:** Since the emergence of smartphone these devices have become incredibly prevalent and widely accepted among the population, especially due to its portability, easy access to internet and worldwide connectivity. The increasing integration of smartphones into daily life can have a significant role in the development of anomalies of the neck and shoulders commonly, rounded shoulders due to the way the shoulders are positioned. This negatively affects the neck disability index of the user. **Need of study:** As there is a paucity of literature regarding prevalence of rounded shoulders among smartphone addicts. So, the need of this study is to find prevalence of rounded shoulders and its effect on neck disability in the district of Vadodara. **Objective:** Prevalence of rounded shoulders among smartphone addicted users and its effect on neck disability. **Methodology:** A cross-sectional observational study was conducted among 40 individuals who were smartphone addicted users to check for rounded shoulders and neck disability, using Problematic Mobile Phone Use Scale, Pectoralis Minor Muscle Length Test, Scapular Index, Neck Disability Index. Results were analysed and interpreted. **Result:** Out of 40 individuals, 38 students were moderately addicted and 2 were severely addicted where the mean±SD of Problematic Mobile Phone Use Scale is 101±2.9, mean±SD of Pectoralis Minor Test is 11.3 mean±SD of 0.67, mean±SD of Scapular Index is 0.91±0.82, mean±SD of ADL is 23.75±25.84. **Conclusion:** The study showed significant relationship among rounded shoulders and neck disability.*

**Keywords:** Neck disability, rounded shoulders, smartphone addicts, smartphone addiction.

## 1. Introduction

Amazingly, 3.3 billion people use smartphones worldwide right now. In other words, a third or more of the world's population has mobile access to the Internet. Due to their gradual integration into daily life, most people no longer think smartphones are weird. Size and portability may be the primary differences between smartphones and other mobile phones with computing capabilities and internet search. [1] Within the last ten years, the mobile phone have evolved into one of the most widely used and the most manipulative form of communication. The mobile phone has the added advantage of mobility and portability and can link people "anytime, anywhere", due to its widespread use and strong penetration. Numerous factors, such as improved portability, subsidized subscriptions, declining costs, and additional services, have contributed to the rapid adoption of smart phones. People who use smart phones today can do things like watch movies, play video games, listen to music, shop online, scroll through social media sites, etc. World is literally at people's fingertips. [2] A rising number of people are worried about smartphone addiction and overuse as a result of this sharp rise in smartphone use. It has been noticed that there are some similarities to other types of addiction, including withdrawal symptoms, an obsession with the sought substance or object, and negative impacts on daily life. So it's possible to classify smartphone addiction as a type of technological addiction. [3] Smartphone addiction is a significant public health issue, problematic smartphone use is associated with negative mental health outcomes like anxiety, depression, behavioral changes, mood swings, a decrease in desire for contact, a fear of missing out, and lack of emotional control. Time away from phone can cause episodes of hysteria, and the addiction fuels further due to easy access to the device. Increased phone use causes lack of attention, resulting in inability to hold conversations, connect to people personally and at times complete isolation. The outside world seems dull, plain and boring. And people

use phones as an escape from reality, an easy way out. The sleep wake cycle is often hampered leading to less sleeping hours and episodes of binge eating increases, leading to obesity. [4] Smartphone use may cause frequent neck flexion posture, which alters the cervical spine's natural curve and places more stress on it. This can cause irritation and spasm in the surrounding skeletal structures and ligaments as well as proprioception deficits in the cervical vertebra. Excessive smartphone use can cause the head and neck to move towards the screen repeatedly and continuously throughout the day. Such motions increase the risk of developing chronic neck pain. [9] Secondary health issues brought on by upper-cross syndrome include myofascial trigger points, cervicogenic headaches, impingement syndromes, neck pain, rotator cuff injuries, and decreased lung function. [10] Neck, shoulder, elbow, wrist, and finger flexion as well as physical exposure are all necessary for the repetitive thumb movements needed to type on a smartphone. Upper back pain, neck pain, elbow pain, hand pain, and shoulder pain are likely to be made worse as a result. Due to problematic smartphone use, these are additional musculoskeletal structures that are frequently impacted. [11] However, there is a paucity of literature regarding prevalence of rounded shoulders among smartphone addicts. So, the need of this study is to find prevalence of rounded shoulders and its effect on neck disability in the district of Vadodara.

## 2. Materials and Methodology

**Study Setting:** Vadodara city

**Study Population:** Smartphone users

**Sample Size:** 40 individuals

**Sampling Method:** Convenient sampling

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**Study Duration:** 3 - 4 months

**Study Design:** cross - sectional observational study

**Materials:** pen, paper, smart phone, measuring tape, chair, plinth

**Inclusion Criteria:**

Patient addicted to smartphones based on "Problematic Mobile Phone Use Scale" score more than 92. Aged 18 - 25 years. Both male and female included Individual must speak, read, write and understand English.

**Exclusion Criteria:** Patient with any musculo - skeletal disorder, neurological disorder, cardiovascular disorder, psychological disorder. Pregnant women (3rd trimester)

**3. Procedure**

Based on the inclusion criteria, 40 smartphone addicts will be selected from the Vadodara district. After getting the patient's informed consent, the "Problematic Mobile Phone Usage Scale" will be administered, and the result will be calculated. If the individual's score is greater than 91, their pectoral minor length will be measured, followed by a scapular index check for rounded shoulders and an NDI scale check for neck disability.

**Outcome measure:**

The Problematic Cell Phone Use Scale evaluates a subject's cell phone usage through a questionnaire. It has 26 items divided into 4 sub - scales measured on a 5 - point Likert - type scale (1 being "not at all appropriate, " 2 "rarely appropriate, " 3 "somewhat appropriate, " 4 "fairly appropriate, " and 5 "completely appropriate"). The score ranges from 26 - 130. As individual's use of cell phones increases, their Problematic Cell Phone Use Scale score rises. [12]

**Pectoralis minor test:**

To evaluate the tightness of the Pectoralis Minor muscle, the patient is told to lie supine with both arms at their sides. The shoulders should be in external rotation, the elbows extended, and the forearms supinated. Using a measuring tape, the distance between the table and the posterior border of the acromion process will be measured. The precision is 82–83%. [13]

**Scapular index:**

It will be necessary for the participant to stand with their hands hanging to the side. The coracoid process and sternal notch will be felt for and marked in the anterior region. The junction of the posterior boundary of the acromion process with the adjacent thoracic vertebral spine will be palpated and marked. The distance between these points will be determined using a measuring tape and the following formula:

$$\text{Scapular Index} = (\text{SN to CP} * 100) / (\text{PLA to TS}). [14]$$

**Neck disability index:**

Neck Disability Index (NDI) evaluates both subjective symptoms and activities of daily living. It is the most well - researched and well - established outcome measure for neck

pain. Number of researchers have evaluated the NDI's validity and reliability. [15]

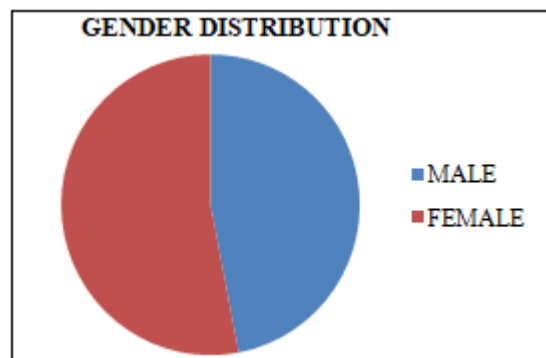
**4. Result**

In this study addicted users was taken and looked for neck disability. Smartphone addicted user's baseline characteristics are shown in the following tables respectively.

**Gender Distribution**

**Table 1:** Gender distribution of smartphone addicted users

Gender	No. of Participants
Male	19
Female	21
Total	40



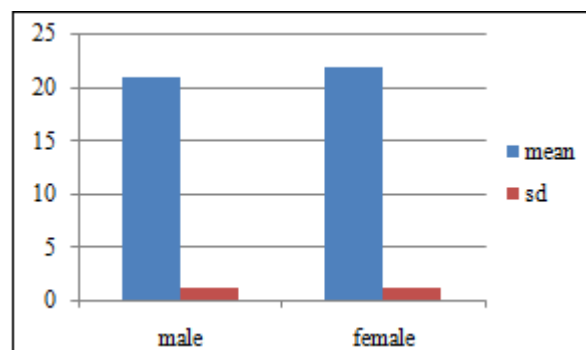
**Graph 2:** Graph represents age distribution, showing mean and SD

Table 2 and Graph 2 represents the statistics of age distribution among smartphone addicted users, where among 21 females the mean age distribution was 21 with a standard deviation of ±1.08 and among 19 male the mean age distribution was 22 with a standard deviation of ±1.11

**Age Distribution**

**Table 2:** Age distribution among smartphone addicted users

Gender	Mean	SD
Male	21	±1.08
Female	22	±1.11



**Graph 2:** Graph represents age distribution, showing mean and SD

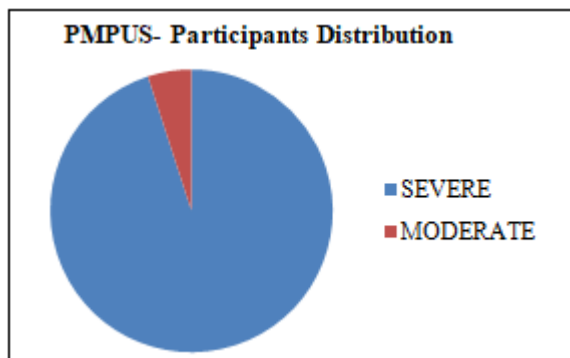
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deviation of  $\pm 1.08$  and among 19 male the mean age distribution was 22 with a standard deviation of  $\pm 1.11$ .

**Problematic mobile phone use scale distribution showing no. of participants**

**Table 3:** Represents PMPUS distribution, showing no. of participants

Score	Criteria	No. of Participants
92 - 113	Moderate	38
<114	Severe	2



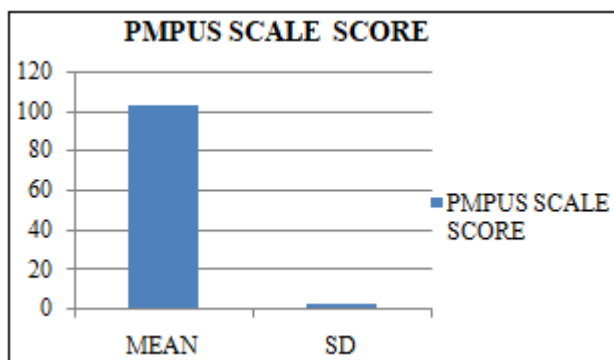
**Graph 3:** Graph represents PMPUS distribution, showing no. of participants

Table 3 and Graph 3 represents that 38 out of 40 individuals were moderately addicted as per the PMPUS and 2 out of 40 were severely addicted.

**PROBLEMATIC MOBILE PHONE USE SCALE DISTRIBUTION SHOWING MEAN AND SD**

PMPUS SCORE	
Mean	103
SD	2.9

**Table 4:** Represents PMPUS distribution, showing no. of participants



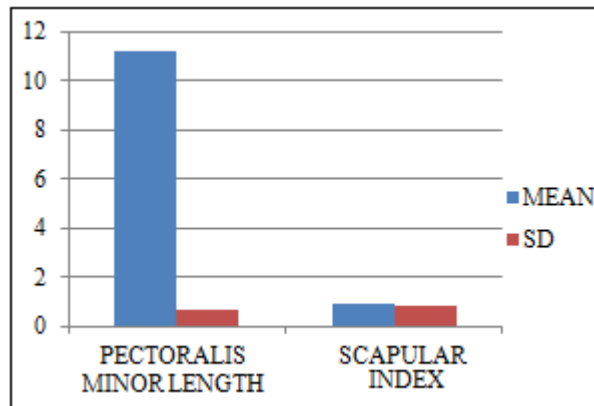
**Graph 4:** Graph represents PMPUS distribution, showing mean and SD

Table 4 and Graph 4 represents that the Mean $\pm$ SD in PMPUS is 101 $\pm$ 2.9.

**Rounded Shoulder Distribution**

**Table 5:** Prevalence of rounded shoulder

Test	Mean	SD
Pectoralis minor tightness	11.3	0.67
Scapular Index	0.91	0.82



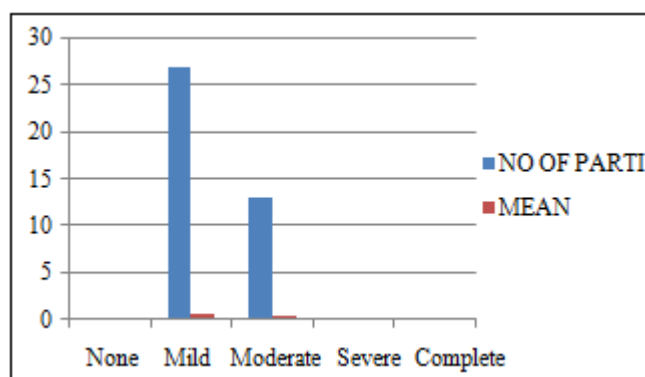
**Graph 5:** Graph represents rounded shoulder distribution, showing mean and SD

Table 5 and Graph 5 represents that the mean ~ standard deviation for Pectoralis minor tightness is 11.3~0.67 and for scapular index is 0.91~0.82.

**NECK disability index distribution**

**Table 6:** Neck disability distribution among smartphone addicted users with rounded shoulders

Disability	No. of Participants	Mean
None	0	0
Mild	27	0.675
Moderate	13	0.325
Severe	0	0
Complete	0	0



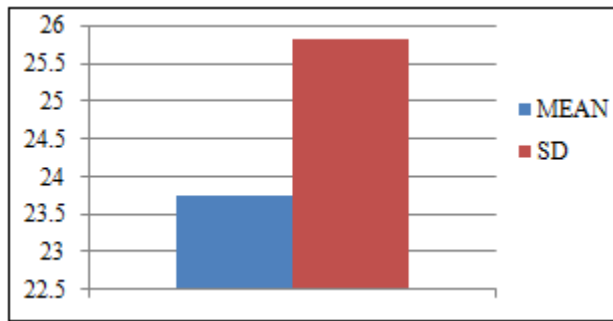
**Graph 6:** Graph represents neck disability distribution showing mean

Table 6 and Graph 6 represents neck disability among smartphone addicted users with rounded shoulder where the number of participants and mean for No Disability is 0 and 0, Mild Disability is 27 and 0.67, Moderate Disability is 13 and 0.325, Severe Disability is 0 and 0 and Complete Disability is 0 and 0.

**ADL Distribution**

**Table 7:** ADL distribution among smartphone addicts

Total Population	Mean	SD
40	23.75	25.84



**Graph 7:** Graph represents ADL distribution, showing mean and SD

Table 7 and Graph 7 represents the ADL distribution among the smartphone addicts, where the mean±SD was 23.75±25.84.

## 5. Discussion

This current study found that smartphone addiction is associated with shoulder and neck disability in healthy young adults. Participants used their smartphones daily and were either moderate or heavy smartphone users according to the PMPUS. This finding supports previous studies that smartphone addiction can lead to neck injuries [16] and effects on the brachial index resulting in rounded shoulders. [17] Bad posture occurs when the head is bent forward and the shoulders are rounded forward. The neck and shoulders are areas that easily feel pain when using a smartphone and show high muscle fatigue, resulting in pain. A flexed neck position can increase the activity of the splenius capitus and trapezius muscles more than when the neck is in a neutral position. Most smartphone - related tasks require people to glance or hold their hands in front of them to read the screen. This causes the head to move forward, causing excessive anterior curvature in the lower cervical vertebrae and excessive posterior curvature in the upper thoracic vertebrae to maintain balance. This stretches the cervical spine and neck muscles. One of the most commonly recognized bad postures in the sagittal plane is forward head posture, which correlates with chronic neck pain. Previous research by Jeremy S Lewis and Rachel E Valentine suggested that the chest length test is a reliable method for measuring round shoulders. [18] In our study, pectoral muscle length varied in all smartphone addiction groups, but the average pectoral muscle length is far from the gold standard value of 2.6 cm. This suggests the existence of a round shoulder among users who are addicted to smartphones. Neck injury in smartphone users may be related to frequent bending of the neck, which alters the natural curvature of the cervical spine and increases stress on the cervical spine, causing irritation and spasms in the surrounding skeletal structures and proprioceptive deficits in the cervical spine backbone. Excessive use of smartphones can cause repeated and continuous movements of the head and neck towards the screen throughout the day. [1] Such movements are associated with chronic neck pain and may explain the strong association between PMPUS and NDI. This study supports the need for public health education programs to educate 23 people about musculoskeletal injuries associated with excessive smartphone use. In conclusion, smartphone addiction leads to neck injuries and rounded shoulders. Due to poor posture associated with its

use and ultimately makes everyday life difficult. This shows that, as per the result, the PMPUS scale, with a mean of 68%, was used to determine that every study participant was a smartphone addict. Only two of the 40 participants met the severe criteria, and the remaining 38 met the moderate criteria. According to the self - reported questionnaire, when their phone was damaged, the participants felt uneasy. Additionally, they displayed loneliness, altered eating and sleeping patterns, diminished concentration, and increased screen time, which are all signs and symptoms of smartphone addiction. Additionally, these people favoured solitude over time with friends or family. The length of the pectoralis minor and scapular index were used to estimate the rounded shoulder caused by smartphone addiction. According to the components, the pectoralis minor (11.3%) is more significantly affected than the scapular index, which has a mean of 1%. The length of the pectoralis minor varied from 9 to 13 cm in 36 smartphone addicts, as opposed to the normal range of 7 - 8 cm in only 4 users in our study. As each and every one of them had mild to moderate neck impairment, which ultimately interfered with daily activities (23.75%), rounded shoulder syndrome ultimately results in neck impairment. The study also shows that most smartphone users with rounded shoulders have a mild neck injury compared to a moderate neck injury. Most of the participants had problems with lifting weights, concentration, work, driving, recreational activities and neck pain. All of them complained of headaches, which were either frequent or rare, and difficulty reading, which led to neck pain.

## 6. Conclusion

The study showed significant relationship among rounded shoulders and neck disability. Smartphone addicted users (N=40) who use smartphone moderately according to the PMPUS showed prevalence of rounded shoulders. The SD of Pectoralis minor muscle tightness and Scapular index is 678.76 and 0.82 respectively. The rounded shoulder syndrome ultimately led to neck disability (Mild disability= 27; Moderate disability= 13) among all the subjects. Out of 40 subjects only 23 faced difficulties in activities of daily living according to the NDI that was taken. This study can be used to further to give proper ergonomic advices and reduce the screen times especially among the age group of 18 - 25. This will eventually help to prevent round shoulder and neck disability among people and perform activities of daily life without any neck pain.

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