

REVIEW ARTICLE

Approach and Analysis on the Cervical Pain Due to the Efficacy of Continuous Usage of Smartphone

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ABSTRACT

In the current world, the smartphone plays an essential part in communication, browsing, see videos and e-mails. Usages of smartphones by university students are more popular than the computer for not only e-learning but also entertainment and others due to their handiness. The frequent use of the phones in awkward body positions make them highly vulnerable in terms of physical injury. The review was done by twenty autonomous analysts who have gone through articles from various online sources utilizing pre-established norms. Cervical pain and musculoskeletal disorder some times create enduring effects on mental and body mechanism. It helps to find out the outcome of frequent usage of the smartphone. The present review is about the frequent usage of smartphone in the neck forward posture leads to muscle weakness and cervical pain.

Keywords: Smartphone usage, Cervical pain, Musculoskeletal disorder

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INTRODUCTION

According to Statista, the statistic shows the number of mobile internet users in Malaysia from 2015 to 2022. In 2017, 19.06 million people accessed the internet through their mobile phone. In 2021, this figure will project to 21.29 million mobile phone internet users. Most smartphone users tend to bent their necks down to maintain their heads in a forward position. The utilization of smartphones by university students are becoming more popular than computers and laptops for not only e-learning but also entertainment and communication. The handiness, easy and frequent use of the phones at any time anywhere in any positions make the subject highly vulnerable in terms of physical injury.

LITERATURE SURVEY

Yanfei Xie et al (2015) conveyed the details about the muscular activity and its pain due to smartphone usage and computer keyboard typing. Electromyography, the electronic equipment were employed for the data collection of muscular activity. Through electromyogram, the Cervical Erector Spine (CES) and Upper Trapezius (UT) are monitored from 40 youngsters

with the combination of 24 male and 16 female within the age group of 23.9±3.2 years. The test was performed on the selective group of people, about six months with standard set-ups physically and technically. They are chosen under some conditions like they have the habit of using the smartphone minimum of two hours daily. Also, they should be right handed practitioners.

The test was performed by using smartphone 4S (Apple Inc., USA). They are instructed to type 15 Words Per Minute (WPM) during the recording of muscular activities. Finally, the collected data were analyzed using the statistical approach. By using Chi-Square test (χ^2), to know whether the distribution of collected data is found as good enough to proceed further the research activities or not. Then another statistical parameter like the Mode is calculated to know the central tendency of smartphone usage. Moreover, the Mann-Whitney U test was performed on the same data for the analysis of group difference in the usage of the smartphone. Similarly, a mixed model repeated measures analysis of variance (RMANOVA) to find the group difference between the subject factors and task within the subject factors. Finally, Statistical Package for Social Sciences (SPSS) version 2000 (IBM, USA) was used for the overall analysis and came to a conclusion.

From the observed data and analyzed results with the help of statistical approach tests, it was finalized that the greater muscle loading effect was found in the neck extensor and in thumb muscle while using smartphones.

Asper conclusion the proper and specific ergonomics guidelines should be developed, then it helps to reduce the musculoskeletal disorders (1).

Gustafsson, E et al (2017) As per the web-based questions, a study was conducted between the age group of 20 to 24 years of Swedish adults by Ewa Gustafsson et al 2017. From the cohort potential population, for the web-based questions, the answers are evaluated from year one to year five. The approval was obtained by the Regional Ethics Review Board in Gothenburg, Sweden. The study was conducted successfully for the population 4148 (1452 men, 2696 women) in year one and some repeated population are continued in the analysis after year five as 2724 (991 men, 1733 women).

It is clear that the text messaging using mobile phones with respect to musculoskeletal disorders shows that the most short period effects, and to a smaller extent, prolonged-term results show musculoskeletal disorders in the neck and upper extremities (2).

Sangyong Lee et al., (2017) conducted a study on the effects of cervical flexion and associated cervical erector spinae as well as in the upper trapezius. It is conducted from the adults in the age group of the 20s. Among the total volunteers, 14 were normal volunteers. The volunteers were instructed to sit in a chair and asked to bend their neck. The volunteers are asked to handle the smartphones on both sides for ten minutes at three different angles at 0°, 30°, and 50° respectively. This procedure is to measure the fatigue as well as the pain in the neck and in shoulder muscle with the help of Electromyography. Smartphone with both hands for 10 minutes and fatigue and pain in the neck and shoulder muscles were measured at different cervical flexion angles (0°, 30°, and 50°). To inspect the muscle exhaustion of the right upper trapezium, left upper trapezium, right cervical erector spinae, and left cervical erector spinae, Algometry and Electromyography equipment was employed to estimate the pain. In the different cervical flexion angle throughout the course of data acquisition while using the smartphone is measured by using Electromyography. From the observed data, the soreness at a cervical flexion angle of 50° is identified as the fact of data are significant reduced in the upper trapezium. This is due to the muscle pain that happened because of the continuous isometric contraction of the trapezius in the flexion angle of 50° (3).

Sami S. AlAbdulwahab et al., (2017), mooted a general justification about the relationship between smartphone usage and neck function. The number of volunteers identified as a totally of 78 persons, in that 39 was female and 39 are male adults. The ages of the volunteers are in the range of 21.3±1.7 years, with mean weight as 63.4±15.9, and mean height as 1.66±8.6 m. Also, they are the people having the habit of using the smartphone several hours a day. They are selected

under the condition that they should not have any physical and mental disease or disorders. It is evaluated with two scales known as the Smartphone Addiction Scale (SAS) and Neck Disability Index (NDI). The Scale for the SAS is from 33 to 198. The higher the degree of the score in SAS indicates that the volunteers suffering from pathological issues. Similarly, for the NDI, 10 items with 50 points to each item were used to evaluate the problems. They are segregated as four related to the subjective symptoms as concentration, headache, pain intensity, and sleeping. Moreover, four activities of daily living are divided for the analysis as driving, lifting, recreation, and work. Furthermore, two discretionary activities are personal care and reading habits. Each item is evaluated individually to 0 to 5 rating scale as assessing points so that it comes totally of 50. The rating scale evaluates 0 as no pain and 5 to the worst imaginable pain. The overall statistical processes were done by using SPSS16.0 (SPSS, Chicago, IL, USA). All the measures are given as mean ± Standard Deviation. As a resultant, the final score obtained as SAS with 119.4 ± 20.7, NDI was 20.98 ± 5.1 with the probability scale (p<0.05) (4).

Yan Fei Xie et al., (2018) evaluated three different tasks as categories. They are evaluated with respect to spinal kinematics in association with (1) texting on a smartphone with one hand, (2) with two hands, and (3) typing on a desktop computer. To analyze the neck pain with the given tasks, a totally of 37 persons (19 Symptomatic and 18 Healthy Persons) were employed. The examinations were carried out in the cervical, lumbar, and thoracic regions with the individual task. Three-dimensional kinematics was used for the examination process. The kinematics associated with the pain with respect to the increased angles of cervical right side flexion during smartphone texting as well as having the greater postural alterations in the cervical rotation. These issues were found when the text-entry tasks performed between the symptomatic groups. Then the Two-handed texting task was performed by the same volunteer which has an increasingly higher degree of cervical flexion when compared to one-handed texting and computer keyboard typing was correlated to asymmetric neck position are not favourable to the spinal position. When comparing the two different methods of texting using a smartphone, the one is bilateral texting associated with the issue of a higher degree of cervical flexion. The other is unilateral texting related to an asymmetric cervical position. The statistical approach was performed using the mixed model repeated measure analysis of variance (RMANOVA) between the groups and SPSS V23.0 (IBM, USA) were employed for the finding of statistical significance with a probability value lower than 0.05. And it shows the unfavourable result between the different sorts of task. So that they concluded the fixed posture during texting is not important and consider as non-neutral with respect to cervical spine pain. They suggested the professionals do the research on the

impact of neck pain and provide proper ergonomics to smartphone users (5).

Abdullah M. Alsalameh et al., (2019) made a survey to find the correlation between smartphone usage and musculoskeletal pain among the medical students studying at Quassim University. The study was conducted on 242 medical students; one-third of the population is female volunteers. The age group selected for the examination between 19 to 32 years. A cross-sectional study was conducted between the dependent and independent variables between the musculoskeletal muscles at various regions. The dependent muscles variables are considered from Neck, Lower Back, and Shoulder. Similarly, for the independent variables the regions are considered for the inspection are Neck, Wrist/Hand, and Knees. The smartphone Addiction Scale Short Version (SAS-SV) statistical analysis was used for the measurement of smartphone addiction. Similarly, the Nordic musculoskeletal questionnaire (NMQ) method of analysis was used to evaluate the musculoskeletal pain in the targeted area. In their survey study, the data were collected from the individuals as self-administered questions. The questions are of three different parts. The first section is based on demographics which are including age, gender, and school year. Similarly, the second section is the scale of how much the time spent in the usage and the behaviour of the smartphone, by using the smartphone. Addiction Scale short version (SAS-SV). The third section consists of questions to measure the reality of musculoskeletal pain by using valid questions (Nordic Musculoskeletal questionnaire). For the quantification of the data preliminary, the Chi-Square Test was employed to evaluate the statistical significance level between the groups. To analyze the overall performance of collected data statistically, the SPSS version 21 (Armonk, NY, IBM Group) with probability less than 0.05 as significant level (6).

Nida Irshad et al., (2019) mooted an analysis about the positions among young male and female subjects using smartphone with respect to upper trapezius (UT), abductor pollicis brevis (APB) and abductor pollicis longus (APL). Above mentioned cervical muscles are monitored with the help of electromyography (EMG). There are different posture like standing, sitting on the chair and sitting cross-legged on the floor for the analysis. Twenty-six young male (age: 23.77 ± 2.47 years) and 26 young female (age: 22.45 ± 2.32 years).

The volunteers are selected from the Centre for Physiotherapy and Rehabilitation Sciences, Jamia Millia Islamia, New Delhi, India. EMG activities of APB, APL, and UT muscles are recorded for the evaluation purpose using surface electrode while using the smartphone in three different positions. The three different positions are sitting cross-legged on the floor, sitting on a chair, and standing posture are considered for the testing and evaluation of pain while typing English quotations for

20 seconds continuously three times. It will be repeated three times with a gap of five minutes. And ten seconds between each quotation. The significant factor of each posture is considered as less than 0.001 to standing, 0.008 to sitting cross-legged during smartphone usage. Moreover, APB and APL muscle activity were not expressively changed between the three positions as the probability distribution significance of about 5%. Furthermore, the activation arrangements of the above-said muscles do not differ between male and female volunteers with a significant factor of 5%. From the study, it is clear that sitting on a chair while using a smartphone is considered an amicable posture (7).

Fadi Al-Hadidi et al., (2019) proposed a systemic study on neck pain among university students, those who are using mobile phone frequently. Cross-sectional analyses were made for the neck pain evaluation using a numeric scale rating. Some considerations like age, gender, and the position of the volunteers while using a mobile phone are taken into account for the rating. Online questions of about 500 in numbers which are based on self-administered one. The data collected between the 15th of February to 18th of March 2017 irrespective of age, gender, and position of mobile phone usage from health care staff members. The volunteers who are teenagers having a higher probability to get neck pain due to the duration of mobile phone usage with respect to different postures. The Numeric Rating Scale (NRS) with 11 as score. A score of 0 is considered as no pain and 10 as worst pain. The SPSS (version 21.0, Chicago, USA) was used in the descriptive statistical analysis of the overall data. The differences analyse with respect to age, posture, and the duration of usage are evaluated using One-way ANOVA and independent sample t-test. Furthermore, the pain severity is estimated using the regression analysis. The thresholds were chosen as 5% in the overall performance for the significance analyses. Nearly 500 different universities students as 166 men and 334 women with the age 21.5 ± 2.6 from the students studying in the faculty of dentistry, medicine, nursing, and rehabilitation. This study determines the substantial-good and positive correlation amongst the time duration of mobile phone usages as well as the verity of neck pain (8).

Glaukus Regiani Bueno et al., (2019) conducted a study with university students of Brazil those who are using smartphones frequently and long time duration for the conversation in the year 2017. The physical, psychological, as well as social problems, are discussed and were reported. These attempts were made to know the factors which are influenced while using smartphones with a longer duration. It is based on the cross-sectional with a quantifiable method with 522 students studying in college having the age from 18 to 26. One of the conditions considered for the volunteers as the person should be an active typist. The active typist referring to send data at least 25 messages or e-mails or browsing or

playing games for more than one hour a day by using their smartphone. Due to the usage of smartphone continuously, it is diagnosed with Repetitive Strain Injury (RSI) as well as Work-related Musculoskeletal Disorders (WMSDs) in the regions of arms, or hands, neck, shoulders, and spine. Some standard questions were prepared on the basis of sociodemographic contour associated with Nordic questions related to musculoskeletal indicators. At a glimpse, it is known that typing methods influenced the musculoskeletal pain cited in the cervical region of about 43.87% cases due to the usage of the smartphone. Especially, the volunteers who are using the smartphone for messaging by keeping head at 45° and 60° posture (anatomical position) while typing than at 0°. The questions are displayed for the data collection are web-based with sociodemographic to indicate the intensity of the pain and rated from 0 to 10, 0 as no pain and 10 as maximum pain. Moreover, the question is based on Nordic musculoskeletal for the analyses of symptoms due to neck and shoulder regions. Totally 1083 questions are asked from the 522 volunteers and are chosen under the proper considerations. The significance between the area with pain and the typing style was evaluated using the Chi-Square Associated test. Then to analyze the relationship between the usage of smartphone in hours used, foremost using hand, and posture of greater interaction are by using the regression model. The severity score associated with hours of smartphone usage per day mostly used hand and greater posture used is calculated by using the Kruskal-Wallis test. It is concluded that between the time and the posture while using smartphone reports as pain (9).

Yukio Yamamoto et al., (2019) done a pilot study for the analyses of Low Back Pain (LBP) and Shoulder Pain (SP) due using of the smartphone from the judo therapist course college students. From the overall population of about 155, 126 students inputs are taken for the cross-sectional study. Self-reported questions are evaluated from the inputs with respect to frequency and time of usage. Furthermore, the clinical evaluations are also carried out for the LBP or SP score. The processes are confounded by the measure called Receiver Operating Characteristics (ROC) with respect to time. Totally 126 college students have participated in the study with the combination of 107 men and 19 women with the age group of 26±8.8 years among 155 students. Some criteria are followed for the analysis are (1). Students in the judo therapist course, (2) Received self-reported questionnaires including smartphone usage, LBP and/or SP in November 2016, (3) Not having acute pain of LBP and/or SP, and (4) Provided written informed consent. The questions and the way of fixation of questions are approved by the Ethical committee of Shikoku Medical College. Towards the clinical parameters' data collections, the age, Body Mass Index (BMI), Body Weight (kg), height (cm), LBP, exercise habits, psychological distress, sex, and SP details were obtained for the self-reported questions. Similarly, the parameters

like duration of the smartphone usage in months, hours of usage per day, screen size of smartphones (inches), and data traffic of usage per month (gigabytes) were evaluated. The unpaired t-test and analyses of covariance (ANCOVA), with the probability significance p , is chosen as less than 5%. The performances of the data were studied with the help of the Chi-Square Test (χ^2). The performance of the Receiver Operating Characteristics (ROC) curve. SPSS version 22 (IBM, o Ltd., Tokyo, Japan) is used for the analysis of the LBP and/or SP. Totally 155 students were chosen for the analysis, by satisfying the constraints about 126 students were used for the analyses purpose. Firstly, a cross-sectional study was conducted without considering the LBP and/or SP. Secondly, the pain is not evaluated at different circumstance like the effect of smartphone usage on LBP and/or SP. Thirdly, the study may not apply to the overall student's community in Japan (10).

Joo-Hee Park, et al., (2017) done a pilot study to investigate the changes in muscle work and postural alignment of the neck and trunk while using smartphone within 5, 10, and 15 minutes. 18 male college undergraduates 21.18 ± 1.90 (range: 20 to 25) year old volunteered from Yonsei University Wonju Campus Korea for this study. In arrange to meet the inclusion criteria, the students were required to be right-hand-dominant, own a smartphone. Participants with congenital problems, musculoskeletal or neurological conditions, or pain in their upper limbs and spine structures were excluded from this study. The normal duration of smartphone utilisation for the subjects was 3.93 ± 0.68 hours/day. Surface electromyography (EMG) and digital camera were utilized to degree the muscle work and angular changes of the neck and trunk of subjects during smartphone utilize for a period of 16 minutes. The EMG data collected and analysed by Noraxon Telemetry 2400T system. The flexion of both the neck and trunk of subjects at 5 minutes, 10 minutes and 15 minutes of the gaming experiment was essentially more noteworthy in comparison with the flexion of the neck and trunk of subjects.

At the starting of the experiment ($p < 0.05$). To begin with, the neck angle of subjects expanded as the time they spent playing the smartphone game increased ($p = 0.000$). The neck flexion of subjects was around 66.01 ± 6.11 degrees at the beginning of the experiment, increase over time to 79.19 ± 9.68 degrees (at 5 minutes) ($p = 0.001$), 84.44 ± 11.35 degrees (at 10 minutes) ($p = 0.000$), and 90.34 ± 11.18 degrees (at 15 minutes) ($p = 0.000$).

Secondly, the angle of subjects decreased as the time they spent playing the smartphone amusement increased ($p = 0.000$). The decrease within the point of the trunk represents expanded flexion of the trunk. Among subjects, the trunk point was roughly 104.01 ± 8.37 degrees at the beginning of the gaming experiment, decreasing over the course of the explore to 91.73 ±

11.38 degrees (at 5 minutes) ($p = 0.000$), 84.53 ± 10.38 degrees (at 10 minutes) ($p = 0.000$), and 81.65 ± 9.01 degrees (at 15 minutes) ($p = 0.000$). Neck and trunk and EMG enactment of CES, UT, LT, and TES during smartphone utilize. The results of this study appear that, as anticipated, neck and trunk flexion increase as the term of smartphone utilizes increments.

This study analyses the impact of smartphone utilisation on pain, posture, and muscle action in the cervical and thoracic regions. Smartphone utilize significantly actuated more flexed pose on the neck and trunk and changed the muscle enactment design of the neck and trunk extensors inside a moderately short period of time, causing all members to feel torment in the neck and trunk. Hence, clinicians have to consider the impacts of smartphone utilisation on posture and muscle movement during the assessment, intercession, and prevention of neck and trunk conditions (11).

Abdullah Farooq Khan, et al., (2017) conducted a survey study with 42 male and 59 female total of 101 undergraduates from the department of Akhtar Saeed trust teaching hospital Lahore. The survey from June 2018 to July 2018 in a period of two months. The inclusion criteria consider were all undergraduate students who were utilizing a smartphone, tablet and portable workstation for the past six-month duration and over. A neck disability index Questionnaire is used for this survey. Data was entered and analysed by use of SPSS version 21.0. In this study, population females were affected more than the male population. The mean age of the participants was 24.97 ± 1.572 year.

This study not consider the degree of neck flexion point and might not include the mindfulness related to the posture whereas utilizing smartphones, tablets and portable work stations. This study concluded the neck pain is very common while using the smartphone if without any warm-up exercises. Female are mostly affected than male by neck pain due to over-usage of the smartphone (12).

Abdulrahman Nasser Alzaid et al., (2018) done a cross-sectional study conducted in Saudi Arabia using an online survey questionnaire through social media network. This survey was done in Arabic language targeting the below 18 years old population living in the kingdom of Saudi Arabia. About 2435 individuals included 42% female and 58% of male below 18 years have responded to the questionnaire.

31.2% (760) of the participants are using 5 to 8 hours per day, 27.1% (659) are using 2 to 4 hours per day, 16.4% (400) participants spend with their smartphone 2 hours on a day, 14.9% (364) of participants used 12 hours per day, 10.3% (252) of the participants are used the smartphone more than 12 hours of the day. Most of the participants (78%) are using sitting than standing position while the time of usage.

The conclusion of this study child who uses e-devices such as a smartphone with improper posture and long

duration have complained about neck pain and other musculoskeletal pain (13).

Ismaeel Firas Tariq (2019) conducted a cross-sectional study in Tikrit university students age 18 to 26 years. 68 male and 36 female total 104 selected as population, Self-administered questionnaire used for this survey. In this population, 30.74% used the smartphone 2 to 4 hours, 22.12% for 4 to 6 hours, the remaining 15.39% for more than 8 hours and 12.51% used less than 2 hours. The results of the current study appeared the males incline toward lay down position during utilizing mobile (61.74% of male), Whereas female lean toward sitting position (55.56% of female), as well as 32.34% (No. = 22) lean toward sitting position, while 25.02% (No. = 9) of female prefer to lay down position, as well as 4.41% (No. = 3) of male incline toward standing position during utilizing phone whereas 1.47% (No. = 1) prefer walking, and 13.89% (No. = 5) of female incline toward standing whereas 5.56% (No. = 2) incline toward walking, so the 77.9% (No. = 81) of utilizing social media whereas 22.1% (No. = 23) not utilize social media, as well as the Precipitants in the study, suffer from neck pain (31.54%) as most elevated rate, taken after by wrist pain (25.38%) %, but the low rate (2.31%) for eye pain and joint pain (8.47%). Relief pain 38.47% (40 tests) respondents favour rest conjointly the same number lean toward altering position whereas 7.69% (8 tests) lean toward lay down, 1.92% (2 tests) take a painkiller.

Discoveries of this study are the appraisal of the impact of smartphones on the musculoskeletal system. Smartphones cause pain primarily in the neck joint, wrist joint, back and muscle spasm. The pain increments by over usage of phones, and calmed by rest or alter the position (14).

Damasceno, G. et al., (2018) made a cross-sectional study with 150 population within the age 18 to 21 from public high school in the state of Rio de Janeiro. The self-report questionnaire used for this study.

The position of the neck of the participants assessed by self-perception and Physiotherapist during texting on phone. The result of this study did not show any association between text neck and neck pains in 18 to 21 years old participants. This discovery against the confidence that the neck position during mobile phone texting is related to the prevalence of neck pain (15).

Namwongsa, S et al., (2018) conducted a cross-sectional survey study with 799 student undergraduate smartphone users from Khon Kaen University, Thailand. The Self-administrated questionnaire used for this study to identify cervical pain and musculoskeletal disorder. Logistic analysis used for associated factors identification. The larger part of the smartphone users who had musculoskeletal clutters utilized smartphone brand A (52.26%), particularly show A (12.91%) with touch screen type (95.65%).

Smartphone users depicted their posture during smartphone utilize by showing stances accepted by different body parts from a menu. Most of the smartphone users in this study who detailed musculoskeletal disorders received positions of neck flexion (82.74%), shoulder protraction (56.61%), elbow flexion (65.16%), wrist and hand flexion during handling (22.40%), wrist and hand supination to support the phone (21.62%), upper back flexion (67.50%), lower back flexion (43.23%), hip and thigh flexion (37.95%), knee flexion (67.81%) and lower leg and foot neutral (61.59%) positions amid smartphone utilize.

The predominance of musculoskeletal disorders among smartphone was most elevated within the neck (32.50%), shoulder 26.91%, upper back 20.69%, wrist and hand 19.75%. Musculoskeletal disorders were less predominant within the lower back 17.26%, the hip and thigh 9.80%, the knee 7.31%, the lower leg and foot 6.69% and the elbow 4.97%. Conclusion of this study declared Person figure of smoking and ergonomic factor of the neck flexion pose were both related to the event of neck musculoskeletal disorder in smartphone users within this study (16).

Al-Hadidi, F et al., (2019) done a cross-sectional study on students from the University of Jordan in the Hashemite Kingdom of Jordan. The self-administered online questionnaire used for this study. The common conditions of mobile phone utilize counting handedness, recurrence of portable phone utilize, term, and position amid utilize were examined.

Students' encounter of neck and shoulder pain related to smartphone utilizes, counting the seriousness of the pain utilizing the NRS-11 was assessed; understudies were inquired to rate their torment on a scale from to 10, where zero speaks to "no torment at all" and 10 speaks to "the most exceedingly bad torment they have ever experienced," utilizing entirety numbers.

A total of 500 university students participated in this study. The mean age for study participants was 21.5 (SD = 2.6). 166 male (33.2%) and 334 female (66.8%) selected a sample of participants. Most of the participating students were from the faculty of medicine (70%), followed by the faculty of pharmacy (11.6%), faculty of dentistry (9.6%), faculty of rehabilitation (5.2%), and finally the faculty of nursing (3.4%).

The seriousness of pain was a critical calculate in empowering and inciting a alter within the most visit position at which the mobile phones are utilized ($p < 0.001$), as 64% of under studies with pain seriousness >4 alter their position compared to 50.4% of understudies with seriousness ≤ 4 . Analyzing the level of mindfulness among understudies with neck and shoulders pain appeared that 68.1% of them thought that their pain may be related to their utilize of versatile phones,

whereas 31.9% did not accept that the design of their portable phone utilize could be connected to their neck and should ers pain.

In conclusion, smartphones are progressively getting to be basic in all perspectives of our lives, and more consideration ought to be given towards increase awareness approximately the significance of having solid sitting positions and utilizing smartphones for limited terms, in arrange to control the increase of neck and shoulder pain in our social orders (17).

Choi, J.-H et al., conducted an experimental study with 15 college students with the age of 20. The reason for this study was to recognize changes within the action and weakness of posterior cervical muscles supporting the head. They formed a group and had to embrace three distinctive postures (maximum flexion, middle flexion, and neutral). Whereas the 15 subjects kept up the position, muscle action and weakness were measured utilizing surface electromyography. An analysis of variance (ANOVA) test was conducted to compare the action and weakness of the cervical erector muscles amid the three diverse positions.

In the result of this study terms the differences within the muscle movement for each position, the four muscles measured (right splenius capitis, right upper trapezius, cleared out splenius capitis, cleared out upper trapezius) did not appear any measurably critical differences (18). Guan, X (2015) et al., done this experimental study with 186 participants included 81 females and 105 Males aged from 17 to 31 years old students from Tongji University Shanghai, China. Participants were informed to stand normally and using a mobile phone as in their own style. Photogrammetry (Measurement in photographs) used as a measurement tool for this study. No significant distinction was found in age between male and female subjects ($p = 0.155$). A significant distinction was apparent in stature and weight ($p = 0.000$), and BMI was altogether higher in male subjects ($p = 0.000$).

A series of one-way ANOVA was done to get to the differences of factors between males and females. When standing neutrally, the neck tilt angle of males was essentially smaller than that of female (male 53.84, female 55.78, $p = 0.035$), whereas head tilt angle was comparable between the two groups ($p = 0.823$). When using smartphone, males had an essentially larger head tilt point (male 97.76, female 91.93, $p = 0.000$) and smaller neck tilt point (male 35.94, female 42.44, $p = 0.000$). In any case, there was no significant difference in look angle. Males showed a bigger forward head shift distance than females in both mobile phone utilize and neutral posture ($p = 0.025$ and 0.029 , respectively).

One-way ANOVA utilizing pose as the gathering factor showed a significant difference between neutral pose and looking at the mobile phone for the measurements.

And this study describes when looking at the mobile phone, the head tilt angle significantly increased and the neck tilt angle diminished altogether. As the head tilt angle we measured represented the angle between the vertical and the line running through the tagus and the acanthus, these differences demonstrated that, when the subject looked at the mobile phone, the head moved more forward. In increased, the forward head posture was moreover affirmed by the significantly increased forward head move (19).

Kim, S. Y., & Koo, S. J. (2016). done study with 34 patients in their 20s and 30s were selected whose tagus was found on the cleared outside instead of at the sidelong acromion angle on radiography in a lateral view of cervical. This study avoided people with neck pain and those with inherent deformities, genuine surgical or neurological illnesses, limb wounds, or limb pain within the earlier 6 months. In this study, Thirty-four adults with forwarding head pose were classified into groups by term of smartphone utilize: From group one 11 participants utilized a smartphone for 10 minutes, from group two 12 for 20 minutes and group three 11 for 30 minutes.

A goniometer was used on all subjects in arrange to evaluate posture as they started to utilize a smartphone. Fatigue of cervical erector spinae and upper trapezius muscles was measured by electromyography, and pain before and after the trial was assessed utilizing Visual Analog Scale (VAS) scores.

The result of this study describe a significant difference within the degree of weakness within the left upper trapezius muscles in group 2 and left cervical erector spinae and bilateral upper trapezius group 3. There was a critical difference in fatigue within the left upper trapezius in groups 1 and 3. Pain and fatigue compounded with longer smartphone utilisation. This study gave information on the proper duration of smartphone utilisation. Proper posture and breaks of at least 20minueare suggest when utilizing smartphones (20).

DISCUSSION

Cervical pain and musculoskeletal disorder may have along-lasting impact on both psychological and physical functioning and thus it is important to identify and evaluate the effects of frequent usage of the smartphone. From the well-defined literature study, it is very cleared that unilateral as well as bilateral texting using smartphones disturbed the posterior cervical and shoulder muscles. Furthermore, due to the forward neck action while texting on the smartphone, Isometrically contraction happened in the neck extensor muscles against the force of gravity.

From the literature survey, it is known that proper

posture in sitting will give a reduced cervical pain score. Also, most of the researcher suggested having proper ergonomics guidelines related to the usage of smartphone among the students or youngsters community. By identifying the characteristics of effective preventive program guidelines can be suggested for developing positions and methods aimed at improving the comfort and pain-free smartphone usage of the students.

CONCLUSION

The present study of this review showed that the prolonged usage of the smartphone will lead to cervical pain and Musculoskeletal disorders. Many researchers have reported weakness of lower neck muscle also cause by neck pain and disability. Moreover, the muscle weakness, position of the neck and duration of usage plays an important role. The neck strengthening exercises conjoined postural correction with frequent intervals of usage will help to prevent neck pain and disability.

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