CHARACTERISTICS OF MUSCULOSKELETAL COMPLAINTS AMONG STUDENTS USING DIGITAL DEVICES FOR ONLINE CLASSES

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We the undersigned certify that we have carefully read and recommended to the Faculty of Medicine, University of Dhaka, for the acceptance of this dissertation entitled.

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Submitted by, **Md. Imam Mehedi Hasan Mojumder**, for partial fulfillment of the requirements for the degree of Bachelor of Science in Physiotherapy (B. Sc. PT).

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Declaration

I declare that the work presented here is my own. All sources used have been cited appropriately. Any mistakes or inaccuracies are my own. I also declare that for any publication, presentation, or dissemination of information of the study, I would be bound to take the written consent of my supervisor & the Physiotherapy Department of Bangladesh Health Professions Institute (BHPI).

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Acronyms

BHPI- Bangladesh Health Professions Institute.

BMI- Body Mass Index

BMRC- Bangladesh Medical and Research council

CRP- Centre for the Rehabilitation of the Paralysed

IRB- Institutional Review Board

MSP- Musculoskeletal Complain (pain)

SPSS- Statistical Package for the Social Science

UVSB-University Students of Bangladesh

VAS-Visual Analog Scale

WHO- World Health Organization

List of table

Abstract

Purpose: The purpose of the study was to determine the characteristics of musculoskeletal complaints among undergraduate students using digital devices for online classes. ***Objectives:*** The study objective was to demonstrate the socio-demographic characteristics related to musculoskeletal complain, to examine the prevalence of musculoskeletal complain, to determine the relationship between pain intensity and site of pain with related independent variables. ***Methodology:*** The dissertation was an observational study with a cross-sectional study design. From June 2021 to September 2021, a total of 239 university students responded to the online survey. Inclusion criteria were age group between 18-26 years, any existing congenital disability, and existing musculoskeletal complaint more than 1.5 years. Participants were selected by snowball sampling. All data were collected through an online semi-structured questionnaire having socio-demographic, physical factors, home or environment-related factors, and pain as the musculoskeletal complaint in the VAS scale and characteristics of pain distribution. A statistical test has been conducted as per the distribution of data. Descriptive statistics were performed by mean, SD, frequency, and percentage. Inferential statistics has been performed by Chi-square, independent t-test, One way ANOVA, and Pearson correlation test. Binary logistic regression has been performed as predictor variables as pain (absent/present), pain intensity & site of pain. Here Alpha (α) value has been set as <0.05. ***Results****:* Among the respondents, 239 students took part in this study. Mean & SD of overall age was 21.41±1.56 BMI was 22.62±3.76. The prevalence of musculoskeletal pain was found to be 78.25 percent (n=187). Where 42.8 percent (n=80) were male and 57.2 percent (n=107) females had musculoskeletal pain. Female participants experienced more musculoskeletal pain than male participants. 26.7 percent had neck pain, 9.6 percent had shoulder pain, 4.8 percent had elbow pain, 4.3 percent had wrist pain, 17.1 percent had thoracic pain, 32.6 percent had lumbar pain, 3.2 percent had knee pain, and 1.6 percent had ankle pain. Participants claimed that their prolonged online time was to blame for their various sites of pain. Association found between feel during online class with pain present/absent; Physical activity level, Follow posture during online class, using an electronic device during online class, using electronic device except for online classes with pain intensity.

Binary regression has been found that-feel during online class (OR=2.049), linear relationship between feeling uncomfortable with pain present. Physical activity level (OR=1.210), follow posture during online class (OR=1.877), Using electronic device during online class (OR=1.640); the linear relationship between physical activity level, follow posture, Using electronic device during online class with pain intensity. Using electronic devices except for online classes (β=-.015), the reverse relationship between using electronic devices except for online classes with pain intensity was related to musculoskeletal complaints. ***Conclusion:*** Most of the participants are suffering musculoskeletal complaints due to using digital devices in online classes.

Keywords: Musculoskeletal complaint, online class, University student, Pandemic situation (Covid-19).

CHAPTER –I INTRODUCTION

1.1 Background

Musculoskeletal disorders are becoming a very fast-growing health problem where teenagers, adults, and young people are being affected (Oha et al., 2014). Musculoskeletal disorders (MSD) are usually both muscle and skeleton-related health occurrences in the body. The affected area of the body includes the back, neck, chest, shoulder, spine, and others (Khan et al., 2013). Electronic devices mainly excessive use of computer causes MSD (Oha et al., 2014).

The term musculoskeletal disorder (MSD) refers to a state that associates the nerves, tendons, muscles, and supporting structure of the body. It has been identified as the most common reason for reported work-related illness, productivity loss, and long-term sick leave (Brady et al., 1997).

Computer usage has emerged as a new risk factor. But it has been used for students' daily activities like online classes, gaming, social network, etc (Kobus et al., 2013).

At present, as computers are fulfilling the solution of daily life, so the dependence on computers has been increased (Ayanniyi et al., 2010). As a result, some side effects have been visualized. Students spend most of their time doing online activity including assignments, tests, writing, and oral examination. Sitting for a long period causes a postural problem and prolonged reading has been mentally stressed. (Rose, 2000). Continuous use of smartphones, desktops, and computer causes pain (Walker-bone et al., 2001). It hampers the normal activity.

Musculoskeletal disorder is connected to uncomfortable. It refers to the pain in the muscle, bones, joints, ligaments, and tendons (Bruusgaard, 2003). It also affects a range of ages (teenage, young, and adult, sex male, female) (Erwin et al., 2012). Musculoskeletal pain has occurred in some special cases such as neck pain, shoulder pain, and back pain (Yeun & Hun, 2017). Musculoskeletal disorder breaks the normal posture. Excessive uses of electronic devices cause extreme disorder and deformity.

Musculoskeletal pain is felt anywhere in bones, muscles, joints, tendons, and ligaments. Muscle pain can be intense or not. The causes of pain are such as

prolonged immobilization, overuse, repetitive movements, postural strain. It causes pain at the related structure (International Association for the study of pain, musculoskeletal pain, 2009). Prolonged sitting, lack of physical activity, high demand for online classes also make pain. The pain may be acute or chronic (Ogunlana et al., 2019).

Coronavirus disease 2019 (COVID-19) first appeared at the end of 2019, spread throughout the world at the beginning of 2020, and was then declared a pandemic by World Health Organization (WHO) (Cucinotta & Vanelli, 2019). It is a contagious disease. As it is transmitted from human to human, so all parts of the world are affected. People's movements are restricted in their daily life. They are facing the new term Lock-down. The lockdown effect is everywhere including personal, social, educational, economic, etc (Mahler et al., 2020). Isolation is the result of COVID-19. As a result, physical classes have been postponed and online classes widely spreading. Online education is a new teaching feature where video and audio lectures are being supplied (Bao, 2020). Musculoskeletal pain has increased for taking online classes. Students have to take online classes for a long time. That is why disorder has occurred. Maximum time they don't catch their problem. Hence they suffer more.

Musculoskeletal pain begins from teenage. But they don't go for treatment. Hence their activity level had been decreased (Jannini et al., 2006).

Electronic devices are the major factors for various types of musculoskeletal-related health occurrences such as computers, laptops, desktops, smartphones, pads, etc. A recent survey proves that excessive use of electronic devices causes a sleeping disturbance, physiological disturbance mental weakness, headache (Sharan et al., 2014).

When Bangladesh finds the first corona suspected patient, the lockdown has been started. School, college, university have been shut off. As a result, students are highly dependent on online classes. And they feel musculoskeletal disorders such as neck pain, spine problem, and shoulder problem (Ichhpujani et al., 2019).

Idiopathic musculoskeletal pain is the most important cause of non-inflammatory pain (Zulian, 2015; Hayden, 2016). This pain is usually an under-diagnosed condition and affects daily life activities (Maia et al., 2016; Hakala et al., 2012).

The early two decades of this century have been witnessed huge changes in electronic devices. Now, these electronic devices are used by only touch screens. This feature is user-friendly and it inspires the users to use it for a long time. As people don't change their posture during using time, then musculoskeletal syndrome begins (Shan. Et al., 2013; Szucs et al., 2018).

Covid-19 pandemic effects all over the world. Hence the educational institutions are in shutdown. Students are doing their classes online. Many advantages have online classes, but still have some problems and one of them is the health issue. Visionary, physiological, psychological, and musculoskeletal disorders are very common. The musculoskeletal problem is back, neck, shoulder, wrist, arm, finger, knee, lower leg, and buttock pain (Jaiswal et al., 2019).

Several countries of the world agreed to postpone temporarily international and domestic travels and enforced curfews, lockdown, shutdown to their citizen. People are relying on electronic devices and face many health occurred. Prolonged use of digital devices behind the reason of it (Lippi et al., 2019; Bouziri et al., 2020; Shariat et al., 2020)

The potential risk factors for the musculoskeletal disorder are awake posture, forceful exertion, duration and rest break, and individual factors.

1.2 Rationale

Physical classes have not been held for a long time because of the pandemic Covid-19. Having online classes as an alternative. But students are facing many problems in online classes. Musculoskeletal problem is one of them.

Musculoskeletal pain and musculoskeletal syndrome are very common. It is very increasing alarmingly. Musculoskeletal problems include neck, shoulder, elbow, wrist & back pain, spine abnormalities, muscle spasm, and others. Students mainly teenagers & young are the most sufferer. As the world is now under lockdown, they are not able to go out for physical activity. They are also feeling pain because of their continuous classes for a long time.

The type of pain is constant. It may be moderate or severe. As students are taking online classes through electronic devices like smartphones, laptops, desktops, etc, they don't get enough time to do the movement properly. Hence they feel musculoskeletal problems as well as pain. As they have limited movement, less amount of range of motion, pressure on the shoulder, and others, so they need to change their (position and postural) bad habits.

All are modern students are using android phones. They use it for a long time without movement. It's a bad habit for undergraduate students. Hence they feel musculoskeletal complaints such as neck, shoulder, elbow, wrist & back pain. Today's children pass their daily activity with the internet. For excessive use of the internet, they don't exercise.

Prolonged classes cause neck pain. Long-term uses of headphones can make the ears hear less. Seeing on the digital display for a long time weakens eye muscle ultimately causing eye problems. Holding the digital devices for a long time affects the hand muscle which results in wrist pain.

Even they do their class in the home environment for a long time, during an online class. Lack of Vitamin-D in their body. Vitamin D is known as the sunshine vitamin. It is produced in the skin by sunlight. Vitamin-d is essential for strong bones because it helps the body use calcium from the diet. Traditionally, vitamin-d deficiency has

been associated with rickets, a disease in which the bone tissue doesn't properly mineralize, leading to soft bones and skeletal deformities.

The study will find the musculoskeletal impairments among Students using digital devices for online classes.

1.3 Research question:

What are the Characteristics of Musculoskeletal Complaints among Students using digital devices for online classes?

1.4 Aim of this study

To find out characteristics of musculoskeletal complaints among students who use digital devices for online classes.

1.5 Objectives of this study

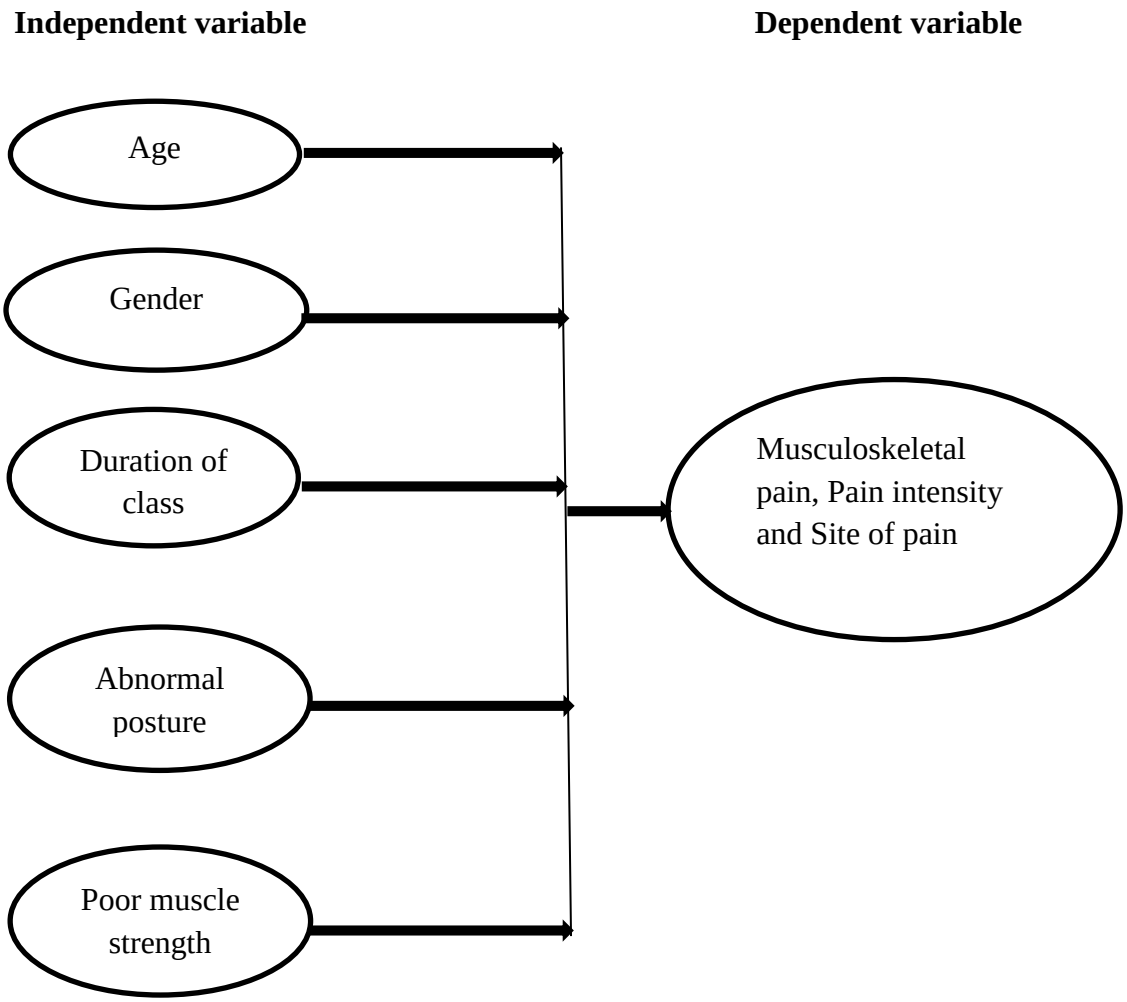
I. To demonstrate a socio-demographic chart related to musculoskeletal complaints, among students who use digital devices for online classes.

II. To examine the prevalence of musculoskeletal complain, among students who use digital devices for online classes.

III. To determine the relationship among duration of online classes with clinical manifestation among students who use digital devices for online classes.

IV. To find out the relationship among socio-demographic variables, clinical parameters among students who use digital devices for online classes.

1.6 List of variable



1.7 Operational definition:

Musculoskeletal complaint (Pain):

- Musculoskeletal pain can be acute, meaning it is sudden and severe. Or the pain can be chronic (long-lasting). You may have localized pain (in one area of your body), or it may affect your entire body**.**
- Musculoskeletal pain is pain that affects: Bones, Joints, Ligaments, Muscles, and Tendons

CHAPTER-II LITERATURE REVIEW

Musculoskeletal disorders (MSD) are conditions that affect the body's nerves, tendons, muscles, and supporting structures, according to the Bureau of Labor Statistics (2009). Musculoskeletal disorder is also known as 'cumulative trauma disorder, "repetitive strain or stress injury,' 'occupational overuse syndrome,' and 'activity-related pain syndrome,' because repeated exposure to the same muscle or tendon has been hypothesized to be a risk factor for injury and inflammation to the affected area.

A musculoskeletal disorder is an injury to a portion of the musculoskeletal system that develops over time (Srilatha et al., 2011). The majority of musculoskeletal disorders are characterized by recurring episodes of pain and disability that can range in severity and impact (Andersen et al, 2011). The term musculoskeletal disorder refers to a large group of conditions caused by traumatizing the body in a minor or major way over time. The disorder is caused by a buildup of trauma. These conditions are frequently centered on a joint and affect the muscle and bone. There are numerous factors in computer work that can contribute to the development of musculoskeletal problems (Veiersted & Waersted, 1999).

Musculoskeletal pain in adolescents is multifactorial. Gender, age, and use of electronic devices are all risk factors for musculoskeletal pain. (Dai et al., 2017). In the current study, cell phone use was common in adolescents with musculoskeletal pain, while television use was reduced. The most common locations for these complaints were the back, neck, and shoulders, and cell phone use may be to blame for musculoskeletal pain (Szeto et al., 2017).

The World Health Organization (WHO) declared Coronavirus disease 2019 (COVID-19) a pandemic after it first appeared at the end of 2019 and spread throughout the world at the beginning of 2020 (Vanelli et al., 2020). Countries affected by the COVID-19 pandemic were forced to impose stringent restrictions on both public and private life. To prevent human-to-human transmission and the spread of the virus, strict precautions based on social distancing rules were implemented. The new

regulations covered all aspects of life, including social life and the education system (Bertozzi et al., 2020).

To ensure social isolation during the pandemic, all formal education has been halted, and distance (online) education has been implemented in many schools, with the assumption that the pandemic will last for a long time. Online education is a training system in which live video and audio lessons are delivered in a completely virtual environment using existing computer technologies, with no requirement for the student or teacher to come to school and is completely independent of time and space (Bao, 2020). The use of online education tools such as computers is greater in the distance education system than in the traditional education system.

Individuals have remained inactive at home as a result of the COVID-19 pandemic due to restrictions and quarantine, and because they have had to continue with their intensive work schedules in an un-ergonomic and unfamiliar environment, musculoskeletal system problems have arisen. Furthermore, musculoskeletal problems caused by this intense period, combined with the pandemic's effect of causing anxiety and depression, have impacted individuals' psychosocial status (Smith et al., 2020).

The increased use of mobile devices in the twenty-first century necessitates studies to investigate the impact of such devices on users' health (Szucs et al., 2018). Many studies in the field are interested in determining and investigating the muscle activities and risk factors associated with the use of electronic devices (Maslen and Straker, 2009).

The findings of a search focusing on user preferences for electronic devices such as mobile phones and touch screen devices for many daily purposes such as educational, communication, and social media, as well as research focusing on the effects of these devices use on musculoskeletal symptoms/disorders, were included in this study (Binboga & Korhan, 2014).

In a study conducted at Roma Tre University, fifteen right-handed participants ranging in age from 21 to 25 years were asked to perform multi-task movements (e.g., video watching, playing, texting, and browsing) while sitting and standing to investigate the effect of smartphone use on changes in neck and trunk posture.

According to the results of the questionnaire data analysis, 66.6 percent of participants reported neck and/or shoulder pain. However, there were no significant differences in neck angle between the activities performed while standing and sitting. The findings suggest that there were risk factors that could lead to neck pain, musculoskeletal fatigue, and disorders as a result of the postures changes during smartphone use (D'Anna et al., 2018).

Students, like everyone else, are increasingly reliant on computers in their daily lives (Kobus et al., 2013). Computers have enabled users to complete tasks more quickly, easily, neatly, and with less frustration (Ukpai et al., 2010). However, there are some drawbacks to using it. Several studies have found a link between university students' computer use and musculoskeletal disorders. (Khan & chew, 2013; Gharib & Hamid, 2013).

University students are expected to work hard academically (assignments, tests, and writing examinations). Because these academic tasks necessitate the constant use of computers, students spend the majority of their time in computer labs. There could be several explanations for the prevalence of musculoskeletal problems among university students. Heavy lifting, prolonged sitting, poor posture, stress, a high academic demand/workload, and a lack of regular exercise were all examples. Students at universities put in long hours of reading (Mbada et al., 2010; Rose, 2000), writing, and computer work, making them a high-risk group for musculoskeletal problems (Graffin et al., 2001).

While there is a wealth of information on musculoskeletal problems among university students' computer users in other countries, there is a scarcity of studies on the prevalence of musculoskeletal problems associated with computer use among South African university students to our knowledge. As a result, the current study was designed to determine the prevalence, causes, and consequences of musculoskeletal disorders among computer users at the University of Venda. Given that musculoskeletal problems in an at-risk population of students are the potential precursor to their future events in the workplace, the determination of the prevalence and pattern of musculoskeletal symptoms is one of the important steps in the effective intervention and prevention of further chronic pain syndromes in young adults.(Sugita, 2000; Kocijancic et al., 2004).

College students frequently use laptop computers for writing assignments, presenting research projects, and engaging in recreational activities (e.g., playing games, watching movies, or communicating with friends). According to two large annual surveys at the University of Texas (Wolff, 2006) and the University of South Carolina (Crews, Brown, Bray, & Pringle, 2007), more than half of students own laptop computers, and the growth rate for student laptop computer ownership has been dramatically increased, with an average of 65 percent from 2002 to 2004 and 227 percent from 2001 to 2006.

Rest breaks away from intensive computer operation are essential for individuals who use computers for extended periods to prevent the onset of musculoskeletal problems. Several researchers have proposed that the risk of musculoskeletal disease is increased in computer operators with few rest breaks (Bergqvist et al., 1995b; Tittiranonda et al., 1999). Rest breaks allow computer operators to recover from the physical strains caused by continuous and constrained computer work, such as static muscle fatigue, decreased blood circulation, and inflammation in tendons, muscles, and nerves (Carter & Banister, 1994).

Smartphones, video games, computers, laptops, and tablets are the most commonly used electronic devices today (Kumcagiz & Gündüz, 2016). Smartphone users in Nigeria are rapidly increasing, making the country one of the world's fastest-growing smartphone markets (Smith & Tran, 2017). Smartphones are used by people of various ages, with young adults having the highest proportion of smartphone use compared to everyone else (Ganu & Nair, 2017). Universities are home to a large number of young adults, and these students have unrestricted use and over-dependence on smartphones (Jena, 2014).

Posture is defined as the regular and balanced arrangement of skeletal components to protect the body's supportive structure from injury and progressive deformation (Pelin et al., 2012). During the use of smartphones, various postures are assumed, including static postures of sitting and lying as well as dynamic postures of walking (Kim & Koo, 2016). Because of the portability of smartphones, they could be used in a variety of postures that may be associated with musculoskeletal exposures that result in postural abnormalities such as forward head and rounded shoulders (Werth & Reeves,

2014). Because smartphones are not designed to allow the wrists to move, users are subjected to awkward neck/shoulder posture and distal upper extremity muscles.

Youths own and use smartphones more than any other age group in the population (Ganu & Nair, 2017).) Undergraduate students' use of smartphones is unrestricted, and they are overly reliant on them (Jena, 2014). They frequently adopt different postures, which cause pain in various parts of the body (Werth & Reeves, 2014). Studies have discovered a link between computer and laptop use and musculoskeletal symptoms. Furthermore, some postural abnormalities have been linked to the use of computers and laptops (Calik & Gursoy, 2014; Hough & Nel, 2017; Singh & Deane, 2014).

Only a few studies have looked into the use of electronic devices, with the majority of them focusing on computers and laptops. Smartphones, on the other hand, are used differently than computers and laptops due to their portability and control via a touch screen interface. Smartphones may thus be associated with different musculoskeletal exposures, posing different risks for musculoskeletal symptoms than computers and laptops (Straker et al., 2017).

The prevalence of musculoskeletal pain among adolescents was found to be higher than in previous studies in Brazil (Janini et al., 2011) and other countries. (Hakala et al., 2011) This evidence alone emphasizes the importance of investigating the factors associated with this problem, making it necessary to provide health assessment and comprehensive health care. In terms of symptom location, the thoracolumbar spine had the highest prevalence of pain complaints (46.9 percent).

Recent studies with Brazilian23 and Chinese students8 revealed that low back pain was prevalent at a rate close to 32%. Although the findings were lower, they appear to corroborate the current findings because this study included symptoms related to the thoracic spine, which may explain the difference. Upper limb pain was the second most common, followed by cervical spine pain. Previous studies (Deshai et al., 2010) found that pain in the cervical and shoulder regions affected approximately 21-22 percent of adolescents.

In their daily lives, undergraduate rehabilitation students are exposed to a variety of factors that may predispose them to MSP or trigger the occurrence of MSP. In this

study, we looked for MSP in 145 occupational therapy and physiotherapy students at a South African university. Other studies have yielded similar results (Hasan et al., 2018) with university students majoring in health sciences. In a systematic review of eight included studies, Xie and colleagues demonstrated the prevalence of musculoskeletal complaints among mobile device users. 34 A wide range of prevalence rates for musculoskeletal complaints was reported, with neck complaints having the highest prevalence. (Rakhadani et al., 2020)

A study at the University of Venda in South Africa found a high prevalence of musculoskeletal concerns among students, with the neck, shoulder, and wrist being the most commonly affected. This was attributed to long periods of computer use, poor sitting posture, and uncomfortable chairs. Long study hours and repeated laptop use were found to increase MSP in Hasan and colleagues' study (Hasan et al., 2018).

Revealed that severe internet addiction resulted in a higher risk of MSP and (Nordin et al., 2014) concluded that reduced physical fitness and prolonged sitting duration were associated with low back pain amongst health science undergraduates. Internet addiction is associated with adopting static postures for a protracted period usually prolonged sitting and this encourages a sedentary lifestyle resulting in low physical fitness. High prevalence of MSP has been consistently reported to be associated with prolonged static postures and a sedentary lifestyle; this fact is corroborated by our present study.

As a result, students spent a significant amount of time sitting in front of a much larger screen than they were accustomed to. This is a significant risk factor for musculoskeletal pain causes. As a result, students began to attend classes for several months while sitting in inadequate, vicious, and misaligned postures, most of the time due to a lack of suitable and safe equipment to maintain proper body balance in front of the computer or phone device.

Furthermore, students' social isolation made it difficult for them to engage in physical activities. Muscle weakness is a fast-developing condition that can occur after only two days of inactivity (Narici et al., 2021). This is yet another risk factor for the development of musculoskeletal pain in this population.

As a result of the COVID-19 pandemic, which is expected to last until 2020 and 2021, medical students around the world have been forced to use information and communication technologies (ICTs) to continue their studies. As a result, higher education institutions have increasingly used ICTs and the Internet to compensate for the lack of face-to-face instruction in classrooms (Gomes et al., 2021).

According to the current study, 55.8 percent of students spent more than 4 hours per day in front of a screen studying during the pandemic. As part of their academic routine, students began to use notebooks and cell phones full-time, adopting very unsettling postures that can cause pain and musculoskeletal changes, particularly in the upper limbs and spine (Morais et al., 2019).

CHAPTER – III METHODOLOGY

3.1 Study design: The purpose of the study was to find out the characteristics of musculoskeletal complain among students using digital devices for online classes. A cross-sectional study design was selected for this study. This design involves identifying the group of students & then collecting the information that the researcher requires when they will be using the particular service (University students). A cross-sectional study can be thought of as providing a snapshot of the frequency & characteristics of a (musculoskeletal complaint) disease in a population at a particular point in time. A cross-sectional study design was used for a large number of participants to collect data.

3.2 Study area: Data had been collected from the some selected university in Bangladesh. Participants are first, second, third & fourth year of university students. The study period was from 7th June 2021 to 15th November 2021.

3.3 Study population: The study population consists of university students in Bangladesh who use digital devices for online classes. This study had been conducted at various universities in Bangladesh, with sample populations drawn from first, second, third, and fourth-year university students aged 18 to 26.

3.4 Sampling Technique: Due to the limited time available, the samples had been chosen using the snowball sampling technique, which is one of the cheapest, and fastest methods of sample selection. The sample was meet the inclusion and exclusion criteria and had been willing to participate in the study.

3.5 Selection criteria:

Inclusion criteria:

- Age group between 18-26 years. (Ichhpujani et al.,2019)
- Both boys & girls participants. (Hasan et al.,2018)
- Being First, second, third & fourth-year students. (Gomes et al., 2020)
- Bangladeshi university students who are taking part.

Exclusion criteria:

- Any exists musculoskeletal complaint more than 1.5 years (Hasan et al.,2018)
- Any exists congenital Physical disability
- Work involvement – students involved in other heavy work or another job apart from this study.
- Unwilling.

3.6 Sample size calculation: The sample size has been calculated as the estimation of sampling scientifically and had been selected as the standard number of the sample as a calculation guide. (Depends on inclusion & exclusion criteria) .

Mathematical Tools:

n=number of sample

p=sample proportion /percentage of incidence & prevalence, =0.5(Total university students of Bangladesh 853267 & total population of Bangladesh 166231089)

q=1-p

z=1.96(constant)

e=margin of error 5%=.05

The equation of sample size calculation is given below-

$$n = \frac{zp2q}{e2}$$

$$= \frac{(1.96)^2 \times 0.5 \times (1-0.5)}{(0.05)^2}$$

$$= \frac{3.8416 \times 0.5 \times 0.5}{0.0025}$$

$$= \frac{0.9406}{0.0025}$$

= 384 (Hannan, 2016)

3.7 Sample size: So, initially, the researcher's goal was to focus the study on 384 samples using the calculation above. However, because the study was conducted as part of a fourth professional academic research project and there were some constraints, the researcher was forced to limit the sample size to 239 students.

3.8 Method of data collection:

The sample size has been calculated as the estimation of sampling scientifically and had been selected as the standard number of the sample as a calculation guide. (This is dependent on the inclusion and exclusion criteria.)

3.9 Questionnaire:

A questionnaire on an online paper was used to collect data. Among university students, there were questions about musculoskeletal complaints when using digital devices for online classes. A pilot study was conducted to reduce questionnaire errors, which included student research (online class) Hours in online classes varied in length, as they studied (online class) 40-120 minutes (1-2 hours), 120-180 minutes (2-3 hours), and more than 180 minutes (3 hours). Except for online classes, they used electronic devices for periods ranging from 1 to 5 hours, 5 to 10 hours, 10-15 hours, and more than 15 hours. Both male and female participants were included. The study posture varies from one to the next.

3.10 Data collection tools: The consent form, online questionnaire, computer, and SPSS (Statistical Package for the Social Sciences) software-20 version was used for this study's materials and tools.

3.11 Data analysis: After completing the initial data collection every questionnaire had been checked again to find out any mistake or unclear information. The data analysis was performed in SPSS version 20. The variables were labeled in a list in order. The researcher put the name of the variables on the variable view of SPSS and defined the types, values, decimal, label alignment, and measurement level of data. Then the inputted data was checked to ensure that all data has been transferred from the questionnaire. The raw data is then ready to be analyzed in SPSS. Data were analyzed by descriptive statistics and calculated as percentages and presented by using tables. Microsoft Office Excel 2013 was used to decorate data. By this study, a lot of information had been collected. All results gave an idea about characteristics of

musculoskeletal complaints among students using digital devices for online classes. To find out the association among the different variables Chi-Square, independent T and one-way ANOVA test others test is normality test and binary logistics was performed.

3.12 Statistical Test

3.12.1 Determination of nature of data

The variable was determined as nominal, ordinal, interval, ratio data & considered their parametric & non-parametric properties based on data type, normality test, and standard procedure (Hicks, Research method for Clinical therapist).

Table 01: Normality test for different variable

Variable	**Description**	**Data type**	**Normality test**	**Data distribution**
Age overall	18-26 years	Ratio	P=(0.000), (0.000)	Parametric
Gender	Male, female	Nominal		Non-parametric
Marital status	Married, Unmarried	Nominal		Non-parametric
Academic year	1st year, 2nd year, 3rd year, 4th year	Ordinal		Non-parametric
Body Mass Index	<18.4, 18.5-24.9, 25-29.9,30-34.9	Ratio	P=(0.041),(0.000)	Parametric
Physical activity level-	Active, Insufficiency active	Nominal		Non-parametric
Physical activity out of class	Gaming, Browsing, Others	Nominal		Non-parametric
Duration of classes(minutes)	40-120,121-180,181-240,241-360,>360	Ratio	P=(0.000),(0.000)	Parametric

Feel during online class	Comfortable, Uncomfortable	Nominal		Non-parametric
Which posture follow online class	Erect, Slouch	Nominal		Non-parametric
Which position follow online class	Desk, Bed, Floor, Others	Nominal		Non-parametric
Using electronic device	Mobile, Computer, Laptop	Nominal		Non-parametric
How much time do you use your electronic device except Online classes(Hours)	1-3, 4-6, 7-10, >11 hours.	Ratio	P=(0.000),(0.000)	Parametric
Sleep at night(Hours)	3-5, 6-7, 8-10, >10 hours.	Ratio	P=(0.000),(0.000)	Parametric
Pain type-	Constant, Intermittent	Nominal		Non-parametric
How much pain intensity during class	(0-10 cm)	Ratio	P=(0.000),(0.000)	Parametric
Limb weakness	Yes ,No	Nominal		Non-parametric
Movement limitation	Yes, No	Nominal		Non-parametric

3.12.2 Determination of statistical test

The statistical had been performed as descriptive and interferential statistics based on parametric or non-parametric properties. The descriptive statistics were performed as frequency & percentage in nominal and ordinal data. Mean and standard deviation had been calculated for interval and ratio data.

The inferential statistic had been performed as follow:

Table 02: Inferential statistical test

Purpose	Variable	Statistical test
Relationship	Two(2) categorical data (non-parametric)	Chi square test
	One categorical (non-parametric) and one parametric data	Independent t-test (independent bi-variate data)
		One way ANOVA (independent Trivariate)
		Chi-square test (independent multi-variant data)
	Two (2) parametric data	Pearson correlation
Regression of relationship	Dependent Bivariate as categorical data (Bivariate)	Binary logistic regression

3.13 Ethical consideration: The proposal was submitted to the Institutional Review Board (IRB) of the Bangladesh Health Profession Institute (BHPI) and after the defense, the research proposal approval was taken from the IRB. Written consent was taken from each participant before collecting the data. The World Health Organization (WHO) guidelines were always followed to conduct the study.

CHAPTER-IV RESULTS

4.1 Socio-demographic part: This table contains different variables such as age, gender, marital status, academic year,(height,weight=BMI), Physical Activity Level, Physical activity out of class, Duration of classes, Following posture, Following position, Using electronic device, How much time using electronic device except online classes, Feeling during class, Sleep at night, Any pain, Site of pain, Pain type, Pain intensity, Feels pain out of class, Limb weakness and Movement limitation these are described frequency, percentage, mean and standard deviation.

Table 03: Socio-demographic chart with frequency, percentage, mean & SD:

Variable	**Category**	**Description of data(Frequency,%, Mean, SD)**
Age- 18-20 21-23 24-26	Ordinal	 75(31.4%) 134(56.1%) 30(12.6%)
Gender- Male Female	Nominal	 109 (45.6%) 130 (54.4%)
Marital status- Married Unmarried	Nominal	 19 (7.9%) 220 (92.1%)
Academic year- 1st year 2nd year 3rd year 4th year	Ordinal	 127(53.1%) 50(20.9%) 21(8.8%) 41(17.2%)
Height-	Ratio	63.68±5.09
Weight-	Ratio	60.65±12.65
BMI=	Ratio	22.62±3.76

Physical Activity level Active Insufficiency active	Nominal	 176(73.6%) 63(26.4%)
Physical activity out of class- Gaming Browsing Others	Nominal	 55(23%) 132(55.2%) 52(21.8%)
Duration of classes-	Ratio	146.56±76.28
Following posture- Erect Slouch	Nominal	75(31.4%) 164(68.6%)
Following position- Desk Bed Floor Other	Nominal	130(54.4%) 96(40.2%) 3(1.3%) 10(4.2%)
Using electronic devices- Mobile Computer Laptop	Nominal	 201(84.1%) 29(12.1%) 9(3.8%)
How much time using electronic devices except online classes-	Ratio	5.33±3.06
Feeling during class- Comfortable Uncomfortable	Nominal	 114(47.7%) 125(52.3%)
Sleep at night-	Ratio	6.75±1.25

Any pain- Yes No	Nominal	 187(78.25%) 52(21.75%)
Site of pain- Wrist Elbow Shoulder Neck Thoracic Lumbar Knee Ankle	Nominal	 8 (4.3%) 9 (4.8%) 18(9.6%) 50(26.7%) 32(17.1%) 61(32.6%) 6(3.2%) 3(1.6%)
Pain type- Constant Intermittent	Nominal	 30(16%) 157(84%)
Pain intensity- 0-10 cm	Interval	 4.30±1.90
Feels pain out of class- 0-10 cm	Interval	 3.87±1.93
Limb weakness- Yes No	Nominal	 95(39.7%) 144(60.3%)
Movement limitation- Yes No	Nominal	 27(11.3%) 212(87.7%)

4.1(A) Socio-demographic part:

The table above shows a total of 239 participants. 18-20 year olds made up 31.4 percent (n=75), 21-23 year olds made up 56.1 percent (n=134), and 24-26 year olds made up 12.6 percent (n=30). Males made up 45.6 percent of the group (n=109), while females made up 54.4 percent (n=130). Married people accounted for 7.9

percent (n=19), while unmarried people accounted for 54.4 percent (n=200). The results showed that 127 (53.1 percent) of the 239 participants were first-year students, 50 (20.9 percent) were second-year students, 21 (8.8 percent) were third-year students, and 41 (17.2%) were fourth-year students.

4.1(B) Physical factor:

The participant's BMI was 22.62±3.76 (Mean & SD). According to the findings, 73.6 % (n=176) of the 239 participants were physically active, while 26.4% (n=63) were not. According to the table, among 239 participants, their physical activity outside of class was as follows: gaming 23 % (n=55), browsing 55.2% (n=132), and other activities 21.8 % (n=52).

4.1(C) Home environment:

The analysis revealed that out of the 239 participants, the mean and standard deviation were [146.56±76.28] 132 (55.2%) participants had attended classes 40-120 minutes per day, 45 (18.8%) participants had attended classes 121-180 minutes/day, 44 (18.4%) participants had attended classes 181-240 minutes/day, 17 (7.1%) participants had attended classes 241-360 minutes/day, and 1 (0.4%) participants had attended classes >360 minutes/day. Out of 239 people, 75 (31.4 percent) had an upright posture, according to the table. Another 164 people (68.6%) slouch in their posture while taking online classes. According to the table, 130 (54.4%) of the people used desks, 96 (40.2%) used beds, 3 (1.3%) used the floor, and 10 (4.2%) used other positions during an online class. According to the table, 201 (84.1 percent) of the students used mobile phones, 29 (12.1 %) used computers, and 9 (3.8 %) used electronic devices during an online class. Except for online classes, use of an electronic device, the mean and standard deviation were 146.56±76.28. Out of 239 people, 114 (47.7 %) felt comfortable. Another 125 people (52.3%) felt uneasy. The participants' feelings during the online class were 6.751.25.

4.1(D) Musculoskeletal complaint:

Out of 239 people, 187 (78.25 %) reported pain yes. Another 52 (21.75% of those polled) reported no pain. 8 (4.3 %) of the people felt pain in their wrist, 9 (4.8 %) of the people felt pain in their elbow, 18 (9.6 %) of the people felt pain in their shoulder, 50 (26.7 %) of the people felt pain in their neck, 32 (17.1 %) of the people felt pain in

their thoracic, 61 (32.6 %) of the people felt pain in their lumber, 6 (3.2 %) of the people felt pain in their knee, and 3 (1.6 %). Out of a total of 239 people with this type of pain, 30 (16%) were constant. Another 157 people (84 %) reported that their pain is intermittent. Pain intensity during online classes was 4.30±1.90, and pain felt after classes were 3.87±1.93.Yes 39.7 % (n=95) of participants had limb weakness, while no 60.3 % (n=144) did. Yes, 11.3 % (n=27) and no, 87.7 % (n=212) reported movement limitations.

4.2 Prevalence:

This table depicts the prevalence of musculoskeletal pain based on age, gender, marital status, academic year, BMI, and the location of the pain. Where the variable denotes the percentage/prevalence of an individual.

Table 04: Prevalence of musculoskeletal pain present

Variable	MSK Pain presents Prevalence (%)
Overall age	78.25%
Age 18-20 21-23 24-26	 31.38 56.07 12.55
Gender- Male Female	 45.60 54.40
Marital status- Married Unmarried	 7.9 92.1
Academic year- 1st year 2nd year 3rd year 4th year	 53.1 20.9 8.8 17.2
BMI- Underweight	 27

Normal weight Overweight Obese	146 54 12
Site of pain- Wrist Elbow Shoulder Neck Thoracic Lumbar Knee Ankle	 4.3 4.8 9.6 26.7 17.1 32.6 3.2 1.6

4.3 Association:

Pain (absent/present) and independent variables (age, gender, marital status, etc.....) have a relationship. This table contained the test value and p values.

Table 05: Association between dependent (Pain present/absent) variable with the independent variable.

Dependent variable: Pain (present/absent)			
Independent Variable	Test	Test value	P-value
Age overall- 18-26 years	Independent T-test	2.276	0.746
Gender- Male, female	Chi-Square	2.767	0.096
Marital status- Married, Unmarried	Chi-Square	0.006	0.938
Academic year- 1st year, 2nd year, 3rd year, 4th year	Chi-Square	1.774	0.627
Body Mass Index- <18.4, 18.5-24.9, 25-29.9,30-34.9	Independent T test	-1.808	0.258

Physical activity level- Active, Insufficiency active	Chi-Square	0.369	0.544
Physical activity out of class- Gaming, Browsing, Others	Chi-Square	0.015	0.993
Duration of classes(minutes)- 40-120,121-180,181-240,241-360,>360 Minutes.	Independent T test	1.195	0.362
Feel during online class- Comfortable, Uncomfortable	Chi-Square	5.103	0.024*
Which posture follow online class- Erect, Slouch	Chi-Square	0.821	0.365
Which position follow online class- Desk, Bed, Floor, Others	Chi-Square	1.098	0.778
Using electronic devices- Mobile, Computer, Laptop	Chi-Square	3.162	0.206
How much time do you use in your electronic device except Online classes(Hours)- 1-3, 4-6, 7-10, >11 hours.	Chi-Square	-0.235	0.093
Sleep at night(Hours)- 3-5, 6-7, 8-10, >10 hours.	Independent T test	-0.255	0.902
Limb weakness- Yes, No	Chi-Square	0.731	0.392
Movement limitation- Yes, No	Chi-Square	0.862	0.353

Alpha value: *=<.05, **=<.01, *=<.001**

The observed age overall independent T-test value was 2.276 and the level of significance was 5%. The overall p-value for age is (p<0.746). As a result, the result was not significant, indicating that there was no strong association between age overall and pain (absent/present).

The gender Chi-Square test value was 2.767, with a 5% level of significance. The gender p-value is (p<0.096). As a result, the outcome was not significant, indicating that there was no strong association between gender and pain (absent/present).

The Chi-Square T-test value for observed marital status was 0.006, with a significance level of 5%. (p<0.938) is the p-value for married status. As a result, the result was not statistically significant, indicating that there was no strong association between marital status and pain (absent/present).

The Chi-Square T-test value for the previous academic year was 1.774, with a significance level of 5%. (p<0.627) is the p-value for the current academic year. As a result, the result was non-significant, implying that there was no strong association between the academic year and pain (absent/present).

The observed independent T-test value for BMI was -1.808, with a 5% level of significance. BMI has a p-value of (p<0.258). As a result, the result was not significant, indicating that BMI and pain (absent/present) had no strong relationship.

The Chi-Square T-test value for the observed level of physical activity was 0.369, with a significance level of 5%. Physical activity level (p<0.544) has a p-value of 0.054. As a result, the result was not significant, implying that there was no strong association between physical activity and pain (absent/present).

The Chi-Square T-test value for observed physical activity level outside of class was 0.015, with a significance level of 5%. (p<0.993) is the p-value for out-of-class physical activity. As a result, the result was not significant, indicating that there was no strong association between out-of-class physical activity and pain (absent/present).

The observed value of the duration of the class independent T-test was 1.195, with a level of significance of 5%. The p-value for the class duration is (p<0.362). As a

result, the outcome was not significant, indicating that there was no strong association between class duration and pain (absent/present).

The Chi-square test value for the observed feeling during online class was 5.103, with a level of significance of 5%. The p-value for the class duration is (p>0.024). As a result, the result was significant, indicating that there was an association between pain (absent/present) and online class.

I discovered that the Chi-Square T-test value for the follow posture online class was 0.0821, with a significance level of 5%. (p<0.365) is the p-value for the online posture class. As a result, the result was not statistically significant, indicating that there was no strong association between following posture online class and pain (absent/present).

Online class position to follow The Chi-Square T-test value was 1.098, with a significance level of 5%. (p<0.778) is the p-value for the following position online class. As a result, the outcome was not significant, indicating that there was no strong association between following position online class and pain (absent/present).

Online class using an electronic device the level of significance was 5%, and the Chi-Square T-test value was 3.162. Follow with an electronic device has a p-value of (p<0.206). As a result, the result was not significant, implying that there was no strong association between following an online class with an electronic device and pain (absent/present).

The Chi-Square T-test value for the observed follow using electronic device except online class was -0.235, with a level of significance of 5%. Except for the online class, the p-value for following using an electronic device is (p<0.093). As a result, the result was not significant, implying that there was no strong association between following instructions on an electronic device except for online classes and pain (absent/present).

The independent T-test value for observed sleep at night was -0.255, with a significance level of 5%. The p-value for nighttime sleep is (p<0.902). As a result, the result was not statistically significant, indicating that there was no strong association between nighttime sleep and pain (absent/present).

The Chi-Square test value for limb weakness was 0.731, with a level of significance of 5%. The p-value for limb weakness is ($p<0.392$). As a result, the result was not statistically significant, indicating that there was no strong association between observed limb weakness and pain (absent/present).

The movement restriction that has been observed The Chi-Square test value was 0.862, with a level of significance of 5%. ($p<0.353$) is the p-value movement restriction. As a result, the result was not statistically significant, indicating that there was no strong association between movement limitation and pain (absent/present).

Table 06: Association between the dependent (Pain intensity) variable with the independent variable.

Dependent variable(Pain intensity)			
Independent Variable	Test	Test value	P-value
Age overall- 18-26 years	Chi-Square	74.244	0.660
Gender- Male, female	Chi-Square	8.913	0.540
Marital status- Married, Unmarried	Chi-Square	2.903	0.984
Academic year- 1st year, 2nd year, 3rd year, 4th year	Chi-Square	23.023	0.814
Body Mass Index- Score	Chi-Square	1245.416	0.968
Physical activity level- Active, Insufficiency active	Chi-Square	19.420	0.035*
Physical activity out of class- Gaming, Browsing, Others	Chi-Square	22.021	0.339
Duration of classes(minutes)- 40-120,121-180,181-240,241-360,>360 Minutes.	Chi-Square	47.885	0.183
Feel during online class- Comfortable, Uncomfortable	Chi-Square	10.352	0.410
Which posture follow online class- Erect, Slouch	Chi-Square	20.313	0.026*

Which position follow online class- Desk, Bed, Floor, Others	Chi-Square	30.616	0.434
Using electronic devices- Mobile, Computer, Laptop	Chi-Square	40.076	0.005**
How much time do you use in your electronic device except Online classes(Hours)- 1-3, 4-6, 7-10, >11 hours.	Chi-Square	201.687	0.049*
Sleep at night(Hours)- 3-5, 6-7, 8-10, >10 hours.	Chi-Square	23.629	0.789
Pain type-Constant, Intermittent	Chi-Square	12.171	0.274
Limb weakness- Yes, No	Chi-Square	8.434	0.586
Movement limitation- Yes, No	Chi-Square	16.258	0.092

With a 5% level of significance, the observed overall age Chi-Square test value for the age was 74.244. The total p-value for age is ($p<0.660$). As a result, the result was not statistically significant, indicating that there was no strong association between overall age and pain intensity.

The observed gender Chi-Square test value was 8.913, with a significance level of 5%. Gender has a p-value of ($p<0.540$). As a result, the result was not significant, indicating that gender and pain intensity did not have a strong relationship.

The Chi-Square test value for observed marital status was 2.903, with a significance level of 5%. ($p<0.984$) is the p-value for married status. As a result, the result was not

statistically significant, indicating that there was no strong association between marital status and pain intensity.

The Chi-Square test value for the current academic year was 23.023, with a significance level of 5%. ($p<0.814$) is the p-value for the current academic year. As a result, the finding was not significant, implying that there was no strong association between academic year and pain intensity.

The observed Chi-Square test value for BMI was 1245.416, with a 5% level of significance. BMI has a p-value of ($p<0.968$). As a result, the result was not significant, indicating that BMI and pain intensity did not have a strong relationship.

The Chi-Square test value for the observed physical activity level was 19.420, with a level of significance of 5%. ($p>0.035$) is the p-value for physical activity level. As a result, the result was statistically significant, indicating that there was an association between physical activity and pain intensity.

The Chi-Square test value for observed physical activity level out of class was 22.021, with a level of significance of 5%. ($p<0.339$) is the p-value for physical activity level outside of class. As a result, the result was not significant, indicating that there was no strong association between outside-of-class physical activity and pain intensity.

The Chi-Square test value for the observed duration of class was 47.885, with a level of significance of 5%. The p-value for the class duration is ($p<0.183$). As a result, the outcome was not significant, indicating that there was no strong association between class duration and pain intensity.

The Chi-square test value for the observed feeling during online class was 10.352, with a 5% level of significance. The p-value for the class duration is ($p<0.410$). As a result, the result was not significant, indicating that there was no association between pain intensity and online class time.

The observed Chi-Square test value for the follow posture online class was 20.313, with a level of significance of 5%. The p-value for the online follow posture class is ($p>0.026$). As a result, the result was significant, indicating that there was an association between pain intensity and following a posture online class.

The Chi-Square test value for the observed follow position online class was 30.616, with a level of significance of 5%. The p-value for the online follow position class is ($p<0.434$). As a result, the result was not significant, indicating that there was no association between pain intensity and follow position online class.

The Chi-Square test value for the observed follow-up using an electronic device online class was 40.076, with a significance level of 5%. Follow-up with an electronic device has a p-value of ($p>0.005$). As a result, the finding was significant, indicating a strong association between using an electronic device and pain intensity.

The Chi-Square test value for the observed follow-up using an electronic device, except for the online class, was 201.687, with a significance level of 5%. Except for the online class, the p-value for using an electronic device is ($p>0.049$). As a result, the finding was significant, indicating that there was an association between pain intensity and the use of electronic devices other than online classes.

The observed sleep at night Chi-Square test value was 23.629 and the level of significance was 5%. The p-value for sleep at night is ($p<0.789$). As a result, the result was not significant, indicating that there was no strong association between sleep at night and pain intensity.

The Chi-Square test value for observed limb weakness was 8.434 with a 5% level of significance. The p-value for nighttime sleep is ($p<0.586$). As a result, the result was not significant, indicating that limb weakness and pain intensity did not have a strong relationship.

The movement restriction that has been observed the value of the Chi-Square test was 16.258 and the level of significance was 5%. ($p<0.092$) is the p-value for nighttime sleep. As a result, the result was not statistically significant, indicating that there was no strong association between movement restriction and pain intensity.

Table 07: Association between dependent (site of pain) variable & independent variable

Dependent variable(Site of Pain)			
Independent variable	Test	Test value	P-value
Age overall- 18,19,20,21,22,23,24,25,26 years	Chi-Square	9.755	0.203
Gender- Male, female	Chi-Square	1.755	0.183
Marital status- Married, Unmarried	Chi-Square	0.089	0.765
Academic year- 1st year, 2nd year, 3rd year, 4th year	Chi-Square	4.310	0.230
Body Mass Index- <18.4, 18.5-24.9, 25-29.9,30-34.9	Chi-Square	2.964	0.397
Physical activity level- Active, Insufficiency active	Chi-Square	0.000	1.000
Physical activity out of class- Gaming, Browsing, Others	Chi-Square	1.333	0.513
Duration of classes(minutes)- 40-120,121-180,181-240,241-360,>360 Minutes.	Chi-Square	2.454	0.653
Feel during online class- Comfortable, Uncomfortable	Chi-Square	0.010	0.919
Which posture follow online class- Erect, Slouch	Chi-Square	0.471	0.492
Which position follow online class- Desk, Bed, Floor, Others	Chi-Square	2.114	0.549
Using electronic devices- Mobile, Computer, Laptop	Chi-Square	4.053	0.132
How much time do you use in your electronic device except Online classes(Hours)- 1-3, 4-6, 7-10, >11 hours.	Chi-Square	11.994	0.679
Sleep at night(Hours)- 3-5, 6-7, 8-10, >10 hours.	Chi-Square	3.373	0.338

Pain type-Constant, Intermittent	Chi-Square	0.195	0.658
How much pain intensity during class-(0-10 cm)	Chi-Square	19.283	0.037*
Limb weakness- Yes, No	Chi-Square	1.019	0.313
Movement limitation- Yes, No	Chi-Square	0.695	0.404

The observed overall musculoskeletal complaint (independent) related variable is Chi-Square test value was more (p<overall independent variable, without one) than p-value, and the level of significance was 5%. As a result, the result was not significant (without one), indicating that there was no association between the overall independent variable and pain (absent/present). The result was significant once the Chi-square test value reached (p>0.037). Indicates association between pain intensity (independent variable) and pain intensity during class.

4.4 Regression:

According to binary logistic findings, feeling during online class-uncomfortable and comfortable, where the predictable variable is uncomfortable, is associated with musculoskeletal pain (present/absent) students. (P=.025*, OR=2.049, 95% CI=1.092, 3.845).Here the coefficient value is a positive, linear relationship between an uncomfortable position with pain present. I predict that pain will be present in an uncomfortable position during the online class.

Physical activity level is divided into two categories: insufficiency active and active, with insufficiency active being the more predictable variable. (P=.605, OR=1.210, 95% CI=0.587, 2.492). Here the coefficient value is a positive, linear relationship between insufficiencies active with higher pain intensity. I predict that during the online class, pain intensity will increase in the insufficiency active position.

Follow your posture during the online class-Slouch and Erect, where slouch is the predictable variable and is linked to pain intensity. (P=.092, OR=1.877, 95% CI=0.902, 3.904). Because the coefficient value is positive, linear relationship between slouch position with higher pain intensity. I anticipate an increase in pain intensity in the slouch position during the online class.

The use of an electronic device during an online class Mobile and Computer is linked to pain intensity when the predictable variable is mobile. (P-value =.215, OR=1.640, 95% CI=0.750, 3.584). Because the coefficient value is positive, linear relationship between using a mobile device with higher pain intensity. I believe that using a mobile device during an online class will increase pain intensity.

Using electronic devices other than online classes has a negative co-efficient value (β= -.015), the reverse relationship between using electronic devices except for online classes with pain intensity. Except for online classes using an electronic device, they can change their posture, maybe while pain can be decreased. Implying that using electronic devices other than online classes reduces pain intensity.

Table 08: Factor associated with musculoskeletal complain among students during online class (Binary logistic)

Predictor variable	**Dependent variable: Presence of pain**				
	NK-R^2	β	P	OR	95%CI
Uncomfortable feeling during online class	.003	.717	.025*	2.049	1.092, 3.843

Predictor variable	**Dependent variable: Higher intensity of pain**				
	NK-R^2	β	P	OR	95%CI
Insufficiency active Physical activity level-	.002	.190	.605	1.210	0.587, 2.492
Slouch posture follow during online class-	.020	.630	.092	1.877	0.902, 3.904
Using(Mobile) electronic device during online class-	.009	.495	.215	1.640	0.750, 3.584
How much time do you use your electronic device except Online classes-	.001	-.015	.774	.985	.888, 1.092

CHAPTER-V: DISCUSSION

The analysis and discussion are about identifying published papers & determining the relevance with the acquired data. In this chapter, the results of the study are discussed about the research questions and objectives of the study. The discussion is focused on identifying the Characteristics of musculoskeletal complaints (pain) among (university) students with their association using digital devices for online classes.

With the COVID-19 pandemic, individuals have remained inactive at home due to the restrictions and quarantine, and because they have had to continue with their intensive study schedules in an un-ergonomic and unfamiliar environment musculoskeletal system problems have arisen.

In this study, 239 participants were selected who had felt musculoskeletal pain yes, 78.25% (n=187), & no pain felt 21.75% (n=52).Where felt pain more than half of the participants 57.2% (n=107) were female & 42.8% (n=80) were male. According to (Morais et al., 2019) state that before starting the remote teaching model, 98 participants (63.6%) did not complain about any type of musculoskeletal pain, but during the pandemic, this percentage changed dramatically, with 51 students (33.1%) reporting no pain and 103 (66.9%) reporting feeling musculoskeletal pain to some extent, with several participants also stating pain in more than one location.

The age ranges of the participants were 18-26 years, & their mean age was 21.41. According to (Morais et al., 2019) state the age range was average 22 out of participants 480 students, out of which 154 students (32.0%) responded.

The observed independent T-test value for BMI was -1.808, with a 5% level of significance. BMI has a p-value of ($p<0.258$). As a result, the result was not significant, indicating that BMI and pain (absent/present) had no strong relationship. (Muthusamy et al., 2018) majority of participants were female (57.5%) when compared to males (42.5%). Nearly 54.8% of participants belonged to the 22-24 age group. Concerning body mass index, the majority of participants (61%) were normal weight whereas 16.4% and 8.9% of them were underweight and obese respectively.

Among 239 participants in my study, it was found that 26.4% of participants had insufficient active and 73.6% had active. A cross-sectional study state that (Rose, 2001) these included the lifting of heavy load, prolonged sitting, improper posture, stress, high academic demand/workload, and lack of regular exercise. University students subject themselves to hours of prolonged reading.

In this study, 239 participants were selected it was found the Chi-Square test value for observed physical activity level was 19.420, with a level of significance of 5%. ($p>0.035$) is the p-value for physical activity level. As a result, the result was statistically significant, indicating that there was an association between physical activity and pain intensity. A similar study found that (Rose, 2001) these included the lifting of heavy load, prolonged sitting, improper posture, stress, high academic demand/workload, and lack of regular exercise. University students subject themselves to hours of prolonged reading.

Among 239 participants in my study, it was found that the duration of class time was mean and the standard deviation is 146.56±76.28. The observed value of the duration of the class independent T-test was 1.195, with a level of significance of 5%. The p-value for the class duration is ($p<0.362$). As a result, the outcome was not significant, indicating that there was no strong association between class duration and pain (absent/present). But the current study (Morais et al., 2019) also revealed that 55.8% of students dedicated more than 4 hours per day in front of the screen to study during the pandemic. Students started to use notebooks and cell phones full time as part of their academic routine, and at these times adopt very unsettling postures, which can cause pain and musculoskeletal changes, especially in the upper limbs and spine.

Among 239 participants in my study, it was found that feel uncomfortable during class participants had 52.3% and the comfortable participant had 47.7%. The Chi-square test value for the observed feeling during online class was 5.103, with a level of significance of 5%. The p-value for the class duration is ($p>0.024$). As a result, the result was significant, indicating that there was an association between pain (absent/present) and online class. A similar article (Sirajudeen et al., 2018) states that Almost 54% of students perceived online classes moderately uncomfortable while 17.5% found it uncomfortable or highly uncomfortable. Though, almost 29% of students perceived online classes as comfortable or highly comfortable.

In this study, 239 participants were selected it was found that slouch posture participants had 68.6% & erect posture maintenance had 31.4%. A similar cross-sectional article found (Sirajudeen et al., 2018) that Students were inquired whether they have a proper place for attending online classes in their homes or not. It was found that 53.5% had a proper place in their home for attending online classes while 34 % did not have a proper place. Other almost 12% of students stated that they did not have a proper place to attend online classes always.

Almost 63 percent of students had study tables and chairs in their home for attending online classes while the rest 37 percent did not have study tables and chairs in their home.

Online classes use different electronic devices such as mobile, computers, laptops, etc. In this study, 239 participants were selected it was found that the mobile using percentage had 84.1% and other devices used 15.9%. The binary logistic state that increase using mobile for online class increased coefficient value (.495%) & increase pain. Data presented (Ichhpujani et at., 2019) that the majority (98.18%) of the students were using mobile for online study. Only almost 29 % of students were using the laptop for online study.

Among 239 participants in my study, it was found that the Chi-Square test value for the observed follow-up using an electronic device online class was 40.076, with a significance level of 5%. Follow-up with an electronic device has a p-value of ($p>0.005$). As a result, the finding was significant, indicating a strong association between using an electronic device and pain intensity. Kim and Kim (2015) state that investigated the correlation between smartphone use and musculoskeletal symptoms. Significant pain in the neck and shoulder of the body positions were found.

In this study, 239 participants were selected it was found that The Chi-Square test value for the observed follows using electronic devices except online class was -0.235, with a level of significance of 5%. Except for the online class, the p-value for following using an electronic device is ($p<0.093$). As a result, the result was not significant, implying that there was no strong association between following instructions on an electronic device except for online classes and pain (absent/present). These findings are also similar to another(Jena, 2017) study carried out on smartphone activities where the majority of the students carried out these same activities on their smartphones which were texting/chatting, internet

browsing, e-learning, phone calls, music, videos, pictures, playing games except for the addition of scheduling and emails.

Among 239 participants in my study, it was found that the Chi-Square test value for the observed follow-up using an electronic device, except for the online class, was 201.687, with a significance level of 5%. Except for the online class, the p-value for using an electronic device is ($p>0.049$). As a result, the finding was significant, indicating that there was an association between pain intensity and the use of electronic devices other than online classes. A similar article found that Kim and Kim (2015) a larger population of the participants used their smartphones for chatting, watching videos, playing games, phone calls, browsing the internet, video calls, reading, and photography. This finding is similar to a study carried out on smartphone activities that reported that 42.5% used their smartphones or chatting, 38. 2% used them for searching the internet, 12.55% used them for playing games, 3.0% used them for typing documents and 3.8% used them for other activities.

Among 239 participants in my study, it was found that the independent T-test value for observed sleep at night was -0.255, with a significance level of 5%. The p-value for nighttime sleep is ($p<0.902$). As a result, the result was not statistically significant, indicating that there was no strong association between nighttime sleep and pain (absent/present). Fourteen of the 25 identified studies (Arora et al., 2014) used some measure of sleep duration, typically by asking participants (or their parent/guardian) to report on sleep and wake times or hours of sleep each night. Overall, these studies suggest that the use of technology does adversely impact sleep duration.

5.1 Limitation of the study: Though the expected sample size was 384 for this study, due to lack of participant response and time limitation, the researcher could manage just 239 samples, which is very small to generalize the results for the wider population of university students. The researcher was only able to collect data from a small number of universities in Bangladesh for a short period, which will affect the result of the study's ability to generalize for a wider population.

CHAPTER-VI: CONCLUSION AND RECOMMENDATION

6.1 Conclusion:

Compared with previous studies and consistent with the literature, the findings of this present study highlights characteristics of musculoskeletal complain among students using digital devices for online classes. Which were predominantly neck, shoulder elbow, wrist, thoracic, lumbar, knee, and ankle pain during online class, attributed to prolonged time on the computer, mobile and laptop/incorrect sitting position, uncomfortable position, and stress. Using digital devices for online classes was significantly associated with physical activity level (insufficiency active), site of pain, duration of the class, feel during online classes (uncomfortable position), and using an electronic device (mobile). Conduct research on other musculoskeletal problems among the students/young adults, where a physiotherapist can work. So it is very important to conduct such type of research in this area.

6.2 Recommendations:

After completing the research, the researcher found some recommendations. In the case of the Result, the discussion researcher found both positive and limited negative experiences of students. Should take more samples for generating the result and make more valid and reliable. Sample should collect from different universities in different district questionnaires of Bangladesh to generalize the result. Data had collected from the student to find out an effective and efficient result in a musculoskeletal complaint.

REFERENCE LIST

Andersen, J.H., Fallentin, N., Thomsen, J.F. and Mikkelsen, S., 2011. Risk factors for neck and upper extremity disorders among computers users and the effect of interventions: an overview of systematic reviews. PloS one, 6(5):19691.

Arora, T., Broglia, E., Thomas, G.N., and Taheri, S., 2014. Associations between specific technologies and adolescent sleep quantity, sleep quality, and parasomnias. Sleep medicine, 15(2):240-247.

Ayanniyi, O., Mbada, C.E. and Iroko, O.P., 2010. Neck Pain Occurrence and Characteristics in Nigerian University Undergraduates. TAF Preventive Medicine Bulletin, 9(3).

Ayanniyi, O., Ukpai, B.O.O., and Adeniyi, A.F., (2010). Differences in prevalence of self-reported musculoskeletal symptoms among computer and non-computer users in a Nigerian population: a cross-sectional study. BMC musculoskeletal disorders, 11(1):1-9.

Bao, W., 2020. COVID-19 and online teaching in higher education: A case study of Peking University. Human Behavior and Emerging Technologies, 2(2):113-115.

Bergqvist, U., Wolgast, E., Nilsson, B., and Voss, M., (1995). Musculoskeletal disorders among visual display terminal workers: individual, ergonomic, and work organizational factors. Ergonomics, 38(4):763-776.

Binboğa, E., and Korhan, O., (2014). Posture, musculoskeletal activities, and possible musculoskeletal discomfort among children using laptops or tablet computers for educational purposes: A literature review. Journal of Science Education and Technology, 23(5):605-616.

Bouziri, H., Smith, D.R., Descatha, A., Dab, W., and Jean, K., (2020). Working from home in the time of covid-19: how to best preserve occupational health?. Occupational and environmental medicine, 77(7):509-510.

Bruusgaard, D., (2003). International monitoring of musculoskeletal complaints: a need for consensus. The European Journal of Public Health, 13(1):20-23.

Crews, T.B., Brown, H.F., Bray, S., and Pringle, E.M., (2007). Student campus technology trends: 2001 versus 2006. Educause Quarterly, 30(4):30-36.

Cucinotta, D., and Vanelli, M., (2020). WHO declares COVID-19 a pandemic. Acta Bio Medica: Atenei Parmensis, 91(1):157.

D'Anna, C., Schmid, M., and Conforto, S., (2021). Linking head and neck posture with muscular activity and perceived discomfort during prolonged smartphone texting. International Journal of Industrial Ergonomics, 83:103134.

Desai, R.A., Krishnan-Sarin, S., Cavallo, D., and Potenza, M.N., (2010). Video-gaming among high school students: health correlates, gender differences, and problematic gaming. Pediatrics, 126(6):1414-1424.

Gharib, N.M., and Hamid, N.S., (2013). Prevalence of mechanical neck pain in Taif university female students: a survey study. J Am Sci, 9(6):347-54.

Gomes, V.T.S., Rodrigues, R.O., Gomes, R.N.S., Gomes, M.S., Viana, L.V.M., and Silva, F.S.S. (2020) The Covid-19 Pandemic: Repercussions of Remote Education on Medical Training. Revista Brasileira de Educação Médica, 44:114.

Goon, D.T. (2017). Musculoskeletal problems associated with university students computer users: a cross-sectional study. Online Journal of Health and Allied Sciences, 16(2).

Hakala, P.T., Saarni, L.A., Punamäki, R.L., Wallenius, M.A., Nygård, C.H. and Rimpelä, A.H., (2012). Musculoskeletal symptoms and computer use among Finnish adolescents-pain intensity and inconvenience to everyday life: a cross-sectional study. BMC musculoskeletal disorders, 13(1):1-7.

Hasan, M.M., Yaqoob, U., Ali, S.S., and Siddiqui, A.A., (2018). Frequency of musculoskeletal pain and associated factors among undergraduate students. Case Reports in Clinical Medicine, 7(2):131-145.

Huguet, A., Tougas, M.E., Hayden, J., McGrath, P.J., Stinson, J.N., and Chambers, C.T., (2016). Systematic review with meta-analysis of childhood and adolescent risk and prognostic factors for musculoskeletal pain. Pain, 157(12):2640-2656.

Ichhpujani, P., Singh, R.B., Foulsham, W., Thakur, S., and Lamba, A.S., (2019). Visual implications of digital device usage in school children: a cross-sectional study. BMC ophthalmology, 19(1):1-8.

Jaiswal, S., Asper, L., Long, J., Lee, A., Harrison, K., and Golebiowski, B., (2019). Ocular and visual discomfort associated with smartphones, tablets and computers: what we do and do not know. Clinical and Experimental Optometry, 102(5):463-477.

Jannini, S.N., Dória-Filho, U., Damiani, D., and Silva, C.A.A., (2011). Musculoskeletal pain in obese adolescents. Jornal de pediatria, 87:329-335.

Khan, S.A., and Chew, K.Y., (2013). Effect of working characteristics and taught ergonomics on the prevalence of musculoskeletal disorders amongst dental students. BMC musculoskeletal disorders, 14(1):1-8.

Kim, H.-J., & Kim, J.-S. (2015). The Relationship Between Smartphone Use and Subjective Musculoskeletal Symptoms and University Students. Journal of Physical Therapy Science, 27(3):575-579.

Kobus M., Rietveld P., and Van Ommeren J., (2013) Ownership versus on-campus use of mobile IT devices by university students. Comp Edu, 68:29-41.

Kobus, M.B., Rietveld, P., and Van Ommeren, J.N., (2013). Ownership versus on-campus use of mobile IT devices by university students. Computers & Education, 68:29-41.

Kumcagiz, H., and Gündüz, Y., (2016). Relationship between Psychological Well-Being and Smartphone Addiction of University Students. International Journal of Higher Education, 5(4):144-156.

Lippi, G., Henry, B.M., Bovo, C., and Sanchis-Gomar, F., (2020). Health risks and potential remedies during prolonged lockdowns for coronavirus disease 2019 (COVID-19). Diagnosis, 7(2):85-90.

Maia, M.M., Gualano, B., Sá-Pinto, A.L., Sallum, A.M., Pereira, R.M., Len, C.A., Terreri, M.T., Barbosa, C.M., Roschel, H., and Silva, C.A., (2016), December. Juvenile fibromyalgia syndrome: blunted heart rate response and cardiac autonomic

dysfunction at diagnosis. In Seminars in arthritis and rheumatism (Vol. 46, No. 3:338-343). WB Saunders.

Maslen, B., and Straker, L., (2009). A comparison of posture and muscle activity means and variation amongst young children, older children and young adults whilst working with computers. Work, 32(3):311-320.

Milenkovic, S., Kocijancic, R., and Belojevic, G., (2004). Left handedness and spine deformities in early adolescence. European journal of epidemiology, 19(10):969-972.

Mohler, G., Bertozzi, A.L., Carter, J., Short, M.B., Sledge, D., Tita, G.E., Uchida, C.D., and Brantingham, P.J., (2020). Impact of social distancing during COVID-19 pandemic on crime in Los Angeles and Indianapolis. Journal of Criminal Justice, 68:101692.

Morais, B.X., Dalmolin, G.D.L., Andolhe, R., Dullius, A.I.D.S., and Rocha, L.P., (2019).Musculoskeletal pain in undergraduate health students: prevalence and associated factors. Revista da Escola de Enfermagem da USP, 53.

Narici, M., Vito, G.D., Franchi, M., Paoli, A., Moro, T., Marcolin, G., Grassi, B., Baldassarre, G., Zuccarelli, L., Biolo, G., and Di Girolamo, F.G., (2021). Impact of sedentarism due to the COVID-19 home confinement on neuromuscular, cardiovascular and metabolic health: Physiological and pathophysiological implications and recommendations for physical and nutritional countermeasures. European journal of sport science, 21(4):614-635.

Nordin, N.A.M., Singh, D.K.A., and Kanglun, L., (2014). Low back pain and associated risk factors among health science undergraduates. Sains Malaysiana, 43(3):423-428.

Ogunlana, M.O., Awobayo, A.O., Oyewole, O.O., and Ayodeji, A.F., (2019). Work and musculoskeletal discomfort of Nigerian health workers: pattern and predictors. Physical Therapy Reviews, 24(6):389-393.

Ogunlana, M.O., Govender, P., and Oyewole, O.O., (2021). Prevalence and patterns of musculoskeletal pain among undergraduate students of occupational therapy and physiotherapy in a South African university. Hong Kong Physiotherapy Journal, 41(01):35-43.

Oha, K., Animägi, L., Pääsuke, M., Coggon, D., and Merisalu, E., (2014). Individual and work-related risk factors for musculoskeletal pain: a cross-sectional study among Estonian computer users. BMC musculoskeletal disorders, 15(1):1-5.

Palmer, K.T., Walker-Bone, K., Griffin, M.J., Syddall, H., Pannett, B., Coggon, D., and Cooper, C., (2001). Prevalence and occupational associations of neck pain in the British population. Scandinavian journal of work, environment & health:49-56.

Prakash, J.S., Singh, V., Deane, A., and Bhatty, S., (2014). Musculoskeletal Disorders associated with Computer Usage among Healthcare College Students: A preliminary report.

Rose, K.A., (2000). The effect of neck pain and headaches on the academic performance of college students. JNMS-JOURNAL OF THE NEUROMUSCULOSKELETAL SYSTEM, 8(4):118-123.

Shariat, A., Cleland, J.A., and Hakakzadeh, A., (2020). Home-based exercises during the COVID-19 quarantine situation for office workers: A commentary. Work, 66(2):381-382.

Sirajudeen MS, Muthusamy H, Alqahtani M, Waly M., and Jilani AK (2018). Computer-related health problems among university students in Majmaah region, Saudi Arabia. Biomedical Research 29(11):2405-2415.

Sperotto, F., Brachi, S., Vittadello, F., and Zulian, F., (2015). Musculoskeletal pain in schoolchildren across puberty: a 3-year follow-up study. Pediatric Rheumatology, 13(1):1-6.

Sugita, K., (2000). Epidemiological study on idiopathic scoliosis in high school students. Prevalence and relation to physique, physical strength and motor ability. [Nihon koshu eisei zasshi] Japanese journal of public health, 47(4):320-325.

Szucs, K.A., Cicuto, K., and Rakow, M., (2018). A comparison of upper body and limb postures across technology and handheld device use in college students. Journal of physical therapy science, 30(10):1293-1300.

Thennarasi, M., 2015. Effectiveness of ergonomics on physical discomfort among computer users at selected it office in Madurai (Doctoral dissertation, College of Nursing, Madurai Medical College, Madurai).

Veiersted, K.B., and Wærsted, M., (1999). Distal upper limb disorders and ergonomics of VDU work: a review of the epidemiological evidence. Norsk Epidemiologi, 9(1).

Wami, S.D., Mekonnen, T.H., Yirdaw, G., and Abere, G., (2021). Musculoskeletal problems and associated risk factors among health science students in Ethiopia: A cross-sectional study. Journal of Public Health, 29(4):943-949.

Wolff, B., (2006). Laptop use in university common spaces. Educause Quarterly, 29(1):74-76.

Woolf, A.D., Erwin, J., and March, L., (2012). The need to address the burden of musculoskeletal conditions. Best practice & research Clinical rheumatology, 26(2):183-224.

Xie, Y., Szeto, G., and Dai, J., (2017). Prevalence and risk factors associated with musculoskeletal complaints among users of mobile handheld devices: A systematic review. Applied ergonomics, 59:132-142.

Yeun, Y.R., and Han, S.J., (2017). Factors associated with neck/shoulder pain in young adults. Biomedical Research (0970-938X):28(16).

Zagyapan, R., Iyem, C., Kurkcuoglu, A., Pelin, C., and Tekindal, M.A., (2012). The relationship between balance, muscles, and anthropomorphic features in young adults. Anatomy research international.

Appendix

Appendix-I(A)

Date: 16 June, 2021.

The Chairman

Institution Review Board (IRB)

Bangladesh Health Professions Institute (BHPI)

CRP, Savar, Dhaka-1343, Bangladesh.

Subject: Application for ethical approval.

Dear Sir,

With due respect, I am Md. Imam Mehedi Hasan Mojumder, student of 4th professional B.Sc. in Physiotherapy at Bangladesh Health Professions Institute (BHPI), academic institute of Centre for the Rehabilitation of the Paralysed (CRP) under the faculty of medicine of University of Dhaka. This is a four-year full-time course. Conducting thesis project is partial fulfilment of the requirement for the degree of B.Sc. in Physiotherapy. I have to conduct a thesis entitled, **"Characteristics of Musculoskeletal Complaints Among Students using Digital Devices for Online Classes"** under the supervision of Kazi Md. Amran Hossain, Lecturer, Department of Physiotherapy, BHPI, CRP, Savar, Dhaka-1343. The purpose of this study is to investigate the Characteristics of Musculoskeletal Complaints among Students who uses digital devices for online classes. I would like to assure that anything of my study will not be harmful for the participants. Informed consent will be received from all participants, data will be kept confidential.

I, therefore pray and hope that your honor would be kind enough to approve my thesis proposal and give me permission to start data collection and oblige thereby.

Sincerely,
Imam Mehedi.
Md. Imam Mehedi Hasan Mojumder

4th professional B.Sc. in Physiotherapy

Roll No.: 36

Session: 2015-16, ID: 112150307

BHPI, CRP, Savar, Dhaka-1343, Bangladesh.

Recommendation from the thesis supervisor:

.....

Kazi Md. Amran Hossain

Lecturer, Department of Physiotherapy,

BHPI, CRP, Savar, Dhaka-1343

Appendix-I (B)

বাংলাদেশ হেল্‌থ প্রফেশন্স ইনস্টিটিউট (বিএইচপিআই)
Bangladesh Health Professions Institute (BHPI)
(The Academic Institute of CRP)

Ref: CRP/BHPI/IRB/06/2021/473

Date: 16/06/2021

To
Md. Imam Mehedi Hasan Mojumder
B.Sc. in Physiotherapy
Session: 2015-16, Student ID:112150307
BHPI, CRP, Savar, Dhaka-1343, Bangladesh

Subject: Approval of the thesis proposal **"Characteristics of Musculoskeletal Complaints among Students using digital devices for online classes."** by ethics committee.

Dear Md. Imam Mehedi Hasan Mojumder
Congratulations.
The Institutional Review Board (IRB) of BHPI has reviewed and discussed your application to conduct the above-mentioned dissertation, with yourself, as the Principal investigator. The Following documents have been reviewed and approved:

Sr. No.	Name of the Documents
1	Dissertation Proposal
2	Questionnaire (English version)
3	Information sheet & consent form.

The purpose of the study is to determine the Characteristics of Musculoskeletal Complaints among Students using digital devices for online classes. The study involves use of a questionnaire to explore that may take 05 to 15 minutes and there is no likelihood of any harm to the participants. Data collectors will receive informed consents from all participants. Any data collected will be kept confidential. The members of the Ethics committee have approved the study to be conducted in the presented form at the meeting held at 8:30am on 1st March, 2020 at BHPI (23rd IRB Meeting).

The institutional Ethics committee expects to be informed about the progress of the study, any changes occurring in the course of the study, any revision in the protocol and patient information or informed consent and ask to be provided a copy of the final report. This Ethics committee is working accordance to Nuremberg Code 1947, World Medical Association Declaration of Helsinki, 1964-2013 and other applicable regulation

Best regards,

Muhammad Millat Hossain
Assistant Professor, Dept. of Rehabilitation Science
Member Secretary, Institutional Review Board (IRB)
BHPI, CRP, Savar, Dhaka-1343, Bangladesh

CRP-Chapain, Savar, Dhaka-1343, Tel : 7745464-5, 7741404
E-mail : principal-bhpi@crp-bangladesh.org, Web: bhpi.edu.bd, www.crp-bangladesh.org

Appendix-II (A)

Code No:

Informed Consent

Greetings!

My name is Md. Imam Mehedi Hasan Mojumder. I am conducting this study which is part of my course curriculum and my dissertation title is **"Characteristics of Musculoskeletal Complaints among Students using digital devices for online classes."** For the fulfillment of my study, I would like to know some information about social, behavioral, and lifestyles among musculoskeletal complain of students. So, I need to ask you some questions in this regard and this will take approximately 5-15 minutes.

I am assuring you that this is a pure professional study and this will not create any harm or unpleasant experiences for you. The information you will provide will be treated as confidential and in event of any report or publication the source of this information will be kept anonymous. I would like to inform you that your participation in this study will be considered voluntary and there will not be any kinds of financial dealings.

As a part of this study or by the rights of the participants you can withdraw yourself at any time from this study or if you will want to skip any questions that you don't want to answer to, you can proceed. If you further have any questions on this study, please feel free to ask researcher Md. Imam Mehedi Hasan Mojumder, 4th-year student, Physiotherapy Department, Bangladesh Health Professions Institute(BHPI), CRP, Savar, Dhaka-1343 or my research supervisor Kazi Md. Amran Hossain,(01735661492), Lecturer of Physiotherapy, BHPI, CRP, Savar, Dhaka-1343.

May I start the interview?

YES	NO

Research questionnaire for the cross-sectional study

Title: Characteristics of Musculoskeletal Complaints among Students using digital devices for online classes.

Participant's identification:

Participant's identification number:	
Participant name:(Optional)	
Address: District: P/O: P/S: Village:	
Date of interview:	
Contact number:	

Part-1: Socio-demographic information

S/N	Question	Variable		Answer
1.1	Age(in years)			
1.2	Gender	1.Male 2.Female		
1.3	Marital status	1.Married 2. Unmarried 3. Separated 4. Widow 5. Divorced		
1.4	Academic year	1.First year 2.Second year 3.Third year 4.Fourth year		

Part-2: Physical factor

2.1	Height in (inch)		
2.2	Weight in (Kg)		
2.3	Body Mass Index (BMI)=		
2.4	Physical activity level?	1.Active 2.Insufficiency active	
2.5	What type of physical activity, out of class?	1.Browsing 2.Gaming 3.Others(Please write)	

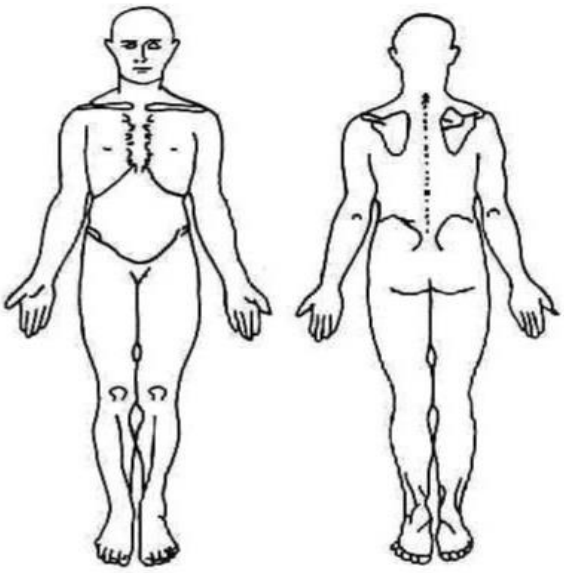
Part-3: Home environment

3.1	Duration of classes per day (min)?		
3.2	Which Posture do you follow in your online classes?	1. Erect 2. Slouch	
3.3	Which Position do you follow in your classes (Online class)?	1. Desk 2. Bed 3. Floor 4. Others	
3.4	Which electronic device do you use in your online classes?	1. Mobile 2. Laptop 3. Computer	
3.5	How much time do you use your electronic device except for Online classes? (hr/day)		
3.6	How do you feel during online classes?	1. Comfortable 2. Uncomfortable	

3.7	Overall, how long do you sleep at night? (in hours?)		

Part-4: Musculoskeletal complain

This part is designed to determine the musculoskeletal complaints among students using digital devices for online classes.

	Question	Variable	Answer
4.1	Do you feel any pain in your body in the last 6 months?	1. Yes 2.No	
4.2	Indicate the site of pain in the body chart?		
4.3	What is the type of pain?	1. Constant 2. Intermittent	
4.4	How much pain intensity do you feel during online classes?		

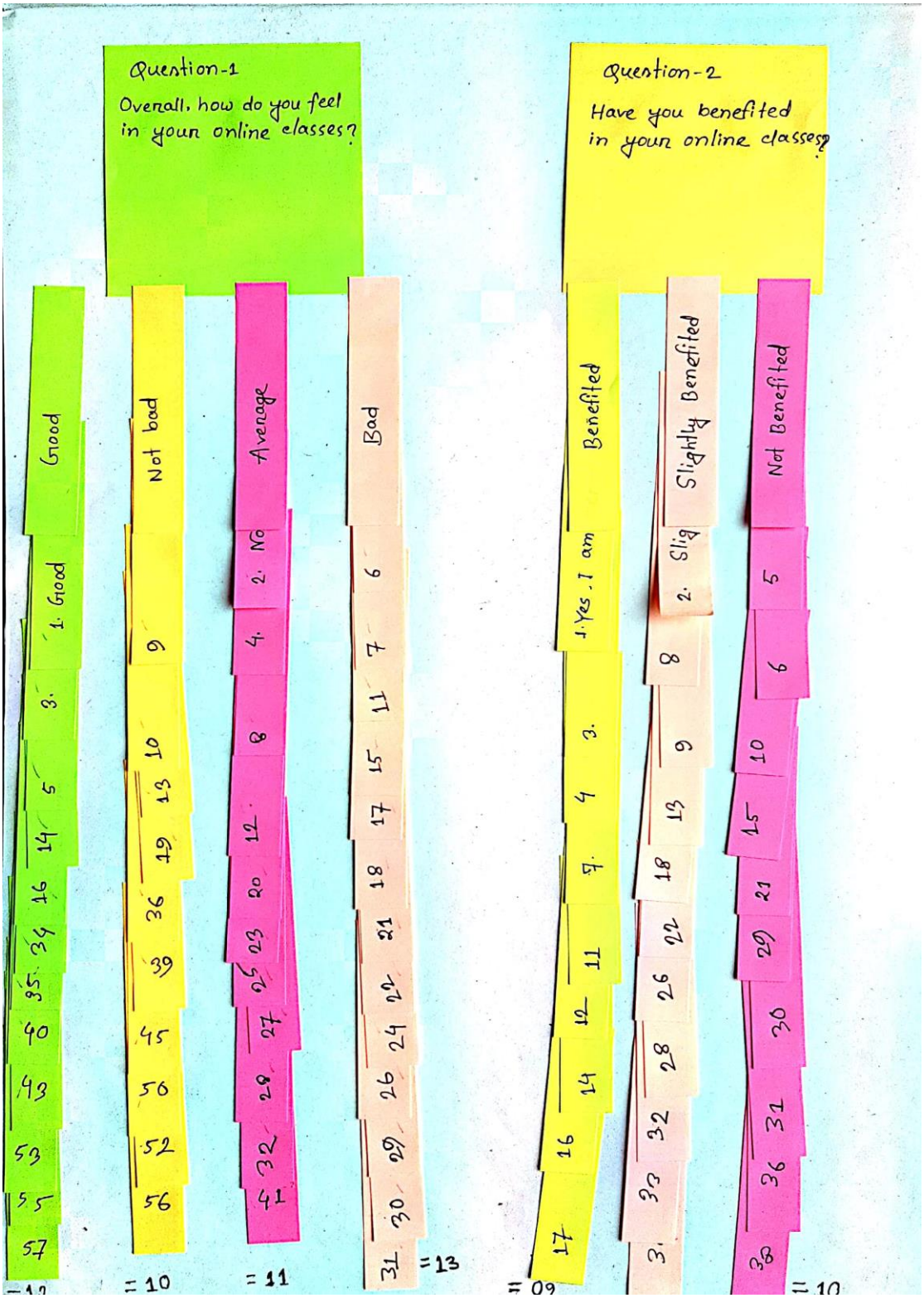
4.5	Do you feel pain out of online classes?		
4.6	Do you feel any weakness in your limbs?	1.Yes ;If yes ,which movement? 2.No	
4.7	Do you feel any movement limitations?	1. Yes; If yes, which movement? 2.No	

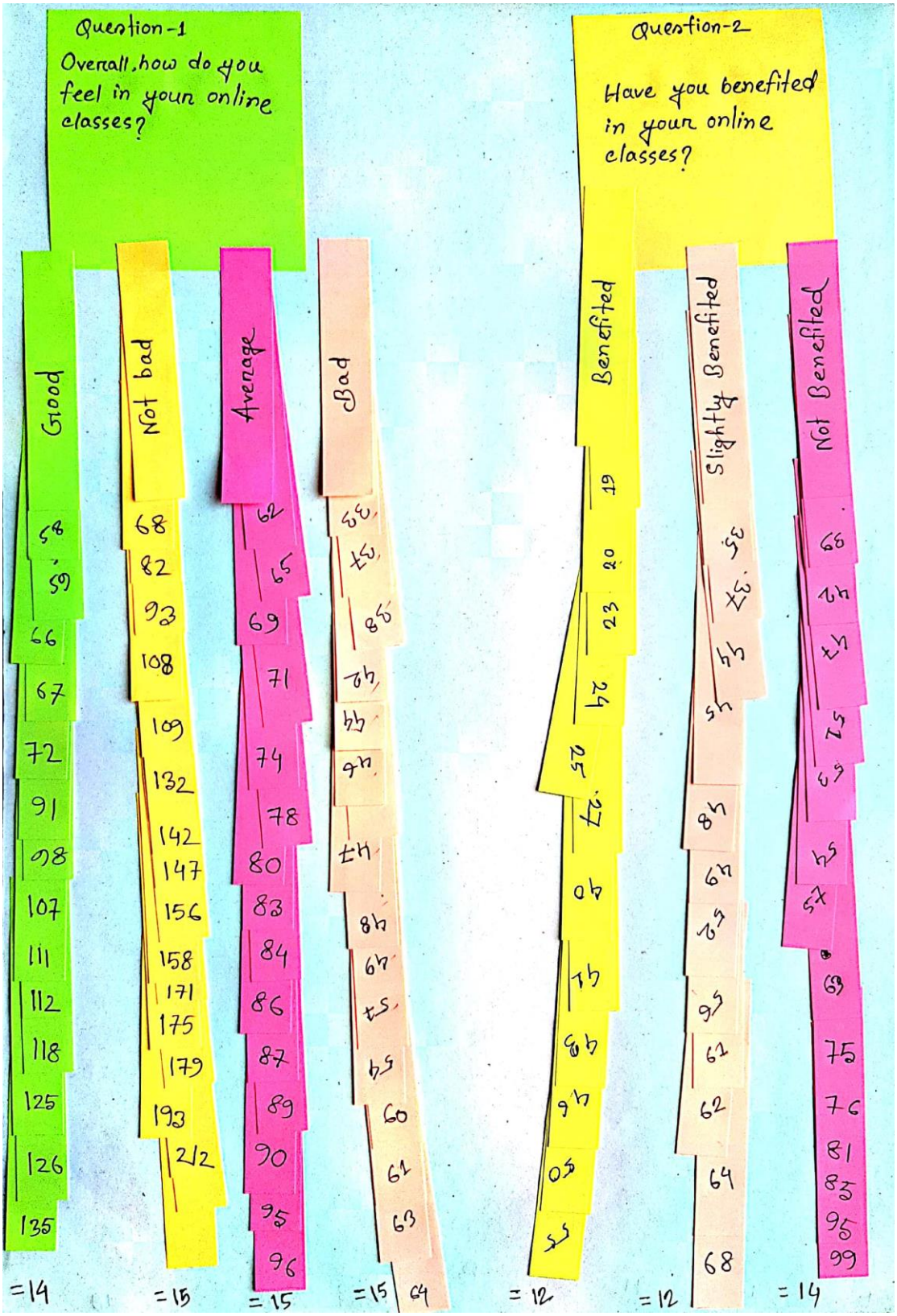
Qualitative question:

1. Overall, how do you feel in your online classes? (Write in a minimum of two sentences).

2. Doing online classes are you benefited? /Have you benefited from your online classes? (Write in a minimum of two sentences).

Appendix-III




Question-1
Overall, how do you feel in your online classes?
Good
58
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66
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72
91
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107
111
112
118
125
126
135
=14
Not bad
68
82
93
108
109
132
142
147
156
158
171
175
179
193
212
=15
Average
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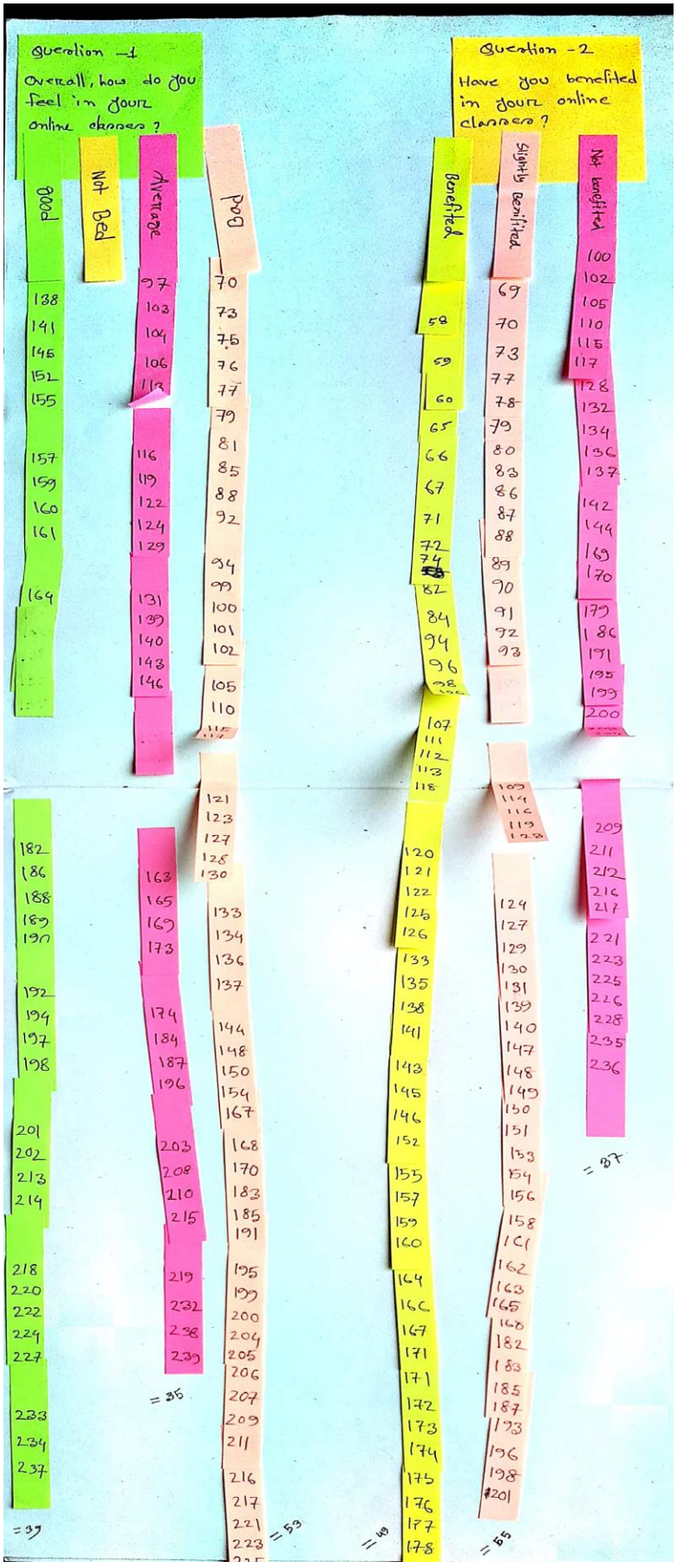
96
=15
Bad
=15
Question-2
Have you benefited in your online classes?
Benefited
19
20
23
24
25
27
40
44
48
49
50
55
=12
Slightly Benefited
=12
Not Benefited
63
75
76
81
83
95
99
=14


Question -1
Overall, how do you feel in your online classes?
Good
Not Bad
Average
Poor
Question -2
Have you benefited in your online classes?
Benefited
Slightly Benifited
Not benefited
= 37
= 35
= 53
= 49
= 65
= 37

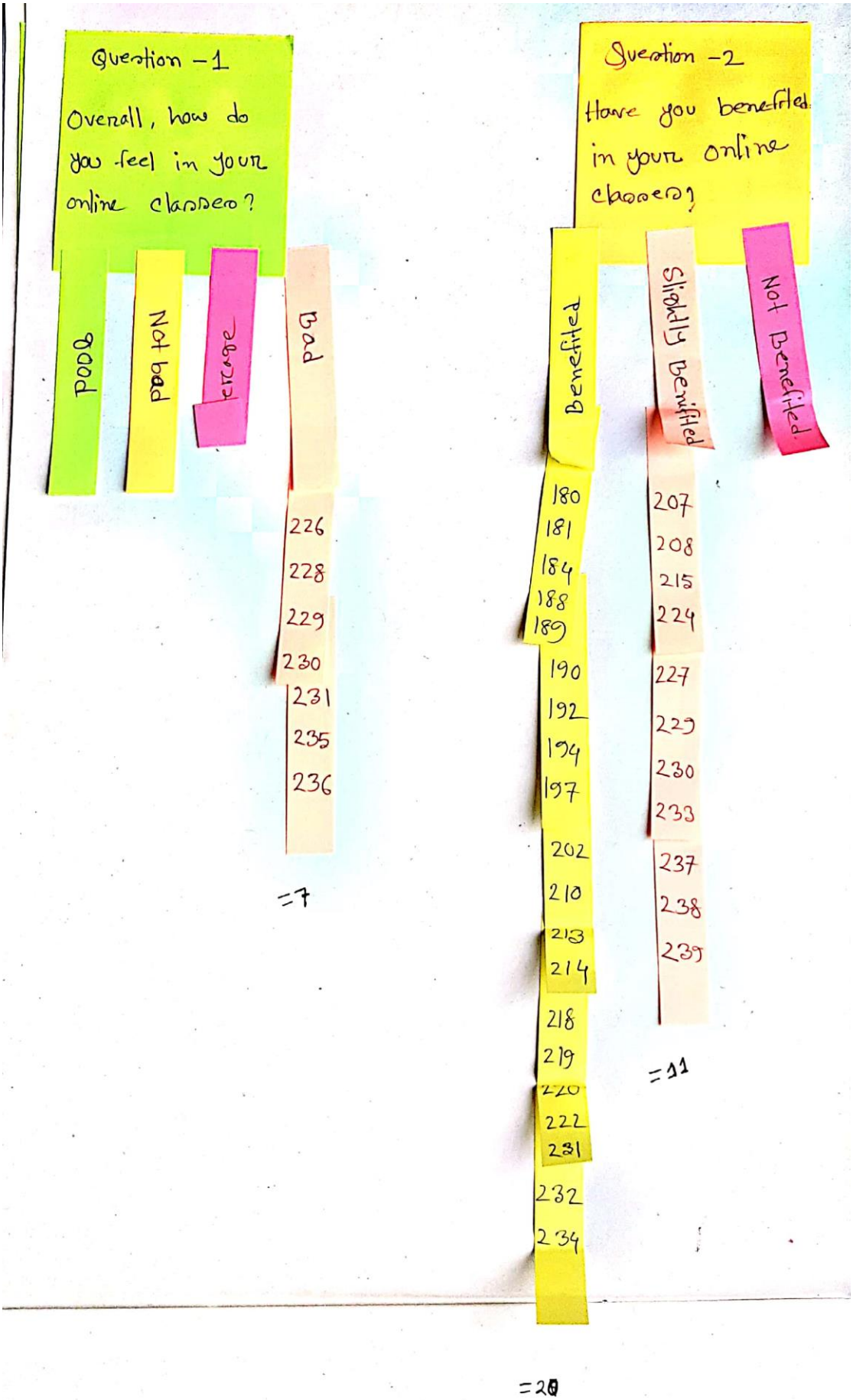

Question -1
Overall, how do you feel in your online classes?
Poor
Not bad
Average
Bad
226
228
229
230
231
235
236
=7
Question -2
Have you benefited in your online classes?
Benefited
Slightly Benifited
Not Benefited.
180
181
184
188
189
190
192
194
197
202
210
213
214
218
219
220
222
231
232
234
207
208
215
224
227
229
230
233
237
238
239
=11
=20

Table 09: Describe qualitative question part

Q-1: Overall, how do you feel in your online classes?					**Q-2: Have you benefited from your online classes?**		
Page No.	Good	Not bad	Average	Bad	Benefited	Slightly benefited	Not benefited
1	12	10	11	13	9	10	10
2	14	15	15	15	12	12	14
3	39	0	35	53	49	55	37
4	0	0	0	7	20	11	0
Total	65	25	61	88	90	88	61

Question-1: Overall, how do you feel in your online classes?

Good=27.20%

Not bad=10.46%

Average=25.523%

Bad=36.82%

Question-2: Have you benefited from your online classes?

Benefited=37.66%

Slightly benefited=36.82%

Not benefited=25.52%