Prevalence of work-related thumb pain in physiotherapists and its association with hours of working and hand position used during the execution of manual techniques

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Abstract:

Thumb pain in physiotherapists is an underlying health condition due to repetitive engagement in manual techniques and prolonged working hours. We have done our investigation on this project in twin cities. The objective of our study is to investigate the frequency of thumb pain among physiotherapists, to conclude the relation between thumb pain and working hours, to check the association between the thumb pain and execution of manual techniques and to identify and highlight effective strategies for prevention of thumb pain. Cross-sectional survey was done using non-probability convenient sampling technique. The sample size was 367 calculated through Open EPI Tool. Study setting was government and private hospitals, medical universities, medical institutes, and private clinics. Target population included physiotherapists, DPT lecturers who were also clinically active, and Internees. Self-administered questionnaires and visual analog were used. To find the association's chi square test was used. Out of 367 participants, out of 367 participants, 72.2% of physiotherapists occasionally suffered from thumb pain. And its association with working hours and hand positioning issignificant as the p-value is <0.05. This study also found an association between the hand posture used during manual therapytechniques and thumb pain among physiotherapists who perform manual techniques for a period of time greater than two hours.

Introduction:

Thumb is that part of hand which plays a significant and efficient role in performing manualtherapy while treating patients having musculoskeletal problems. Thumb pain is major problem in upcoming therapists during performing treatment like the overuse and inappropriate use of thumb. (Kareem et al., 2020)

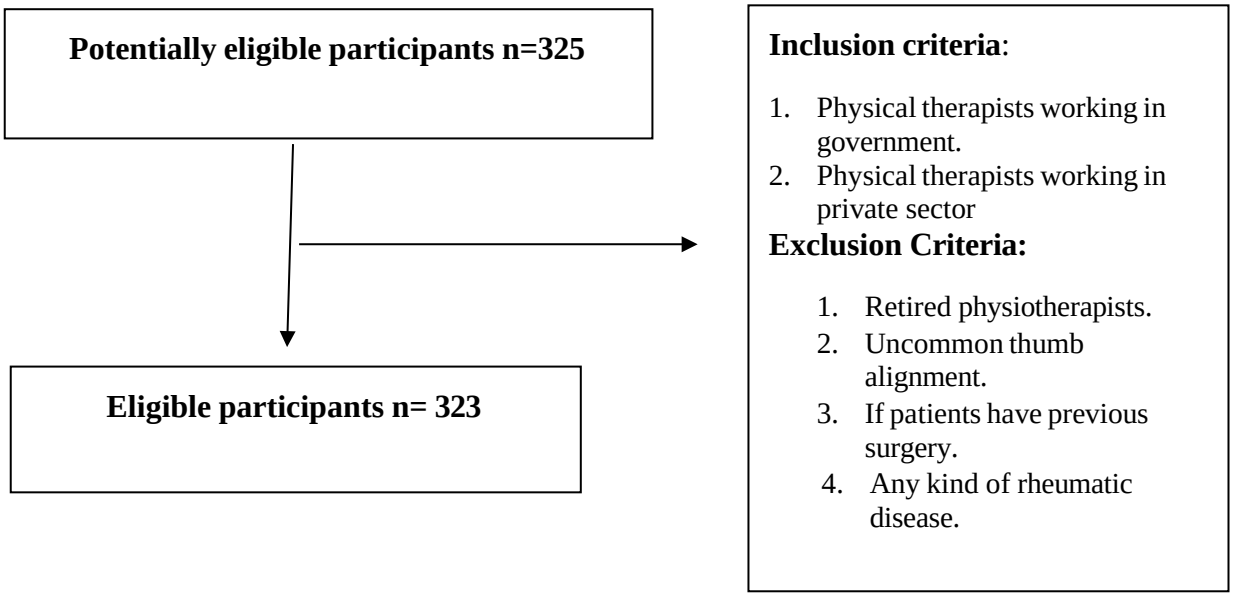
As according to profession physiotherapists work in repetitive manner and manual techniquesdemand high force which cause excessive pain in thumb but studies showed that manual therapists are more prone to pain than physiotherapists, who perform manual techniques rather than modalities and other treatment equipment's. Work demand of physical therapy of high loading and repetitive movements can cause pain(Yaseen et al., 2019) All structures in hand can cause pain but the parts which are more prone to pain are distal parts of hand and thumb MCP and CMC joint due to continuously compressing forces during mobilization and massage, and manual techniques if cause pain can alter the anatomy of hand.(Kareem et al.,2020) WHO defined that "any work related acute illness or problem can be irreversible and then can be change into any kind of disability or worse with further use if remain unconcerned".(Yaseen et al., 2019)

One of our digits, the thumb, is the shortest. The trapeziometacarpal (TMC) or first carpometacarpal (CMC1), also known as the basal thumb joint, is crucial for the thumb'sextensive range of motion. (Fontaine et al., 2021). Its skeleton includes of the first metacarpal, two phalanges (proximal and distal), and thescaphoid and trapezium carpal bones. Four joints - the scaphotrapezial, anterolateral scaphotrapeziotrapezoid (STT) joint, the TMC, the metacarpophalangeal (MCP), and the interphalangeal (IP). (Fontaine et al., 2021). The first metacarpal's base has an articular surface that is reciprocally biconcave, matching the trapezium's articular surface. The anterior oblique ligament attaches into a protruding "beak" on the ulnar palmar side of the joint concavity. When the anterior oblique ligament is inserted into the trapezium, the anterior (volar) "beak" of the thumb metacarpal articulates with a depression in the anterior (volar) surface of the trapezium. (Komatsu & Lubahn, 2018) The TMC joint is actively stabilized by the muscles. The thumb seems lopsided due to the four extrinsic (or long) muscles, three of which are on the dorsal side, and the five intrinsic(or short) muscles, all of which are on the palmer side.

The radial artery and its branch give rise to the vessels of the trapeziometacarpal joint, the main artery of the thumb. (Goubau et al., 2012) Radial and median nerves innervatethe TMC. (Fontaine et al., 2021) Movements and axes - abduction and adduction which happens at trepezometacarpal joint in the frontal plane (that of the palm). In contrast to adduction, abduction moves the polices away from the first metacarpal. Oriented anteriorly, medially, and slightly distally. (Fontaineet al., 2021) At the TMC joint, which is located in the longitudinal plane and oriented at around 45-degrees to the frontal plane and 30 degrees to the sagittal plane, flexion and extension take place (Goubier et al., 2011). When applying PA pressures, physiotherapists who could keep their MP and IP joints extended improved the longitudinal force transmission to more proximal joints and were less likely to experience thumb pain. (Mahajan et al., 2020) Splints, taping, medicines, modifications, ergonomics, and education are all includedin treatment procedures (Van de Velde & Cattrysse, 2013).
Many therapists who tried the treatment and were satisfied with it claim that rest maybe the best therapy Second, medicine proved to be a successful form of therapy. Sometherapists also found success using taping or bracing. (Van de Velde & Cattrysse, 2013)

Material and Methods:

A convenience sample of 323 participants was selected based on inclusion and exclusion criteria by using the open EPI tool. Participants were selected from the government and private sectors of Rawalpindi and Islamabad. Participants who are retired, having any uncommon thumb alignment, have previous surgery, or presence of any kind of rheumaticdisease, are excluded from the study. The proposed sample is 367 with 95% confidence interval. This research is a cross sectional observational survey study; a self-administered questionnaire and visual analogue scale independently conducted on each individual underprecise supervision of researchers. The duration of study is 4 months.



Data collection Procedure:

Physiotherapists working in clinical settings are more prone to thumb injury which is identified by using self-administered questionnaire and visual analogue scale. Questionnaire sent by paper form and Google forms having percentage of 85.83% and 14.16% respectively. Consent was taken first. Questionnaire form was set to collect data from physiotherapists of private and government sectors. And demographics of questionnaire are age, gender, marital status, occupation and presence of specific illness.

Study has no physical, emotional or psychological harm to the patients. All data collected will be confidential. The critical point of research is ethical consideration. We have taken these considerations by Informed consent, Confidentiality is not breached and Discrimination on basis of cast, color, or breed was avoided.

RESULTS:

Out of 367 participants, 72.2% of physiotherapists occasionally suffered from thumb pain. And it's association with working hours and hand positioning issignificant as the p-value is <0.05. The data will be analyzed using SPSS version 21.0 IBM Software. Level of significancechooses was 0.05. Chi Square Test was used to find association between variables.

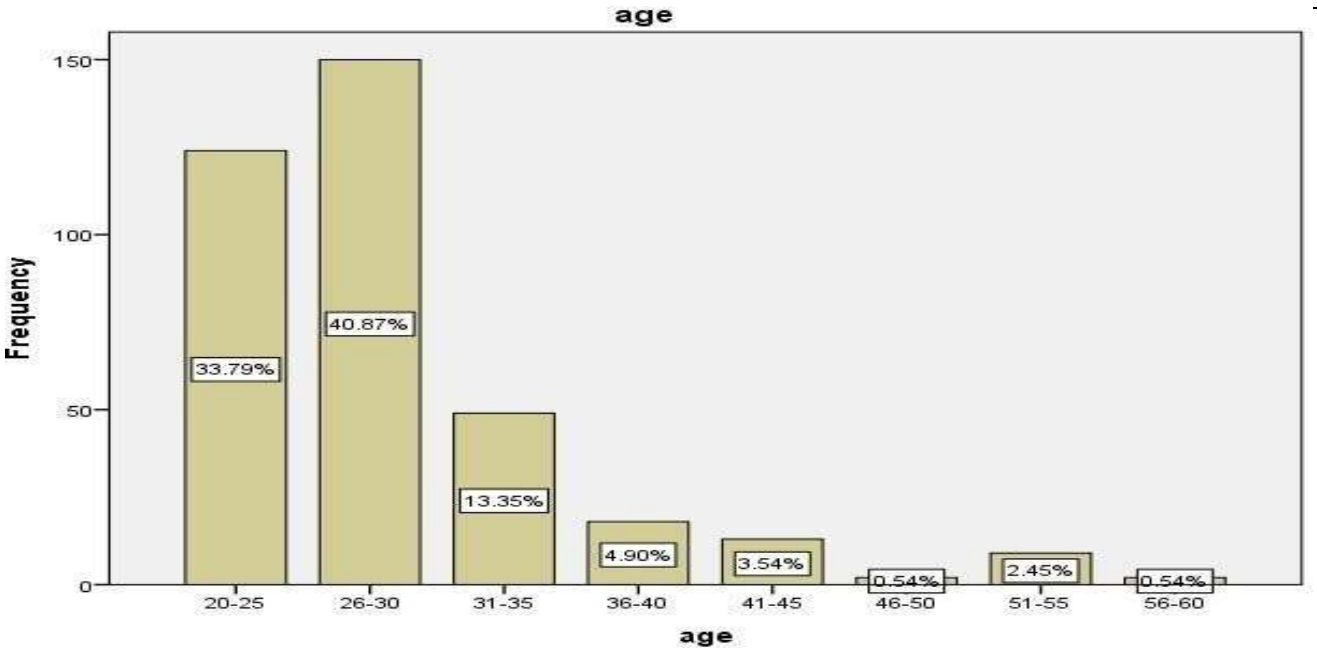


Figure 1: Age: By determining group of working physiotherapists from 20 to 60 years of age, 124 participants (33.8%) are included in range of age 20 to 25, 150 (40.9%) in range of 26 to30, 49 (13.4%) are in range of 31 to 35. 18(4.9%) participants are included in age group of 36to 40. 13(3.5%) are in group of 41 to 45. 2(.5%) are included in 46 to 50 of age group. 9(2.5%) lie in 51 to 55 of age. 2(.5%) in age of 56 to 60 age group.

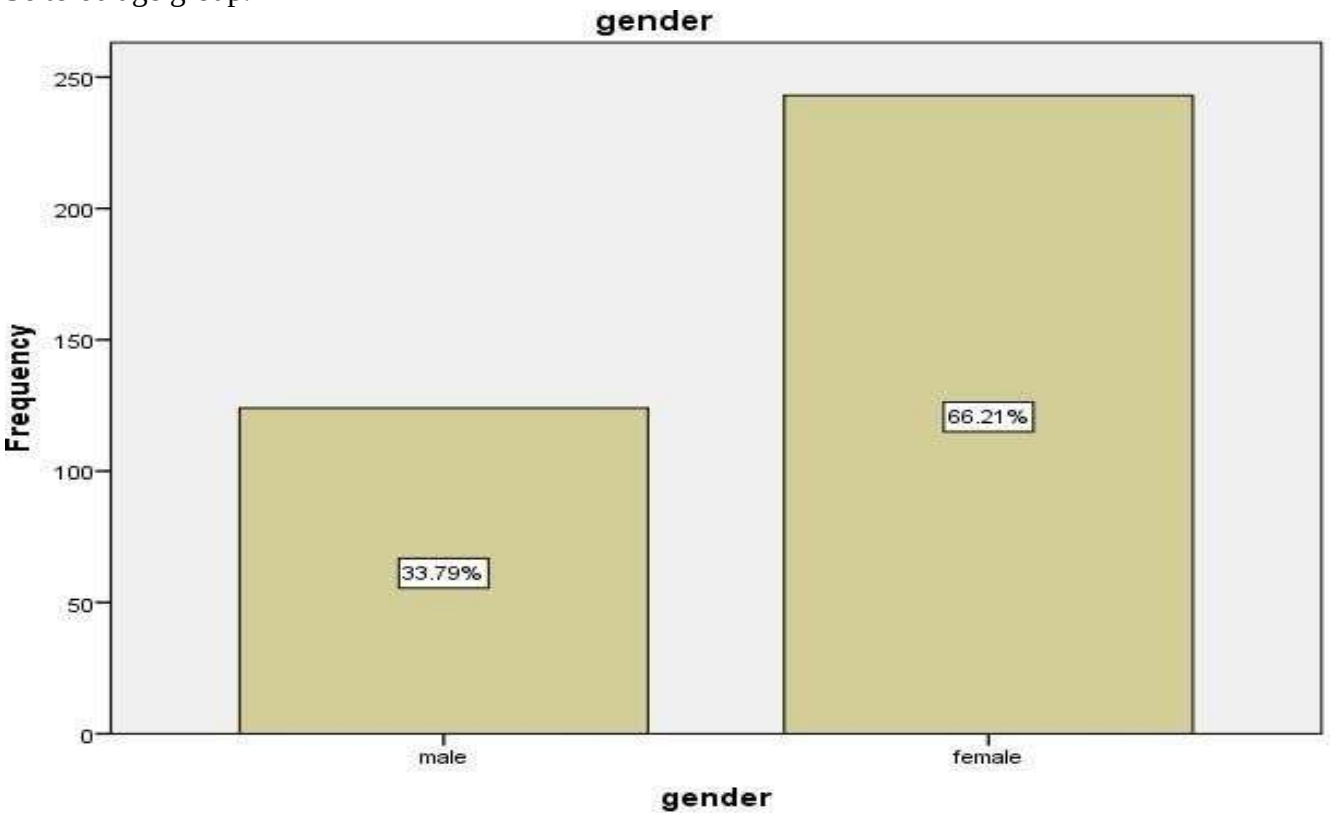


Figure 2: Frequency of Gender: In considering gender, male population is 124 of 33.8% and female 243 of 66.2%of total 367 participants.

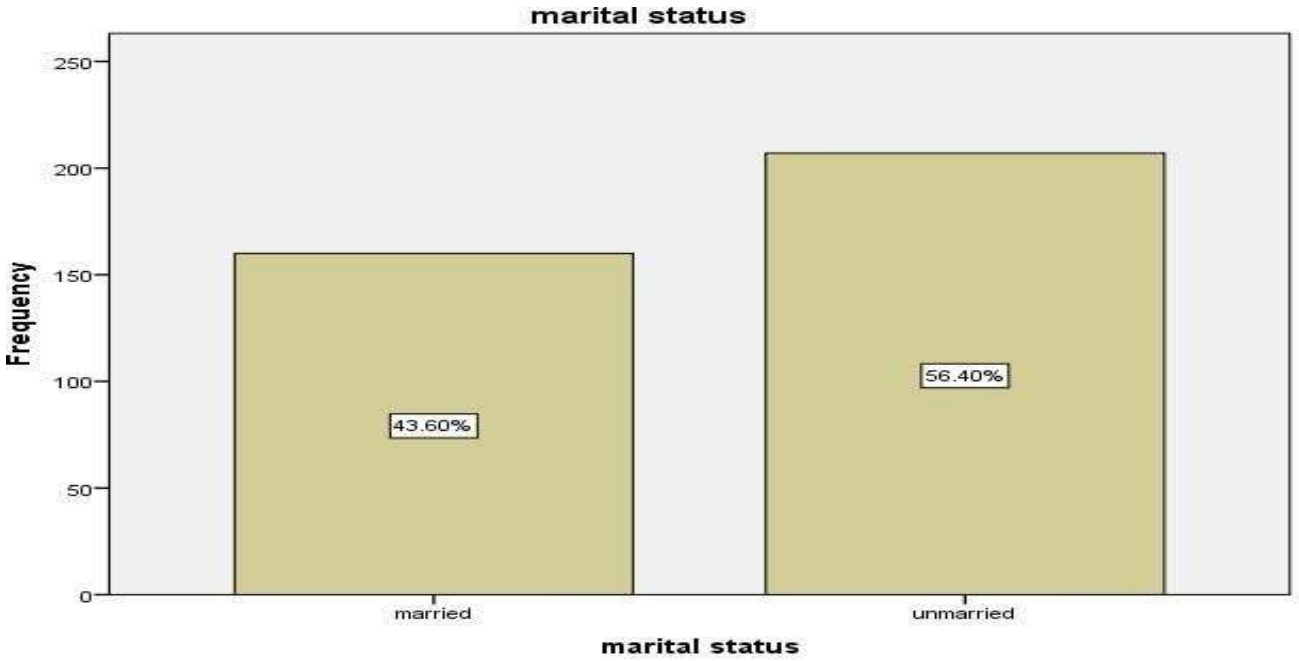


Figure 3: Frequency of Marital status:160 participants were married and 207 were unmarried with percentage43.6% and 56.4% respectively.

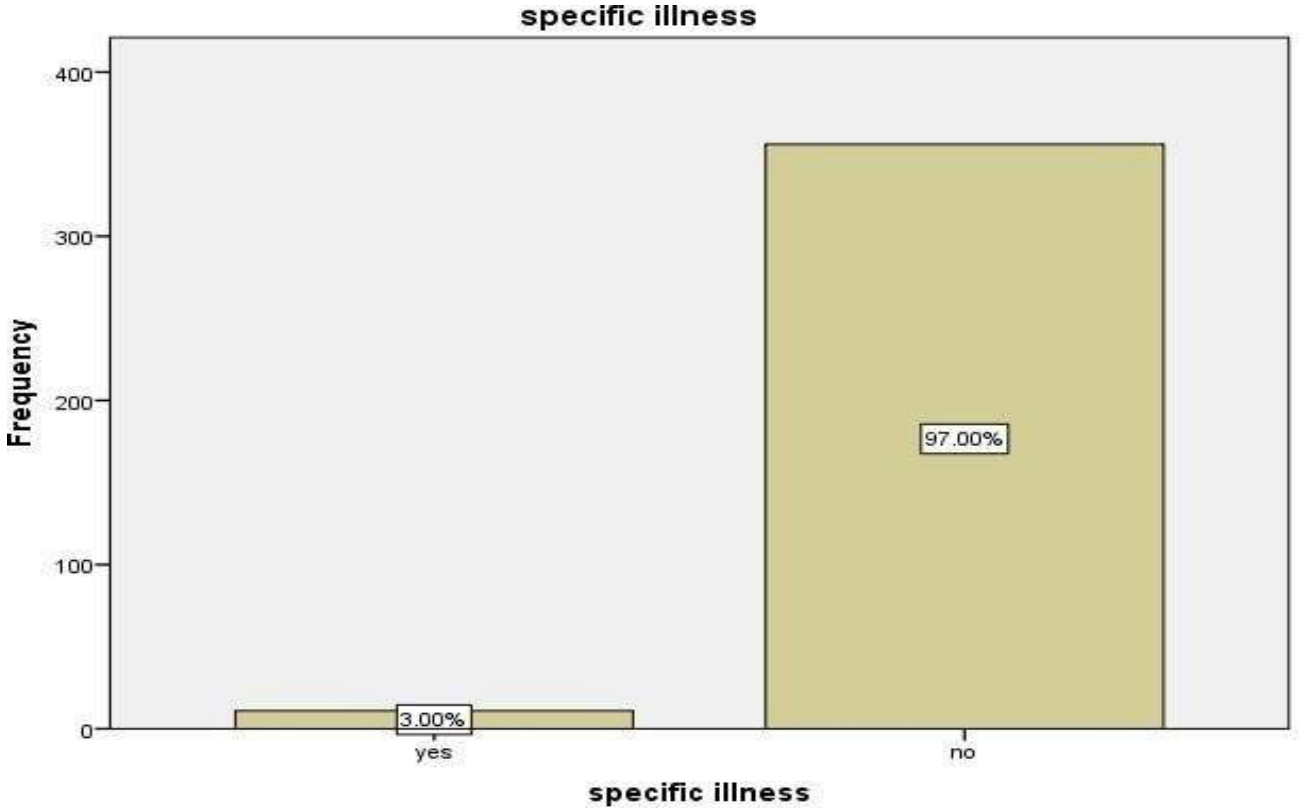


Figure 4: Frequency of specific illness: In participants of 367, 11(3%) had mentioned presence of any kind ofillness and 356(97%) had no illness.

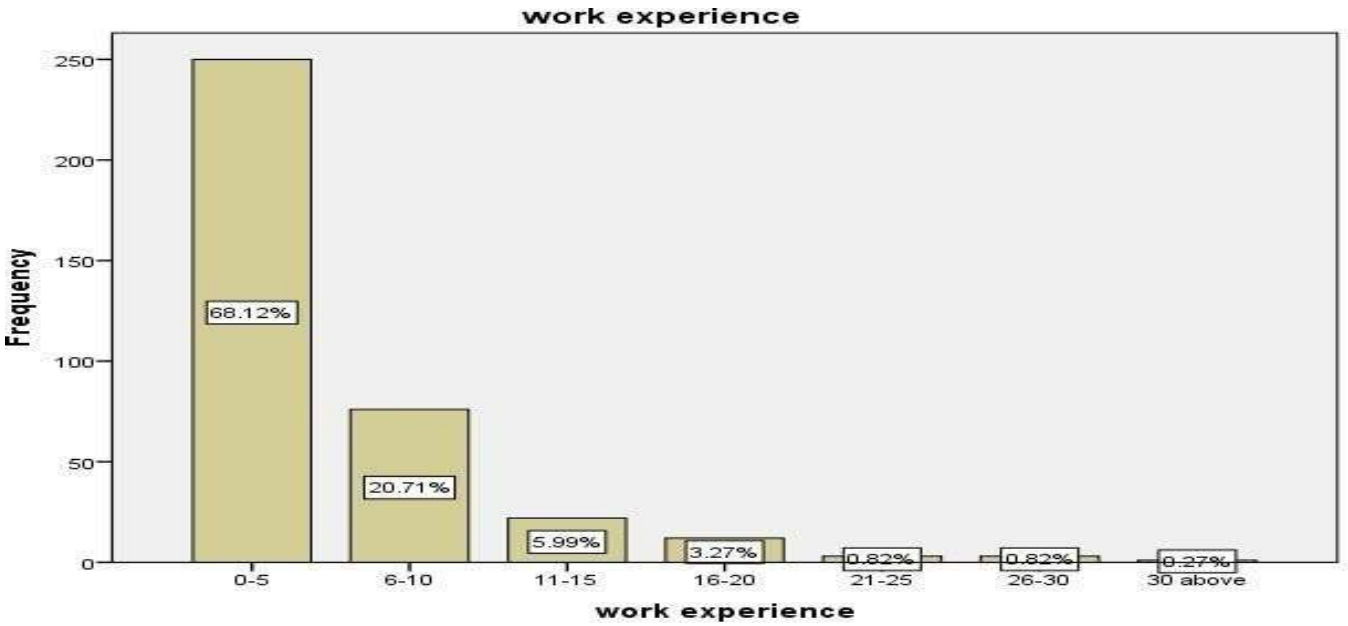


Figure 5: In relation with working experience, 250 participants lie in 0-5 years, 76 participants lie in 6-10 years of practice, 22 participants lie in 11 to 15 years of experience, 12 participants having experience of 16 to 20 years. 3 physiotherapists lie in 21 to 25 years ofexperience, 3 lie in 26 to 30 years of working experience, 1 participant having experience of above 30 years.

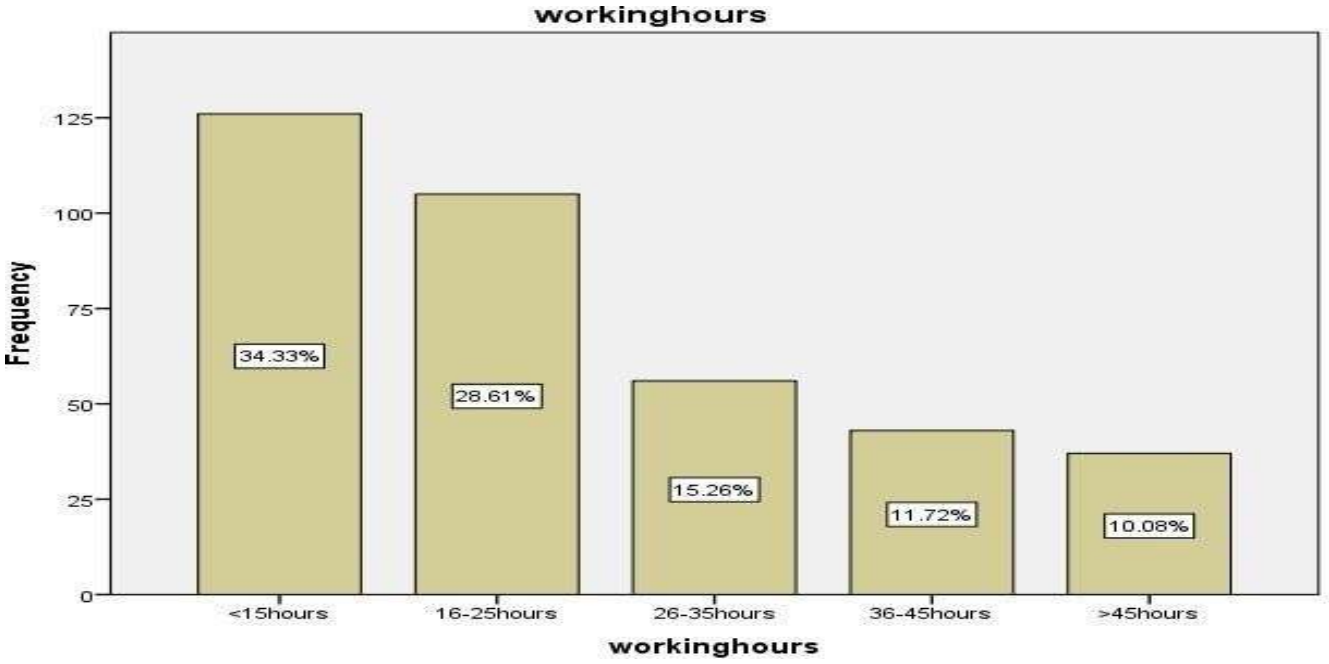


Figure 6: In comparing working hours 126 physiotherapists lie in <15 hours, 105 physiotherapists lie in group of 16 to 25 hours, 56 participants lie in 26 to 35 hours per week,43 physiotherapists lie in working hours of 36 to 45 hours, 37 participants are included in group of >45 hours.

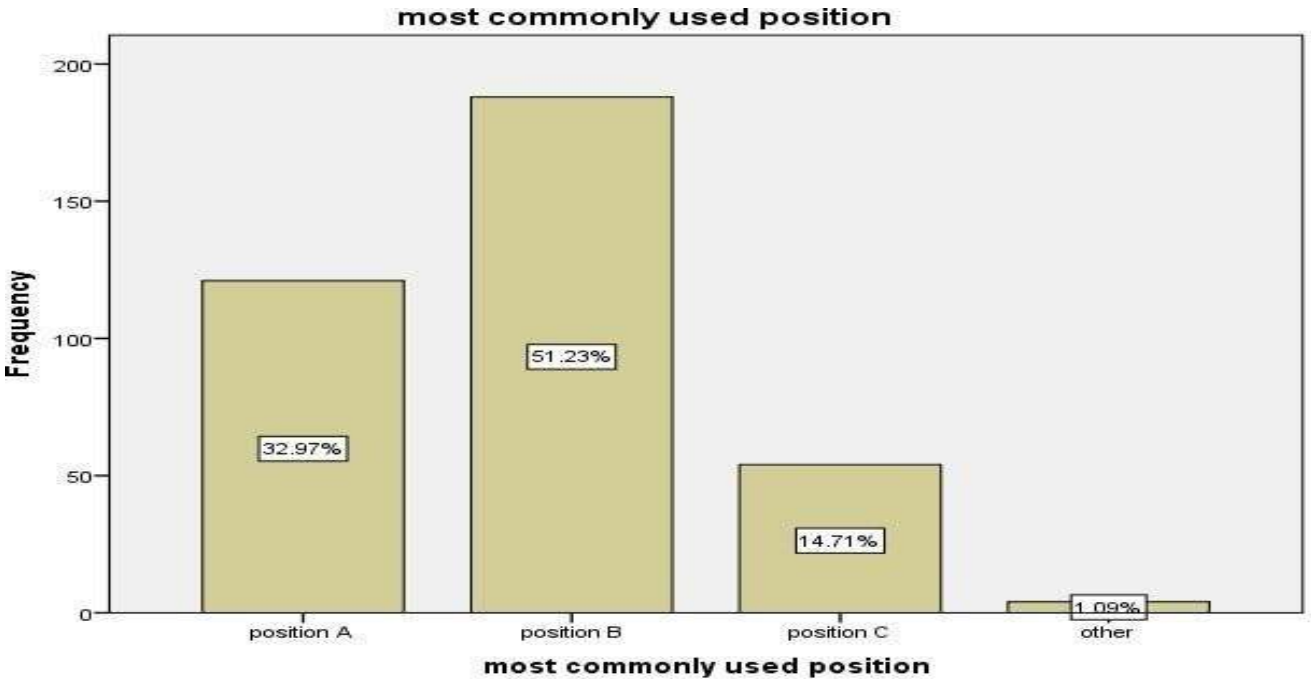


Figure 7: In total population of 367 participants, 121 were included in position A.188physiotherapists selected position B, 54 selected position C. 4 of them selected optionof other.

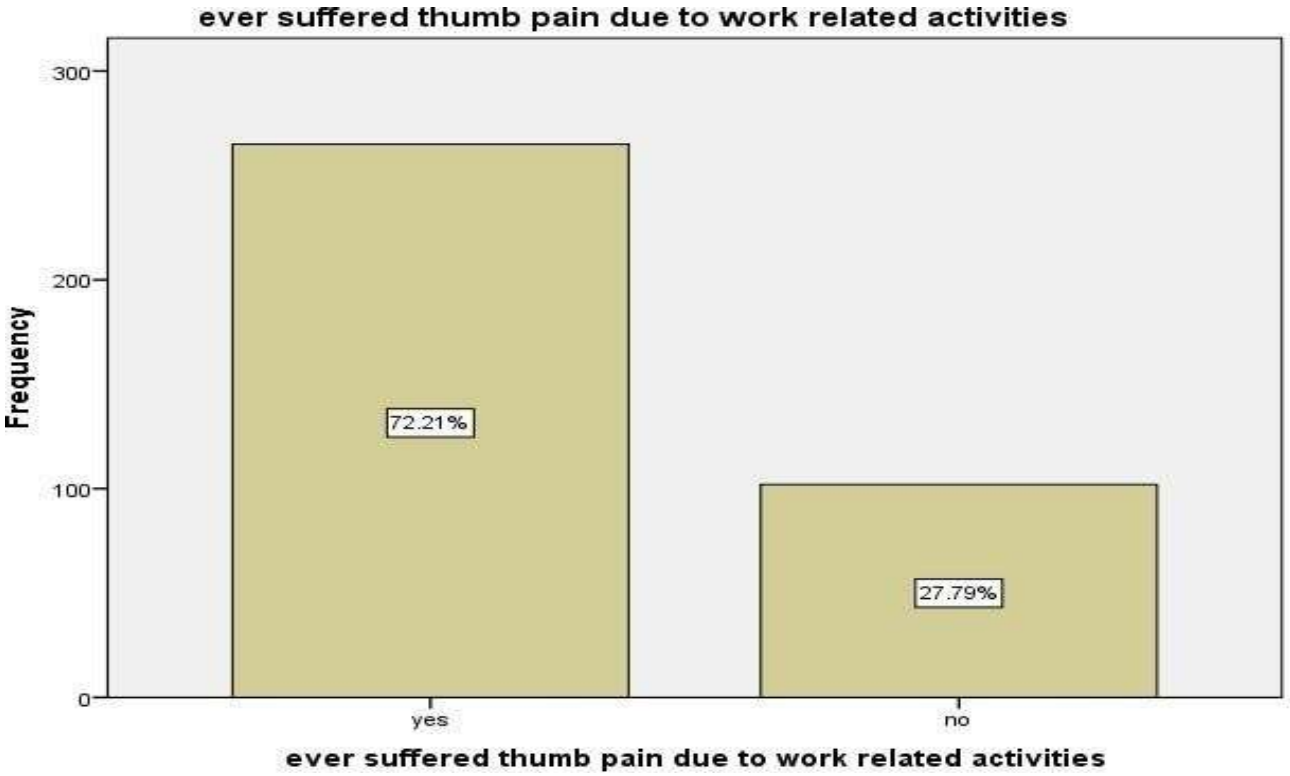


Figure 8: In population of 367 participants, 265 of 72.2% participants had pain and102 participants of 27.8% had no pain ever.

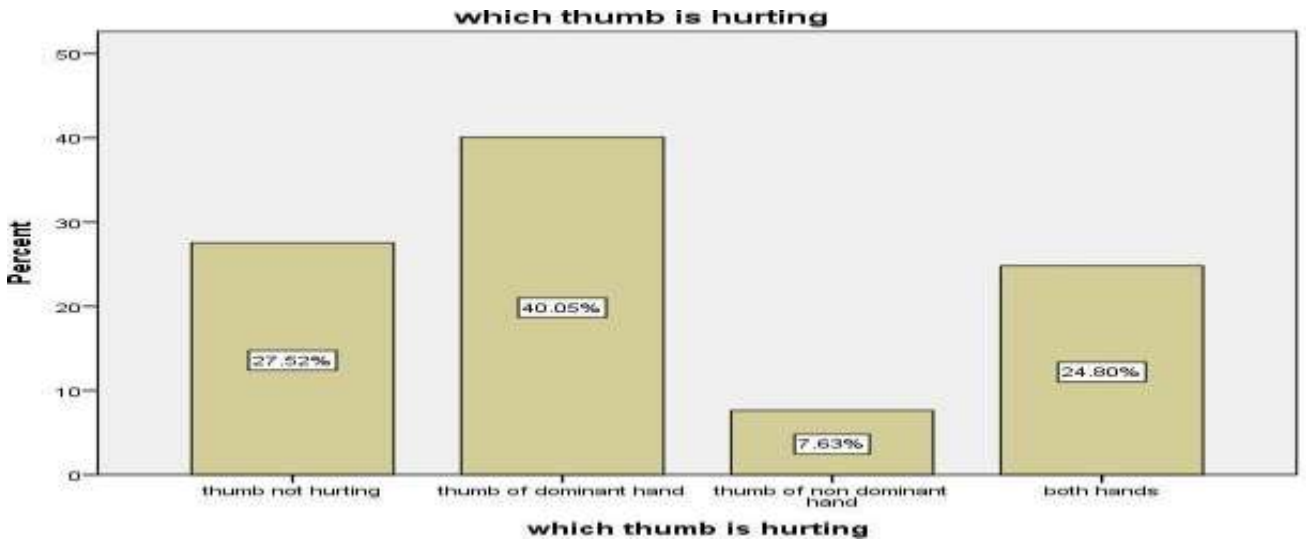


Figure 9: showed out of 367 participants, 101(27.5%) participants had no pain; 147 (40.1%) participants experienced pain in their dominant hand's thumb; 28 (7.6%)participants experienced pain in their non-dominant hand's thumb; and 91 (24.8%) participants experienced discomfort in both thumbs.

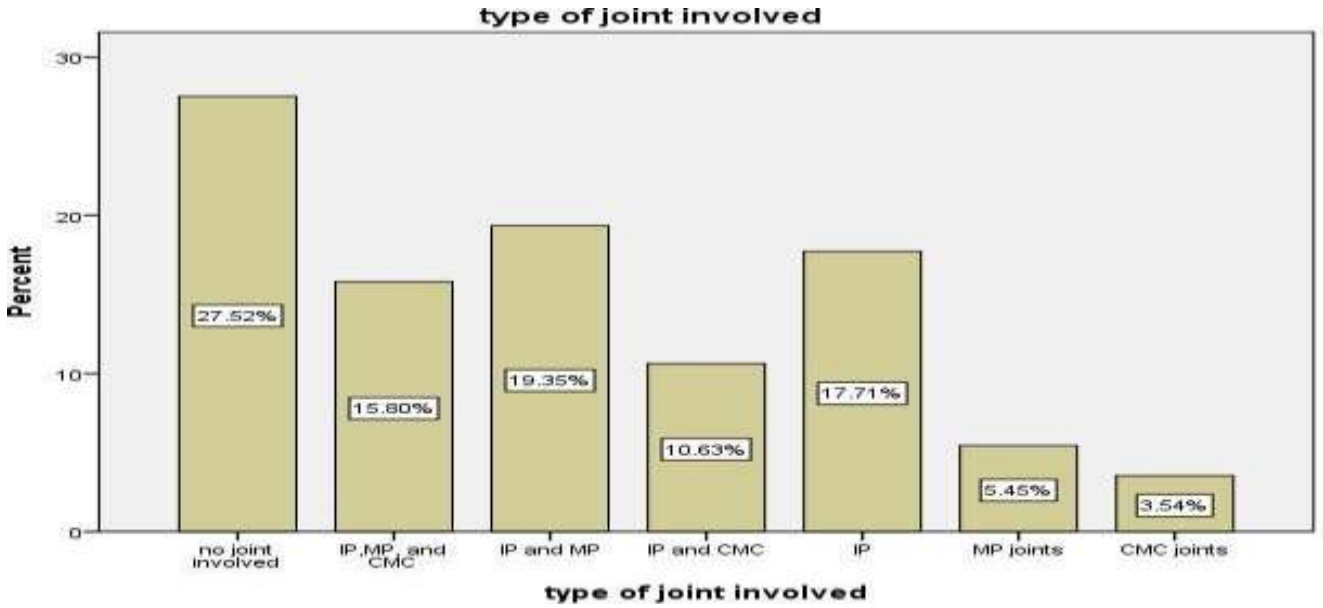


Figure 10:showed in a population of 367 working physiotherapists 101(27.5%) participants were those with no thumb joint pain; 58(15.8%) participants lie in a grouphaving pain in IP, MP, and CMC joints; 71(19.3%) participants reported having pain in IP and MP joints; 39(10.6%) participants reported having pain in IP and CMC joints; 65(17.7%) participants reported having pain in IP joint; 20(5.4%) participants reported having pain in MP joint; 13(3.5%) participants reported having pain in CMC joint.

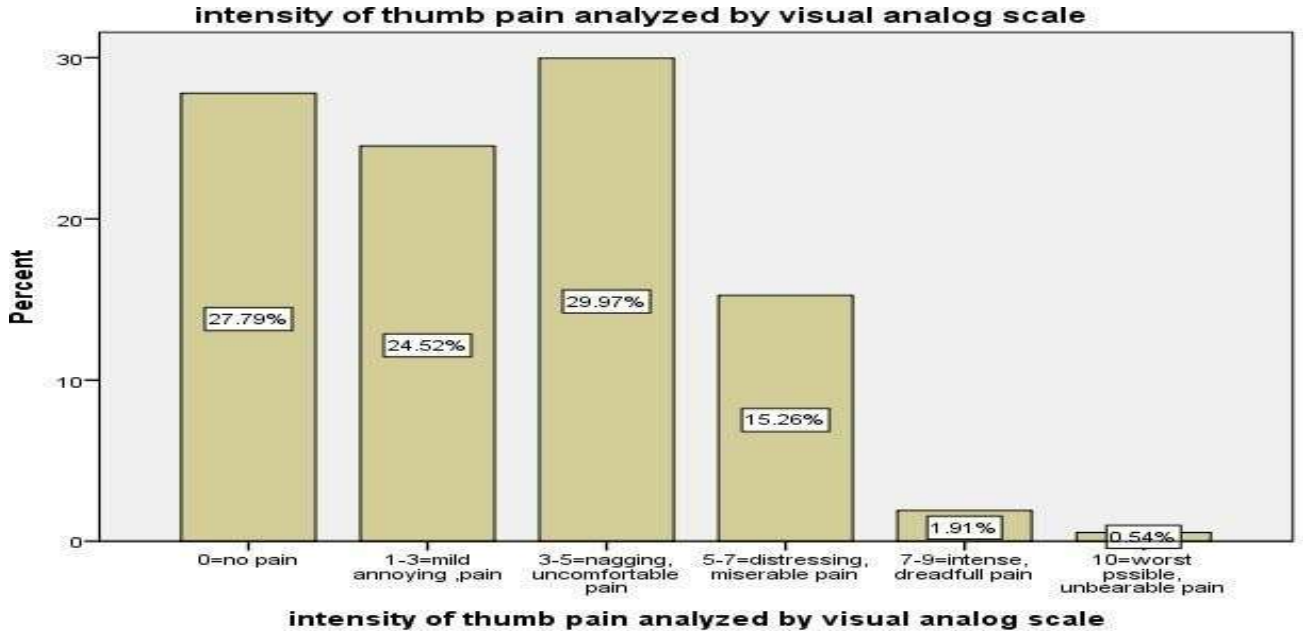


Figure 11: showed pain rating according to visual analogue scale in population of 367 participants, 102(27.8%) were those having no pain; 90(24.5%) were those who had mild annoying pain; 110(30.0%) had mentioned uncomfortable and nagging pain;56(15.3%) had mentioned miserable and distressing pain; 7(1.9%) participants declared dreadful and intense pain; 2(0.5%) participants had mentioned worst painintensity**.**

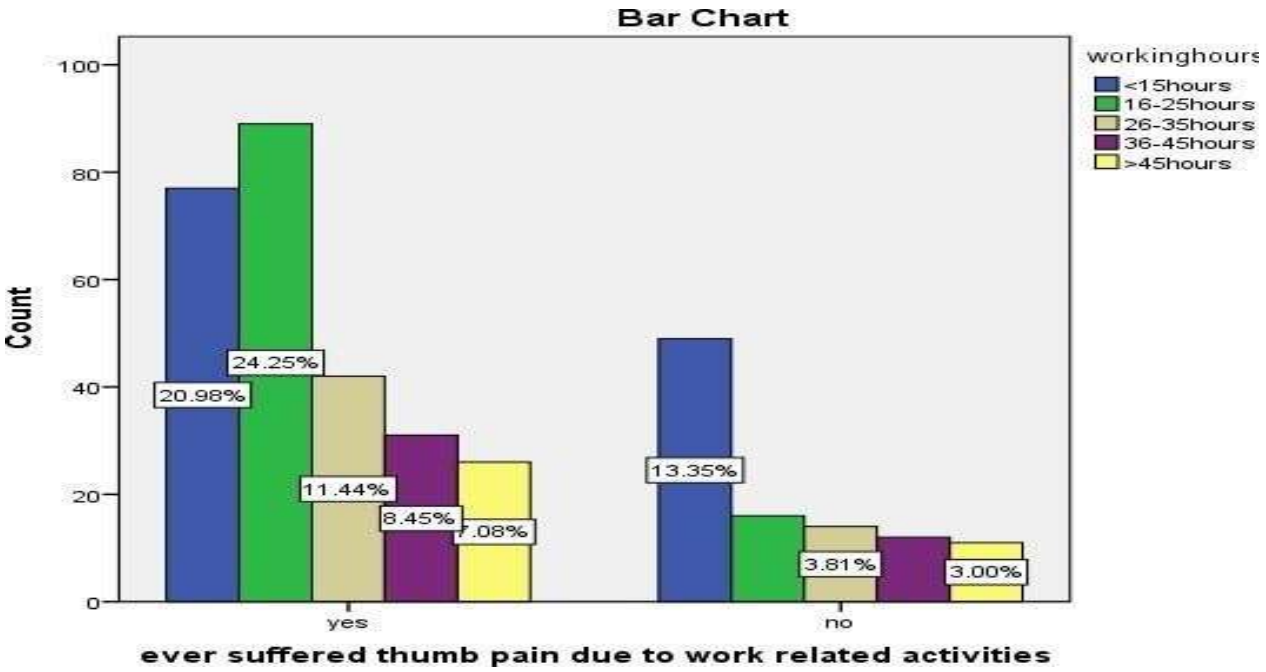


Figure 12: Association between Ever Suffered thumb pain due to work related activities and Working Hours. Shows p- value is < 0.05 so there is significant association between these twovariables. With increase in working hours there is increase in thumb pain

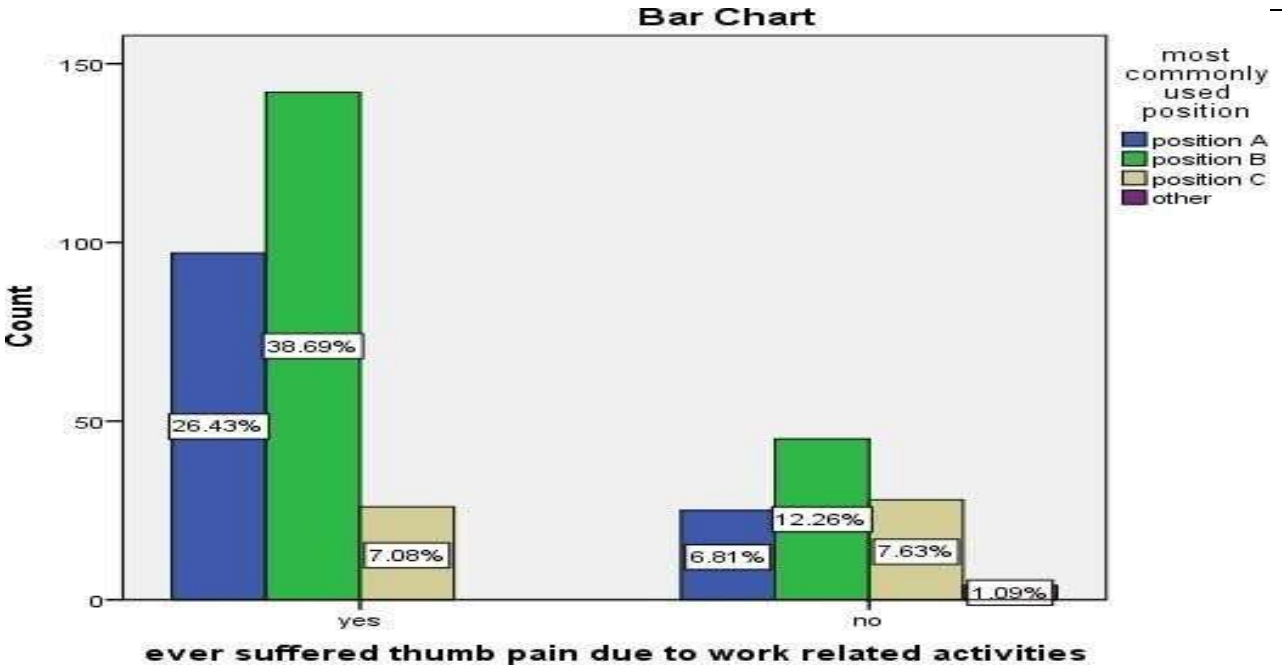


Figure 13: Association of Thumb pain and hand position commonlyused. shows association between these two variables, most commonly used hand position by working physiotherapist and thumb pain ever suffered due to work. P-value is <0.05 so the association is significant

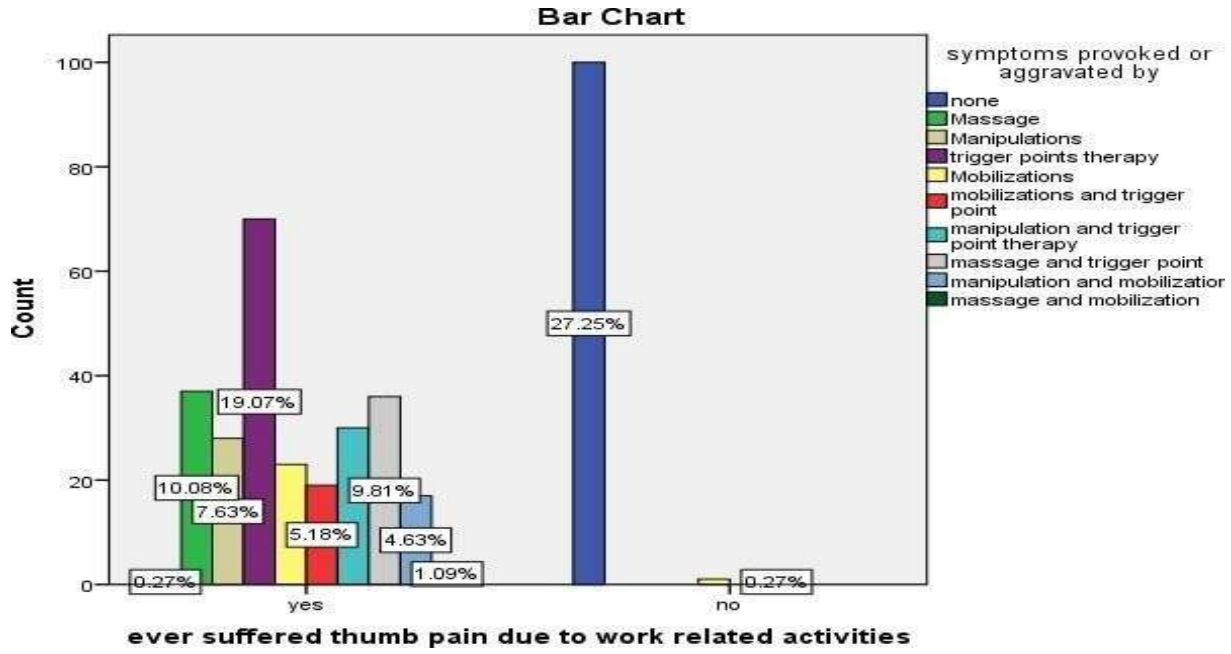


Figure 14: Association between thumb pain due towork related activities * symptoms provoked or aggravated; As p-value is <0.05 so this association between these two variables is significant.

DISCUSSIONS

This cross-sectional study aimed at finding the incidence of thumb pain in physiotherapists practicing manual therapy in government and private hospitals and manual therapy clinics inRawalpindi and Islamabad and its impact on clinical practice.

This cross-sectional study states that out of 367 participants 265(72.2%) responds with thumbpain and 102(27.8%) reported that they never experienced pain. 124 (33.8%) participants were belonging to age group of 20 to 25 and remaining 150 (40.9 %) subjects were in betweenof 26- 30 years. Female were of 243(66.2%) and in higher percentage than males which are of 124 (33.8%) who showed thumb pain.

Firstly, we consider the presence of thumb pain in relation with hours of working where results represent significance value (p0.003) that out of total 367 population 265 mentionedpain occurrence, and highest percentage goes to level of hours of working <15 which is 34.3%. Second highest is 28.6% working for 16 to 25 hours per week. Then there are subjects, their working hours of 25 to 35 having pain percentage of 15.3%. 11.7% participants faced thumb pain, who work for hours 36 to 45 and 10.1% mentioned pain for working >45hours

Secondly in our study for thumb pain in physiotherapists the main thing which relate with thumb pain is way of hand position used during performing manual techniques having highest significance of (p0.00) in which position A represents if thumbs not supported by index fingers, MCP joints are touching, thumbs are not overlapping, 33% population used position A and say yes to thumb pain. Position B demonstrate that thumbs not supported byindex fingers, MCP joints are not touching, thumbs are overlapping. Most commonly used position is B having percentage of 51.2%, and having thumb pain. Whereas position C exhibit thumbs supported by index fingers, MCP joints are touching, thumbs are not overlapping. Position C is protective position which can prevent further thumb pain during manual therapy and 14.7% population used position C, having thumb pain. So, it indicates that hand position during application of manual protocols directly effects the thumb.

In comparison with what manual technique is mostly contributing factor in presenting thumbpain, 101 participants mentioned no pain with 27.5%. Highest percentage of 19.1% got fromtrigger point therapy. 37 participants of 10.1% mentioned pain due to massage techniques. Third highest percentage is 10.1% of 36 participants with massage and trigger points therapy

During applying manual technique.160 married (43.6%) and 207 unmarried (56.4%) out of 367 participant 11% indicate illness and 356 were healthy. 367 working physiotherapists, 250show thumb pain and experience pain between 0 to 5 years the second category in which 6 - 10-year present about 76 (20.7%) in 367 respondent manual physiotherapist were in higher percentage. Increased pain observed in dominant hand 147(40.1 %) according to result IP and MP joint 71(19.3%) were observed under pain in high percentage. Discomfort and pain reported during releasing trigger point 19.1%. Chi square evaluation shows association between symptoms provoked or aggravated and thumb pain ever suffered due to work. P- value is <0.05 which shows the association is significant and show pain in mild (110[30%] to moderate level (15.3%)126 participant show mild pain working less than 15 hour in week and 105 show 28.6 % work about 16 -25 Association between working hours and thumb pain ever suffered due to work related activities'-value is <0.05 so the association between the two variables is significant. Most common hand position which shows higher percentage were B in which thumb not supported by index finger, MCP joints are not touching thumbs are overlapping percentage. shows association between these two variables, most commonly used hand position by working physiotherapist and thumb pain ever suffereddue to work. P-value is <0.05 so the association is

significant.

The study conducted by Tabish et al. in India was first compared to our findings. The prevalence of thumb discomfort was found to be 38.98%, which had the following effects onphysiotherapists' work practices—a figure lower than the 57% found in our study. Our study found a high level of roughly 43% compared to 32.61% who modified the way they implemented their treatment methods, 32.61% who changed the methods they chose, and 15.22% who reduced the number of patients they treated. 7.1% for treatment in daily routine,10.87% for fewer hours worked and 8.70% for less manual labor, respectively, scored lower levels. The most significant result of this study's low incidence of thumb pain (38.98%) in physiotherapists who use manual treatment was a change in the selection and application of treatment technique

Physical therapists are more likely than the general population to develop WRTP, with a prevalence of 48%, according to the study's findings. 39% of physiotherapists who have WRTP are under 30 years old, which is comparable to about 40% of those who are between the ages of 25 and 30. It was discovered to be more common (29%) among manual therapists.In comparison to our survey, 23% of the respondent's higher level acknowledged trigger point therapy. Additionally, manipulation (17%) and mobilization (17%) are the methods thatcause a larger percentage of thumb pain. The result of WRTP is a change in treatment technique selection that is (17%) lower than what was seen in our study. The relationship between WRTP and gender is shown to be negligible, and this finding is in line with earlier studies17 and 18. which in our analysis likewise shows no correlation.

However, other studies did identify gender as a contributing factor to the development of thumb pain12. We discovered no correlation between thump pain, age, or field of practice.

In article of Anam Akram et al conducted in 2020, it is stated as a result that percentage of commonly hurting joint i.e. IP is 30.30% and IP, MP, CMC joint is 27.27% with associationof (0.001). Percentage of having thumb pain on dominant hand is 85% with significance value of (0.001). In contrast to our study where highest percentage having thumb pain is of joint IP and MP joint which is 20.2%, and IP joint is 17.7%, and all joint like IP, MP, and CMC is 15.8% with association of (0.00) whereas prevalence of dominant hand is 41.1% with association of (0.00) excluding those 97 who have no pain.

Fareeha Ihsan Kareem Amjad claimed in their questionnaire that it was sent to 190 physical therapists and that the results were as follows. There were 190 physiotherapists, of which 58(30.5%) were men and 132 (70.5%) were women. 38 (20%) massage therapists reported

feeling pain, of which 51 (26.7%) scored 3 and 15 (7.9%) rated 5 on the VAS. As comparedto our study where total population was 367, 37(10.1%) participants reported having pain while performing massage; 70(19.1%) participants had pain while performing trigger pointtherapy and according to VAS 92(25.1%) were those who had (1-3) mild annoying pain; (5-7) miserable and distressing pain.

In research article of K VAN DE VELDE, physiotherapist who had first carpometacarpal joint, the MP joint (35%) and the CMC joint (23%) were substantially P0.001) more commonthan the IP joint (6%). 40% of the physiotherapists had current thumb pain. In comparison with this our study has shown the significance of Out of 367 physiotherapists 265(72.2%) of reported having pain. Out of 367 participants, 210(57.2%) physiotherapists were currently suffering from thumb pain. 65(17.7%) participants reported having pain in IP joint, and 58(15.8%) participants lie in a group having pain in IP, MP, and CMC joints

LIMITATIONS:

Limitation of our investigation is that we have only investigated two risk factors which arehours of working and hand position used during the execution of the manual techniques.
The issue arises with permission regarding the collection of data in government hospitals andsome private set ups.

CONCLUSSION:

The current study in Rawalpindi and Islamabad concluded that 72.2% of physiotherapists hadthumb pain at a time because of their profession. This study also concludes that physiotherapists who work manually for more than 2 hours are more prone to developing thumb pain in connection with which hand position they use during the manual techniques they apply, especially when they performed trigger point therapy or massage. Change in technique execution is the key adaptation to thumb difficulties. The use of the pisiform and hypothenar eminences as an alternative method of applying longitudinal force along the thumb to patients when executing manual techniques was also suggested as a preventative approach. Splints, taping, medicines, modifications, ergonomics, and education are all part ofthe treatment plans.

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