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ASSOCIATION BETWEEN CARPAL TUNNEL SYNDROME AND USAGE OF COMPUTER KEYBOARD AND MOUSE IN YOUNG, ADULT AND MIDDLE - AGED MALE INFORMATION TECHNOLOGY PROFESSIONALS - A SURVEY BASED ANALYSIS

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M. Laksita, Karthik Ganesh Mohanraj*, JothiPriya A. ASSOCIATION BETWEEN CARPAL TUNNEL SYNDROME AND USAGE OF COMPUTER KEYBOARD AND MOUSE IN YOUNG, ADULT AND MIDDLE - AGED MALE INFORMATION TECHNOLOGY PROFESSIONALS - A SURVEY BASED ANALYSIS--Palarch's Journal Of Archaeology Of Egypt/Egyptology 17(7), 1097-1109. ISSN 1567-214x

Keywords: Occupational hazards; Musculoskeletal disorder; Carpal tunnel syndrome; statistics; Computers.

ABSTRACT

The rise in computer use and concurrent high rates in musculoskeletal complaints and Carpal Tunnel Syndrome (CTS) among users have led to a controversy. The aim of this study is to determine the association between CTS and usage of computer keyboard and mouse in

young, adult and middle - aged male Information technology professionals. The present study has used statistics to analyse and evaluate a possible relationship between CTS and computer use. 100 general participants were included in this study. A simple random sampling was used for analysis and the statistics were analysed using "student's unpaired T-test". The results were assessed using SPSS software. The results are represented in pie charts. The participants were within the age group of 18 - 65 years. Most of them were IT professionals and most of the participants had some amount of knowledge about carpal tunnel syndrome and its causes and effects. The study shows that computer use does not pose a severe occupational hazard for developing symptoms of carpal tunnel syndrome. There is evidence to suggest that occupational factors play a role in CTS.

INTRODUCTION

Carpal Tunnel Syndrome (CTS) is a disorder or it can also be defined as the compression neuropathy of the median nerve that passes through the carpal tunnel. It is regarded as the most frequent entrapment neuropathy of the upper limb (Atroshi*et al.*, 2007). CTS is generally believed that it is caused due to the increased pressure on the carpel tunnel. Additionally, CTS is one of the musculoskeletal disorders that is often described as the occupational hazards including occupations involving computer use (Shiri and Falah-Hassani, 2015). There is evidence of industrial repetitive and forceful work which is a contributing factor in CTS (Goonetilleke and Karwowski, 2017).Symptoms of the median nerve compression include pain, numbness or tingling which is usually found in the anterior surface of the index finger, middle finger and the radial half of the ring finger. It is often associated with weakness of handgrip which are nocturnal symptoms of hand or arm pain that causes numbness. The other reason is, Postural stress due to poor workstation ergonomics such as inappropriate location of the monitor, keyboard or mouse have been to be associated with musculoskeletal problems such as carpal tunnel syndrome(Levi, 1984)(Mediouni*et al.*, 2014)(Andersen *et al.*, 2003)(Campbell, Terry Canale and Beaty, 2008)(Seppan*et al.*, 2018).

The reported prevalence of CTS among the general population ranges from 0.7% to 9.2% among women and 0.4% to 2.1% among men (Krishna, Nivesh Krishna and YuvarajBabu, 2016)(Nandhini*et al.*, 2018). The growing use of computers results in concurrent increase of musculoskeletal complaints among users which is a long running controversy that makes exposure to computers causes development of CTS ((Wright, 2008)(Thejeswar and Thenmozhi, 2015)(Sriram, Thenmozhi and Yuvaraj, 2015). Several reviews had concluded that there is no evidence for such an association (Gorsche*et al.*, 1999). Only one study which had used a longitudinal design has found a positive association in between right handed mouse use which shows the symptoms of occurance of CTS (Abu-Taleb and El Beshlawy, 2015; Keerthana and Thenmozhi, 2016). The incidence of CTS has been reported to be high among those working with vibrating machinery and among office workers, especially typists and data entry clerks (Tucker and Owens, 2016). It is known that the South Texas veterans health care system in San Antonio, TX, USA has reported that CTS is a common computer related illness in a significant portion of the American population (Wahlström and (Sweden), 2003).

Phalen's sign was considered positive if paraesthesia was elucidated in the median nerve distribution (Aaras*et al.,* 1997).
Since, in the field of modern IT and academic sectors, the usage of computers for a long time leads to the compression of the median nerve which leads to the occurrence of CTS. Prevalence on the importance of this scenario is much needed for the current world. The aim of our study is to determine the association between CTS and usage of computer keyboard and mouse in young, adult and middle - aged male Information technology professionals.

MATERIALS & METHODS

A cross sectional and a self designed questionnaire was prepared and circulated to 100 participants of Chennai population. The questionnaire was distributed through an online "survey planet" link. Institutional review board approval was obtained. No human and animal ethical approval are needed. Simple random sampling was used. The questionnaire includes the basic demographic datas such as age, gender, etc. The participants involved were within the age group of 18-65 years. The statistics used to analyse the results was "students unpaired T test" using SPSS software. The results obtained were represented as pie charts.

RESULTS & DISCUSSION

The conducted was within the age group of 18-65 years. Figure 1 represents that 52% males and 48% females participated in the conducted survey. Figure 2 represents that, among the participants, 63% were information technology professionals. Figure 3 represents that 39% of the people use computers between 2-8 hours per day, 34% use greater than 8 hours per day and 27% of the participants do not use computers daily. Figure 4 represents that 77% of the participants support that CTS is associated with the use of computers. Figure 5 represents that 63% participants support saying diabetes, rheumatoid arthritis and thyroid imbalance are associated with CTS. Figure 6 represents that, 73% people's opinion was, CTS is caused due to median nerve damage. Figure 7 represents that tingling/numbness and weakness are the main symptoms of CTS. Figure 8 represents that, improving posture, frequent breaks, keeping hands warm and reducing force will prevent CTS from affecting us, which was supported by 72% of the participants. Figure 9 shows that, 73% participants, saying that heredity, hemodialysis, pregnancy, alcohol and old age are other factors that contribute to the development of CTS. Figure 10 shows that females are more affected due to CTS than males. Figure 11, shows that occupations like medicine, painter, Gardner, musician, cashier and IT professionals will also contribute to CTS which are supported by 77% of participants. Figure 12 represents that obesity is one of the major risk factors that causes CTS, which was supported by 90% participants.

This study has evaluated that potential relationship between computer use and CTS using simple measures of computer use (time spent at the computer and the importance of computer use in the job) and found no association in two seperate prospective cohort studies. Both cohorts included workers from many different industries whose tasks involved other biochemical exposures (i.e., hand force, repetition, vibration) that have previously been associated with CTS (Johnson *et al.,* 2020)(Sekar*et al.,* 2019). Within this diverse working

population, any association between using a computer and CTS was too small to be detected (Pratha, AshwathaPratha and Thenmozhi, 2016)(Subashri and Thenmozhi, 2016). But, some studies has shown prevalence in association between computer usage and CTS (Menon and Thenmozhi, 2016)(Samuel and Thenmozhi, 2015)(Hafeez and Thenmozhi, 2016). Very few studies have shown CTS prevalence based on clinical signs and symptoms from the survey done among the general population (Choudhari and Thenmozhi, 2016; Kannan and Thenmozhi, 2016). Some studies have reported that prevalence of CTS among the general population ranged from 3% to 6% (Krom*et al.*, 1992)(Papanicolaou, McCabe and Firrell, 2001). Among the general population, the prevalence of CTS was found higher among females than among males (Stanley, 1998) which is similar to our study. CTS becomes narrower when the hand is kept flexed, and there is malpositioning of the wrist joint when compared to the neutral position (Atroshi, 1999). Many studies have demonstrated the association of CTS along with obesity (Krom*et al.*, 1990)(Coggon *et al.*, 2013)(Karpitskaya, Novak and Mackinnon, 2002)(Forstner, Cunha and Hamm, 2018)cand short stature(Mattioli *et al.*, 2009). Though pregnancy, use of oral contraceptive and menopause are linked with CTS, the epidemiological evidence are contradictory (Cooper and Palmer, 2010). Our study did not report any significantly higher rate for these variables along with the respondents with CTS, either in the Univariate or multivariate model.

Health care providers need to be aware of this syndrome and it is necessary to identify the risk factors for CTS among computer professionals and explore possible preventive measures. It is also important to study the related risk factors further and to implement suitable ergonomics measures and work regulations to alleviate much suffering and pain among those involved in this ever expanding occupation. Limitation of our study is the possibility of recall bias before the information regarding past computer use, history of major illness, previous use of contraceptives and past smoking was self reported. Because of insufficient quality, bias, lack of consistency and statistical powers, evidence is insufficient to conclude that computer work (mouse and keyboard) causes CTS. There is no proper knowledge among people regarding the causes and treatment of CTS. The study can be taken from the further clinical evaluation.

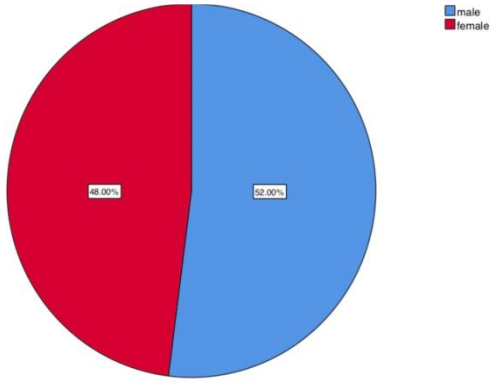

Figure 1: Pie chart representing the gender distribution of the population. 52% males and 42% females participated in the study

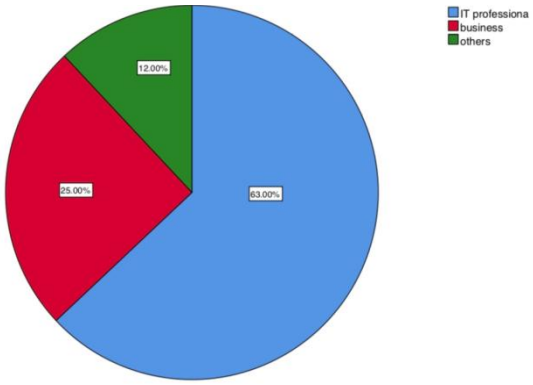

Figure 2: Pie chart representing the participant's occupation. 63% IT professionals, 25% business and 12% others have participated in the study

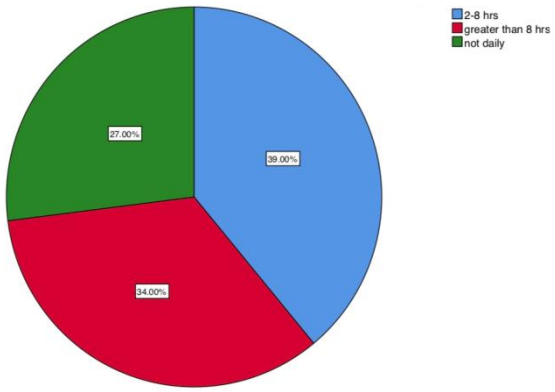

Figure 3: Pie chart representing the time consumption in usage of computers. 39% use computers 2-8 hours in a day, 43% use greater than 8 hours and 27% does not use daily

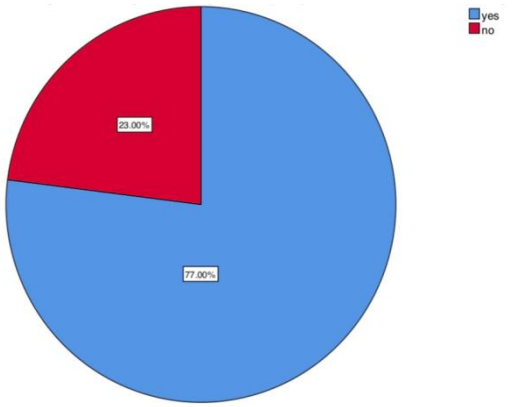

Figure 4: Pie chart representing the opinion on association of CTS with the use of computers. 77% agree that CTS is associated with use of computers and 23% disagree that there is association between CTS and use of computers

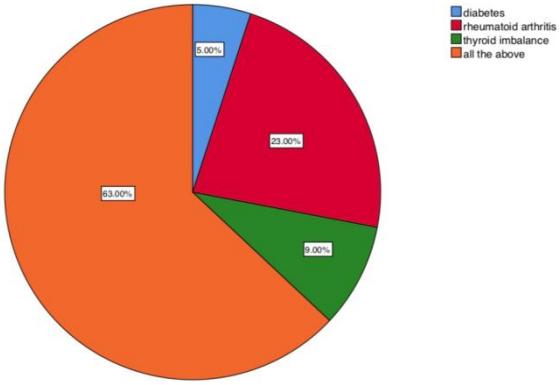

Figure 5: Pie chart representing the knowledge about diseases that are associated with CTS. 63% agree that CTS is associated with diabetes, rheumatoid arthritis and thyroid imbalance

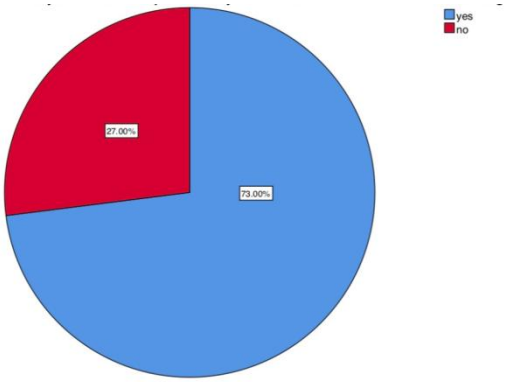

Figure 6: Pie chart representing the awareness about occurrence of CTS due to median nerve damage. 73% says CTS is caused due to severe median nerve damage and 27% says CTS is not associated with median nerve damage

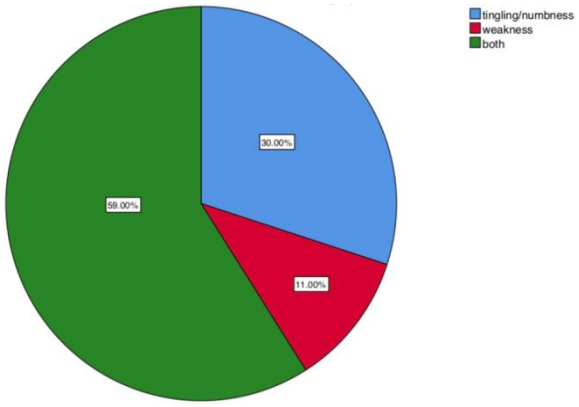

Figure 7: Pie chart representing the awareness of symptoms of CTS. 59% of the study population state that both weakness and tingling/numbness are the symptoms of CTS

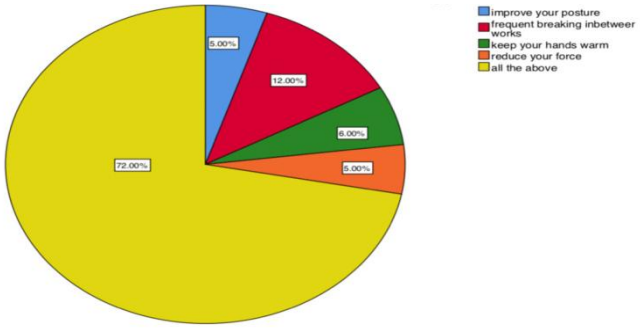

Figure 8: Pie chart representing the awareness of preventive measures taken to resolve CTS. 72% of the study population state that improving posture, frequent breaks in between works, keeping hands warm and reducing force will prevent the attacking

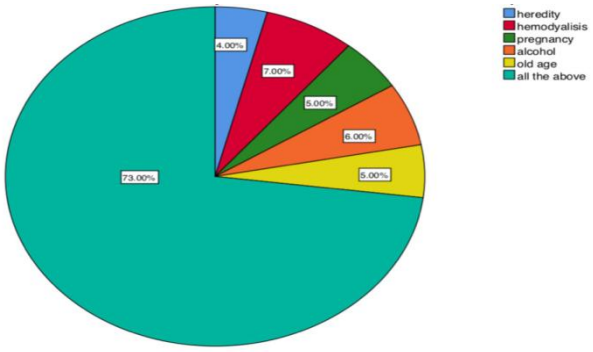

Figure 9: Pie chart representing the awareness of factors that contribute to the development of CTS. 73% of the study population state that heredity, hemodialysis, pregnancy, alcohol and old age are the factors that contributes to the development of CTS

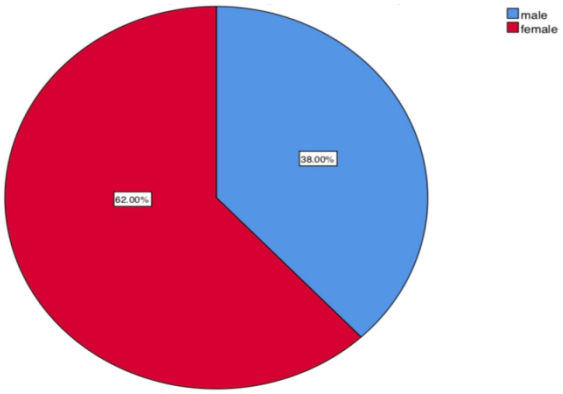

Figure 10: Pie chart representing the opinion on gender that gets more affected by CTS. 62% agree that female gets more affected from CTS and 38% agree that male gets more affected from CTS

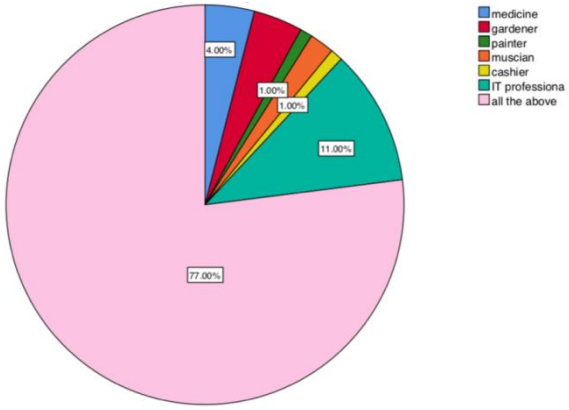

Figure 11: Pie chart representing the opinion on occupations that are associated with CTS. 77% agree that occupations like medicine, gardner, painter, musician, cashier and IT profession are associated with CTS

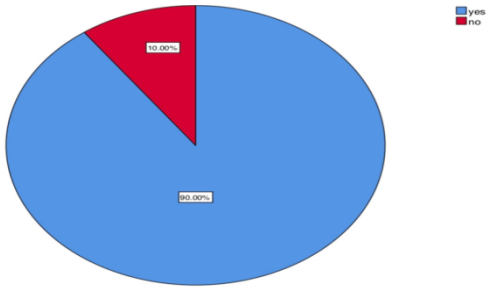

Figure 12: Pie chart representing obesity as the major risk factor for CTS. 90% agree that obesity is a risk factor for CTS and 10% disagree that obesity is a risk factor for CTS

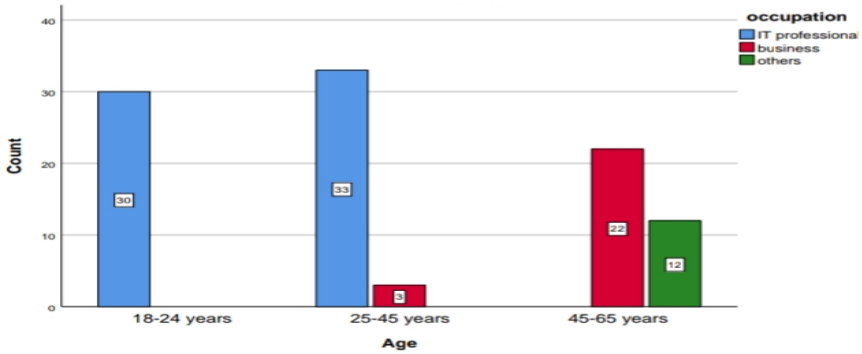

Figure 13: Bar chart represents the association between age and the occupation of the participants. X axis represents participant's age and Y axis represents the participant's occupation i.e., IT professionals (blue), business (red), others (green). Chi square test showing p = 0.000 (p<0.05 indicating statistically significant).

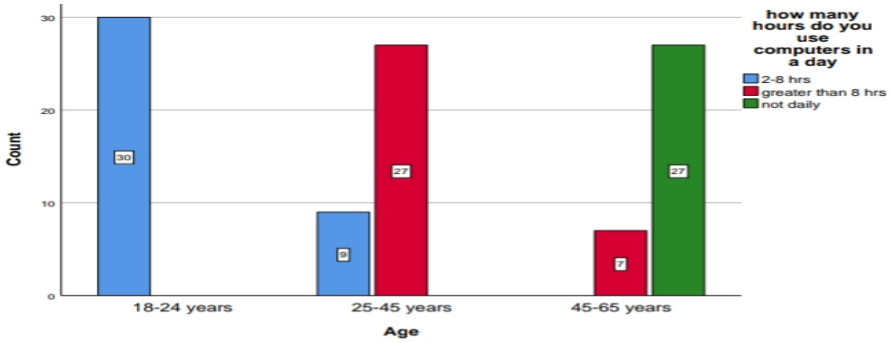

Figure 14: Bar chart represents the association between age and participant's time consumption in computers. X axis represents the age of participants and Y axis represents participant's time consumption in computers i.e., between 2-8 hours (blue), greater than 8 hours (red) and not daily (green). Chi square test showing p = 0.000 (p<0.05 indicating statistically significant).

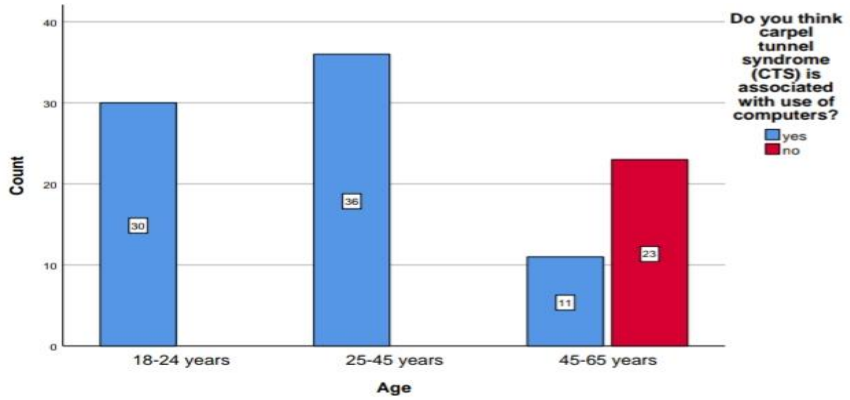

Figure 15: Bar chart represents the association between age group and awareness of CTS. X axis represents the age group and Y axis represents the number of participants who are aware (blue) and not aware (red). Chi square test showing p = 0.000 (p<0.005 indicating statistically significant).

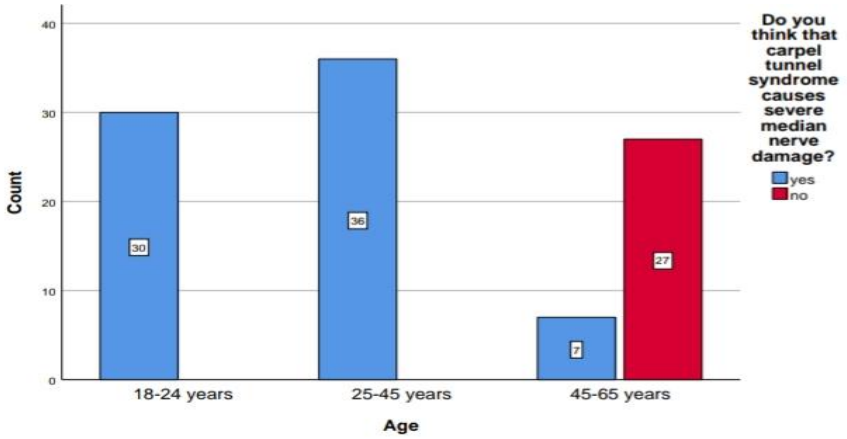

Figure 16: Bar chart represents the association between age and awareness about the cause of CTS. X axis represents the age group of participants and Y axis represents who are aware (blue) and not aware (red). Chi square test showing p = 0.000 (p<0.05 indicating statistically significant).

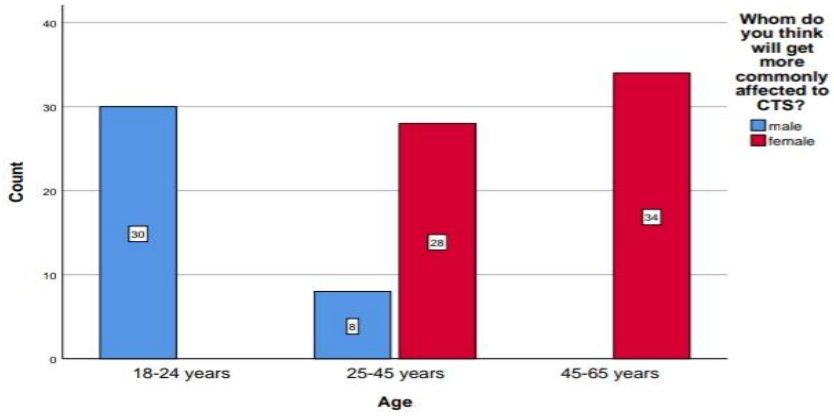

Figure 17: Bar graph represents the association between the age group of participants and gender that gets more affected by CTS. X axis represents the age group of participants and Y axis represents the gender i.e., Male (blue) and female (red). Chi square test showing p = 0.000 (p<0.05 indicating statistically significant).

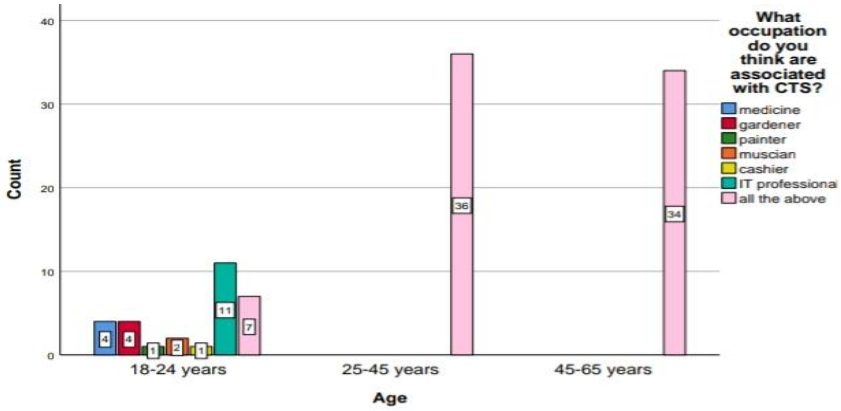

Figure 18: Bar chart represents the association between age and the occupation that is associated with development of CTS. X axis represents the age group of participants and Y axis represents the occupation associated with

the development of CTS. Chi square test showing p = 0.000 (p<0.05 indicating statistically significant).

CONCLUSION

The study emphasises that computer use does not pose a severe occupational hazard for developing symptoms of CTS. There is evidence to suggest that occupational factors play a role in CTS, particularly work which involves exposure to repetitive movements and/or hand - held vibrating tools. Conservative management can be helpful for mild symptoms but many people will ultimately undergo carpal tunnel release.

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