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A cross-sectional survey study on impact of sitting postures in *Trikashoola* w.s.r. to Low Back Pain among Information Technology Professionals

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ABSTRACT

Occupational health aims at the promotion and maintenance of highest degree of physical, mental and social well being of workers in all occupations. Now, around world the occupational health personnel are witnessing the emergence of health related problems in computer users. *Sadathura*, the person who are continuously exposed to illness because of their professions. *Panyajivi* is one among them. 21st century integrates technology where computer's plays an important role in people's life, which makes them to sit for long hours. *Trikashoola* is one among the *Vatavyadhi*. *Vata Dosha* is considered to be main reason for pain. Low back pain is a disease of modernization due to desk jobs and the sitting position, poor work station design (desk), bad postures, type of chair and use of foot rest. Back pain is the second most frequent reason for visiting a physician and the common pain syndrome in developed and in developing countries. Ergonomics is concerned with human engineering. Bengaluru is the India's largest I.T hub, also called as Silicon Valley of India and home for large number of Information Technology Professionals. 311 subjects were included in this survey study. The diagnosis was done through Oswestry disability index scale.

Key words: *Sadathura, Panyajivi, Vata Dosha, Trikashoola, Low back pain, Ergonomics, zero desk, plus desk, minus desk*

INTRODUCTION

Occupation is a person's usual or principal work or business, especially as a means of earning a living, vocation.[1] Occupational health aims at the promotion and maintenance of highest degree of physical, mental and social well being of workers in all occupations.[2] Information Technology (IT) is defined as "the study, design, development, implementation, support and management of computer based information systems, particularly software applications and computer hardware"[3] IT professionals perform a variety of duties that range from installation of applications to designing complex computer networks and information databases.

These health problems are seen in the IT professionals who spend their inordinate amount of time in front of the computer. These problems, if ignored can prove debilitating and can cause crippling injuries forcing them to quit their jobs.

India, being the fore runner in the IT sector, occupational health personnel is slowly awakening towards the modern occupational diseases which are taking roots among the IT professionals. Common

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ISSN: 2456-3110 ORIGINAL ARTICLE July 2023

health issues in the computer users are pain in back, neck, shoulder, arm, wrist and hand, eye strain, headache, stress, obesity, repetitive stress injury.[4]

Low back pain is the second most frequent reason for visiting a physician and is the most common chronic pain syndrome in industrial countries.[5] *Trikashoola*, a clinical entity has similar signs and symptoms of low back pain which is explained under *Vatavyadhi*. *Vata Dosha* is considered to be main reason for pain.[6] *Peeda* or pain in the *Trika Pradesha* is known as *Trikashoola*, *Trika* is the union of two *Sphik Asthi* and *Prustha-Vamsha*.[7]

Incidence and Prevalence:

- Low back pain is experienced in 50%-80% of adults at some point in their lifetime.[8]
- It is estimated that the annual worldwide LBP incidence in adults to be 15% and the point prevalence to be 30%.[9]
- Researchers found that almost one in 10 people (9.4%) worldwide suffers from LBP.[10]
- Prevalence of low back ache is considered to be 68% as per the previous studies in Information Technology Professionals.[11]

At present a majority of human society is leading a mechanical life, frequently changing lifestyle, unexpected environmental changes, etc. The critical busy schedule, restlessness, anxiety, stress, strain and running for the comfortable life involves the constant work schedule in improper sitting posture, continuous and over exertion, prolonged travelling by different vehicles, less sports activities, exercise etc, cause undue pressure on spinal cord and produces low back pain.

Bengaluru, the "Silicon Valley of India" or IT capital of India has its own role as the nation's leading IT exporter. IT firms in Bengaluru has near about 1.5 million employees in various IT and IT-enabled services sectors. Hence the study is planned to find the real extend of problem among the IT professionals due to long & improper sitting to contribute low back pain.

Aim

The present study was planned as a cross-sectional survey study and it was approved by Institutional Ethics Committee (IEC) prior to the starting of the work.

Objectives

1. To assess the relation between zero desk, and desk, minus desk arrangements and low back pain.
2. To draw a conclusion about impact of long sitting hours leading to low back pain.
3. To study the relation of sitting postures in low back pain.

Materials and Methods

Source of Data

Samples with the symptom of low back pain with respect to age (between 20-40 years), irrespective of their gender, religion, caste, race, socio-economic status were taken from the software companies in Bengaluru.

Study design: Cross sectional survey study

Diagnostic Criteria

Oswestry disability index

- It has 10 sections of questionnaire.
- For each section the total possible score is 5
- If the first statement is marked the section score = 0
- If the last statement is marked, it = 5.

Interpretation of Oswestry Disability Index Scale:

Scoring	Interpretation
0% to 20%	Minimal disability
21%-40%	Moderate disability
41%-60%	Severe disability
61%-80%	Crippled
81%-100%	Either bed-bound or exaggerating their symptoms

ISSN: 2456-3110 ORIGINAL ARTICLE July 2023

Method of collection of data

Subjects who were fulfilling inclusion criteria were selected for the study.

(a) Inclusion Criteria

- Subjects having a symptom of Low back pain.
- Subjects of age group between 20- 40 years, irrespective of their gender, religion and socio-economic status.
- Subjects working on computer/ laptop for more than 6 hours a day.
- Subjects working in the Information Technology sector for more than 2 years.
- Subjects fulfilling the criteria of 0-60% in Oswestry disability index scale.
- Subjects who are willing to participate in the study.

(b) Exclusion Criteria

- Subjects with the history of previous specific traumatic injuries.
- Subjects with the history of hip and pelvic injuries.
- Neurological problems.
- Subjects with any history of spinal or abdominal surgeries.
- Pregnant women, Congenital anomalies.
- Subjects with any tumor, infection, inflammatory conditions.
- Subjects with chronic systemic diseases.

Method of Study

After assessing the inclusion / exclusion criteria's, details were collected and questionnaire was given through online via google forms.

Questionnaire

Self-validated questionnaire which includes sitting postures, work duration, type of chair etc. For the standardization of questionnaire, it has been sent to AIIA and BHU, got validated from there. The reliability for the questionnaire also checked and it's analyzed via. Cronbach's alpha, which is 0.606

Totally for 343 samples questionnaire were given. Out of it, 32 samples were excluded based on the exclusion criteria. Finally 311 samples data were choose for the study.

Statistical Analysis:

(a) From questionnaire data were collected, based on data appropriate descriptive summaries were calculated. (Number and percentage of subjects having Low back pain in each sitting postures).

(b) Comparison of Low back pain with sitting postures and desk-chair arrangements will be analyzed using Chi square test and Spearman correlation analysis done with the help of IBM Statistical Package for Social Sciences v20.

Sample Size Estimation:

Based on previous studies prevalence of low back ache in Information Technology Professionals was found to be 68%. A minimum of 300 samples were taken for the study. In the present study 343 samples got enrolled out of which 32 samples excluded based on exclusion criteria and 311 samples included in the study.

Observations and Results

Age: (Chart 1)

Subject aged 20-40 years were included in the study, among 311 subjects, 41.5% were between 20-25 years, 37.9% were from 26-30 years, 18% were from 31-35 years and 2.6% were from 36-40 years. It is found that IT professionals involved in this study were more of 20-30 years of age and had low back pain with minimum disability. There was an association found between low back pain and age of the subject. It was non modifiable risk factor to the low back pain.

Gender: (Chart 2)

Among 311 subjects 43.4% were female and 56.6% were male. It suggested that male were more prone for low back pain and had moderate disability. There was an association found between gender and low back pain. It was non modifiable risk factor to the low back pain.

Religion: (Chart 3)

Among 311 subjects 92.6% were Hindu, 3.9% subjects were Muslims, 1.6% subjects were Christian. It

ISSN: 2456-3110 ORIGINAL ARTICLE July 2023

suggested that geographic distribution were more Hindu and was no association between low back pains. It was non modifiable risk factor to the low back pain.

Number of years working in IT sector: (Chart 4)

Among 311 subjects, 88 subjects were working 2 years in IT sector where 28.1% had low back pain with minimal disability and 22.7% had moderate disability, 91 subjects working less than 4 years where 29.4% had minimal disability and 27.3% had moderate disability, 66 subjects working less than 6 years where 20.8% had minimal disability and 27.3% had moderate disability and 66 subjects working more than 8 years where 21.1% had minimal disability and 22.7% had moderate disability.

Hours of computer usage during work: (Chart 5)

Among 311 subjects of IT professionals, 24 subjects used work for 4-5 hours where 7.6% had low back pain with minimal disability and 9.1% had moderate disability. 30 subjects used to work for 5-6 hours where 9.7% had minimal disability and 9.1% had moderate disability. 122 subjects used to work for 6-8 hours where 39.1% had minimal disability and 40.9% had moderate disability. 135 subjects used to work for more than 8 hours where 43.6% had minimal disability and 40.9% had moderate disability.

Continuously sit and work without break: (Chart 6)

Among 311 subjects of IT professionals, 40 subjects used work continuously without break for less than 1hour where 12.8% had low back pain with minimal disability and 13.6% had moderate disability. 113 subjects used to work continuously without break for less than 2 hours where 36.3% had minimal disability and 36.4% had moderate disability. 122 subjects used to work continuously without break for less than 3 hours where 32.2% had minimal disability and 36.4% had moderate disability. 57 subjects used to work continuously without break for more than 4 hours where 18.7% had minimal disability and 13.6% had moderate disability.

Number of breaks during working hours: (Chart 7)

Among 311 subjects of IT sector, 65 subjects were used to take break for less than 2 times in a day where 20.8% had low back pain with minimal disability and 22.7% had moderate disability, 161 subjects were used to take break for less than 4 times where 51.6% had minimal disability and 54.5% had moderate disability, 66 subjects were used to take break for less than 6 times where 21.1% had minimal disability and 22.7% had moderate disability. 19 subjects were used to take break for more than 8 times where 6.6% had minimal disability.

Duration of break: (Chart 8)

Among 311 subjects of IT sector, 91 subjects were used to take less than 10 minutes of break in a day where 29.1% had low back pain with minimal disability and 31.8% had moderate disability, 117 subjects were used to take less than 15 minutes break where 37.4% had minimal disability and 40.9% had moderate disability, 76 subjects were used to take break for less than 20 minutes where 24.6% had minimal disability and 22.7% had moderate disability. 27 subjects were used to take break for more than 30 minutes where 9% had minimal disability and 4.5% had moderate disability.

Chair with or without back rest: (Chart 9)

Among 311 subjects of IT sector, 250 subjects were used chair with back rest in which 82% had low back pain with minimal disability and 59.1% had moderate disability, 59 subjects were used chair without back rest where 17.3% had minimal disability and 40.9% had moderate disability.

Type of chair used: (Chart 10)

Among 311 subjects of IT sector, 136 subjects were used minus desk where 43.6% had low back pain with minimal disability and 45.5% had moderate disability, 64 subjects were used zero desk where 21.1% had minimal disability and 13.6% had moderate disability, 111 subjects were used plus desk where 35.3% had minimal disability and 40.9% had moderate disability.

Duration of leaning forward from the chair: (Chart 11)

Among 311 subjects of IT sector, 106 subjects were used to lean forward from the chair for less than 1 hour where 31.8% had minimal disability and 63.6% had moderate disability, 95 subjects were used to lean forward from the chair for less than 1-2 hours where

ISSN: 2456-3110 ORIGINAL ARTICLE July 2023

30.8% had minimal disability and 27.3% had moderate disability, 55 subjects were used to lean forward from the chair for less than 2-3 hours where all 19% had minimal disability. 55 subjects were used to lean forward from the chair for more than 3 hours where 18.3% had minimal disability and 9.1% had moderate disability.

Part of the back that rest on the chair: (Chart 12)

Among 311 subjects of IT sector, 109 subjects were used to take lower back part to rest on the chair where 33.9% had low back pain with minimal disability and 50% had moderate disability, 111 subjects were used to take mid part of the back to rest on the chair where 37% had minimal disability and 18.2% had moderate disability, 45 subjects were used to take neck and upper part of the back to rest on the chair where 14.2% had minimal disability and 18.2% had moderate disability. 46 subjects were used to take complete back part to rest on the chair where 14.9% had minimal disability and 13.6% had moderate disability.

Placing of legs in relation to knees and hips while working: (Chart 13)

Among 311 subjects of IT sector, 89 subjects were used to place their legs lower with relation of knees to hips while working where 29.4% had low back pain with minimal disability and 18.2% had moderate disability, 103 subjects were used to place their legs at same height with relation of knees to hips while working where 31.8% had minimal disability and 50% had moderate disability, 107 subjects were used to place their legs as cross legged with relation of knees to hips while working where 34.6% had minimal disability and 31.8% had moderate disability. 12 subjects were used to place their legs higher with relation of knees to hips while working where 4.2% had minimal disability.

Angle of knees to hip while sitting on the chair: (Chart 14)

Among 311 subjects of IT sector, 94 subjects were used to place their knee at 90 degree angle while sitting on the chair where 29.4% had low back pain with minimal disability and 40.9% had moderate disability, 85 subjects were used to place their knee backwards (45°) angle while sitting on the chair where 27.3% had minimal disability and 27.3% had moderate disability, 91 subjects were used to place their knee forwards (120°) angle while sitting on the chair where 30.1% had minimal disability and 18.2% had moderate disability. 41 subjects were used place their knee cross legged while sitting on the chair where 13.1% had minimal disability and 13.6% had moderate disability.

Mode of transport to reach the work place: (Chart 15)

Among 311 subjects of IT sector, 33 subjects were used their personal car to reach work place where 10.4% had low back pain with minimal disability and 13.6% had moderate disability, 66 subjects were used office cab to their reach work place where 20.8% had minimal disability and 27.3% had moderate disability, 89 subjects were used public transport to reach work place where 29.8% had minimal disability and 13.6% had moderate disability. 123 subjects were used their bike to reach work place where 39.1% had minimal disability and 45.5% had moderate disability.

Duration of Low Back Pain: (Chart 16)

Among 311 subjects of IT sector, 261 subjects had duration of 1-3 days of low back pain where 86.5% subjects had low back pain with minimal disability and 50% had moderate disability, 21 subjects had duration of 3-5 days of low back pain where 6.9% had minimal disability and 4.5% had moderate disability, 9 subjects had duration of 5-10 days of low back pain where 2.1% had minimal disability and 13.6% had moderate disability. 20 subjects had duration of more than 10 days of low back pain where 4.5% had minimal disability and 31.8% had moderate disability.

Whether they have suffered from low back pain during last 6 months: (Chart 17)

Among 311 subjects of IT sector, 134 subjects were suffered from low back pain during last 6 months in which 41.2% had low back pain with minimal disability and 68.2% had moderate disability, 177 subjects were not suffered from low back pain during last 6 months where 58.8% had minimal disability and 31.8% had moderate disability.

ISSN: 2456-3110 ORIGINAL ARTICLE July 2023

Medication for Low Back Pain: (Chart 18)

Among 311 subjects of IT sector, 11 subjects were taking medication for low back pain in which 3.1% had low back pain with minimal disability and 9.1% had moderate disability, 300 subjects were not taking medication for low back pain where 96.9% had minimal disability and 90.9% had moderate disability.

Practice of any exercise while sitting in the chair for long hours: (Chart 19)

Among 311 subjects of IT sector, 95 subjects were practicing any exercise while sitting in the chair for long hours in which 31.1% had low back pain with minimal disability and 22.7% had moderate disability, 215 subjects were not practicing any exercise while sitting in the chair for long hours where 68.5% had minimal disability and 77.3% had moderate disability.

DISCUSSION

Ergonomics is now a well recognized discipline and constitutes an integral part of any advanced occupational health service. The term "ergonomics" is derived from the Greek words ergon, means work and nomos means law. It simply means "fitting the job to the worker." The object of ergonomics is "to achieve the best mutual adjustment of man and his work, for the improvement of human efficiency and well being."[12]

The application of ergonomics has made a significant contribution to the overall health and efficiency of the workers. Most of the Information Technology Jobs are considered to be desk jobs as they sit for long time. So, sitting postures are to be given prime importance. Hence, desk chair arrangements are to be properly taken care. Working for long hours in unphysiological postures is the cause of fatigue, backache, diseases of joints and muscles and impairment of the worker's health and efficiency.[13]

Posture is the position in which you hold your body while standing, sitting or lying down. Good posture involves training your body to stand, walk, sit and lie so as to place the least strain on muscles and ligaments while you are moving or performing weight-bearing activities.[14]

It is important to know about sitting arrangements in Information technology professionals as most of their's will be desk jobs. If desk- chair arrangements are improper, it may result in the development of postural defects in individuals.

There are 3 types of desk-chair arrangements;[15]

a) Zero desk

b) Plus desk

c) Minus desk

Zero desks: It is one where in the vertical line from the margin of the desk touches the edge of the chair.

Plus desk: It is one where in there is a space between the edge of the chair and the vertical line from the desk.

Minus desk: It is one where in the vertical line from the desk falls on the chair.

It suggested that as they sit continuously without break prevalence of the low back pain increased. Without break, sitting in the same posture will produce strain in vertebral column and causes low back pain.

Discussion on the questionnaire:

Subjects in this study, who took break for less than 2 times and less than 4 times had minimal and moderate disability. Because increase the break times helps to relax and there will be no low back pain.

- Use of ordinary chairs don't provide the curvature properly and causes low back pain. Usually, back rest aligns the back and neck, even improves the posture.
- Use of back rest helps the spinal column to be straight and ODI score disability will be less. Statistically, there was strong positive association between the usage of back rest and low back pain and ODI score
- Use of plus desk and zero desk, they have to lean forward towards the desk, curvature of the spine increases and causes low back pain. But in minus desk, spine will be straight and there will be reduce the incidence of low back pain.

ISSN: 2456-3110 **ORIGINAL ARTICLE** July 2023

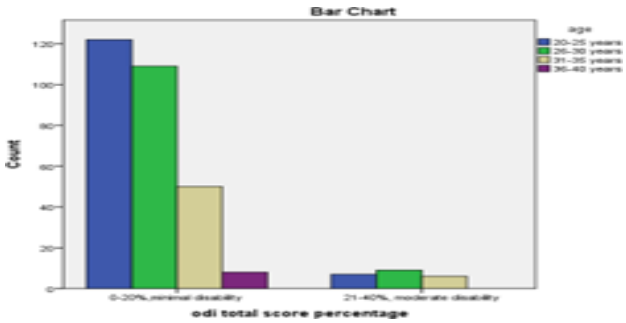
- Leaning forward for long hours may lead to disability because curvature of spine will be changed and causes low back pain.
- Subjects who took support of neck and upper back, mid part of the back for rest had minimum disability and maximum disability in ODI score. Because there will be strain in the particular part where they used to rest and due to that pain will be seen.
- Subjects sitting in cross legged posture while working had minimal disability. It will make pelvis to rotate and tilt and may cause low back pain. There was an association found between placing of legs in relation to knees and hips while working and ODI score of low back pain. Sitting straight at 90° angle for long term is harmful because proper angle of sitting will be between 120-135°. But more concentration towards the work will get through sitting at 90°.
- Subjects who used bike as the mode of transportation to reach the work place had minimal and moderate disability. Because of poor spinal position when they sat on bike will cause low back pain.
- The most of the subjects had 1-3days duration of low back pain. Because of acute cases were included in this study. It acts as modifiable risk factors.
- The most of the subjects were not practicing exercise while sitting in the chair for long hours. This may be a reason for low back pain as practicing exercise will relax the strained muscles of the back and pressure in the vertebral column will be decreased.

CONCLUSION

This survey study was attempt made to understand the impact of sitting postures in low back pain among IT professionals. *Trikashoola* is mentioned under *Vatavyadhi, Peeda* in *Trikabhaga.* Therefore, *Lakshna* of *Trikashoola* is considered as low back pain. As low back pain is the second most frequent reason for visiting a physician and the common pain syndrome in developed and in developing countries. 311 subjects were included in this study and questionnaire was given. After, a detail conceptual study critical review, observations, analysis of data and discussion, the following conclusion were evolved. All the factors were based on data, appropriate descriptive summaries were calculated and analyzed through chi square test and spearman correlation.

Pain is a subjective, solitary experience. It is difficult to compare either qualitatively or quantitatively from person to person. It depends on physical strain and one's psychological state, culture, and environment. It contains both a physical and a mental component, with each influencing the other. All the objectives in the study acts as risk factors for the low back pain. To conclude, statistically it showed significance in relation between sitting postures and low back pain especially during working hours sitting in lean forward position from the chair for long hours. So, we have to accept research hypothesis. Statistically it doesn't showed significance in the relation between zero desk, plus desk, minus desk arrangements and also for impact of long sitting hours and low back pain. So, we have to accept null hypothesis.

Chart 1



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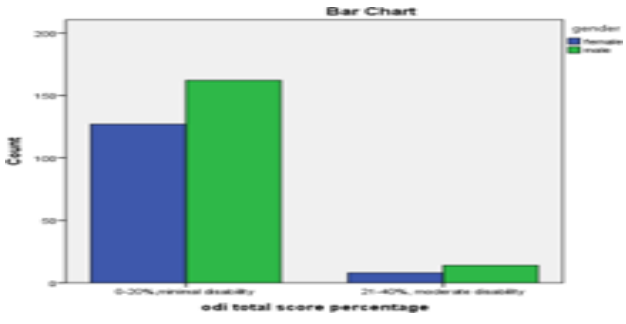
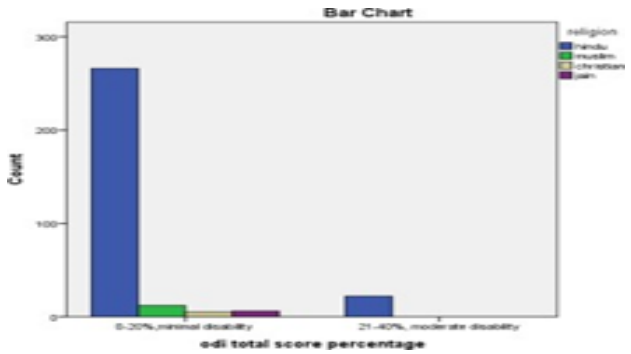


ISSN: 2456-3110 **ORIGINAL ARTICLE** July 2023

Chart 3



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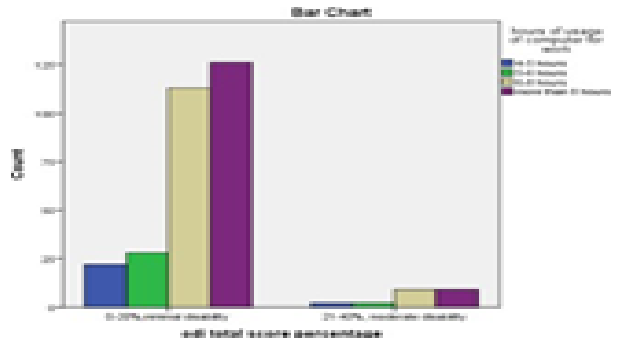

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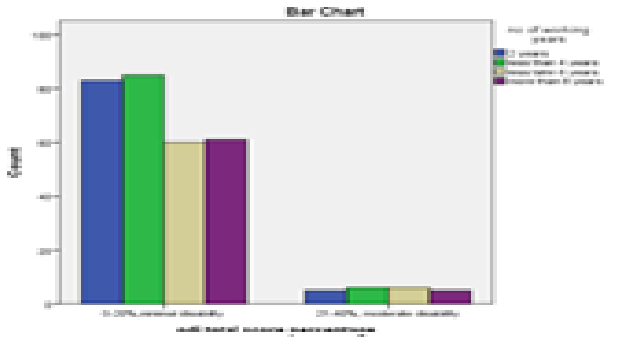

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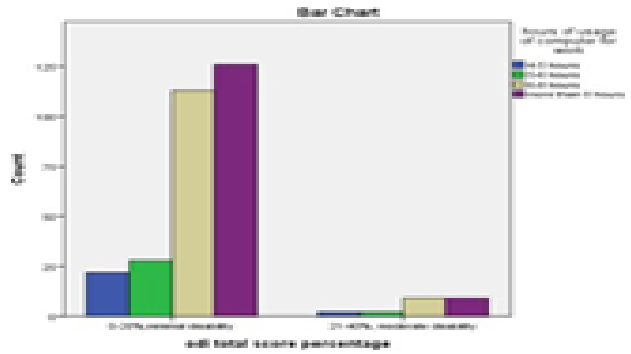

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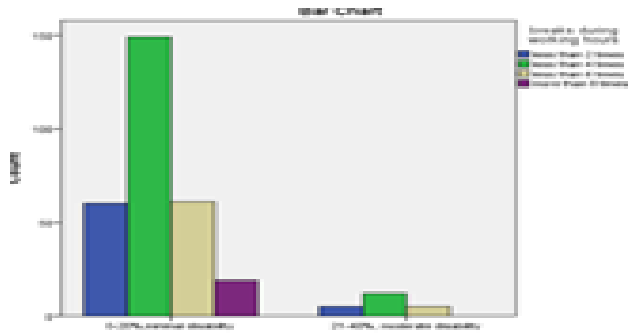

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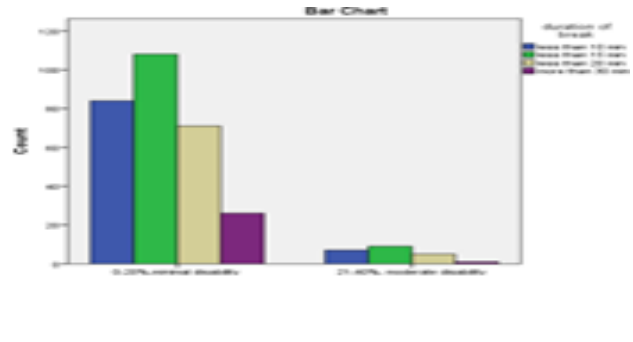

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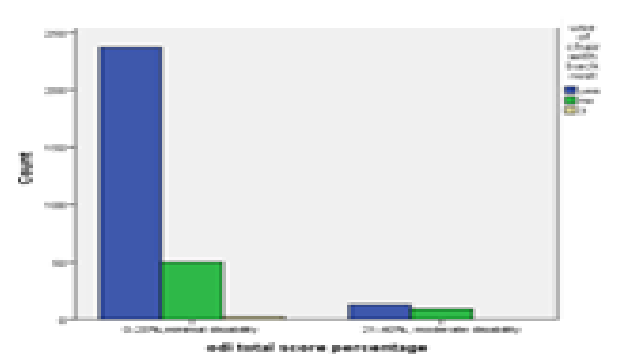

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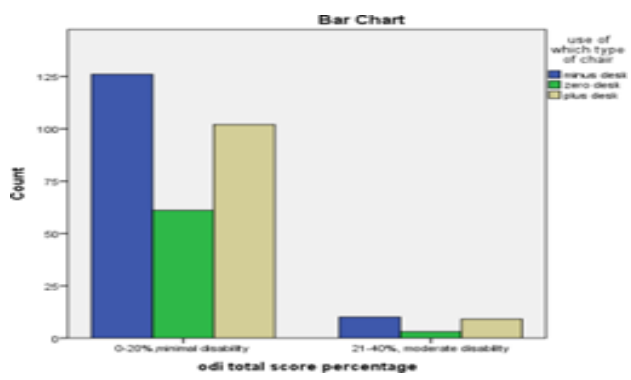
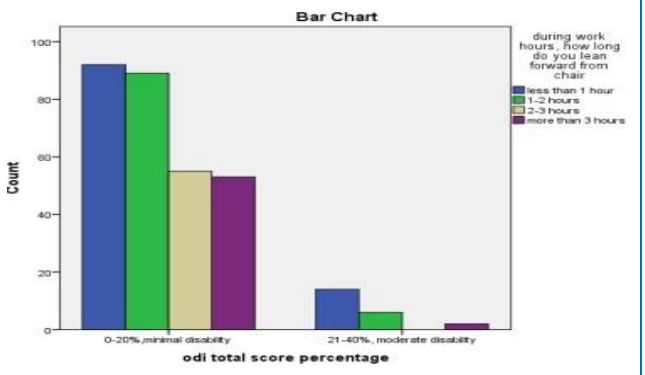


ISSN: 2456-3110 **ORIGINAL ARTICLE** July 2023

Chart 11



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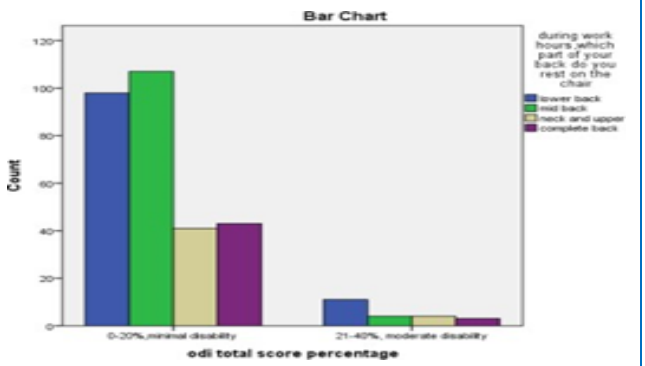

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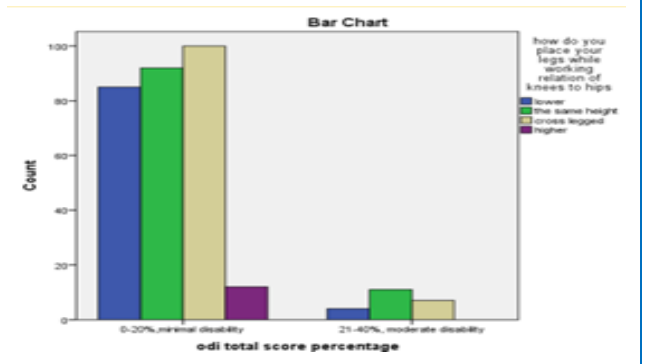

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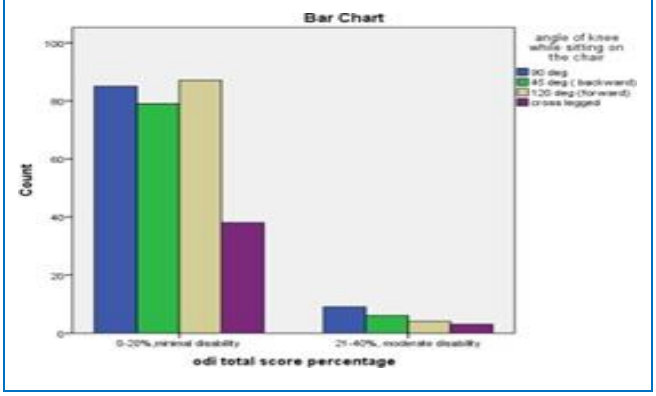


Chart 15

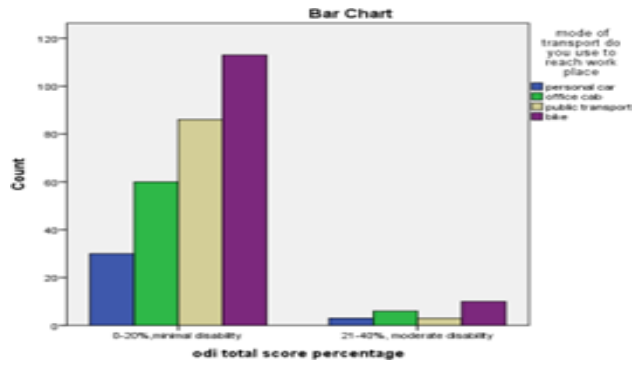


Chart 16

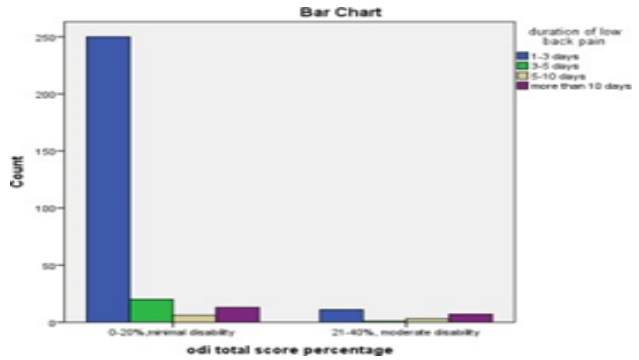


Chart 17

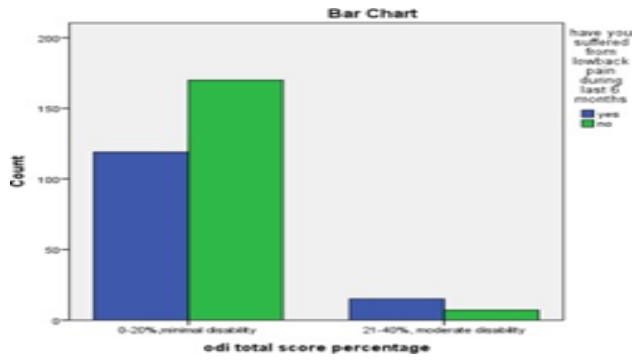
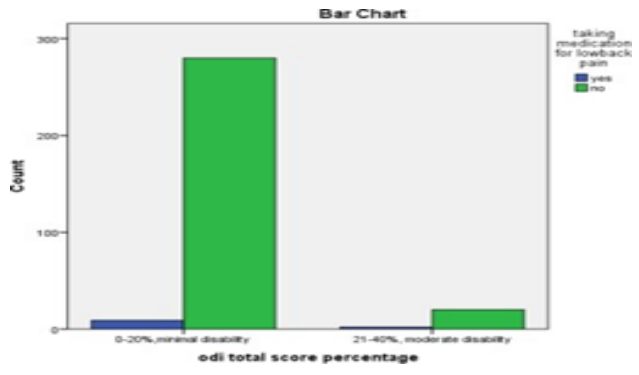
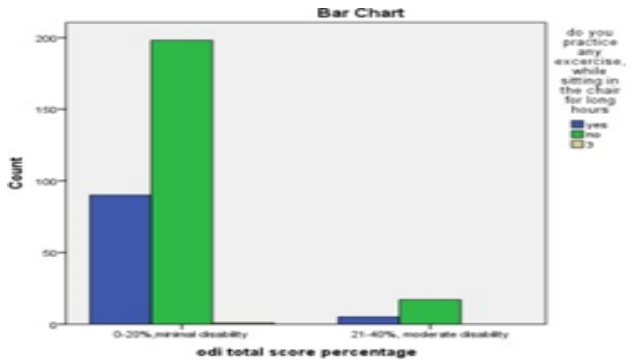


Chart 18



ISSN: 2456-3110 ORIGINAL ARTICLE July 2023

Chart 19



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