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COMPARISON OF Q ANGLE IN DESK WORKERS WITH AND WITHOUT MECHANICAL BACK PAIN : A CROSS - SECTIONAL STUDY.

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KEYWORDS

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Abstract

Background : Mechanical low back pain is highly prevalent condition among desk workers due to prolonged sitting poor ergonomic. Altered lower limb alignment particularly change in the quadriceps (Q) angle may influence pelvic alignment and lumbar load distribution. However, limited comparative evidence exists between desk workers with and without mechanical back pain.

Aim and Objectives: To compare Q-angle in desk workers with and without mechanical low back pain using outcome measures goniometry and Oswestry Disability Index .

Methodology : A quantitative cross sectional study was conducted in sangli city on 140 desk workers aged 25-40 years selected through convenience sampling and Q angle was measured using universal goniometer in supine position.Functional disability was assessed using Oswestry Disability index. Ethical clearance was obtained and informed consent was taken from all participants.

Results: Desk workers with mechanical low back pain shows a significantly higher mean Q-angle 18.82 ± 3.28 compared to asymptomatic workers 15.74 ± 3.02 suggesting biomechanical association with low back pain. A slightly higher Q angle and prevalence of pain was observed among females 52.86%. ODI scores among affected individuals predominantly indicated moderate to severe disability, reflecting the functional impact of mechanical low back pain on daily activities.

Conclusion: Desk workers with mechanical back pain exhibit significantly increased Q-angle values compared to those without back pain, indicating that altered lower limb alignment may contribute to mechanical low back pain.

INTRODUCTION:

Q angle is defined as the angle formed between an imaginary line connecting the anterior superior iliac spine (ASIS) of the pelvis to the patella's midpoint and a proximal projection of the line running from the tibial tubercle to the patella's centre.[1] it represents the resultant force vector of the quadriceps and patellar tendons acting on the patella. Men have 11-14° & women have 18-20° normal Q angle. It is higher in women because of wider pelvis.[2] is an important factor in the assessment lower extremity alignment. The Q angle can be measured either upright or supine position typical method is to measure it while lying with the quadriceps relaxed and the knees extended. Increased Q angle is thought to be a risk factor for a number of conditions and injuries, including knee osteoarthritis, anterior cruciate ligament injury, patellar Instability, Patello-femoral Pain (PFP), patellar subluxation and dislocation, also ankle sprains and overuse injuries, patella Alta, Chondromalacia can all be linked to a decreased Q angle.[3]

The term "Low Back Pain'' refers to pain and discomfort that is situated above the inferior gluteal fold and below the costal margin with or without sciatica. It also describes the pain and discomfort that are restricted to the area of the lumbar region.[4] Three types of low back pain can be distinguished; acute (less than 6 weeks) sub-acute(between 6 and 12 weeks) and chronic

(More than 12 weeks). Up to 23% of people worldwide suffer from chronic low back pain and between24% to 80% of individuals experience a recurrence within a year. Low back pain symptoms can range in intensity from mild to severe and manifest as dull aching to burning, stabbing, sharp shooting pain.[5]

Back pain present due to abnormal posture, from the spine, inter vertebral disks, or surrounding soft tissues is known as mechanical low back pain. Movement causes mechanical discomfort, while rest reduces it. The pain does not radiate down the leg and is described as dull, painful, and similar to a toothache. Patients may report pain when turning over in bed and symptoms after getting out of a seated or supine position. Back discomfort warning signs include age of onset: under 20 or over 55 years old, Recent violent trauma history ,Non-mechanical discomfort that doesn't go away with bed rest , Pain in the thorax, History of malignant tumors in the past long-term corticosteroid use HIV, immunosuppression, and drug misuse Systemically ill Unaccounted-for weight loss Numerous neurological symptoms, such as fever, structural malformation Among the warning signs are Perception of back pain as detrimental or even incapacitating Fear and aversion to movement or activity inclination toward depression and social disengagement expectation of passive therapy instead of faith in the assistance of an active participant. Chronic back pain frequently follows an acute flare-up, and an increase in frequency can make it more difficult to perform activities of daily living (ADLs).[6] Clinically it is typically impossible to differentiate between the disc, facet joints, muscles, ligaments, and sacroiliac joints as the source of pain. Flexion-related discomfort may be associated with disc pain, while hyperextension may exacerbate facet pain. Chronic mechanical low back pain often arises from work-related injuries and is often caused by overuse and repetitive damage. Most people with activity-limiting low back pain have recurrent episodes.[6]

According to earlier studies, the prevalence of Work-related Musculoskeletal Disorders (WMSD's) is rising among desk workers globally. In addition to other risk factors like low socioeconomic status, poor education, physical factors like lifting heavy objects, repetitive jobs, prolonged static posture, and awkward posture, along with psychosocial factors like anxiety, depression, job

dissatisfaction, lack of job control, mental stress, working hours, and obesity.[7]A sedentary lifestyle and prolonged office period are common causes of mechanical back pain. According to a previous study, prolonged sitting with the trunk flexed thins the lumbar soft tissues because they gradually elongate. This reduces the rigidity of the lumbar spine in the Antero-posterior direction and compromises the stability of the spine support mechanism.[8]

Desk workers are those whose roles are primarily performed at a dedicated workstation usually in an office relying on desk or laptop computers, fixed communication tools, and structured digital systems. Desk workers may suffer from discomfort in the lower back as a result of their lumbar spine's excessive movement, which activates their pain receptors.[8]All of these symptoms are seen in desk workers as a result of their extended sitting positions, low back flexion, and rotation.[9]Thus, the purpose of this research is to compare the q angle with or without mechanical back pain in desk workers.

- **Novelty of study**: One of the most common issue among desk workers is low back pain which is cause due to extended sitting position, low back flexion and rotation. According to the studies that are already proven there is high prevalence of low back pain is seen in the desk worker. But there is no proven study is conducted to identify differences in Q angles between desk workers with and without mechanical back pain. This may help to develop ergonomic interventions and also may help in creating awareness about prevention of pain.

2. MATERIALS AND METHODS:

i. Study place: Desk workers in sangli.

ii. Study design: A cross-sectional study.

iii. Study duration: 06 months

iv. Study population: Desk workers

v. Selection of cases:

Inclusion criteria:

-Desktop workers sitting 6 hours in a day for at least 2 years.
-Both Male and female

-Age group of 25-45 years

Exclusion criteria:

-Back pain due to trauma

-Diagnosed cases of Rheumatoid arthritis or osteoarthritis of the spine, hip, knee.

-Spinal deformity, Disc Herniation, Neurological Diseases.

-Pregnancy or postpartum women.

-Patients who are not willing to participate or uncooperative

vi. Sampling technique: Convenience sampling.

Vii. Sample size: 140

Prevalence of low back pain in desk worker is considered to be 90%
P=90% and q = 10% at 95% confidence interval.
By using formula
$n= Z_2 \times p \times q \div e_2$
$= (1.96)_2 \times 0.90 \times 0.10 \div (0.05)_2$
=138.29~138Approximately take 140 samples
Where , n= sample size
Z= confidence interval 'Z' table value at 5% level of significance.
P= prevalence rate
q= 1-P
e= margin of error.

viii. Study tools:

- Oswestry Disability index (ODI) – Used to measures a patient's

disability & quality of life, related to Low Back Pain. Validity -0.424 Reliability- High inter-rater reliability =0.93	- Goniometry - To measure Q angle. Validity - 0.98 Reliability-0.99

ix. Statistical analysis

Statistical data analysis was performed using online statistics calculator and MS- Excel Table No. 1**:** Inferential Statistics**:** To compare Q angle of desk workers with pain and without pain unpaired t- test were performed. Table No. 2, 3 and 4: Descriptive Statistics**:** Frequency and percentage distribution were used to describe gender and disability level of desk workers of with and without pain. Mean and S.D. were calculated to describe age of desk workers.

3. RESULTS:

Desk workers with mechanical low back pain shows a significantly higher mean Q-angle 18.82 ± 3.28 compared to asymptomatic workers 15.74 ± 3.02, suggesting a biomechanical association with low back pain. A slightly higher Q angle and prevalence of pain was observed among females 52.86%. ODI scores among affected individuals predominantly indicated moderate to severe disability, reflecting the functional impact of mechanical low back pain on daily activities.

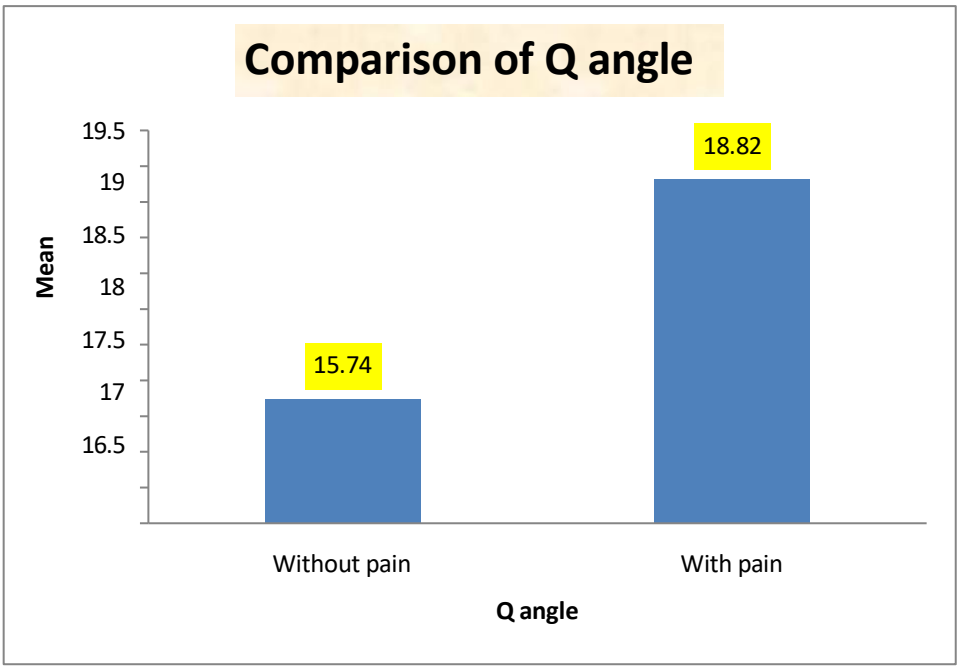
Table No. 1: Comparison of the Q angle in desk workers with or without mechanical pain. n= 70 + 70

Q angle	Mean	S.D.	Unpaired t- test	p- value	Interpretation
Without pain	15.74	3.02	5.77	0.00001	Significant
With pain	18.82	3.28			

From above table no 1 following results were obtained; Mean and S.D. of Q angle without mechanical back pain it was 15.74 and 3.02 Mean and S.D. of Q angle with mechanical back pain it was 18.82 and 3.28 Unpaired t- value it was 5.77 and p- value it was 0.00001

Table No. 1: Inferential Statistics: To compare Q angle of desk workers with pain and without pain unpaired t- test were performed.

Graph No 1: Comparison of Q angle without and with mechanical low back pain.

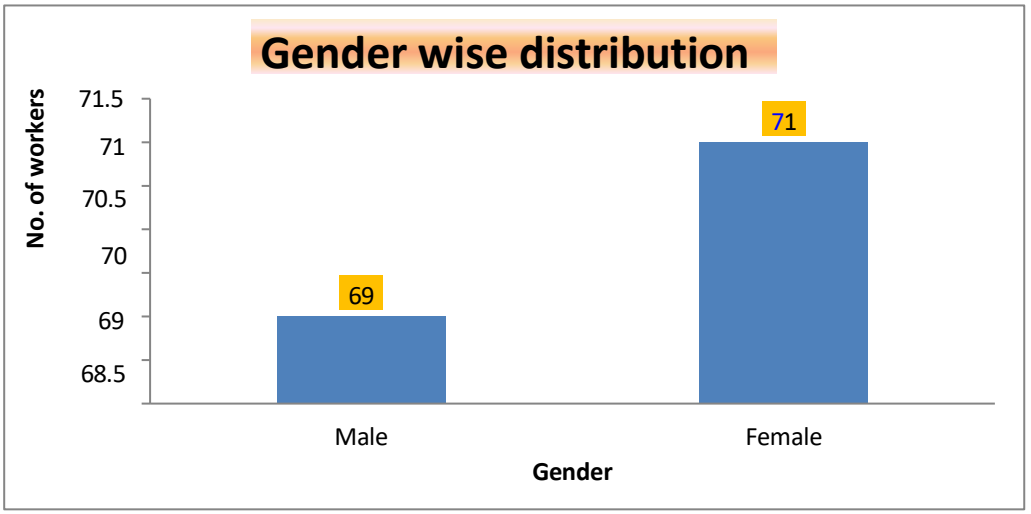


The above graph no 1 concludes that there is significant difference between with mechanical low back pain and without mechanical low back pain.

Table No. 2: Gender wise distribution of desk workers. n= 140

Gender	Frequency	Percentage
Male	69	49.29
Female	71	50.71

Graph No. 2: Gender wise distribution of desk workers. n= 140



The above table no 2 and graph no 2 shows that there were 69 (49.29%) female and 71 (50.715%) male involved in this study.

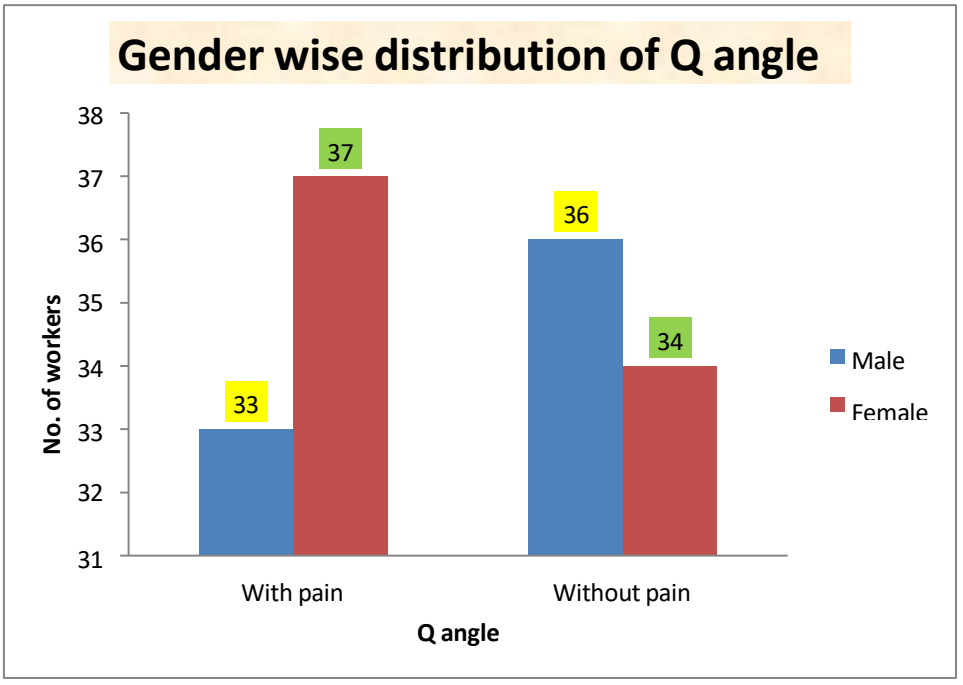
Table No. 3: Gender wise distribution of the Q angles in desk workers with or without mechanical pain. n= 70 + 70

Gender	With pain		Without pain	
	f	%	f	%
Male	33	47.14	36	51.43
Female	37	52.86	34	48.57

From above table no 3 following results were obtained;

Most of 37 (52.86%) were female and 33 (47%) were male has mechanical low back pain. Most of 36 (51.43%) were male and 34 (48.57%) were female has no mechanical low back pain. Mean and SD age of selected sample were 35.83 and 5.81

Graph No. 3: Gender wise distribution of the Q angles in desk workers with or without mechanical pain. n = 70 + 70

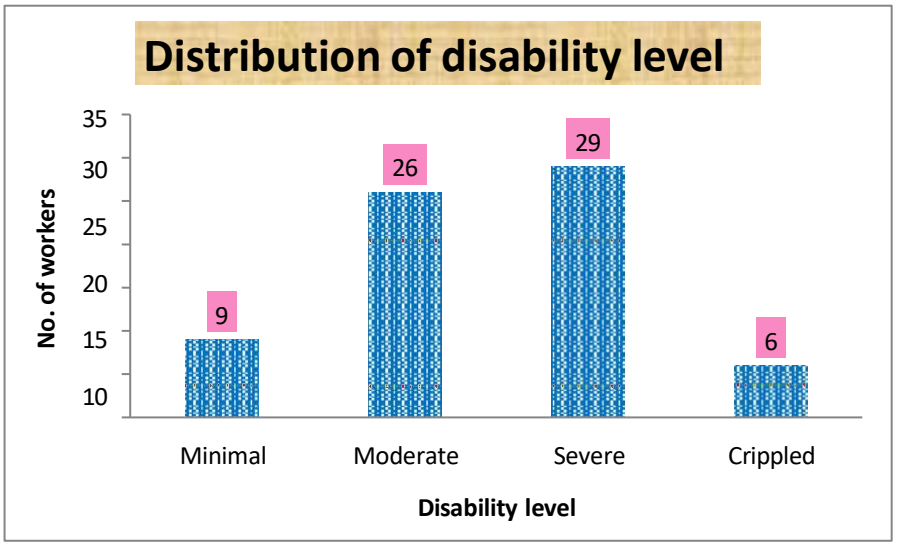


Above graph no 3 shows that Most of 37 (52.86%) were female and 33 (47%) were male has mechanical low back pain. Most of 36 (51.43%) were male and 34 (48.57%) were female not having mechanical back pain. Table No. 4: Assessment of disability of desk workers with mechanical pain. **n= 70**

Score	Disability level	Frequency	Percentage
0% – 20%	Minimal	9	12.86
21% - 40%	Moderate	26	37.14
41% - 60%	Severe	29	41.43
61% - 80%	Crippled	6	8.57

Above table no 4 shows that disability of desk workers with mechanical low back pain , among 70 workers, most of 29 (41.43%) has severe, 26 (37.14%) has moderate, 9 (12.86%) has minimal and 6 (8.57%) has crippled level of disability

Graph No. 4: Assessment of disability of desk workers with mechanical pain.n= 70



From above graph no 4 it is concluded that, most of workers suffers disability that is among 70 workers, most of 29 (41.43%) has severe, 26 (37.14%) has moderate,

9 (12.86%) has minimal and 6 (8.57%) has crippled level of disability.

4.DISCUSSION

A cross sectional study was conducted to compare the quadriceps (Q) angle in desk workers with and without mechanical back pain and to examine its relationship with gender distribution and levels of disability. In previous study it is reported a higher prevalence of chronic low back pain (CLBP) among females compared to males.[1]In the present study, most participants belonged to the age group of 25–45 which identifying the working-age population as especially vulnerable. The prevalence of chronic low back pain was notably higher among office workers.[1] This occupational categories commonly associated with extended periods of sitting, combined with poor postural habits such as lumbar flexion and rotation are considered significant contributors to mechanical stress on the lumbar spine.[10] sedentary lifestyle of both domestic and corporate work environments presents a major risk factor for the development of mechanical low back pain. Among women, this risk is further compounded by ongoing physical demands, psychological stress and in some cases, dissatisfaction with occupational roles.[11] Additionally, a lack of understanding of body mechanics, ergonomics, and appropriate load-bearing techniques further increases the likelihood of developing mechanical low back pain, especially in desk-based occupations.[8]

Previous research has established that chronic low back pain leads to a decline in lumbar extensor muscle strength and endurance. There is also documented evidence of delayed activation in stabilizing muscles such as the multifidus and transversus abdominis which play a crucial role in maintaining spinal integrity.[12] These neuromuscular impairments contribute substantially to functional limitations and disability. According to study hamstring tightness has also been implicated as a contributing factor, as it can increase tibial torsion and, in turn, affect the alignment of the patella relative to the tibia, resulting in an increased Q-angle.[13] This angular changes reflects abnormal lower limb alignment, which can be caused by repetitive mechanical loading and improper movement patterns during functional tasks such as walking. Biomechanically, the Q-angle serves as an indirect indicator of quadriceps muscle alignment and function. Also A higher Q-angle may compromise the efficiency of the quadriceps femoris by altering force transmission and reducing the mechanical output. This alteration can impair neuromuscular coordination,[14] Reflex timing which potentially leading to deficits in postural control and dynamic stability along with difficulty in maintaining balance, particularly in the medial-lateral plane, which elevating their risk of falls.[15]

The present cross-sectional study was designed to evaluate the Q-angle in desk workers with and without mechanical low back pain, while also exploring gender distribution and levels of disability. The sample comprised 140 desk workers between age group of 25–45 which equally divided between those experiencing mechanical back pain and those without mechanical back pain. The primary finding of this study was that the mean Q angle was significantly higher in participants with mechanical back pain 18.82 ± 3.28 degrees compared to those without low back pain 15.74 ± 3.02 degrees. The difference was statistically significant $t = 5.77$, $p = 0.00001$. This supports the hypothesis that an increased Q angle may be a contributing factor in the development or presence of mechanical low back pain among desk workers. This result indicated that participants with mechanical low back pain

exhibited significantly higher Q-angles compared to asymptomatic individuals. This finding suggests that altered lower limb and pelvic alignment may impose compensatory stresses on the lumbar spine, particularly during sustained sitting postures. These biomechanical discrepancies could play a significant role in the onset and persistence of mechanical low back pain. Overall the study highlights the need to evaluate lower body alignment, including the Q-angle, when treating people with low back pain.

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