VALIDITY TO MEASURE PELVIC TORSION WITH PELVIC INCLINOMETER

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ABSTRACT

BACKGROUND: Pelvic torsion is one of the important factor for pelvic stability. Due to the muscle imbalance there is change in pelvic torsion and leads to improper posture. In manual assessment of the pelvic girdle involves a variety of orthopedically, neurological, pain, postural and functional assessment procedure. Related to the patient complain, postural assessment address whether abnormal frontal plane pelvic torsion. Since pelvic torsion has not been concentrated among treatment and lack of diverse to measure pelvic torsion.

OBJECTIVE: To find out the validity to measure pelvic torsion with pelvic inclinometer.

METHODOLOGY: STUDY DESIGN: Non experimental design STUDY TYPE: observational type, SAMPLING METHOD: convenient sampling, STUDY SETTING: SRM College of Physiotherapy, SRM Institute of Science and Technology.

PROCEDURE: 100 subjects was collected according to inclusion and exclusion criteria. The pelvic torsion alignment were measured through pelvic inclinometer. Pelvic torsion has been measured in three position 1. Normal stance, 2. Stance with the 1.5inches foot elevated by standing on a wooden block and, 3. The same manner in opposite leg

RESULTS AND CONCLUSION: The results showed that there is strong correlation for anterior torsion and perfect correlation for retro torsion and concludes that pelvic torsion is comparatively found in college going students which may be due to muscle imbalance, improper posture. The inter validity of pelvic inclinometer identifies the pelvic torsion with pelvic inclinometer.

KEYWORDS: Pelvic Torsion, Pelvic Inclinometer.

I. INTRODUCTION

Pelvis is a structure between the lumbosacral and hip complex, where the diverse muscle group gets attachments to it adjacent their movement. In pelvis, postural assessment is very important in sagittal alignment1.

Asymmetrical motion of ilio-sacral joint leads to pelvic torsion of innominate. The innominate side of the hip flexion will be torsion in a posterior direction while the hip extension in an anterior direction.2,3

The pelvic joint angle changes according to the location of pelvis, the musculoskeletal system gets affected due to change in position which influence stability and alignment of spine leading to abnormal gait pattern, improper posture during forward and backward tilt exercises.4

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Pelvic torsion is one of the important factor for pelvic stability. Due to the muscle imbalance there is change in pelvic torsion and leads to improper posture. In manual assessment of the pelvic girdle involves a variety of orthopedically, neurological, pain, postural and functional examination procedure. Postural assessment address whether abnormal frontal plane pelvic torsion may be related to patients complaints. Since pelvic torsion has not been concentrated among treatment and lack of diverse to measure pelvic torsion.

Pelvic torsion is of two-types anterior and posterior torsion, which may be due to improper posture, muscle imbalance such as hip flexor tightness, weak abdominals and gluteus maximums on same side for anterior torsion and for posterior torsion more common for prolonged weight bearing in same side, direct fall on ischial tuberosity, hamstring tightness of the same side similarly gluteus medius weakness on same side.

The treatment for inter innominate subluxation for the complaint of lumber-pelvic pain. Some of these concepts involve translatory misalignment, such as the chiropractic “anterior-superior” and “posterior- inferior” ilium.

There are number of studies examined that the effects of pelvic adjustment on balance foot pressure and leg length inequality, the effects of changes on pelvic adjustment in posture but there has no study to determine the validity of pelvic torsion measurement due to lack of pelvic inclinometer.

During the normal gait, the pelvic torsion is found to a greater extend about 3 to 19 degrees, but to analyze the abnormality of pelvic torsion. The most important factor to be considered in pelvic torsion is Range of motion, kinematics of innominate bone, though there are several orthopedic assessment to analyze pelvic torsion but this factor is not well considered.

AIM OF THE STUDY
To find out the validity to measure pelvic torsion with pelvic inclinometer.

NEED OF THE STUDY
There are studies to assess pelvic torsion through various methods such as limb length inequality, 4D analysis, X-ray, Photogrammetry, digital pelvic inclinometer, but the pelvic inclinometer is not in access in south India. This study focusses on customized pelvic inclinometer to measure pelvic torsion and its validity.

METHODOLOGY
STUDY DESIGN:Non experimental design
STUDY TYPE: observational type
SAMPLING METHOD: convenient sampling
STUDY SETTING: SRM College of Physiotherapy, SRM Institute of Science and Technology.

INCLUSION CRITERIA
Age: 18-25 years.
Gender: male and female

EXCLUSION CRITERIA
Menstrual period
Lower limb fracture
Low back pain
Related musculoskeletal pain

II. PROCEDURE
The subjects were selected according to inclusion and exclusion criteria, and informed consent was obtained from them. The subject of 100 was evaluated with pelvic inclinometer. Each person angle is checked by two physiotherapists for inter-validity of pelvic inclinometer – the angle between the parallel to the floor and line
passing through the PSIS and ASIS – was measured using the calipers fitted with plumb line and a protractor 1. Normal stance, 2. Stance with the 1.5inches foot elevated by standing on a wooden block and, 3. The same manner in opposite leg

All the reading was taken for pelvic torsion to check ante version and retro version of each individual. A normal range of pelvic torsion is $3^\circ$ to $19^\circ$.

**SPECIFICATIONS FOR PELVIC INCLINOMETER**

The customized model for analyzing pelvic torsion was done using pelvic inclinometer has a length base of 23cm, two 15 cm arm in both sides that moves $360^\circ$ in horizontal plane. The end of the arm are placed on the bony landmark. The goniometer was placed on the inclinometer with the plumb line hanging from it, when the arm are placed on the right point of the body, the angle between these lines and the point of $90^\circ$ on the goniometer shows the pelvic inclination angle.13

### III. RESULTS

The study results that there is strong correlation in normal stance right anterior torsion was highly correlated inter validity values are 0.995, and the p-value was 0.00 ($>0.05$). So, there is a significant difference between them.

In foot elevation anterior torsion was highly correlated with inter validity values are 0.990, and the p-value was 0.00 ($>0.05$). So, there is a significant difference between them.

In normal stance and foot elevated the retro torsion is perfect negative correlation with inter validity values are -1, and the p-value was 0.00 ($>0.05$). So, there is a significant difference between them.

There is strong correlation in normal stance left anterior torsion was highly correlated inter validity values are 0.971, and the p-value was 0.00 ($>0.05$). So, there is a significant difference between them.

In foot elevation left anterior torsion was highly correlated with inter validity values are 0.994, and the p-value was 0.00 ($>0.05$). So, there is a significant difference between them.

There is strong correlation in normal stance left retro torsion was highly correlated inter validity values are 0.996, and the p-value was 0.00 ($>0.05$). So, there is a significant difference between them.

There is perfect correlation in foot elevation left retro torsion was highly correlated inter validity values are 1.000, and the p-value was 0.00 ($>0.05$). So, there is a significant difference between them.
IV. DISCUSSION

The purpose of this study was to find out the validity and reliability of pelvic inclinometer. Pelvic inclinometer is a device helps to identify the pelvic torsion. Pelvic torsion is not commonly analyzed in general population. The negligence of analyzing the pelvic torsion may lead to secondary complications such as upper cross syndrome, pelvic disproportion, gait deviation. Although pelvic torsion is an established fact, its clinical significance is entirely not clear. Limb length difference is checked by inch tape in innominate bone rotate anterior on the shortened leg and posteriorly on longer leg, ranging between 13 to 23 mm.

Cummings et al. examine the effects of lifted ranging in height 6 to 22 mm and subjects with the limb length inequality and found a relative anterior rotation of the contra lateral innominate was less than 4 mm.

Beautdon et al. examine 15 mm lift and likewise found contralateral anterior rotation on innominate pelvis.

But present study have changed the normal range in height from 15 to 24 mm. At last limb length inequality, several studies undergo various ranges about the pelvic torsion, but no constant value has been taken properly as it depends on each individuals.

Pelvic torsion is common in male subjects due to weakness by cross leg sitting leads to muscle weakness such as internal and external oblique, rectus abdominis.

In addition to sacral iliac joint has instability in generalized hip adduction, however, also create multiple risk in cross leg sitting can cause asymmetry trunk due to use of abdominal muscle on two sides and increase the rotation of spine in an individual with the limited range of hip joint by the pelvis rotation.

In 1936 Pitkin and Pheasant, was developed pelvic inclinometer which is very expensive and not available in India. So, we decided to commit with the customized inclinometer to analyze pelvic torsion.

There is no statistical relationship between body mass index and pelvic torsion in health subjects, but there may be changes in limb length discrepancy.

V. CONCLUSION

The study concludes that pelvic torsion is comparatively found in college going students which may be due to muscle imbalance, improper posture. The inter validity of pelvic inclinometer identifies the pelvic torsion with pelvic inclinometer. Improper analysis of pelvic torsion leads to secondary complication like dysmenorrhea, complication during labor, and men common with low back pathology. In order to avoid secondary complications, pelvic torsion has to be concentrated all assessment part the correct with proper intervention program. The intervention program helps to reduce muscle imbalance postural changes.
The limitation of the study, the values of pelvic torsion was inaccurate which affects the inter validity inbetween the two physiotherapist, the accurate value was difficult to found as it was not a digital. The customized device was made longer duration so recommend digital to assess the pelvic torsion without any complications.

CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

ETHICAL CLEARANCE

Institutional Ethical Clearance

REFERENCES