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"ASSOCIATION OF FORWARD HEAD POSTURE WITH PAIN AND CERVICAL RANGE OF MOTION IN DESK USERS"

Physiotherapy

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ABSTRACT

Background: Forward head posture afflicts a large percentage of population and can cause significant neck pain, the estimated 1-year incidence of neck pain ranges between 10.4 and 21.3%, and the overall prevalence of neck pain in general population can be as high as 86.8%. Strong evidence was found to relate neck pain with female gender, older age, being an ex-smoker, high job demands, and low social or work support. Regarding physical work factors, neck pain was significantly associated with holding the neck in a forward bent posture for a prolonged time and making repetitive movements. **Methodology:** Individuals selected according to inclusion/exclusion criteria and were explained regarding the study. Total 100 participants (Age 30 years and above) were included in the study. Subject were assessed for Forward Head Posture, Pain and Cervical ROM. **Result:** Association testing were done using pearsons Correlation method. Among a total of 100 office workers took part in the survey 73% were female. The mean age of participants was 39±8 years. Results shows Moderately positive Correlation of forward neck with reduction of ROM of Neck and moderately positive Correlation of Pain and forward head posture seen according to pearsons Correlation at the level of P<0.01. **Conclusion:** The present study demonstrated the Correlation of forward head posture with pain and cervical range of motion in desk users it shows moderately negative Correlation between pain and tragus to wall test and it shows positive Correlation between pain and cervical range of motion.

KEYWORDS

Forward Head Posture (FHP), Neck pain and disability scale (NPDS)

INTRODUCTION

Forward head posture (FHP) is the anterior positioning of the cervical spine, this posture is called as "text neck", "scholar's neck, "wearies neck", "reading neck". Forward head posture afflicts a large percentage of population and can cause significant neck pain, the estimated 1-year incidence of neck pain ranges between 10.4 and 21.3%, and the overall prevalence of neck pain in general population can be as high as 86.8%.[1]

Forward head posture (FHP) is the most common postural deformity seen in the sagittal plane. It can be defined as any alignment in which the external auditory meatus is positioned anterior to the plumb line through the shoulder joint. In FHP, head moves anteriorly and the peak of the increased cervical lordotic curve is a noticeable distance away from center of gravity.[2-3] FHP gradually leads to abnormal compression of zygapophyseal joint, posterior vertebral disks, narrowed intervertebral foramina and shortened posterior zygapophyseal joint capsule causing nerve root compression.[3]

The FHP could lead to muscle ischemia, muscle pain, fatigue, inflammation, reduced cervical range of motion and sometimes protrusion of nucleus pulpous, rotation of mandible which cause compression and irritation of retrodiscal pad. There are various methods to evaluate FHP but many studies have declared that Craniovertebral angle (CVA) is the best indicator to measure the FHP. CVA is measured by the angle between the imaginary line which passes through C7 and tragus and a horizontal line through C7.[4-5]

Neck pain is one of the very common musculoskeletal conditions in the general population. Neck pain can vary from a small discomfort to severe disabling pain making it one of the major health problems that carries important economic costs. Less severe neck pains occur due to poor posture, neck strains, occupational and sport injuries and mental state such as anxiety and depression, while mechanical and degenerative factors are more likely to develop chronic neck pain.[6]

Strong evidence was found to relate neck pain with female gender, older age, being an ex- smoker, high job demands, and low social or work support. Regarding physical work factors, neck pain was significantly associated with holding the neck in a forward bent posture for a prolonged time and making repetitive movements.[7] In addition, the increasing use of new information and communication technologies has led to an increase in time spent texting messages on mobile phones or using computers, which might have a long-term impact on neck pain, potentially due to prolonged periods of neck flexion.

The increasing use of new information and communication technologies has led to an increase in time spent texting messages on mobile phones or using computers, which might have a long-term impact on neck pain, potentially due to prolonged periods of neck flexion. Neck flexion may facilitate forward head posture (FHP), which refers to forward placement of the head in relation to the shoulder.[8] This is the most common cervical postural fault in the sagittal plane that is found with different severity levels in almost all populations. Greater FHP has been associated with greater deficits in cervical range of motion (ROM), particularly neck rotation and flexion.[9]

There exist several methods for the evaluation of the spinal posture i.e. radiography, 3D motion analysis via electromagnetic and optical tools, raster stereography, photographic postural analysis and in manual methods (Universal goniometer). Among which Universal goniometer has excellent reliability and is cost effective.

This change in posture can lead to a spatial change between the spine and the line of gravity, causing an overload on muscles and connective tissues[10]. Neck pain or neck dysfunction is a musculoskeletal disorder caused by improper posture with physical impairment or functional limitation. The FHP is known as an internal factor that causes dysfunction with shoulder and neck pain [11]. A FHP results in a posture in which the extended head and upper cervical, and the lower cervical vertebrae flex[12].

This increases the length of the external moment (the arm) by moving the gravitational center (the head) ahead of the load bearing axis [12]. The exposure to this constant load on the craniovertebral extension muscles and the noncontractile structures causes a change in the biomechanical movement, and this increased stress can cause musculoskeletal damage or pain [13]. In addition, FHP can also limit the functional movement in the head and neck area [14]. These limitations are caused by irregular rotation and gliding movement inside the articular capsule whilst moving the joint. Moreover, it was reported that extended periods of FHP can result in a decreased number of sarcomere, as well as shortening of the muscle fibers, which can affect muscular contraction.

With normal flexion of the cervical region, there is separation of the posterior structures with an increase of the intervertebral foramina [15] However, the altered mechanics associated with forward head posture may lead to excessive compression on the facet joints and posterior surfaces of the vertebral bodies[16]. in the forward head position, there is an overriding of the articular processes and narrowing of the

intervertebral space of the mid cervical region which approaches the relationship observed in cervical extension.

The use of computers has increased dramatically over the past decade in various offices so that staffs spend a lot of time sitting behind the computer. These rapid changes may be accompanied by increased prevalence of poor posture and resultant neck pain. FHP (forward head posture) and rounded shoulders are defined as protrusion of the head and shoulders in the sagittal plane.[17]

Early diagnosis of forward head posture will help to minimize the consequences. This study aims to investigate the incidence of forward head posture in desk users using Goniometer and its association with pain and range of motion of cervical spine.[18] The objective of this study is to find the percentage of forward head posture in desk users using Goniometer and to find the associated problems of forward head posture in desktop users on Neck Pain and Disability Scale and Cervical Range of Motion.

METHODOLOGY

Research Design: Observational Study

Study Population: 30 years and above.

Source of Data: Miscellaneous

Sample Size: 100 participants

Inclusion Criteria:
- Individuals who work for >3hrs/day on Desktop for 1 year.
- Both males and females age group 30 and above.

Exclusion Criteria:
- Cervical vertebrae fracture, Deformity of spine like scoliosis\kyphosis, Medical condition like vertigo, tumor in cervical region were excluded.

Materials:
- Consent form
- Goniometer
- Ruler scale
- Pen and pencil
- Mobile phone

Outcome Measures
- Neck Pain and Disability (NDI) Scale
- Cervical Range of Motion (ROM)
- TWT (Tragus to Wall Test)

Neck Pain and Disability Scale (NPDS):
- The NPDS is a 20-item measure that was specifically developed for patients with neck pain. It measures the intensity of pain; its interference with vocational, recreational, social, and functional aspects of living; and the extent of associated emotional factors. Patients responded to each item by marking along a 10-cm visual analogue scale. Item scores range from 0 to 5, and the total score is the sum of the item scores [possible range 0 (no pain)–100 (maximal pain)].
- High test - retest reliability is 0.93
- Time Required: 5 minutes

Cervical Range of Motion

Goniometers are the measuring tool to measure the range of motion in grades base on the landmarks. For example, goniometer are myrin goniometer, Spring-T goniometer and cervical range of motion instrument.

Procedure:

i) Cervical Flexion:
- Center fulcrum of the goniometer over the external auditory meatus.
- Align proximal arm so that it is either perpendicular or parallel to the ground.
- Align distal arm with the base of the nares.

ii) Cervical Extension:
- Center fulcrum of the goniometer over the external auditory meatus.
- Align proximal arm so that it is either perpendicular or parallel to the ground.
- Align distal arm with the base of the nares.

iii) Cervical Lateral Flexion:
- Center fulcrum of the goniometer over the spinous process of the C7 vertebra.
- Align proximal arm with the spinous processes of the thoracic vertebrae so that the arm is perpendicular to the ground.
- Align distal arm with the dorsal midline of the head, using the occipital protuberance for reference.

iv) Cervical Rotation:
- Center fulcrum of the goniometer over the center of the cranial aspect of the head.
- Align proximal arm parallel to an imaginary line between the left and right acromial processes.
- Align distal arm with the tip of the nose.

Tragus to Wall Test
- To objectively measure the cervical mobility of an individual.
- Shipe et al (2013) describe the measuring the tragus to wall distance (TWD) as: "the horizontal distance between the tragus, the auricular cartilaginous flap anterior to the external auditory meatus, and a wall
- The TWD can be measured as cued or relaxed, i.e the clinician prompts the individual to assume as close to an anatomical posture as possible e.g "Stand tall.", or the clinician measures the individual in their usual or presenting posture.
- The measurement can be done standing or sitting and it is worth documenting which position has been used.
- The TWD can be measured on both the individual's right and left, and then an average can be calculated.
- Reliability: In AS, test-retest correlations have been reported at between 0.93 and 0.95. Inter-tester reliability has also been reported as "excellent" in individuals with PD.
- Validity: In PD, the TWD has shown convergent validity with similar measures (occiput to wall status, C7 to wall distance, photographically derived trunk flexion angle, and inclinometric Thoracic Hyperkyphosis measure). It has also shown the ability to discriminate between groups (those who could touch occiput to wall when prompted to stand tall) and conditions (cued or relaxed).

Procedure Of The Study:

After getting approval from Institutional Ethical Committee (IEC)., individuals selected according to inclusion/exclusion criteria and were explained regarding the study. After explaining about the study, informed consent form were taken from the participants who were willing to participate in the study. Subject were assessed for Forward Head Posture, Pain and Cervical ROM.

RESULTS

All statistical analysis was done using SPSS 25.0 software for windows. Descriptive analysis was used to obtain mean and stanard deviations. Correlation testing were done using pearsons correlation method. Among a total of 100 office workers took part in the survey 73% were female. The mean age of participants was 39±8 years.

Descriptive Statistics:

Table 1: Mean Values and Standard Deviation

Variable	Mean	Standard Deviation	N
NPDS	22.4500	12.19155	100
TWD	9.4400	1.61633	100
FLEXION	70.9500	5.73026	100
EXTENSION	59.9700	6.40463	100
LSF	34.2400	7.22526	100
RSF	31.5000	7.51093	100
LR	68.1400	9.97676	100
RR	68.1800	10.68122	100

Table 2: Correlation of NPDS with TWD, Neck ROM parameters

NPDS	Correlation	TWD	Flexion	Extension	Side Flexion (Rt)	Side Flexion (Lt)	Rotation (Rt)	Rotation (Lt)
		-0.145	-0.009	0.190	0.004	-0.43	0.069	0.077
	Significance	0.149	-.926	0.058	0.967	0.670	0.498	0.444

Correlation between NPDS and TWD and Neck ROM parameters. The

correlations between NPDS and TWD were moderate negative significant correlation (r = -0.145, p = 0.149). The correlations between NPDS and NECK ROM is moderately positive correlation is seen. (Table 2).

Table 3: Correlation of TWD with NPDS, Neck ROM parameters

TWD	Correlation	NPDS	Flexion	Extension	Side Flexion (Rt)	Side Flexion (Lt)	Rotation (Rt)	Rotation (Lt)
		-0.145	- 0.013	0.145	-0.128	-0.084	0.016	0.017
	Significance	0.149	0.899	0.151	0.204	0.404	0.871	0.863

Correlation between TWD and NPDS and Neck ROM parameters. The correlations between NPDS and TWD were moderate negative significant correlation (r = -0.145, p = 0.149), The correlations between TWD and NECK ROM moderately positive correlation is seen. (Table 3)

Table 4: Correlation of Flexion ROM with NPDS & TWD

Flexion	Correlation	NPDS	TWD
		-.009	-.013
	Significance	.926	.899

Correlation of flexion ROM with NPDS & TWD. The moderately negative correlation between flexion ROM with NPDS and TWD were not significant. ®= -0.009, p= 0.926) (r= -0.013, p = 0.899) (Table 4)

Table 5: Correlation of Extension ROM with NPDS & TWD

Extension	Correlation	NPDS	TWD
		.190	.145
	Significance	.058	.151

Table 6: Correlation of Right-Side Flexion ROM with NPDS & TWD

Side Flexion (Rt)	Correlation	NPDS	TWD
		.004	-.128
	Significance	.967	.204

Table 7: Correlation of Left Side Flexion ROM with NPDS & TWD

Side Flexion (Lt)	Correlation	NPDS	TWD
		-.043	- .084
	Significance	.670	.404

Table 8: Correlation of Left Rotation with NPDS & TWD

Rotation (Lt)	Correlation	NPDS	TWD
		.077	.017
	Significance	.444	.863

Table 9: Correlation of Right Rotation with NPDS & TWD

Rotation (Rt)	Correlation	NPDS	TWD
		.069	.016
	Significance	.498	.871

Correlation between cervical Flexion TWD and NPDS and Neck ROM parameters. The correlations between NPDS and TWD with cervical ROM is moderate positive significant correlation The correlations between TWD and NECK ROM moderately positive correlation is seen. (Table 5 to 9).

Results shows Moderately positive correlation of forward neck with reduction of ROM of Neck and moderately positive correlation of Pain and forward head posture seen according to pearsons correlation at the level of P<0.01.

RESULTS DISCUSSION

The results of the present study show that among 100 office workers who was working with computers there is positive Correlation between NPDS, TWG and Neck ROM parameters. The correlations between NPDS and TWD were moderate negative significant correlation (r = -0.145, p = 0.149), The correlations between NPDS and Neck ROM is moderately positive correlation is seen.

There is also Correlation between cervical Flexion, TWD and NPDS and Neck ROM parameters The correlations between NPDS and TWD with cervical ROM is moderate positive significant correlation and the correlations between TWD and Neck ROM moderately positive correlation is seen. Results shows Moderately positive correlation of forward neck with reduction of ROM of Neck and moderately positive correlation of Pain and forward head posture seen according to pearsons correlation at the level of P<0.01.

One of study demonstrate that the prevalence of neck pain among Iranian office workers versus office workers in other countries almost is comparable so that it was reported 64% and 36.1% in sudan and sri lanka respectively [19]. Comparing comparison between the prevalence of shoulder pain among Iranian employees and employees of other countries shows that it is less common among Iranian office workers (9.3% versus 41 % and 34.3 % in Sudan and Sri Lanka respectively). In a survey on Chinese adolescents in 2008, the prevalence of forward head posture was reported as high as 25% [8]. In reviewing the literature, no data was found on the relationship between head and spinal posture during work and chronic neck pain. According to our study, office workers using computer had more forward head, kyphosis and rounded shoulder posture.[20]

The improper posture of head, cervical and thoracic spine was more common in the symptomatic group comparing the asymptomatic group during computer working that is equivalent to the results of mentioned cross-sectional studies that showed a significant relationship between individual's posture and neck pain.

Duration of computer use may have an impact on the incidence of neck pain. According to results of other cross-sectional studies, it was found that there is positive correlation between duration of sitting and neck pain prevalence. Another study showed that sitting behind desk for over 5 hours per day, is considered a risk factor for neck pain. Despite of these studies, in a systematic review, it was found that there is no significant correlation between duration of sitting and neck pain.

According to our study, there was no relationship between the duration of working with computer and neck pain (p = 0.322). In a prospective study with a 3-year follow-up by ariens et al on over 1,334 employees, it was observed that there is a strong relationship between duration of sitting in working hours and neck pain in such a way that if one is in sitting position for over 95% of his working hours, the probability of suffering from neck pain is increased (rr= 2.01%).

According to results of some studies, it was observed that FHP is more prevalent in women compared to men, while in present study it was seen that there is no difference in FHP prevalence in men and women. Another systematic review indicated that there is no correlation between participation in various sport and recreational exercises and neck pain. In a research by dimberg et al, it was found that taking part in rocket sport is a negative risk factor for neck pains . Of course, in our research on university office workers it was seen that they have no regular sport activity and a few of them may exercise a particular kind of sport at the weekends occasionally which was negligible and no positive or negative correlation was found in this regard. It needs further studies in the future. Another factor investigated in most previous studies is the relationship between driving and prevalence of neck and shoulder pain.

One of the study have revealed that office employees had a more improper posture while working with a computer versus sitting with forward looking (not a working) position, and that the defective posture in the working position was more severe in the symptomatic group. It may be due to poor ergonomics of chair, desk, computers position and also lack of attention paid to body position during work. Lack of awareness of posture while working among employees is important in causing improper posture of head and neck; so paying attention to head and neck posture during work might be a good way to decrease the poor posture. It can be introduced into the office environment by feedback methods, mirror or alarming instruments.

According to the results of Cagnie et al. study, it has been found that there is a positive correlation between duration of computer work and neck pain. Other studies that were published before 2000 showed that if duration of sitting at a desk is longer than 5 hours per day, it is considered as a risk factor for neck pain. In contrast to these findings, a systematic review of the 3 studies has found that there was no significant relationship between the duration of sitting and neck pain.[21,22]Based on our findings, there was no relationship between hours of work with a computer and neck pain (p = 0.322).

CONCLUSION

The present study demonstrated the Association of forward head posture with pain and cervical range of motion in desk users. It shows moderately negative correlation between pain and tragus to wall test and it shows positive correlation between pain and cervical range of motion.

Abbreviations

FHP: Forward Head Posture, NPRS: Numerical pain rating scale , VAS: Visual Analogue scale, CVA: Craniovertebral angle, NPDS: Neck pain and disability scale , ROM: Range of Motion, TWT: Tragus to wall test, TWD: Targus to wall distance

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