

# Normative Data of Forward Head Posture (FHP) by using Innovative Device DGL - MeTer in among Kopergaon District Population - An Analysis

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**Abstract:** *Background:* Forward head posture also known as scholar's neck, recently considered to be most common musculoskeletal postural imbalance, causing protrusion of head anterior to trunk. It is unclear how age - related habitual changes such as FHP have an influence on thoracic kyphosis and lumbar lordosis in normal healthy adults. The aim of this study was to introduce an India's First innovative instrument DGL - MeTer (Darade, Ganvir & Ladhe Founder and Maker of Instrument, Mahajan & Tejas Co - founder) and its importance in FHP. *Methodology:* Total 300 subjects were taken, age 11 years onwards. Subjects were asked to stand erect, then DGL - MeTer was placed on sternal notch and the vertical scale was attached to nose tip by sling over scale and then measurements were taken and recorded. *Result:* The mean for age group was calculated. (11 - 20 years ( $7.9 \pm 0.8$ ), 21 - 30 years ( $8 \pm 1.1$ ), 31 - 40 years ( $8.2 \pm 1.3$ ), 41 - 50 years ( $8.5 \pm 1.5$ ), 51 - 60 years ( $8.8 \pm 1.8$ ), 60 years above ( $9.1 \pm 2.1$ )). The mean shows that, as increasing age there is increase in reading of DGL - MeTer. i.e., as age increases the posture altered and leads to increase in forward head posture. *Conclusion:* It has been concluded that, this study supports the innovative DGL - MeTer instrument as a clinical tool for identification of FHP & it is easy to use and helpful to measure Forward Head Posture (FHP).

**Keywords:** Forward Head Posture, DGL - MeTer, postural imbalance, alignment

## 1. Introduction

In modern era there is extended use of mobile phone and computers has increases anterior weight bearing of cervical spine leading to a variety of musculoskeletal disorders related to the neck by changing the biomechanical stress of cervical spine. [1] Forward head posture (FHP) is most common postural problems. [2] Head when positioned anterior to trunk, increasing the cervical convexity with the apex of lordotic cervical curve considering the distance from Line of Gravity in optimal posture is known to be forward head posture. [3] Forward head posture is defined as "any alignment in which the external auditory meatus is positioned anteriorly to the plumb line through the shoulder joint" Forward head posture is generally recognized types of poor head posture in sagittal plane. [1]

Various occupations require people to assume static postures for long periods, which causes continuous contractions of the head and neck muscles. [4, 5] The head constitutes 6% of the total body weight, which is linked to the cervical spine and all other joints through the kinematic chain [6] by various muscles. Prolonged or repetitive forward head flexion causes constant isometric contraction of the cervical extensors to counteract the excessive external flexion moment and to maintain the head in forward position. This leads to muscle imbalances which causes postural impairments; if prolonged, they may cause chronic forward head posture. [7] FHP is also associated with increased thoracic kyphosis, reduced

lumbar lordosis as well as reduced proprioception. Therefore, it is important to recover from forward head posture to relieve neck pain, improve posture, and increase the range of motion. [8]

The prevalence of anterior head translation in neck pain patients was found to be 37%, out of which 58% were female and 42% were male number. A review of different observational studies of neck pain around the world showed that its 1 - year prevalence ranged from 16.5 to 75.1% for the entire adult population which aged from 17 to 70 years. The diagnosis of FHP comprises of various methods. The most common ones are, calculating the anterior weight bearing in a lateral view of plain radiograph, Cranial Vertical Angle and Cranial Rotation Angle through a photograph of the lateral view of the subject. [9]

FHP increases extension of the atlanto - occipital joint and the upper cervical vertebrae as well as flexion of the lower cervical and upper thoracic vertebrae. Furthermore, this posture causes persistent and abnormal contraction of the suboccipital, neck, and shoulder muscles. In FHP, the center of gravity (COG) of the head shifts in the anterosuperior direction, increasing the load on the neck, which causes dysfunction of the musculoskeletal, neuronal, and vascular systems. [10] Additionally, the muscles around the head and shoulders, including the trapezius, sternocleidomastoid, suboccipital, and temporal, are affected by FHP, which further worsens postural deformity. These changes cause

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persistent and abnormal pressure in the muscles, fascia, and nerves of the neck and shoulders, and rounding of the shoulders occurs to compensate for this deficit, which in turn, causes a high load on the superior trapezius and levator scapula muscles. [11] All of these changes eventually cause tension neck syndrome. Persistent tension in the head and posterior neck muscles can pathologically mimic tension headache. Additionally, FHP alters the COG of the body that lead to mechanical modifications related to postural control in the torso and every joint. The body attempts to adapt to these changes by altering its balance control mechanisms; these adaptations decrease balance ability while performing different activities and increase the risk of falling and musculoskeletal injury, [12] and ultimately result in limited body function and a high incidence of cervicogenic diseases.

If the natural alignment of the spine not only affects the person's cosmetic appearance but also causes pain and physical disorders along with respiratory problems or damage to internal organs. [13] Thoracic and Lumbar curves of the spinal column refers to kyphosis and lordosis, respectively. Lumbar spine maintains posture and provides stability during static and dynamic postures. Kyphosis is referred to the outward curvature of the thoracic spine and lordosis is referred to inward curvature of lumbar spine. Kyphosis is commonly caused due to poor posture and weakened muscles, while increased lordosis may increase the risk of degeneration and injury to spinal ligaments. The lumbar spine supports the upper body by transmitting weight of the upper body to pelvis and lower limbs. [14, 15]

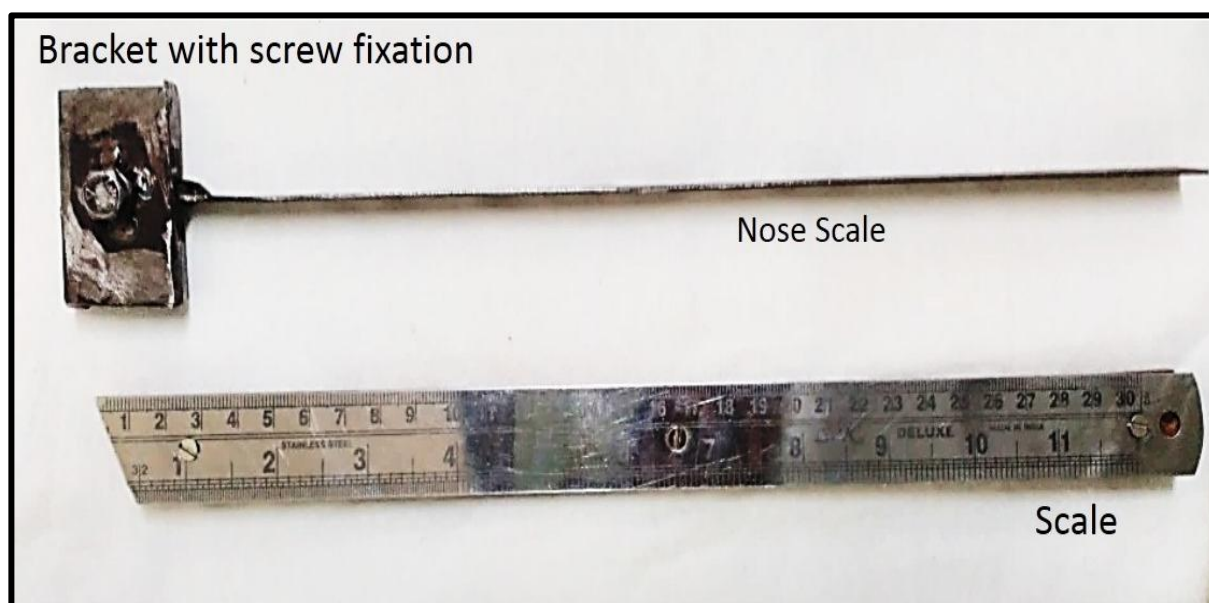
FHP is poorly noticed and an under - diagnosed problem of neck. The positioning of skeletal structures directly

influenced adjacent structures as the regions of spinal columns interact through the vertebral system. Poor sitting posture causes posterior pelvic tilt which in - turn causes reduced lumbar lordosis that leads to increase in thoracic kyphosis through anticlockwise mechanism of cogwheel and eventually affects the cervical spine. Even though due to sedentary life style and constant use of mobile phones and computer laptops which gives constant stress over neck & upper trunk which leads FHP. There is no any accurate instrument for measurement of FHP. Hence the aim this study to introduce India's First an innovative Clinical tool DGL – MeTer for accurate measurement of FHP.

## 2. Materials and Methods

The study was planned to note the normative data of FHP by DGL - MeTerin among Kopargaon district population. It is an observational study and the prerequisite ethical clearance and approval was obtained from IEC. Total 318 participants of both genders; aged from 11 to 70 years old and who were willing to participate were included by using simple random sampling. The written inform consent was taken from participants. The participants with severe musculoskeletal diseases, severe cervical pathologies, neurological conditions, any recent surgery etc. were excluded.

**DGL - MeTer (Darade, Ganvir & Ladhe Founder and Maker of Instrument, Mahajan & Tejas Co - founder) – This is \*\*India's First innovative Clinical tool which measures the Forward Head Posture (FHP) \*\* as shown below,**



It is manual made which consists of a simple measuring scale mounted on wooden scale with screw and metal bracket which will pass the measuring scale through it, metal bracket includes fix nut bolt which fix the scale during measurement and thin metal plate on metal bracket which act as nose scale or plate.

## 3. Procedure

Participants sit or stand comfortably, and have to look straight. Instructor places the DL – MeTer oblique end of measuring scale having starting point zero, over the sternal notch or upper border of manubrium and then slide the metal bracket with nose scale or plate till tip of nose. Then fix the nut bolt of metal bracket to stabilize measuring scale into

bracket. Then record the distance or reading over measuring scale. (Pictures shown below)

Age group – 11 to 20 years



Age group – 21 to 40 years



Age group – 60 years above



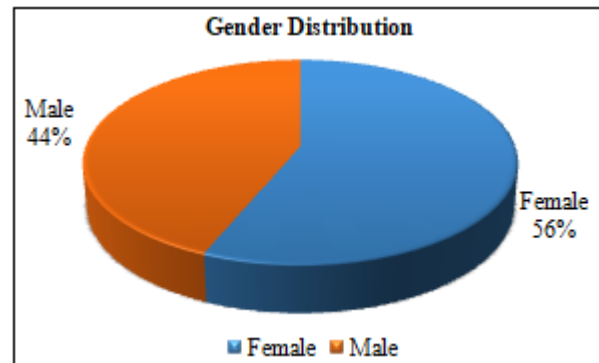
**4. Result**

By using Graphpad version3.0, the mean and standard deviation has been obtained.

**Gender Distribution**

**Table 1**

Gender Distribution		
Sex	Female	Male
No. of Participant	169	131
Percentage	56%	44%



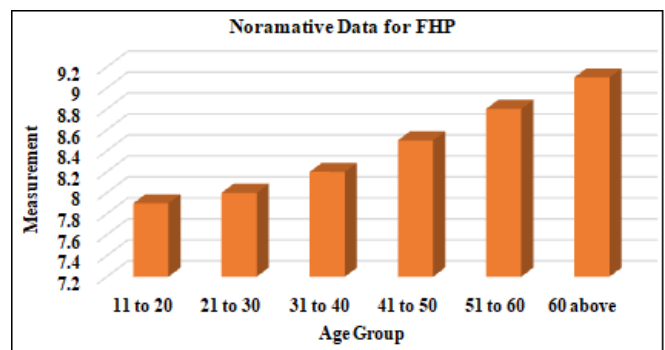
**Graph 1**

According to gender distribution, 56 % of females and 44 % male participants was there.

**Normative Data for FHP -**

**Table 2**

Normative Data for FHP by using DGL - MeTer						
Age group	11 to 20	21 to 30	31 to 40	41 to 50	51 to 60	60 above
Mean ± SD	7.9 ± 0.8	8 ± 1.1	8.2 ± 1.3	8.5 ± 1.5	8.8 ± 1.8	9.1 ± 2.1



**Graph 2**

The age group wise data were recorded and the mean & standard deviation has been calculated. The data from table and graph no.1 shows there is increase in measurement as the age group increases.

**5. Discussion**

In this present study, total 318 participants with age group from 11 year onwards were included, whereas per data collection we found that with increasing age the forward head posture also increases. Similarly in addition, as per Silva & Hsiao et al, according to linear regression analysis, younger patients showed more reduced CA and greater forward head position. In healthy individuals, the degree of forward head posture has tendency to increase with age. This is remarkably trendy association of decreased range of motion in the cervical region. However, after comparison of the cervical angle in neck pain patients with same aged pain

- free subjects, one study explained that patients who had spontaneous neck pain may have developed poor posture than healthy individuals. Aged neck pain patients who had decreased cervical spine mobility due to degenerative changes seem to be less affected by poor posture as compared to younger patients with neck pain.<sup>16,17</sup>

Shahidi et al concluded that, there is absolutely no relationship between the forward head position and trigger points with respect to location and numbers, which suggested that the mechanism of pain related to the forward head position does not account for myofascial trigger points. Even though computer work involves mental challenges which is associated with neck pain and forward head posture, only accounted for increased activity in Upper trapezius muscle. Psychosocial stress with similarly cognitive demands may raise an increased arousal along with an increasing activity in upper trapezius muscle which may eventually lead to neck disturbance<sup>18</sup>.

Talati et al also concluded that, 108 individuals which participated 18.18% had forward head posture and 81.48% were normal individuals with normal anatomy. Although this result of this study made no significant correlation of forward head posture and kyphosis; 55% individuals with kyphosis and FHP while 45% did not had kyphosis and FHP. 30.68% individuals had kyphosis with neutral head position. There were 64.81% individuals abstain kyphosis irrespective of forward head posture.

Rehan Youssef used the photography method; Firstly, adhesive markers were placed bilaterally on the tragus of the ear, as well as the calcaneocuboid joint of the foot. To capture the images, a Fuji film digital camera (3 mega pixel) was mounted on a tripod that was placed at a distance of 100 cm from the subject's lateral foot. The height of the camera was adjusted according the subject's height and aligned at the tragus level. An inclinometer was also included to verify the horizontal alignment of the camera. In addition, a plumb line was placed lateral to the tested subject to mark the true vertical line. First, subjects were asked to stand with the side of the trunk facing the camera and to gaze at a target fixed in front. The researcher asked the subject to flex and extend the neck for a few counts before assuming the standing resting posture. All participants were instructed, before the photo capturing, to assume a relaxing resting posture while looking forward at the target with arm rested at side the body. After that, sagittal plane photos were captured by the digital camera from three sides and saved to a personal computer for further reference & analysis. Repetition of photographs were done to reduce bias due to subject's photo consciousness as well as to minimize the difference between measurements because of postural swaying. For photographs in standing position, 132 healthy subjects and 41 patients suffering mechanical neck pain were assessed, whereas 90 healthy subjects and 56 patients suffering neck pain were assessed from sitting position applying the same procedures. Digital photographs were measured by using the open access Kinovea software.

Hence, we accomplished by designing the tool which is user friendly irrespective to time and place, also this device needs no electricity or computer software or camera and any sort of

setup. It is cost effective device made up from waste material. DGL - MeTer is easiest way to measure Forward Head Posture.

## 6. Conclusion

From our study, it has been concluded that, an India's First Innovated Clinical Device DGL - MeTeris helpful to identify and measure the Forward Head Posture (FHP).

## 7. Limitations

- 1) Validity & Reliability is in process.
- 2) Copyright of instrument is in process (Diary Number: 20136/2021 - CO/A)
- 3) Patent registration is in process.

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