

Greevastambha (Cervical Stiffness) In the Digital Era: An Integrative Anatomical and Behavioral Study on Smartphone Addiction and Cervical Posture in Young Adults

Dr. Shubham Arun Sapkal¹, Dr. Srishti Jidani², Dr. Snehal Deshpande³

^{1,2}MD Rachana Sharir CBPACS New Delhi

³Assistant Professor Department of Kriya Sharir SSGMAM Shegaon

doi.org/10.64643/IJIRTV12I12-202752-459

Abstract—Background: Due to the widespread usage of smartphones, young people are now spending too much time staring at screens, which is a problem for their musculoskeletal health. Prolong smartphone use is associated with altered cervical posture, particularly forward head posture, which may predispose individuals to cervical stiffness and functional disability. Craniovertebral angle (CVA) serve as an objective indicator of cervical posture; however, its association with smartphone addiction and cervical stiffness has not been sufficiently explored from an integrative biomedical and Ayurvedic perspective. **Objective:** -To assess the association between smartphone addiction, craniovertebral angle and cervical stiffness in young adults, with interpretive correlation to Greevastambha describe in ayurveda. **Methods:** An observational cross-sectional study was conducted on 220 healthy individuals aged 18-25 years who reported smartphone usage ≥ 36 hours per week for at least three years. smartphone addiction assessed by smartphone addiction scale (SAS). Cervical stiffness and functional disability were evaluated by using Neck disability index (NDI). Craniovertebral angle was measured was measured using a universal goniometer. Statistical analysis included chi-square test and Pearson's correlation coefficient. **Results:** A significant association was observed between smartphone addiction severity and reduced craniovertebral angle. [$p < 0.05$]. Higher addiction scores correlated with increased neck disability and cervical stiffness. A significant negative correlation was noted between CVA and both smartphone addiction scores and NDI values, indicating worsening posture and functional impairment with increased screen dependence. **Conclusion** -Excessive smartphone use is significantly associated with reduced craniovertebral angle and increased cervical stiffness in young adults. From an integrative perspective, these

findings correlate with Greevastambha a Vata – dominant musculoskeletal condition described in ayurveda. Early ergonomic correlation and lifestyle modification are essential to prevent long term cervical morbidity.

I. INTRODUCTION

The rapid proliferation of smartphone has fundamentally altered daily human behaviour, particularly among young adults. While smartphone offer unparalleled accessibility to communication and information, excessive and prolonged use has emerged as a growing public health concern. Among the various health consequences reported, musculoskeletal disorder of the cervical spine has gained increasing attention.¹

Behavioral patterns of compulsive usage, diminished control, and sustained engagement despite negative effects define smartphone addiction.² In contrast to conventional occupational screen exposure, smartphone use is frequently associated with maintained neck flexion, typically carried out for extended periods and in an unsupported posture. This regular posture has been firmly related to forward head posture (FHP), a disorder recognized to change the biomechanics of the cervix and raise mechanical strain on cervical components.³

A widely accepted objective measure of forward head posture is the craniovertebral angle (CVA). A decrease in CVA indicates anterior displacement of the head in relation to the trunk, which causes more pressure on the muscles, ligaments, intervertebral discs, and cervical vertebrae.⁴ Biomechanical research has

revealed that the effective load on the cervical spine increases exponentially with increasing neck flexion, making people more susceptible to discomfort, stiffness, and progressive long-term alterations.⁵

The Neck Disability Index (NDI) is frequently used to evaluate cervical stiffness, which is a practical result of prolonged postural stress. If left untreated, decreased cervical mobility and increased disability might lead to persistent neck problems in addition to disrupting daily activities.⁶

From an integrative medicine viewpoint, the cervical region is the structural and functional equivalent of the Greeva in Ayurvedic anatomy. It serves as a vital junction point between the head (shira) and trunk (antaradhi).⁷ According to ancient Ayurvedic texts, Greevastambha is a Vata-dominated illness marked by neck stiffness, limited mobility, and pain.⁸ The modern risk factors associated with excessive use of digital screens are very similar to the etiological factors that cause Vata to worsen, such as poor posture, excessive strain, prolonged static position, and psychological stress.⁹

The two systems maintain identical conceptual frameworks because modern biomechanical explanations match the Ayurvedic description, yet researchers have not combined objective postural evaluation with traditional musculoskeletal theories in their studies. The discovery of this relationship will help medical professionals understand cervical disorders better. This will enable them to develop preventive strategies that combine different approaches.

The current research investigates how smartphone addiction relates to craniocervical angle, and cervical stiffness among young adults. The researcher study uses validated assessment tools together with objective postural measurement to connect modern musculoskeletal research with Ayurvedic interpretative systems. This will add evidence to the field of integrative medicine literature.

II. MATERIAL AND METHODS:

Ethics:

This study (IEC Code: CBP-IEC/2023/RS/MD/04) Was approved by IEC, CBPACS vide letter no. F2(602)/19-20/CBPACS/Princ. /IEC/5581-82 dated on 29/11/2023 from the Guru Gobind Singh Indraprastha University, New Delhi, India.

Clinical procedure:

Healthy participants aged 18-25 years were recruited from CBPACS College, New Delhi. The participant's comprehensive history was documented using standardized proforma. Before enrolling them, all participants provided written consent, indicating their informed agreement to participate in the study.

Study design:

An observational cross-sectional study was conducted over a period of 18 months at a tertiary-care academic institution from May 2024 to Oct 2025.

Key eligibility criteria:

- a) Male and Female both healthy individuals of the age 18-25 years.
- b) Subjects who are using smartphone in the past 3 years for 36 hours per week (approx. more than 5 hours per day).

Outcome Measures:

a) Smartphone

Smartphone addiction was assessed using the Smartphone Addiction Scale (SAS), a validated self-reported questionnaire measuring behavioural dependency and excessive usage patterns.

b) Craniocervical Angle (CVA)

CVA was measured using a universal goniometer by identifying anatomical landmarks at the tragus of the ear and the spinous process of C7. A lower CVA indicated increased forward head posture.

c) Cervical Stiffness

Cervical stiffness and functional limitation were assessed using the Neck Disability Index (NDI).

Statistical Analysis:

Data were analysed using standard statistical software. Descriptive statistics were used to summarize demographic variables. Associations between smartphone addiction, CVA, and NDI were evaluated using Chi-square tests. Pearson's correlation coefficient was used to determine the strength and direction of relationship. Statistical significance was set at $p < 0.05$.

III. RESULT AND OBSERVATION

DEMOGRAPHIC ANALYSIS

Table:1: Socio-demographic and Sleep Characteristics of Participants (N=220)

Variable	Category	N	%
Age(years)	18-21	80	36.4
	22-25	140	63.6
Sex	Female	122	55.5
	Male	98	44.5
Habitat	Urban	120	54.5
	Rural	100	45.5
Religion	Hindu	208	94.5
	Muslim	10	4.5
	Sikh	2	0.9
Sleep Pattern	Normal	91	41.4
	Disturbed	129	58.6

The study included 220 young adults, with the majority (63.6%) between the ages of 21 and 25 and the remaining 36.4% between the ages of 18 and 21. The fact that CBPACS College has more female students is reflected in the somewhat higher proportion of women (55.5%) as opposed to men (44.5%). There was a small majority of urban participants over rural participants (54.5% vs. 45.5%). The majority of the sample was religiously uniform, with 94.5% of participants identifying as Hindus. Significantly, 58.6% of the study participants reported having poor sleep, which suggests a significant sleep-related burden among them.

Table:2: Distribution of study participant according to smartphone addiction, craniovertebral Angle, and neck Disability Index (n=220)

Parameter	Category	n	%
Smartphone Addiction scale (SAS)	No addiction	27	12.3
	Mild addiction	56	25.5
	Moderate addiction	135	61.4
	Severe addiction	2	0.9
Craniovertebral angle (CVA)	Normal angle	39	17.7
	Low-risk angle	91	41.4
	Moderate-risk angle	72	32.7
	High-risk angle	18	8.2
Neck Disability Index (NDI)	No disability	50	22.7
	Mild disability	68	30.9
	Moderate disability	100	45.5
	Complete disability	2	0.9

Moderate smartphone addiction was the most common category in the current study (n=220), affecting 61.4% of participants, while 87.7% showed at least a little bit of smartphone addiction. Postural deviation in the craniovertebral angle was found in 82.3% of the participants, with the most prevalent angles being low-risk (41.4%) and medium-risk (32.7%). The majority of the sample had moderate neck impairment (45.5%), followed by mild impairment (30.9%), with an overall rate of 77.3%. Only a small proportion of participants—less than 10% in each case—experienced severe symptoms, such as a severe addiction to smartphones, a high-risk craniovertebral angle, and a total neck impairment. The study participants showed a prevalence of moderate smartphone addiction, postural changes, and neck impairment, according to these results.

Table 3: Association of smartphone addiction severity with craniovertebral angle (CVA) and neck disability

Variable	Category	No addiction	Mild addiction	Moderate addiction	Severe addiction	Total
CVA	Normal	21	16	1	1	39
	Low risk	5	35	51	0	91
	Moderate risk	1	5	66	0	72
	High risk	0	0	17	1	18
	$\chi^2(p)$					134.83(<0.001)
	Cramer's V					0.45
NDI	No disability	23	15	11	1	50

	Mild disability	4	37	27	0	68
	Moderate disability	0	4	95	1	100
	Complete disability	0	0	2	0	2
	$\chi^2(p)$					140.57(<0.001)
	Cramer's V					0.46

A highly significant association was observed between smartphone addiction and craniovertebral angle ($\chi^2 = 134.834, p < 0.001$) with a large effect size (cramer's $V=0.452$), demonstrating a progressive worsening of craniovertebral posture with increasing addiction severity. Participant with normal angle predominantly exhibits no or mild addiction, whereas low and moderate-risk angle were largely associated with moderate addiction. Similarly, smartphone addiction showed addiction showed a strong association with neck disability ($\chi^2=140.571, p<0.001$; Cramer's $V = 0.462$) with higher addiction levels corresponding to increase disability severity. Participant with no or mild disability mainly showed no or mild addiction while moderate and complete disability were overwhelmingly linked to moderate addiction. These findings indicate a clear dose-response relationship between smartphone addiction, postural alteration, and neck-related functional impairment.

Table 4: Correlation of smartphone addiction with craniovertebral angle and neck disability index (N=220)

Outcome Variable	Smartphone addiction scale (Mean \pm SD)	Outcome measures (Mean \pm SD)	Pearson's r	p-value
Craniovertebral angle (CVA)	14.62 \pm 6.31	44.23 \pm 3.33	-0.756	< 0.001
Neck Disability Index (NDI)	14.62 \pm 6.31	12.13 \pm 7.41	+0.607	<0.001

Correlation analysis of 220 participants demonstrated a strong and statistically significant negative correlation between smartphone addiction score (SAS) and craniovertebral angle ($r= -0.756, p<0.001$),

indicating progressive deterioration of head-neck posture with increasing smartphone addiction. A significant positive correlation was also observed between SAS and neck disability index (NDI) scores ($r=0.607, p<0.001$), reflecting greater neck-related functional impairment with higher addiction levels. The mean SAS score was 14.62 ± 6.31 , while mean CVA and NDI value were 44.23 ± 3.33 and 12.13 ± 7.41 , respectively. Both correlations demonstrate large effect sizes, suggesting a robust dose response relationship. These findings indicate that excessive smartphone use is strongly associated with forward head posture and increased biochemical stress on cervical structure.

IV. Discussion:

The current cross-sectional study shows a significant and clinically relevant link between smartphone addiction, changes in cervical posture, and functional neck impairment in young adults. The majority of subjects had a moderate degree of smartphone addiction, which was strongly linked to a lower craniovertebral angle (CVA) and a higher neck disability index (NDI) score. According to these findings, excessive use of digital screens is not just a behavioral issue but also results in quantifiable anatomical abnormalities and functional abnormalities in the cervical spine.

Higher levels of smartphone dependency are associated with Forward head position, as evidenced by the strong inverse relationship between CVA and smartphone addiction scale (SAS) scores. This is consistent with well-known biochemical concepts, which state that maintaining cervical flexion raises the axial load on the cervical spine, hastens muscular tiredness, and increases the likelihood of ligamentous and discal stress. The simultaneous positive correlation between SAS and NDI supports a dose-response relationship, indicating that behavioral

addiction may gradually cause functional impairment even in a young, otherwise healthy population.

The fact that many participants experienced disrupted sleep further contributes to the lifestyle aspect of these results. Circadian disruption is likely caused by late-night smartphone use, exposure to blue light, and compulsive checking behavior. This disruption then worsens musculoskeletal pain perception and slows tissue recovery. From an integrative perspective, this triad of addiction, postural abnormalities, and sleep disruption is indicative of a systemic lifestyle illness as opposed to an isolated musculoskeletal problem.

The clinical picture, when interpreted in terms of ayurvedic agriculture, is very similar to greevastambha, a vataja nanatmaj vyadhi. Overuse of smartphones might be seen as an atiyoga of Chakshu and manas, which falls under asatyama indriyarthasamyoga and results in mvat prakopa. Lower CVA and greater NDI values are consistent with the resulting stambha (rigidity), shola (pain), and karmakshamta hani (functional limitation). In the majority of participants, disturbed sleep (nidranasha) was found to exacerbate vata even more, resulting in a self-sustaining cycle of stiffness and impairment.

By integrating functional evaluation (NDI), objective anatomical measurements (CVA), and behavioral assessment (SAS), this study provides an integrated model that connects lifestyle behavior with structural and clinical outcomes. In contrast to previous studies that mostly concentrated on pain or ergonomic issues, the current study created a consistent behavioral-anatomical-functional continuum that can be interpreted both ayurvedically and in contemporary terms.

In spite of its cross-sectional approach and single-centered structure, the study brings attention to a growing public health issue: the early start of cervical dysfunction in young adults, brought on by digital screen addiction. The discovery emphasizes the necessity of early screening, ergonomic training, digital use regulation, and integrative preventive interventions that include posture correction, sleep hygiene, exercise, yoga, and Ayurvedic lifestyle principles.

In conclusion, the research offers strong proof that smartphone addiction is strongly correlated with poor cervical posture, neck impairment, and sleep disturbances. It strengthens the applicability of integrative methods in comprehending and treating

technology-related musculoskeletal illnesses in the digital age by bridging biomechanics with classical Ayurvedic philosophy.

V. CONCLUSION:

This research demonstrates a definite correlation between smartphone addiction, poor cervical alignment, and neck stiffness in young people. An increasing reliance on smartphones was linked to a smaller craniovertebral angle, which suggests forward head position and the related mechanical stress on the cervical spine. According to ayurveda, disruption of the normal alignment of Greevagata kasheruka contradicts its physiological function in preserving neuromuscular balance and structural integrity. The discovery highlights the convergence of classical anatomical principles with current behavioral health concerns, stressing that prolonged digital exposure places unusual, non-physiological stress on the cervical area. To avoid new musculoskeletal diseases associated with technology, it is imperative to combine traditional anatomical knowledge with current ergonomic understanding.

REFERENCES

- [1] A. S. Parasuraman, A. T. Sam, S. W. Yee, B. L. Chuon, and L. Y. Ren, "Smartphone usage and increased risk of mobile phone addiction: A concurrent study," *International Journal of Pharmaceutical Investigation*, vol. 7, no. 3, p. 125, Jul. 2017.
- [2] M. O. Kim, H. Kim, K. Kim, S. Ju, J. Choi, and M. I. Yu, "Smartphone addiction: (focused depression, aggression and impulsions) among college students," *Indian Journal of Science and Technology*, vol. 8, no. 25, pp. 1–6, Oct. 2015.
- [3] P. P. Samani, N. A. Athavale, A. Shyam, and P. K. Sancheti, "Awareness of text neck syndrome in young-adult population," *International Journal of Community Medicine and Public Health*, vol. 5, no. 8, pp. 3335–3339, Aug. 2018, doi: 10.18203/2394-6040.ijcmph20183057.
- [4] B. Shaghayeghfard, A. Ahmadi, N. Maroufi, and J. Sarrafzadeh, "Evaluation of forward head posture in sitting and standing positions," *European Spine Journal*, vol. 25, no. 11, pp. 3577–3582, Nov. 2016.

- [5] P. Côté, G. van der Velde, J. D. Cassidy, L. J. Carroll, S. Hogg-Johnson, L. W. Holm, E. J. Carragee, S. Haldeman, M. Nordin, E. L. Hurwitz, and J. Guzman, “The burden and determinants of neck pain in workers,” *Journal of Manipulative and Physiological Therapeutics*, vol. 32, no. 2S, pp. S70–S86, Feb. 2009.
- [6] P. K. Shastri and D. G. Chaturvedi, *Charaka Samhita with Vidyotini Hindi Commentary*, 1st ed. Varanasi, India: Chaukhambha Bharati Academy, 2017, Sharira Sthana, ch. 7/5, p. 911.
- [7] B. Tripathi, *Madhava Nidanam with the Sanskrit Commentary Madhukosa*, vol. 1, 1st ed. Varanasi, India, ch. 6/8.
- [8] P. K. Shastri and D. G. Chaturvedi, *Charaka Samhita with Vidyotini Hindi Commentary*, 1st ed. Varanasi, India: Chaukhambha Bharati Academy, 2017, Chikitsasthana, ch. 28, verses 15–18.