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Impact of Prolonged Mobile Phone Use on Posture and Malocclusion in Children Aged 6-13 Years: A Cross-Sectional Study

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Abstract

Background/Objectives: This study aimed to assess the impact of mobile phone usage on posture and malocclusion in children aged 6-13 years. The relationship between mobile phone use, craniovertebral angle, and dental malocclusion was examined. Materials and Method: A cross-sectional observational study was conducted with 200 children aged 6-13 years in Davangere city. Participants were divided into two groups: mobile phone users (using a phone for more than 1 hour/day) and non-users (less than 1 hour/week). Data collection involved a structured questionnaire, craniovertebral angle measurement through side-profile images, and intraoral examinations to assess malocclusion. Statistical analysis included the Chi-Square Test and Independent Samples t-Test. Results: Mobile phone users had a significantly lower craniovertebral angle ($p < 0.001$), indicating a greater degree of forward head posture. A significant association was observed between mobile phone use and slouched posture ($p = 0.019$), increased overjet ($p = 0.003$), crowding in the upper arch ($p = 0.011$), spacing in the upper anterior teeth ($p = 0.009$), and posterior crossbite ($p < 0.001$). Habits like mouth breathing and thumb sucking were significantly higher in mobile phone users ($p = 0.003$). Conclusion: Findings suggest that children who use mobile phones for extended durations are more likely to exhibit forward head posture, which is associated with an increased prevalence of malocclusion. This study highlights the relationship between prolonged mobile phone use, postural changes, and malocclusion in children.

Keywords: Mobile phone use, Posture, Malocclusion, Craniovertebral angle, Pediatric dentistry.

INTRODUCTION

With the rapid advancement of technology, mobile phones have become an integral part of daily life, even among children. Unfortunately, this is becoming an all-too-common reality that children are growing up with mobile phones as a constant companion [1]. While these devices offer convenience and learning opportunities, the dangers lurking behind the glowing screens include compromised physical health, mental well-being, and social skills [2].

Indian studies reveal that children are introduced to screen-based media as early as 2 months old, with a median first exposure at around 10 months. By 18 months of age, most children have already encountered such media. Notably, smartphone usage (96%) exceeds television viewing (89%) among these young children [3].

The increasing prevalence of mobile device usage among children has raised concerns about its potential impact on their physical health. While strong evidence links excessive use to poor sleep outcomes, musculoskeletal health, ocular symptoms, and neurological issues [4].

The morphology of the first cervical vertebra has been found to influence head posture and craniofacial structures, variations in its anatomy may affect head positioning, potentially impacting craniofacial development [5]. Excessive mobile phone use has been linked to poor head positioning and discomfort contributing to changes in craniovertebral angle and increased neck disability, indicating its impact on posture and musculoskeletal health [6] and respiratory function [7].

Malocclusion has been closely linked to oral habits and mouth breathing, which can significantly influence craniofacial development. Persistent dysfunctional breathing patterns and habits may contribute to dental misalignment and skeletal imbalances [8]. Given the rising prevalence of mobile phone use among children and its potential health implications, it is essential to investigate its relationship with posture and malocclusion. The present study aimed to investigate the association between mobile phone usage postural habits, and the prevalence of malocclusion in children aged 6–13 years. It specifically sought to assess forward head posture by measuring the craniovertebral angle (CVA) through photographic analysis and to evaluate dental parameters such as overjet, overbite, crowding, and spacing.

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Furthermore, the study examined the relationship between mobile phone usage patterns and the presence of dysfunctional oral habits, including thumb sucking and mouth breathing.

METHODOLOGY

A cross-sectional observational study was conducted in Davangere city with a total of 200 children aged 6-13 years. Before the clinical inspection, written informed consent was obtained from the parents or guardians after explaining the full details.

The Inclusion criteria for the selection of participants comprise the following:

- Children aged 6-13 years
- Regular mobile phone users (at least 1 hour per day)
- Non mobile phone users (less than 1 hour per week)
- No previous orthodontic treatment or craniofacial anomalies

Exclusion criteria:

- Children with congenital craniofacial defects
- Children who have undergone prior dental or orthodontic treatments

Participants were recruited from private dental clinics and schools in Davangere city over a six-month period. A total of 200 children aged 6–13 years, who met the inclusion criteria, were enrolled in the study. Informed consent was obtained from the parents prior to participation, and the study was approved by the Institutional Ethics Committee (Approval No. [CODS/IEC/14/2024-25]). All procedures performed in this study involving human participants were conducted in accordance with the ethical standards of the institutional and/or national research committee and with the 1975 Helsinki Declaration, as revised in 2013.

Participants were divided into two groups based on mobile phone usage patterns reported by their parents:

- Group A:Children with high mobile phone usage (> 4 hours/day)
- Group B:Children with low mobile phone usage (< 4 hours/day)

Questionnaire

A structured questionnaire was administered to both the parents and children. It assessed mobile phone usage habits (average daily duration, posture while using the phone), and the presence of oral habits such as thumb sucking, tongue thrusting, mouth breathing, nail or lip biting.

Photography and Postural Assessment

Postural assessment was conducted by capturing standardized side-profile photographs of each participant in a natural standing position without external support. Photographs were taken using a mobile phone and adjusted to the participant's ear level to maintain perpendicular alignment with the sagittal plane [8].

The craniovertebral angle (CVA) was measured from the photographs using MB-Ruler Software [9], a validated digital protractor tool that enables precise angular measurement. A horizontal line was drawn through the C7 marker and another line connecting the tragus to C7. The angle between these lines was recorded as the CVA. A smaller CVA indicated a more pronounced forward head posture. Measurements were performed by an examiner blinded to the group allocation to avoid bias.

Dental Examination

A clinical oral examination was conducted to assess malocclusion. The parameters evaluated included molar relationship (Angle's classification), overjet, overbite, crowding, and spacing. The examination was performed under natural daylight using a sterile mouth mirror and probe, following standard infection control protocols.

STATISTICAL ANALYSIS

Data were analyzed using the Statistical Package for the Social Sciences (SPSS) version 26.0 (IBM Corp., Armonk, NY, USA). Continuous variables were expressed as mean ± standard deviation (SD). An unpaired t-test was used to compare craniovertebral angles and malocclusion parameters between the two groups. Categorical variables from the questionnaire were analyzed using the chi-square test. A p-value of <0.05 was considered statistically significant.

RESULTS

There were no significant differences between the two groups in terms of gender distribution (Table 1).

A statistically significant reduction in craniovertebral angle (CVA) was observed in children belonging to Group A (mobile phone users) compared to those in Group B (non-users), indicating a more pronounced forward head posture among the users (Table 2). Postural evaluation revealed that slouched posture were significantly more common in Group A, whereas Group B showed a relatively higher frequency of good sitting posture and standing posture (Table 3).

Dental examination revealed that children in Group A demonstrated a higher prevalence of Class II molar relationships compared to Group B, while Class I molar relation was more common among non-users (Table 4). A statistically significant increase in overjet was seen among mobile phone users, with more children showing increased overjet in Group A than in Group B (Table/Fig 5). Upper anterior crowding was notably more frequent in mobile phone users, showing a statistically significant difference (Table 6), whereas spacing in the upper arch was more commonly observed in non-users (Table 7).

Regarding oral habits, mouth breathing and thumb sucking were significantly more prevalent among Group A participants, indicating a possible link between increased screen exposure and the development or persistence of these habits (Table 8). These findings, in combination, suggest that mobile phone usage may influence orofacial muscle activity and head posture, potentially contributing to developing or exacerbating malocclusions in growing children.

LIMITATION

This study has a few limitations. The sample size was not equally distributed, with more mobile phone users compared to non-users, which may have influenced the results. Being a cross-sectional study, it cannot establish cause-and-effect relationships. Additionally, participants were selected from a single city, which may limit the generalizability of the findings. Future studies with larger sample and longitudinal design are recommended.

Table 1: Gender Distribution Among Participants

Gender	Mobile Phone Users (n=150)	Non-Users (n=50)	Total (n=200)	p-value
Female	76 (73.8%)	27 (26.2%)	103 (51.5%)	0.683
Male	74 (76.3%)	23 (23.7%)	97 (48.5%)	
Total	150 (75.0%)	50 (25.0%)	200 (100%)	

Table 2: Craniovertebral Angle Comparison

Group	N	Mean CVA (°)	SD	p-value
Mobile Phone Users	150	44.89	0.618	<0.001
Non-Users	50	45.57	0.620	

*CVA: Craniovertebral Angle

Table 3: Association Between Mobile Phone Usage and Posture

Posture	Mobile Phone Users	Non-Users	Total	p-value
Lying	33 (75.0%)	11 (25.0%)	44	0.019
Sitting with Good Posture	42 (72.4%)	16 (27.6%)	58	
Sitting with Slouched Posture	75 (78.9%)	20 (21.1%)	95	
Standing	0 (0.0%)	3 (100%)	3	

Table 4: Association Between Mobile Phone Usage and Molar Relation

Molar Relation	Mobile Phone Users	Non-Users	Total
Class I	111 (75.0%)	37 (25.0%)	148
Class II	28 (84.8%)	5 (15.2%)	33
Class III	9 (90.0%)	1 (10.0%)	10

Table 5: Association Between Mobile Phone Usage and Overjet

Overjet	Mobile Phone Users	Non-Users	Total	p-value
Normal	80 (70.2%)	34 (29.8%)	114	0.003
Increased	55 (90.2%)	6 (9.8%)	61	
Decreased	15 (60.0%)	10 (40.0%)	25	

Table 6: Crowding in Upper Arch

Crowding (Upper Arch)	Mobile Phone Users	Non-Users	Total	p-value
Yes	49 (87.5%)	7 (12.5%)	56	0.011
No	101 (70.1%)	43 (29.9%)	144	

Table 7: Spacing in Upper Arch

Spacing (Upper Arch)	Mobile Phone Users	Non-Users	Total	p-value
Yes	50 (64.9%)	27 (35.1%)	77	0.009
No	100 (81.3%)	23 (18.7%)	123	

Table 8: Association Between Mobile Phone Usage and Habits

Habit	Mobile Phone Users	Non-Users	Total	p-value
Mouth Breathing	45 (84.9%)	8 (15.1%)	53	0.003
Thumb Sucking	26 (92.9%)	2 (7.1%)	28	

DISCUSSION

Dental malocclusion is widely prevalent among children and adolescents, and its potential influence on body posture provides valuable insights for orthodontic treatment.

In our study, mobile phone users demonstrated a significantly lower craniovertebral angle (CVA) compared to non-users, suggesting a greater degree of forward head posture. These findings align with those of Shinde et al [6], who reported a reduction in CVA among mobile phone users, indicating musculoskeletal misalignment. Similarly, Jung et al [7] highlighted the negative effects of prolonged smartphone usage on posture and respiratory function. Abdel-Aziem et al [8] further confirmed that longer smartphone screen viewing durations and poor body positions significantly affect head and neck posture in elementary school children, supporting the influence of device use on musculoskeletal health. Kim et al [14] also observed that increased smartphone usage is significantly associated with musculoskeletal symptoms, supporting the negative impact of prolonged device use on posture. The reduced CVA observed in our participants supports the notion that excessive mobile phone usage can disrupt cervical spine alignment and overall postural stability.

A significant association was observed between mobile phone use and the prevalence of dental malocclusions, particularly increased overjet, crowding in the upper arch. These results corroborate the findings of Solow and Sonnesen [11], who demonstrated that altered head posture contributes to dental crowding and sagittal discrepancies. Kasparaviciene et al [12] also emphasized the role of oral habits, such as thumb sucking and mouth breathing, in the development of malocclusion. Similarly, AlKofide and AlNamankani [13] reported a significant association between head posture and malocclusion among Saudi subjects, reinforcing the idea that craniovertebral alignment plays a critical role in craniofacial development. Our study reinforces these findings by showing a higher occurrence of such habits among frequent mobile phone users.

Further, Nobili and Adversi [15] suggested that malocclusion types are associated with specific postural patterns, where Class II malocclusion corresponds with forward head posture, and Class III with a posterior shift. Additionally, Nowak et al [16] emphasized that dental occlusion may influence postural stability and gait parameters, further highlighting the complex interaction between craniofacial and musculoskeletal systems. Our observations are in agreement, highlighting how prolonged device use may influence craniofacial growth patterns.

Mobile phone users in our study also exhibited a higher prevalence of dysfunctional oral habits, including mouth breathing and thumb sucking. These findings are consistent with Grippaudo et al [10], who reported a direct link between oral habits and malocclusion. The persistent forward head posture associated with smartphone use may further exacerbate these dysfunctional habits, leading to compromised orofacial development.

Sambataro et al [17] discussed how postural anomalies correlate with malocclusion in children, particularly noting an association between crossbites and scoliosis, suggesting systemic effects of poor posture on craniofacial and skeletal health. Extended head posture has also been linked to the development of malocclusion, as demonstrated by Tankhiwale et al [18], suggesting a biomechanical relationship between cervical alignment and dental occlusion. Our findings extend this evidence to the pediatric population in the context of increased digital exposure.

On the other hand, Michelotti et al [19] reviewed the influence of dental occlusion on overall posture, concluding that while associations exist, multiple factors should be considered in diagnosis and treatment planning. This perspective underscores the multifactorial nature of postural and dental health, as observed in our findings.

CONCLUSION

This study highlights a clear association between prolonged mobile phone use, forward head posture, and increased prevalence of malocclusion in children. Children who used mobile phones for longer durations showed reduced craniovertebral angles and a higher incidence of oral habits and dental irregularities. Early preventive measures, including posture correction and limiting screen time, are essential to minimize these risks. Further research with balanced groups and long-term follow-up is needed to better understand these effects.

Conflicts of Interest

The author reports no conflicts of interest.

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