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Indonesian Journal of MEDICAL ANTHROPOLOGY

Journal homepage: https://ijma.usu.ac.id

Indonesian Orthodontists' Perceptions about malocclusion and postural in Diagnosis

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ARTICLE INFO

Article history:
Received:2 June 2025
Revised : 30 August
Accepted : 21 September 2025
Available online : 30 September 2025

How to cite:
Sofyanti E, Manurung PSA, Purbiati M, Farmasyanti CA, Mardiati E, Narmada IB, Alhasyimi AA. (2025). Indonesian Orthodontists' Perceptions about Malocclusion and Postural in Diagnosis, Indonesian Journal of Medical Anthropology.6(2),16-24.

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http://doi.org/10.32734/ijma.v6i2.22433

ABSTRACT

The relationship between dental occlusion and posture remain controversial due to the lack of clear cause-and-effect evidence. Scientifically validated and reliable evidence can shape individuals' perceptions and influence their decisions regarding orthodontic treatment. This study aimed to conduct a survey to assess Indonesian orthodontists' perceptions regarding the relationship between malocclusion and posture (both oral and body posture) based on gender and years of professional experience. An online survey was conducted involving orthodontists who attended the Orthodontic Meeting in November based on a 7-item Likert scale modified questionnaire. Levene's test was performed continued with a prerequisite for the Multivariate Analysis of Variance test ($p<0.05$). The perceptions of 214 active members of the Indonesian Orthodontist Association showed a positive agreement regarding the relationship between malocclusion and posture (both oral and body). There was no significant interaction between gender and perception ($p=0.417$), nor between years of professional experience as an orthodontist and perception ($p=0.182$) regarding the relationship between malocclusion and posture. Since this survey-based analytical study found no interaction between gender and years of professional experience in orthodontists' agreement on the premise, these findings should be considered when updating the standard operating procedures curriculum for orthodontic diagnosis and multidisciplinary orthodontic approaches.

Keyword: Perception, Orthodontist, Malocclusion, Posture

ABSTRAK

Hubungan antara oklusi gigi dan postur telah menjadi topik yang masih diperdebatkan karena kurangnya bukti yang jelas mengenai hubungan sebab-akibat. Bukti ilmiah yang tervalidasi dan andal dapat membentuk persepsi individu dan memengaruhi keputusan mereka terkait perawatan ortodonti. Penelitian ini bertujuan untuk melakukan survei guna menilai persepsi ortodontis Indonesia terhadap hubungan antara maloklusi dan postur (baik postur oral maupun tubuh) berdasarkan jenis kelamin dan lama pengalaman profesional. Survei daring pada pertemuan ortodontis di Jakarta November 2023 menggunakan kue. sioner dengan skala Likert 7 poin. Uji Levene dilanjutkan dengan uji Multivariate Analysis of Variance ($p<0,05$). Persepsi dari 214 anggota aktif Persatuan Ortodontis Indonesia menunjukkan tingkat kesepakatan

positif terhadap hubungan antara maloklusi dan postur (baik oral maupun tubuh). Tidak ditemukan interaksi yang signifikan antara jenis kelamin dan persepsi (p=0,417), maupun antara lama pengalaman profesional dan persepsi (p=0,182) terhadap hubungan maloklusi dan postur. Karena studi analitik berbasis survei ini tidak menemukan interaksi antara jenis kelamin dan lama pengalaman terhadap kesepakatan ortodontis mengenai premis tersebut, temuan ini perlu dipertimbangkan dalam pembaruan kurikulum prosedur operasional standar untuk diagnosis ortodonti dan pendekatan ortodonti multidisipliner.

Keyword: Persepsi, Ortodontis, Maloklusi, Postur.

1. Introduction

Posture is a result of complex interactions between the musculoskeletal system and the afferent and efferent pathways of the central nervous system. It plays a crucial role in maintaining skeletal-muscular balance, preventing injuries, and minimizing progressive deformities. (Carini et al., 2017) Any postural disorder can be recognized as a contributing factor to malocclusion and metabolic disorders that may disrupt overall bone growth. Recent studies suggest that malocclusion, temporomandibular joint disorders, and other oral conditions can significantly impact posture, craniofacial development, and even systemic health. Emerging scientific research has highlighted the dynamic interplay between these systems, revealing its influence not only on facial aesthetics but also on overall well-being. The intricate connection between oral and skeletal structures has long intrigued clinicians and researchers. These insights are driving a shift toward more integrated and holistic treatment approaches, emphasizing the importance of both dental and skeletal health in order to get an optimal patient outcomes. (Kui et al., 2024; Manfredini et al., 2012; Pokhrel, 2024; Šidlauskienė et al., 2015; Sofyanti et al., 2020; Wu et al., 2023)

The correlation between dental occlusion and posture has been a topic of clinical interest for years, though it remains controversial due to the lack of clear cause-and-effect evidence. There are several key theories including neuromuscular, craniomandibular, and biomechanical theories. (Różańska-Perlińska et al., 2024; Sofyanti et al., 2020; Wu et al., 2023)The debate is still not over and therefore further studies are necessary to be able to confirm one or the other argument about anatomical and physiology of overall postural components. (Manfredini et al., 2012; Pokhrel, 2024) One theory suggests a neuromuscular link, where a misaligned bite leads to compensatory postural adjustments, such as head tilting or body shifting to maintain balance, caused by abnormal muscle tension or jaw asymmetry. Another theory related to craniomandibular patterns posits that jaw disorders influence head and neck positioning, potentially leading to discomfort or dysfunction due to forward head posture or shoulder height compensation resulting from poor bite alignment. This condition may cause secondary effects on the cervical spine, shoulder region, and temporomandibular joint dysfunction. From a biomechanical perspective, the jaw and spinal column are connected through muscular and ligamentous chains, meaning that changes in one area can gradually affect others. (Cuccia & Caradonna, 2009; Kui et al., 2024; Pokhrel, 2024; Šidlauskienė et al., 2015)

The interaction between occlusion and posture influences skeletal structure and muscle tone control is unique. The periodontal ligament mechanoreceptors mediator in biomechanical signalling pathway. (Cuccia & Caradonna, 2009; Omar et al., 2023b) For instance, a strong correlation has been found between kyphotic posture and nasopharyngeal obstruction in pre-orthodontic patients aged 7–14 years, with kyphotic posture linked to a lower mandibular angle relative to the cranial base. (Šidlauskienė et al., 2015) Additionally, a cross-sectional study of Spanish children aged 6–9 years found that the Clarke angle decreased with development, while the Foot Posture Index (FPI) increased from Angle classification Class I to Class III. (Marchena-Rodríguez et al., 2018) These findings underscore the necessity of considering developmental asymmetry in clinical evaluations, emphasizing its importance as part of comprehensive orthodontic diagnostic procedures (Baldini, 2010; Omar et al., 2023a; Pokhrel, 2024; Shrivastava et al., 2018; Sofyanti et al., 2020; Stancker et al., 2015)

Advancements in diagnostic tools and imaging technologies have progressively delved our understanding of the impact of oral health on overall skeletal and human body development. However, previous studies in Indonesia sub-population about malocclusion and posture are still limited. A poor correlation between sagittal jaw discrepancies based on radiography and angle of trunk rotation among young adult orthodontic patients. (Sofyanti et al., 2021) A significant difference between the incidence of malocclusion in midline shift and body posture was reported among Surabaya sub-population teenagers. (Parmasari et al., 2025) Even though relationship between malocclusion and posture is complex and not

fully established, this study provided additional evidence of a potential link between malocclusion and scoliosis. It emphasizes the importance of early screening by dentists and orthopedists to detect both conditions promptly, helping to prevent severe progression that could necessitate extensive treatment or even surgery. (Saccomanno et al., 2023) These premises shape individuals' reactions, perceptions, attitudes, and behaviours. Evidence-based scientific data that have been tested for validity and reliability can influence a person's perception and subsequent decisions regarding orthodontic treatment. (Kieu & Senanayake, 2023; Montemayor & Haladjian, 2017; Narangerel et al., 2022)

Perception is a complex process shaped by experience, cognition, and emotions, influencing how individuals interpret information from their surroundings. The acceptance and understanding of these concepts among orthodontists play a significant role in advancing orthodontic science, driven by patient expectations and available infrastructure. (Kieu & Senanayake, 2023; Montemayor & Haladjian, 2017) Variations in knowledge and experience can impact professional perspectives, which in turn may affect the content and quality of orthodontic curricula. Orthodontists' perceptions are particularly important, as they contribute to shaping policies that influence dental practice across various countries. (Narangerel et al., 2022; Saccomanno et al., 2023; Sambataro et al., 2019) Research assessing similarities in perception is crucial to emphasizing the importance of an interdisciplinary approach to preventive orthodontic care, which is essential for enhancing the quality of life for patients with malocclusion. This cross-sectional study aims to analysis the Indonesian orthodontists' perceptions in response about malocclusion and posture (both oral and body posture) relationship based on gender and years of professional experience as orthodontist.

2. Method

This cross-sectional study has been approved by the Universitas Sumatera Utara Medical Faculty of Health Research Ethics Commission / Adam Malik Teaching Hospital (21/KEPK/USU/2023). These questionnaires were assessed in terms of five-step Likert scale in positive statement (1 ⟶ 5= very disagree ⟶ very agree). Prior to obtaining valid and reliable these online questionnaires, Pearson correlation and Cronbach's alpha analyses have been conducted to 30 active Indonesian orthodontists. Table 1 presents a questionnaire comprising seven main domains of theoretical perceptions. The first theory suggests that physiological process of swallowing correction to the cranio-cervico-facial tension and posture balancing. (Scoppa & Pirino, 2019) The second theory indicates a relationship between tongue position and anterior open bite malocclusion. (Assaf et al., 2021) The third theory proposes a connection between changes in head posture (such as forward head posture) and skeletal malocclusion. (Zokaitė et al., 2022) The fourth theory describes a relationship between spinal deformity and the position of the mandible relative to the cranial base plane in the anteroposterior direction. (Šidlauskienė et al., 2015) The fifth theory identifies an association between scoliosis and the development of unilateral posterior crossbite. (Sambataro et al., 2019) The sixth theory suggests a link between different mandibular positions and gait stability. (Šidlauskienė et al., 2015) The seventh theory highlights an association between foot posture (pronation) and Class III Angle malocclusion. (Marchena-Rodríguez et al., 2018)

In this study, the non-random convenience sample study distributed valid and reliable questionnaires via whatsapp application link to active Indonesian orthodontists from various regions who attended the Jakarta Orthodontic Meeting in November 2023. The level of significance validity test with Pearson correlation item showed the seven main domains of questionnaires were valid and the reliability test with Cronbach alphas also reliable. Levene's test was performed to analyze the homogeneity of variance in gender and years of experience as orthodontist as a prerequisite for the MANOVA (Multivariate Analysis of Variance) test, with statistical significance set at $p < 0.05$, using SPSS version 29.0.

Table 1. The Questionnaires in Agreement of orthodontists' Perceptions about malocclusion and postural in Diagnosis.

1.	What is your level agreement in understanding the theory about physiological process of swallowing related to the cranio-cervico-facial tension and posture balancing?(Scoppa & Pirino, 2019)
2.	What is your level agreement in understanding the theory about there is a relationship between tongue position and anterior open bite malocclusion(Assaf et al., 2021)
3.	What is your level agreement in understanding the theory about relationship between changes

	in head posture (forward head posture) and skeletal malocclusion.(Zokaitė et al., 2022)
4.	What is your level agreement in understanding the theory about there is a relationship between spinal deformity and the position of the mandible against the plane of the base of the cranii (in the Antero posterior direction).(Šidlauskienė et al., 2015)
5.	What is your level agreement understanding the theory about association between scoliosis and the development of unilateral posterior crossbite.(Sambataro et al., 2019)
6.	What is your level agreement in understanding the theory about relationship between spinal deformity and the position of the mandible against the plane of the base of the cranii (in the antero posterior direction).(Šidlauskienė et al., 2015)
7.	What is your level agreement in understanding the theory about there is an association between foot posture (pronation) and class III Angle malocclusion.(Cabrera-Domínguez et al., 2021; Marchena-Rodríguez et al., 2018; Rothbart, 2008; Różańska-Perlińska et al., 2023)

3. Result and Discussion

There were 214 Indonesian orthodontist who were willing to participate in this study and has completed the demographic information (gender, regional practice, and duration of practice as orthodontist) and perception questionnaires about relationship malocclusion and posture (oral and body). Figure 2 presents a visualization of the Likert scale illustrating the relationship between malocclusion and posture (oral and body), ranging from "strongly disagree" to "strongly agree." Table 2 reported that there was no significant difference of malocclusion and posture (oral and body) perception by gender (p=0.417). Table 3 also demonstrated that the significance level of malocclusion and posture (oral and body) perception by years of professional experience as orthodontist was no difference (p=0.182).The findings from the conducted research on the adaption of the questionnaire form the basis of this analysis. The reliability assessment was conducted by administering questionnaires to identical respondents on two separate occasions.

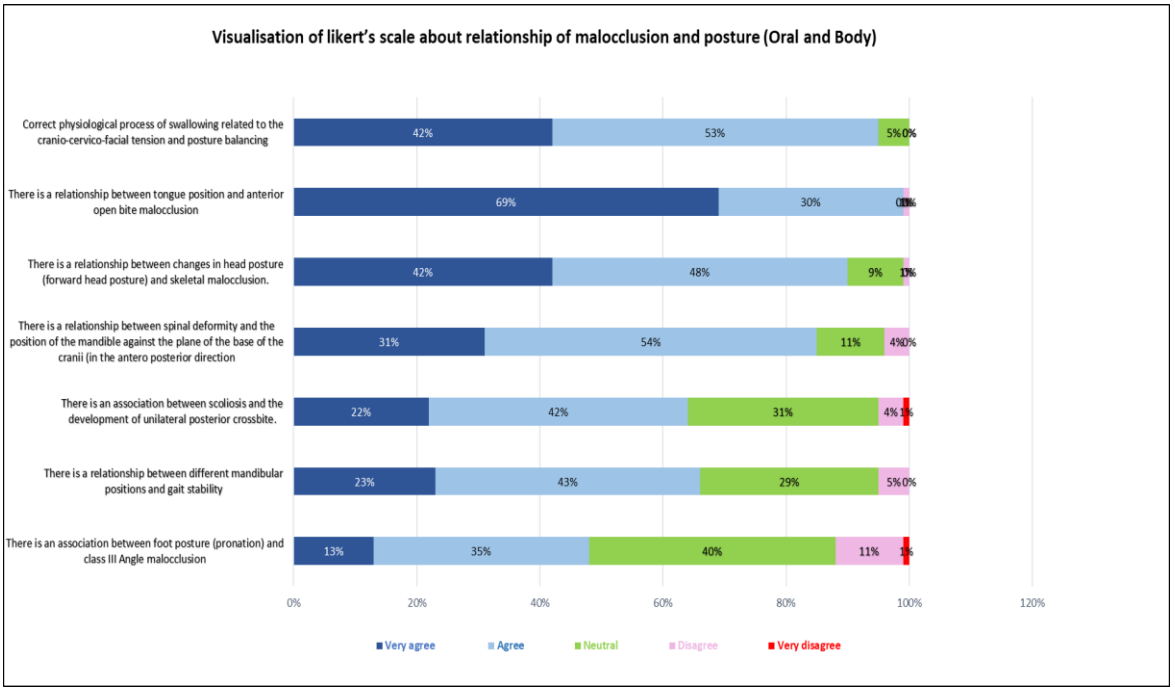

Figure 1. Visualisation of Likert's scale about relationship of malocclusion and posture (Oral and Body)

Table 2. Significance level of malocclusion and posture (oral and body) perception by gender.

Gender	**Practice Duration**	**N**	***Perception***		
			Mean±SD	**Range**	***p***
Male	<5 year	13	4.06±0.62		
	5 to 10 year	20	4.19±0.39		

	10 to 15 year	9	4.00±0.60	4.07±0.57	
	15 to 20 year	0	0		
	>20 year	3	3.57±1.24		
Female	<5 year	63	4.12±.0.51		0.42
	5 to 10 year	60	4.13±0.45		
	10 to 15 year	31	3.97±0.58	4.09±0.52	
	15 to 20 year	7	4.29±0.83		
	>20 year	8	3.96±0.549		
TOTAL		214			

Note: *) $p<0.05$: significant (Wiks Lambda)

Table 3. Significance level of malocclusion and posture (oral and body) perception by years of professional experience as orthodontist.

Years of professional experience as orthodontist	**N**	***Perception***		
		Mean±SD	**Range**	***p***
<5 year	76	4.11±0.52	4.09±0.74	0.18
5 to 10 year	80	4.15±0.43		
10 to 15 year	40	3.97±0.58		
15 to 20 year	7	4.29±0.83		
>20 year	11	3.86±0.74		

Note: *) p<0.05: significant (Wiks Lambda)

The influence of dental occlusion on body balance has been extensively studied and remains a topic of debate among orthodontic professionals today. This study builds on previous research recommendations to identify core principles based on public perception, integrating insights from visual and social experiences to develop a deliberative and dynamic curriculum renewal model. As malocclusion and individual posture affect physical appearance and aesthetics, the findings of this study hold promise for enhancing the curriculum content for orthodontic clinical care.

The first and second theory informed that tongue can be regarded as a diaphragm that connects the anterior and posterior muscle chains due to the predominantly transversal arrangement of its fibers at the functional level. The muscular tone of these chains is well-balanced due to the correct posture of the tongue and physiological deglutition by ensuring proper coordination of mouth, throat, and neck muscles. This mechanism may lead to correct the physiological process of swallowing harmonizes the balance of cranio-cervico-facial tension and posture. The correct physiological process of swallowing helps harmonize cranio-cervico-facial tension and overall body posture by ensuring coordinated muscle activation in the face, jaw, neck, and spine. Efficient swallowing minimizes muscle imbalances and prevents tension in the cranio-cervico-facial region, which directly contributes to better alignment and osteopathic medicine posture throughout the body. Therefore, the clinician's goal is to restore the patient's homeostasis, and we believe that this task is more concrete if the patient is approached after understanding all the contractile districts, including the tongue. (Bordoni et al., 2018; Cuccia & Caradonna, 2009; Nakamura et al., 2021; Omar et al., 2023; Scoppa & Pirino, 2019) The tongue's tip exerts pressure on the anterior palate in conjunction with transmitting force to the sphenoid rostrum through the vomer. Although this force is relatively weak, it plays a vital role in subtly mobilizing the sphenoid. (Assaf et al., 2021) This process is essential for activating the spheno-basilar synchondrosis and facilitating a natural rhythmic cranial impulse. Misalignment of the tongue due to malocclusion may contribute to head and neck disorders, ultimately affecting overall postural balance. (Bordoni et al., 2018; Gutiérrez et al., 2021; Omar et al., 2023b)

The third, fourth, and fifth theories were supported by previous findings that indicated an association of cervical inclination and head upright position to the posterior position of the mandible which is important in growth and development issue. (Pradeep et al., 2021; Sofyanti et al., 2020; Zokaitė et al., 2022) Even though previous clinical studies reported a weak correlation between anteroposterior malocclusion and spinal alignment related to overall body posture (Kerbrat et al., 2022; Manfredini et al., 2012; Sofyanti et al., 2021), these theories align with other researches that identified significant differences in maxillary and mandibular inclination relative to the spinal column in children with skeletal malocclusion. Cervical posture appears to be closely linked to both the sagittal and vertical dimensions of

the face. (D'Attilio et al., 2005; Kui et al., 2024; Pokhrel, 2024; Różańska-Perlińska et al., 2024) Moreover, some cross-sectional orthodontic studies have also indicated about relationship between scoliosis and malocclusion with transversal asymmetry presence, such as: mandibular deviation and midline shifting. (Oetomo et al., 2021; Parmasari et al., 2025) Since this study related to growth and development issue, this discrepancy may be attributed to limitations in advance of diagnostic tools and the presence of other stomatognathic disorders, such as: nasopharyngeal obstruction and temporomandibular dysfunction/disorder.3,10,13,35 Moreover, previous studies have reported that crossbite becomes more prevalent as scoliosis progresses, with a statistically significant relationship between unilateral crossbite and spinal curve deviation on the opposite side in individuals with scoliosis. (Sambataro et al., 2019; Zhou et al., 2013).

The sixth and seventh theory described that analysis static and dynamic of foot posture related to skeletal and dental malocclusion. (Nowak et al., 2023) Previous studies also reported about correlation between skeletal malocclusion based on mandibular position whilst dental based on molar permanent classification with foot posture.(Cabrera-Domínguez et al., 2021; Marchena-Rodríguez et al., 2018; Nowak et al., 2023; Pérez-Belloso et al., 2020; Pradeep et al., 2021; Rothbart, 2008; Różańska-Perlińska et al., 2023; Rothbart, 2008) As shown in Figure 8, some respondents strongly disagreed with the fifth and seventh theories. This indicates that orthodontists acknowledge malocclusion as a dynamic process and should be examined along with poor habitual posture, standing posture, and gait patterns. However, existing evidence remains limited in establishing a direct cause-and-effect relationship in scoliosis and foot posture index. Instead, previous studies have suggested that asymmetrical occlusion and temporomandibular disorders may serve as more relevant diagnostic indicators than body sway. (Perinetti et al., 2010; Sofyanti et al., 2024)

Incorporating posture assessment into comprehensive orthodontic evaluations and early treatment may lead to more accurate diagnoses, particularly in malocclusion with temporomandibular joint dysfunction/disorder and orthognathic case. As presented in Table 2 and Table 3, there were no significant differences of orthodontists' perceptions in relationship between malocclusion and posture (both body and oral) across gender ($p=0.42$). It was also no significant differences of orthodontists' perceptions in relationship between malocclusion and posture (both body and oral) across years of professional experience as orthodontist ($p=0.18$). These findings suggest that integrating this topic into the orthodontic curriculum for referral diagnosis and determine the prognosis may be beneficial. It also implied the importance of continued research to identify additional variables associated with oral dysfunction and the long-term stability of orthodontic treatment. (Assaf et al., 2021)

The modified questionnaire items were derived from previous theoretical studies suggesting a potential relationship, although this connection has not been explicitly confirmed in orthodontics standard examination procedure. This study is limited by potential selection bias and its cross-sectional design, which allows for the identification of associations but not causal relationships. While the use of a non-random convenience sampling method in this study seems limit the sample's representativeness, as long as the survey was conducted to generate hypotheses rather than establish causal relationships during an orthodontist meeting forum, so relying on participants' willingness could mitigate this limitation. The longitudinal studies among orthodontists for further investigate causal relationship posture in malocclusion may provide a stronger foundation for orthodontic diagnostic assessments and clinical referrals. Additionally, incorporating postural assessments—both oral and bodily—into the diagnostic process for orthodontic patients could enhance comprehensive treatment planning. To support this integration, high-quality evidence from longitudinal cohort studies is necessary to establish the value of posture examinations in orthodontic evaluations.

4. Conclusion

There was no significant interaction between gender and perception ($p=0.417$), nor between years of professional experience as an orthodontist and perception ($p=0.182$) regarding the relationship between malocclusion and posture. Since this survey-based analytical study found no interaction between gender and years of professional experience in orthodontists' agreement on the premise, these findings should be considered when updating the standard operating procedures curriculum for orthodontic diagnosis and multidisciplinary orthodontic approaches.

5. Acknowledgement

We would also like to thank the active members of the Indonesian Association of Orthodontics who kindly willing to participate as respondents.

6. Funding

This work was partially supported by the World Class University Program Funding Research from Universitas Sumatera Utara (No.36//UN5.2.3.1/PPM/KP-WCU/2022).

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