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Impact of Early Malocclusion on The Oral Health Related Quality of Life Among Children with Mixed Dentition and Their Parents in Chhattisgarh – A Case Control Study

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Abstract

Objective: This case-control study was designed to evaluate the impact of early malocclusion oral health–related quality of life (OHRQoL) among children aged 7–12 years and their parents/caregivers in Rajnandgaon district, Chhattisgarh and also to evaluate impact of mixed dentition malocclusion in parents of these children.

Settings and Design: A community-based case-control study conducted among children from urban and rural regions of Rajnandgaon.

Methods and Material: A total of 200 subjects (100 cases with definite orthodontic treatment need and 100 with no definite need of orthodontic treatment[control]) and their caregivers were included. Malocclusion was assessed using the Modified Index of Orthodontic Treatment Need (mIOTN). OHRQoL was evaluated using the prevalidated and pretested Child Perception Questionnaire ($CPQ_{8–10}$) and Parent–Caregiver Perception Questionnaire (P-CPQ). This study was registered under the Clinical Trials Registry of India (CTRI/2025/05/086436).

Results: Children with malocclusion demonstrated significantly higher $CPQ_{8–10}$ and P-CPQ scores compared to controls ($p < 0.001$), indicating poorer OHRQoL. Functional limitations, emotional well-being, and social well-being were the domains notably affected. Multiple linear regression analysis revealed that orthodontic treatment need was the strongest independent predictor of OHRQoL across all domains and total score ($p < 0.001$).

Guardian education and area of residence significantly influenced emotional wellbeing.

Conclusions: Early malocclusion has a significant negative impact on the quality of life of children and their caregivers. Early diagnosis and timely orthodontic intervention are essential to improve OHRQoL.

Keywords: Malocclusion, OHRQoL, Mixed dentition, $CPQ_{8–10}$, P-CPQ, Orthodontic Treatment Need, Children, Caregivers

Introduction

Malocclusion is a common oral health problem that can affect not only dental function and aesthetics but also the psychological and social well-being of children. These findings highlight the critical role of early diagnosis and timely intervention in reducing the negative consequences of malocclusion on oral health and overall quality of life. Apart from aesthetic concerns, early malocclusion may cause functional problems such as impaired mastication, speech difficulties, and a higher risk of dental trauma and caries.[1] Its effects are not limited to physical health but also extend to psychological well-being and social interactions. [2,3] In children, perceptible dental irregularities can lead to diminished self-esteem and unfavourable peer perceptions. Consequently, these factors can adversely affect oral health–related quality of life (OHRQoL), which includes functional, emotional, and social aspects of well-being. Furthermore, parents and caregivers may also experience emotional distress and financial burden due to concerns regarding their child's oral health. Therefore, a comprehensive understanding of OHRQoL is essential for informed clinical decision-making, identification of treatment needs, and effective implementation of public health strategies.

Although the prevalence and clinical features of malocclusion have been widely studied, its impact on OHRQoL—particularly in younger children and their caregivers—remains less explored, especially in specific regional populations. Limited data are available from central India, and to date, no study has specifically assessed this relationship in children from Rajnandgaon district, Chhattisgarh.

Therefore, the present study was undertaken to evaluate the impact of early malocclusion on the OHRQoL of children aged 7–12 years and their parents/caregivers. Understanding this relationship will help in identifying treatment needs, prioritizing early orthodontic interventions, and guiding public health strategies aimed at improving overall oral health and quality of life

Materials and Method

A case control study was conducted to evaluate and compare oral health–related quality of life (OHRQoL) among children with early malocclusion of varying degrees, along with their parents/caregivers, in Rajnandgaon district, Chhattisgarh. Prior to the commencement of the study, ethical approval was obtained from the Institutional Ethics Committee of Chhattisgarh Dental College and Research Institute (EC/NEW/INST/2020/1034), and the study was registered under the Clinical Trials Registry of India (CTRI/2025/05/086436). This study was carried out in accordance with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines (Figure 1).[4] The sample size was determined using an appropriate statistical formula,

$$n = 2\frac{S^2(Z1 + Z2)^2}{(M1 - M2)^2}$$

With confidence interval is set at 95% and probability of alpha error (level of significance) set at 5% also power of the study set at 80%. A minimum sample size of 200 was calculated. All eligible participants and their parents/caregivers were provided with oral and written

information regarding the objectives and procedures of the study in a language they could understand (Hindi/English). They were assured of confidentiality and anonymity. Only those children whose caregivers provided written informed consent and who assented to participate were included in the study. Children aged 7–12 years in the mixed dentition phase, with fully erupted permanent central incisors and first permanent molars, and residing in the study area with their parents/caregivers were included. Participants who were cooperative during examination and questionnaire administration were enrolled in the study.

Children with a history of orthodontic treatment, dental trauma, congenital anomalies, or physical/mental disabilities were excluded. Participants were selected from both urban and rural areas using a convenient random sampling technique. The children along with their caregivers who were enrolled were then categorized into two groups based on modified index orthodontic treatment need: a case group comprising children with definite need for orthodontic treatment and a control group comprising those with malocclusion but without definite need of orthodontic treatment.

The primary outcome of the study was oral health–related quality of life (OHRQoL) of children and their caregivers, assessed using the Child Perception Questionnaire ($CPQ_{8–10}$) and the Parent–Caregiver Perception Questionnaire (P-CPQ), respectively. Child Perception Questionnaire for 8-10 y/o (CPQ_{8-10}) structurally comprises of 25 items distributed under four dimensions namely Oral Symptoms (OS), Functional limitations (FL), Emotional well-being (EW), Social well-being (SW). Each domain consists of the following number of questions: oral symptoms - 5 questions; functional limitations - 5 questions; emotional well-being - 5 questions; and social well-being - 10 questions. On the contrary Parent - Caregiver Perception Questionnaire comprises of 31 items distributed under four different domains similar to that of the CPQ_{8-10}. The domains consist of: Oral symptoms (six questions), Functional limitations (eight questions), Emotional well-being (seven questions) and social well-being (ten questions). The scales for both the questionnaires have five rating response options to record how often an event has occurred in the life of a child: 0 = Never 1 = Once - twice 2 = Sometimes 3 = Often 4 = Every day. CPQ_{8-10} and P-CPQ scores are calculated as a simple sum of the response codes. CPQ_{8-10} scores range from 0 (no impact) to 100 (maximum impact) same goes for the P-CPQ depending on the number of questions in the questionnaire. Higher the CPQ_{8-10} / P-CPQ value, the greater the negative impact of the condition on the OHRQoL of child and their caregivers. Both the questionnaires were self-administered to the subjects as well as their caregivers, and sufficient time was given to answer the questions. The main exposure variable was the presence of early malocclusion, determined by orthodontic treatment need. Additional variables included age, gender, area of residence, socioeconomic status, and education level of caregivers, which were considered as potential predictors and confounders, while socioeconomic status and area of residence were also evaluated as possible effect modifiers. Socioeconomic status was categorized according to the Kuppuswamy Scale (2025), and area of residence was classified as urban or rural for subgroup and regression analyses.

Malocclusion and orthodontic treatment need were assessed using the Modified Index of Orthodontic Treatment Need (mIOTN), incorporating both the Dental Aesthetic Component and Dental Health Component. With Grade 1-7 classified into no definite need for treatment (control group) and Grade 8-10 segregated into

definite need for treatment group (case group) along with Dental Health Component of the same scale. Clinical oral examinations were performed using standard instruments under adequate illumination, and measurements were recorded using a William's graduated periodontal probe and vernier callipers following standardized criteria. Sociodemographic information was obtained using a structured proforma, and socioeconomic status was assessed using the Modified Kuppuswamy scale (2025).

To ensure comparability, identical examination procedures and validated assessment tools were used for the groups under similar conditions. Efforts were made to minimize bias by applying strict inclusion and exclusion criteria, using standardized diagnostic and assessment methods, and ensuring uniform data collection by a single trained examiner. Furthermore, potential confounding variables were controlled through adjusted multiple linear regression analysis.

All data were entered and analysed using the Statistical Package for the Social Sciences (SPSS), version 26.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics were generated for all study variables. Continuous variables are presented as mean ± standard deviation (SD), while categorical variables are expressed as frequencies and percentages for clarity. To identify independent predictors of oral health–related quality of life (OHRQoL), adjusted multiple linear regression analyses were performed separately for $CPQ_{8–10}$ and PPQ domain scores and total scores. The dependent variables included all the four dimensions and total score of both CPQ_{8-10} and P-CPQ. The independent variables entered into the models were that of gender, area of residence, socioeconomic status, Education level of guardian, orthodontic treatment need. Regression coefficients (β), 95% confidence intervals (CI), and p-values were reported. Variables with $p < 0.05$ were considered statistically significant predictors.

Result

A total of 200 children aged 7–12 years and their caregivers were included in the study following screening based on inclusion and exclusion criteria. The mean age of the children was 8.52 ± 1.73 years, while the mean age of the parents/guardians was 34.65 ± 4.46 years. The study population comprised 112 males (56%) and 88 females (44%). The majority of participants belonged to rural areas (119; 59.5%), with the remaining from urban areas (81; 40.5%). In terms of socioeconomic status, most participants were from the upper-lower class (102; 51%) and lower-middle class (66; 33%), while fewer belonged to the upper-middle (15; 7.5%) and lower socioeconomic classes (17; 8.5%). The study sample was equally divided into case (100; 50%) and control groups (100; 50%) based on the degree of early malocclusion according to mIOTN, respectively. All enrolled participants completed the study and were included in the final analysis (Table 1).

Item-wise analysis of CPQ_{8-10} and P-CPQ revealed significantly higher scores in the case group across almost all domains, indicating poorer oral health–related quality of life (OHRQoL) among children with malocclusion. Statistically significant differences ($p < 0.001$) were observed in oral symptoms, functional limitations, emotional wellbeing, and social wellbeing items, except for minor variations in specific items.

Domain-wise analysis further confirmed these findings (Table 2). The mean scores for oral symptoms, functional limitations, emotional wellbeing, and social wellbeing were significantly higher in the case group compared to controls ($p < 0.001$ for all). The total $CPQ_{8–10}$ score was also markedly elevated in the case group (2.73 ± 0.23) compared to the control group (0.13 ± 0.23), indicating a

substantial negative impact of malocclusion on children's OHRQoL.

Similarly, P-CPQ item-wise analysis demonstrated significantly higher scores in the case group for nearly all items, reflecting greater and apt perception of impact on child's quality of life by caregiver. Most differences were highly statistically significant ($p < 0.001$), except for probability of child to experiance mouth sores and difficulty in eating or chewing hot or cold food, which showed no significant difference. Domain-wise comparisons for the same (Table 3) revealed significantly higher mean scores in the case group for oral symptoms, functional limitations, emotional wellbeing, and social wellbeing ($p < 0.001$). The total P-CPQ score was also significantly greater in the case group (2.58 ± 0.23) compared to controls (0.12 ± 0.20), indicating a pronounced caregiver-perceived impact.

Multiple linear regression analysis revealed that orthodontic treatment need was the strongest independent predictor of OHRQoL across all domains and total score ($p < 0.001$). It showed significant negative associations with oral symptoms ($\beta = -1.475$), functional limitations ($\beta = -2.274$), emotional wellbeing ($\beta = -3.018$), social wellbeing ($\beta = -3.121$), and total score ($\beta = -2.602$). In contrast, gender, area of residence, socioeconomic status, and guardian education were not significantly associated with $CPQ_{8–10}$ domain scores or total score ($p > 0.05$), indicating minimal confounding effects of these variables (Table 4).

Regression analysis for P-CPQ scores also identified orthodontic treatment need as the most significant predictor across all domains and total score ($p < 0.001$) (Table 5). Additionally, socioeconomic status showed a significant association with oral symptoms ($\beta = 0.425$) and emotional wellbeing ($\beta = -0.730$). Guardian education and area of residence significantly influenced emotional wellbeing. Gender did not show a significant association with any PPQ domain or total score.

Discussion

In the current study, individuals aged 7 to 12 years old with malocclusion (DAI 7-10) had a significantly greater negative impact on their OHRQoL (measured using CPQ_{8-10}[5] and P-CPQ[6]) than those with less severe forms of malocclusion. Also, children with malocclusion that necessitated immediate orthodontic treatment experienced more significant psychosocial effects on their daily lives than those with lower DAI scores. The outcomes are in line with the existing literature and systematic reviews that have shown negative impact of malocclusion on children's OHRQoL. [7,8]

Study by Piassi et al. focused on children of very same age group in the mixed dentition stage using the CPQ_{8-10} indicated that there were no statistically significant differences between the level of severity of malocclusion identified by the Dental Aesthetic Index (DAI) and the children's reported oral health-related quality of life. Additionally, their study observed no correlation between a family's socioeconomic status and the presence of malocclusion.[9] In the present study the P-CPQ multiple regression analysis had a conclusion similar to Sardenberg et al.[10] stating that socioeconomic status and guardian education showed significant associations with emotional wellbeing, suggesting that parental awareness, expectations, and coping mechanisms may influence how emotional impacts are perceived and managed. Children from lower socioeconomic backgrounds or with less educated caregivers may face additional psychosocial stressors, limited access to dental care, and reduced health literacy, which can exacerbate emotional distress related to oral health problems. These findings highlight the need for holistic management approaches that consider not only the child's clinical condition but also

the family's social context. From a clinical standpoint, these findings emphasize the importance of early screening and interceptive orthodontic measures to alleviate discomfort and prevent progression of symptoms. Addressing malocclusion at an early stage may contribute not only to improved oral health but also to enhanced daily comfort for the child.

Similarly, Martins Junior et al. [11] found that malocclusion of more severe forms leading to greater impairment adversely affected the quality of life of children aged 8–10 years, with, particularly in social, emotional, and functional dimensions aligning with the findings of our study where functional limitations domain, the case group recorded a mean score of 2.40 ± 0.71, while the control group showed a mean score of 0.13 ± 0.23 whereas the emotional wellbeing domain demonstrated a mean score of 3.16 ± 0.50 wit in the case group, compared to a mean score of 0.16 ± 0.30. Thus the intergroup difference was statistically significant ($p < 0.001$) for these domains. Evidences suggest, around eight years of age children begin to understand how poor oral health can influence their social interactions, aligning with key psychosocial developments during childhood.[12] As they transition into adolescence — social relationships become increasingly significant, reaching a peak after early adolescence and stabilizing thereafter. Adolescents with common malocclusions are often at greater risk for reduced self-esteem and challenges in social adjustment. Additionally, bullying is frequently reported as a social outcome associated with malocclusion.[12] Similarly, the social wellbeing dimension showed a negative effect in the case group in our study with difference between the two groups was statistically significant ($p < 0.001$) with three cases of bullying being reported among the subjects of case group as a social outcome associated with malocclusion. Although not always directly linked to malocclusion itself, studies note that CPQ scores are correlated with anxiety and depressive symptoms in children with oral health issues, reinforcing the psychological overlap between oral conditions and mental wellbeing.[13]

On the contrary, according to our findings parental perception of malocclusion is a critical determinant in this time frame, as parents play a central role in decision-making related to orthodontic care. Their attitudes and beliefs significantly influence the initiation, acceptance, and continuation of orthodontic treatment. Understanding parental perspectives regarding their child's malocclusion is therefore essential to ensure treatment compliance and to support the long-term maintenance of the child's oral health. However, parents' awareness and interpretation of their children's esthetic concerns, particularly during the mixed dentition period, remain insufficiently understood. A clear understanding of parental expectations is necessary to foster effective cooperation and to avoid compromising both treatment adherence and orthodontic outcomes.[14]

The regression analysis revealed that orthodontic treatment need was the strongest predictor of emotional wellbeing scores in both $CPQ_{8–10}$ and P-CPQ. Additionally, significant association between orthodontic treatment need and psychosocial dimension in this study is consistent with existing evidence indicating that aesthetic concerns and peer interactions play a crucial role in determining oral health–related quality of life (OHRQoL) among children. The present findings further broaden this understanding by situating it within an Indian context, where cultural attitudes toward dental appearance and the availability of orthodontic care may differ from those observed in Western populations.

The results of this study have important implications linking pediatric dental practice with public health

policy. Interceptive orthodontic treatment during the mixed dentition phase may prevent the progression of malocclusion, reduce functional and psychosocial burdens, and enhance self-esteem and social integration. From a public health perspective, incorporating OHRQoL assessments into routine dental screening programs can help identify children who may benefit most from early intervention.

The use of standardized and validated assessment tools, namely the Child Perception Questionnaire ($CPQ_{8–10}$) and the Parent–Caregiver Perception Questionnaire (P-CPQ), enhances the reliability and comparability of the results with other studies conducted in similar age groups. Additionally, the inclusion criteria ensured a relatively homogeneous sample in terms of developmental stage (mixed dentition), thereby supporting the applicability of the findings to children within this specific age bracket. Furthermore, the absence of condition-specific instruments designed exclusively for individuals with malocclusion represents a limitation of the $CPQ_{8–10}$ and P-CPQ questionnaires employed in this study. Nevertheless, in the absence of such specialized tools in the existing literature, a generic OHRQoL instrument was considered the most appropriate choice. However, we recommend that an OHRQoL measure specific for malocclusion should be developed as it would probably be more suitable and could achieve more specific results.

Certain methodological aspects such as study being confined to a single district, regional variations in cultural practices, access to dental care, and awareness regarding orthodontic treatment may restrict the applicability of the findings to other populations. Future longitudinal studies are required to evaluate changes in OHRQoL after orthodontic intervention.

Conclusion

Caregivers' responses on the P-CPQ closely mirrored children's self-reports, indicating that parents are generally aware of the emotional distress and daily difficulties experienced by their children due to malocclusion. Social wellbeing was the most severely affected domain, reflecting problems such as teasing, avoidance of smiling or speaking, reduced participation in social and school activities, and difficulty concentrating in class. Orthodontic treatment need emerged as the strongest and most consistent predictor of impaired OHRQoL. Socioeconomic status and guardian education had a notable association with emotional wellbeing in parent-reported outcomes. Early identification and interceptive orthodontic intervention during the mixed dentition phase have the potential to reduce functional difficulties, alleviate psychosocial distress, and improve overall quality of life.

Clinical significance: With respect to public health, incorporating OHRQoL assessments into routine dental screening programs can help identify children who may benefit most from early intervention. Also, fabrication of a scale/questionnaire specific to malocclusion to measure the OHRQoL is the need of the hour to obtain better and more specific outcomes.

List of abbreviations

OHRQoL: Oral Health Related Quality of Life

CPQ_{8-10}: Child Perception Questionnaire 8-10

P-CPQ: Parent Caregiver Perception Questionnaire

CTRI: Clinical Trail Registry of India

mIOTN: Modified Index of Orthodontic Treatment Need

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Legend Figures and Tables:

Figure 1: STROBE flow chart. (Strengthening the Reporting of Observational Studies in Epidemiology)

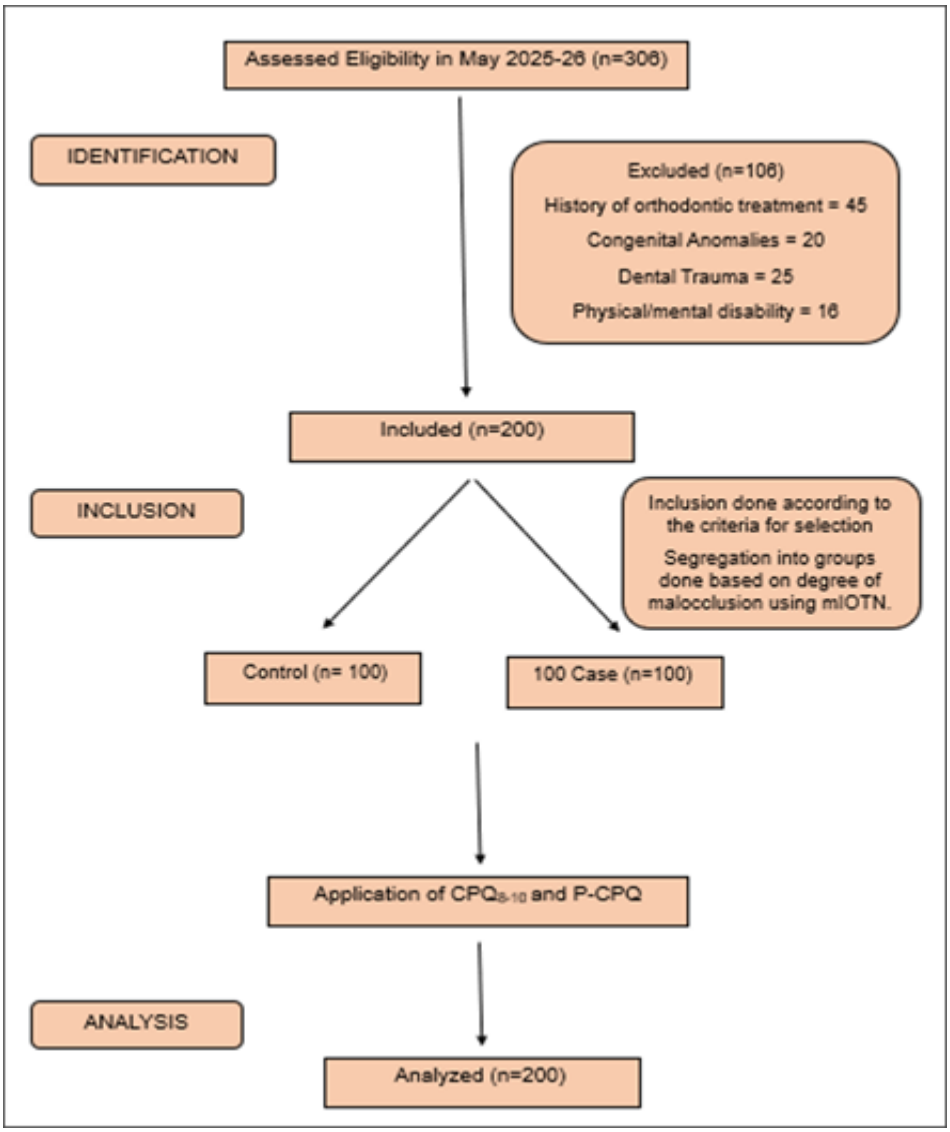

Table 1: Baseline Characteristics of Study Participants

Variable	Case Group (n=100)	Control Group (n=100)
Age of child (years)	8.73 ± 1.73	8.31 ± 1.72
Age of guardian (years)	34.90 ± 4.41	34.40 ± 4.51
Gender (Male/Female)	47 / 53	65 / 35
Residence (Rural/Urban)	60 / 40	59 / 41
Socioeconomic status		
Upper middle	7%	8%
Lower middle	32%	34%
Upper lower	47%	55%
Lower	14%	3%

Table 2: Domain-wise Comparison of CPQ8–10 scores

Domain	Case (Mean ± SD)	Control (Mean ± SD)	z-value	p-value
Oral symptoms	1.61 ± 0.36	0.13 ± 0.26	−12.47	<0.001**
Functional limitations	2.40 ± 0.71	0.13 ± 0.23	−12.53	<0.001**
Emotional wellbeing	3.16 ± 0.50	0.16 ± 0.30	−12.61	<0.001**
Social wellbeing	3.24 ± 0.35	0.12 ± 0.22	−12.57	<0.001**
Total score	2.73 ± 0.23	0.13 ± 0.23	−12.49	<0.001**

Statistical significance at p<0.05* and p<0.001** will be considered statistically highly significant

Table 3: Domain-wise Comparison of P-CPQ Scores

Domain	Case (Mean ± SD)	Control (Mean ± SD)	z-value	p-value
Oral symptoms	1.67 ± 0.38	0.16 ± 0.28	−12.42	<0.001**
Functional limitations	2.14 ± 0.67	0.06 ± 0.10	−12.55	<0.001**
Emotional wellbeing	2.63 ± 0.48	0.13 ± 0.26	−12.55	<0.001**
Social wellbeing	3.30 ± 0.37	0.13 ± 0.23	−12.54	<0.001**
Total score	2.58 ± 0.23	0.12 ± 0.20	−12.43	<0.001**

Statistical significance at p<0.05* and p<0.001** will be considered statistically highly significant

Table 4: Adjusted Multiple Linear Regression Analysis for $CPQ_{8–10}$ Total Score

Parameter	Oral symptoms	Functional limitations	Emotional wellbeing	Social wellbeing	Total score
Gender	-0.009 p=0.845	-0.035 p=0.651	-0.066 p=0.280	0.043 p=0.321	-0.005 p=0.88
Area of residence	0.114 p=0.190	0.097 p=0.516	-0.158 p=0.174	-0.081 p=0.328	-0.022 p=0.73
SES	0.357 p=0.063	0.089 p=0.775	0.428 p=0.094	0.024 p=0.894	0.013 p=0.92
Education of guardian	0.16 p=0.133	0.030 p=0.875	0.030 p=0.176	0.026 p=0.805	0.010 p=0.90
Ortho T/t need	-1.475 p<0.001**	-2.274 p<0.001**	-3.018 p<0.001**	-3.12 p<0.001**	-2.602 p<0.001**
Constant	1.073	4.168	8.726	6.238	5.288

Statistical significance at p<0.05* and p<0.001** will be considered statistically highly significant

Table 5: Adjusted Multiple Linear Regression Analysis for P-CPQ Total Score

Parameter	Oral symptoms	Functional limitations	Emotional wellbeing	Social wellbeing	Total score
Gender	-0.020 p=0.458	0.010 p=0.805	-0.001 p=0.963	-0.002 p=0.946	-0.002 p=0.88
Area of residence	0.112	0.065	-0.328	0.015	-0.009

	p=0.226	p=0.632	p=0.002*	p=0.863	p=0.88
SES	0.425 p=0.038	0.009 p=0.977	-0.730 p=0.009*	0.232 p=0.222	0.056 p=0.67
Education of guardian	0.231 p=0.054	-0.006 p=0.974	-0.357 p=0.009*	0.141 p=0.206	0.040 p=0.60
Ortho T/t need	-1.505 p<0.001**	-2.081 p<0.001**	-2.512 p<0.001**	-3.174 p<0.001**	-2.462 p<0.001**
Constant	0.730	4.101	9.451	5.144	4.715

Statistical significance at p<0.05* and p<0.001** will be considered statistically highly significant