PSYCHOSOCIAL IMPACT OF MALOCCLUSION ON ADOLESCENT PATIENTS IN KLINIK PERGIGIAN LANANG, SIBU, SARAWAK

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Abstract

Malocclusion affects dental aesthetics and a person's psychosocial well-being. Patient's perspective should be considered while assessing orthodontic treatment need. The objectives of this research were to study the psychosocial impact of dental aesthetics on adolescent patients attending Klinik Pergigian Lanang, and to determine its relationship with self-perceived need of orthodontic treatment, gender, age and race. A cross-sectional study was carried out on 167 adolescents aged 12-17 years visiting Klinik Pergigian Lanang using a self-administered questionnaire. All subjects answered all three sections of the questionnaire that included: demographic information (gender, age, race), Psychosocial Impact of Dental Aesthetics Questionnaire (Malaysian version), and the last section where they self-evaluated their own malocclusion using the Index of Orthodontic Treatment Need – Aesthetic Component. Prevalence and extent of psychosocial impacts were compared with self-perceived malocclusion status using Chi-Square and Fisher's Exact Test. Severity of impacts was compared using Independent t-Test. Mean scores between age groups and gender were compared using Independent t-Test, whereas ANOVA was used to compare mean scores between races. The overall prevalence of impacts was 95.2% (n=159). Prevalence was highest in Dental Self-Confidence domain, followed by Psychological Impact, Social Impact and Aesthetic Concern. The prevalence in Dental Self-Confidence, Social Impact and Aesthetic Concern domains were significantly higher in patients who reported self-perceived malocclusion (p<0.05). Those with self-perceived malocclusion had significantly higher severity of impacts (p<0.05). Up to 34.7% (n=58) of all subjects reported significant impact on all domains. The difference in extent of psychosocial impacts between subjects who reported self-perceived malocclusion and subjects without self-perceived malocclusion, was statistically significant (p<0.05). 62.4% of subjects with self-perceived malocclusion recorded significant impact in more than 2 domains, whereas 62.1% of subjects who did not report self-perceived malocclusion had significant psychosocial impact in 2 or less domains. Female subjects obtained statistically significant higher mean total scores, and scores for Social Impact and Psychological Impact domains (p<0.05). Higher mean total score in older adolescents was not statistically significant (p=0.151). The effect of race on psychosocial impact was not statistically significant (p=0.101). In conclusion, the prevalence, severity and extent of psychosocial impact of malocclusion on adolescent patients visiting Klinik Pergigian Lanang were high. Those with self-perceived malocclusion had significantly higher severity of impacts.

Keywords: Malocclusion, Oral Health-Related Quality of Life, Orthodontics, Orthodontic Treatment Need, Questionnaire

Introduction

The word 'aesthetic' takes root from the Greek word 'aísthēsis' which means 'perceive'. Today in dentistry, this term is used to describe something that is beautiful and appealing (1). Dental aesthetics depends on numerous factors including size, shape, colour of teeth, and its arrangement in the oral cavity (2). Malocclusion, on the other hand is the deviation from normal occlusion (3, 4) and it encompasses a variety of conditions, for example crowded, spaced or severely protruded teeth. Thus, malocclusion affects dental aesthetics. In addition to the

impact on a person's appearance, malocclusion also affects daily functions such as speech and mastication.

The most common method of determining orthodontic treatment need is by using the Index of Orthodontic Treatment Need – Dental Health Component (IOTN-DHC), which is a normative need relying mainly on clinician-based indicators (5). However, studies have shown that majority of patients seek orthodontic treatment out of a concern for aesthetics, rather than health or function (6, 7). A systematic review also revealed that malocclusion negatively affects a person's psychological and social well-being, leading to poorer oral health-related quality of life (8). Thus, it is useful to incorporate an indicator that measures subjective need, i.e. patient's self-perceived dental appearance and psychosocial dimensions while assessing orthodontic treatment need.

Klages and co-workers from the University of Mainz, Germany developed the Psychosocial Impact of Dental Aesthetics Questionnaire (PIDAQ), which is a useful tool to investigate orthodontic-specific quality of life and clinically assess treatment need from the patient's perspective (3, 9). It has undergone further cross-cultural adaptation and validated in various languages e.g. Swedish (10), Arabic (11), and Portuguese (12). In 2017, Wan Hassan and co-workers translated, cross-culturally adapted and validated a bilingual (Malay and English) Malaysian PIDAQ to be used in the Malaysian population (13, 14). The translated versions were equivalent to the original PIDAQ, comprising of four domains, except that they only have 22 items in total instead of 23. The Dental Self-Confidence (DSC) domain gauges the positive influence of dental aesthetics on a person's emotion using 6 items. The Social Impact (SI) domain uses 8 items to assess problems that may arise in social settings due to subjective perception of an individual's unfavourable dental appearance. The Psychological Impact (PI) domain comprises of 6 items that deals with the inferior or unhappy feeling when a person compares themself with superior dental aesthetics. Finally, the Aesthetic Concern (AC) domain contains 2 items that assess the dissatisfaction an individual's own dental appearance when facing their own image in a mirror or photograph (9). The Malaysian PIDAQ was validated for adolescents aged 12-17 years old in the Malaysian population (13, 14).

In Malaysia, the prevalence of orthodontic treatment need determined using the IOTN-DHC was high. The study by Zreaqat et al. (15) showed that 51.4% of 12-year-old school children and 56.4% of 16-year-old school children had definite need for treatment (IOTN-DHC ≥ 4). Based on the latest guidelines issued, only patients whose IOTN-DHC scores are 4 or 5 will be accepted for orthodontic referral in government dental clinics in Malaysia (16). Often many patients who are not satisfied with their dentofacial appearance were denied orthodontic treatment just because their IOTN-DHC scores do not satisfy the criteria for referral. Therefore, it might be useful to integrate normative clinical measure with a patient-based indicator, for example the psychosocial impact of dental aesthetics (PIDA), to more appropriately assess orthodontic treatment need. This would enable oral health policy makers in Malaysia to prioritise patients who will truly benefit from orthodontic treatment, leading to rational allocation and effective utilization of dental services and resources (17).

The PIDAQ is a self-administered questionnaire assessed in a five-point Likert scale. The original PIDAQ and most translated versions have 23 items in total. Hence, the maximum score that can be obtained is 92 points, whereby higher scores indicate a more negative psychosocial impact. The usage of PIDAQ in numerous studies have revealed varying degrees of psychosocial impact in different populations across the world. For example, an Australian study using the original PIDAQ reported a mean total PIDAQ score of 28.8 among adults aged 18 and above (18). Using the Spanish PIDAQ on adolescents aged 12 to 16, a mean total score of 21.1 was obtained (7). Militi et al. reported a mean total PIDAQ score of 49.3 in their sample of dental patients in the adolescent and young adult age group (14 – 29 years) using the Italian PIDAQ (19).

This is not the first study to use the Malaysian PIDAQ. Wan Hassan et al. conducted a cross-sectional study using the Malaysian PIDAQ on 12- to 17-year-old urban schoolchildren across Malaysia. The prevalence of PIDA was reported to be 90.0%, with Psychological Impact domain being the most affected, followed closely by Dental Self Confidence, Social Impact, and finally the Aesthetic Concern domain. The mean total PIDA score was 32.6 out of 88 in Wan Hassan's study. Significant impact on all four domains was reported in 14.0% of the subjects (17). Another study conducted on young adults in Selangor found that the prevalence of PIDA was 87.8% (20).

The aim of this research is to study the psychosocial impact of dental aesthetics on adolescent patients attending Klinik Pergigian Lanang using the Malaysian PIDAQ. In view of the paucity of data in Sarawak, this preliminary study in Sibu, a town in Sarawak, provided the baseline epidemiological data for future studies which is potentially useful for specialist mapping in this region. Furthermore, the specific objectives of this research are to determine the relationship between self-perceived need of orthodontic treatment and PIDA. The research also investigated the influence of gender, age, and race on PIDA of adolescent patients in Klinik Pergigian Lanang.

Materials and Methods

Sample collection

This was a cross-sectional study involving adolescent patients aged 12-17 years old visiting Klinik Pergigian Lanang, a primary care dental clinic in Sibu, Sarawak. Subjects were recruited through convenience sampling. Certain participants were excluded, for example patients with cleft lip, cleft palate or other craniofacial deformities, patients with ongoing orthodontic treatment or previously completed orthodontic treatment, and patients who could

not understand the bilingual questionnaire. Subjects who fulfilled the inclusion and exclusion criteria then answered a self-administered questionnaire in a quiet and peaceful environment.

Sample size was calculated using the prevalence of PIDA of 0.90 obtained from Wan Hassan's study (17), 95% confidence interval, and precision of 5%, giving a sample size of 139. An additional 20% was added to compensate for missing data, leading to a total sample of 167 subjects.

The questionnaire used in the study comprised of three sections. Firstly, subjects reported their demographic characteristics (gender, age, and race). They then answered the Malaysian PIDAQ (13, 14) in the second section. The Malaysian PIDAQ contains a total 22 items expressed in 4 domains: Dental Self-Confidence (DSC) has six items, Social Impact (SI) has eight items, Psychological Impact (PI) has six items, and Aesthetic Concern (AC) has two items. The items were assessed based on a five-point Likert scale. The items in the Dental Self-Confidence domain will be scored as such: 4=not at all, 3=a little, 2=somewhat, 1=strongly, and 0=very strongly. The rest of the items in the other three domains will be scored as such: 0=not at all, 1=a little, 2=somewhat, 3=strongly, and 4=very strongly agree. In the last section, subjects self-evaluated their own malocclusion using the Index of Orthodontic Treatment Need – Aesthetic Component (IOTN-AC) (5). Ten colour photographs were shown with the explanation: "These ten photographs show different levels of dental attractiveness. Number 1 is the most attractive and number 10 the least attractive. Where on this scale would you place your teeth?". Subjects were instructed to look for an overall aesthetic impression of their current dentition, and not to focus on finding a complete match with the photos provided. A single response was recorded.

This research was approved by the Medical Research and Ethics Committee, Ministry of Health, Malaysia (NMRR-20-3099-57741) on 4th May 2021 [Ref: KKM/NIHSEC/P21-592(4)]. Data collection took place from May 2021 to December 2021. Informed consent was obtained from the parents/legal guardians, and assent was obtained from the adolescent subjects prior to data collection.

Data analysis

Data analysis was done using the IBM SPSS Statistics for Windows, Version 25.0 (SPSS V.25) (21). The prevalence of PIDA was determined by calculating the percentage of participants who obtained a score 3 or 4 in any of the items in the questionnaire, indicating a "significant impact". The severity of PIDA was calculated from the total score of all items in the questionnaire. The maximum score that can be obtained using the Malaysian PIDAQ is 88. A high PIDAQ score suggests that an individual is experiencing negative psychosocial impact due to unfavourable dental aesthetics (17). Mean and standard deviation of the PIDAQ scores were also calculated. The extent of PIDA was determined by calculating the percentage of participants with the number of domains reporting "significant impact" in at least one item (score 3 or 4). On the other hand, based on the IOTN-AC score given by subjects after rating their own malocclusion, they were categorized into those with self-perceived malocclusion (IOTN-AC score 3 or more), and those without self-perceived malocclusion (IOTN-AC score 1 or 2) (22). Demographic information including gender, age, and race were analysed. Participants were divided into two genders: male and female, and two age groups: younger adolescents 12-14 years old, and older adolescents 15-17 years old (17). The predominant races found in Sibu, Sarawak included Chinese, Malays, Iban, and Melanau, whereas the "others" category represented the remaining ethnic minorities.

Chi-Square Test and Fisher's Exact Test were used to compare the prevalence and extent of psychosocial impacts between the "self-perceived malocclusion" and "no self-perceived malocclusion" groups. The severity of psychosocial impacts between the two groups were also compared using Independent t-Test. As for the demographic factors, Independent t-Test was used to compare mean total PIDA scores between age groups and gender. ANOVA was used to compare the mean total PIDA scores between different races. The statistical significance level was established at $p<0.05$.

Results

Internal consistencies of the PIDA domains were satisfactory and consistent with previous studies using the Malaysian PIDAQ (13, 14). The Cronbach alpha values for the DSC (0.86), SI (0.92), PI (0.88) and AC (0.75) domains were within the recommended range of 0.70 and 0.95 (23).

Demographic data

Out of 167 subjects, there were more females (70.1%) than males (29.9%). The mean age was 14.9 ± 1.58 years. Almost two-thirds of the subjects were in the 15-17 years age group (65.3%). The majority of the subjects were Chinese (73.0%), followed by Iban (10.2%), Malay (9.0%), Melanau (5.4%), and others (2.4%). The demographic information of the sample is presented in Table 1.

Table 1: Demographic characteristics of the subjects

Variables	Group	n (%)
Gender	Male	50 (29.9)
	Female	117 (70.1)
Age group (years)	12-14	58 (34.7)
	15-17	109 (65.3)
Race	Chinese	122 (73.0)
	Iban	17 (10.2)
	Malay	15 (9.0)
	Melanau	9 (5.4)
	Others	4 (2.4)

Prevalence of Psychosocial Impact of Dental Aesthetics

The prevalence of psychosocial impact was determined by calculating the percentage of participants who obtained a score 3 or 4 in any of the items in the questionnaire, indicating a "significant impact". The prevalence of PIDA for the "self-perceived malocclusion" group, the "no self-perceived malocclusion" group, and for the whole sample, are listed in Table 2. The overall prevalence of PIDA of all participants in this study was 95.2% (n=159). Significantly higher prevalence of psychosocial impacts in DSC, SI and AC domains were reported in "self-perceived malocclusion" group compared to the "no self-perceived malocclusion" group (p<0.05). Though the PI domain and total PIDA and also showed higher prevalence of psychosocial impacts in the "self-perceived malocclusion" group, this finding was not statistically significant (p>0.05). Overall, the DSC domain recorded the highest prevalence of PIDA (85.6%), followed by PI (79.0%), SI (58.7%) and AC (39.5%) domains.

Table 2: Prevalence of PIDA among subjects

Variables	Overall (n=167) n (%)	Self-perceived malocclusion (IOTN-AC ≥ 3) (n=109) n (%)	No self-perceived malocclusion (IOTN-AC < 3) (n=58) n (%)	χ2 value (df)	*p*-value
Total PIDA	159 (95.2)	106 (97.2)	53 (91.4)		0.128[a]
DSC	143 (85.6)	98 (89.9)	45 (77.6)	4.67 (1)	0.031[b]
PI	132 (79.0)	91 (83.5)	41 (70.7)	3.74 (1)	0.053[b]
SI	98 (58.7)	73 (67.0)	25 (43.1)	8.90 (1)	0.003[b]
AC	66 (39.5)	54 (49.5)	12 (20.7)	13.18 (1)	<0.001[b]

[a]Fisher's Exact Test; [b]Chi-Square Test; psychosocial impact of dental aesthetics, PIDA; Index of Orthodontic Treatment Need – Aesthetic Component, IOTN-AC; Dental Self-Confidence, DSC; Social Impact, SI; Psychological Impact, PI; Aesthetic Concern, AC

Severity of Psychosocial Impact of Dental Aesthetics

The sum of the scores all items in the questionnaire represents the severity of psychosocial impact. Higher PIDAQ scores indicate a greater degree of negative psychosocial impact related to dental aesthetics. Table 3 shows the mean (standard deviation) scores for total PIDA and the corresponding domains. Mean total PIDA score was 42.1 out of a maximum score of 88. This is followed by the mean scores for each domain namely DSC 15.3, SI 12.2, PI 11.2, and AC 3.4. The table also describes the mean scores of total PIDA and its domains amongst subjects with and without self-perceived malocclusion. The "self-perceived malocclusion" group reported significantly higher score (i.e., greater severity of psychosocial impact) for total PIDA and all four domains (p<0.05).

Table 3: Severity of PIDA among subjects

Variables	Overall (n=167) Mean score (SD)	Self-perceived malocclusion (IOTN-AC ≥ 3) (n=109) Mean score (SD)	No self-perceived malocclusion (IOTN-AC < 3) (n=58) Mean score (SD)	Mean difference (95% CI)	t-value (df)	*p*-value[a]
Total PIDA	42.1 (17.8)	46.1 (17.6)	34.6 (15.8)	11.58 (6.13, 17.03)	4.193 (165)	<0.001
DSC	15.3 (5.3)	16.6 (4.9)	12.8 (5.2)	3.79 (2.18, 5.40)	4.654 (165)	<0.001
SI	12.2 (8.1)	13.5 (8.3)	9.8 (7.0)	3.67 (1.15, 6.20)	2.869 (165)	0.005
PI	11.2 (5.8)	12.2 (5.8)	9.3 (5.2)	2.89 (1.08, 4.70)	3.156 (165)	0.002
AC	3.4 (2.2)	3.9 (2.2)	2.7 (2.0)	1.22 (0.54, 1.89)	3.560 (165)	<0.001

[a]Independent t-Test, equal variances assumed; psychosocial impact of dental aesthetics, PIDA; Index of Orthodontic Treatment Need – Aesthetic Component, IOTN-AC; Dental Self-Confidence, DSC; Social Impact, SI; Psychological Impact, PI; Aesthetic Concern, AC; standard deviation, SD

Extent of Psychosocial Impact of Dental Aesthetics

The extent of psychosocial impact was determined by calculating the percentage of participants with the number of domains reporting "significant impact" in at least one item (score 3 or 4). Overall, up to 34.7% (n=58) of all subjects reported significant impact on all domains, 19.2%

(n=32) on three domains, 25.1% (n=42) on two domains, 16.2% (n=27) on one domain, and 4.8% (n=8) had no significant impact on any domains.

Table 4 shows the extent of PIDA in the "self-perceived malocclusion" group and "no self-perceived malocclusion" group. The subjects were divided into two categories, those with "2 or less domains with significant impact", and those with "more than 2 domains with significant impact". This study found that difference in extent of PIDA between the "self-perceived malocclusion" group and "no self-perceived malocclusion" group was statistically significant (p<0.05) as seen from the Chi-Square Test results. Amongst those subjects with self-perceived malocclusion, majority (62.4%) reported significant impact in more than 2 domains. In contrast, a large portion of the "no self-perceived malocclusion" group (62.1%) reported significant impact in 2 or less domains.

Table 4: Extent of PIDA among subjects

Number of domains with significant impact in ≥ 1 item	Overall (n=167) n (%)	Self-perceived malocclusion (IOTN-AC ≥ 3) (n=109) n (%)	No self-perceived malocclusion (IOTN-AC < 3) (n=58) n (%)	χ2 value (df)	*p*-value[a]
2 or less domains	77 (46.1)	41 (37.6)	36 (62.1)	9.11 (1)	0.003
More than 2 domains	90 (53.9)	68 (62.4)	22 (37.9)		

[a]Chi-Square Test; psychosocial impact of dental aesthetics, PIDA; Index of Orthodontic Treatment Need – Aesthetic Component, IOTN-AC

Influence of gender, age, and race on PIDA

Table 5 compares the mean scores obtained by male and female subjects in total PIDA and its domains. Overall, females recorded higher mean scores than males in total PIDA and in all the other domains. In total PIDA, SI domain, and PI domain, the scores obtained by females were significantly higher than males (p<0.05).

The mean score of total PIDA and its domains in younger (12-14 years) and older (15-17 years) adolescents are also shown in Table 5. Older adolescents recorded a mean total PIDA score of 43.4±19.3, which was higher than that of younger adolescents at 39.6±14.4. However, the differences in mean score for total PIDA, DSC, SI and AC domains between the younger and older age group were not statistically significant. All domains recorded a higher score in the older age group except for the DSC domain, where the younger adolescents scored higher than the older adolescents. The mean score for PI domain in the older age group was significantly higher than that of the younger age group (p<0.05).

Table 5: Effect of gender and age on PIDA

	Gender					Age				
	Mean score (SD)	Mean score (SD)	Mean difference (95% CI)	t-value (df)	*p*-value	Mean score (SD)	Mean score (SD)	Mean difference (95% CI)	t-value (df)	*p*-value
	Male (n=50)	Female (n=117)				12-14 years (n=58)	15-17 years (n=109)			
Total PIDA	36.8 (14.1)	44.4 (18.8)	7.54 (2.31, 12.78)	2.854 (122.106)	0.005[b]	39.6 (14.4)	43.4 (19.3)	3.81 (-1.41, 9.03)	1.442 (147.626)	0.151[b]
DSC	15.2 (5.3)	15.3 (5.4)	0.10 (-1.68, 1.88)	0.113 (165)	0.910[a]	16.1 (4.7)	14.8 (5.6)	-1.28 (-2.98, 0.42)	-1.485 (165)	0.139[a]
SI	9.5 (6.4)	13.3 (8.4)	3.81 (1.44, 6.18)	3.188 (120.119)	0.002[b]	10.8 (6.9)	12.9 (8.5)	2.17 (-0.40, 4.74)	1.667 (165)	0.098[a]
PI	9.0 (4.7)	12.2 (6.0)	3.19 (1.47, 4.90)	3.680 (115.527)	<0.001[b]	9.7 (4.7)	12.1 (6.2)	2.42 (0.74, 4.10)	2.841 (145.618)	0.005[b]
AC	3.1 (2.0)	3.6 (2.2)	0.44 (-0.28, 1.17)	1.202 (165)	0.231[a]	3.1 (1.9)	3.6 (2.3)	0.50 (-0.19, 1.20)	1.428 (165)	0.155[a]

[a]Independent t-Test, equal variances assumed; [b]Independent t-Test, equal variances not assumed; psychosocial impact of dental aesthetics, PIDA; Dental Self-Confidence, DSC; Social Impact, SI; Psychological Impact, PI; Aesthetic Concern, AC; standard deviation, SD

Table 6 describes the mean total PIDA score obtained by the subjects of different race groups. The effect of race on PIDA was not significant (p>0.05). Malays recorded the highest mean total PIDA score at 50.6±23.0. Whereas Chinese recorded the lowest mean total PIDA score at 40.0±16.4.

Table 6: Effect of race on PIDA

Variables	Total PIDA Mean score (SD)	F-value (df)	*p*-value[a]
Race			
Chinese (n=122)	40.0 (16.4)		
Iban (n=17)	48.4 (21.8)		
Malay (n=15)	50.6 (23.0)	1.972 (4)	0.101
Melanau (n=9)	45.8 (15.8)		
Others (n=4)	41.8 (15.7)		

[a]ANOVA; psychosocial impact of dental aesthetics, PIDA; standard deviation, SD

Discussion

To date, this is the first study that was carried out in Sibu, a town in Sarawak, to investigate the psychosocial impact of dental aesthetics. Using the Malaysian PIDAQ, previous studies carried out by Wan Hassan et al. (13, 14, 17) and Tajudin et al. (20) were largely based on subjects living in West Malaysia. As there are significant disparities in racial composition, culture, and socioeconomic status between people of Sarawak and other states in Malaysia, this preliminary study could be useful as a baseline data for future large-scale studies involving the people of East Malaysia.

The overall prevalence of psychosocial impact of dental aesthetics reported amongst adolescent patients in Klinik Pergigian Lanang, Sibu was high (95.2%). In fact, it was higher than that reported by Wan Hassan (90.0%) and Tajudin (87.8%) (17,20). This could be attributed to the fact that our sample was obtained from patients visiting a primary care dental clinic. Thus, the sample may have captured a significant portion of adolescent subjects who were not satisfied with their dentition. These adolescent patients came to the primary dental clinic due to various reasons, and seeking referral for orthodontic treatment may be one of them.

The order of prevalence was greatest in the Dental Self-Confidence domain, followed by Psychological Impact, Social Impact, and Aesthetic Concern domains. This is slightly different from the previous studies by Wan Hassan et al. (17) and Tajudin et al. (20), where both reported highest prevalence of impact in the Psychological Impact domain, followed by Dental Self-Confidence, Social Impact, and Aesthetic Concern domains. A semi-urban dental clinic like Klinik Pergigian Lanang receives patients not only from Sibu town itself, but also from the outskirts such as Sarikei, Mukah, Kapit and Betong. Hence, the possible reason for the lower prevalence of Psychological Impact could be attributed to the lack of the sense of inferiority in the study subjects. Unlike the urban areas in West Malaysia, the awareness of seeking orthodontic treatment in Sibu is lower and people tend to be indifferent to malocclusions affecting their physical appearance.

Similarly, as the prevalence of PIDA was higher in our sample, this trend was also reflected in the severity of PIDA (sum of PIDAQ score). The mean scores in total PIDA and each of its domains in this study was higher than that of previous Malaysian studies (17, 20). Looking at a study conducted on Spanish adolescents, the mean total PIDAQ score was only 21.1 (7), approximately half of that obtained by the subjects in our study (42.1). In contrast, an Italian study reported a mean total PIDAQ score of 49.3 (19), almost similar to our results. The differences could be due to the sampling method, whereby the former study in Spain recruited pupils from schools across a region, whereas the Italian study and our study were conducted on patients visiting a dental clinic. However, it is imperative to note that the Aesthetic Concern domain of the Malaysian PIDAQ has one less item than PIDAQ versions of other languages, thus comparisons of mean total PIDA score, and mean score of Aesthetic Concern domain should take into consideration of this factor.

In terms of the extent of psychosocial impact, majority of our study subjects with self-perceived malocclusion reported significant impact in more than two domains, whereas those without self-perceived malocclusion reported significant impact in two or less domains. This is in agreement with a previous study conducted using the same instrument in Malaysia (20).

Overall, participants with self-perceived malocclusion (IOTN-AC score ≥ 3) demonstrated higher prevalence, severity, and extent of PIDA than those without self-perceived malocclusion (IOTN-AC score < 3). This upholds the findings by Klages and coworkers who created the PIDA questionnaire (9), along with studies which were conducted in Malaysia (17, 20). Apart from this, studies on high school students in Indonesia (24) and dental students in a university in Pakistan (25) also corroborated with our results by showing a statistically significant relationship between greater IOTN-AC scores and higher psychosocial impact measured using PIDAQ.

Influences of demographic characteristics such as age, gender and race on PIDA were also investigated in this study. Our findings suggest that age was not associated with the expressions of total PIDA score. This concurred with a few studies within and outside Malaysia (7, 20, 26, 27). However, this was in contradiction with a previous research done on Malaysian adolescents of the same age group, where a statistically significant difference was reported between the younger and older adolescents (17). In their sample, younger adolescents reported higher impacts. However, it must be noted that the effect size was considered to be very small hence the differences may be

considered negligible in that study. Since the Malaysian PIDAQ was validated on adolescents aged 12 to 17 years (13, 14), we decided to recruit adolescent subjects instead of young adults. The narrow age range in the present study might have contributed to the insignificant difference in mean total PIDA score.

Females in this study had scored significantly higher in mean total PIDA score, which was also analogous in several other studies (7, 20). Overall, they also scored higher than males in all four PIDA domains. However, Pouralimardan et al., Haq et al., and Campos et al. reported no significant gender differences with regards to PIDAQ score in their sample (4, 25, 27). A possible limitation in our sample whereby females (70%) outnumber males (30%) could have resulted in this finding. Nevertheless, females tend to be more critical in perceiving impact related to dental aesthetics (7). Thus, the impact of malocclusion on an individual's psychological well-being is relevant, especially in females (19). This explains why dental attractiveness seems to be more critically affecting the psychological and social aspects of adolescent females in our sample, whereby the differences in gender reached statistical significance for the Psychological Impact and Social Impact domains in the present study. In another study, females scored significantly higher than males in the Social Impact and Aesthetic Concern domains (28).

The effect of race on PIDA was not significant in this study. This was confirmed previously by several Malaysian investigators (20). However, this was not the case in another study which described Malays to be more likely to express concern in the Social Impact and Psychological Impact domains when compared to Chinese, Indians and others (26). Nevertheless, it is worth noting that due to geographical differences, the racial composition in the present study comprised mainly of Chinese, Iban, Malay and Melanau people. Hence meaningful comparisons with previous Malaysian studies cannot be made until further research is done in the Sarawak population.

In view of high psychosocial impact of dental aesthetics on adolescents in Sibu Division, it is recommended that patient perception should be incorporated into indices used to assess the need for orthodontic treatment. This could be achieved via the sociodental model, which combines normative need (IOTN-DHC), impact-related need (PIDAQ) and propensity-related need (29). This method can effectively identify individuals who will benefit most from orthodontic treatment, hence allowing better management of the long waiting list in government orthodontic units. Thus, it will ensure better delivery of orthodontic services to people who are negatively impacted by their malocclusion. Furthermore, the simplified version of Malaysian PIDAQ with only eight items can be useful in a busy government dental set up, as it is easier and more practical to be used, besides being equally informative as the original version (30).

The current study has several limitations that may curtail the generalization of results. Firstly, the sample was small as it was only obtained from patients visiting a single government dental clinic in Sibu. Klinik Pergigian Lanang was selected as the study site because it is the only government dental clinic in Sarawak Central Zone which also has an orthodontic unit providing orthodontic treatment to patients coming from Sibu, Sarikei, Kapit and Mukah Divisions. In addition, it may not capture patients seeking orthodontic care from private dental practitioners. Notwithstanding, the study provides an indication of the psychosocial impact of dental aesthetics in an adolescent population in a particular region of Sarawak that has not yet been reported. Apart from that, malocclusion causes difficulty in daily functions like masticatory efficiency and speech, which in turn affects oral health-related quality of life. These functional aspects are not covered in PIDAQ as it only focuses on the aesthetic aspect of malocclusion. In addition, other potential influencing factors of PIDA such as socioeconomic status was not included in this study.

Conclusion

The prevalence, severity and extent of psychosocial impact of dental aesthetics on adolescent patients in Klinik Pergigian Lanang were high. Those with self-perceived malocclusion (IOTN-AC score ≥ 3) had significantly higher severity of psychosocial impacts (higher PIDAQ score). Despite the fact that psychosocial impact of dental aesthetics was not influenced by age and race, this study found that females have significantly higher psychosocial impacts.

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Competing interests

The authors declare that they have no competing interests.

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References

1. Demir F, Oktay E, Topcu F. Smile and dental aesthetics: a literature review. Med Sci Int Med J. 2017; 6(1):1.
2. Hafiz A, Zahid D, Yushar A, Ibrahim Z, Mastura S, Octavianti F, *et al*. The psychosocial impact of dental aesthetics on orthodontics patients. J Int Dent Med Res. 2018; 12(2):563–8.
3. Zakyah AD, Laviana A. Psychosocial impact of dental aesthetics questionnaire (PIDAQ) as a subjective diagnostic instrument in orthodontic: a literature

review. Int Public Heal J. 2020; 2(September 2019):109–19.
4. Pouralimardan M, Afshar MK, Afshar MK. The correlation between orthodontic treatment need and psychosocial impact of dental aesthetics among patients seeking orthodontic treatment. J Kerman Univ Med Sci. 2022; 29(6):536–41.
5. Brook PH, Shaw WC. The development of an index of orthodontic treatment priority. Eur J Orthod. 1989; 11(3):309–20.
6. Abdullah AAA, Yasssin ZZN. Reasons for seeking orthodontic treatment. Ann Dent Univ Malaya. 2001; 8(1):13–9.
7. Iranzo-Cortés JE, Montiel-Company JM, Bellot-Arcis C, Almerich-Torres T, Acevedo-Atala C, Ortolá-Siscar JC, *et al*. Factors related to the psychological impact of malocclusion in adolescents. Sci Rep. 2020; 10(1):1–8.
8. Dimberg L, Arnrup K, Bondemark L. The impact of malocclusion on the quality of life among children and adolescents: a systematic review of quantitative studies. Eur J Orthod. 2015; 37(3):238–47.
9. Klages U, Claus N, Wehrbein H, Zentner A. Development of a questionnaire for assessment of the psychosocial impact of dental aesthetics in young adults. Eur J Orthod. 2006; 28(2):103–11.
10. Göranson E, Norevall LI, Bågesund M, Dimberg L. Translation and validation of the Swedish version of the Psychosocial Impact of Dental Aesthetics Questionnaire (PIDAQ) for adolescents. Acta Odontol Scand. 2021; 79(4):241–7.
11. Alharbi R, Eshky R, Marae S, Hifnawy T, Alsulaimani M. Translation and validation of the Arabic version of the Psychosocial Impact of Dental Aesthetics Questionnaire (PIDAQ). J Orthod Sci. 2020; 9(1):19.
12. Fidalgo J, Botelho J, Proença L, Mendes JJ, Machado V, Delgado AS. Cross-cultural adaptation and validation of the Portuguese version of the Psychosocial Impact of Dental Aesthetics Questionnaire. Int J Environ Res Public Health. 2022; 19(16):9931.
13. Wan Hassan WN, Yusof ZYM, Makhbul MZM, Shahidan SSZ, Mohd Ali SF, Burhanudin R, *et al.* Validation and reliability of the Malaysian English version of the Psychosocial Impact of Dental Aesthetics Questionnaire for adolescents. Health Qual Life Outcomes. 2017; 15(1):1–14.
14. Wan Hassan WN, Yusof ZYM, Shahidan SSZ, Mohd Ali SF, Makhbul MZM. Validation and reliability of the translated Malay version of the Psychosocial Impact of Dental Aesthetics Questionnaire for adolescents. Health Qual Life Outcomes. 2017; 15(1):1–15.
15. Zreaqat M, Hassan R, Ismail AR, Ismail NM, Aziz FA. Orthodontic treatment need and demand among 12- and 16 year-old school children in Malaysia. Oral Health Dent Manag. 2013; 12(4):217–21.
16. Oral Health Program, Ministry of Health Malaysia. Garis Panduan Rujukan Rawatan Ortodontik di Fasiliti Perkhidmatan Pergigian Kementerian Kesihatan Malaysia (KKM). Accessed 1 June 2023.
17. Wan Hassan WN, Yusof ZYM, Yuen SW, Tajudin ZM, Lokman N, Makhbul MZM. Prevalence, extent and severity of the psychosocial impact of dental aesthetics among Malaysian adolescents. Sains Malaysiana. 2019; 48(8):1729–36.
18. Wahab A, Ju X, Jamieson L, Dreyer C. Modelling risk factors for high/low Psychosocial Impact of Dental Aesthetics Questionnaire (PIDAQ) in the Australian adults. Eur J Orthod. 2021; 43(2):200–7.
19. Militi A, Sicari F, Portelli M, Merlo EM, Terranova A, Frisone F, *et al*. Psychological and social effects of oral health and dental aesthetic in adolescence and early adulthood: an observational study. Int J Environ Res Public Health. 2021; 18(17):2–9.
20. Tajudin ZM, Wan Hassan WN, Yusof ZYM, Makhbul MZM. Impacts of self-perceived malocclusion on the oral health related quality of life of young adults. Healthcare. 2021; 9(3):248.
21. IBM Corp. IBM SPSS Statistics for Windows, Version 25.0. Armonk, NY: IBM Corp. 2017.
22. Grzywacz I. The value of the aesthetic component of the Index of Orthodontic Treatment Need in the assessment of subjective orthodontic treatment need. Eur J Orthod. 2003; 25(1):57–63.
23. Terwee CB, Bot SDM, de Boer MR, van der Windt DAWM, Knol DL, Dekker J, *et al*. Quality criteria were proposed for measurement properties of health status questionnaires. J Clin Epidemiol. 2007; 60(1):34–42.
24. Sari CN, Jazaldi F, Ismah N. Association between psychosocial status and orthodontic treatment needs in Indonesian high school students. Pesqui Bras Odontopediatria Clin Integr. 2020; 20:1–8.
25. Haq S, Khan N, Durrani OK. Assessment of Psychosocial Impact of Dental Aesthetics. Pakistan Orthod J. 2018; 10(1):2–7.
26. Ravindranath S, En JTS, Heng APK. Orthodontic treatment needs and self-perceived psychosocial impact of dental esthetics in a university adult population in Malaysia. J Indian Orthod Soc. 2017; 51(2):69–74.
27. Campos LA, Costa MA, Bonafé FSS, Marôco J, Campos JADB. Psychosocial impact of dental aesthetics on dental patients. Int Dent J. 2020; 70(5):321–7.
28. Zaidi AB, Karim AA, Mohiuddin S, Rehman K. Effects of dental aesthetics on psycho-social wellbeing among students of health sciences. J Pak Med Assoc. 2020; 70(6):1002–5.
29. Wan Hassan WN, Makhbul MZM, Yusof ZYM. Use of the sociodental approach in estimating orthodontic treatment needs in adolescent patients. J Orofac Orthop / Fortschritte der Kieferorthopädie. 2021; 83(4):244–54.
30. Wan Hassan WN, Makhbul MZM, Othman SA, Yusof ZYM. Validation of the simplified Malaysian Psychosocial Impact of Dental Aesthetics Questionnaire for the sociodental approach to estimate the orthodontic treatment need. Int J Environ Res Public Health. 2022; 19(14):8665.