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Prevalence, Extent and Severity of the Psychosocial Impact of Dental Aesthetics among Malaysian Adolescents

(Keprevalenan, Takat dan Keterukan Kesan Psikososial Pergigian Estetika dalam kalangan Remaja Malaysia

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ABSTRACT

This study aimed to assess the prevalence, extent and severity of the psychosocial impact of dental aesthetics (PIDA) among Malaysian adolescents especially those with self-perceived malocclusion, and to determine if age and gender affected their PIDA. A cross-sectional study using a self-administered questionnaire was conducted on 12-17 year old schoolchildren from schools across Malaysia selected via a multi-stage sampling method. The questionnaire included the Malaysian Psychosocial Impact of Dental Aesthetics (Malaysian PIDA) questionnaire and the Aesthetic Component of the Index of Orthodontic Treatment Need (IOTN-AC). The Malaysian PIDA measured four domains: (Dental Self Confidence, 6 items; Social Impact, 8 items; Psychological Impact, 6 items; and Aesthetic Concern, 2 items) to assess impacts on the oral health-related quality of life specific to malocclusion. While the IOTN-AC comprised a 10-point photographic scale to assess self-perceived malocclusion. Data analysis using SPSS version 20 was involved using complete data on 901 participants. The prevalence of PIDA was 90.0% while prevalence associated with self-perceived malocclusion was 96.0%. Impact of dental aesthetics was highest on the psychological wellbeing of the adolescents, followed by their self-confidence. In terms of the extent of impact, 14.0% reported significant impact on all four domains and 19.2% were associated with self-perceived malocclusion. The prevalence of impacts was higher in younger adolescents and females. In terms of the extent and severity of impacts, younger adolescents reported higher impacts but with small effect sizes, while differences between boys and girls were not significant.

Keywords: Adolescent health; malocclusion; oral health care; oral health-related quality of life; orthodontics

ABSTRAK

Kajian ini bertujuan menilai prevalens, tahap dan keterukan impak estetik pergigian terhadap psikososial (PIDA) dalam kalangan remaja di Malaysia terutamanya yang bertanggapan bahawa mereka mempunyai malokulusi dan kajian juga ingin menentukan sama ada umur dan jantina mempengaruhi PIDA mereka. Kajian keratan rentas yang menggunakan soal selidik pengurusan kendiri telah dijalankan ke atas kanak-kanak sekolah berumur 12-17 tahun daripada sekolah-sekolah seluruh Malaysia yang dipilih melalui kaedah pensampelan pelbagai tahap. Soal selidik merangkumi soal selidik Impak Estetik Pergigian terhadap Psikososial populasi Malaysia (PIDA Malaysia) dan Komponen Estetik Indeks Keperluan Rawatan Ortodontik (IOTN-AC). PIDA Malaysia mengukur empat domain: (Keyakinan Diri Berkaitan Pergigian, 6 item; Impak Sosial, 8 item; Impak Psikologi, 6 item; dan Keprihatinan Estetik, 2 item) bagi menilai impak kesihatan oral khusus tentang malokulusi terhadap kualiti hidup. Sementara itu, IOTN-AC yang merangkumi skala 10-mata berbentuk gambarajah digunakan untuk menilai malokulusi tanggapan kendiri. Data yang dianalisis menggunakan SPSS versi 20 melibatkan data lengkap 901 responden. Prevalens PIDA adalah 90.0% manakala prevalens berkaitan malokulusi tanggapan kendiri adalah 96.0%. Kesan estetik pergigian memberi kesan tertinggi kepada kesejahteraan psikologi remaja, diikuti dengan keyakinan diri mereka. Daripada segi tahap impak, 14.0% melaporkan kesan yang signifikan ke atas semua domain dan 19.2% dikaitkan dengan malokulusi tanggapan kendiri. Prevalens impak adalah lebih tinggi dalam kalangan responden awal remaja dan perempuan. Daripada segi tahap dan keterukan impak, responden awal remaja melaporkan impak yang lebih tinggi, namun kesan saiznya adalah kecil, sementara perbezaan antara responden lelaki dan perempuan adalah tidak signifikan.

Kata kunci: Kesihatan remaja; kualiti hidup berkaitan kesihatan oral; malokulusi; ortodontik; penjagaan kesihatan pergigian

INTRODUCTION

Population studies on malocclusion have largely been based on clinical indicators to determine treatment need. The proportion of adolescents across the world who needed orthodontic treatment had been reported to be between 12.1% (Jamilian et al. 2010) and 59.5% (Nobile et al. 2007), when measured using the dental health component of the index of orthodontic treatment need (Brook &

Shaw 1989). In Malaysia, the prevalence fell within that range at 47.9% (Abdullah & Rock 2001). If orthodontic treatment is provided based on the normative treatment need alone, this may be very costly and not cost-effective in a resource-constraint oral health care system. A recent study among a group of Malaysian adolescents showed that 34.3% desired orthodontic correction (Zreaqat et al. 2013), which suggested they were unhappy about their dental appearance regardless of their levels of normative need. However, demand alone does not provide strong justification for the provision of orthodontic treatment to these adolescents.

Based on the current evidence, it is not sufficient to use clinical indicators only to determine orthodontic treatment need. A more holistic approach that considers a patient's feelings and/or impacts relating to oral functioning and appearance, which would require using patient-based indicators, is increasingly been advocated to determine orthodontic treatment need (Gherunpong et al. 2006). The psychosocial impact of dental aesthetics (PIDA) questionnaire is one of the few patient-based indicators developed specifically for patients to assess the psychosocial impact related to arrangement of their teeth (Klages et al. 2006).

As demand for orthodontic treatment increases in Malaysia, policy makers need more substantial evidence of the impact of malocclusion on the patient's daily life and well-being, and the likelihood that provision of orthodontic treatment would improve the population's oral health-related quality of life (OHRQoL) and provide good justification for the use of resources. The PIDA was therefore proposed to be used for assessing treatment need in patients requesting orthodontic treatment (Klages et al. 2006). A population-based data set in Malaysia would help determine how frequently and severely malocclusion impacts on adolescents' OHRQoL. Thus, the aim of this study was to provide epidemiological data that would serve as the baseline for evaluating the psychosocial impacts of dental aesthetics among Malaysian adolescents, specifically, those with self-perceived malocclusion, and to determine if adolescents' age and gender affected their PIDA.

Materials and Methods

A cross-sectional study was conducted among 12-17 year old secondary schoolchildren in Malaysia selected using a multi-stage sampling technique. First, the country was divided into five regions (central, northern, southern and eastern regions of the peninsular Malaysia and the Borneo region). At the first stage, one state per region was randomly selected. At the second stage, one school per state was randomly selected from a list of secondary schools of each state. At the third stage, it was not feasible to randomly select the schoolchildren because students taking national examinations were not allowed to take part in the study. Thus, the subjects were non-randomly selected by the teachers who helped in the sample recruitment. Exclusion criteria were adolescents having or have had experience with orthodontic treatment and having learning difficulties. The sample size for a prevalence study (Daniel 1999) with a 95% confidence, an expected prevalence of 18.8% (Abdullah 2011) and a precision of 5% is 235 subjects. A design effect (Bland 2005) of 3.09 and 3.35 for an estimated intra-class correlation of 0.045 and 0.051, based on a past study (Wan Hassan et al. 2017a), and equal cluster per school (n=47) would require a total of 727 to 788 subjects. In this study, to account for a possible wider variance of the PIDA due to varied geographical locations, a larger design effect of 4 was chosen, giving a sample size of 940. Anticipating a 25% dropout rate, the final sample size for the study was 1175.

The research was approved by the Medical Ethics Committee, Faculty of Dentistry, University of Malaya (DF CD1513/0092(L)). Permission was obtained from the Ministry of Education Malaysia, the state education departments and the school principals. Consent was obtained from the parents and students prior to data collection.

Questionnaire

The questionnaire comprised three sections and was self-administered either in classroom, school hall or canteen. In the first section, the validated 22-item Malaysian Psychosocial Impact of Dental Aesthetics (Malaysian PIDA) (Wan Hassan et al. 2017a, 2017b) was used to assess impacts on the OHRQoL due to the arrangement of the teeth. It measures a positive domain: Dental Self-Confidence (DSC; 6 items) and three negative domains: Social Impact (SI; 8 items), Psychological Impact (PI; 6 items) and Aesthetic Concern (AC; 2 items). Responses of subject's agreement to each item were recorded using a 5-point Likert scale ranging from not at all to very strongly. In the second section, self-perceived malocclusion was measured using the aesthetic component of the index of orthodontic treatment need (IOTN-AC) (Grzywacz 2003). Subjects were asked to rate their perceptions of themselves on the 10-point black-and-white photographic scale where one was considered as the most attractive dental appearance and 10 as the least attractive dental appearance. The final section recorded demographic information.

Data Cleaning and Analysis

Initially, 12 (1.2%) subjects were removed because they did not disclose demographic information. For the Malaysian PIDA questionnaire, to avoid complex analysis of principled missing data methods, data from subjects whose questionnaires had more than 20% of items per domain missing were excluded (Dong & Peng 2013). Therefore, only one missing item per domain was allowed for the DSC, SI and PI subscales and none was allowed from the AC subscale. Based on these criteria, 16 subjects were excluded due to unacceptable proportions of missing items per domain. For the DSC subscale, two items had one missing data point (0.1% each) and one item had two

missing data points (0.2%); for the SI subscale, three items had one missing data point (0.1% each) and one item had two missing data points (0.2%); and for the PI subscale, three items had one missing data point (0.1%). Missing data were replaced with values calculated based on the personal mean score method, which was calculated as the mean of the completed items of the scale (Peyre et al. 2011). Thus, nine subjects (0.01%) each had one data point imputed and one subject (<0.01%) had three data points imputed.

For the IOTN-AC, 16 subjects who did not rate themselves were excluded. Subjects who rated themselves with no need for treatment (grades 1 and 2) were considered to have no self-perceived malocclusion, while those who rated themselves with slight (grades 3 and 4), moderate (grades 5 to 7) and severe need (grades 8 to 10) for treatment were considered to have self-perceived malocclusion (Grzywacz 2003).

CALCULATING PREVALENCE, EXTENT AND SEVERITY OF IMPACT

In this study, for the negative SI, PI and AC domains, items were considered to have significant impact if they were rated between strongly and very strongly (scores 3 & 4) while for the positive DSC domain, items with significant impact were those rated between not at all and a little (scores 0 & 1).

The prevalence of PIDA was defined as the percentage of subjects who reported significant impact on any of the items. The prevalence of impact in each domain is the percentage of subjects who reported significant impact on any items of the DSC, SI, PI and AC domains.

The extent of impact is the percentage of subjects reporting significant impact on one or more of the PIDA domains. In this respect, the domain must have a significant impact on at least one of the items. The score could range from 0 to 4 domains with impact.

The severity of the PIDA was calculated by adding up the response codes for each item in the SI, PI and AC domains and reverse scores codes for the DSC domain. The severity for each domain was calculated by adding the response codes for each item in the domain. For the DSC domain, reverse scores were used. The severity scores could range from 0 to 88 for the total PIDA, 0 to 24 for DSC and PI domains, 0 to 32 for the SI domain and 0 to 8 for the AC domain. Higher scores indicated higher severity of the psychosocial impact of dental aesthetics (PIDA) and poorer OHRQoL.

DETERMINING IF AGE AND GENDER AFFECTED THE PIDA

The chi-square test was used to determine the influence of age and gender on the prevalence of impact with calculated 95% confidence interval differences (Petrie & Sabin 2009). The Mann-Whitney test was used to determine the influence of age and gender on the extent of impact with calculated effect size for the degree of influence (Field 2005). For the influence of age and gender on the severity of impacts, interval scores were derived by Rasch analysis using Winsteps based on the non-imputed data (version 3.80.1; Winsteps, Beaverton, Oregon, USA) (Bond & Fox 2015). Multivariate analysis of covariance (MANCOVA) was used to assess possible differences between the demographic variables (age group and gender) for subjects who had the same level of self-perceived malocclusion on the severity of the PIDA domains, and if there were interactions between the independent variables (if being younger girls, younger boys, older girls or older boys) would have significant difference on their OHRQoL. If the multivariate test detected differences between the demographic variables, follow up univariate analysis of variance test was performed to determine how the dependent variables differ for the demographic variables concerned, with an alpha Bonferroni correction at 0.0125. To assess the effect size, the general rule of thumb was that 0.1 is considered as a small effect, 0.3 as a medium effect and 0.5 as a large effect (Field 2005).

Results and Discussion

Overall, five secondary schools were randomly included in the study. Among the 1175 subjects approached in the five schools, 1009 volunteered but 64 (6.4%) were excluded because they reported experience with orthodontic treatment. Thus, the resultant response rate was 85.1% (n=945/1111). After data cleaning, 44 subjects with missing demographic information and unacceptable missing items were removed. The total sample included in the analysis was 901 subjects.

The internal consistencies of the PIDA domains were satisfactorily and consistent with past reports (Wan Hassan et al. 2017a, 2017b). The Cronbach alpha values for the DSC (0.86), SI (0.88) and PI (0.85) domains were within the recommended range of 0.70 and 0.95 (Terwee et al. 2007). The 2-itemed AC domain had the lowest Cronbach alpha value (0.66). Nonetheless, for domains with few items, Cronbach alpha of 0.5 is acceptable (Shrout & Yager 1989; Ware et al. 1981).

DEMOGRAPHICS

The mean age of subjects was 14.1 (SD = 1.4) years. Table 1 shows the demographics of the participants.

More than half were in the younger age group of 12-14 years (n=571; 63.4%) and girls (n=497; 55.2%). The majority of subjects rated themselves as having no malocclusion (n=480; 53.3%), followed by 349 (38.7%) with slight malocclusion, 49 (5.4%) with moderate malocclusion and 23 (2.6%) with severe malocclusion. The prevalence of self-perceived malocclusion was 29.0% (n=261) among younger adolescents and 17.8% (n=160) among older adolescents. The prevalence of self-perceived malocclusion in boys was 20.2% (n=182) and in girls was 26.5% (n=239). Chi-square tests between adolescents with and without self-perceived malocclusion by age group (p=0.421) and gender (p=0.363) were not significant.

TABLE 1. Association of age and gender with the presence of self-perceived malocclusion

Characteristics	Distribution			
	Total (*n*=901)	Self-perceived malocclusion (*n*=421)	No self-perceived malocclusion (*n*=480)	p-value[χ]
	N (%)	N (%)	N (%)	
Age group				
12-14 years	571 (63.4)	261 (62.0)	310 (64.6)	0.421
15-17 years	330 (36.6)	160 (38.0)	170 (35.4)	
Gender				
Male	404 (44.8)	182 (43.2)	222 (46.3)	0.363
Female	497 (55.2)	239 (56.8)	258 (53.8)	

[χ]Chi-square; *$p<0.05$

PREVALENCE OF IMPACTS

The overall prevalence of PIDA was 90.0% (*n*=811). The most affected domain was the PI at 72.5% (*n*=653), followed by the DSC domain at 65.9% (*n*=594), the SI domain at 43.1% (*n*=388) and the AC domain at 19.1% (*n*=172). The prevalence of PIDA among those with self-perceived malocclusion was 96.0% (*n*=404), with the PI being the predominant domain affecting 79.6% (*n*=335), followed by the DSC domain at 77.0% (*n*=324), the SI domain at 50.8% (*n*=214) and the AC domain at 24.2% (*n*=102).

EXTENT OF IMPACTS

Fourteen percent (*n*=126) of subjects reported significant impact on all domains, 20.5% (*n*=185) on three domains, 27.5% (*n*=248) on two domains, 28.0% (*n*=252) on one domain, and 10.0% (*n*=90) had no significant impact on any domains. The extent of impact associated with self-perceived malocclusion having significant impact on all domains was 19.2% (*n*=81), followed by 24.2% (*n*=102) with significant impact on three domains, 29.5% (*n*=124) on two domains, 23.0% (*n*=97) on one domain and 4.0% (*n*=17) with no significant impact on any domains.

SEVERITY OF IMPACT

In general, for all subjects and those with self-perceived malocclusion, the severity of impacts for the overall PIDA and for the DSC and PI domains were in normal distribution while the trend for the SI and AC domains were moderately positively skewed (Bulmer 1979).

For all subjects, the mean severity score was 32.6 for the overall PIDA, 11.3 for the DSC domain and 9.8 for the PI domain (Table 2). For the positively skewed domains (non-normally distributed), the median severity score was 8.0 for the SI domain and 2.0 for the AC domain. Those with self-perceived malocclusion had higher severity of impacts, overall and for all domains.

INFLUENCE OF AGE AND GENDER ON THE PIDA

There were statistically significant associations ($p<0.05$) between the prevalence of PIDA with age and gender, respectively (Table 3). The difference in the prevalence of impacts between younger and older adolescents was small at 4.6% (95% CI 1.1%, 8.2%) while the difference in the prevalence of impacts between boys and girls was also small at 4.6% (95% CI 2.4%, 6.9%).

The extent of impact was statistically more predominant among the younger adolescents than older adolescents (Table 3). However, the effect size was very small with only 2.4% of the variability in the ranks accounted by age. The extent of impacts was not significantly different between boys and girls.

In terms of severity of impact, a statistically significant difference was found between the younger and older

TABLE 2. Severity of impact among all subjects and those with self-perceived malocclusion

Domains	All subjects (*n*=901)			Self-perceived malocclusion (*n*=421)		
	Mean	s.d.	Median	Mean	s.d.	Median
Overall psychosocial impact of dental aesthetics	32.6	16.2	31.0	38.4	15.7	38.4
Dental self-confidence (lack of)	11.3	5.4	11.0	13.3	5.0	13.0
Social impact	9.0	6.6	8.0	10.7	6.9	10.0
Psychological impact	9.8	5.4	9.0	11.5	5.3	11.0
Aesthetic concern	2.4	1.9	2.0	2.9	1.9	3.0

s.d. = standard deviation

TABLE 3. Prevalence and extent of impact on the PIDA by covariables (n = 901)

Prevalence of impact						
Covariables		Impact		No Impact		p-value[χ]
		n	%	*n*	%	
Age group						
12-14 years		529	58.7	48	5.3	0.001
15-17 years		282	31.3	42	4.7	
Gender						
Boys		374	41.5	30	3.3	0.021
Girls		437	48.5	60	6.7	
Extent of impact						
Covariables	*n*	Extent of impacts				p-value[λ] Effect size
		Mean	s.d.	Range	Quartiles	
Age group						
12-14 years	571	2.2	1.2	0 - 4	(1, 2, 3)	0.000 0.024
15-17 years	330	1.8	1.2	0 - 4	(1, 2, 3)	
Gender						
Boys	404	2.0	1.1	0 - 4	(1, 2, 3)	0.898 0.000
Girls	497	2.0	1.3	0 - 4	(1, 2, 3)	

[χ]Chi-square test; [λ]Mann-Whitney test; s.d. = standard deviation

adolescents (F=6.39; $p<0.001$) and between boys and girls (F=3.81; $p=0.004$) on the combined dependent variables of the OHRQoL for all PIDA domains after controlling for their self-perceived malocclusion (Table 4). Interactions between the independent variables were not statistically significant ($p>0.05$). When the results of the dependent variables were considered separately, the differences in age group reached statistical significance, using a Bonferroni correction (alpha level of 0.0125) for the DSC (F=8.14; $p=0.004$), SI (F=16.05; $p<0.001$), PI (F=22.70; $p<0.001$) and AC (F=7.48; $p=0.006$) domains. Differences in gender did not reach statistical significance for the DSC (F=3.79; $p=0.052$), the SI (F=0.63; $p=0.427$), the PI (F=2.11; $p=0.146$) and the AC (F=2.74; $p=0.098$) domains. Younger adolescents reported higher impacts on their DSC and higher SI, PI and AC than older adolescents with a mean difference between 0.3 and 1.4 points. However, the effect sizes were considered very small (between 0.008 and 0.025).

This is the first epidemiological study reporting the prevalence, extent and severity of the PIDA among Malaysian adolescents. Past epidemiological studies have assessed the impact of malocclusion on adolescents' OHRQoL using the oral impacts on daily performances (OIDP) scale (Bernabe et al. 2008, 2007). OIDP was designed to assess impacts due to general oral health, though later was modified to measure impacts related to malocclusion (Gherunpong et al. 2006). The current study is of value because the instrument used was specifically developed to measure impacts related to malocclusion (Klages et al. 2006).

In the current study, malocclusion was self-rated. Bernabe et al. (2007) proposed that a self-perceived indicator was more appropriate than a normative definition of malocclusion because clinical orthodontic need indices are not strongly associated with perceptions of individuals' oral health status and quality of life. Self-assessment was further supported by a past study that demonstrated that PIDA was consistently well discriminated when malocclusion was self-rated, unlike the case of investigator-rated malocclusion (Wan Hassan et al. 2017a). The IOTN-AC is a predictive variable for the PIDA (Bellot-Arcis et al. 2013) and was thus used for this study.

Dental aesthetics affected the OHRQoL of the majority of Malaysian adolescents, especially those with self-perceived malocclusion. Our subjects with self-perceived malocclusion reported higher impact in the PI domain, followed by the DSC, SI and AC domains compared to overall sample. This concurred with Bernabe et al. (2007), who found self-perceived malocclusion impacted Peruvian adolescents, particularly in relation to their psychological and social activities. It is a concern that large proportions of Malaysian adolescents have feelings of inferiority and unhappiness, as measured by the PI domain (Klages et al. 2006), their emotional state affected, as measured by the DSC domain (Klages et al. 2006), and have potential problems in social situations, as measured by the SI domain (Klages et al. 2006), because of anxieties over the arrangement of their teeth. If orthodontic treatment can improve OHRQoL (Kang & Kang 2014), then the current data provide evidence to prioritize orthodontic service provision for Malaysian adolescents, in particular those whose self-perceived malocclusion are impacting their OHRQoL. Nonetheless, whether this would give long term benefits require evidence from a longitudinal study.

TABLE 4. Multivariate analysis of covariance

Dependent variables	Independent variables		Difference	*p*-value	95% CI		Effect size
					Lower	Upper	
	Age group						
	12-14 years	15-17 years					
Dental self-confidence (lack of)	11.1 (0.1)	10.4 (0.2)	0.7 (0.2)	0.004*	0.2	1.2	0.009
Social impact	12.6 (0.2)	11.2 (0.3)	1.4 (0.4)	0.000*	0.7	2.1	0.018
Psychological impact	11.7 (0.2)	10.5 (0.2)	1.2 (0.3)	0.000*	0.7	1.7	0.025
Aesthetic concern	2.9 (0.1)	2.5 (0.1)	0.3 (0.1)	0.006*	0.1	0.6	0.008
	Gender						
	Boys	Girls					
Dental self-confidence (lack of)	10.6 (0.2)	11.0 (0.2)	-0.5 (0.2)	0.052	-0.9	0.9	0.004
Social impact	12.2 (0.3)	11.6 (0.2)	0.3 (0.3)	0.427	-0.4	0.9	0.001
Psychological impact	10.9 (0.2)	11.3 (0.2)	-0.4 (0.2)	0.146	-0.8	0.1	0.002
Aesthetic concern	2.6 (0.1)	2.8 (0.1)	-0.2 (0.1)	0.098	-0.4	0	0.003

CI = confidence interval

A recent study on early treatment for Class III correction did not provide enough support whether early treatment improved self-esteem or reduced impact of malocclusion when compared with those who did not receive treatment (Mandall et al. 2016). However, some evidence to indicate the benefit of orthodontic treatment on OHRQoL was shown in a study on early treatment of Class II correction where the subjects showed an increase in self-concept and a reduction in negative social experiences after treatment (O'Brien et al. 2003), though those who received treatment later had OHRQoL similar to those who had earlier treatment (O'Brien et al. 2009). Thus, the evidence on the impacts of orthodontic treatment on the OHRQoL of the subjects or the reasons why some children become more or less concerned about their malocclusion over time will require further studies (Mandall et al. 2016; Spalj et al. 2016).

Our younger adolescents reported more impacts than older adolescents, in terms of prevalence, extent and severity. This finding concurred with a past study, which found the impact on certain PIDA domains reduced with age (Spalj et al. 2016). The reported impacts in this study are anticipated to reflect the psychosocial impacts due to malocclusion that is indicative for orthodontic treatment since the youngest age of this sample was 12 years old, which is the age when development of the permanent dentition related to dental aesthetics (incisors up to the second premolars) are expected to have erupted (Diamanti & Townsend 2003). Nevertheless, it is possible that some of the reported impacts were due to malocclusion that was in transition from mixed dentition to permanent dentition of those with physiologically delayed dental development rather than indicating a need for orthodontic treatment since eruption of the dentition related to dental aesthetics can occur later, which can be up to 14.5 years for the upper percentile of the population (Diamanti & Townsend 2003). However, the prevalence of our younger adolescents with impacts was only significantly more by less than 5% while the effect size for difference in the extent of impacts was small (less than 0.1). The differences in the severity of impacts were also not large, at less than 1.5 points. Since there is no information on the minimal important difference value of the PIDA, it is not known if the differences were of clinical significance. The lower impacts among the older adolescents may also be confounded by exclusion of subjects whose OHRQoL have been impacted by their malocclusion but have had earlier treatment. Thus, the difference between the two age groups is considered negligible.

Although the current study found a small difference of less than 5% in the prevalence of impacts between boys and girls, in terms of extent and severity, the OHRQoL of Malaysian boys were equally as impacted by their self-perceived malocclusion as were Malaysian girls. This contrasted with other studies which found females to have higher severity of PIDA (Bellot-Arcis et al. 2013; Spalj et al. 2016).

In this study, despite the majority of subjects reported no self-perceived malocclusion, those with self-perceived malocclusion reported high prevalence of impact when assessed using the Malaysian PIDA. The use of Malaysian PIDA in the overall assessment of orthodontic treatment need among adolescents based on patient's perspective (Klages et al. 2006), is recommended to identify patients with high impact due to dental aesthetics. This would enhance treatment success and effective use of resources. The study findings also suggest plans for orthodontic healthcare provision where they should provide equal opportunities to all adolescents in Malaysia regardless of their age and gender.

LIMITATIONS OF THE STUDY

The current study included schoolchildren from schools that were randomly selected from five different regions in Malaysia. All the five selected schools were from

urban areas. As such, the disparity in OHRQoL between schoolchildren in rural and urban areas was not assessed in this study. Further study involving adolescents from rural schools is recommended.

The current study only assessed the influence of two main independent variables of the schoolchildren, which were age and gender (Bellot-Arcis et al. 2013; Spalj et al. 2016), on the PIDA. Other potential influencing factors such as family socio-economic status and home environment characteristics were not included (Kumar et al. 2014). However, these were not the focus of the current study. Further studies assessing parental factors that could influence the impact of dental aesthetics on the OHRQoL are recommended.

PIDA questionnaire is currently the only condition-specific instrument developed to assess impact related to dental aesthetics that is validated for the Malaysian population. Thus, it was applied for the current study. However, impacts due to malocclusion on the OHRQoL may not necessarily be limited to the psychosocial aspects, as measured by this instrument. Malocclusions have been identified to impact the OHRQoL through other modes such as in terms of oral health like *getting food stuck between crowded teeth* and function like *interferences in the bite* (Patel et al. 2016), which were not measured by the current instrument. Thus, the PIDA questionnaire potentially may have under reported oral impacts related to physical functions of the teeth.

Conclusion

In summary, this study provides baseline evidence to demonstrate the influence of dental aesthetics on adolescents' OHRQoL in Malaysia. The prevalence of psychosocial impact of dental aesthetics was high. Adolescents across ages and genders are similarly impacted by their dental aesthetics.

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