

Factors Associated with Fake Braces Use Among Thai Adolescents Living in Bangkok

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Abstract

This study investigates the association between the underlying determinants for obtaining fake braces among adolescents in Bangkok. The study design was case-controlled. Participants included 45 cases of adolescents who obtained fake braces and 336 controls who obtained professional braces. They were sampled from 12- to 18-year-old students who had experiences of orthodontic braces or fake braces. Independent variables like socioeconomic status, information support, subjective norm, knowledge, and attitude were assessed by a self-administered questionnaire. The univariate analyses were performed using chi-square tests and Kolmogorov-Smirnov tests to compare differences between groups then logistic regression was used to identify the influential factors. We found that the fake braces group was mostly of younger adolescents (93.3%). Information from friends, the influence of friends and famous persons, lack of knowledge, and lower socioeconomic status had statistically significant associations with fake braces obtaining ($P < 0.05$). As opposed to the professional braces group, most of the adolescents who obtained fake braces did not expect good tooth alignment results ($P < 0.001$). Their attitudes about the social class symbol of braces also were discordant with the professional braces group ($P = 0.002$). The logistic regression model showed the fake braces group tended to be younger (OR = 0.17; 95% CI: 0.002-0.112). They also tended to get braces information from friends (OR = 14.83; 95% CI: 3.44-63.91), ignore tooth alignment results (OR = 0.13; 95% CI: 0.05-0.31), accept braces as a social class symbol (OR = 2.20; 95% CI: 1.04-4.64), and have a lower knowledge score (OR = 0.70; 95% CI: 0.50-0.98). In conclusion, this study proved that peer influence, the expectation of esthetic results, social ladder, and knowledge among younger adolescents had strong associations with the type of braces obtained. The measures to alleviate the fake braces situation should be determined to include these significant factors.

Keywords : Adolescent, Fake braces, Orthodontic appliances

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Introduction

Fake braces (FBs), or fashion braces, refer to apparatuses that imitate the appearance of orthodontic appliances, but they do not treat malocclusion.¹ The appearances of FBs are offered in a variety of forms but all of them will present the colorful elastomeric ring or bracket on the anterior teeth. FBs can be beads wired on anterior teeth, brackets attached on teeth like real fixed orthodontic appliances, removable plates with brackets on a labial wire, or brackets ligated on a wire with retentive arms on posterior teeth. Unlike orthodontic appliances, FBs are sold over the counter or online without certificated dental care, and they can be fitted by a non-dentist provider using unapproved material or by the wearer themselves without a plan of removal.

In recent years, the orthodontic perceived need has increased among adolescents while the sources of orthodontic services are limited. These result in excess unmet demands for braces which somehow are satisfied by FBs. FBs have become popular among adolescents in Southeast Asian countries e.g. Thailand, Indonesia, and Malaysia.² Many adolescents wear braces as a fashion statement. In Thailand, adolescents seek orthodontic treatment not only to correct malocclusion, but they also want to wear braces like others and for fashion reasons.³ FBs with multicolored rubber bands are worn like an ornament matching the costume.⁴ The cost of FBs also is only \$45 - \$100 which is about 35 times cheaper than the orthodontic treatment course.^{5,6} Hence, the affordability of FBs makes them more advantageous than real braces. In addition, braces can be used as a social class symbol because of the connotation of high social class. The high cost and inadequate accessibility of orthodontic braces give braces a luxury value, and some adolescents may wear braces or FBs to feel that value.¹

Although FBs are prevalent in adolescents, the safety of their material and fitting procedures are still questionable. Authorities claim that FBs material may contaminate with hazardous heavy metals, and they can

compromise a health status such as malocclusion, dental caries, gingival inflammation, soft tissue ulceration, and life-threatening infection.^{5,8} In Thailand, there have been many attempts to solve the FBs situation. For example, the Consumer Protection Board has issued a prohibition on the sales of FBs materials as well as punishments for violations. The Food and Drug Administration (FDA) has also issued a regulation to control the import, production, and sale of braces materials. In the same way, the risk of wearing FBs has been campaigned by many health sectors. Nevertheless, these measures are still questionable regarding their success and require adequate evidence for greater impact.

To understand the mechanism of causes and health outcomes of FBs obtained, the social determinants of oral health model were applied to our conceptual framework.⁹ The model highlighted the effect on health of the social conditions and environments in which people are born, raised, live, work and age. The social, political, economic and environmental factors, the causes of the causes, as the key etiological factors bring about socioeconomic position. These structural determinants consequently patterned the more proximal factors on health through intermediary determinants. The intermediary determinants were mainly categorized to material circumstances (e.g. housing, neighborhood quality), psychosocial circumstances (e.g. social support) and behavioral/biological factors (e.g. health compromising behavior, FBs use). Finally, the intermediary determinants shaped health outcomes and in turn they could “feed back” to affect the functioning of social, economic and political mechanisms.

Recently, several studies in Thailand have attempted to describe the causes of FBs wearing among adolescents. Determinants such as fashion and high social class statements, feelings of self-confidence and attractiveness, affordability, more available access, peer pressure and lack of knowledge of the danger of FBs were reported to be contributing factors of FBs obtaining.³⁻⁸ These deter-

minants could affect adolescent to use FBs or professional orthodontic services. However, most of them were intermediary determinants which could be patterned by broader proximal factors, such as socioeconomic status, gender and education. Therefore, our study included broader proximal factors to reveal association to FBs obtaining.

Furthermore, there has been no analytical study to confirm the strong association between determinants and FBs obtaining. Profound implications of the association were needed to alleviate the FBs situation. This study aimed to describe underlying determinants reported from previous anecdotal evidence to have the association with FBs obtained among adolescents in Bangkok.

Participants and methods

This study was a case-control design. The cases were participants who had obtained fake braces, whereas the controls were those who had obtained professional braces (PBs). The participants were classified into case and control by the manner of appliances and data from questionnaires. The sample size calculation was based on formula testing difference in proportions for a case-control study which the following parameters were used: Odd ratio for FBs considered to be 0.13 (based on our pilot study); sensitivity 95% (α level = 0.05) and power 80%. The sample size was estimated to be 36 for each group. With 10% topped up, 39 participants per group were required.

Public secondary schools around well-known areas of FBs providers in Bangkok i.e. Bangkapi (Tawanna flea market), Talingchan (Southern Bus Terminal flea market), Don Mueang, and Huai Kwang were surveyed to participate in this study and facilitate sampling of the cases. Six schools agreed to participate in this study. The informed consent forms were obtained from the principals of the schools who represented the guardians of the students for participation. Thai students aged 12 – 18 years old were recruited and identified for their type of braces or history of braces obtaining. Only students who were wearing PBs/FBs or had removed them for not more than 12 months were included in the study. The study protocol was approved by the Human Research Ethics Committee of the Faculty of Dentistry, Chulalongkorn University (HREC-DCU 2018-003).

The outcome of this study was the different types of braces obtained by adolescents. The independent variables were the following social determinants:

1. Socioeconomic status (SES): The SESs of each household were determined by the household questionnaires considering selected household assets (floors, roofs, or walls; flush or pour-flush toilets; transportation, including bicycles, motorcycles, cars, or trucks; and electrical equipment, including radios, televisions, line or mobile telephones, refrigerators, and computers) were combined using principal component analysis to form an asset index.¹⁰ The SESs were divided into five groups by being ranked according to the asset index using quintile as the cut point level.

2. Information support: questions about the person from whom adolescents received information before obtaining PBs or FBs were used to assess the association between information support and the type of braces obtained.

3. Subjective norm and attitude: the questions from the original study¹¹ in adolescents using FBs were used to assess the subjective norms and attitudes associated with the type of braces obtained by 5- pointed Likert scales. There were three questions for subjective norms and four questions for attitudes (questions were listed under Table 2)

4. Knowledge: the knowledge of the consequences of FBs wearing was assessed by yes-no questions. The mean knowledge scores of all questions were calculated for the FBs and PBs groups.

All variables were collected by self-administered online questionnaires in Thai via Google Forms. The questionnaires were anonymously and individually completed by students. A researcher was available for queries in completing the questionnaires addressed by the students.

Data were extracted from Google Forms as Microsoft Excel files. Data analyses were performed with SPSS Statistic version 22 (IBM Company, Chicago, Illinois, USA). Descriptive analysis was carried out to determine the characteristics of participants in both groups. Univariate analyses of braces types using the chi-square test and Kolmogorov-Smirnov tests were carried out to evaluate differences between cases and controls for independent variables. For multivariate analysis, a logistic regression model was

applied by enter technique to identify the adjusted odds ratios (OR) and 95% confidence interval (95% CI) of the fake braces obtaining. Covariates with the P-value < 0.25 in the univariate analyses were included in the model. The goodness of fit of the models was tested with the Hosmer–Lemeshow test. A P-value of < 0.05 was deemed to be statistically significant.

Results

A total of 381 students completed the questionnaires. Participants included 76 boys (19.9 %) and 305 girls

(80.1 %), with a mean age of 15.54 ± 1.52 years (13.84 ± 1.04 years in the FBs group and 15.76 ± 1.43 years in the PBs group). The average age of students studying in grade 7 was 12.90 years, grade 8 was 13.78 years, grade 9 was 14.60 years, grade 10 was 15.46 years, grade 11 was 16.66 years, and grade 12 was 17.76 years. Age and educational level had significant associations with the type of braces obtained whereas gender did not. Younger adolescents studying in grade 7 to 9 more often obtained FBs than PBs ($P < 0.001$). The data is shown in Table 1.

Table 1 Characteristics of sample and associations between factors and type of braces obtaining

Variables	Total N = 381 n (%)	FBs N = 45 n (%)	PBs N = 336 n (%)	P-value
Age				<0.001 ^a
≤ 15 years	222 (58.3)	42 (93.3)	180 (53.6)	
> 15 years	159 (41.7)	3 (6.7)	156 (46.4)	
Gender				0.432 ^a
Male	76 (19.9)	7 (15.6)	69 (20.5)	
Female	305 (80.1)	38 (84.4)	267 (79.5)	
Educational level				<0.001 ^a
Grade 7 to 9	198 (52.0)	42 (93.3)	156 (46.4)	
Grade 10 to 12	183 (48.0)	3 (6.7)	180 (53.6)	
Socioeconomic group				<0.001 ^b
Very high	39 (10.2)	4 (8.9)	35 (10.4)	
High	101 (26.5)	3 (6.7)	98 (29.2)	
Middle	88 (23.1)	4 (8.9)	84 (25.0)	
Low	77 (20.2)	11 (24.4)	66 (19.6)	
Very low	76 (19.9)	23 (51.1)	53 (15.8)	
Information support (Answer Yes)				
Family/relatives	187 (49.0)	7 (15.6)	180 (53.6)	<0.001 ^a
Advertisement/social media	66 (17.3)	5 (11.1)	61 (18.2)	0.241 ^a
Friend	102 (26.8)	36 (80.0)	66 (19.6)	<0.001 ^a
Knowledge (Correct answer)				
Dental caries	197 (51.7)	11 (24.4)	186 (55.4)	<0.001 ^a
Tooth malalignment	246 (64.6)	22 (48.9)	224 (66.7)	0.019 ^a
Oral ulceration	220 (57.7)	18 (40.0)	202 (60.1)	0.01 ^a
Infection	250 (65.6)	13 (28.9)	237 (70.5)	<0.001 ^a
Deadly infection	140 (36.7)	4 (8.9)	136 (40.5)	<0.001 ^a
Knowledge score (Mean ± SD)		1.5 ± 1.6	2.9 ± 1.9	<0.001 ^b

^aChi-square test

^bKolmogorov-Smirnov test

Knowledge: Which is(are) the consequence(s) of fake braces wearing? a. Tooth decay; b. Poorly aligned teeth; c. Mouth sores; d. Infection; e. Death from infection.

FBs, fake braces; PBs, professional braces

In Table 1, the chi-square test indicated a statistically significant association between the type of braces obtained and independent variables (SES, information support, and knowledge). Regarding SES, 39 (10.2%) participants had a very high status, 101 (26.5 %) participants had a high status, 88 (23.1 %) participants had a medium status, 77 (20.2 %) participants had a low status, and 76 (19.9 %) participants had a very low status. 75.6 % of the students with FBs were low or very low SES whereas 64.6 % of the students with PBs were moderate to very high SES ($P < 0.001$).

Students with FBs sought braces information from their friends more than the students with PBs ($P < 0.001$). Conversely, the PBs received information from family members more than the FBs ($P < 0.001$). Information from advertisements and social media did not significantly affect the type of braces obtained ($P = 0.241$). Concerning knowledge, the FBs had knowledge scores lower than the PBs (1.51 ± 1.60 and 2.93 ± 1.88 respectively) ($P < 0.001$). Similarly, considering each aspect of knowledge, the FBs had lower knowledge than the PBs ($P < 0.05$).

Table 2 shows statistically significant associations between the type of braces obtained and the following variables (subjective norm and attitude). As regards subjective norm, nearly half of the FBs agreed or strongly agreed that friends influenced their braces obtaining while the PBs tended to disagree ($P < 0.001$). Moreover, the degree of

disagreeing with the influence of famous persons was different, the PBs indicated more strongly disagree than the FBs ($P = 0.013$).

Concerning their attitude towards braces, the students with PBs agreed that they expected esthetic results from their braces more than the students with FBs ($P < 0.001$). The PBs also tended to disagree that their braces were wasting time whereas the FBs tended to be neutral and agree ($P < 0.001$). In addition, although adolescents in both groups tended to disagree that their braces made them look like a high social class person, the percentage who strongly disagree was more in the PBs group than in the FBs group ($P = 0.002$).

Table 3 reports discussion results from the final logistic regression model which considered the effect of other confounding variables. It appeared that younger adolescents were more likely to obtain FBs (OR = 0.17; 95% CI: 0.002-0.112). Adolescents who wore FBs tended to receive information support from friends (OR = 14.83; 95% CI: 3.44-63.91) and to use FBs as a social class symbol (OR = 2.20; 95% CI: 1.04-4.64). They also tended to have lower knowledge scores (OR = 0.70; 95% CI: 0.50-0.98). Conversely, adolescents who wore PBs were more likely to expect good results in tooth alignment (OR = 0.13; 95% CI: 0.05-0.31). However, the logistic regression model did not show the statistically significant effect of SES and subjective norms on the type of braces obtained.

Table 2 Associations between factors and type of braces obtained (subjective norm and attitude)

Variables	FBs N = 45 n (%)					PBs N = 336 n (%)					P-value ^a
	SD	D	N	A	SA	SD	D	N	A	SA	
Subjective norm											
Friend	4 (8.9)	6 (13.3)	16 (35.6)	15 (33.3)	4 (8.9)	109 (32.4)	67 (19.9)	107 (31.8)	38 (11.3)	15 (4.5)	0.001
Boyfriend/girlfriend	24 (53.3)	13 (28.9)	7 (15.6)	1 (2.2)	0 (0.0)	214 (63.7)	56 (16.7)	37 (11.0)	22 (6.5)	7 (2.1)	0.788
Famous person	13 (28.9)	14 (31.1)	11 (24.4)	5 (11.1)	2 (4.4)	182 (54.2)	55 (16.4)	68 (20.2)	18 (5.4)	13 (3.9)	0.013
Attitude											
Esthetic result	2 (4.4)	3 (6.7)	24 (53.3)	13 (28.9)	3 (6.7)	2 (0.6)	2 (0.6)	19 (5.7)	153 (45.5)	160 (47.6)	<0.001
Attractiveness	1 (2.2)	2 (4.4)	17 (37.8)	21 (46.7)	4 (8.9)	9 (2.7)	31 (9.2)	131 (39.0)	120 (35.7)	45 (13.4)	0.997
Social class	5 (11.1)	22 (48.9)	14 (31.1)	2 (4.4)	2 (4.4)	138 (41.1)	117 (34.8)	55 (16.4)	23 (6.8)	3 (0.9)	0.002
Waste of time	4 (8.9)	7 (15.6)	17 (37.8)	12 (26.7)	5 (11.1)	142 (42.3)	110 (32.7)	67 (19.9)	13 (3.9)	4 (1.2)	<0.001

^aKolmogorov-Smirnov test

Subjective norm: Do you agree with the sentences? a. Friend was the person who influenced your decision to get braces.; b. Boyfriend or girlfriend was the person who influenced your decision to get braces.; c. Famous person was the person who influenced your decision to get braces.

Attitude: Do you agree with the following sentences before you have started wearing braces? a. Suppose I wear braces, my teeth will be straightened.; b. Suppose I wear braces, my appearance will be more attractive. c. Suppose I wear braces, my appearance will look like high social class.; d. Suppose I wear braces, my time will be wasted.

FBs, fake braces; PBs, professional braces

SD, strongly disagree; D, disagree; N, neutral; A, agree; SA, strongly agree

Table 3 Univariate and multivariate analysis of fake braces obtaining considering Gender, Age, Information support, Subjective norm, Attitude, Knowledge score and SES.

Outcome	Variables	P-value	Adjusted OR	95% CI	Unadjusted OR	95% CI
Type of braces 0 = PBs 1 = FBs	Gender	0.428				
	Male		1.798	0.422-7.669	0.713	0.305-1.665
	Female		1		1	
	Age	<0.001				
	≤ 15 years		1		1	
	> 15 years		0.170	0.002-0.112	0.062	0.019-0.204
	Information support					
	Friend	<0.001				
	Yes		14.829	3.441-63.912	16.364	7.513-35.641
	No		1		1	
	Relatives	0.233				
	Yes		0.416	0.098-1.762	0.160	0.069-0.368
	No		1		1	
	Social	0.596				
	Yes		1.599	0.282-9.081	0.564	0.214-1.487
	No		1		1	
	Subjective norm					
	Friend	0.248	1.456	0.769-2.756	1.831	1.388-2.416
	Famous person	0.974	0.991	0.578-1.700	1.341	1.046-1.720
	Attitude					
	Esthetic result	<0.001	0.126	0.052-0.308	0.177	0.107-0.291
	Social class	0.039	2.197	1.041-4.636	1.625	1.208-2.187
	Waste of time	0.181	1.613	0.800-3.249	3.036	2.183-4.224
	Knowledge score	0.040	0.701	0.499-0.984	0.660	0.550-0.793
	SES	0.133	0.687	0.421-1.121	0.506	0.379-0.674

P at Hosmer and Lemeshow test = 0.186

Subjective norm: range from 1 to 5 (strongly disagree to strongly agree)

Attitude: range from 1 to 5 (strongly disagree to strongly agree)

SES: range from 1 to 5 (very low to very high)

OR, Odd ratio

SES, socioeconomic status

Discussion

The logistic regression analyses of the factor associated with FBs obtaining including the SES, source of information, attitude, subjective norm, and knowledge

indicated younger adolescents who sought braces information from friends and wore braces as a social class symbol tended to wear FBs while senior adolescents

who expect better tooth alignment tended to wear PBs. However, the results indicated no significant effect of SES and subjective norms associated with FBs obtaining.

Results revealed that girls wore FBs more than boys. This gender effect was also found in a previous FBs study¹¹ and many other PBs studies.^{3, 12-17} The studies suggested that girls had more esthetic concerns than boys, and they tended to have greater orthodontic treatment needs. Our results further revealed age and educational level effects associated with FBs wearing. The younger students who were grade 7 to 9 wore FBs more than older student who were grade 10 to 12, respectively. In Thailand, the age of students and educational level were closely related which was controlled by the compulsory educational system. Therefore, age and educational level followed the same trend. From these results, it could implied that the FBs problem is prevalent among junior adolescents on whom intervention should be focused.

The observed influence of SES assessed by asset index on PBs obtaining was consistent with other studies.^{16,18,19} The increased proportion of FBs obtaining in the lower SES group was attributed to vulnerability to health-compromising conditions such as financial constraints.^{9,20} Moreover, the availability of free orthodontic treatment affected the demand for treatment.²¹ In Thailand, orthodontic treatment is not included in public health insurance (except for a cleft lip or a cleft palate) and the expense of orthodontic treatment was relatively high. Therefore adolescents with lower SES might be hindered from PBs, and they had no other choices than FBs. However, logistic regression did not show the significant effect of SES assessed by the asset index. This implied the effects of other factors over SES on FBs obtaining.

Information support was a type of social support. Social supports provide information that can affect health and healthcare utilization. Our study found that adolescents get information from parents before obtaining PBs. They needed permission from their parents to support the braces expenses so information from the parents or relatives was significant. On the other hand, friends were an important

source of information for adolescents who obtained FBs. They could find reviews and FBs providing stores from friends without permission from the parents. They certainly do not want their parents to know because fittings of FBs were illegal. In addition, our study found adolescents in both groups rarely searched braces information from social media. Henzell *et al.*²² indicated that most patients tend to find orthodontic treatment information directly from orthodontists rather than from social media. It can be implied that social media was only an alternative way for adolescents to find information about braces. They rather accept information from orthodontists, parents, or friends.

Knowledge about the importance of oral health plays a part in dental attendance patterns.²³ Low oral health literacy impeded recognition of the risk for oral diseases as well as the need for oral health care.²⁴ Regarding FBs obtaining, knowledge of the danger of FBs would be needed to protect adolescents from the hazards of wearing FBs. It was found that adolescents in the FBs group had lower knowledge in all topics, and logistic regression showed they tended to have lower mean scores. These findings emphasized the importance of oral health education against FBs.

Subjective norms are perceived as social pressure to perform or not to perform the behavior.²⁵ According to Atisook and Chuacharoen³, social norms had an association with the demand for orthodontic treatment in adolescents. The influence of peer groups and famous persons on the increase of braces need were observed in our study as well as many FBs studies.^{11,26} It was reasonable to think that adolescents wear FBs, instead of unaffordable PBs, because of peer pressure or just imitating celebrities. However, logistic regression did not confirm the significant effect of the subjective norms.

Regarding attitude, compared to previous evidence^{11,26}, our data observed that both FBs and PBs made adolescents feel more attractive but there was no difference between groups. Multivariate analysis showed that adolescents were more likely to think about the esthetic result before wearing PBs while adolescents

thinking about social class were more likely to wear FBs. This finding indicates that the FBs were not aware of malocclusion improvement, but they only try to move up their social class and feel more confident. Actual SES seems to be less significant than the expectation to be higher social class. In addition, we noticed that the attitudes of adolescents in both groups were the same trend except for the wasting time aspect. More than one-third of the FBs thought that FBs was time-wasting, but they still wore FBs.

This study was an analytical evidence-based research that investigated fake braces in Bangkok, Thailand. The effects of peer influence, social ladder, and knowledge on obtaining fake braces reported by several anecdotal evidences were emphasized. Nevertheless, the result should be interpreted carefully because this study had a limitation as data was collected in Bangkok and the size of sample is not quite large enough to show all relationships. Another error in this study can occur while participants wearing FBs were completing the questionnaires. They might be reluctant to tell the truth because of fear of punishment. Further research is suggested with a large sample size and well-controlled bias would clarify more relationships between FBs and the factors.

Conclusion

Although many determinants were associated with braces obtaining, our study revealed that peer influence, knowledge, the expectation of good tooth alignment, and the expectation of looking like they are from a higher social class among the younger adolescents were proven to associate more strongly with the type of braces obtained. Therefore, to deal with the FBs situation, the provision of a health promotion program about FBs should focus on younger students (age less than 15 years old) to provide information and emphasize positive attitudes toward the esthetic result of orthodontic treatment. The attitudes toward the social class symbol of FBs should be changed. Health education about the lack of safety of FBs wearing is still needed. In addition, for an upstream approach, lower cost or even free-of-charge orthodontic

treatment for more types of malocclusion patients might be included in public health insurance to increase the affordability for the lower SES patients.

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