ORAL HEALTH STATUS AND THE BODY MASS INDEX IN YOUNG ADULTS

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ABSTRACT

Poor oral health has been reported to correlate to the body mass index (BMI) of the overweight and the obesity groups. These has yet widely studied in Indonesia. The aim of this study was to analysed the oral health, socioeconomy factors (FSE) and the BMI in the seemingly healthy university students in Kediri aged 18-21 years old. This cross-sectional study was conducted amongst male and female students of IIKBW, Kediri, Indonesia (n=150). We analysed their BMI from the body weight and height (kg/m2). Their oral health was determined by the DMFT index (decayed missing filled teeth index), the stimulated salivary flow rate (SSFR) and the gingival index (GI). FSE studied include father's highest education and monthly income, tooth brushing frequency in a day and dental floss habitual use. Data was analysed using SPSS 17 with level of significance of p<0.05. No significant differences in BMI, DMFT index, SSFR and GI respectively (p=0.411; p=0.037, p=0.880, p=0.142) between male and female groups. No significant corelation BMI with DMFT index, SSFR and GI, respectively (p=0.340, p=0.420, p=0,446). FSE are not significantly correlated to either the BMI, DMFT index, SSFR or GI (p > 0.05). There were 41.8% of males and 57.8% of females have "bad" score of DMFT and 98.6% of males and 92.1% of females have "bad" score of GI; 4.1% of males and 2.6% of females have low score of SSFR. Although we found no significant differences in the BMI and oral health parameters between genders, in the seemingly healthy young adults oral health hygiene could be compromised as found in the current study indicated by bad scores of DMFT, SSFR or GI. Here we found that either BMI or FSE was not significantly correlated to any of oral health parameters measured in the current study.

Keywords: DMFT index, SSFR, gingival index, socioeconomy factor

ABSTRAK

Kesehatan mulut yang kurang baik berkorelasi dengan besarnya indeks massa tubuh (BMI). Hal tersebut belum banyak dipelajari di Indonesia terutama di kalangan mahasiswa tanpa adanya gangguan kesehatan berat. Tujuan dari penelitian ini adalah untuk menganalisis hubungan kesehatan mulut, faktor sosioekonomi (FSE) dan BMI pada mahasiswa dengan kondisi sehat di Kediri usia 18-22 tahun. Penelitian cross-sectional ini dilakukan di IIKBW, Kediri, Indonesia (n = 150). Kesehatan mulut dinilai dari indeks DMFT (decayed missing filled teeth index), stimulated salivary flow rate (SSFR) dan indeks gingiva (GI). FSE dinilai dari kuesioner berisi pendidikan tertinggi ayah, penghasilan ayah per bulan, frekuensi menggosok gigi per hari dan kebiasaan menggunakan dental floss. Data dianalisis menggunakan SPSS 17 laki-lakiperempuandengan tingkat signifikansi p<0,05. Tidak ditemukan adanya beda signifikan pada BMI, indeks DMFT, SSFR dan GI antara kelompok laki-laki dan perempuan (p=0,411; p=0,037; p=0,880; p=0,142). Tidak ada korelasi signifikan antara BMI dengan indeks DMFT, SSFR dan GI (p=0,340; p=0,420; p=0,446). FSE tidak berkorelasi signifikan dengan BMI, maupun dengan indeks DMFT, SSFR dan GI (p> 0,05). Sekitar 41,8% laki-laki dan 57,8% perempuan memiliki skor DMFT yang buruk, 98,6% laki-laki dan 92,1% perempuan memiliki skor GI yang jelek, 4,1% laki-laki dan 2,6% perempuan memiliki skor SSFR yang rendah. Meskipun demikian, pada orang dewasa yang tampak sehat, kualitas kesehatan mulut yang kurang baik dapat ditemukan, terbukti dari skor DMFT, SSFR ataupun GI yang buruk. Dari studi ini ditemukan bahwa BMI dan FSE tidak berhubungan dengan parameter kesehatan mulut berupa DMFT, SSFR dan GI.

Kata kunci: Indeks DMFT; SSFR; indeks gingiva; faktor sosioekonomi

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INTRODUCTION

Obesity and overweight are defined as excessive deposition of fat that may alter one's health. In an adult the overweight is diagnosed when the body mass index (BMI) is ≥ 25; whilst obese if the BMI is ≥ 30 kg/m2 (Al-Qahtani et al 2018). The World Health Organization (WHO) (2000) estimates that obesity is amongst the big five of mortality cause in the world (Alswat et al 2016). The obesity rate has doubled in the past 20 years in both developing and developed countries (Yang et al 2009). The prevalence of obesity among young adults in the developing countries ranges from 2.3% to 12%, with the overweight prevalence is as high as 28% (Poobalan & Aucott 2016). The poor oral health i.e. dental caries, periodontal disease, and a decrease stimulated salivary flow rate (SSFR) have been reported to correlate to the BMI in the overweight and the obesity groups (Reeves et al 2006, Modéer et al 2010, Verma et al 2013). In other previous studies however, poor oral health has been reported to have no correlation to the BMI; i.e. to the overweight and the obesity groups. So far, several studies conducted in the developing countries including Indonesia had shown no consistency on the correlation between the BMI, FSE and oral health parameters including the dental caries (Al-Zahrani et al 2003, Hiremath 2011, Tyrrell et al 2016). Hence, here we aimed to analysed the body mass index (BMI), socioeconomy factors (FSE) and oral health status (DMFT Index, SSFR and GI) in the seemingly healthy male and female university students to comprehend the prevalence and any possible correlations existed.

MATERIALS AND METHODS

A cross-sectional study was conducted amongst male and female students of IIKBW, Kediri, Indonesia (n=150). Ethical clearance was obtained from the KEPK, Universitas Airlangga. We analysed their BMI from the body weight and height (kg/m2). The BMI was calculated as weight in kilograms divided by height squared in metres. Subjects with BMI of less than 18.5kg/m2 were classified as underweight, 18.5-22.9 kg/m2 were classified as normal weight, 23.0-24.9 kg/m2 were classified as overweight, 25.0-29.9 kg/m2 were classified as obese I and BMI greater than or equal to 30 kg/m2 were defined as obese II (WHO 2000). Their oral health was determined by the DMFT index (decayed missing filled teeth index), the stimulated salivary flow rate (SSFR) and the gingival index (GI) (Modéer et al 2010, Al-Zahrani et al 2003). DMFT index measurement by looking at permanent teeth that have caries (D), missing teeth due to the presence of previous caries (M), and dental fill conditions due to the presence of previous caries (F). The index is measured

using the dental mirror (Medesy, Italy) and standard explorer no. 23 (Medesy, Italy). The DMFT index score was classified into good (very low : DFMT index score 0.1-1.1; low : DFMT index score 1.2 - 2.6 and moderate : DFMT index score 2.7-4.4) and bad (high : DFMT index score 4.5- 6.5 and very high : DFMT index score >6.5) (Joe et al 2007, Noviani 2010, Hiremath 2011). SSFR measurements are carried out in the morning (08.00-10.00 am), there is no limit to the food given to patients. All stimulated saliva was collected by asking the subject to chew gum (Happydent complete sugar free chewing gum Italy, Indonesia) for 5 minutes. Before collecting saliva, the subject rinsed the mouth with water and spits saliva into a test tube. The amount of saliva is determined after the saliva is collected and the level of salivary secretion is expressed as ml/minute (Modéer et al 2010). The normal SSFR level in adults is 1-2 ml per minute and SSFR < 1 ml was hyposalivation (Kidd 2005). GI measurements were measured by Loe and Silness criteria (1964) using a periodontal probe (Probe Periodontal PFG-W, OSUNG Co., Gimpo, Korea) inserted into the gingival sulcus area as deep as 1 mm into the gingival sulcus or pocket in the distal aspect of most posterior teeth in the buccal surface quadrant. A light probe across the length of the sulcus to the mesial interproximal region on the facial aspect was done, and continued along all quadrant teeth from the facial aspect. After 30 seconds, the bleeding on the distal, facial and mesial surfaces were noted. These were repeated on the lingual-palatal aspect (Hiremath 2011, Carranza 2015), the gingival surface changes in size, color, surface texture (dried first), consistency of the gingiva and gingival contours were examined (Carranza 2015); GI was categorized into normal (GI score < 0.1) and gingivitis (mild : GI score 0.1 ‚Äì 1.0 ; moderate : GI score 1.1 ‚Äì 2.0 and severe : GI score 2.1 ‚Äì 3.0) (Hiremath 2011; Carranza 2015). These were measured by professional dentists whose blinded and pre-trained to the standard references to achieve optimal objectivity. These would then be classified each into the low score and high score groups. Parents' income is categorized based on the average minimum regional payment in Kediri, Indonesia around 1,797,819 rupiah (Pergub Jatim, 2018). Other FSE including father's highest education, tooth brushing frequency in a day and dental floss habitual use were collected by self-questionnaire. Data was analysed using SPSS 17 to seek any differences in the BMI, the DMFT index, SSFR, GI and FSE between males and females; and any correlations between these variables. The level of significance is p<0.05.

RESULTS

The mean values and proportions for various anthropological parameters and oral health status are given in Table 1-4. There were 74 male and 76 female participants. According to their BMI, 23 (15.3%) underweight, 27 (18%) normal, 54 (36%) overweight, 33 (22%) obese 1, and 13 (8.7%) obese 2. No significant difference in BMI (p= 0.411), SSFR (p = 0.587), and GI (p = 0.294) between male and female groups. There is significant difference in DMFT index (p= 0.036). There are no significant correlation between BMI with DMFT index (p= 0.340), SSFR (p = 0.420) and GI (p = 0.446). The father's highest education and monthly income, tooth brushing frequency, and dental floss are not significantly correlated to either the DMFT index, SSFR or GI with p > 0.05. Either father's highest education and monthly income, tooth brushing, or dental floss were not significantly correlated to the BMI with p > 0.05. There were 41.8% of males (n= 31) and 57.8% (n= 44) of females have "bad" score of DMFT and 98.6% of males (n= 73) and 92.1% (n= 70) of females have "bad" score of GI; 4.1% of males (n= 3) and 2.6% (n=2) of females have low score of SSFR.

DISCUSSION

We found no significant differences in the BMI between male and female students. Furthermore, no other significant differences of oral health parameters were found between genders, except DMFT index. The result in the current study was in accordance to the previous study by Alswat et al (2015). They found that from 385 subjects with a mean age of 28.39 years no significant difference on the BMI between genders (26.61 compared to 26.39 in males vs. females (p = 0.809)). Alhaffar et al (2018) found that from 70 subjects with a mean age 36.5 years have significant difference (p = 0.007). Carvalho et al (2016) found that from 171 subjects with a mean age of 18-33 years no significant difference in the SSFR between genders (p = 0.82). The SSFR was 1.54 ml/ minute in males and 1.52 ml/ minute in females. Kazem et al (2017) found that from 60 subjects with a mean age of 18-33 years, no significant difference in the GI between genders (p = 0.728). The GI rate was 1.063 in males and 1.118 in females. Here the socioeconomy factors were not significantly correlated to any oral health parameters, or to the BMI. The socioeconomy could be one factor influencing the BMI and the oral health parameters. These were reported by Tyrrell et al (2016) showed that in study with 119.669 men and women of British ancestry aged between 37 and 73 years, the income and education levels are correlated to the BMI. On the other hand, the tooth brushing frequency were surprisingly not significantly correlated to the oral health parameters in this study. These habits were reported to significantly decreased the incidence of dental caries and gingivitis in the study by Chesters et al (1992) and Kolawole et al (2011). These habits can decrease dental plaque containing bacterial biofilm that causes caries, chronic gingivitis and periodontitis. Caries and periodontal diseases develop as an interaction of hosts and bacteria, resulting in changes of hard tissue of the teeth and periodontal (Prpić et al 2013, De Campos et al 2014). The dental floss use after eating also has no significant correlation to any oral health parameters studied here.

However, in the study by Rahman and Al Kawas (2013) use of dental floss and brushing the teeth twice a day can decrease gingival inflammation. Modéer et al (2010) showed that SSFR in obese patients were less than those with normal BMI, 1.2 ml/minute: 2 ml/minute. Obesity was associated with decayed missing filled teeth index (DMFT index) whereas the mean caries index of individuals who are obese was significantly higher than those of other mean BMI categories (Verma et al 2013). Meanwhile, the prevalence of periodontal disease is 76% higher amongst young obese individuals aged 18-34 years than in normal weight individuals; being overweight is associated with an increased risk of periodontitis among those aged 17-21 years (Al-Zahrani et al 2003, Reeves et al 2006). However, a study by Vallogini et al (2017) reported that the amount of plaque recorded on the teethsurfaces of the obese persons was significantly less than in the control normal weight group. This result might be somehow similar to the current study, although clear underlying mechanism has still controversial. It has been reported that in adolescent with obesity, the decayed teeth observed are fewer, whilst the periodeontal health status is better due to lesser inflammation occurs than in normal weight group. In this study, the health awareness of the parents with higher education and monthly income are quite intensive that might implement as better oral hygiene for their children, yet in other previous study this has still been debatable (Vallogini et al 2016, Prpić et al 2013).

CONCLUSION

Although we found no significant differences in the BMI and oral health parameters between genders, the oral health hygiene was found to be compromised in several cases. We also found that either BMI or socioeconomy factor was not significantly correlated to any of oral health parameters measured in the current study.

Table 1. Anthropometry and oral health parameters of study subjects

Variables	All	Males (n = 74)	Females (n = 76)	p value
Weight (kg) (μ (SD))	62.3 (14.9)	67.9 (15.9)	56.7 (11.5)	<0.001
Height (cm) (μ (SD))	162.1 (8.3)	168.2 (5.8)	156.1 (5.6)	<0.001
BMI (kg/m2) (μ (SD))	23.6 (4.8)	23.9 (5.1)	23.3 (4.5)	0.411
BMI < 18.5 kg/m^2 (n (%))	23 (15.3)	12 (16.2)	11 (14.5)	0.945
BMI 23-24.9 kg/m^2 (n (%))	27 (18)	8 (10.8)	19 (25)	0.040
BMI 18.5-22.9 kg/m^2 (n (%))	54 (36)	24 (32.4)	30 (39.5)	0.467
BMI 25.0-29.9kg/m^2 (n (%))	33 (22)	24 (32.4)	9 (11.8)	0.004
BMI ≥ 30 kg/m^2 (n (%))	13 (8.7)	6 (8.1)	7 (9.2)	1
BMI ≥ 23 kg/m^2 (n (%))	73 (48.7%)	38 (51.4%)	35 (46.1%)	0.627
DMFT Index (μ (SD))	4.57 (3.15)	4.03 (2.84)	5.1 (3.37)	0.037
Underweight	4.30 (2.81)	3.16 (1.74)	5.55 (3.29)	
Normal	4.7 (3.24)	4.6 (3.07)	4.9 (3.38)	
Overweight	5.22 (3.53)	4.88 (3.6)	5.37 (3.56)	
Obese 1	4.63 (3.13)	4.17 (2.71)	5.79 (3.55)	
Obese 2	2.85 (2.2)	2.00 (2)	3.57 (2.3)	
DMFT index (n (%))				
Very low	25 (16.7%)	15 (10%)	10 (6.7%)	
Low	22 (14.7%)	12 (8%)	10 (6.7%)	
Moderate	28 (18.7%)	16 (10.7%)	12 (8%)	
High	37 (24.7%)	19 (12.7%)	18 (12%)	
Very high	38 (25.3%)	12 (8%)	26 (17.3%)	
SSFR (ml/min) (μ (SD))	1.45 (0.68)	1.46 (0.73)	1.45 (0.64)	0.880
Underweight	1.45 (0.86)	1.73 (1.1)	1.154 (0.34)	
Normal	1.48 (0.64)	1.42 (0.56)	1.53 (0.7)	
Overweight	1.44 (0.61)	1.25 (0.41)	1.52 (0.67)	
Obese 1	1.41 (0.68)	1.46 (0.65)	1.23 (0.31)	
Obese 2	1.46 (0.72)	1.27 (0.55)	1.64 (0.84)	
SSFR (n (%))				
Hiposalivation	5 (3.3%)	3 (4.1%)	2 (2.6%)	
Normal	145 (96.7%)	71 (95.9%)	74 (97.4%)	
Gingival index (μ (SD))	0.65 (0.36)	0.69 (0.34)	0.61 (0.367)	0.142
Underweight	0.59 (0.32)	0.67 (0.29)	0.5 (0.35)	
Normal	0.7 (0.38)	0.76 (0.35)	0.66 (0.39)	
Overweight	0.59 (0.37)	0.63 (0.4)	0.58 (0.37)	
Obese 1	0.62 (0.29)	0.65 (2.8)	0.55 (0.29)	
Obese 2	0.73 (0.44)	0.77 (0.5)	0.70 (0.42)	
Gingival index (n (%))				
Normal	7 (4.7%)	1 (0.7%)	6 (4%)	
Mild inflammation	120 (80%)	62 (41.3%)	58 (38.7%)	
Moderate inflammation	23 (15.3%)	11 (7.3%)	12 (8%)	
Severe inflammation	0 (0%)	0 (0%)	0 (0%)	
Father's highest education (n (%))				
Elementary school	5 (3.3%)	2 (1.3%)	4 (2.7%)	
Junior high school	2 (1.3%)	2 (1.3%)	1 (0.7%)	
Senior high school degree	35 (23.3%)	14 (9.3%)	23 (15.3%)	
Graduation degree	76 (50.7%)	38 (25.3%)	39 (26%)	
Post-graduation degree	32 (21.3%)	18 (12%)	7 (4.7%)	
Tooth brushing (n (%))				
< 2 times a day	150 (100%)	74 (49.3%)	76 (50.7%)	
≥ 2 times a day	37 (24.7%)	18 (12%)	19 (12.7%)	
Use of dental floss (n (%))	24 (16%)	12 (8%)	12 (8%)	
Level of income (n (%))				
< regional minimum payment	7 (4.7%)	5 (6.6%)	2 (2.6%)	
≥ regional minimum payment	143 (95.3%)	59 (93.4%)	74 (97.4%)	

Table 2. Pearson's correlation coefficients (r) of BMI with DMFT index

Subject	BMI	
	DMFT index	GI
Overall (Male & Female)		
p value	0.340	0.446
Male		
p value	0.587	0.854
Female		
p value	0.531	0.443

Table 3. Spearman's correlation coefficients (r) of BMI with GI and SSFR

Subject	BMI
	SSFR
Overall (Male & Female)	
p value	0.420
Male	
p value	0.098
Female	
p value	0.583

Table 4. Chi-square's test of DMFT index with father's highest education, monthly income, tooth brushing frequency in a day and dental floss habitual use

Socioeconomy factor	DMFT index		
	Good	Bad	P value
Father's highest education (n (%))			
Elementary school	2 (2.6%)	3 (4%)	1.000
Junior high school	2 (2.6%)	0 (0%)	0.497
Senior high school degree	18 (24%)	17 (22.6%)	1.000
Graduation degre	36 (48%)	40 (53.3%)	0.842
Post-graduation degree	17 (22.6%)	15 (2%)	0.82
Level of income (n (%))			
< regional minumum payment	0 (0%)	1 (1.3%)	1.000
≥ regional minumum payment	75 (100%)	74 98.7%)	
Use of dental floss (n (%))			
Yes	12 (16%)	12 (16%)	1.000
No	63 (84%)	63 (84%)	
Tooth brushing (n (%))			
< 2 times a day	0 (0%)	2 (2.6%)	0.497
≥ 2 times a day	75 (100%)	73 (97.3%)	

Table 5. Chi-square's test of SSFR with father's highest education, monthly income, tooth brushing frequency in a day and dental floss habitual use

Socioeconomy factor	SSFR		
	Normal	hiposalivation	P value
Father's highest education (n (%))			
Elementary school	5 (3.4%)	0 (0%)	1.000
Junior high school	2 (1.3%)	0 (0%)	1.000
Senior high school degree	34 (23.4%)	1 (20%)	1.000
Graduation degre	72 (49.6%)	4 (80%)	0.367
Post-graduation degree	32 (22%)	0 (0%)	0.585
Level of income (n (%))			
< regional minumum payment	144 (99.3%)	0 (0%)	1.000
≥ regional minumum payment	1 (0.6%)	5 (100%)	
Use of dental floss (n (%))			
Yes	23 (15%)	1 (20%)	0.587
No	122 (84%)	4 (80%)	
Tooth brushing (n (%))			
< 2 times a day	2 (1.3%)	0 (0%)	1.000
≥ 2 times a day	143 (98.6%)	5 (100%)	

Table 6. Chi-square's test of GI with father's highest education, monthly income, tooth brushing frequency in a day and dental floss habitual use

Socioeconomy factor	GI		
	Normal	Gingivitis	P value
Father's highest education (n)			
Elementary school	0 (0%)	5 (3%)	1.000
Junior high school	0 (0%)	2 (1.3%)	1.000
Senior high school degree	2 (28.5%)	33 (23%	0.667
Graduation degre	5 (71.4%)	71 (49.6%)	0.442
Post-graduation degree	0 (0%)	32 (22.3%)	0.346
Level of income (n)			
< regional minumum payment	0 (0%)	1 (0.69%)	1.000
≥ regional minumum payment	7 (100%)	142 (99.3%)	
Use of dental floss (n)			
Yes	0 (0%)	24 (16%)	0.598
No	7 (100%)	119 (83.2%)	
Tooth brushing (n)			
< 2 times a day	0 (13%)	2 (1.3%)	1.000
≥ 2 times a day	7 (100%)	141 (98.6%)	

Table 7. Chi-square's test of BMI with father's highest education, monthly income, tooth brushing frequency in a day and dental floss habitual use

Socioeconomy factor	BMI		
	Underweight	Normal	P value
Father's highest education (n (%))			
Elementary school	0 (0%)	2 (3.7%)	1.000; 1.000
Junior high school	1 (4.3%)	1 (2.8%)	0.284; 0.684
Senior high school degree	5 (21.7%)	12 (22.2%)	1.000; 0.856
Graduation degre	12 (52.1%)	27 (50%)	1.000; 1.000
Post-graduation degree	5 (21.7%)	12 (22.2%)	1.000; 1.000
Level of income (n (%))			
< regional minumum payment	0 (0%)	0 (0%)	1.000; 1.000
≥ regional minumum payment	23 (100%)	54 (100%)	
Use of dental floss (n (%))			
Yes	3 (13%)	8 (14.8%)	1.000; 0.948

No	20 (86.9%)	46 (58.2%)	
Tooth brushing (n (%))			
< 2 times a day	0 (0%)	2 (3%)	1.000; 0.128
≥ 2 times a day	23 (100%)	52 (96.2%)	

Table 8. Chi-square's test of BMI with father's highest education, monthly income, tooth brushing frequency in a day and dental floss habitual use

Socioeconomy factor	IMT		
	Over weight	Obese	P value
Father's highest education (n (%))			
Elementary school	2 (7.4%)	1 (2%)	0.220; 1.000
Junior high school	0 (0%)	0 (0%)	1.000;1.000
Senior high school degree	7 (25.9%)	11 (23.9%)	0.937; 1.000
Graduation degre	10 (37%)	27 (58.6%)	0.176;0.258
Post-graduation degree	8 (29.6%)	7 (15.2%)	0.367; 0.317
Level of income (n (%))			
< regional minumum payment	1 (3.7%)	0 (0%)	0.180; 1.000
≥ regional minumum payment	26 (96.2%)	46 (100%)	
Use of dental floss (n (%))			
Yes	5 (18.5%)	8 (17.4%)	0.772; 0.811
No	22 (81.4%)	38 (82.6%)	
Tooth brushing (n (%))			
< 2 times a day	0 (0%0	0 (0%)	1.000; 1.000
≥ 2 times a day	27 (100%)	46 (100%)	

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