

## Frequency of food intakes and dental caries in a Malaysian dental student group

Sulinda D<sup>1</sup>, Marina MM<sup>2</sup>, Rahim ZHA<sup>3</sup>, Ferguson DB<sup>4</sup>

### ABSTRACT

**Objective:** Although the relationship between snack food eating and dental caries has been investigated in the United States and European groups, no data exist for Asian snack foods and diets. Our objective was to investigate snack food eating and dental caries in a Malaysian dental student group.

**Methodology:** Frequency of eating was assessed on a basis of 2 weekday and 2 weekend day diaries for non-fasting students and one weekday and one weekend day during Ramadan, and a similar set outside Ramadan for fasting students. The sucrose and carbohydrate composition of between meal snacks and drinks was identified. The total number of decayed, missing, and filled teeth was recorded by two dental examiners.

**Results:** The modal number of total food intakes was 2 or 3 per day on both weekdays and weekends. The number of between-meal snacks and drinks varied between 0 and 5. They were either high sucrose/low carbohydrate or high sucrose/high carbohydrate. DMFS scores were very low in all subjects but increased with between-meal snack intakes, particularly in the high sucrose/low carbohydrate category.

**Conclusions:** Malaysian students had relatively low frequencies of food intakes but there was still an association between frequency of between-meal snacks and caries rates, as in Western countries.

**KEY WORDS:** Diet, Dental Caries, Eating Frequency, Students.

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### INTRODUCTION

The original studies of Stephan<sup>1</sup> demonstrated that, after an initial sucrose challenge, the pH on the tooth surface dropped and stayed below that at which dental enamel might be expected to dissolve for some 20-30 minutes. One implication of these observations is that multiple sucrose challenges such as might result from frequent food intakes would be more harmful than intakes widely separated in time. It was not surprising, therefore, that several later observers were able to show an association between the number of food or drink intakes during the day and the severity of dental caries attack as demonstrated by DMF or DMFS scores.<sup>2-5</sup> Rugg-Gunn et al<sup>6</sup> report figures for frequency of oral intakes by UK children, giving a mean of 6.8 per day, with a range from 4.3 to 11.7. Arcella et al<sup>4</sup> found that Italian children had

1. Sulinda D,
2. Marina MM,
3. Rahim ZHA,
4. Ferguson DB,
- 1-4: Department of Oral Biology,  
Faculty of Dentistry,  
University of Malaya,  
Malaysia.

Correspondence:

Dr. David Bulmer Ferguson,  
25 Partridge Avenue,  
Manchester, M23 1PL,  
United Kingdom.

E-mail: db.ferguson@yahoo.com.sg

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a mean frequency of oral intakes of 4.93. Yabao et al<sup>7</sup> reported that the sugar intake of 6-8 year old children in le Trinidad, Benquet, Philippines, was twice the WHO recommendation of 59 g per person per day, but there was no significant correlation between sugar intake and dental caries. Zahara et al<sup>8</sup> who carried a study on Malaysian preschool children (5-6 years) had reported oral intake frequency of sugary food and drink as 2-3 per day while Yabao et al<sup>7</sup> reported 0-3 per day for 6-12 year old children in le Trinidad.<sup>7</sup>

We decided to assess the number of daily oral intakes in a group of Malaysian dental students, partly to see how Malaysian adolescents in their home country compared with their European counterparts, and partly to give some information on the potential intakes of immigrant SE Asians in European populations.

### METHODOLOGY

The University of Malaya first year dental student class of 2009, comprising 19 males and 49 females with a mean age of 18.98 years gave informed written consent to participate in the study. They were divided into two groups, fasting (38 students) and non-fasting (30 students). Students were asked to record each intake of any food or drink over 24 hours and indicate the nature and estimated amount of each intake. Non-fasting students recorded four survey days, one a weekday and one a weekend day in two separate weeks. Fasting students completed 2 days during the fasting month of Ramadan and then 2 days in a non-fasting week. At the end of the recording period 2 examiners determined the DMFS score for each subject using a mirror and probe with an intraoral light. The dentition of the subjects was also observed to determine if there was any variation from the norm. No radiographs were taken. The inter-examiner and intra-examiner reliability were evaluated by repeating observations. Because the caries rates were so low and the sample population small, there was complete agreement between and within observers ( $\kappa=1.0$ )

The number of oral intakes per day was recorded as a histogram, from which modal values and range could be observed. Mean values of DMFS for the students were calculated. The number of oral intakes was then adjusted by eliminating the main meals (usually 3) and the remaining intakes were then characterized in terms of sucrose and carbohydrate content as suggested by Arcello et al<sup>4</sup> with data from the Malaysian foods database.<sup>9</sup> The mean DMFS for each of the numbers of intakes apart from the main meals

was calculated and the 95% confidence interval calculated.

### RESULTS

The modal frequency of oral intakes in the whole group of students during non-fasting weeks was between 3 and 4 (Fig-1). The fasting students during Ramadan had, as expected, a modal value between 2 and 3, entirely during the hours of darkness.

The dental examination revealed a mean DMFS of 1.54. Teeth missing because of orthodontic extraction and non-erupted third molars were excluded. As a result the M component was zero. Actual caries was detected in 43 individuals and consisted only of sticky fissures and, in one case, a single pit on the palatal side of an upper second molar. The filled component was also small: the total number of teeth with fillings was 60 and these fillings were, with one exception, simple spot occlusal fillings.

There was no correlation between the total number of food and drink intakes and dental caries experience. The between meal intakes were assessed in terms of their sucrose and carbohydrate content from the available tables of Nutrients.<sup>9</sup> They were all either high sucrose, low carbohydrate or high sucrose, high carbohydrate. The mean DMFS for each number of intakes in these categories was calculated, resulting in the following values. Students taking no between-meals food or drink had a mean DMFS of 0.71 (CI 0.42). Number of daily intakes of high sucrose, low carbohydrate: one intake was associated with a mean DMFS of 2.70 (CI 1.40), 2 intakes with a mean DMFS of 5.5 (CI 0.98), and 3 intakes with a

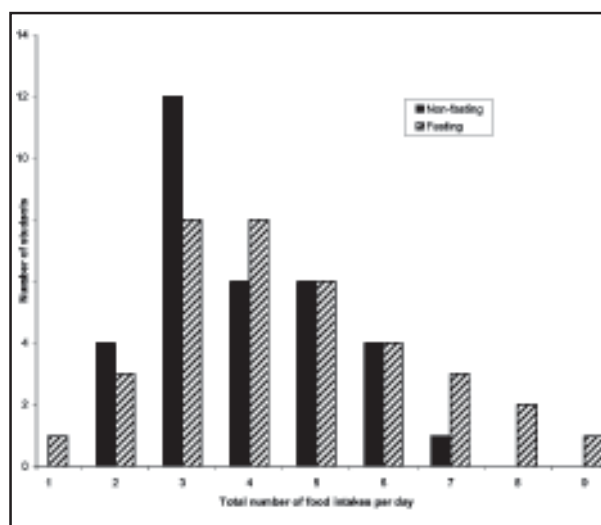


Fig-1: The mean frequency of food intakes over 4 sample days for non-fasting students and 2 sample days for fasting students.

mean DMFS of 3.0 (CI 1.73). The corresponding figures for the high sucrose, high carbohydrate intakes were: one intake mean DMFS 2.05 (CI 1.10), 2 intakes mean DMFS 0.70 (CI 0.48), and 3 intakes mean DMFS 3.0 (CI 0.66). When the figures were combined, the mean DMFS values were as follows: for 1 intake 1.83 (CI 0.96), for 2 intakes 1.50 (CI 1.08), and for 3 or more intakes 2.33 (CI 1.09).

## DISCUSSION

The reported frequency of oral intakes was very low in comparison with typical Western figures. We had no reason to suspect under-reporting as even water intakes were recorded. There are several reasons why intake frequencies should be so low. Confectionery (candies) is not a usual item in the Malaysian diet, possibly because frequent sugar intake seems less necessary in a tropical climate. The dental students live on campus and have a very full timetable, factors restricting availability of, and times for, between-meals snacks or drinks. Although some individuals had a frequent water intake, this was actually water and not canned or bottled drinks containing sugar.

The mean DMFS score of 1.54 was lower than those commonly recorded in most Western students. It was surprising to see so many uniformly complete perfect dentitions with large well-formed teeth. Malaysia does have water fluoridation at around 0.7ppm<sup>10</sup> but there was no evidence of fluoride-induced mottling in this group of students. Any caries detected was fissure caries with the exception already noted. That particular lesion was in an otherwise caries-free mouth. The DMFS values recorded in these dental students are lower than those in the general Malaysian population of 15-19 year olds as recorded in the last Dental Health report at a mean of 2.85.<sup>11</sup> The corresponding British figure (2003 survey) is 2.1.<sup>12</sup> The results when only between-meal eating was analysed suggested that high sucrose, low carbohydrate intakes as defined by Arcello et al<sup>4</sup> were associated with DMFS values greater than those for the rest of this population. The high sucrose high carbohydrate intakes were less likely to affect the DMFS values except when the number of intakes was high. Evidence from the literature links low DMFS scores with a low frequency of oral intakes<sup>2-5</sup> and this would fit with our present observations. Whether one can extrapolate these observations to students or immigrants from SE Asia in European countries is debatable. Custom and habit might be strong enough for them to maintain eating patterns and caries experience in a temperate climate despite peer pressure from their

European associates, but this could not be guaranteed. Second generation immigrants with parents originally from SE Asia might well conform to the habits and customs of the surrounding population. In summary, the Malaysian dental students had low frequencies of oral intakes and an associated lack of carious lesions. Even then, between-meals snacks high in sucrose were likely to be associated with higher dental caries scores.

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## Authors Contributions:

Sulinda D: Questionnaire administration.

Marina MM: Caries assessment.

Rahim ZHA: Provision of laboratory and technical assistance

Ferguson DB: Caries assessment, analysis of data.