Comparison between Periodontal Self-examination and Self-reported Periodontal Disease among Selected Adults in Kuala Lumpur

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ABSTRACT

Periodontal disease, generally known as a silent disease, is one of the major global oral health burdens that contributes to tooth loss in adults. This study was to compare findings and agreement between periodontal self-examination (SE) and self-reported (SR) assessments in detection of periodontal disease among selected adult patients in Kuala Lumpur. The subjects were patients who attended the periodontic clinics in Faculty of Dentistry, UKM. Periodontal patients who met the inclusion criteria were randomly assigned into two groups, SE and SR groups. Patients in the SE group performed a periodontal SE using illustrated written manual with questionnaire, while those in the SR group answered questionnaire. Both groups were given similar content of questionnaire. Clinical oral examinations were carried out on all patients by a single trained calibrated examiner. A total of 172 patients (86 in each group) participated in the study with the mean age of 48 years (SD 12.6). Majority of them had severe periodontal disease. Only item "total number of teeth" had showed good agreement ($p < 0.01$) between groups. SR group showed higher sensitivity for all items (mobility, colour, recession and bleeding). Meanwhile, the SE group demonstrated higher specificity for items on mobility, recession and bleeding. Both SR and SE assessment areas were reliable in measuring total number of teeth in periodontal patients. SR assessment is more sensitive in detecting periodontal disease in terms of items for mobility, colour, recession and bleeding.

Keywords: Adult; periodontal disease; periodontitis; self-examination; self-reported

INTRODUCTION

Periodontal disease, generally known as a silent disease, is one of major global oral health burdens that contributes to tooth loss in adults (Albandar & Rams, 2002; Dye, 2012). In Malaysia, 94% of adults had some form of periodontal disease (OHD-MOH, 2004, 2013; Corbet & Leung, 2011). Focusing on earlier identification of disease by patient self-care was found to be useful in improving the patient's awareness towards

dental disease and should be an integral part of disease management (Malik *et al.*, 2012).

Self-examination (SE) is one of the methods for early detection of oral disease. It is defined as any investigation or inspection made by the individual itself for the purpose of finding any disease in their own awareness (Dirckx, 1997). Any pathological changes as compared to normal condition in the SE will trigger the patients to seek further treatment and thus help in the early detection of chronic diseases (Rizvi *et al.*, 2013). This method is known to be cost-effective, affordable, acceptable and easily accessible for the majority of at-risk group (Cole & Austin, 1981; Holtzman & Celentano, 1983). Furthermore, by using SE aided with written manual, Glavind & Attström (1979) had reported close correlation between symptoms of periodontal disease found by patients and clinical examination by dentist. They also found out that patients became more motivated to improve their oral hygiene and became better acquainted with their teeth and gum after performing SE at home. In other studies, a positive correlation between self-assessed gingival bleeding and gingival health was seen, which suggested that this item can be a good diagnostic tool in determining periodontal health (Kallio *et al.*, 1990; El-Qaderi & Taani, 2004).

Self-reported (SR) questionnaires can be another method of assessing periodontal disease. Prevalence reported from SR periodontal disease may be valid to be used for surveillance of periodontal disease burden and trends (Blicher *et al.*, 2005; Taylor & Borgnakke, 2007). However, in determining periodontal disease, the validity of each item in this SR questionnaire is still being debated. Inconsistent findings on item bleeding from gingiva were seen when it was used repeatedly in other studies (Blicher *et al.*, 2005). It was also found that this item is a weak predictor of periodontal status indicators that are unable to reflect the general population (Gilbert & Nuttall, 1999; Buhlin *et al.*, 2002). In order to improve the finding from the SR periodontal disease, SE

with an illustrated written manual has been suggested.

This cross-sectional study aimed to compare the findings and agreement between periodontal SE and SR periodontal disease with clinical findings as a gold standard among the selected adult patients in Kuala Lumpur.

MATERIALS AND METHODS

Study Design

This was a comparative cross-sectional study involving two components, which were questionnaires and periodontal health examinations. Ethical approval was obtained from the ethics committee of Universiti Kebangsaan Malaysia (UKM 1.5.3.5/244/DD/2013/015 2).

This study involved patients who attended treatment at Primary Care Clinic, and Periodontic and Preventive Clinic, Faculty of Dentistry, Universiti Kebangsaan Malaysia. The patients who had fulfilled the following inclusion criteria such as a Malaysian citizen, within the age range of 15 to 75 years old and able to read and understand bahasa Malaysia were eligible to be selected in this study. On the other hand, patients were excluded if they had one of these criteria such as those who presented with full mouth removable partial denture on both upper and lower arches. Patients who were not physically and mentally healthy such as suffering from Parkinson's disease or any related disease which involves the ability to use manual dexterity or dementia were excluded from this study.

Patients who attended treatment were selected based on the basic periodontal screening (BPE) code 3 and 4. The sample size was calculated using cross-sectional formula based on the National Oral Health Survey of Adults 2000 (NOHSA 2000) (OHD-MOH, 2004). With 95% confidence interval and *p*-value of 94.5%, the calculated

sample size was 96 subjects for each group including the 20% dropped out rate. Consent was taken after the patients had received brief information regarding the study. All subjects were randomly assigned into SE and SR group using the table list numbers. Participants in the SE group received illustrated written manual with questionnaires and SE kit that consist of disposable mouth mirror, Colgate toothpaste and toothbrush. A similar questionnaire was given to the SR group but without an examination kit. For SE group, periodontal SE was performed in front of a face mirror and patient would answer the questionnaires according to the illustrated written manual. The SR group would answer the questionnaires accordingly. Full periodontal examination was carried out for both groups by a calibrated single examiner in a dental chair (Fig. 1).
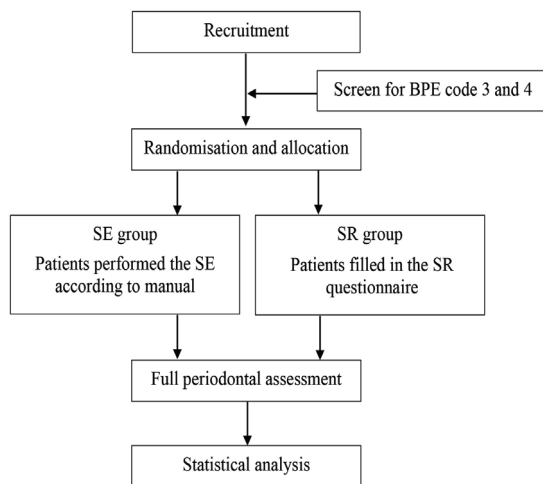
Fig. 1 Flowchart of the research methodology.

SE Illustrated Written Manual with Questionnaire

This manual was adapted from Glavind & Attström (1979) which consist of a set of SE kit and written manual. This written manual was translated into bahasa Malaysia for better understandings of the participants. The translation was verified by Institut Terjemahan & Buku Malaysia (Ref: SRF43344). In order to improve patients' understanding, illustrated clinical pictures were added in the manual according to each instruction. The manual was written in such way of guiding the patient in performing the SE, using the set of examination kit given. This illustrated written manual had three main sections with single answer "yes" or "no". This single answer was adopted from a study by Yamamoto *et al*. (2009) and translated to bahasa Malaysia. Patient information and demographic data were obtained at the beginning of the manual. Age, gender, race and education level were stated by the patients and were considered for the sociodemographic evaluation.

Section A consists of the objective of periodontal SE. In the section B, assessment of knowledge of periodontal disease, plaque involvement and the symptoms experienced by the patients were obtained. The participants were asked to perform periodontal SE in the section C using the provide SE kit. There were five instructions for patients to follow and questionnaires to be answered in this section. The instructions involved were counting the number of teeth, checking the tooth mobility, checking the colour of gingiva, checking the recession and bleeding on brushing. Single answered either yes or no were obtained from the questionnaires. Before ending the section C, based on SE carried out by the patients, an evaluation was made by patients either they had periodontal disease or healthy periodontal tissue. They also were asked if they think that they need further treatment in the dental clinic. The illustrated written manual was pre-tested in 15 samples of patients that were not involved in this study.

Clinical Examination

Clinical examination was carried out after patients had completed the questionnaires. A single calibrated examiner performed the periodontal examination at six sites per tooth, i.e., mesiobuccal, midbuccal,

distobuccal, mesiopalatal midpalatal and distopalatal using 10 mm Williams periodontal probe. The parameters were measured in millimetres and recorded as probing pocket depth (PPD); measured from gingival margin to base of pocket, gingival recession (Rec); from cemento-enamel junction to gingival margin, clinical attachment level (CAL); distance from periodontal pocket to cemento-enamel junction (CEJ), mobility (Miller, 1985); classified as grade I, II and III, bleeding on probing (BOP); percentage of sites bleeding after full mouth gently probing (Löe, 1967), plaque index (PI); percentage of surfaces with visible plaque (Löe, 1967). For assessing the agreement between patient's evaluation of the periodontal status and clinical finding during examination, the cut-off point used for colour of gingiva was 35% and more than 25% for bleeding on brushing (Caton *et al.*, 1988; Lang & Tonetti, 2003). A case definition by Eke *et al.* (2012) for periodontal disease was used to identify the severity of periodontal disease.

Statistical Analysis

Collected data was analysed using statistical programmed (SPSS, version 22.0). Descriptive analysis was reported in mean value with standard deviation and frequency distribution. Kappa value was used for agreement between patient's findings and clinical examination. An interclass correlation coefficient was tabulated to evaluate relationship between the number of teeth and clinical findings. Cross-tabulation was used for sensitivity and specificity on each item. The level of significant was set at $p < 0.01$.

RESULTS

Data was collected from January 2014 until April 2015. A total of 172 subjects were recruited in this study, which involved 86 respondents in each group. As Table 1 shows, age of the respondents was ranged from 15 to 73 years old with the mean age of 48 years old (±12.6). The majority of patient was female and Malay ethnicity. This was then followed by Chinese and Indian which consist of 27.9% ($n = 24$) and 18.6% ($n = 16$), respectively. In terms of education level, majority of the patients was from tertiary education level, which comprised of 54.7% in the SE group and 52.3% in SR group. For knowledge of patients towards periodontal disease in SE group, majority of the patients were not aware about periodontal disease (51.2%). Similarly, in SR group, 59.3% of the patients did not know about periodontal disease. However, majority of the patients from both SE and SR group knew that plaque caused periodontal diseases which constitute 75.6% and 73.3%, respectively (Table 2).

In Table 3, mean for total number of teeth in SE group was 24.24 ± 6.02, while 22.99 ± 6.97 was in the SR group. The mean for PPD, Rec and CAL were almost similar between the SE and SR group. However, mean percentage of BOP and mean percentage of PI in the SR group were higher compared to the SE group which consist of 34.68% (± 20.0) and 58.74% (± 25.10), respectively. Most of the patients in the SE and SR group presented with no mobility with majority of the patients in both groups had mobility grade I, 191 teeth (SE) and 258 teeth (SR). Grade III mobility was reported less in patients of both groups. For disease severity, it was found that majority of the patients had severe periodontitis, consists of 48.8% followed by moderate periodontitis (38.4%) in SE group. Similarly, in the SR group, majority of the patient had severe periodontitis (68.6%), moderate periodontitis (30.2%) and mild periodontitis (1.2%).

Strong agreement was seen between the total numbers of tooth counts by patients with clinical examination in both groups. This is evidenced in the interclass correlation coefficient of 0.88 for SE group and 0.79 in the SR group (Table 4).

Table 5 illustrates the four important items for patients to evaluate which were tooth mobility, gingiva colour, recession and bleeding gums, however poor agreement was found in both groups. SR had the highest sensitivity on item for bleeding gums, which represents 0.86. Most of the patients in SR group had shown ability to inspect bleeding from the gum similar to clinical examination. On the other hand, SE had the lowest sensitivity for item colour of gingiva which was 0.19. Among the 86 patients who had carried out periodontal SE on the colour of gingiva, only 19 patients were able to identify the gingiva colour as red, similar to the clinical finding. In the periodontal SE and SR, the highest specificity item was seen in the colour of gingiva, 0.75 and 0.77, respectively. Moderate specificity was found in other items such as tooth mobility in both periodontal SE and SR group.

Table 1 Demographic characteristics of the study population of SE and SR group (n = 172)

Demographic characteristics	SE n (%)	SR n (%)
Gender		
Male	36 (41.8)	37 (43.0)
Female	50 (58.2)	49 (57.0)
Race		
Malay	68 (79.1)	63 (73.2)
Chinese	8 (9.3)	16 (18.6)
Indian	10 (11.6)	6 (7.0)
Others	0 (0.0)	1 (1.2)
Age range (years old)		
≤ 34	20 (23.3)	14 (16.3)
35–44	15 (17.4)	16 (18.6)
45–54	20 (23.3)	27 (31.4)
≥ 55	31 (36.0)	29 (33.7)
Education		
Primary	4 (4.6)	3 (3.5)
Secondary	35 (40.7)	38 (44.2)
Tertiary	47 (54.7)	45 (52.3)

Table 2 Knowledge of periodontal disease among the patients in the SE and SR group (n = 172)

Items	SE n (%)	SR n (%)
Knowledge about periodontal disease		
Yes	42 (48.8)	35 (40.7)
No	44 (51.2)	51 (59.3)
Plaque causing periodontal disease		
Yes	65 (75.6)	63 (73.3)
No	21 (24.4)	23 (26.7)

Table 3 Descriptive data of periodontal condition of the patients in the SE and SR groups ($n = 172$)

Clinical parameters	SE ($n = 86$)	SR ($n = 86$)
Mean total number of teeth	24.24 (±6.02)	22.99 (±6.97)
Mean PPD (mm)	2.84 (±0.63)	2.55 (±0.59)
Mean Rec (mm)	0.37 (±0.54)	0.44 (±0.70)
Mean CAL (mm)	3.55 (±0.91)	3.51 (±0.94)
Mobility (%)		
No mobility	1844 (87.8)	1680 (84.4)
Grade I	191 (9.0)	258 (13.0)
Grade II	52 (2.5)	44 (2.2)
Grade III	14 (0.7)	9 (0.4)
Mean BOP (%)	27.84 (±17.9)	34.68 (±20.0)
Mean PI (%)	44.37 (±22.3)	58.74 (±25.1)
Periodontal status (%)		
Mild	11 (12.8)	1 (1.2)
Moderate	33 (38.4)	26 (30.2)
Severe	42 (48.8)	59 (68.6)

Table 4 The agreement between periodontal SE and SR with clinical examination ($n = 86$)

Items	Total number of teeth	Clinical examination	ICC	p-value	Interpretation
SE	23.62 (±6.15)	24.24 (±6.02)	0.88	0.00	Very strong
SR	22.95 (±7.31)	22.99 (±6.97)	0.79	0.00	Strong

Note: ICC – Interclass correlation coefficient

Table 5 The comparison of each item between SE and SR in responses, kappa value, sensitivity and specificity ($n = 86$)

Items	True positive response		False positive response		True negative response		False negative response		Sensitivity (95% CI)		Specificity (95% CI)		Positive predictive value		Negative predictive value		Kappa (*p*-value)	
	SE	SR	SE	SR	SE	SR	SE	SR	SE	SR	SE	SR	SE	SR	SE	SR	SE	SR
Tooth mobility	21	25	20	20	26	20	19	21	0.52 (0.36–0.68)	0.54 (0.39–0.68)	0.56 (0.41–0.70)	0.50 (0.34–0.65)	0.51 (0.35–0.66)	0.55 (0.40–0.70)	0.57 (0.42–0.72)	0.48 (0.33–0.64)	0.09 (0.40)	0.04 (0.68)
Colour of gingiva	8	13	11	11	33	37	34	25	0.19 (0.09–0.34)	0.34 (0.20–0.51)	0.75 (0.59–0.86)	0.77 (0.62–0.87)	0.42 (0.21–0.66)	0.54 (0.33–0.73)	0.49 (0.37–0.61)	0.59 (0.46–0.71)	0.06 (0.50)	0.12 (0.24)
Recession	6	6	42	47	34	31	4	2	0.60 (0.27–0.86)	0.75 (0.35–0.95)	0.44 (0.33–0.56)	0.39 (0.29–0.51)	0.12 (0.05–0.25)	0.11 (0.04–0.23)	0.89 (0.74–0.96)	0.93 (0.78–0.98)	0.02 (0.77)	0.04 (0.41)
Bleeding gums	47	70	3	3	4	2	32	11	0.59 (0.47–0.70)	0.86 (0.76–0.92)	0.57 (0.20–0.88)	0.40 (0.07–0.83)	0.94 (0.82–0.98)	0.95 (0.87–0.98)	0.11 (0.03–0.27)	0.15 (0.02–0.46)	0.06 (0.39)	0.15 (0.10)

DISCUSSION

From the present study, subjects presented a significant change of their periodontal tissue as compared with subjects without periodontal disease. However, poor agreement was observed in all items which varied in specificity and sensitivity values. All of the items that were asked in this study were part of the sign and symptoms of periodontal disease. These items (counting number of teeth, bleeding on brushing, the colour of gingiva, tooth mobility and tooth appeared longer) were compared with clinical gold standard such as PPD, CAL, BOP and mobility. However, many studies had used different clinical gold standard in order to achieve agreement between patients' self-assessed and the actual clinical findings. This condition had contributed to differences in agreement and thus had affected the validity of each item. This can be seen in a study by Gilbert & Nuttall (1999) where they had used pockets more than 4 mm and any teeth that presented with mobility more than 0.2 mm for their clinical gold standard for item of recession. In contrast, mean recession was used as the clinical gold standard in the present study where it was in accordance with the definition of recession. This had reflected similarity between item for recession with the measurement of clinical gold standard. For item bleeding from gums during tooth brushing, many previous studies had used similar clinical gold standard with the present study (Kallio *et al.*, 1994; Kallio, 1996). Study by Kallio (1996) had found that 74% of agreement between subject and clinical gold standard using percentage of BOP. However, he found sensitivity and specificity were 24% and 72%, respectively. The findings from his report were slightly lower when compared to the finding from the present study that showed 86% of sensitivity and 40% of specificity in the SR group. Taani & Alhaija (2003) had reported positive correlation between self-assessed gingival bleeding and gingival health in their subject, however they had used Löe (1967) as their reference for clinical gold standard. In item colour of gingiva, Gilbert & Nuttall

(1999) had reported 12% of sensitivity and 93% of specificity by using more than 40% bleeding sites as their clinical gold standard. This was similar to the present study, which low sensitivity and moderate specificity were seen in both groups using present and absent of inflammation, and more than 35% bleeding sites as the clinical gold standard. Dissimilarities in the clinical gold standard that were used in SR periodontal disease questionnaire had contributed to the difference in agreement, sensitivity and specificity in each of the items in those many studies.

Blicher *et al.* (2005) reported that an increase of tooth mobility was related to the severity of the periodontal disease. This condition could be easily noticed by the patient. The finding was in accordance with a study by Gilbert & Nuttall (1999) for item "Think teeth loose or wobbly" where high specificity (92%) but low in sensitivity (29%) of this item was seen. Glavind & Attström (1979) found high sensitivity (92%) for item tooth mobility but low in specificity (53%). The reason behind this acceptance of validity was because Blicher *et al.* (2005) had used a combination of sensitivity and specificity resulting more than 120% which were considered good in validity. In the present study, moderate sensitivity and specificity was found in both groups with poor agreement seen in item of tooth mobility. This was due to the majority of the teeth presents clinically with grade I mobility which was similar to the study by Buhlin *et al.* (2002). It was expected that patients had difficulty to detect small movement of teeth, according to its direction (Miller, 1985). In contrast with the present study, Glavind & Attström (1979) had reported high agreement, although their patients had used handle of toothbrush to test for tooth mobility. However, they had divided the teeth into sextants which had contributed into better agreement.

In a country with multiracial population, language can be a barrier between individuals when they communicate which could result

in difference of meanings. This can be seen in many studies that used questionnaires as a tool of assessment. Blicher *et al.* (2005) had reported that same item such as bleeding from gums, which repeatedly used in other studies had difference in sensitivity and specificity value. Thus, a standardised national language with the use of simple word were selected for this study. Although the sentence was kept simple and easy to understand, however poor agreement was seen in all items when compared to gold standard despite the majority of the subjects were Malay ethnicity. This showed that specific word played an important role in making patient understand what was being asked for example "Do you have periodontal disease?" or "Have you ever been told by a dentist that you have periodontal disease?" compared to "Do you have gum problems?". From the demographic data, most of the patients had secondary and tertiary education, however, closed ended questions with the answer yes or no was used. This had restricted the subject from expressing their thought and opinion on each item that being asked. If patients had fully utilised dental care, this also may trigger their thoughts while answering the questions.

From the results, further study is suggested by focusing on SR questionnaire with combination of several validated items and sequence in asking questions such as "Have you ever had tooth extracted because it was loose?", "Have you ever noticed the loosing of more than one tooth?". A written instruction and dental mirror can be enclosed together, which could probably improve the correlation between the answer and the clinical findings. Hence, this may potentially give higher validity in assessing the periodontal health status (Buhlin *et al.*, 2002; Blicher *et al.*, 2005).

CONCLUSION

The item total number of teeth had good agreement in periodontal SE and SR periodontal disease. Item for bleeding from gingiva in the SR periodontal disease had good sensitivity and item for colour of gingiva showed the highest specificity in SE and SR group.

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