Self-assessment tool for evaluating periodontal conditions

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Abstract

Background: The global prevalence of periodontal disease is steadily rising. Early detection through the active screening of potential patients is important because periodontal disease leads to high disease, clinical, and economic burdens. The aim of this study is to develop a simple periodontal assessment tool for the Malay-speaking population; this tool is referred to in this work as MyGusi. **Methods**: Translation and back-translation of a self-assessment tool containing 10 items related to periodontal health conditions and risk behaviors were conducted by three bilingual translators. Nine periodontists were selected to determine the content validity of the tool. After pre-testing for face validity, MyGusi was distributed to patients attending dental clinics in a public university in Kuala Lumpur. The Basic Periodontal Examination (BPE) of each patient was obtained from their dental records. **Results**: The scale-content validity index of MyGusi was 0.92, which indicates good validity. Cronbach's alpha was calculated to assess the internal consistency of the tool, and the value obtained (0.72) indicated acceptable reliability. The mean total MyGusi and BPE scores were positively correlated at 0.488 ($p < 0.001$). **Conclusion**: MyGusi has good content validity and is positively correlated with BPE, an established periodontal screening tool.

Keywords: periodontal diseases, periodontitis, screening, self-assessment

Introduction

Periodontal disease is a common oral infection that affects the tissues surrounding and supporting the teeth.[1] It is a chronic infection that starts with gum inflammation, also known as gingivitis. Uncontrolled gingivitis leads to further destruction of the supporting tissues, including the alveolar bone, which is called periodontitis.[2] Periodontal disease is a chronic oral health problem that is prevalent across the globe. A recent study on the global prevalence of periodontal disease revealed that the percentage of adults affected by various stages of periodontal disease is 100% in China, India, and Belarus.[3] In addition, over half of the adult population in Belarus (76%), Germany (73%), Nepal (64%), Poland (62%), Malaysia (60%), Libya (56%), Iran (53%), and Taiwan (53%) have periodontitis.

Patients with periodontitis are more likely to have halitosis than those without[4] and at higher risk of developing tooth loss, which could lead to various issues, such as difficulties in mastication and pronunciation of certain sounds, undesirable facial aesthetics, and poor cognitive functions.[5–8] Unknown to many non-dentists, evidence shows that periodontal disease is associated with several systemic conditions, such as diabetes, cardiovascular disease, and adverse pregnancy outcomes.[9] The periodontal–systemic disease connection is believed to be caused by the metastatic spread of microorganisms and their by-products in dental plaque and inflammatory mediators from periodontal tissues to other organs of the body.

Pathological changes in periodontal disease may occur over a long time before patients notice discomfort or pain. Thus, most individuals are unaware of their disease at the initial stages and seek treatment only when advanced supporting tissue loss has occurred. Some patients believe that dentists only treat teeth and consult medical doctors or other non-oral healthcare professionals for their gum or other oral pathologies. While these consultations provide an opportunity for non-oral healthcare professionals to intervene, the majority of these professionals are not trained to manage oral health issues and, therefore, do not have the confidence to manage oral health problems.[10] Some healthcare professionals are not fully aware of the connection between periodontal disease and general health.[11] Additionally, among doctors who reported that

they are aware of this connection, only a fraction referred their patients to dentists for further management of periodontal conditions.

Periodontal disease can only be diagnosed by a trained oral healthcare professional because such a diagnosis requires a thorough clinical examination of the supportive structures surrounding the tooth. Basic periodontal examination (BPE) is a simple clinical tool that helps screen patients at risk of periodontal disease.[12] However, clinical examination and BPE require specific tools and must be conducted by trained oral healthcare professionals. Self-reported periodontal conditions have been documented to facilitate voluntary dental visits, epidemiological surveys, and disease surveillance, but the applications of such measures in the non-dental clinical setting have not been established.[13,14] A simple periodontal assessment tool that does not require specific clinical skills may help non-oral healthcare professionals screen their patients while in the health clinic. Such a tool could help these professionals assess their patients' risk of periodontal disease and facilitate referrals to their dental counterparts for better management. The objective of this study is to develop a simple tool for the self-assessment of periodontal conditions in the Malay language and compare its validity with an accepted clinical screening tool.

Methods

Ethics approval was granted by the UKM Research and Ethics Committee (UKM PPI/111/8/JEP-2018-198). Permission to conduct this study was granted by the Institutional Review Board. The methodology of this study involves three components: (1) development of the periodontal condition self-assessment tool hereinafter referred to as MyGusi, (2) description of the BPE, and (3) implementation of a questionnaire survey using MyGusi.

Development of the Malaysian version of MyGusi. MyGusi is a newly developed tool for the self-assessment of periodontal conditions based on a set of questions established by Yamamoto *et al.*[15] It comprises 10 items related to the symptoms of periodontal conditions and periodontal risk behaviors, as reported by patients, and is validated against clinical parameters in a work-based community setting. Participants must choose "yes" or "no" for each item. The tool was translated with written permission from the original author from English to Malay by two bilingual dentists and then back-translated by an English teacher whose native language is Malay.

The content validity test of MyGusi was evaluated by nine periodontists to determine its item-related content validity (I-CVI) and scale-related content validity (S-CVI/Ave) indices.[16] All experts were asked to rate the relevance of each item in the questionnaire from 1 (least relevant) to 4 (most relevant). The I-CVI reflects the proportion of content experts agree is relevant (i.e., ratings of 3 or 4) and is determined by calculating the number of experts who agreed divided by the total number of experts. S-CVI/Ave reflects the average I-CVI score for all items and is determined by dividing the total I-CVI score with the total number of items.

A pre-test was conducted to establish the face validity of the questionnaire. Then, the tool was discussed by the tool development committee, which consisted of four bilingual dentists, to finalize its content and suitability based on the results of the pre-test.

Basic periodontal examination. BPE is a simple screening tool used to indicate the level of periodontal examination needed by a patient and provide basic guidance on treatment needs. The dentitions were divided into six sextants. All teeth in each sextant except third molars were examined; third molars were assessed when first or second molars were missing. Sextants with only one or no teeth were not recorded. WHO probes were used, and the probe was walked around each tooth to determine tooth scores. The tooth with the highest score was recorded as the sextant's score. The sextant with the highest score was then recorded as the BPE score for the participant. BPE also records furcation involvement, which is determined together with the tooth and sextant score as an asterisk. For example, a BPE code of 3* indicates a code of 3 with involvement of tooth furcation. The BPE score codes are summarized as follows.[17] BPE 0 indicates healthy gums with pockets of < 3.5 mm, no calculus/overhangs, and no bleeding on probing; hence, no periodontal treatment is needed. BPE 1 shows bleeding on probing with pockets of < 3.5 mm and no calculus/overhangs; hence, oral hygiene instruction (OHI) is needed. BPE 2 shows supra or subgingival calculus/overhangs with pockets of < 3.5 mm; thus, OHI and removal of all supra and subgingival calculus are needed. BPE 3 indicates partially visible black bands at a probing depth of 3.5–5.5 mm. BPE 4 indicates the disappearance of black bands at a probing depth of > 5.5 mm. Both BPE 3 and BPE 4 require OHI, calculus removal, and root surface debridement. In the case of BPE 4 or furcation involvement (*), assessment for more complex treatment is needed and referral to a specialist may be indicated.

Implementation of the questionnaire survey using MyGusi. MyGusi was distributed to patients visiting a dental clinic at a public dental school in Kuala Lumpur. Only Malaysian adults (age, >18 years) who understood spoken and written Malay were recruited in this study. The age and gender of each participant was noted, and each subject was asked 12 questions related to their periodontal status. The BPE of the participants was

obtained from their clinical records. All clinicians who conducted the BPE were properly trained, and the results were calibrated to ensure standardization.

Statistical analysis. Each item answered "yes" in MyGusi was scored 1, while each item answered "no" was scored 0. The total score ranged from 0 to 10. Data analysis was conducted using Microsoft Excel to determine the CVI values, and IBM SPSS version 22 was used to conduct a descriptive analysis of the participants' profiles and measure the relationships between MyGusi and BPE. Correlation analysis was used to determine the relationship between the total scores of MyGusi and BPE. Independent t-test was used to determine differences in mean BPE scores between participants who answered "yes" and those who answered "no" for each item of MyGusi.

Results

Table 1 shows the results of the agreement of experts on each of the items in the tool. All items had good I-CVI values, except for question number 6 (Q6), which had an I-CVI of 0.67; this value is lower than the recommended value of 0.78 necessary to indicate good item-related content validity.[18] The S-CVI/Ave was 0.92, which indicates that the scale had good validity. Cronbach's alpha was calculated to assess the internal consistency of the tool, and the value obtained was 0.72, which indicates acceptable reliability.

Table 1. I-CVI and S-CVI results of MyGusi

		Experts in agreement	I-CVI
Q1	Are you a smoker or an ex-smoker?	7	0.78
Q2	Have your gums bleed recently?	9	1
Q3	Do you suffer from swollen gum?	9	1
Q4	Do you have any loose teeth?	9	1
Q5	Do you think your teeth looks longer than before?	9	1
Q6	Do you have gum disease?	6	0.67
Q7	Have you been told to have gum disease by your dentist?	9	1
Q8	Have you been told to have deep gum pocket by your dentist?	9	1
Q9	Have you been asked to undergo gum treatment?	9	1
Q10	Have you had any gum treatment surgery?	7	0.78
S-CVI/ Ave			0.92

A total of 207 patients participated in this study, but 17 participants were excluded from the data analysis because of incomplete data. Among the remaining 190 participants, 62 were males (32.6%) and 128 (67.4%) were females. The mean age was 34 ± 13 years. Eight participants (4.2%) scored 1 for BPE status, 132 participants (69.5%) scored 2, fifty participants (26.3%) scored 3 or 4 for BPE status, and 8 participants (4.2%) had furcation involvement. All patients with furcation involvement had a BPE score of 4.

The mean total MyGusi and BPE scores were positively correlated at 0.488 ($p < 0.001$). Table 2 shows the differences in mean BPEs among those who answered "yes" and "no" for each item of MyGusi. The mean BPE scores for those who answered "yes" to Q1, Q4, Q5, Q6, Q7, Q8, and Q9 were significantly higher than the mean BPE scores of those who answered "no" ($p < 0.05$).

Discussion

This study compared a self-reported questionnaire, MyGusi, with BPE, an established clinical screening tool for periodontal disease. BPE was first introduced over 30 years ago and is widely used not only in the UK but also other countries, including Malaysia, on account of its ability to screen patients for systematic periodontal management.[12,19–21]

The Malaysian National Oral Health Survey for Adults reported that 94% of all Malaysians are affected by periodontal disease at various levels.[22] However, according to the BPE of the participants in the current study, none of the participants had healthy periodontia. This study was conducted at a dental healthcare facility, which may have influenced the demographics of the participants; specifically, most individuals who visit dental clinics have dental problems. According to the National Health and Morbidity Survey (2015), among those with oral health problems, over 50% do not seek care.[12]

In the present study, only 26.3% of the participants responded with scores of 3 and 4 for their BPE. A score of 3 and above indicates the need for further investigation to determine the cause and management of periodontal disease. These findings are lower than the general prevalence of periodontitis in the country, where 48.5% of the population are reported to suffer from either moderate or severe periodontitis. Nevertheless, the national data reported were obtained a decade ago, and several strategies have since been planned and implemented by the relevant sectors to address this problem. These strategies may have influenced the current proportion of periodontal disease sufferers in the country.

Table 2. Differences in BPE scores between respondents who answered "yes" and those who answered "no" to MyGusi items

Items on MyGusi	Answered "Yes" for each item				Answered "No" for each item		*p*
	N	%	Mean BPE	(SD)	Mean BPE	(SD)	
Smoker	31	16.3	2.68	(0.87)	2.31	(0.75)	0.033*
Gums bleed	61	32.1	2.48	(0.85)	2.32	(0.75)	0.218
Swollen gums	61	32.1	2.52	(0.85)	2.29	(0.75)	0.073
Loose teeth	37	19.5	3.03	(0.96)	2.21	(0.65)	< 0.001*
Teeth looks longer	27	14.2	2.93	(0.96)	2.28	(0.71)	0.002*
Gum disease	43	22.6	2.88	(0.96)	2.22	(0.66)	< 0.001*
Dentist informed about gum disease	29	15.3	3.31	(0.85)	2.20	(0.64)	< 0.001*
Dentist informed about pockets	30	15.8	3.47	(0.78)	2.16	(0.59)	< 0.001*
Told to get gum treatment	38	20.0	3.37	(0.82)	2.12	(0.54)	< 0.001*
Had gum surgery	13	6.8	2.77	(0.93)	2.34	(0.77)	0.056

Independent t-test, *$p < 0.05$

All of the items used in this questionnaire were taken from a tool used in a study conducted by Yamamoto *et al.*[15] Each question was selected on the basis of a systematic review of reports related to the validation of self-reported periodontal disease.[23] In the current study, all items showed good I-CVI values except Q6 ("Do you have gum disease?"), which revealed an I-CVI of 0.67; this value is slightly lower than the recommended value for good I-CVIs (0.78).[18] The tool development committee decided to retain Q6 because, besides the systematic review of Blicher *et al.*, a more recent systematic review and meta-analysis by Abbood *et al.* confirmed that self-perceived periodontal disease has acceptable validity for predicting clinically diagnosed periodontal disease.[24]

The total score of MyGusi was positively correlated with the mean BPE score. The higher the total score for MyGusi, the higher the mean score for the BPE. Considering the items used in MyGusi, the mean BPE scores of subjects who answered "yes" to 7 out of 10 items were positively higher than those who answered "no" and the remaining 3 items did not show significant differences in mean value. Bleeding and swelling of the gum are signs of gingivitis and may also be observed among those with low BPE scores; thus, the mean difference between the two groups in terms of this parameter is not significant.[25] As for the question on experience with gum treatment surgery, while those participants who had undergone surgery had higher BPE mean scores, the small number of subjects who had actually received this surgery may have influenced the significance of the results.

MyGusi may be unable to discriminate between gingivitis and periodontitis, but it provides a simple and reliable risk assessment and screening tool for periodontal disease. Patient-reported data on periodontal risk factors and indicators could provide a reliable detection method for representative periodontitis.[26] The tool may be especially useful when screening via clinical methods cannot be carried out, especially among patients seen by non-oral healthcare professionals.

Medical doctors and other non-oral healthcare professionals can play an important role in improving their patients' oral health by giving brief dental advice, particularly to those patients who are not regular dental attendees. Having a simple yet valid and reliable questionnaire-based tool may help doctors and healthcare professionals other than dentists screen patients with potential periodontal problems without adding unnecessary burden on the former.

Periodontitis, similar to any other oral condition, does not cause death on its own. However, its associations with non-communicable diseases, such as diabetes and cardiovascular diseases, contribute to the increased disease burden of these systemic conditions and may ultimately lead to fatality. Easy screening for periodontal disease could help prevent its occurrence and reduce the projected clinical and economic burdens of not just periodontal disease but also other associated non-communicable diseases.[27,28]

This study compared a questionnaire-based tool to assess periodontal conditions against BPE, an established clinical screening tool for detecting periodontal disease. Multivariate analysis to evaluate how each item in the tool contributes to periodontal disease detection was not conducted as a diagnosis cannot be established from the BPE alone.

Conclusion

MyGusi has good content validity and is positively correlated with the BPE. This periodontal self-assessment tool is useful when clinical examination is not possible, such as when a non-dental healthcare worker suspects their patient may have periodontal problems and wishes to refer them to their dental counterpart.

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Conflict of Interest Statement

The authors declare no affiliations, ownership, interests, or patent-licensing arrangements that could be considered to pose a financial conflict of interest in connection with the article.

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