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# COMMUNITY HEALTH PROJECT REPORT 2015

## Is 'Oil Pulling' a 'Snake Oil'?

### – A Clinical Trial



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## – A Clinical Trial

Group 4.4 (2014/15)

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## 1.0 ABSTRACT

The traditional Ayurveda practice of 'oil pulling' has become a recent phenomenon and concerns about its efficacy have been raised. **Objectives:** (1) to determine awareness about the practice of 'oil pulling' among a group of young adults, and to determine variations in awareness with respect to socio-demographic factors, oral health behaviours (oral hygiene and dental attendance) and use of natural health products; (2) to determine the effectiveness of 'oil pulling' and conventional oral hygiene practice compared to the use of conventional oral hygiene practice alone in terms of oral hygiene and (3) to determine the effectiveness of 'oil pulling' and conventional oral hygiene practice compared to the use of conventional oral hygiene practice alone in terms of gingival health. **Methods:** Group members recruited seventy-four young adults to participate in a clinical trial over a two-month period comparing the effectiveness of (a) 'oil pulling' and conventional oral hygiene methods (toothbrush and toothpaste) versus (b) conventional oral hygiene methods alone. Oral hygiene was assessed using the Plaque Index - PI (Silness and Løe, 1964) and the proportion of sites with visible plaque (PVP). Gingival health was assessed using the Gingival Index – GI (Silness and Løe, 1963) and the proportion of sites with gingival bleeding (PGB). Participants were block randomized in groups of four to a cross over clinical trial and assessments were conducted at one-month and two-months. **Results:** Approximately a quarter (28.4%, 21) of participants was aware of the practice of 'oil pulling'. Awareness of the practice was associated with reported use of natural dental/oral health products ( $p < 0.01$ ). From baseline to one-month there was a significant improvement in proportion of sites with visible plaque among the test group ( $p < 0.01$ ). However, there was no significant difference between both groups ( $p > 0.05$ ). There were observed significant differences in gingival health among both the test and control groups from baseline to one-month ( $p < 0.01$ ) but no significant differences between them ( $p > 0.05$ ). No significant differences were observed in oral health parameters from one-month to two-month among neither the test nor control groups

( $p > 0.05$ ). **Conclusion:** Awareness of the practice of 'oil pulling' is relatively common and is associated with use of natural dental/oral health products. Findings from the clinical trial failed to support the adjunct use of 'oil pulling' in addition to conventional oral hygiene practices.

Word count: 376

Key words: oil pulling, clinical trial, Ayurveda, gingival health, oral hygiene

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## 2.0 INTRODUCTION

'*Traditional medicine*' has been defined as knowledge, skills, and practices based on theories, beliefs and experiences of indigenous communities in different cultures; and used for the maintenance, prevention, diagnoses and treatment of illnesses (WHO, 2000). The integration of traditional medicine is an underlying philosophy of the *Primary Health Care Approach* (PHCA) – “*essential health care based on scientifically sound and socially acceptable methods and technologies made universally accessible to individuals and families in the community; in the spirit of self-reliance and self-determination*” (WHO, 1978). There are many different types of Traditional Medicines among the most common being Traditional Chinese Medicine, Ayurveda (Hindu Traditional Medicine), Unani (Middle Eastern) and Muti (Traditional African Medicine) (Payyappallimana, 2010). The importance of using appropriate technology such as traditional medicine that is accessible, affordable, feasible and culturally acceptable to the community still holds strong. It is estimated that among developing nations of Africa and Asia that up to 80% of the population rely on traditional medicine/ remedies as their primary health care needs (Payyappallimana, 2010).

There is a growing interest in and use of *Traditional Medicine* outside of their traditional cultures referred to under the umbrella term of '*Complementary and Alternative Medicine*' – CAM (Cohen, 2003). The size and scope of CAM is considerable and continues to increase; it is estimated that about 50% of people in developed countries use some form of CAM. A systematic review of use of CAM among the public has reported prevalence usage of between 5% to 74.8% (Frass et al., 2012). Coupled with this there is growing acceptance of CAM among the public reflected in 'out-of-pocket' expenses on CAM when not covered by national insurance systems and an increased usage of CAM within health care systems where insurance coverage permits (CDC, 2009). A study in the United States reported that approximately 40% of adults and 11.8%



of children had a history of using CAM therapy in the past 12 months according to a 2007 National Health Interview Survey (Patricia et al., 2008). In 2008, within the USA it was estimated that \$8.6 billion was spent on CAM products/ services (Davis et al., 2013).

Traditional medicines/ CAM have been used widely in general medicine and also for oral health (Lakshmi et al., 2013). These include acupuncture, natural dental health products such as herbal toothpaste, and 'oil pulling' therapy. Their underlying aims are to improve overall health by tipping the balance towards a healthy body, instead of targeting the signs and symptoms of disease.

'Oil pulling' is a form of CAM specific to Ayurveda dating back to between 3,000 and 5,000 years and has extensively been used in a traditional Indian remedy in the maintenance of oral health, prevention and management of oral diseases, and specifically for gum and oral mucosal problems (Torwane et al., 2014). Some believe that systemic problems including headaches, migraines, diabetes mellitus, asthma and acne can also be improved as a result of 'oil pulling' (Lakshmi et al., 2013).

The practice of 'oil pulling' involves placing a tablespoon (or so) of edible oil (sesame, olive, sunflower or coconut) inside the mouth, and swishing or 'pulling' the oil through the teeth and oral cavity for five minutes or longer (oilpulling.com, 2015). It has been suggested that the prolonged and forceful action of 'oil pulling' plays a physical or mechanical role in dislodging bacteria and other matter from the teeth, gums and mouth crevices (Gardener, 2014). It has also been suggested that the viscosity of the oils can inhibit bacterial adhesion and plaque co-aggregation. Another possible mechanism might be the saponification and emulsification effects that occur as a result of the alkali hydrolysis of the oil (Asokan et al., 2011). In addition, some oils are reported to have antioxidant effects and thereby modulate inflammatory responses and

protect from infection. Gums are also thought to be 'moisturized' by the oil providing relief for dry mouth. However the exact mechanism of 'oil pulling' remains unknown.

Asokan et al (2009) has conducted a study to evaluate the effect of oil pulling with sesame oil on plaque-induced gingivitis, and to compare its efficacy with chlorhexidine mouthwash. The study showed a reduction in plaque index, modified gingival scores and total colony count of aerobic microorganisms in the plaque of adolescents with plaque-induced gingivitis. However, there is little research on this issue and there were case reports in the literature showing that 'oil pulling' might give rise to medical problems, such as lipoid pneumonia, diarrhea, and gastric upset (ADA, 2014).

The practice of 'oil pulling' has recently been popularized in the social media and endorsed by celebrities around the world including Hong Kong. In Hong Kong, for example, Cheuk Wan Chi, a radio personality, and Yimho, a columnist have advocated its use. However, numerous Dental Associations around the world – including the American Dental Association (ADA, 2014); the Australian Dental Association and the British Dental Association have raised concerns about the lack of evidence to support this CAM practice (NewsComAu, 2013). They do not recommend 'oil pulling' as an adjunct or replacement of conventional oral hygiene practice. Our community health project aimed to shed light on this matter by investigating the use of 'oil pulling' and its effectiveness.

### **3.0 Aims**

1. To determine awareness about the practice of 'oil pulling' among a group of young adults, and to determine variations in awareness with respect to socio-demographic factors, oral health behaviours (oral hygiene and dental attendance) and use of natural health products.
2. To determine the effectiveness of 'oil pulling' and conventional oral hygiene practice compared to the use of conventional oral hygiene practice alone in terms of oral hygiene.
3. To determine the effectiveness of 'oil pulling' and conventional oral hygiene practice compared to the use of conventional oral hygiene practice alone in terms of gingival health.

## 4.0 Methodology

### 4.1 Recruitment and screening

From the onset our target was to recruit ~60 young adults and each group member aimed to invite at least five people to a dental screening. Seventy-four people attended the dental screening and firstly self-completed a questionnaire (*Appendix 1*). Information was collected on (i) socio-demographic profile – age, gender, current role (student or employed) and place of birth (Hong Kong, Mainland China or elsewhere); (ii) oral hygiene habits – frequency of tooth brushing (twice or more daily, once daily, less than once daily), use of additional oral hygiene aids other than brushing, type of additional oral hygiene aids (floss, interdental brush, mouth rinses or others – multiple answer possible), frequency of use of additional oral hygiene aids (every day, almost every day, less often), and also reported dental attendance annually for a check-up; (iii) use of natural health products – use of natural health products overall and frequency (no, yes occasionally, yes very often, yes all the time), use of natural dental/oral health products overall and frequency (no, yes occasionally, yes very often, yes all the time); (iv) awareness (heard of) ‘oil -pulling’, previous practice of ‘oil- pulling’, length of time practiced (in months) and perceived effectiveness of the practice (*Appendix 1*). A brief medical history ascertained long term medical problems and current use of medication (including antibiotics).

All were then examined for evidence of dental caries using WHO methods and criteria (WHO, 1997). Periodontal health was assessed on index teeth among six sextants – tooth 16, 11, 26, 36, 31, and 46 using the Community Periodontal Index – CPI (Ainamo et al., 1982). All clinical examinations were carried out using disposable mouth-mirrors with intra-oral LED light source and CPI probes.

**Table 4.1 Dental Caries and Periodontal Health Screening**

**Examination form**

Date: \_\_\_\_\_ Name: \_\_\_\_\_ (# \_\_\_\_\_ )

Microbial samples collection  Completed

---

Screening

Community Periodontal Index of Treatment need 

16	11	26
46	31	36

Dentition status

18	17	16	15	14	13	12	11	21	22	23	24	25	26	27	28

Inclusion as subject:  YES  NO

#### 4.2 Oral hygiene and gingival health assessments

Subjects who fulfilled inclusion criteria underwent an examination of their oral hygiene by two trained examiners using the Plaque Index - PI (Silness and Løe, 1964). Buccal and palatal sites on all teeth were examined for presence of plaque based on the PI criteria. A periodontal probe was used to determine presence of plaque not visible to the naked eye.

**Table 4.2 Plaque Index - PI (Silness and Løe, 1964).**

0	No plaque
1	A film of plaque adhering to free gingival margin and adjacent area of tooth. Plaque may be seen in situ ONLY with disclosing agent or by using probe
2	Moderate accumulation of soft deposit within gingival pocket, or tooth and gingival margin which can be seen with naked eye
3	Abundance of soft deposit within gingival pocket and/or tooth and gingival margin

Gingival health was assessed using the *Gingival Index* (GI) as described by Silness and Løe (1963) in terms of colour and shape of gingivae and response to bleeding on probing. Buccal and lingual/palatal sites of all teeth were examined.

**Table 4.3 Gingival Index - GI (Silness and Løe,1963).**

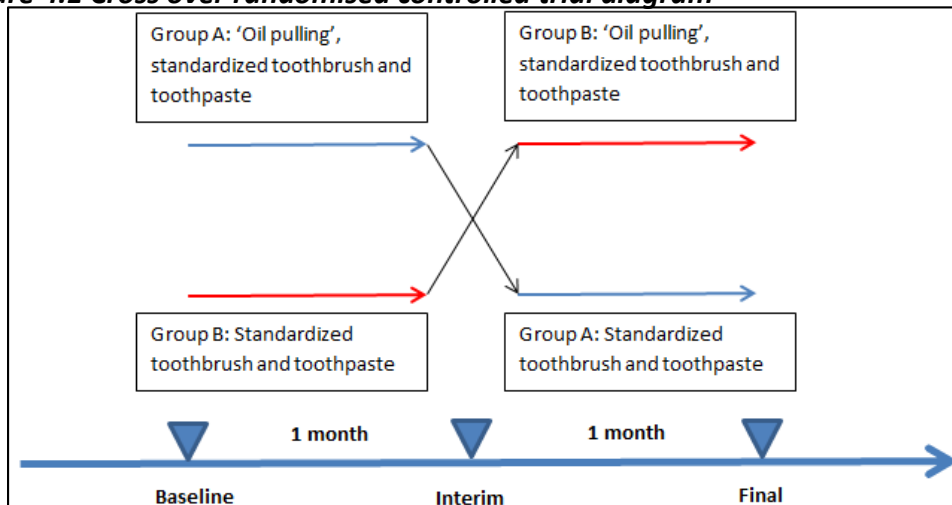
0	Absence of inflammation
1	Mild inflammation; slight change in color, little change in texture
2	Moderate inflammation; moderate glazing, redness, edema, and/or hypertrophy; bleeding on pressure
3	Severe inflammation; marked redness and hypertrophy; tendency to spontaneous bleeding; ulceration

At baseline 12 assessments of PI and 11 of GI were conducted to determined examiner's reliability.

### 4.3 Randomization and intervention

Subjects were block randomized in groups of four to the two arms of the trial using a computer generated list, *Figure 4.1*. Group A were allocated to perform the 'oil pulling' first. Participants were given a concealed bag containing commercially available organic virgin coconut oil (700ml, Agrilife, Thailand), toothbrush (SlimSoft Toothbrush, Colgate) and toothpaste (Total Pro-gum Health Toothpaste, Colgate). They were instructed to perform 'oil pulling', with one tablespoon of coconut oil provided, for around 10 minutes in the morning, in addition to their routine oral hygiene practices with toothbrush and toothpaste provided in the first month. A video of instructions for 'oil pulling' was provided, *Figure 4.2*, and uploaded to YouTube and participants were provided with the link ([www.youtube.com/watch?v=oy5Rqw3wlfY](http://www.youtube.com/watch?v=oy5Rqw3wlfY)). On the bottles containing the oil, the commercial labels were removed and instructions on 'oil pulling' labels were added, *Figure 4.3*. Group B were provided a concealed bag containing toothbrush (SlimSoft Toothbrush, Colgate) and toothpaste (Total Pro-gum Health Toothpaste, Colgate) and instructed to perform tooth brushing daily with products supplied. Information sheet and telephone number were provided for all participants in case of any problems or concerns. Arrangements were made for one-month assessment.

**Figure 4.1 Cross over randomised controlled trial diagram**



**Figure 4.2 YouTube instructions on 'oil pulling'**



**Figure 4.3 Instruction label on 'oil pulling'**

**DIRECTIONS:**

1. Do this in the **MORNING, ONCE** every day
2. Take 1 tablespoon full (approximately 20ml) of coconut oil and put it in your mouth.
3. Swish in your mouth with sucking motion.
4. Keep doing this as long as 10 minutes. Then, spit the oil out and rinse with water.
5. After that, clean your teeth as usual (using the toothbrush and toothpaste provided).

**使用方法：**

1. 早上刷牙前使用，每天一次。
2. 先倒一湯匙（約 20 毫升）椰子油，再放入口中。
3. 把油在口腔內滑動，好像平時漱口一樣。
4. 約 10 分鐘後，把油吐出，最後用清水漱口。
5. 漱口後請如常清潔牙齒（請使用提供的牙膏牙刷刷牙）。



#### 4.4 Interim assessment

At one-month follow up, participants' oral hygiene and gingival health were examined, using disposable mouth-mirrors with intra-oral LED light source and CPI probes. Oral hygiene was again assessed using the Plaque Index - PI (Silness and Løe, 1964). Buccal and palatal sites on all teeth were examined for presence of plaque based on the PI criteria. A periodontal probe was used to determine presence of plaque not visible to the naked eye, *Table 4.2*. Gingival health was assessed using the *Gingival Index* (GI) as described by Silness and Løe (1963) in terms of colour and shape of gingivae, and response to bleeding on probing. Buccal and lingual/palatal sites of all teeth were examined, *Table 4.3*. At interim assessment, 9 assessments of PI and 11 of GI were conducted to determine examiner's reliability.

Among those who had completed the 'oil pulling', participants self-completed an assessment on the frequency of 'oil pulling' (every day, almost every day, or less often); duration of 'oil pulling' in minutes; time period of 'oil pulling' (morning, night, or after meals); perceived effectiveness (very effective, quite effective, little effective, or not effective); acceptability of 'oil pulling'; whether they would continue the practice of 'oil pulling'; and any other thoughts/comments on the practice of 'oil pulling', *Appendix 2*.

Participants were then assigned to the other arm of the trial. Group B were then allocated to perform the 'oil pulling'. Participants were given a concealed bag containing commercially available organic virgin coconut oil (700ml, Agrilife, Thailand), toothbrush (SlimSoft Toothbrush, Colgate) and toothpaste (Total Pro-gum Health Toothpaste, Colgate). They were instructed to perform 'oil pulling', with one tablespoon of coconut oil provided, for around 10 minutes in the morning, in addition to their routine oral hygiene practices with toothbrush and toothpaste provided in the first month. A video of instructions for 'oil pulling' was provided

([www.youtube.com/watch?v=oy5Rqw3wlfY](http://www.youtube.com/watch?v=oy5Rqw3wlfY)). Group A were provided a concealed bag containing toothbrush (SlimSoft Toothbrush, Colgate) and toothpaste (Total Pro-gum Health Toothpaste, Colgate).

#### **4.5 Final assessment (2-months later)**

At the final assessment, participants' oral hygiene and gingival health were examined, again with disposable mouth-mirrors with intra-oral LED light source and CPI probes. Oral hygiene was again assessed using the Plaque Index - PI (Silness and Løe, 1964). Buccal and palatal sites on all teeth were examined for presence of plaque based on the PI criteria. A periodontal probe was used to determine presence of plaque not visible to the naked eye, *Table 4.2*. Gingival health was assessed using the *Gingival Index* (GI) as described by Silness and Løe (1963) in terms of colour and shape of gingivae and response to bleeding on probing. Buccal and lingual/palatal sites of all teeth were examined, *Table 4.3*. At final assessment, 6 assessments of PI and 6 of GI were conducted to determine examiner's reliability.

Among those who had completed the 'oil pulling', participants self-completed an assessment on the frequency of 'oil pulling' (every day, almost every day, or less often); duration of 'oil pulling' in minutes; time period of 'oil pulling' (morning, night, or after meals); perceived effectiveness (very effective, quite effective, little effective, or not effective); acceptability of 'oil pulling'; whether they would continue the practice of 'oil pulling'; and any other thoughts/comments on the practice of 'oil pulling', *Appendix 2*.

## 4.6 Data analyses

The baseline questionnaire data were entered into SPSS (Version 20). Frequency tables were produced and checked with original data collection forms. Clinical data were entered for each site and verified with original clinical data collection forms. The PI scores (PIS) were produced by summing responses to the PI categories divided by the number of sites examined. The proportion of sites with visible plaque (PVP) was determined by counting the number of sites with visible plaque divided by the number of sites examined. The GI scores (GIS) were produced by summing responses to the GI categories divided by the number of sites examined. The proportion of sites with gingival bleeding (PGB) was determined by counting the number of sites with gingival bleeding divided by the number of sites examined.

Frequency tables were produced to provide the profile of the socio-demographic of participants (age, gender, current role and place of birth); reported oral hygiene practices (frequency of toothbrushing, use of additional oral hygiene aids, type of oral hygiene aid, frequency of use of additional oral hygiene aids); reported dental attendance pattern; use of natural health products (overall and specifically for dental/oral health); and knowledge of 'oil pulling' (heard about 'oil pulling'). Variations in knowledge of 'oil pulling' in relation to socio-demographic factors, oral health practices, and use of natural health products were determined using *chi-square statistics*. The *Chi-squared test* is used to determine whether there is a significant difference between the expected frequencies and the observed frequencies in one or more categories.

Eligibility to participate in the trial was determined following screening. The profile of those eligible to participate compared to those not eligible to participate was compared with

respect to socio-demographic factors, oral health practices, and use of natural health products were determined using *chi-square statistics*.

Mean (SD), median (IQR), and range values were produced for PIS, PVP, GIS, and PGB for baseline, interim and final assessments. Correlation between initial and repeat assessment of PIS, PVP, GIS, and PGB was conducted to determine examiners' reliability.

Variations in baseline PIS, PVP, GIS, and PGB values were determined in relation to socio-demographic factors (age, gender, current role, and place of birth); oral health practices (frequency of toothbrushing, use of additional oral hygiene aids, type of oral hygiene aid, frequency of use of additional oral hygiene aids); reported dental attendance pattern; use of natural health products (overall and specifically for dental/oral health); and knowledge of 'oil pulling' (heard about 'oil pulling') using *Mann-Whitney U test* and *Kruskal Wallis test* (since the data did not follow a normal distribution). The *Mann-Whitney U test* is equivalent to the *t-test* for independent samples. The *Kruskal Wallis test* is equivalent to the *ANOVA test* for multiple independent factors.

Comparison of PIS, PVP, GIS, and PGB at baseline and interim period was determined using *Wilcoxon Signed-Rank test* (a non-parametric equivalent to the *paired t-test*) for both groups. The changes in PIS, PVP, GIS, and PGB between baseline and interim period were determined and variations in the change between test and control groups were determined using *Mann-Whitney U test* (equivalent to *t-test* for independent samples).

Compliance and attitude to 'oil pulling' at interim and final stage was determined.

## 5.0 RESULTS

### 5.1 Screening participants socio-demographic profile

Seventy-four subjects attended the dental screening. The socio-demographic profile is presented in *Table 5.1*. Most were aged 20-24 (73%, 54); and were currently university students (79.7%, 59). There was approximately equal proportion of males and females (male 51.4% versus female 48.6%). Over half were born in Hong Kong (56.8%, 42).

**Table 5.1 Socio-Demographic Profile**

		% (number)
Age	<i>&lt;20 years old</i>	27.0 (20)
	<i>20-24 years old</i>	73.0 (54)
Gender	<i>Male</i>	51.4 (38)
	<i>Female</i>	48.6 (36)
Current Role	<i>Student</i>	79.7 (59)
	<i>Working</i>	20.3 (15)
Place of Birth	<i>Hong Kong</i>	56.8 (42)
	<i>Mainland China</i>	14.9 (11)
	<i>Elsewhere</i>	28.4 (21)

## 5.2 Screening participants oral health practices

All screening participants reported to brush their teeth daily with almost 90% claiming to brush twice a day (89.2%, 66), *Table 5.2*. Approximately two-thirds reported using other oral hygiene aids in addition to tooth brushing (62.2%, 46); most frequently using floss (50.0%, 37). Use of additional oral hygiene aids was infrequent. Half (50.0%, 37) reported to routinely attend for a dental check-up annually.

**Table 5.2 Reported Oral Hygiene Practices**

		% (number)
Brushing Habit	<i>Twice daily</i>	89.2 (66)
	<i>Less than twice daily</i>	10.8 (8)
Additional Aids	Yes	62.2 (46)
	No	37.8 (28)
Type of Aids	<i>Floss</i>	50.0 (37)
	<i>Mouth rinse</i>	24.3 (18)
	<i>ID brush</i>	1.4 (1)
	<i>Other</i>	1.4 (1)
Frequency of Aid*	<i>Everyday</i>	9.5 (7)
	<i>Almost everyday</i>	18.9 (14)
	<i>Less often</i>	33.8 (25)

*\*Based on those who reported to use additional oral hygiene aids n= 46*

### 5.3 Screening participants use of natural health products

Approximately three in ten of the screening participants reported to have used natural health products (28.4%, 21); mostly this was ‘occasionally’ 20.3% (15), *Table 5.3*. Approximately one-in-twenty of screening participants reported to have used natural dental/oral health products (6.8%, 5). Over a quarter of screening participants has heard of ‘oil pulling’ but only one survey participants had tried it and did so for a month and rated it as ‘very effective’.

**Table 5.3 Reported use of natural health products**

		% (number)
Used natural health products	<i>No</i>	71.6 (53)
	<i>Yes, occasionally</i>	20.3 (15)
	<i>Yes, very often</i>	6.8(5)
	<i>Yes, all the time</i>	1.4(1)
Used natural health products for dental health	<i>No</i>	93.2 (69)
	<i>Yes, occasionally</i>	6.8 (5)
Heard of oil pulling	<i>No</i>	71.6 (53)
	<i>Yes</i>	28.4 (21)

#### 5.4 Variations in awareness of 'oil pulling' in relation to socio-demographics

There was no significant association between knowledge of (heard about) 'oil pulling' and socio-demographic factors, *Table 5.4*: age group ( $p>0.05$ ), gender ( $p>0.05$ ), current role ( $p>0.05$ ), or place of birth ( $p>0.05$ ).

**Table 5.4 Awareness of 'oil pulling' in relation to socio-demographics**

'Oil Pulling'		'Heard of' % (number)	'Not heard of' % (number)	<i>p-value*</i>
Age	<20	33.3 (7)	24.5 (13)	0.442
	20-24	66.7 (14)	75.5 (40)	
Gender	Male	42.9 (9)	54.7 (29)	0.357
	Female	57.1 (12)	45.3 (24)	
Current role	Student	85.7 (18)	77.4 (41)	0.420
	Employed	14.3 (3)	22.6 (12)	
Place of birth	Hong Kong	38.1 (8)	64.2 (34)	0.056
	Mainland China	28.6 (6)	9.4 (5)	
	Elsewhere	33.3 (7)	26.4 (14)	

\**p-value derived from Chi-square statistics*



### 5.5 Variations in awareness of 'oil pulling' in relation to oral health practices

There was no significant association between knowledge of (heard about) 'oil pulling' and reported oral health practices, *Table 5.5*: reported frequency of brushing ( $p>0.05$ ), use of other oral hygiene aids ( $p>0.05$ ), or dental attendance for regular dental check-up ( $p>0.05$ ).

**Table 5.5 Awareness of 'oil pulling' in relation to oral health practices**

<i>'Oil Pulling'</i>		'Heard of'	'Not heard of'	<i>p-value*</i>
		% (number)	% (number)	
Brushing frequency	<i>Twice daily</i>	85.7 (18)	90.6 (48)	0.545
	<i>Less than twice daily</i>	14.3 (3)	9.4 (5)	
Use additional oral hygiene aids	<i>Yes</i>	71.4 (15)	58.5 (31)	0.301
	<i>No</i>	28.6 (6)	41.5 (22)	
Dental check-up	<i>Annually</i>	47.6 (10)	50.9 (27)	0.797
	<i>Not annually</i>	52.4 (11)	49.1 (26)	

*\*p-value derived from Chi-square statistics*

### 5.6 Variations in awareness of 'oil pulling' and use of natural health products

There was a significant association between awareness of (heard about) 'oil pulling' and reported use of natural oral health practices,  $p < 0.01$ , Table 5.6. Among those who had knowledge of 'oil pulling' 4 (19%) reported using natural oral health products compared with only 1 (1.9%) of those who had not knowledge about oil pulling who reported to use natural products. Reported use of natural health products overall was not significantly associated with knowledge of (heard about) 'oil pulling' ( $p > 0.05$ ).

**Table 5.6 Variations in use of Natural Health Products**

'Oil Pulling'		'Heard of'	'Not heard of'	<i>p-value*</i>
		% (number)	% (number)	
Use Natural Health Products	Yes	42.9 (9)	22.6 (12)	0.082
	No	57.1 (12)	77.4 (41)	
Use Natural Oral Health Products	Yes	19.0 (4)	1.9 (1)	0.008
	No	81.0 (17)	98.1 (52)	

*\*p-value derived from Chi-square statistics*

### **5.7 Baseline participants of the trial**

Sixty eight (91.9%) of the 74 subjects screening met with the inclusion criteria to participate in the clinical trial. Six subjects were excluded: 4 because of evidence of caries (at the cavitation level); 1 because currently using antibiotics, and 1 because of no visible plaque on any teeth.

There was no significant difference in the socio-demographic profile of those who were eligible to participate in the trial compared to those not eligible to participate in the trial in terms of age ( $p>0.05$ ), gender ( $p>0.05$ ), current role ( $p>0.05$ ), area of birth ( $p>0.05$ ), *Table 5.7*. In addition, there was no significant difference in the reported oral health practices of those eligible to participate in the trial compared to those not eligible to participate in the trial in terms of tooth brushing frequency ( $p>0.05$ ), use of other oral hygiene aids ( $p>0.05$ ), and dental attendance ( $p>0.05$ ). Furthermore, there was no significant difference in the profile of those eligible to participate in the trial compared to those not eligible to participate in the trial in terms of reported use of natural health products overall ( $p>0.05$ ), use of natural dental/oral health products ( $p>0.05$ ), or having knowledge about (heard of) 'oil-pulling' ( $p>0.05$ ).

**Table 5.7 Profile of those screened eligible to participated in the trial**

		Eligible % (number)	Not Eligible % (number)	<i>p-value*</i>
Age	<20	26.5 (18)	33.3 (2)	0.717
	20-24	73.5 (50)	66.7 (4)	
Gender	Male	51.5 (35)	50.0 (3)	0.945
	Female	48.5 (33)	50.0 (3)	
Current role	Student	80.9 (55)	66.7 (4)	0.406
	Employed	19.1 (13)	33.3 (2)	
Place of birth	Hong Kong	57.4 (39)	50.0 (3)	0.393
	Mainland China	13.2 (9)	33.3 (2)	
	Elsewhere	29.4 (20)	16.7 (1)	
Tooth brushing	Twice daily	88.2 (60)	100.0 (6)	0.374
	Once	11.8 (8)	0.0 (0)	
Use other OH aids	Yes	63.2 (43)	50.0 (3)	0.522
	No	36.8 (25)	50.0 (3)	
Annual check-up	Yes	50.0 (34)	50.0 (3)	1.000
	No	50.0 (34)	50.0 (3)	
Natural health products	Yes	29.4 (20)	16.7 (1)	0.507
	No	70.6 (48)	83.3 (5)	
Natural dental products	Yes	7.4 (5)	100.0 (6)	0.492
	No	92.6 (63)	0.0 (0)	
Heard of Oil pulling	Yes	29.4 (20)	16.7 (1)	0.507
	No	70.6 (48)	83.3 (5)	

*\*p-value derived from chi-square statistics*

### 5.8 Baseline clinical oral health status of trial participants

Baseline *Plaque Index* scores (PIS) ranged from 0.50 to 2.13; the mean PIS was 1.15 (SD 0.30); and the median PIS was 1.14 (IQR 1.0, 1.33), *Table 5.8*. The proportion of sites with visible plaque (PVP) ranged from 0 to 0.90; the mean PVP was 0.27 (SD 0.19); and the median PVP was 0.21 (IQR 0.13, 0.39).

In terms of gingival health, *Gingival Index* scores (GIS) ranged from 0.56 to 2.0; the mean GIS was 1.57 (SD 0.28); and the median GIS was 1.62 (IQR 1.41, 1.79), *Table 5.8*. The proportion of sites with gingival bleeding (PGB) ranged from 0 to 1.00; the mean PGB was 0.60 (SD 0.24); and the median PGB was 0.63 (IQR 0.45, 0.79).

**Table 5.8 Baseline Plaque and Gingival Health**

		Mean (SD)	Median (IQR)
Oral Hygiene	<i>PIS</i>	1.15 (0.30)	1.14 (1.0, 1.33)
	<i>PVP</i>	0.27 (0.19)	0.21 (0.13, 0.39)
Gingival Health	<i>GIS</i>	1.57 (0.28)	1.62 (1.41, 1.79)
	<i>PGB</i>	0.60 (0.24)	0.63 (0.45, 0.79)

## 5.9 Socio-demographic variations in clinical parameters at baseline

No socio-demographic variations in PI scores were apparent with respect to age ( $p>0.05$ ), gender ( $p>0.05$ ), employment status ( $p>0.05$ ), or place of birth ( $p>0.05$ ), Table 5.9. No socio-demographic variations in the proportion of sites with visible plaque (PVP) were apparent with respect to age ( $p>0.05$ ), gender ( $p>0.05$ ), employment status ( $p>0.05$ ), or place of birth ( $p>0.05$ ). No socio-demographic variations in GI scores were apparent with respect to age ( $p>0.05$ ), gender ( $p>0.05$ ), employment status ( $p>0.05$ ), or place of birth ( $p>0.05$ ). No socio-demographic variations in the proportion of sites with gingival bleeding (PGB) were apparent with respect to age ( $p>0.05$ ), gender ( $p>0.05$ ), employment status ( $p>0.05$ ), or place of birth ( $p>0.05$ ).

**Table 5.9 Socio-demographic Variations in Plaque and Gingival Health**

		PIS	PVP	GIS	PGB
		Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Age	<20	1.20 (0.30)	0.27 (0.21)	1.57 (0.27)	0.58 (0.26)
	20-24	1.13 (0.30)	0.27 (0.18)	1.57 (0.29)	0.60 (0.24)
	<i>p-value</i> *	0.78	0.90	0.78	0.78
Gender	Male	1.17 (0.32)	0.28 (0.21)	1.62 (0.28)	0.64 (0.24)
	Female	1.13 (0.27)	0.26 (0.16)	1.52 (0.29)	0.55 (0.24)
	<i>p-value</i> *	1.00	0.81	0.05	0.05
Current role	Employed	1.14 (0.25)	0.26 (0.19)	1.48 (0.41)	0.54 (0.30)
	Student	1.15 (0.31)	0.27 (0.19)	1.59 (0.24)	0.61 (0.23)
	<i>p-value</i> *	0.54	0.91	1.00	1.00
Place of Birth	HK	1.20 (0.27)	0.27 (0.20)	1.59 (0.30)	0.61 (0.26)
	China	1.08 (0.34)	0.25 (0.21)	1.53 (0.24)	0.55 (0.23)
	Elsewhere	1.09 (0.32)	0.26 (0.17)	1.56 (0.27)	0.59 (0.22)
	<i>p-value</i> **	0.93	0.96	0.21	0.07

\* *p-value* calculated using *Mann-Whitney U Test* for independent samples (non parametric equivalence of *t-test* for independent samples)

\*\* *p-value* derived from *Kruskal-Wallis Test* for multiple independent samples

## 5.10 Variations in clinical parameters and oral health practices at baseline

No significant variations in PI scores were apparent with respect to frequency of tooth brushing ( $p>0.05$ ), use of additional oral hygiene aids ( $p>0.05$ ), or dental attendance patterns ( $p>0.05$ ), *Table 5.10*. No significant variations in the proportion of sites with visible plaque (PVP) were apparent with respect to frequency of tooth brushing ( $p>0.05$ ), use of additional oral hygiene aids ( $p>0.05$ ), or dental attendance patterns ( $p>0.05$ ). No significant variations in GI scores were apparent with respect to frequency of tooth brushing ( $p>0.05$ ) or use of additional oral hygiene aids ( $p>0.05$ ). Dental attendance was significantly associated with GI scores ( $p<0.05$ ). No significant variations in the proportion of sites with gingival bleeding (PGB) were apparent with respect to frequency of tooth brushing ( $p>0.05$ ) or use of additional oral hygiene aids ( $p>0.05$ ). Dental attendance was significantly associated with PGB ( $p<0.05$ ).



**Table 5.10 Reported Health Practices and Clinical Oral Health Status**

		PIS	PVP	GIS	PGB
		Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Brushing	<i>Twice daily</i>	1.15 (0.30)	0.27 (0.19)	1.57 (0.29)	0.59 (0.25)
	<i>Less frequent</i>	1.12 (0.31)	0.26 (0.18)	1.61 (0.21)	0.63 (0.16)
	<i>p-value*</i>	0.71	0.77	0.71	0.71
Additional Aids	<i>Yes</i>	1.10 (0.26)	0.23 (0.15)	1.56 (0.27)	0.58 (0.24)
	<i>No</i>	1.23 (0.34)	0.33 (0.23)	1.59 (0.32)	0.62 (0.25)
	<i>p-value*</i>	0.31	0.49	0.31	0.31
Annual check-up	<i>Yes</i>	1.14 (0.29)	0.24 (0.19)	1.51 (0.32)	0.54 (0.28)
	<i>No</i>	1.16 (0.31)	0.29 (0.18)	1.64 (0.23)	0.66 (0.19)
	<i>p-value*</i>	0.47	0.63	0.03	0.03

\* *p-value* calculated using *Mann-Whitney U Test* for independent samples (non parametric equivalence of *t-test* for independent samples)

### **5.11 Variations in clinical parameters and use of natural health products**

No significant variations in PI scores were apparent with respect to use of natural health products overall ( $p>0.05$ ) or reported use of natural dental/oral health products ( $p>0.05$ ), Table 5.11. No significant variations in the proportion of sites with visible plaque (PVP) were apparent with respect to use of natural products ( $p>0.05$ ). However, reported use of natural dental/oral health products was significantly associated with proportion of sites with visible plaque (PVP) ( $p<0.05$ ). Among those who reported to use natural dental/oral health products the mean PVP was 0.42 (SD=0.17) compared to a mean PVP of 0.25 (SD=0.19) among those who claimed not to use natural dental/oral health products.

No significant variations in GI scores were apparent with respect to use of natural products overall ( $p>0.05$ ) or use of natural dental/oral health products ( $p>0.05$ ). No significant variations in the proportion of sites with gingival bleeding (PGB) were apparent with respect to use of natural products overall ( $p>0.05$ ) or use of natural dental/oral health products ( $p>0.05$ ).

**Table 5.11 Reported Use of Natural Products,  
Natural Dental Health Products and Clinical Oral Health Status**

		PIS	PVP	GIS	PGB
		Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Use of natural products	No	1.15 (0.30)	0.26 (0.20)	1.55 (0.28)	0.57 (0.24)
	Yes	1.20 (0.28)	0.30 (0.19)	1.60 (0.30)	0.63 (0.24)
	<i>p-value*</i>	0.64	0.44	0.31	0.31
Use of natural dental health products	No	1.14 (0.30)	0.25 (0.19)	1.56 (0.28)	0.59 (0.24)
	Yes	1.26 (0.26)	0.42 (0.17)	1.68 (0.28)	0.70 (0.26)
	<i>p-value*</i>	0.38	0.036	0.31	0.32

\* *p-value* calculated using *Mann-Whitney U Test* for independent samples (non-parametric equivalence of *t-test* for independent samples)

### **5.12 Comparison of the profile of the test and control group at baseline**

There was a significant difference in the gender profile of those assigned to receive the test ('oil pulling') in the first arm of the trial. 61.8% (21) were female compared with 35.3% (12) female among those assigned to the control group (conventional oral hygiene practices) in the first arm of the trial, *Table 5.12*. No socio-demographic profile variations in allocation were apparent in terms of age ( $p>0.05$ ), current role ( $p>0.05$ ) or place of birth ( $p>0.05$ ).

There was no significant difference in the reported oral health practices among those allocated to the test and control arms: in terms of tooth brushing frequency ( $p>0.05$ ), use of other oral hygiene aids ( $p>0.05$ ), and dental attendance ( $p>0.05$ ). Furthermore, there was no significant difference in the profile of participants allocated to treatment arms with respect to use of natural health products overall ( $p>0.05$ ), use of natural dental/oral health products ( $p>0.05$ ), or having knowledge about (heard of) 'oil-pulling' ( $p>0.05$ ).

**Table 5.12 Socio-demographic profile of test and control group**

		Group A	Group B	<i>p-value*</i>
		% (No.)	% (No.)	
Age	<20	29.4 (10)	23.5 (8)	0.582
	20-24	70.6 (24)	76.5 (26)	
Gender	Male	38.2 (13)	64.7 (22)	0.029
	Female	61.8 (21)	35.3 (12)	
Current role	Student	85.3 (29)	76.5 (26)	0.355
	Employed	14.7 (15)	23.5 (8)	
Place of birth	Hong Kong	61.8 (21)	52.9 (18)	0.763
	Mainland China	11.8 (4)	14.7 (5)	
	Elsewhere	26.5 (9)	32.4 (11)	
Tooth brushing	Twice daily	85.3 (29)	91.2 (31)	0.452
	Once	14.7 (5)	8.8 (3)	
Use other OH aids	Yes	61.8 (21)	64.7 (22)	0.801
	No	38.2 (13)	35.3 (12)	
Annual check-up	Yes	44.1 (15)	55.9 (19)	0.332
	No	55.9 (19)	44.1 (15)	
Natural health products	Yes	26.5 (9)	32.4 (11)	0.595
	No	73.5 (25)	67.6 (23)	
Natural dental products	Yes	5.9 (2)	8.8 (3)	0.642
	No	94.1 (32)	91.2 (31)	
Heard of Oil pulling	Yes	32.4 (11)	26.5 (9)	0.595
	No	67.6 (23)	73.5 (25)	

\**p-value* derived from chi-square statistics

### 5.13 Comparison of oral hygiene and gingival health status and treatment arm allocation

There was no significant difference in the reported oral hygiene and gingival health status among those allocated to the test and control arms: in terms of Plaque Index (PIS) ( $p>0.05$ ), proportion of sites with visible plaque (PVP) ( $p>0.05$ ), Gingival Index (GI), ( $p>0.05$ ) and proportion of sites with gingival bleeding (PGB) ( $p>0.05$ ), Table 5.13.

**Table 5.13 Clinical Oral Hygiene and gingival health (PI and GI) of test and control arms**

		Test Arm1	Control Arm1	<i>p-value</i> **
PIS	Mean(SD)	1.15 (0.28)	1.15 (0.32)	0.47
PVP	Mean(SD)	0.27 (0.17)	0.26 (0.21)	0.63
GIS	Mean(SD)	1.57 (0.27)	1.58 (0.31)	0.81
PGB	Mean(SD)	0.59 (0.23)	0.60 (0.26)	0.81

\*\* *p-value calculated using Mann-Whitney U Test for independent samples (non parametric equivalence of t-test for independent samples)*

### 5.14 Comparison of the clinical parameters in baseline and one-month follow up

Overall among participants, there were no significant variations in Plaque Index Scores (PIS) of baseline compared to one-month follow up ( $p>0.05$ ), Table 5.14. There were significant differences in proportion of sites with visible plaque (PVP) at baseline compared to one-month follow up ( $p=0.001$ ). The mean PVP at baseline was 0.26 (SD=0.18), whereas at interim the mean PVP value was 0.18 (SD=0.13). There were significant differences in Gingival Index Scores (GIS) at baseline compared to one-month follow up ( $p<0.001$ ). The mean GIS at baseline was 1.57 (SD=0.29), whereas at interim the mean GIS value was 1.75 (SD=0.22). There were significant differences in proportion of sites with gingival bleeding (PGB) at baseline compared to one-month follow up ( $p<0.001$ ). The mean PGB at baseline was 0.60 (SD=0.25), whereas at interim the mean PGB value was 0.76 (SD=0.21).

**Table 5.14 Variations in baseline and one-month follow up of clinical parameters**

	PIS Mean (SD)	PVP Mean (SD)	GIS Mean (SD)	PGB Mean (SD)
Baseline	1.14 (0.30)	0.26 (0.18)	1.57 (0.29)	0.60 (0.25)
Interim	1.08 (0.23)	0.18 (0.13)	1.75 (0.22)	0.76 (0.21)
<i>p-value*</i>	0.11	0.001	<0.001	<0.001

\* *p-value* calculated using *Wilcoxon Signed-Rank test* (a non-parametric equivalent to the paired *t-test*)

**5.15 Comparison of the clinical parameters in baseline and one-month follow up for 'oil pulling' group**

Overall among participants, there were no significant variations in Plaque Index Scores (PIS) of baseline compared to one-month follow up ( $p>0.05$ ), *Table 5.15*. There were significant differences in proportion of sites with visible plaque (PVP) at baseline compared to one-month follow up ( $p=0.001$ ). The mean PVP at baseline was 0.28 (SD=0.17), whereas at interim the mean PVP value was 0.17 (SD=0.11). There were significant differences in Gingival Index Scores (GIS) at baseline compared to one-month follow up ( $p=0.001$ ). The mean GIS at baseline was 1.57 (SD=0.27), whereas at interim the mean GIS value was 1.75 (SD=0.25). There were significant differences in proportion of sites with gingival bleeding (PGB) at baseline compared to one-month follow up ( $p=0.003$ ). The mean PGB at baseline was 0.59 (SD=0.23), whereas at interim the mean PGB value was 0.76 (SD=0.24).

**Table 5.15 Variations of clinical parameters from baseline to one-month for 'oil pulling'/test group**

	PIS Mean (SD)	PVP Mean (SD)	GIS Mean (SD)	PGB Mean (SD)
Baseline	1.15 (0.29)	0.28 (0.17)	1.57 (0.27)	0.59 (0.23)
Interim	1.08 (0.22)	0.17 (0.12)	1.75 (0.25)	0.76 (0.24)
<i>p-value*</i>	0.063	0.001	0.001	0.003

\* *p-value* calculated using *Wilcoxon Signed-Rank test* (a non-parametric equivalent to the paired *t-test*)



**5.16 Comparison of the clinical parameters in baseline and one-month follow up for control group**

Overall among participants, there were no significant variations in Plaque Index Scores (PIS) and proportion of sites with visible plaque (PVP) of baseline compared to one-month follow up ( $p>0.05$ ), Table 5.16. There were significant differences in Gingival Index Scores (GIS) at baseline compared to one-month follow up ( $p=0.003$ ). The mean GIS at baseline was 1.57 (SD=0.31), whereas at interim the mean GIS value was 1.75 (SD=0.19). There were significant differences in proportion of sites with gingival bleeding (PGB) at baseline compared to one-month follow up ( $p=0.004$ ). The mean PGB at baseline was 0.60 (SD=0.26), whereas at interim the mean PGB value was 0.76 (SD=0.18).

**Table 5.16 Variations of clinical parameters from baseline to one-month for control group**

	PIS Mean (SD)	PVP Mean (SD)	GIS Mean (SD)	PGB Mean (SD)
Baseline	1.12 (0.31)	0.24 (0.19)	1.57 (0.31)	0.60 (0.26)
Interim	1.08 (0.24)	0.18 (0.13)	1.75 (0.19)	0.76 (0.18)
<i>p-value*</i>	0.56	0.28	0.003	0.004

\* *p-value* calculated using *Wilcoxon Signed-Rank test* (a non-parametric equivalent to the paired *t-test*)

### **5.17 Changes in clinical parameters from baseline to one-month**

The change in PI scores from baseline to one-month ranged from -0.73 to 0.88; the mean change in PI score was 0.06 (SD 0.29); and the median change in PI scores was 0.07 (IQR -0.11, 0.18), *Table 5.17*. The change in PVP from baseline to one-month ranged from -0.42 to 0.65; the mean change in PVP was 0.08 (SD 0.19); and the median change in PVP was 0.06 (IQR -0.03, 0.19).

In terms of gingival health, the change in GI scores from baseline to one-month ranged from -0.98 to 0.38; the mean change in GI score was -0.18 (SD 0.30); and the median change in GI scores was -0.19 (IQR -0.35, 0.04). The change in PGB from baseline to one-month ranged from -0.77 to 0.38; the mean change in PGB was -0.16 (SD 0.28); and the median change in PGB was -0.17 (IQR -0.31, 0.08).

**Table 5.17 Changes in clinical parameters from baseline to one-month**

	Change in PIS	Change in PVP	Change in GIS	Change in PGB
Mean	0.06	0.08	-0.18	-0.16
Median	0.07	0.06	-0.19	-0.17
1 <sup>st</sup> quartile	-0.11	-0.03	-0.35	-0.31
3 <sup>rd</sup> quartile	0.18	0.19	0.04	0.08
SD	0.29	0.19	0.30	0.28

### 5.18 Changes in clinical parameters from baseline to one-month between groups

There were no significant differences in the change in PIS between the test and control groups ( $p>0.05$ ), Table 5.18. There were no significant differences in the change in PVP between the test and control groups ( $p>0.05$ ). There were no significant differences in the change in GIS between the test and control groups ( $p>0.05$ ). There were no significant differences in the change in PGB between the test and control groups ( $p>0.05$ ).

**Table 5.18 Changes in clinical parameters from baseline to one-month by group**

	Change in PIS Mean (SD)	Change in PVP Mean (SD)	Change in GIS Mean (SD)	Change in PGB Mean (SD)
Test	0.07 (0.24)	0.11 (0.16)	-0.18 (0.27)	-0.16 (0.26)
Control	0.04 (0.33)	0.06 (0.21)	-0.19 (0.33)	-0.16 (0.29)
<i>p-value</i> **	1.00	0.21	0.45	0.21

\*\* *p-value* calculated using Mann-Whitney U Test for independent samples (non parametric equivalence of t-test for independent samples)

### 5.19 Variations in one-month to final of clinical parameters

Overall among participants, there were no significant variations in Plaque Index Scores (PIS), proportion of sites with visible plaque (PVP), Gingival Index Scores (GIS) and proportion of sites with gingival bleeding (PGB) from one-month to final assessment at two months ( $p>0.05$ ).

Table 5.19.

**Table 5.19 Variations in one-month to final of clinical parameters**

	PIS Mean (SD)	PVP Mean (SD)	GIS Mean (SD)	PGB Mean (SD)
Interim	1.08 (0.23)	0.17 (0.13)	1.75 (0.22)	0.75 (0.21)
Final	1.12 (0.20)	0.17 (0.13)	1.77 (0.22)	0.78 (0.21)
<i>p-value*</i>	0.22	0.92	0.65	0.54

\* *p-value* calculated using *Wilcoxon Signed-Rank test* (a non-parametric equivalent to the paired *t-test*)

### 5.20 Variations of clinical parameters from one-month to final for control group

Among the control group there were no significant variations in Plaque Index Scores (PIS), proportion of sites with visible plaque (PVP), Gingival Index Scores (GIS) and proportion of sites with gingival bleeding (PGB) within the control group from one-month to final assessment at two months ( $p>0.05$ ), Table 5.20.

**Table 5.20 Variations of clinical parameters from one-month to final for control group**

	PIS Mean (SD)	PVP Mean (SD)	GIS Mean (SD)	PGB Mean (SD)
Interim	1.08 (0.22)	0.17 (0.12)	1.75 (0.25)	0.76 (0.24)
Final	1.15 (0.20)	0.19 (0.14)	1.77 (0.24)	0.78 (0.22)
<i>p-value*</i>	0.10	0.82	0.60	0.45

\* *p-value* calculated using *Wilcoxon Signed-Rank test* (a non-parametric equivalent to the paired *t-test*)

### 5.21 Variations of clinical parameters from one-month to final for 'oil-pulling' group

Among the test group, there were no significant variations in Plaque Index Scores (PIS), proportion of sites with visible plaque (PVP), Gingival Index Scores (GIS) and proportion of sites with gingival bleeding (PGB) within the oil-pulling group from one-month to final assessment at two months ( $p>0.05$ ). Table 5.21.

**Table 5.21 Variations of clinical parameters from one-month to final for 'oil-pulling' group**

	PIS Mean (SD)	PVP Mean (SD)	GIS Mean (SD)	PGB Mean (SD)
Interim	1.08 (0.24)	0.18 (0.13)	1.75 (0.19)	0.75 (0.18)
Final	1.08 (0.21)	0.16 (0.12)	1.76 (0.21)	0.76 (0.19)
<i>p-value*</i>	0.90	0.59	0.90	0.95

\* *p-value* calculated using *Wilcoxon Signed-Rank test* (a non-parametric equivalent to the paired *t-test*)

## 5.22 Changes in clinical parameters from interim to final

The change in Plaque Index (PI) scores from one-month to final (one month later) ranged from -0.43 to 0.39; the mean change in PI score was -0.04 (SD 0.20); and the median change in PI scores was -0.03 (IQR -0.15, 0.09), *Table 5.19*. The change in PVP from interim to final ranged from -0.37 to 0.38; the mean change in PVP was 0.00 (SD 0.12); and the median change in PVP was 0.02 (IQR -0.08, 0.07).

In terms of gingival health, the change in Gingival Index (GI) scores from interim to final ranged from -0.54 to 0.65; the mean change in GI scores was -0.02 (SD 0.20); and the median change in GI scores was 0.00 (IQR -0.11, 0.08), *Table 5.19*. The change in PGB from interim to final ranged from -0.54 to 0.50; the mean change in PGB -0.02 (SD 0.18); and the median change in PGB was 0.00 (IQR -0.10, 0.08).

**Table 5.22 Changes in clinical parameters from one-month to final**

	Change in PIS	Change in PVP	Change in GIS	Change in PGB
Mean	-0.04	0.00	-0.02	-0.02
Median	-0.03	0.02	0.00	0.00
1 <sup>st</sup> quartile	-0.15	-0.08	-0.11	-0.10
3 <sup>rd</sup> quartile	0.09	0.07	0.08	0.08
SD	0.20	0.12	0.20	0.18

### 5.23 Changes in clinical parameters from one-month to final between groups

There were no significant differences in the change in PIS between the test and control groups ( $p>0.05$ ), Table 5.20. There were no significant differences in the change in PVP between the test and control groups ( $p>0.05$ ). There were no significant differences in the change in GIS between the test and control groups ( $p>0.05$ ). There were no significant differences in the change in PGB between the test and control groups ( $p>0.05$ ).

**Table 5.23 Changes of clinical parameters from one month to final between groups**

	Change in PIS Mean (SD)	Change in PVP Mean (SD)	Change in GIS Mean (SD)	Change in PGB Mean (SD)
Control	-0.07 (0.17)	-0.02 (0.12)	-0.03 (0.17)	-0.03 (0.16)
Test	-0.01 (0.22)	0.03 (0.11)	-0.01 (0.23)	-0.01 (0.21)
<i>p-value</i> **	0.90	0.90	0.71	0.54

\*\* *p-value* calculated using Mann-Whitney U Test for independent samples (non parametric equivalence of t-test for independent samples)



### 5.24 Compliance of oil pulling

Most (88.9%, 56) reported to comply with the 'oil pulling' practice daily or almost every day. The majority (69.8%, 44) claimed to practice the 'oil-pulling' for 10 minutes or more. The practice was mostly performed in the morning (93.7%, 59).

Approximately one in ten (11.1%, 7) did not perceive 'oil pulling' to be effective. A third (33.3%, 21) rated 'oil-pulling' as quite effective. One in five reported the (20.6%, 13) oil pulling' practice to be acceptable. However, more than half (52.4%, 33) claimed they would not continue with the practice of oil pulling.

**Table 5.24 Compliance of oil pulling**

		<i>Total % (No.)</i>
Frequencies	<i>Less often</i>	11.1 (7)
	<i>Almost everyday</i>	55.6 (35)
	<i>Everyday</i>	33.3 (21)
Duration	<i>&lt; 10</i>	30.2 (19)
	<i>≥ 10</i>	69.8 (44)
Timing	<i>Night</i>	6.3 (4)
	<i>Morning</i>	93.7 (59)
Effectiveness	<i>Not effective</i>	11.1 (7)
	<i>A little effective</i>	54.0 (34)
	<i>Quite effective</i>	33.3 (21)
	<i>Very effective</i>	1.6 (1)
Acceptable	<i>No</i>	17.5 (11)
	<i>Yes, but not very acceptable</i>	61.9 (39)
	<i>Yes, and acceptable</i>	20.6 (13)
Continue oil pulling?	<i>No</i>	52.4 (33)
	<i>Yes</i>	47.6 (30)

## 6.0 Discussion

It was feasible to recruit seventy-four participants to attend the screening for the 'oil pulling' intervention. The group largely reflected young adults who were students. They varied in terms of socio-demographic backgrounds in terms of place of birth (approximately half were born outside Hong Kong). Reported oral hygiene practices were generally favorable, in that the vast majority (~ 90%) reported to brush twice daily and used additional oral hygiene aids (~ two-thirds) – albeit using additional oral hygiene aids infrequent. Not surprisingly floss was the most common type of additional oral hygiene aids reported. This represents better oral hygiene practices that has been reported in the most recent Oral Health Survey in Hong Kong among middle-aged adults (35-44 years old) where 77% reported to brush twice daily (Department of Health, 2011). This is likely to reflect an increased awareness and more positive attitudes to oral health among the younger Hong Kong population.

Among participants that were screened, approximately one in three reported using natural health products but with less than 10% reported using them very often or all the time. This highlights the growing trend in the use of natural health products as has been observed in other western countries (Troppmann et al., 2002; Kelly et al., 2005). The use of natural products for dental/oral health was reported to be less common at around 7% but nonetheless shows an interest in the use of CAM for oral health.

More than a quarter had heard about the practice of 'oil pulling' highlighting awareness of the trend which is likely to reflect social media reports and celebrities endorsement. Thus the importance for the dental profession to provide evidence and recommendations regarding this practice as has been highlighted by other dental associations (ADA, 2014).

Variation in awareness regarding the practice of 'oil pulling' was significantly associated with the reported use of natural dental/oral health products. This suggests that this may be a specific target group to educate and inform about the potential merits or not of the practice of 'oil pulling'. No significant differences in awareness of the practice of 'oil pulling' were apparent with respect to socio-demographic or reported oral health practices.

It was feasible to include around 90% of participants screened in our clinical trial. Approximately 5% were not eligible because of evidence of caries at cavitation level which highlights the ongoing problem with caries in young adults which may go untreated. One participant was excluded on the use of antibiotics as this may have an effect on gingival health outcomes as reported in the literature (Sgolastra et al., 2011). One subject did not have any evidence of visible plaque and was excluded since no greater benefit would be feasible by participating into the trial. There were no significant differences in the profile of eligible and non-eligible subjects in the trial in relation to socio-demographics, oral practices and use of natural health products.

The oral hygiene of trial participants at baseline varied considerably and the mean Plaque Index Score was 1.15. Approximately a quarter of all sites examined had evidence of visible plaque. This reflects better oral hygiene than has been reported among adults aged 35-44 in the most recent Oral Health Survey where 96.7% of adults have half or more of their teeth covered with visible dental plaque (Department of Health, 2011). Interestingly the reported use of natural dental/oral health products was significantly associated with a higher mean proportion of sites with visible plaque among participants of our study compared with those who reported of not using natural dental/oral health products. This in part may be related to the lack of anti-plaque properties of commercially available natural dental/oral health products.

In terms of gingival health, this also varied considerably among participants with a mean Gingival Index Score of 1.17 and 60% of sites examined had gingival bleeding on probing. This highlights the high prevalence of gingival and potentially periodontal problems. Findings from the most recent Oral Health Survey have reported that gingival problems are very common even at age 12 (Department of Health, 2011). For example at age 12, 63.8% have bleeding gums and at age 35-44, 98.6% have bleeding gums on examination and 80.1% have half or more of the teeth with bleeding gums. Gingival health was not significantly associated with any socio-demographic factors (although females tended to have better gingival health). Dental attendance was associated with gingival health in that those who reported to attend annual dental check-up to have lower Gingival Index scores and fewer sites with gingival bleeding supporting the practice of regular dental check-ups (Lang et al., 1994).

We attempted to establish the effectiveness of 'oil pulling' as an adjunct measure to conventional oral hygiene in a clinical trial. To 'blind' clinical assessors of what intervention/treatment arm each participant was allocated to, participants were sent to a separate station away from the clinic where they would receive their interventions – a bag containing the oil, toothbrush and toothpaste versus a bag containing only toothbrush and toothpaste. Subjects were block randomized in groups of four as determined by computer software and was only known to the group member who assigned interventions not examiners. Ideally a wash-out period following phase one of the intervention is desirable, however it was assumed that the 'oil pulling' would not have a prolonged effect and in addition arranging additional visits within interim period was problematic. Thus analysis was based on changes from baseline to interim (one-month) and from interim (one-month) to final assessment, i.e. a total period spanning two months.

The response rate to the trial was high at over 90%. Among those assigned to the 'oil pulling' intervention, between baseline and one month there was a reduction in Plaque Index scores,

although this was not significantly different. However, there was a significant difference in the proportion of sites with visible plaque - a reduction from 26% to 18%, reflecting approximately 30% of improvement. Among those assigned to the conventional oral hygiene alone, between baseline and one month there was no significant difference in Plaque Index Scores or proportion of sites with visible plaque. However, there was no significant difference between the mean change in plaque parameters between the test and control group. This would indicate no additional benefits from practice of 'oil pulling' for oral hygiene.

In terms of gingival health an unexpected outcome was observed for both the test and control group there was significant increase in Gingival Index Scores and the proportions of sites with gingival bleeding. It is difficult to postulate why this would have occurred given that reliability between assessors was good and similar criteria of assessment was used. Possibilities we have considered are effects of trauma from vigorous tooth brushing especially prior to the day of examination and also possibly relation to stress and gingival health as exams neared. There were no significant differences in gingival health outcomes between the test and control groups from baseline to interim period, indicating no additional value of the 'oil pulling' practice for gingival health.

From interim period to the final assessment one month later, among both the test and control group there were no significant differences in oral hygiene as reflected in Plaque Index scores and proportions of sites with visible plaque. In addition there was no significant difference in the test or control group in terms of gingival health as reflected in Gingival Index scores and proportions of sites with gingival bleeding. Furthermore, there was no significant difference in magnitude of change in oral hygiene and gingival health between interim assessment and follow-up at two months.

## 7.0 Conclusions and recommendations

1. Among our study participants, approximately a quarter were aware of the practice of 'oil pulling' highlighting the trend in Hong Kong as has been observed elsewhere. Awareness of the practice of 'oil pulling' was associated with reported use of natural dental/oral health products suggesting that this group in particular may follow this traditional Ayurvedic practice. There is a clear need to provide evidence to support or refute the practice of 'oil pulling'.
2. Findings from the clinical trial identified significant improvements in oral hygiene in terms of proportions of sites with visible plaque from baseline to one-month among both the test and control groups. However, no significant differences were apparent between groups. Between one-month and two-month, there were no significant changes in oral hygiene among either the test or the control group. This implies that the adjunct practice of 'oil pulling' has no additional benefit over conventional oral hygiene practices of tooth brushing with toothpaste for improving oral hygiene.
3. In terms of gingival health, there was observed deterioration from baseline to one-month among the test and control group. However, there were no significant differences in changes in gingival health between groups. The exact reason for this is unclear. Between one-month and two-month, there was no significant difference of inter- or intra- gingival health. Our intervention programme could not be supported for improving gingival health.
4. Based on the findings in our Community Health Project, we support the practice of conventional oral hygiene with toothbrush and toothpaste. However, there is a need for further studies on this popular traditional oral health practice and where possible cross-over clinical trial with wash-out period.

## 8.0 References

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**Faculty of Dentistry, HKU**  
**Community Health Project 2015**  
 Questionnaire 問卷

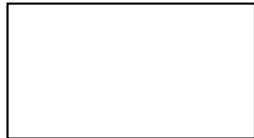
We would like to ask you a few questions regarding your oral care habits. Please tick the appropriate box or fill in the blanks when necessary. You may only tick one box per questions (unless stated otherwise). Thank you.

請在適當空格內填上  號或在橫線上填上答案。每條問題只可選擇一個答案(題目指明除外)。謝謝!

1. Do you brush your teeth every day? 你有沒有每天刷牙?	<input type="checkbox"/> Yes 有 <input type="checkbox"/> No 沒有 (Skip Q2 跳過 Q2)
2. How many times do you brush per day? 你每天刷多少次牙?	<input type="checkbox"/> Less than once 少於一次 <input type="checkbox"/> Once 一次 <input type="checkbox"/> Twice or more 兩次或多於兩次
3. Do you go for routine dental check-up annually? 你有沒有每年進行例行口腔檢查?	<input type="checkbox"/> Yes 有 <input type="checkbox"/> No 沒有
4. Do you use additional oral hygiene aids other than brushing? 除了刷牙外, 你有沒有使用其他口腔護理用品?	<input type="checkbox"/> Yes 有 <input type="checkbox"/> No 沒有 (Skip Q5,6 跳過 Q5,6)
5. What additional oral hygiene aids do you use? (Multiple answers possible) 你有使用什麼額外的口腔護理用品? (可選擇多於一個答案)	<input type="checkbox"/> Floss 牙線 <input type="checkbox"/> Interdental Brush 牙縫刷 <input type="checkbox"/> Mouth rinse 漱口水 (Brand 牌子: _____) <input type="checkbox"/> Other (please state) 其他(請註明): _____
6. How often do you use the aids mentioned in Q5? 承上題, 你有多經常使用這些口腔護理用品?	<input type="checkbox"/> Every day 每天 <input type="checkbox"/> Almost Every day 幾乎每天 <input type="checkbox"/> Less Often 間中
7. Do you use natural health product? 你有沒有使用任何天然健康產品?	<input type="checkbox"/> Yes, all the time 每天使用 <input type="checkbox"/> Yes, very often (more than once a week) 每星期幾次 <input type="checkbox"/> Yes, occasionally 間中使用 <input type="checkbox"/> No 沒有
8. Do you use natural health products for your dental health, e.g. natural herbal toothpaste? 你有沒有使用護理牙齒健康的天然健康產品? 例如: 天然草藥牙膏?	<input type="checkbox"/> Yes, all the time 每天使用 <input type="checkbox"/> Yes, very often (more than once a week) 每星期幾次 <input type="checkbox"/> Yes, occasionally 間中使用 <input type="checkbox"/> No 沒有
9. Have you heard of 'Oil Pulling'? 你有沒有聽過「油拔法」?	<input type="checkbox"/> Yes 有 <input type="checkbox"/> No 沒有

10. Have you tried 'Oil Pulling' before? 你有沒有試過「油拔法」?	<input type="checkbox"/> Yes 有 <input type="checkbox"/> No 沒有(Skip Q10,11 跳過 Q10,11)
11. How long have you been using 'Oil Pulling'? 承上題，你用了「油拔法」多久?	_____ month(s) 個月
12. How effective do you find 'Oil Pulling'? 你認為「油拔法」有效嗎?	<input type="checkbox"/> Very effective 非常有效 <input type="checkbox"/> Quite effective 頗有效 <input type="checkbox"/> A little effective 有一點效 <input type="checkbox"/> Not effective 完全沒有效

**Faculty of Dentistry, HKU**  
**Community Health Project 2015**  
Questionnaire 問卷



We would like to collect a little information about yourself, please tick the box as appropriate. All the information collected will be kept confidential. Thank you for your kind cooperation!

我們希望收集一些關於你的資料，請在適當的空格填上  號。所以資料絕對保密。謝謝。

Name: \_\_\_\_\_

Email Address: \_\_\_\_\_

Date: \_\_\_\_\_

1. What is your gender? 你的性別是?	<input type="checkbox"/> Male 男 <input type="checkbox"/> Female 女
2. What is your age? 你的年齡是?	<input type="checkbox"/> <20 <input type="checkbox"/> 20-24 <input type="checkbox"/> 25-30 <input type="checkbox"/> >30
3. Are you a student or currently employed? 你是學生還是在職?	<input type="checkbox"/> Student 學生 <input type="checkbox"/> Employed 在職
4. Where is your place of birth? 你的出生地點是?	<input type="checkbox"/> Hong Kong 香港 <input type="checkbox"/> Mainland China 中國大陸 <input type="checkbox"/> Other(please state) 其他(請註明): _____
5. Do you have any long-term medical problems? 你有沒有任何長期疾病?	<input type="checkbox"/> Yes (please state)有(請註明): _____ <input type="checkbox"/> No 沒有
6. Are you taking any long-term medications? (e.g. antibiotics) 你有沒有長期服用任何藥物?(例如: 抗生素)	<input type="checkbox"/> Yes (please state)有(請註明): _____ <input type="checkbox"/> No 沒有

**Faculty of Dentistry, HKU**  
**Community Health Project 2015**  
 Questionnaire 問卷

We would like to ask you a few questions regarding your oil pulling habits. Please tick the appropriate box or fill in the blanks when necessary. You may only tick one box per questions (unless stated otherwise). Thank you.

請在適當空格內填上  號或在橫線上填上答案。每條問題只可選擇一個答案(題目指明除外)。謝謝!

1. How often did you use 'Oil Pulling'? 你多久進行一次油拔法?	<input type="checkbox"/> Every day 每日 <input type="checkbox"/> Almost every day 幾乎每日 <input type="checkbox"/> Less often 間中
2. How long did you oil pull each time? 你每次油拔的時間是多久?	_____ minutes 分鐘
3. What time do you oil pull? 你在什麼時候進行油拔法?	<input type="checkbox"/> Morning 早上 <input type="checkbox"/> Night 晚上 <input type="checkbox"/> After meals 餐後
4. Did you find it effective? 你認為油拔法有效嗎?	<input type="checkbox"/> Very effective 非常有效 <input type="checkbox"/> Quite effective 頗有效 <input type="checkbox"/> A little effective 有一點效 <input type="checkbox"/> Not effective 完全沒有效
5. Do you like oil pulling? 你喜歡油拔法嗎?	<input type="checkbox"/> Yes, and acceptable 喜歡 <input type="checkbox"/> Yes, but not very acceptable 一般 <input type="checkbox"/> No 不喜歡
6. Would you like to continue 'Oil Pulling'? 你會繼續進行油拔法嗎?	<input type="checkbox"/> Yes 會 <input type="checkbox"/> No 不會
7. Do you have any other thoughts on 'Oil Pulling'? 你對油拔法有沒有任何意見/想法?	
<hr/> <hr/> <hr/>	

The End