ORAL HEALTH KNOWLEDGE, ATTITUDES AND BEHAVIOURS OF 11 -12 YEAR OLD ORANG ASLI CHILDREN IN CAMERON HIGHLAND, PAHANG

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ABSTRACT

The objectives of this study were to assess the levels of oral health knowledge, attitudes and related behaviours of 11 – 12 year old Orang Asli (OA) schoolchildren in Cameron Highland, Pahang, and to develop a suitable oral health education (OHE) module for OA primary school children. **Methods:** This was a cross-sectional study using a self-filled questionnaire. The study population was OA primary schoolchildren in the Pahang state. The sample population was all OA primary schoolchildren in Cameron Highland (CH) district, Pahang. The inclusion criteria were 11-12 year old OA children (Year 5-6) who attended OA primary schools, whose parents were from OA descendents, and who were able to read and write. The questionnaire was adopted from a questionnaire used in a local study. It was validated for use by the OA children to assess OA children's oral health knowledge (OHK), attitudes (OHA), and related behaviours (OHB). Ethical approval was granted by the Medical Ethics Committee, Faculty of Dentistry (Ethic No: DF DP 1206/0078 (L)). Permissions to conduct the study were obtained from the Jabatan Kemajuan Orang Asli (JAKOA), Ministry of Education, State and District Education Departments, school headmasters and parents. **Result:** The response rate was 91.2%. The majority of OA children had poor scores on 7 of 9 OHK items (score range = 55.1-76.7%), representing 77.8% of OHK items. About one-third (33.5%) had moderate score on item '*Brushing with fluoride toothpaste can prevent tooth decay'*, and less than half (40.5%) had moderate score on item '*We are encouraged to brush our teeth twice a day'*. In terms of oral health attitudes, the majority of OA children had poor scores on six of 13 OHA items (score range = 64.8-79.7%), representing 46.2% of OHA items. The poor scores were related to OHA items *'sweet foods and drinks is good for the teeth'* (65.6%), *'sweet foods and beverage should be sold in school canteen'* (64.8%), *'chewing betel nuts will makes teeth look beautiful'* (75.8%), and *'chewing betel nut will be add freshness to mouth'* (79.7%). However, the majority had good to moderate scores in all five items

related to toothbrushing. In terms of oral health behaviours, the majority of OA children brushed their teeth ≥2 times/day (83.7%), and used fluoride toothpaste ≥2 times/day (80.2%). However, a large majority (83.3%) had experienced chewing betel nut with 67.4% chewed ≥1 time/day. The majority of OA children consumed sugary/carbonated drinks ≥2 times/day (53.8%), consumed sugary foods ≥2 times/day (56.3%) and rinsed their mouth after meal ≥2 times/day (54.6%). A small proportion smoked cigarettes (4.0%). An OHE package was developed based on the study findings. **Conclusion:** This study showed that OA schoolchildren in Cameron Highland had poor oral health knowledge, attitudes and behaviours. Subsequently, suitable OHE package was developed for use in OA primary schools to improve OA children's oral health knowledge, attitude, behaviors, and oral health status.

ABSTRAK

Tujuan penyelidikan ini adalah untuk mengkaji tahap asas pengetahuan, sikap dan kelakuan terpilih terhadap kesihatan oral murid-murid OA yang berumur 11-12 tahun dan membentuk modul pendidikan kesihatan oral yang sesuai untuk murid OA di sekolah rendah. **Kaedah:** Ini merupakan kajian keratan rentas dan menggunakan borang kaji selidik. Populasi kajian adalah murid OA di Negeri Pahang. Sampel kajian adalah murid-murid sekolah rendah OA yang terdapat di daerah Cameron Highland (CH), Pahang. Kriteria inklusif adalah murid OA berumur 11-12 tahun (Tahun 5-6) yang bersekolah di sekolah rendah OA, ibu-bapa berketurunan OA dan boleh membaca dan menulis. Borang kaji selidik telah digunakan dalam hasil kajian setempat. Ia telah disahkan sesuai digunakan untuk menilai pengetahuan, sikap dan kelakuan murid OA terhadap kesihatan oral. Kelulusan etika penyelidikan telah diperolehi dari Jawatankuasa Etika Perubatan, Fakulti Pergigian (No. Etika: DF DP 1206/0078 (L)). Kebenaran untuk menjalankan penyelidikan telah diperoleh dari Jabatan Kemajuan Orang Asli (JAKOA), Kementerian Pendidikan, Jabatan Pendidikan Negeri dan Daerah, guru besar dan ibu bapa. **Keputusan:** Kadar maklumbalas yang diterima adalah 91.2%. Majoriti murid OA memperoleh skor yang rendah 7 daripada 9 soalan pengetahuan kesihatan oral (kadar skor = 55.1-76.7%), mewakili 77.8% jumlah keseluruhan soalan. Kira-kira satu per tiga (33.5%) mempunyai skor sederhana untuk kenyataan '*Memberus gigi dengan menggunakan berus gigi berfluorida boleh mencegah gigi dari reput/buruk*', dan kurang daripada separuh murid OA (40.5%) mempunyai skor sederhana untuk kenyataan '*Kita digalakkan untuk memberus gigi 2 kali sehari*'. Untuk soalan sikap terhadap kesihatan oral pula, majoriti murid OA memperoleh skor rendah untuk 6 daripada 13 soalan mengenai sikap terhadap kesihatan oral, (kadar skor = 64.8-79.7%), mewakili 46.2% jumlah keseluruhan soalan. Skor yang rendah tersebut adalah mengenai kenyataan '*makanan dan minuman yang manis adalah baik untuk gigi* saya' (65.6%), *'makanan/minuman yang manis patut dijual*

di kantin sekolah' (64.8%), *'mengunyah pinang membuat gigi saya cantik'* (75.8%), dan '*mengunyah pinang menyegarkan mulut saya'* (79.7%). Walaubagaimanapun, majoriti mempunyai skor baik ke sederhana untuk 5 kenyataan mengenai memberus gigi. Untuk soalan kelakuan terhadap kesihatan oral, majoriti murid OA memberus gigi ≥2 kali/hari (83.7%), dan menggunakan ubat gigi berfluorida ≥2 kali/hari (80.2%). Namun, majoriti (83.3%) murid OA mengunyah pinang dan 67.4% daripada mereka mengunyah pinang lebih dari satu kali setiap hari. Majoriti murid OA minum minuman manis ≥2 kali/hari (53.8%), makan makanan manis ≥2 kali/hari (56.3%) dan berkumur dengan air selepas makan ≥2 kali/hari (54.6%). Sekumpulan kecil murid OA (4.0%) adalah merokok. Modul pendidikan kesihatan mulut yang sesuai telah dibentuk berdasarkan keputusan kajian dalam penyelidikan ini. **Kesimpulan:** Kajian ini menunjukkan bahawa murid-murid OA mempunyai pengetahuan, sikap dan kelakuan yang lemah terhadap kesihatan oral. Oleh itu, modul pendidikan kesihatan mulut yang sesuai telah dibentuk untuk kegunaan murid sekolah rendah OA dalam membantu meningkatkan tahap pengetahuan, sikap dan juga kelakuan mereka terhadap kesihatan oral.

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Rianti Samosir 2017

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LIST OF SYMBOLS AND ABBREVIATIONS

CH	: Cameron Highland
DMFT/dmft	: How many teeth (T/t) are decayed (D/d), missing (M/s) or filled (F/f)
DMP	: Doktor Muda Program
ICC	: Intraclass Correlation Coefficient
JAKOA	: Jabatan Kemajuan Orang Asli
JHEOA	: Jabatan Hal Ehwal Orang Asli
KMO	: Kaiser-Meyer-Olkin
MLR	: Multiple Linear Regression
MOE	: Ministry of Higher Education
NOHSS	: The National Oral Health Survey of School Children
OA	: Orang Asli
OHA	: Oral Health Attitude
OHB	: Oral Health Behaviour
OHE	: Oral Health Education
OHK	: Oral Health Knowledge
OHRQoL	: Oral Health Related Quality of Life
RS	: Rianti Samosir
SLR	: Simple Linear Regression
WHO	: World Health Organization

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CHAPTER 1: INTRODUCTION

1.1 Introduction to the Study Area

Figure 1.1: The Map of Peninsular Malaysia

The present study was conducted in the state of Pahang, one of the 13 states in Malaysia. Pahang is one of the largest states in Malaysia apart from Sabah and Sarawak. It is bordered to the north by Kelantan, to the west by Perak, Selangor and Negeri Sembilan, to the south by Johor and to the east by Terengganu and the South China Sea. It has an area of 36,137 km^2. Pahang has a population of more than million people with ethic composition comprises Malay (70.6%), Chinese (14.9%), Indian (4.1%) and other races (10.4%). (J. P. Malaysia, 2010).

Pahang comprises of eleven districts including Jerantut, Bentung, Pekan, Maran, Raub, Rompin, Bera, Kuantan, Temerloh, Lipis and Cameron Highland (Figure 1.2). All

of the districts are provided with physical infrastructure such as roads, piped drinking water and electricity. Cameron Highland is the smallest constituency in Pahang (712 km^2). Pahang has the highest Orang Asli population in Peninsular Malaysia whereby 67,506 out of 178,197 (37.9%) of Orang Asli (OA) resided in Pahang (SyedHussain et al., 2017). The OA in Peninsular Malaysia are divided into 3 main races; Senoi, Proto-Malays and Negrito. In State of Pahang, the most number of OA are the Proto-Malays (55%), then the Senoi race (43.6%), whereas the Negrito race only 1.4 percent (SyedHussain et al., 2017).

Figure 1.2: Districts in Cameron Highland

1.2 Rationale of Study

There have been many studies conducted on the urban population in Peninsular Malaysia but little research has been done on the OA communities especially children. The only available study on OA children was a study on caries prevalence by Kadir and Yassin (1990). A local study on evaluation of the impacts of Doktor Muda Program (DMP) on schoolchildren's levels of oral health knowledge, attitude and behaviours had demonstrated a significant impact in promoting positive oral health among the 11 – 12 year old urban schoollchildren in Malaysia (Yusof & Jaafar, 2013).

This present study intended to involve the OA children aged 11-12 years old and was aimed to assess OA children's levels of knowledge, attitudes and behaviour of oral health. Since the study by Yusof and Jaafar (2013) had proved that DMP had demonstrated a positive impact on oral health among the schoolchildren, a suitable OHP module will be developed for use by OA school children according to DMP guidelines.

The present study used a cross-sectional study design involved OA children with the above mentioned aged who attended the OA schools in Cameron Highland. The 60% of caries prevalence done by Kadir and Yassin (1990) was used as reference in sample size calculation. Cross-sectional study was chosen because this study involved data collected at a defined time.

In order to assess the levels of oral health knowledge, attitude and behavior of the OA children, a new set of validated self-administrated questionnaire was developed. The outcome of the study would be useful to inform policymakers, sponsors, teachers, school community, students and parents. It would provide empirical data in term of improving the OA children's oral health and to justify future funding.

1.3 Aim

i. To assess the levels of oral health knowledge, attitudes, and related behaviors of 11-12 year old OA children and develop a suitable oral health education (OHE) module for use by the OA primary school children.

1.4 Objectives

The objectives of this study were:

i. To assess the levels of oral health knowledge, attitudes and related behaviors of 11-12 year old OA children

ii. To identify significant factors associated with levels of oral health knowledge (OHK) and oral health attitude (OHA)

iii. To recommend an oral health education module for OA primary school children based on findings of this study.

CHAPTER 2: LITERATURE REVIEW

2.1 The Concept of Oral Health

The oral health definition by the World Health Organization (WHO) is not only based on having a good set of teeth; it is also fundamental to measure overall general health which is essential for overall well- being. It is a reflection of being free from pain and oral diseases that affecting the mouth, throat, lips and teeth such as oral and pharyngeal (throat) cancer, oral tissue lesions, birth defects such as cleft lip and palate, chronic oro-facial pain and other diseases and disorders that affect the oral, dental and craniofacial tissues, collectively known as the craniofacial complex (Petersen, 2003).

2.2 The Common Oral Diseases and Their Etiology

The two most common oral diseases are caries and periodontal disease (gum disease). Dental caries, also known as dental cavities or tooth decay, is a multi-factorial disease. The etiological factors include sugars and microorganisms (bacteria) (Moynihan & Petersen, 2004). Dental caries has a dynamic disease process, consisting of periods of demineralization and remineralization of tooth structure, caused by microbial metabolism at the tooth surface (Moynihan & Petersen, 2004).

When we consumes a sticky and sweet foods, these bacteria metabolize the sugars produce acids that break down the tooth enamel (hard outer part of the tooth). Over time, these processes can result in cavitation of the tooth surface (Williams et al., 2011). Caries experience is measured by the decayed missing and filled teeth index (DMFT) for permanent (adult) teeth or by the dmft index for deciduous (children) teeth. Both indices measure how many teeth (T/t) are decayed (D/d), missing (M/s) or filled (F/f) (Thomson, 2003). These two indices are clinical indicators of the cumulative dental caries experience of an individual (Jamieson et al., 2007).

Dental caries is also a complex disease, it can affect both deciduous and permanent teeth. If caries is found early, it can be treated and there will be no long term effect. However, if it is leave untreated, the caries continues to grow and develop a cavity that can be painful. The untreated cavity can further weaken the tooth walls causing the tooth to break. When the tooth breaks, it requires a major treatment to restore it or it may have to be extracted. Untreated carious lesions can also affect the pulp tissue inside the tooth. At the end, this can results in an abscess (swelling) and painful toothaches, and eventually the tooth will have to be extracted (Yeng et al., 2007). The varying intensities of pain is a common symptom of dental caries and may be associated with infection. Pain of greater intensity is associated with crying and interruption to sleep and can detrimentally impact a child's ability to perform normal routine activities (Plutzer & Spencer, 2008).

Dental caries during childhood is associated with numerous symptoms that may have significant consequences on the overall health and development of a child (Plutzer & Spencer, 2008). There are a number of factors that make a person more likely or less likely to develops caries such as sugary diet (Jamieson et al., 2010), water fluoridation (Lee & Dennison, 2004), tooth brushing (Zander et al., 2013), and irregular dental checkup (Brennan & Carter, 1998). Dental diseases related to diet include dental caries, developmental defects of enamel, dental erosion and periodontal disease (Moynihan & Petersen, 2004).

Dental caries is considered as a public health problem due to its high prevalence and significant social impacts. Dental caries is a preventable disease despite its multi-factorial and complex etiology. It remains as a global public health issue and a continuing burden despite the wide use of fluoride and other preventive management at both individual and community levels. Dental caries is the most prevalent disease in the Asia and Latin America. It was estimated that 60.0% - 90.0% of school children around the world and most adults have experienced it (Procope-Beckles, 2007). The National Oral

Health Survey of School Children (NOHSS) in 2007 recorded caries prevalence of primary teeth in 6 and 16 year old students were more than 50.0% in both groups. Caries prevalence at 6 and 16 year old were 74.5% and 59.6% respectively, meanwhile for 12 year olds, it was 41.5%. In addition, data reported by WHO mentioned that 60 – 90.0% of schoolchildren worldwide have experienced caries (Petersen et al., 2005). The latest research conducted in Jakarta found that 84.0% of the 12 year old children examined had experienced dental caries (Adiatman et al., 2016).

Fluoridated water has been shown to be an effective method for reducing the prevalence of dental caries. However, many remote area do not have access to artificially fluoridated water, although some naturally occurring fluoride may exist. Apart from easy access to sugary foods and drinks, the increase in caries among Australian Indigenous children in remote communities may be associated with decreased water fluoridation (Jamieson et al., 2007).

Periodontal disease, also known as gum disease, is the infection of the gums and supporting tissues around the tooth causing an inflammation (Thomson, 2003). Bacteria in dental plaque is responsible for damaging the soft tissues and the surrounding bones. Unlike caries, they are specifically attributed to poor oral hygiene as opposed to poor diet. However, both caries and periodontal diseases are preventable and treatable. The severity of periodontal disease ranges from a mild and completely reversible form (gingivitis) to a severe destruction of the supporting tissues and the bone around the tooth (Periodontitis) (Thomson, 2003). There is no specific index to measure periodontal disease. Therefore, the use of different indices to measure the clinical presentation of periodontal disease results in a wide range of prevalence within the same population (Williams et al., 2011).

2.3 Orang Asli and Oral Health

The importance of oral health care is one of the routines practiced by the entire community either in urban or rural district. However, the methods and techniques used are different from one location to another. For urban communities, there are no barriers to seek a dental treatment. Information on proper techniques of oral hygiene are available from dental professionals, social and electronic media that make them more aware of oral hygiene compared to a group of people who live in remote areas, especially the Orang Asli (OA) peoples.

"Indigenous" has prevailed as a generic term used for many years. In some countries, other term was used such as "aboriginals", "ethnic groups" or maybe first peoples/nations. In Malaysia, Indigenous people are called Orang Asli (OA). Indigenous people holding a unique language, cultural diversity and possess of invaluable knowledge for sustainable of natural resources (Economic, 2009) It is estimated that there are more than 370 million of OA people spread across 90 countries worldwide (Economic, 2009). In Malaysia generally, OA communities make up only 0.7 percent of the total population in Malaysia (Means, 1985). There are three dominating ethnic-cultural divisions in the OA peoples in Malaysia; Negrito, Senoi and Proto-Malay (Means, 1985).

Dental caries is a widespread disease within indigenous communities and it has a particularly severe impact on indigenous children (Welfare, 2012). A study has shown that indigenous children in Australia experienced more caries than non-indigenous children in their deciduous teeth (Jamieson et al., 2007). Australian indigenous children experience, on average, twice the level of dental caries in both the deciduous and permanent dentitions with more untreated decay than their non-indigenous counterparts (Roberts-Thomson, 2004). Study of Aboriginal and Torres Strait Islander child oral health in remote communities reported that indigenous children who lived in rural areas had highest DMFT scores followed by indigenous children in urban areas. Furthermore, non-

indigenous children in both rural and urban areas had similar levels of decayed, filled and missing teeth in deciduous and permanent teeth but lower than among Indigenous children (Jamieson et al., 2007).

OA in Malaysia especially children face major challenges regarding their oral health. In Malaysia, according to a study, there was 60.0% caries prevalence among 303 OA children aged 6-15 years in a study in Selangor (Kadir & Yassin, 1990). The same study found that 87.3% of OA children had at least one carious primary tooth (Kadir & Yassin, 1990). In Australia, nearly 80.0% of indigenous pre-school children examined had dental caries (Seow et al., 1996). Findings from the study by Kadir and Yassin (1990) indicated that aboriginal children did not seem to attach much importance to dental hygiene. Majority of the children (70%) examined had extrinsic stains on their tooth surfaces. In addition, 84% of the children examined admitted that they never used toothbrush provided by the Malaysian Ministry of Education (Abdul-Kadir & Yassin, 1989).

In term of periodontal disease among OA children, according to a study, severe periodontal disease was rarely found in children (Jamieson et al., 2007). However, gingivitis was relatively common among indigenous children, especially older children. Indigenous children aged 6-15 years in South Australia had higher prevalence of gingival bleeding than their non-indigenous counterparts. The level of gingival bleeding among indigenous 5 year olds was almost four times higher than that among their non-indigenous counterparts. Meanwhile, 48.0% of 12 year old indigenous children had gingival bleeding compared with 23.0% of non-indigenous children (Jamieson et al., 2007).

A similar study on indigenous children in New South Wales (NSW) aged 12-14 year olds had a markedly higher prevalence of bleeding compared to non-Indigenous counterparts. Meanwhile, there was little difference in prevalence between indigenous and non-Indigenous children aged 4-12 years. Three-in-five indigenous children living in

remote communities showed some evidence of gingivitis and approximately one-in-five children were at moderate risk of developing gingivitis. More than two-fifths (42.0%) of indigenous children aged 15-16 years were at moderate risk of developing gingivitis and 25.0% were at high risk (Jamieson et al., 2007).

In Malaysia, a study by Abdul-Kadir and Yassin (1989) reported that 74.9% of OA children in Selangor had healthy gingivae. In addition, no periodontal pockets were detected in any of the children examined. The findings of this survey indicated a generally low prevalence of periodontal problems (bleeding and calculus) among OA children (Proto-Malay) in Selangor (Abdul-Kadir & Yassin, 1989).

Dental caries and periodontal disease were uncommon in rural and remote indigenous communities up until the later of twentieth century; the main problem experienced by the indigenous population at that time was attrition (dental wear) (Campbell, 1938).

2.4 Oral health knowledge, attitudes and behaviours

2.4.1 Oral health knowledge (OHK)

Oral health knowledge (OHK) refers to oral health factual information possessed by an individual (Emmanuel & Chang'endo, 2010). This aspect is a starting point for health promotion campaigns. The target population needs to receive information on oral diseases, understand what oral disease is and how it arises, the risk factors and measures that can be adopted to prevent them. In theory, knowledge will lead to changes in attitude, which then would lead to healthier changes in daily life. However, such oral health education program not only to aim by providing information, but also to improve attitudes regarding oral health, and to facilitate the transformation of these attitudes into good behaviour. Oral health knowledge is considered to be crucial for developing healthy

behaviours, and it has been shown that there is an association between increased knowledge and better oral health (Haque et al., 2016).

2.4.2 Oral Health Attitudes (OHA)

Oral health attitude (OHA) is a positive or negative evaluation of an oral health behavior, and that action performance will lead to valued outcomes (Emmanuel & Chang'endo, 2010). It is how a person thinks and whether he/she lean to become optimistic or pessimistic. According to Smyth et al. (2007), providing adequate information and motivation to a group could make positive changes in their attitudes and behaviours. This is similar for those with positive attitudes towards oral health where attitudes is usually influenced by knowledge in oral hygiene care. A study by Ab Murat and Watt (2006) mentioned that appropriate oral health education can help to cultivate healthy oral health practice. Hence, assessment of knowledge, attitude and behaviours are essential in order to create an appropriate health education package (Al-Omiri et al., 2006).

2.4.3 **Oral Health Behaviours** (OHB)

Oral health behaviours (OHB) refer to all of individual's actions that affect oral health. Christensen (2004) found in a study that parents and other family member's characteristics influenced their children health-related behaviors. In addition, research has proven parent's attitude and knowledge towards health influence children's oral health behaviour (Adair et al., 2004). Most caries prevention techniques have required the parent change an existing behaviour, however, providing knowledge alone to the parents rarely lead to long term changes in preventive behaviors (Benitez et al., 1994) In terms of oral health, it was found that children with poor oral health is associated with parent's poor oral health-related behavior (Mattila et al., 2000).

2.4.4 Oral health knowledge, attitudes and behaviour among indigenous community

Concerning knowledge, sugary food and beverage always correlated with children because the majority of children love to take chocolate, candy, cake and carbonated drinks. As mentioned before, organic acids formed by bacteria in dental plaque through the anaerobic metabolism of sugars derived from the diet will cause demineralization of enamel and dentine (the hard tissues of the teeth) resulting in dental caries (Grenby, 1999). Although it has been proven that sugar is the one of important risk factor for dental caries (Akhter et al., 2008), but not all children are aware about this and continue consuming sugary foods and beverage.

About 50.0% of 5 – 16 year old Indigenous student in Chepang, Nepal did not know that sugar can caused tooth decay (Dixit et al., 2013). However, more than half of the 12 years old, urban and rural children in China with 82.0% and 61.0%, respectively knew that consuming sugar and sweet foods could cause tooth decay (Wong et al., 2001). More than half of the respondents (77.0%) with the aged of 12 years old know that sugar and sweet food cause dental caries (Zhang et al., 2015). Meanwhile, only a small group of 8% urban and 5% rural children could identify that bacteria and plaque as a cause of tooth decay.

In term of knowledge about fluoride toothpaste, 82.0% of Indigenous school children in Chepang Nepal were reported did not know about fluoride and its benefit on dental health (Dixit et al., 2013). Only 3.7% of rural children in Shaanxi, China agreed fluoride tooth paste is good for preventing dental caries (Gao et al., 2014). Meanwhile, study reported only 23.9% of school children aged 12-14 years in Qatar known that fluoride helps protect teeth from decay (Al-Darwish et al., 2015).

Smoking had significant impact on the development, progression and severity of periodontal diseases (Do et al., 2008). Based on National Aboriginal and Torres Strait

Islander health survey between 2004 – 2005 found that 50% of Australian Indigenous population between 18 years old and above age group smoked one or more cigarettes per day. Smoking was more prevalent among Indigenous than non-Indigenous adults in every age group (Trewin, 2004).

In Malaysia, the quid chewing habit became to be a dying habit among the younger generation and urbanites since an aged ago. However, this habit still widely practiced by some sections of population including Indian working in remote plantation, some elderly Malays living in rural villages and also indigenous people in Sabah and Sarawak (R. Zain, 1999). There are many forms of tobacco smoking in Malaysia. The commercial brand cigarettes seemed to be the most common form. Handmade paper-rolled cigarette also known as "rokok daun" is a leaf-rolled cigarettes consist of raw tobacco rolled in temburna leaves prior to smoking used by some rural Malays. An Indonesian imported type of cigarette (kretek) containing spices such as cloves in addition to the tobacco is also common (R. B. Zain et al., 1999). Study done by Ali et al. (1991) reported more than 50.0 % of OA population with aged 7 years old and above from Kuala Pangsoon, Selangor Malaysia were smoker. Dunne et al. (2000) found that smoking habit in Australian Indigenous children as young as 7 years of age.

2.5 Oral Health Education (OHE)

Education can be defined as actions or processes meant to facilitate the formation and development of a person's physical, intellectual, sensory-motor and affective characteristics (Trentesaux et al., 2014). Meanwhile, 'oral health education' has been defined as any learning activity which aims to improve an individual's knowledge, attitudes and skills relevant to their oral health (Kay & Locker, 1998). Education is patient-centered and includes organized awareness, information, self-care learning and psychosocial support regarding the disease as well as prescribed treatment, care, hospital

and other healthcare environments, organizational information, and behavior related to health and illness. It is designed to help patients and their families understand the disease and the associated treatment, cooperate with health care providers, live in good health, and maintain or improve their quality of life (Organization, 1998).

"Oral health promotion" by contrast, has been explained as any process which enables individuals or communities to increase control over the determinants of their oral health (Kay & Locker, 1998). The phrase of "dental health education" was commonly used during the early 1990 and later the term was changed to "oral health education" and was widely used, reflecting a greater emphasis on the health of the entire mouth (Stillman-Lowe, 2008).

An adult should play an important role in educating the younger, especially children in regards of importance of dental hygiene. Good knowledge should be taught since young age. Smyth et al. (2007) showed a strong knowledge of oral health demonstrates a good oral care behavior. To establish a positive attitude, the multilevel effort should be made because good knowledge not only to teach, but also must be practiced to form a good attitude. When a good attitude has been formed, then good behavior will be followed next. A more positive attitude towards oral health are usually influenced by a better knowledge in oral health care. Research has shown that appropriate oral health education can help to cultivate healthy oral health practice (Ab Murat & Watt, 2006).

There are many changes in dental health education mentioned by Stillman-Lowe (2008) in term of improvement such as dental health education has become more distinct, and has expanded the number of target groups to which it is conducted. In addition, over the last 20 years dental health education has progressively looked for an input from the fields of education, sociology and psychology. Dental health education has also moved away from delivering information and towards seeking to modify attitudes and change

behavior. Another improvement is there has been a shift away from propaganda and a dependence on didactic teaching methods, towards education which stresses involvement and participation in learning experiences. Last but not least is a major change in responsibility, thus the need to evaluate what is done at all stages.

Although there are many changes in dental health education, still have their own challenge. Review by Sprod et al. (1996) mentioned changing personal health behaviour prove to be more challenging for some community than others; this may lead in condemning the victims for not practicing the appropriate behaviour changes. If this is challenging to apply for urban communities, then the difficulties will be more complicated towards OA people. In order to create dental education, the assessment of knowledge, attitude and behavior is essential. Dental education shall be established in accordance with the selected population. Methods in selection of delivery should be appropriate to their age, race and method used to deliver the message must be easy to understand.

The evaluation of oral health promotion is important in terms of developing effective interventions, disseminating models of good practice, providing feedback to both participants and professionals, ensuring the appropriate use of scarce resources and guaranteeing ethical principles are followed (Blinkhorn, 1993).

2.6 Oral Hygiene Practice of the Orang Asli Population

There are many oral hygiene aids for maintaining optimum oral health. According to the study by Al-Ansari et al. (2006), toothbrush and toothpaste were most often used as oral hygiene aids. Tooth brushing is the most commonly performed oral self-care behavior (Gilbert et al., 1993). Brushing teeth at least twice a day is the most suggested dental advice by dentists worldwide. Therefore, those who brush their teeth twice a day is considered to have good dental behaviour (Davies et al., 2003). Toothbrush and

toothpaste are not the only oral hygiene aids for cleaning the teeth; in some areas there are other methods used to clean the teeth. Approximately 97.6% of 5-12 year old children in rural Mangalore used toothpaste and toothbrush to clean their teeth while 5.2% used other tools to clean their teeth (Kamath et al., 2014).

In Malaysia, known fact that OA peoples often use natural ingredients to clean their teeth, including with a miswak and charcoal (Foong-San, 1972). This may be because the material is more readily available than the modern dental cleaning tool that is commonly used by urban communities. In Nigeria and most African countries, chewing stick is traditionally used for cleaning and strengthening the teeth (Ogundiya et al., 2006). About 80.0-90.0% of Nigerians use chewing sticks mainly because they are readily available, cheap and efficacious (Rotimi & Mosadomi, 1987). The choice of chewing sticks to be used in most cases depends on its cleansing action on the teeth, the therapeutic value, or preferred taste or flavor (Ogundiya et al., 2006).

Majority of the children brushed their teeth at least once a day; a survey concerning the oral health status among 12 years old children showed that 85% were brushing their teeth once a day or less (Vadiakas et al., 2012). While the data reported from Kuusela et al. (1997) mentioned 73.0–83.0% of children in Sweden, Denmark, Germany, Austria and Norway brushed their teeth twice a day. Mwakatobe (2007), reported that tooth brushing at least once a day was practiced by 92.1% of children and 71.9% used toothpaste. Study by Zhang et al. (2014) recorded that 90.0% of the 12 years old children in China brushed their teeth at least once daily. Another study by Zhang et al. (2015) mentioned that almost all the respondents (96.0%) of 12 years old children in Yunnan Province, China brushed their teeth at least once daily.

2.7 Areca Nut and Orang Asli Population

Areca nut chewing or commonly known as betel nut chewing is one of the popular habits among OA communities in Malaysia (Rahman et al., 1999). Based on the study done by Ko et al. (1992) in Taiwan, China the habit was practiced widely, particularly in the aboriginal areas. Betel nut is not common among the urban community. However, betel nut was introduced to the OA children from a very young age because of the betel quit chewing habits that practiced by the adults. A 'betel quid' commonly contains betel leaf, Areca nut and slaked lime, and may also contain tobacco. Other substances, especially spices, including cardamom, saffron, cloves, aniseed, turmeric, mustard or sweeteners, are added according to local preference. Even though this habit pioneered by adults, but it's also become a role model to the children because driven by the curiosity appear within them. There are also many studies reported that this betel nut chewing habits was started in a very young age (Lu et al. (1993), Yang et al. (1996), Chen and Shaw (1996) & Ho et al. (2000)).

The quid main ingredients used are areca nut, betel-leaf, tobacco and lime (Auluck et al., 2009). Some individuals may report chewing only betel nut quid without any tobacco products or chewing some tobacco product without areca nut at different times. Betel nut often chewed in a betel quid and is used as a mildly euphoric stimulant because it contains relatively high levels of psychoactive alkaloids. Chewing betel nut also will increase the capacity to work causes a hot sensation in the body and heightens alertness(S. Williams et al., 2002).

A study reported in Malaysia, betel quid usage is pioneered especially by the OA community. They are also adding some tobacco to the quid (Rahman et al., 1999). Meanwhile, in urban society, ethnic Indian incorporates tobacco in betel quid, but not in ethnic Malay (Gupta & Ray, 2004) & (Gupta & Warnakulasuriya, 2002). Moreover, in rural Sarawak, betel nut is essentially an item of local produce and was known as

"Pinang". The habits tended to begin in young adulthood and this habit more common in female compared to male with 47.0% and 22.0%, respectively (Gupta & Warnakulasuriya, 2002).

Study done by Gupta and Warnakulasuriya (2002) was also reported that Areca nut or betel nut chewing is widespread in south Asia and in the Pacific region. Based on studies done in the Commonwealth of the Northern Mariana Islands (Micronesia), more than half of the respondents (63.4%) claimed to use betel nut regularly. This study also mentioned that the mean age of betel nut chewing was 12 years and 60 out of 309 high school students (range 14–18 years) had started the habit at 10 years of age or younger (Oakley et al., 2005).

CHAPTER 3: METHODOLOGY

3.1 Study design

This study used a cross-sectional study design.

3.2 Reference population

This research was conducted in the state of Pahang. The reference population was 11-12 year old OA children in Cameron Highland. Pahang was chosen because it has the highest Aboriginal population in Peninsular Malaysia with 67,504 OA (37.9%) resided in Pahang (total OA in Malaysia = 178,197). There were 26 OA primary schools (with 100% OA school children) in Pahang (Jabatan Pendidikan, 2014). The population of OA generally live in remote areas in Pahang while smaller proportions live near the roads leading up to Cameron Highland. Data have shown that approximately 40.0% of OA people lived close to or within forested areas (Masron et al., 2013). For OA people who live near the road, they earn their living by selling handicrafts such as baskets, bags, chairs that are made of forest products such as palm leaves and rattans. They also sell honey collected from nearby forests as well as *petai*, *durian*, rattan and resins to earn cash incomes.

Figure 3.1: District of Cameron Highland in Peninsular Malaysia map

3.3 Sample population, Sample size estimation, Sample selection and list of schools

3.3.1 Sample population

There are 10 districts in Pahang state namely Bentong, Jerantut, Lipis, Cameron Highland (CH), Kuantan, Pekan, Raub, Temerloh, Rompin, and Bera (Figure 3.1). The sample population for this study was OA school children in CH. Cameron Highland district was non-randomly chosen as a venue for data collection mainly because of several factors. First, it has among the highest number of OA primary schools in Pahang. In 2014, there were 4 OA schools in CH (Jabatan Pendidikan, 2014). Secondly, the ability to access the sample was also a factor in the research location selection. The journey to CH took about 3 hours from University of Malaya compared to other states.

There were 4 OA primary schools in CH district, namely S.K (Asli) Menson, S.K (Asli) Telanok, S.K (Asli) Terisu and S.K (Asli) Lemoi (Figure 3.2). Three out of the 4 OA primary schools were located about one hour journey from Tanah Rata, CH, except

for S.K (Asli) Lemoi whose journey from Tanah Rata took about 2 hours. Thirdly, another a large majority of school children rate at the 4 OA schools lived in hostels within the school areas. As a result, their attendance at school was relatively high compared to OA children in other districts where most of the children lived away from the schools with their parents. As a result, they often missed school on daily basis. The school officials in the 4 OA schools were also very cooperative and willing to help when initial visits were made to the schools.

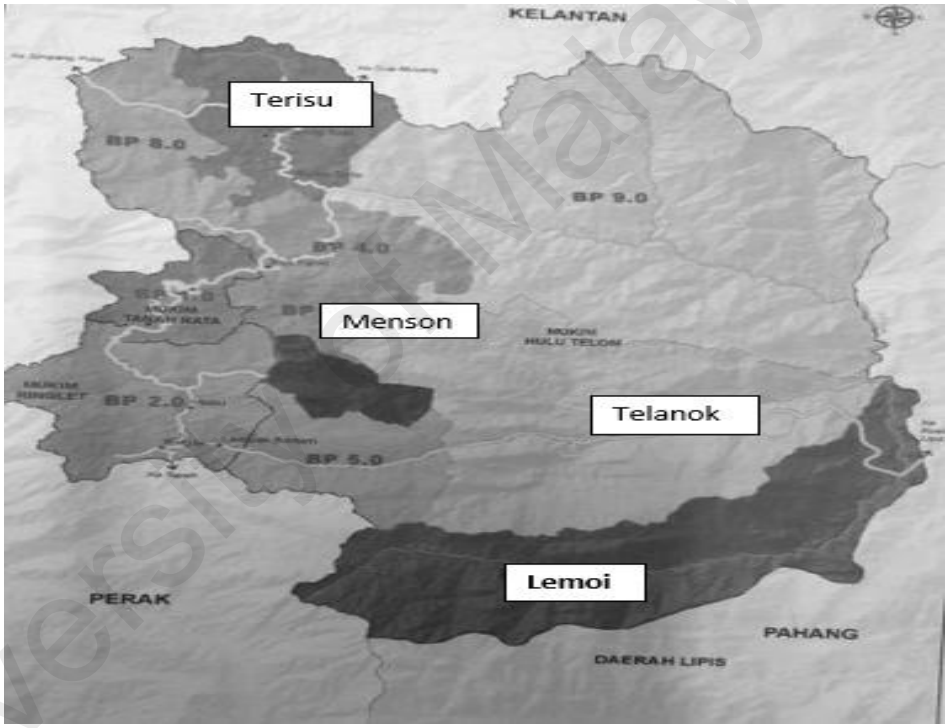

Figure 3.2: Location of SK(A) Terisu, SK(A) Menson, SK(A) Telanok and SK(A) Lemoi in Pahang state

3.3.2 Sample size estimation

Sample size calculation was important to ensure that the study sample fulfilled the required precision or confidence level required in this study. Sample size calculation was based on 60.0% caries prevalence from a study involving 303 OA children aged 6-15 years in Selangor (Kadir & Yassin, 1990). This is the only published study that reported the prevalence of dental caries among OA children since the 1990s. As levels of oral health knowledge, attitudes and behaviors were associated with levels of caries prevalence (Yusof & Jaafar, 2013), the OA caries prevalence reported in the study by Kadir and Yassin (1990) was taken as a proxy for calculating the sample size for the study. In addition, there has been no study reported on OA children's levels of oral health knowledge, attitudes and behaviors in Malaysia. As the total enrolment of 11-12 year old OA children in CH at the beginning of the year was known at the start of the study (n=249)**,** sample size calculation for this study was based on the formula for known population size (Krejcie & Morgan, 1970) (Figure 3.3).

Based on this formula, the sample size calculated for this study was 157 subjects (see below). The calculated sample size was for the desired precision or CI width assuming there was no problem related to issues of non-response or missing values. Therefore, to address potential non-responders, oversampling of 30% was included. Thus, the sample size required for this study was 204 subjects. It was observed that the estimated sample size (n=204) was not too far off from the total number of 11-12 year old OA children in the 4 schools. Therefore, for the purpose of this study, it was decided that all 11-12 year old OA children in the 4 OA schools who fulfilled the study criteria were included as the study sample (n=249). As the study was based on total sampling, design effect was not included in the estimation.

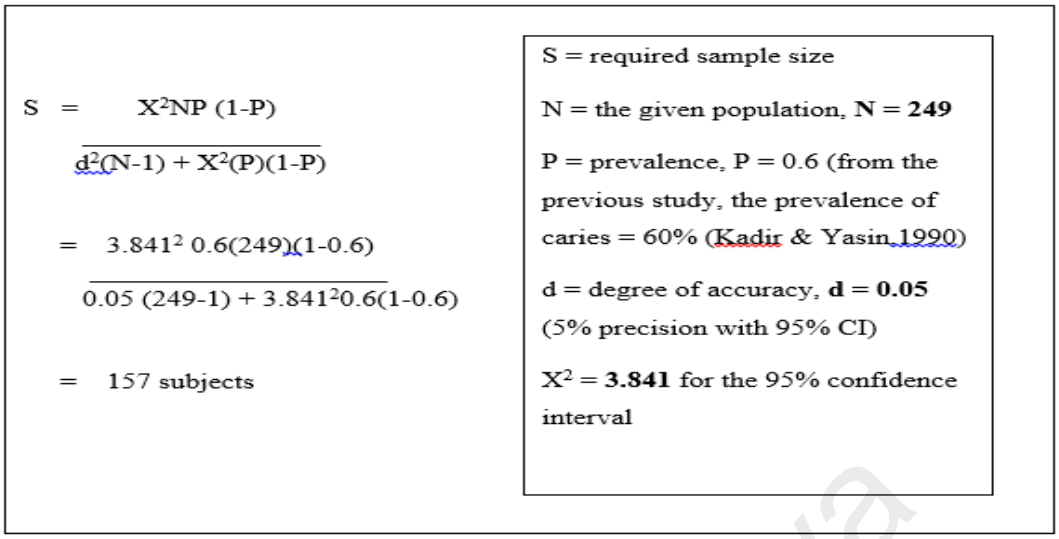

Figure 3.3: Sample size calculation based on the formula for known population size (Krejcie & Morgan, 1970)

3.3.3 Sample selection

The sample selection for this research focused on OA children aged 11-12 years old. To facilitate data collection, OA schools had been chosen as a venue for data collection. In addition, demographic information of the respondents, such as the date of birth, father's and mother's age, family income and education levels of parents can be obtained either from the OA children, their parents or the school's authority. In order to ensure only OA children were recruited, the main inclusion criteria in selecting the sample in this research was 11-12 year old OA children in OA schools. The inclusion criteria were:

1. 11 – 12 year old OA children attending OA schools.
2. Both parents from OA descendants.
3. OA children who can read and write.

There were no 11-12 year old OA children excluded from this study because all of them were able to read and write.

3.3.4 List of schools

The 4 OA schools were presented as follows:

Table 3.1: The total number of OA children according to school (n=227)

School Name	Number of students		Total
	Standard 5	Standard 6	
Sekolah Rendah (Asli) Menson	39	22	61
Sekolah Rendah (Asli) Telanok	75	17	92
Sekolah Rendah (Asli) Lemoi	13	17	30
Sekolah Rendah (Asli) Terisu	24	20	44
		Grand total:	**227**

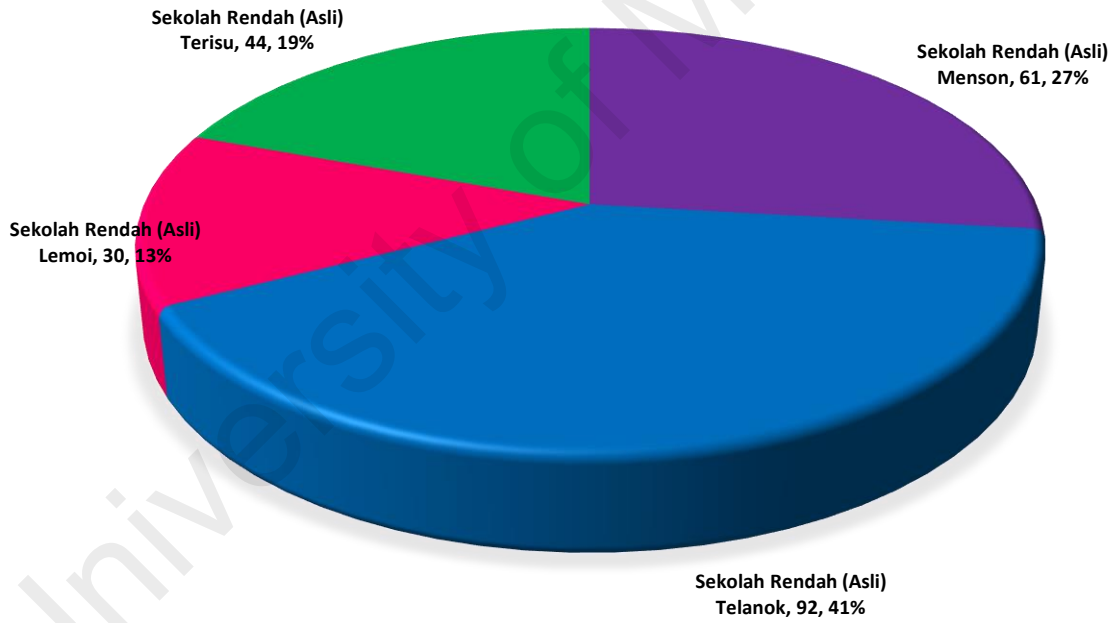

Figure 3.4: Total number of OA children according to school

3.4 Study instrument

The study instrument was a self-administered questionnaire. The questionnaire contained 5 sections. The first 2 sections were related to OA children's socio-demographic background including those of their parents. Meanwhile, the other 3 sections contained questions on oral health knowledge (OHK), oral health attitudes (OHA) and oral health behaviours (OHB).

3.5 Pilot study

3.5.1 Development of the Oral Health Education Questionnaire for use by OA school children

Development of the questionnaire consisted of 3 phases; drafting the questionnaire, followed by linguistic and psychometric validation. Standard protocol developed by Acquadro et al. (2004) was used as a reference.

3.5.1 (a) Development of draft OHE questionnaire

The first step in developing the questionnaire was to develop a draft questionnaire that met the levels of OA children's cognitive and affective abilities at the aged of 11-12 years old. Each question was initially developed in English based on the Oral Health Promotion Evaluation Tool Kit (Watt & Watt, 2004) and the dental literature (Poutanen et al., 2005). A total of 12 OHK domains were identified. These were effects on teeth of sugary drinks and foods consumption, dental caries and prevention, gum disease and prevention, importance and frequency of tooth brushing, dental visit, benefit of good oral health, and oral health effects of smoking and chewing areca nut. The betel nut chewing's question was included because OA population in Malaysia tend to have the habit of chewing betel nuts, not only among adults but also among children.

For OHA items, these were drafted based on the potential impact of OHK items on OA children's oral health and related attitudes (Green & Kreuter, 2005). These were attitudes toward tooth brushing, attitudes towards consumption of sugary foods and drinks, and attitudes towards betel nut intake. OHB items were drafted based on the dental literature, and in relation to the drafted OHK and OHA items. The OHB items consisted of questions on frequencies of tooth brushing, sugary foods and drinks intake, mouth rinsing after meal, smoking and betel nut chewing.

Next, the items were arranged into a questionnaire and organized into 3 sections, i.e. OHK, OHA and OHB sections which consisted of 12, 13 and 9 items, respectively. OHK and OHA items used a 5-point rating scale, i.e. strongly agree (scale 1), agree (scale 2), unsure (scale 3), disagree (scale 4) to strongly disagree (scale 5). OHB items used an 8 point rating score, i.e. more than twice a day (score 1), twice a day (score 2), once daily (score 3), 2-3 times a week (score 4), once a week (score 5), once a month (score 6), once in 2-12 months (score 7) and never (score 8). Participant's information sheet, consent form, information on the purpose of the research, answering techniques and instructions were added.

3.5.1 (b) Content Validation of Draft Questionnaire

Validity of content refers to the sufficiency of the measure in evaluating the domain of interest; whether the items conformed to current scientific knowledge, relevant to the topic and the concepts were culturally relevant and acceptable to the society (Watt et al., 2006). Apart from content validation, the applicability, efficiency, clarity and sensitivity of the measure were also assessed (Watt et al., 2006). The content validation was done by a lecturer from Department of Community Oral Health and Clinical Prevention and a lecturer from Department of Restorative Dentistry, Faculty of Dentistry, University of Malaya. Both were proficient in English and Malay languages. After the

content validity assessment, separate discussions with the 2 reviewers was held before the question was finalized. The final questionnaire consisted of 34 items, i.e. 12 OHK items, 13 OHA items and 9 OHB items. All the items were deemed relevant by the lecturers and sufficiently addresses the objectives of the study.

3.5.1 (c) Translation of Draft Questionnaire from English into Malay

Two independent translators who were proficient in Malay and English languages and experts in dental public health were involved in the translation process. Then, a meeting with the translators was held to discuss the translated questionnaire focusing on the concept between the English questionnaire and its Malay version. The concept of equality refers to whether answers to the same questions reflect the same concept. Item equivalence refers to whether equivalence of meaning of the items is maintained throughout the translation (Herdman et al., 1997). Following the meeting, the translators agreed on a single consensus Malay translation.

The draft Malay version of the questionnaire was tested for face validation on a non-random sample of 20, 11-12 year old OA schoolchildren from a different primary school that was not included in the actual study. Face validation was facilitated by the researcher (RS) and assisted by the classroom teacher. Schoolchildren were gathered in the classroom. Instruction was given on how to participate in the face validation process. The children were asked to answer the questionnaire. The time taken to complete the questionnaire was recorded. At the end of the session, a discussion on the purpose, content, wording, instruction, answer options and the general structure of the questionnaire was carried out with the schoolchildren. The OA children were asked if they had any questions regarding the questionnaire. Following the discussion, minor changes were made to the questionnaire accordingly.

Next, back translation of the draft Malay questionnaire into English was carried out by an expert who was proficient in English and Malay languages. The output from the back translation of the draft Malay questionnaire and the validated initial English version was compared and discussed. After all parties reached an agreement, minor modifications were made to the draft Malay questionnaire before it was finalized.

3.5.1 (d) Psychometric Validation of the Draft Malay Questionnaire

Two rural OA schools in Selangor were selected to test the draft Malay questionnaire in terms of test-retest reliability. Non-random sample of 20, 11-12 (standard 5 and 6) year-old schoolchildren were selected. All participants answered the questionnaire in a classroom setting. The questionnaire was re-administered to 17 students one week later. Apart from test-retest reliability analysis, other psychometric properties of the draft Malay questionnaire were tested by means of factor analysis and internal consistency analysis. These psychometric analyses were conducted on the actual sample of 227 OA children.

3.6 Results of the Pilot Study

3.6.1(a) Face and Content Validation Test Analysis

The questionnaire used in this research was a newly developed set of questionnaire. It was developed in English and translated into Malay. The two experts from different departments i.e. Department of Community Oral Health and Clinical Prevention and Department of Restorative Dentistry, Faculty of Dentistry, University of Malaya were proficient in both English and Malay languages. They had verified the content validity of the questionnaire based on the study objectives. The Malay version of the questionnaire had also been verified to have attained the conceptual and item equivalence with the original English version.

The face validation of the Malay version was verified by a group of OA schoolchildren who were not involved in the actual study. The school children who participated in the face validation test were students from OA primary schools in Selangor. The students answered the questionnaire in a classroom setting. The whole questionnaire took 10 - 12 minutes to answer. Each of the words in the questionnaire was discussed and verified to be easy to understand or was changed with similar word(s) according to the students' suggestion and their levels of understanding. The feasibility of the questionnaire administration under field condition was also verified.

3.6.1(b) Data Analyses of the Malay OHE Questionnaire

In the beginning, the 34 items of the draft Malay questionnaire were reverse scored where indicated. This enabled a student with good oral health knowledge, attitudes and behavior to score highly on the scale. Then, the 34 items were factor analyzed using principal component analysis (Field, 2009). The number of factors were limited to 3 factors as there were 3 intended factors or dimensions in the questionnaire. Varimax rotation method with Kaiser-Meyer-Olkin (KMO) test was used to calculate the sampling adequacy, and Barlett's test of Sphericity to test for sample adequacy and item correlation (Kaiser, 1974).

Following factor analysis, each emerging factor with its designated items was analyzed for internal and test-retest reliability. Internal reliability was assessed using Cronbach's alpha coefficient (Cronbach, 1951) and corrected item-total correlation. Test-retest reliability was assessed using intraclass correlation (ICC) using two-way random effects models and Kappa statistics (Field, 2009). Data were analyzed using SPSS version 20.

3.6.2 Result of psychometric analysis of the Malay OHE questionnaire

3.6.2(a) Results of factor analysis

Table 3.2 shows the results of factor analysis of the questionnaire. Factor analysis of the 34 items revealed 3 factors. The three factors were named Factor 1 = Oral health attitudes, Factor 2 = Oral health behaviour, and Factor 3 = Oral health knowledge. The names were based on the OHK, OHA and OHB sections of the questionnaire. This was despite 15 out of the 34 items had loaded unexpectedly into different factors. Most items which were originally developed for Factor 1 (OHA) had loaded into Factor 1 (7 items) and Factor 2 (6 items). Meanwhile, items originally developed for Factor 2 (OHB) had loaded into factor 2 (5 items), Factor 1 (3 items) and Factor 3 (1 item). Most items originally developed for Factors 3 (OHK) had loaded into Factors 1 (5 items) and 2 (2 items). Six items which were developed for Factor 1 (E2a, E2b, E2d, and E3a – E3c) had loaded into Factor 2 while 4 items which were developed for Factor 2 (D1, D2, D8, D9) had loaded into Factor 1 and 3. For Factor 3, 7 items had loaded into Factor 1 and 2 (C3, C6-C11). The 3 factors explained 25.3% of the total variance in the data. Item loading values ranged from 0.370-0.627 for Factor 1, 0.107-0.251 for Factor 2, and 0.532-0.731 for Factor 3. The Kaiser-Meyer Olkin (KMO) measure verified the sampling adequacy for the analysis, KMO = 0.63. (Kaiser, 1974). The Barlett's test of Sphericity was significant ($p<0.001$) indicated that correlations between items were sufficiently large.

Table 3.2: Factor analysis of the draft Malay OHE Questionnaire showing items loading into 3 factors

Dimension	Factor 1	Factor 2	Factor 3
Oral health attitude (13 items)	E1a – E1e (0.370 – 0.627) E2c (0.466) E3d (0.485)	E2a – E2b (0.521 – 0.531) E2d (0.557) E3a – E3c (0.632 – 0.698)	
Oral health behavior (9 items)	D1 – D2 (0.323 – 0.344) D8 (0.227)	D3 – D7 (0.107 - 251)	D9 (0.144)
Oral health knowledge (12 items)	C3 (0.457) C6 – C8 (0.333 – 0.481) C10 (0.481)	C9 (0.461) C11 (0.317)	C1-C2 (0.685 – 0.731) C4 – C5 (0.591 – 0.650) C12 (0.532)

Making sure the new set of questionnaire is qualified to use as a medium to access the oral health knowledge, attitude and behavior, these questionnaires must be undergoing some analysis to analyze the content and effectiveness. This analysis is to prove the quality on each question is valid to access the relevant aspect. Despite the various items of OHK, OHA and OHB fall into different domains, it was decided that items for each domain were analyzed together for interval consistency because the respective items had undergone content validation by experts. If the Cronbach alpha value was acceptable, these items will be grouped together in domain they were originally designed for.

3.6.2 (b) Internal and test-retest reliability analysis of OHK dimension

Table 3.3 shows the final analysis generating the best values for Cronbach's alpha, ICC and Kappa coefficient of the final 9out of 12 items of the OHK dimension. Three items from OHK domain were removed to increase the value of Cronbach's alpha, ICC and Kappa coefficient, respectively. The three items removed were "proper brushing technique can prevent gum disease", "hard toothbrush is better than soft toothbrush to clean the teeth", and "regular dental visit every six months". The corrected item-total

correlations for 8 out of 9 items were positive with values ranging from 0.025 to 0.466. However, one item had negative corrected item-total correlations value. Despite the negative value, it was decided to include the item in the questionnaire because the item was essential to assess knowledge of tooth brushing among the OA schoolchildren.

Five out of 9 items have corrected item-total correlations values above 0.3 and the rest between 0.02-0.3. The final Cronbach's alpha coefficient was 0.523 after 3 items was deleted. The ICC value was 0.804 indicating the sub-scale OHK has high test-retest reliability and the Kappa coefficient was 0.514. The Cronbach's alpha was the coefficient value to indicate the internal consistency of the subscale. Cronbach's alpha value indicates a high internal consistency. George and Mallery (2003) provide the following rules of thumb: " ≥.9 – Excellent, ≥.8 – Good, ≥ .7 – Acceptable, ≥ .6 – Questionable, ≥ .5 – Poor, and ≤ .5 – Unacceptable". The Intraclass Correlation Coefficient (ICC) is a measure of the reliability of measurements or ratings between two or more quantity measurement. The inter-rater agreement statistic (Kappa) to evaluate the agreement between two classifications on ordinal or nominal scales (Fleiss et al., 2013). Overall, although the OHK subscale has relatively low internal consistency, it was still valid to be treated as a scale and can still be used to assess OHK scores. Furthermore, the 9 items were highly relevant to assess OHK content among the OA children which include essential OHK on sugars, caries, gum disease, fluoride toothpaste, tooth brushing frequencies and essential knowledge on smoking and betel nut chewing.

Table 3.3: The Cronbach's alpha, Intraclass Correlation coefficient and Kappa coefficient of the 9 items of OHK dimension

No	Item / question	Corrected item – Total Correlation	Cronbach's Alpha if item deleted
1	Consuming a lot of sweet food causes tooth decay.	0.466	0.401
2	A hole in the tooth is a sign of tooth decay.	0.406	0.442
3	Reducing sugary foods can reduce the risk of tooth decay.	0.213	0.500
4	Dental plaque can cause gum disease	0.302	0.472
5	Bleeding gums is a sign of gum disease.	0.464	0.415
6	Brushing with fluoride toothpaste can prevent tooth decay.	0.122	0.527
7	We are encouraged to brush our teeth twice a day.	-0.139	0.604
8	The habit of chewing betel nut is good practice for dental health	0.025	0.558
9	Smoking is bad for the health of gums.	0.308	0.469
	Cronbach's alpha = 0.523 **Intraclass Correlation coefficient = 0.804** **Kappa coefficient = 0.514**		

3.6.2 (c) Internal and test-retest reliability analysis of OHA dimension

Table 3.4 shows the Cronbach's alpha, ICC and Kappa coefficient of the 13 items of OHA dimension. The corrected item-total correlation for all 13 items were positive with values ranging from 0.126 to 0.465. Six items have corrected item-total correlation values above 0.3, 4 items between 0.2 – 0.3, and 3 items below 0.2. The Cronbach's alpha coefficient was 0.675 and the value did not increase significantly if and of the items was deleted. The ICC was 0.629 and the Kappa coefficient was 0.393.

Table 3.4: The Cronbach's alpha coefficient, Intraclass correlation coefficient and Kappa coefficient of the 13 items of OHA dimension

No.	Item / Question	Corrected item – Total Correction	Cronbach's Alpha if item deleted
	Brushing teeth is very important to me because:		
1	It makes my breath feeling fresh.	0.126	0.679
2	It makes my confidence grow.	0.158	0.677
3	The mouth is one of the body areas that needs cleaning.	0.179	0.673
4	It prevents my teeth from becoming yellow.	0.283	0.660
5	It prevents my teeth from decay.	0.363	0.648
	Cronbach's alpha for items 1-5 = 0.527		
	Sweet food / drinks:		
6	Is good for my teeth.	0.357	0.649
7	Is my favorite food.	0.218	0.669
8	Is a habit that needs to be reduced	0.276	0.661
9	Should be sold at the school canteen.	0.241	0.667
	Cronbach's alpha for items 6-9 = 0.354		
	Chewing betel nuts:		
10	Makes my teeth look beautiful.	0.395	0.642
11	Adds freshness to my mouth.	0.465	0.632
12	Will not harm my mouth.	0.422	0.638
13	Is a habit that should be avoided	0.384	0.644
	Cronbach's alpha for items 10-13 = 0.683		
	Cronbach's alpha = 0.675		
	Intraclass Correlation coefficient = 0.629		
	Kappa coefficient = 0.393		

3.6.2 (d) Oral Health Behavior (OHB) items

OHB domain consists of 9 items as in Table 3.5. The items were related to frequency of tooth brushing, usage of fluorite toothpaste while brushing, frequency of cleaning teeth using tools other than a toothbrush, tobacco smoking and betel nut chewing habit, frequency of consuming sugary foods and drinks, rinsing mouth after eating and dental visit. These items were analyzed for internal and test-retest reliability. However, the results showed very low Cronbach's alpha, ICC and Kappa coefficient values. As the items were essential items for assessing OHB, it was decided that all the items were included in the final questionnaire. Instead of composite score, the items would be analyzed independently item by item.

Table 3.5: Oral Health Behavior (OHB) items

Oral Health Behavior items
1. How often do you brush your teeth?
2. How often do you use toothpaste when brushing?
3. How often do you use anything other than a toothbrush to clean teeth?
4. How often do you smoke cigarettes?
5. How often do you chew betel?
6. How often do you drink sugary drinks / carbonated drink?
7. How often do you eat sugary foods such as cakes / candy / chocolate / ice cream?
8. How often do you rinse your mouth with water after eating?
9. How often do you see a dentist?

3.7 Questionnaire Finalization

The final questionnaire consisted of 5 sections; 6 items in student's personal details, 7 items in socio-demographics of parents, 9 items of Oral Health Knowledge (OHK), 9 items of Oral Health Behavior (OHB) and 13 items of Oral Health Attitude (OHA). The final questionnaire comprised 44 items in total. The items of the final questionnaire were presented in Table 3.6 (Appendix F).

Table 3.6: Items of the final OHE Questionnaire

Section A:	**Student information**
1	Name
2	Age
3	Gender
4	Tribe
5	School's name
6	Standard
Section B:	**Socio-demographic**
1	Father's age
2	Mother's age
3	Father's occupation
4	Mother's occupation
5	Father's education levels
6	Mother's education levels
7	Total family income
Section C	**Oral Health Knowledge items** (5 answer options) **(1-Strongly agree, 2-Agree, 3-Unsure, 4-Disagree, 5-Strongly disagree)**
1	Consuming a lot of sweet food causes tooth decay.
2	A hole in the tooth is a sign of tooth decay.
3	Reducing sugary foods can reduce the risk of tooth decay.
4	Dental plaque can cause gum disease
5	Bleeding gums is a sign of gum disease.
6	Brushing with fluoride toothpaste can prevent tooth decay.
7	We are encouraged to brush our teeth twice a day.
8	The habit of chewing betel nut is good practice for dental health
9	Smoking is bad for the health of gums.
Section D	**Oral Health Behavior items** (8 answer options) **(1-More than twice a day 2-Twice a day, 3-Once daily, 4-2-3 times a week, 5-Once a week, 6-Once a month, 7-Once in 2-12 months and 8-Never)**
1	How often do you brush your teeth?
2	How often do you use toothpaste when brushing?

	3	How often do you use anything other than a toothbrush to clean teeth?
	4	How often do you smoke cigarettes?
	5	How often do you chew betel nut?
	6	How often do you drink sugary drinks / carbonated drink?
	7	How often do you eat sugary foods such as cakes / candy / chocolate / ice cream?
	8	How often do you rinse your mouth with water after eating?
	9	How often do you see a dentist?
Section E	**Oral Health Attitude Items** (5 answer options) **(1-Strongly agree, 2-Agree, 3-Unsure, 4-Disagree, 5-Strongly disagree)**	
	Tooth brushing:	
	1	It makes my breath feeling fresh.
	2	It makes my confidence grow.
	3	The mouth is one of the body areas that needs cleaning.
	4	It prevents my teeth from becoming yellow.
	5	It prevents my teeth from decay.
	Sweet food/beverages:	
	6	It is good for my teeth.
	7	It is my favorite food.
	8	It is a habit that needs to be reduced.
	9	It should be sold at the school canteen.
	Chewing betel nuts:	
	10	Makes my teeth look beautiful.
	11	Adding freshness to my mouth.
	12	Will not harm my mouth.
	13	It is a habit that should be avoided.

3.8 Conduct of study

In this research, organized and detailed conduct of study plan was essential so that this study followed the scheduled timetable. There were many parties participated directly or indirectly in this study because this research involved schools and pupils. An ethical approval was granted and at the same time, the application process in getting the approval from the relevant authority departments were submitted. The relevant authorities were Ministry of Education (MOE), State Education Department of Pahang, District Education Department of Cameron Highland, and designated schools. Consent from parents was sought before the questionnaire was distributed.

3.8.1 Ethics approval

A study protocol was presented and ethics approval was granted by the Medical Ethics Committee, Faculty of Dentistry, and University of Malaya. The ethics number was **DF DP 1206/0078 (L).**

3.8.2 Jabatan Kemajuan Orang Asli (JAKOA)

Jabatan Kemajuan Orang Asli (JAKOA), previously known as Jabatan Hal Ehwal Orang Asli (JHEOA), was the first authority from which permission to conduct the research among OA populations was obtained. JAKOA plays an important role in managing the welfare of OA communities such as boosting their income, removing them from the poverty threshold, improving the infrastructure coverage and social amenities, and empowering the OA people through comprehensive development of OA human capital. JAKOA also plays a role in increasing the standard of health of OA people towards prosperous living, conserving and upholding traditional knowledge and OA heritage, and improving the effectiveness of the organization by adopting and embracing good governance (Appendix A).

3.8.3 Ministry of Education (MOE)

The Ministry of Education (MOE) is a department and an agency responsible for the management of education in Malaysia including primary and secondary schools, polytechnics, colleges, private and government universities. MOE is the highest education department in Malaysia and is responsible for the development of a world-class quality education system for developing the individual's potential and fulfill the aspirations of the country. Thus, to start any project or research involving educational institutions such as schools and students, the completed application must go through the Ministry of Education. Application process was submitted, detailed information about the background of the research was disclosed and explained. The official permission letter was issued right after the application was approved (Appendix B).

3.8.4 State Education Department of Pahang

The application to conduct research must be submitted to the designated state where the research was conducted. State Education Department of Pahang issued permission letter to conduct the research in CH. The official permission letter was issued right after the application was approved (Appendix C).

3.8.5 District Education Department of Cameron Highland

Official authorization letters from MOE and State Education Department of Pahang were submitted when submitting the application letter to the District Education Department of CH. The district education department was responsible in the management of schools in the area in terms of academic and co-curriculum activities. The application took about a month to be approved. The official permission letter was issued right after the application was approved (Appendix D).

3.8.6 Permission from Designated Schools

Next, permission to conduct the research at the designated schools was sought from the school headmasters. In the application process, permission letters from the MOE, State Education Department of Pahang and District Education Department of CH were included. A short description of the locations and the selection of the research sample of OA communities was included. The duration of the research was 1 month. This research involved 4 OA primary schools in CH. The schools involved were Sekolah Kebangsaan (Asli) Telanok, Sekolah Kebangsaan (Asli) Terisu, Sekolah Kebangsaan (Asli) Menson and Sekolah Kebangsaan (Asli) Lemoi.

3.8.7 Consent from the parents

Consent from parents was obtained before data collection began. This study was informed to parents through the school management team prior to data collection. The parent was required to sign the consent form before data collection began. Since illiteracy was common among OA population, the signature from the head master was taken as a proxy to represent all parents whose children were involved in the study (Appendix E).

3.8.8 Data Collection

Data collection involved one school at a time and it took about a week to complete data collection of the 4 schools. S.K Terisu was the first school visited which was located about an hour drive from Tanah Rata, CH. Discussion with the school's head master and the co-curricular teacher led to the students gathered in their respective class. There were only one class for standard 5 and one for standard 6, with 24 and 20 students, respectively. Data collection took about an hour followed by an oral health education.

Next, data collection involved another 2 schools, i.e. SK (Asli) Menson and SK (Asli) Telanok. The time duration to assemble the students and completed the questionnaire

was about 55 minutes to an hour. Oral health education was delivered to the students after the questionnaire session which took another 40 minutes to complete. The OHE was conducted once the data collection completed to OA children as a basic understanding and exposure because when the OA school children were asked randomly about the tooth brushing technique, none of them could shows the proper technique.

Sekolah Kebangsaan (Asli) Lemoi was the last school visited. Arrangement was made with the school's head master who was willing to lend the school's 4-wheel drive vehicle to take the researcher to the school as it was located quite far in remote area. Similar to students in previous schools, students in SK (Asli) Lemoi took about 50 minutes to complete the questionnaire followed by oral health education that took 30-40 minutes to complete.

The oral health education included proper tooth brushing techniques, information about dental plaque and the effects of high sugary food and drinks on dental health. All students were informed on the effects of smoking and betel nut chewing on oral health since more than 80% of the students confessed that they had betel nut chewing habit when asked in the classroom. Students were also advised to brush teeth at least twice a day and rinse mouth after meals.

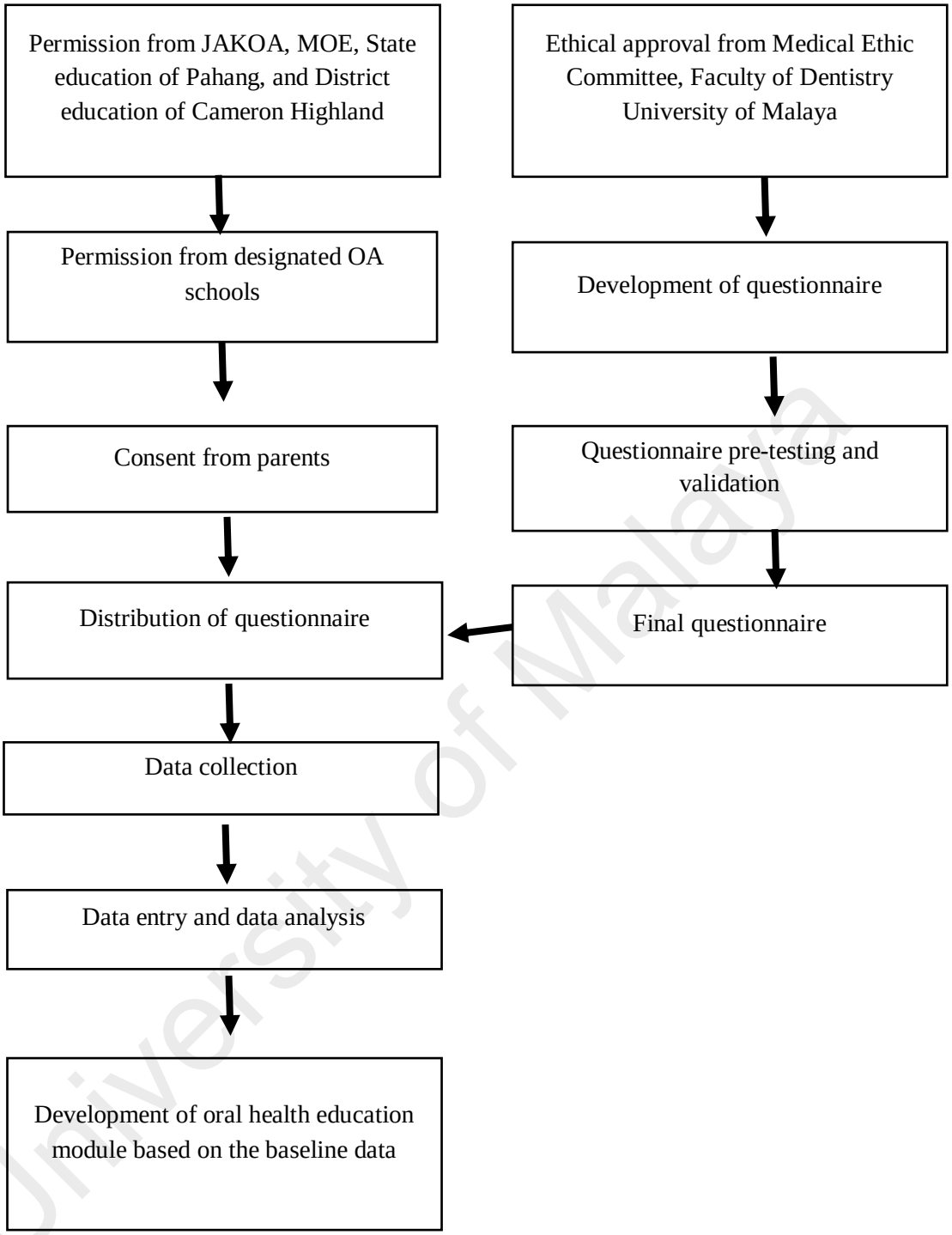

Figure 3.5: Flow chart of the conduct of the study

3.9 Data analyses

In this present study, multiple analyses were carried out in order to assess the levels of OHK, OHA and OHB of the OA children. Data were analyzed using SPSS software version 20. The univariate analyses such as One Way Anova and Independent sample T-test were used to find the significant relationship between socio-demographic background and OHK and OHA subscales. The Simple Linear Regression and Multiple Linear Regression analyses were conducted to analyze the relationship between the socio-demographic background and OHA items, bivariate and multivariate analyses were conducted using Stata software version 11.

3.9.1 Statistical Analysis of OA children's oral health knowledge, attitudes and behavior

The questionnaire comprised 5 sections, i.e. the socio-demographic information of child and parents, OHK, OHA and OHB.

3.9.1(a) Statistical analysis for OHK items

OHK section consisted of 9 items. Each item used a 5-point rating scale, i.e. strongly agree (score 1), agree (score 2), unsure (score 3), disagree (score 4) and strongly disagree (score 5). The 9 OHK items consisted of a mixture of 1 negative and 8 positive statements. For the 8 positive items, the answers were reverse-scored to strongly agree (score 5), agree (score 4), unsure (score 3), disagree (score 2) to strongly disagree (score 1) so that a high score would indicate good knowledge on the item and vice versa. As OHK is a subscale, total score was obtained by adding up the score of each item. High total score would indicate higher level of OHK and vice versa. The items that were reverse-scored were items number 1-7 and 9.

In the statistical analysis for proportion of OA children with good, moderate and poor score on the OHK items, the 5-point rating scale was re-categoried into 3-point rating scale. The strongly agree (score 5) was recoded as good score and agree (score 4) was recorded as moderate score. Meanwhile, unsure (score 3), disagree (score 2) and strongly disagree (score 1) were recoded as poor score.

To determine the levels of OHK, good level was indicated with the highest total scores between 37 – 45. Meanwhile total scores between 28 – 36 was graded as moderate level, and total scores between 5 – 27 was graded as poor level of OHK. The univariate analysis between OHK scores and socio-demographic background was conducted to see the association.

3.9.1(b) Statistical analysis for OHA items

OHA section consisted of 13 items. Each item used a 5-point rating scale, i.e. strongly agree (score 1), agree (score 2), unsure (score 3), disagree (score 4) and strongly disagree (score 5). The 13 OHA items consisted of a mixture of 6 negative and 7 positive statements. For the 7 positive items, the answers were reverse-scored to strongly agree (score 5), agree (score 4), unsure (score 3), disagree (score 2) to strongly disagree (score 1) so that a high score would indicate good attitude on the item and vice versa. The items that were reverse scored were items 1-5, 8 and 13.

First analysis was to find the proportion of OA children with good, moderate and poor score of OHA, the 5-point rating scale was re-categorised into 3-categories. The strongly agree (score 5) will be recoded as good score, agree (score 4) was recorded as moderate score. Meanwhile, unsure (score 3), disagree (score 2) and strongly disagree (score 1) were recorded as a poor score. To determine the levels of OHA, good level was indicated by the highest total scores between 53 – 65. Meanwhile total scores between 40

– 52 were regarded as achieving moderate level and total scores between 5 – 39 indicated poor level of OHA.

Next, the univariate analysis between OHA scores and socio-demographic background were analyzed. There were 7 variables in socio-demography and these variables need to be recorded before further analysis was conducted. According to father and mother's education levels, there were 5 answer options, i.e. 1-no formal education, 2-primary school, 3-secondary school, 4-STPM/Diploma and 5-University. These variables were re-categorized into 3, i.e. 1- no formal education, 2-up to primary school and 3-secondary school or higher. Similar to father and mother's education levels, the answer options were re-categorized from 6 into 3, i.e. 1-Government/private (Fixed income), 2-Farmer/Laborers/self-employed and 3-Not working. Total family income also was recoded into 3 categories; 1-Up to RM500, 2-RM 501 – RM 1000 and 3-RM 1001 and above. Simple and multiple linear regression were conducted to assess the relationship of OHA total scores.

3.9.1(c) Statistical analysis for OHB items

The questions on OHB were primarily based on the frequencies of tooth brushing, fluoride tooth paste usage while brushing, and frequencies of cleaning teeth using other tools than a toothbrush. There were also questions on oral health habits such as frequencies of smoking and betel nut chewing. The assessment on frequencies of consumption of sugary foods and drinks were also made. Rinsing habit was also assessed and the final item was frequency of dentist visit.

The OHB consisted of 9 items in total. The answer options were based on an 8 point rating score; more than twice a day (score 1), twice a day (score 2), once a day (score 3), 2-3 times a week (score 4), once a week (score 5), once a month (score 6), once a year (score 7) and the final score was never (score 8). These items were not developed

as a scale since the internal consistency analysis showed very low value of Cronbach's alpha, ICC and Kappa coefficient. Thus, it was decided that these items would be analyzed based on each item.

In order to assess the OHB levels, the frequency and percentage of each item were calculated individually. Thus, 5 items were selected to be included to determine a good, moderate and poor score. However, this five potential high risk habits will not be recorded as a scale, but to represent the levels of oral health behavior among the target group on each selected behavior. This behavior was selected because this was the potential high risk habits that can lead to oral health disease among the OA children.

To divide the score according to their category, the answer was collapsed from 8 to 3 categories. For tooth brushing, use of toothpaste and rinsing, good score has included the answer from 'more than 2 times a day' and '2 times a day'. The answer option 'once a day' will be categorized into moderate score, meanwhile for those who answered '2 – 3 times a week' until 'never' will be categorized as poor score. However, for oral high risk habits such as smoking and chewing betel nut behavior, for those who answered 'never' will fall under good score and for those who answered 'more than 2 times a day' until 'once in 2 – 12 month' will be included in the poor score. There were no moderate category.

Table 3.7: Categorization of item and total score of the OHK, OHA and OHB sub-scales into the analysis

Sub-scale	Item	Analysis	Score	Category of score	Range of total score
OHK	All 9 items	Percentage of agree, unsure and disagree	4-5 (Agree - strongly agree)	Agree	-
			3 (Unsure)	Unsure	-
			1-2(Strongly disagree- disagree)	Disagree	-
		Proportion of good, moderate and poor score	5 (Strongly agree)	Good score	-
			4 (Agree)	Moderate score	-
			1-3 (Strongly disagree – unsure)	Poor score	-
		Level of good, moderate and poor	5 (Strongly agree)	Good level	37 – 45
			4 (Agree)	Moderate level	28 – 36
			1-3(Strongly disagree – unsure)	Poor level	0 – 27
OHA	All 13 items	Percentage of agree, unsure and disagree	4-5 (Agree to strongly agree)	Agree	
			3 (unsure)	Unsure	

			1-2(Strongly disagree- disagree)	Disagree	
		Proportion of good, moderate and poor score	5 (Strongly agree)	Good score	
			4 (Agree)	Moderate score	
			1-3(Strongly disagree – unsure)	Poor score	
		Level of good, moderate and poor	5 (Strongly agree)	Good level	53 – 65
			4 (Agree)	Moderate level	40 – 52
			1-3(Strongly disagree – unsure)	Poor level	0 – 39
OHB[a]	5 Selected behavior	1-2[b] & 5[b]	7-8(twice/day-more than twice/day)	Good score	-
			5 (once/day)	Moderate score	-
			1-4(never – 2-3 times/week)	Poor score	-
		3-4[c]	1 (never)	Good score	-
			2-8 (once in 2-12 month – more than twice/day	Poor score	-

[a]OHB items: 1=Tooth brushing; 2=Used of fluoride toothpaste; 3=Smoking; 4=Betel nut chewing; 5=Mouth rinsing after meal
[b]The cut off points are based on literature for tooth brushing frequency and fluoride use (Davies et al. (2003); The American Dental Association (ADA), 2012), soft drinks and sweets intake (Watt et al., 2003).
[c]The effect of betel nut based on study by Trivedy et al. (2002). The oral health consequences of chewing areca nut. Addiction Biology, 7: 115-25

CHAPTER 4: RESULT

4.1 Response rate of the sample

Overall, 227, 11-12 year old OA children from 4 OA primary schools in Cameron Highland responded. The response rate was 91.2% (Table 4.1).

Table 4.1: **Respond rate of the study (n=227)**

		No. of subjects
(a)	No of OA children	249
(b)	Number of respondents	227
(c)	Response rate	227/249 x 100% = **91.2%**

Figure 4.1 shows the demographic information of the OA children. This research included an approximately equal number of males and females, i.e. 110 (48.5%) were males and the rest were females (51.5%). More children were in Year 5 (n=151, 66.5%) compared to those in Year 6 (33.5%) (Figure 4.1). In terms of father's occupation, more children had fathers who worked as farmers (27.3%), followed by private sector workers (26.4%), self-employed (18.1%), government servants (7%), and labourers (10.1%). Fewer had fathers who were unemployed (7.9%). In terms of mother's occupation, more children reported that their mothers were housewives (59.5%), followed by farmers (24.7%), self-employed (10.1%) and private sector workers (2.6%).

In terms of father's education, more OA fathers had education up to secondary school level (42.7%), followed by primary school level (17.6%). Less than one-third (28.6%) of fathers had no formal education. Only a few children had fathers with education up to STPM/Diploma and university level, i.e. 2 (0.9%) and 1 (0.4%), respectively. When the children were asked about their mother's education level, more children had mothers with education up to secondary school level (36.6%), followed by primary school level (24.7%), STPM/Diploma (0.9%) and university level (0.4%). More than one-quarter of OA children had mothers with no formal education (28.6%).

In terms of family income, more children (41.0%) were unaware of their family's total income. Fewer children (26.4%) reported total family income below RM500, followed by RM501 – RM1000 (18.9%), RM1001 – RM2000 (n=24, 10.6%), and RM2001 and above (3.1%). The demographic information of the OA children presented in the Table 4.2.

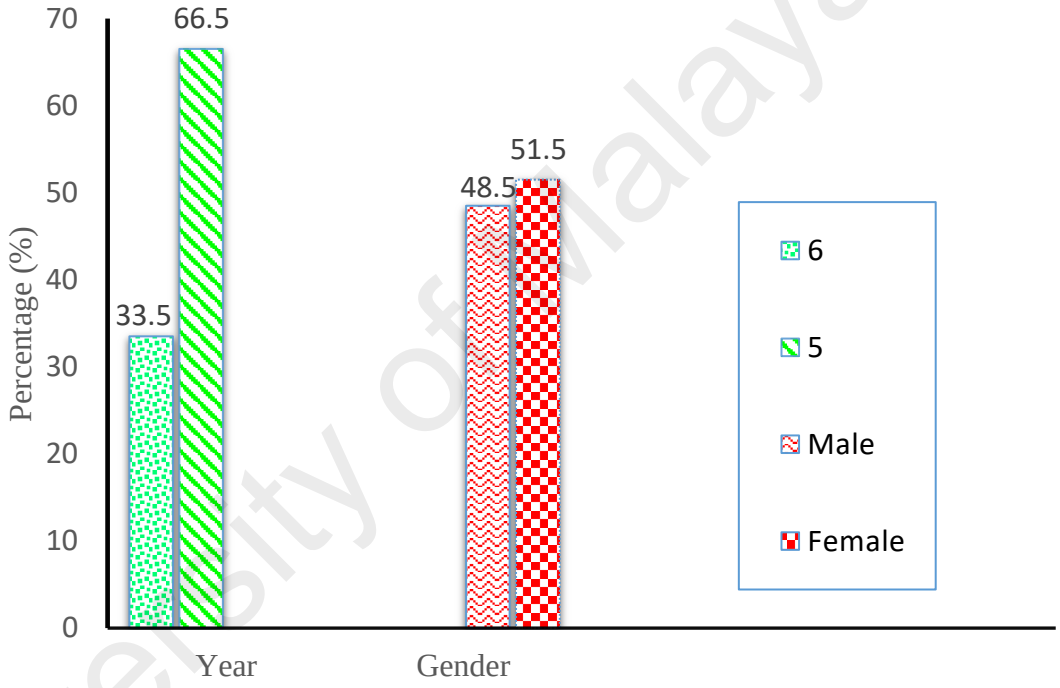

Figure 4.1: The percentage of sample according to year of study and gender (n=227)

Table 4.2: Demographic background of the sample (N=227)

Variable	n=227	%
Gender		
Male	110	48.5
Female	117	51.5
Standard		
5	151	66.5
6	76	33.5
***Father's Occupation**		
Government servant	16	7.0
Private sector worker	60	26.4
Farmer	62	27.3
Labourer	23	10.1
Self-employed	41	18.1
Unemployed	18	7.9
No record	7	3.1
***Mother's Occupation**		
Government servant	4	1.8
Private sector worker	6	2.6
Farmer	56	24.7
Labourer	1	0.4
Self-employed	23	10.1
Housewife	135	59.5
No record	2	0.9
***Father's Education Background**		
No formal education	65	28.6
Primary school	40	17.6
Secondary school	97	42.7
STPM/Diploma	2	0.9
University	1	0.4
No record	22	9.7
***Mother's Education Background**		
No formal education	65	28.6
Primary school	56	24.7
Secondary school	83	36.6
STPM/Diploma	2	0.9
University	1	0.4
No record	20	8.8
***Household family income**		
RM 500 and below	60	26.4
RM 501 – RM1000	43	18.9
RM1001 – RM 2000	24	10.6
RM2001 and above	7	3.1
No record	93	41.0

*The total number does not equal to n=227 due to missing data

4.2 Oral Health Knowledge (OHK) of the OA Children

4.2.1 Proportions of OA children with good, moderate and poor scores on OHK items

Table 4.3 shows proportions of OA schoolchildren with good, moderate and poor scores on OHK items. Overall, the majority of OA children had poor score on 7 out of 9 OHK items, representing 77.8% of the OHK items.

Items where more OA children had poor score were items 1= consuming a lot of sweet foods cause tooth decay (65.6%), 2= A hole in the tooth is a sign of tooth decay (74.0%), 3= reducing sugary foods can reduce the risk of tooth decay(53.7%), 4= Dental plaque can cause gum disease (76.2%), 5= Bleeding gums is a sign of gum disease (68.7%), 8= The habit of chewing betel nut is good practice for dental health (55.1%) and 9= Smoking is bad for the health of gums (76.7%). The proportions of OA children with poor score on OHK items were between 53.7% - 76.7% in the 7 items. Items where more OA children had moderate score were items 7= we are encouraged to brush out teeth twice a day (40.5%).

Meanwhile, items where more OA children had equal proportions of good, moderate and poor scores were items 6= brushing with fluoride toothpaste can prevent tooth decay with 33.5%, 33.5% and 33.0% respectively.

Table 4.3: Proportions of OA children with good, moderate and poor scores on OHK items (n = 227)

No	Item	Good score n(%)	Moderate score n(%)	Poor score n(%)
1	Consuming a lot of sweet food causes tooth decay.	55 (24.2)	23 (10.1)	**149 (65.6)**
2	A hole in the tooth is a sign of tooth decay.	22 (9.7)	37 (16.3)	**168 (74.0)**
3	Reducing sugary foods can reduce the risk of tooth decay.	51 (22.5)	54 (23.8)	**122 (53.7)**
4	Dental plaque can cause gum disease	24 (10.6)	30 (13.2)	**173 (76.2)**
5	Bleeding gums is a sign of gum disease.	26 (11.5)	45 (19.8)	**156 (68.7)**
6	Brushing with fluoride toothpaste can prevent tooth decay.	76 (33.5)	76 (33.5)	75 (33.0)
7	We are encouraged to brush our teeth twice a day.	60 (26.4)	92 (40.5)	75 (33.0)
8	The habit of chewing betel nut is good practice for dental health	32 (14.1)	70 (30.8)	**125 (55.1)**
9	Smoking is bad for the health of gums.	20 (8.8)	33 (14.5)	**174 (76.7)**

4.2.2 Item and Total Score of OHK subscale among the OA children

Table 4.4 shows mean item and total scores of OHK subscale of the OA children. There were 5 rating scores; strongly agree (score 5), agree (score 4), unsure (score 3), disagree (score 2) and strongly disagree (score 1). The results show that the range of OHK scores for the 9 items were between 2.5 – 3.8 indicating the OA children provided answers between 'disagree' to 'agree' for all the OHK items. Seven items had mean scores closer to 3 (unsure) while 2 items (item 6 and 7) had mean scores closer to 4 (agree). Mean total score was 27.80.

Table 4.4: Item and total scores of OHK items of the OA children (n = 227)

No	Item	Item score Mean (SD)
1	Consuming a lot of sweet foods causes tooth decay.	3.0 (1.4)
2	A hole in the tooth is a sign of tooth decay.	2.8 (1.1)
3	Reducing sugary foods can reduce the risk of tooth decay.	3.3 (1.3)
4	Dental plaque can cause gum disease	2.7 (1.2)
5	Bleeding gums is a sign of gum disease.	2.9 (1.2)
6	Brushing with fluoride toothpaste can prevent tooth decay.	3.8 (1.2)
7	We are encouraged to brush our teeth twice a day.	3.6 (1.2)
8	The habit of chewing betel nut is good practice for dental health	3.2 (1.2)
9	Smoking is bad for gums health.	2.5 (1.2)
	Mean total score	27.80

4.2.3 Levels of OHK among the OA Children

Table 4.5 shows levels of OHK among the OA children. More than half of OA children (51.1%) had poor level of OHK, meanwhile another 42.7% had moderate level of OHK. Only a minority of OA children (6.2%) had good level of OHK.

Table 4.5: Levels of OHK among OA children (n = 227)

	Good level (Sum score 37-45) n (%)	**Moderate level (Sum score 28-36) n (%)**	**Poor level (Sum score 5-27) n (%)**
Levels of Oral health knowledge	14 (6.2)	97 (42.7)	**116 (51.1)**

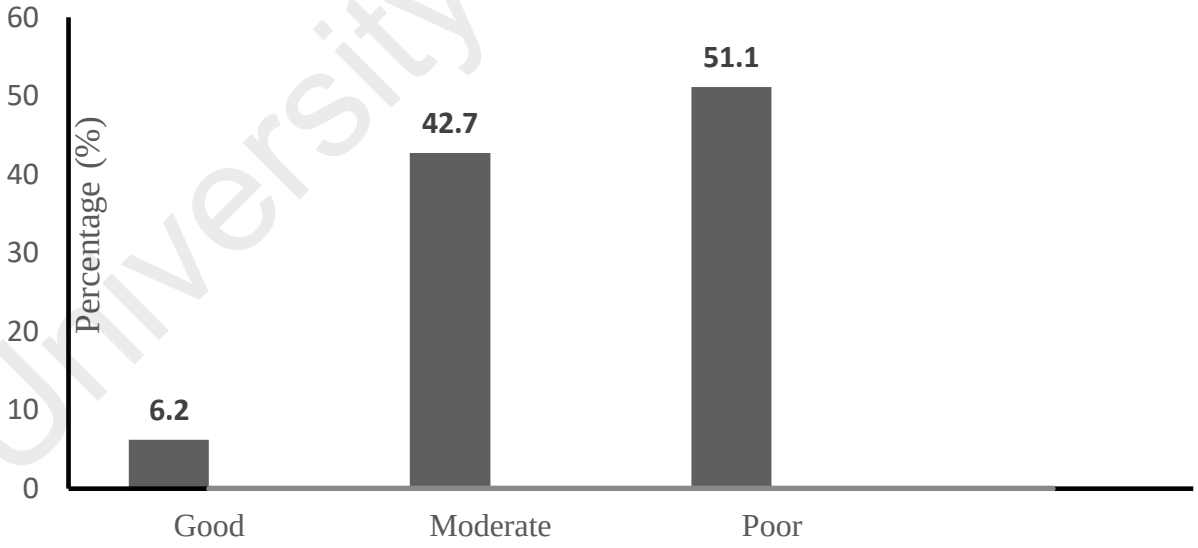

Figure 4.2: Levels of OHK among OA children (n=227)

4.2.4 The Univariate Analysis between OHK Score and Socio-demographic Characteristics and Selected Oral Health Behaviours of the OA Children

Table 4.6 shows univariate analyses between OHK scores and socio-demographic characteristic and selected oral health behaviours of the OA children. Parametric tests (One Way Anova and Independent Sample T-Test) were used for the initial statistical comparison of quantitative variables within group as the data have a normal distribution. It was found that there were no significant associations ($p>0.05$) between OHK scores and socio-demographic characteristics of the OA children. Since there were no significant differences in mean OHK sum scores by socio-demographic variables, further multivariate regression analysis was not conducted.

Table 4.6: Univariate analysis between OHK scores and demographic characteristics and selected oral health behaviours of the OA children (n = 227)

Demographic variable	n (%)	Mean (SD)	OHK score (Quartile)	p-value
Gender				
Male	110(48.5)	28.1 (5.1)	(24.0, 27.0, 31.3)	0.385[b]
Female	117(51.5)	27.5 (5.0)	(24.0, 27.0, 31.5)	
School				
SK Menson	61(26.9)	28.5 (4.9)	(25.0, 28.0, 32.0)	0.435[a]
SK Telanok	92(40.5)	27.2 (4.7)	(23.3, 27.0, 30.0)	
SK Terisu	44(19.4)	28.2 (5.7)	(22.3, 28.0, 32.8)	
SK Lemoi	30(13.2)	27.5 (5.6)	(23.8, 27.5, 31.0)	
Father's Education Level				
Secondary school or higher	100 (44.1)	28.5 (5.1)	(25.0, 28.0, 32.8)	0.084[a]
Primary school	40 (17.6)	27.4 (5.6)	(23.3, 27.0, 31.8)	
No formal education	65 (28.6)	26.8 (4.6)	(23.0, 27.0, 30.0)	
Mother's Education Level				
Secondary school or higher	86 (37.9)	28.7 (5.2)	(25.0, 28.0, 33.0)	0.114[a]
Primary school	56 (24.7)	27.6 (5.1)	(24.0, 28.0, 31.0)	
No formal education	65 (28.6)	27.0 (5.1)	(23.0, 27.0, 30.5)	
Father's employment status				
Government / private (Fixed income)	76 (33.5)	27.3 (4.6)	(24.0, 27.0, 30.0)	0.599[a]
Farmer/Labourer/Self employed	126 (55.5)	28.0 (5.4)	(24.0, 28.0, 32.0)	
Not working	18 (7.9)	27.4 (4.4)	(24.0, 27.0, 31.3)	
Mother's employment status				
Government / private (Fixed income)	10 (4.4)	28.3 (5.8)	(24.5, 27.0, 34.0)	0.945[a]
Farmer/Labourer/Self employed	80 (35.2)	27.9 (5.7)	(23.0, 26.5, 33.0)	
Not working	135 (59.5)	27.8 (4.6)	(25.0, 28.0, 31.0)	

Monthly household income				
Up to RM 500	60 (26.4)	28.1 (5.2)	(24.3, 27.0, 31.0)	0.889[a]
RM 501 – RM 1000	43 (18.9)	28.5 (5.3)	(25.0, 29.0, 33.0)	
RM1001 and above	31 (13.7)	28.5 (4.7)	(25.0, 28.0, 33.0)	
Tooth brushing				
≥ 2 times per day	190 (83.7)	27.9 (5.3)	(24.0, 27.0, 32.0)	0.842[a]
Once a day	36 (15.9)	27.4 (3.8)	(24.3, 28.0, 31.0)	
Irregular	1 (0.4)	27.0 (0)	(27.0, 27.0, 27.0)	
Use of Fluoride Toothpaste				
≥ 2 times per day	182 (80.2)	27.8 (5.3)	(24.0, 27.0, 32.0)	0.881[a]
Once a day	42 (18.5)	27.8 (4.0)	(24.8, 28.0, 31.0)	
Irregular	3 (1.3)	26.3 (4.0)	(22.0, 27.0)	
Sugary drinks intake				
≥ 2 times per day	122 (53.7)	27.8 (4.9)	(24.0, 27.0, 31.0)	0.688[a]
Once a day	80 (35.2)	27.6 (5.1)	(24.0, 27.0, 32.0)	
Irregular	25 (11.0)	28.6 (6.0)	(23.5, 28.0, 33.0)	
Sugary foods intake				
≥ 2 times per day	128 (56.4)	27.7 (5.0)	(23.3, 27.0, 31.0)	
Once a day	54 (23.8)	28.6 (5.6)	(24.0, 28.0, 33.0)	0.319[a]
Irregular	45 (19.8)	27.1 (4.4)	(23.5, 27.0, 31.0)	

*The total number does not equal to n=227 due to missing data
a = One way Anova
b = Independent sample T-test

4.3 Oral Health Attitudes (OHA) of the OA Children

4.3.1 Proportions of OA children with good, moderate and poor scores on OHA items

Table 4.7 shows proportions of OA children with good, moderate and poor scores on the OHA items. Overall, the majority of OA children had poor score in 6 out of 13 attitudes items (46.2%).

In terms of attitudes towards tooth brushing, overall, more OA children had moderate scores on item 1, 2 and 3. The first question was asking about the importance of tooth brushing in making the breath feeling fresh. More OA children (45.4%) had moderate score in this item. Only 36.6% of OA children had good score on this statement. Less than half of OA children (36.6%) had moderate score on item 2, i.e. Tooth brushing makes my confidence grow, while only 27.3% had good score on this item.

Almost half of OA children (48.9%) had moderate score on items 3, i.e. 'the mouth is one of the body areas that needs cleaning'. For the remaining two items, less than half of OA children (46.7%) had poor score on the statement 'tooth brushing prevents my teeth from becoming yellow. Only 24.7% and 28.6% of OA children had good score and moderate score, respectively. Meanwhile, more OA children (43.6%) had poor score on item 5, i.e. 'tooth brushing prevents my teeth from decay, while 27.3% and 29.1% had good score and moderate score, respectively.

In terms of OA children's attitudes towards sugary foods and drinks consumption, majority of OA children had poor scores on 3 out of 4 items, i.e. items 6, 7 and 9. When OA children were asked whether sweet food / drinks was good for teeth, majority (65.6%) scored poorly while only 22.0% had moderate score. Majority of OA children (64.8%) had poor score on the statement 'sugary foods / drinks is my favorite food', meanwhile 24.2% had moderate score. When the OA children were asked whether sweet foods/drinks

should be sold at school canteens, the majority of OA children (70.0%) had poor score. Only 19.4% and 10.6% had moderate score and good scores respectively.

Overall in term of attitudes towards chewing betel nuts, the majority of OA children had poor score on 3 out of 4 items, i.e. items 10, 11 and 13. Item 10 was asking whether chewing betel nuts makes teeth look beautiful. Majority of OA children (75.8%) had poor score on this item, only 10.6% and 13.7% of OA children had good and moderate score respectively. Item 11 was asking whether chewing betel nut adds freshness in the mouth. A large majority of OA children (79.7%) had poor score on this item while only 12.3% and 7.9% has moderate score and good score respectively. Other item was related to chewing betel nuts and the effect of this habit on the mouth. The majority of OA children (74.0%) had poor score in this item. Only 15.9% had moderate score while 10.1% had good score in this item. Next, the OA children were asked whether chewing betel nuts is a habit that should be avoided. More OA children (41.0%) had poor score on this statement. Only 28.2% and 30.8% and had good and moderate score, respectively.

Table 4.7: Proportions of OA schoolchildren with good, moderate and poor score on Oral Health Attitude (OHA) items (n = 227)

No	Item	Good score n (%)	Moderate score n(%)	Poor score n(%)
	Brushing teeth is very important to me because:			
1	It makes my breath feeling fresh.	83 (36.6)	103 (45.4)	41 (18.1)
2	It makes my confidence grow.	62 (27.3)	83 (36.6)	82 (36.1)
3	The mouth is one of the body areas that needs cleaning.	75 (33.0)	111 (48.9)	41 (18.1)
4	It prevents my teeth from becoming yellow.	56 (24.7)	65 (28.6)	106 (46.7)
5	It prevents my teeth from decay.	62 (27.3)	66 (29.1)	99 (43.6)
	Sweet foods / drinks:			
6	Is good for my teeth.	28 (12.3)	50 (22.0)	**149 (65.6)**
7	Is my favorite food.	25 (11.0)	55 (24.2)	**147 (64.8)**
8	Is a habit that needs to be reduced	53 (23.3)	84 (37.0)	90 (39.6)
9	Should be sold at the school canteen.	24 (10.6)	44 (19.4)	**159 (70.0)**
	Chewing betel nuts:			
10	Makes my teeth look beautiful.	24 (10.6)	31 (13.7)	**172 (75.8)**
11	Adds freshness to my mouth.	18 (7.9)	28 (12.3)	**181 (79.7)**
12	Will not harm my mouth.	23 (10.1)	36 (15.9)	**168 (74.0)**
13	Is a habit that should be avoided	64 (28.2)	70 (30.8)	93 (41.0)

4.3.2 Item and total scores of the OHA subscale among the OA children

Table 4.8 shows item and total scores of the OHA subscale. The mean scores ranged between 3.2 – 4.1 which indicate the OA children tended to be between 'unsure' to 'agree' with all the attitude items. Eight items (item 1 – 4, 8, 10, 13) had mean score closer to 4 (agree) while five items (item 6, 7, 11, 12) had mean score closer to 3 (unsure). Mean total score was 45.73.

Table 4.8: Item and total scores of OHA subscale of the OA school children (n = 227)

No	Item	Item score Mean (SD)
	Brushing teeth is very important to me because:	
1	It makes my breath feeling fresh.	4.1 (0.9)
2	It makes my confidence grow.	3.8 (1.1)
3	The mouth is one of the body areas that needs cleaning.	4.1 (0.9)
4	It prevents my teeth from becoming yellow.	3.5 (1.2)
5	It prevents my teeth from decay.	3.5 (1.2)
	Sweet food / drinks:	
6	Is good for my teeth.	3.2 (1.3)
7	Is my favorite food.	3.0 (1.1)
8	Is a habit that needs to be reduced	3.6 (1.1)
9	Should be sold at the school canteen.	3.2 (1.2)
	Chewing betel nuts:	
10	Makes my teeth look beautiful.	3.5 (1.3)
11	Adds freshness to my mouth.	3.4 (1.2)
12	Will not harm my mouth.	3.3 (1.2)
13	Is a habit that should be avoided	3.6 (1.2)
	Mean total score:	45.73
	Range of scores:	3.2 – 4.1

4.3.3 Levels of OHA among OA children

Table 4.9 shows levels of OHA of the OA children in Cameron Highland. Majority (61.7%) of OA children had moderate level of OHA. Proportions of OA children with good and poor levels of OHA were almost equal, i.e. 18.9% and 19.4%, respectively.

Table 4.9: Levels of OHA among the OA children (n = 227)

	Good level (53-65) n(%)	**Moderate level (40-52) n(%)**	**Poor level (0-39) n(%)**
Level of Oral health Attitude	43 (18.9%)	**140 (61.7)**	44 (19.4)

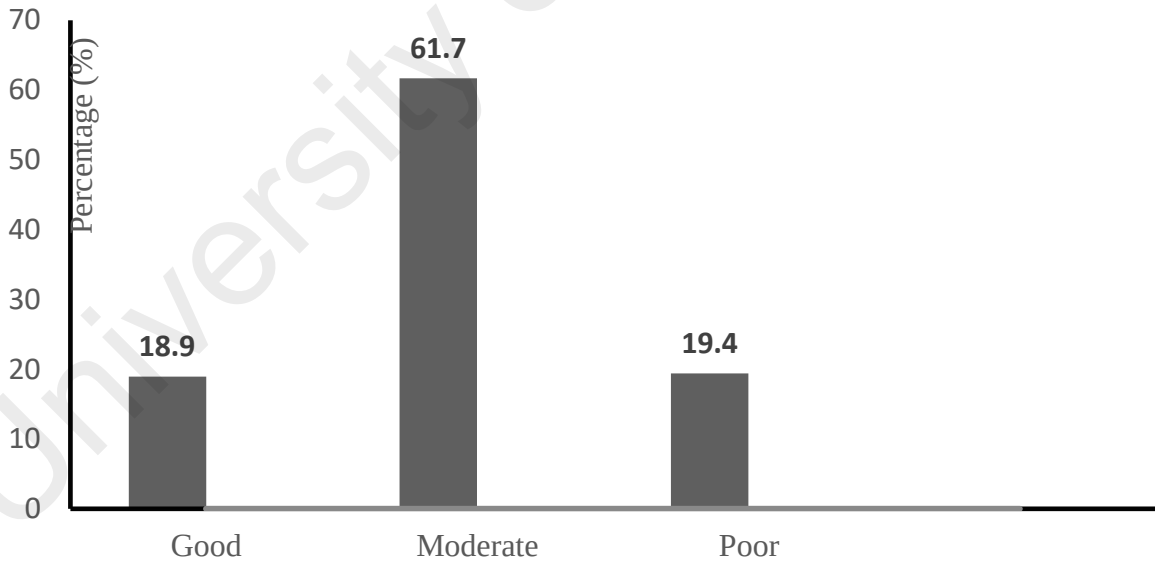

Figure 4.3: Levels of OHA among the OA children (n = 227)

4.3.4 Univariate analysis between OHA scores and categories of the demographic characteristics of the OA children

Univariate analyses between OHA total scores and categories of demographic characteristics are presented in Table 4.10. Parametric tests (One-Way Anova and Independent Sample T-Test) were used for the initial statistical comparison of quantitative variables within group as the data have a normal distribution. Based on the results presented in the table, four demographic variables had statistically significant differences in OHA mean total scores between its categories, respectively. The variables were gender, school, father's education level and mother's education level. Simple linear regression was run to assess the relationship between OHA scores and categories of these variables respectively.

Table 4.10: The Univariate analysis between OHA scores and categories of the demographic characteristics of the OA children (n = 227)

Demographic variables	n(%)	Mean (SD)	OHA score (Quartile)	p-value
Gender				
Male	110(48.5)	44.7 (6.0)	(41.0, 44.0, 49.0)	***0.030[b]**
Female	117(51.5)	46.7 (7.4)	(42.0, 46.0, 53.0)	
Schools				
SK Menson	61(26.9)	46.4 (7.0)	(41.5, 46.0, 52.0)	***0.047[a]**
SK Telanok	92(40.5)	45.7 (6.8)	(41.0, 45.0, 51.8)	
SK Terisu	44(19.4)	46.9 (6.3)	(43.0, 47.0, 49.8)	
SK Lemoi	30(13.2)	42.7 (6.5)	(39.0, 42.0, 45.3)	
***Father's Education Level**				
Secondary school or higher	100 (44.1)	46.9 (7.2)	(42.0, 47.0, 52.8)	***0.008[a]**
Primary school	40 (17.6)	46.2 (6.0)	(43.0, 46.0, 49.0)	
No formal education	65 (28.6)	43.6 (6.2)	(39.0, 43.0, 47.0)	
***Mother's Education Level**				
Secondary school or higher	86 (37.9)	47.2 (7.0)	(42.0, 47.0, 52.3)	***0.019[a]**
Primary school	56 (24.7)	45.4 (6.0)	(41.0, 45.0, 49.0)	
No formal education	65 (28.6)	44.1 (7.0)	(39.0, 43.0, 49.0)	
***Father's employment status**				
Government / private (Fixed income)	76 (33.5)	46.0 (6.0)	(42.0, 46.0, 50.8)	0.744[a]
Farmer/Laborers/Self employed	126 (55.5)	45.7 (7.1)	(41.0, 45.0, 50.0)	
Not working	18 (7.9)	44.6 (7.0)	(38.8, 42.5, 50.8)	
***Mother's employment status**				
Government / private (Fixed income)	10 (4.4)	47.4 (7.7)	(41.3, 47.5, 55.0)	0.740[a]
Farmer/Laborers/Self employed	80 (35.2)	45.7 (7.2)	(41.0, 44.5, 51.5)	

Not working	135 (59.5)	45.7 (6.5)	(41.0, 46.0, 50.0)	
***Monthly household income**				
Up to RM 500	60 (26.4)	46.2 (7.0)	(41.0, 45.5, 52.0)	0.249[a]
RM 501 – RM 1000	43 (18.9)	44.4 (5.7)	(41.0, 44.0, 48.0)	
RM1001 and above	31 (13.7)	44.2 (7.1)	(41.0, 44.0, 49.0)	

*The total number does not equal to n=227 due to missing data
* P-value is significant ($p<0.05$)
a = One way Anova
b = Independent sample T-test

4.3.5 Simple Linear Regression and Multiple Linear Regression of the OHA scores

Table 4.11 shows the results of Simple linear regression (SLR) and multiple linear regression (MLR) analyses with OHA total scores as the outcome variable. Variables with p-value less than 0.25 in Simple Linear Regression were considered as potential significant variables in multiple linear regression. These variables were selected for further analyses in MLR. Only variable S.K Lemoi was found to have a significant impact on OHA (p value = 0.003). Other variables do not show any significant value in MLR analyses (p value > 0.05)

Table 4.11: Simple and multiple linear regression analyses of OHA scores among the OA children

	Simple linear regression		Multiple linear regression	
	b[a] (95%CI)	**p-value**	**b[a] (95%CI)**	**p-value**
Gender				
Male	0		0	
Female	1.98 (0.22, 3.75)	**0.028***	1.62(-0.23,3.48)	0.087
Schools				
SK Terisu	0		0	
SK Menson	-0.46(-3.08,2.16)	0.729	-2.65 (-5.71, 0.40)	0.088
SK Lemoi	-4.19 (-7.32, -1.05)	**0.009***	-4.80 (-7.99, -1.61)	**0.003***
SK Telanok	-1.18 (-3.61, 1.25)	0.339	-1.80 (-4.29, 0.68)	0.154
Father's Education Level				
No formal education	0		0	
Primary school	2.65 (-0.01, 5.30)	0.051	2.78 (-0.39, 5.95)	0.085
Secondary school or higher	3.33 (1.22, 5.43)	**0.002***	2.53 (-0.28, 5.34)	0.077
Mother's Education Level				
No formal education	0		0	
Primary school	1.26 (-1.15, 3.68)	0.303	-0.57 (-3.38, 2.25)	0.691
Secondary school or higher	3.09 (0.92, 5.227)	**0.006***	1.93 (-1.00, 4.87)	0.195

* SLR potential significant (p-value = 0.25)
* MLR significant variable (p value = 0.05)

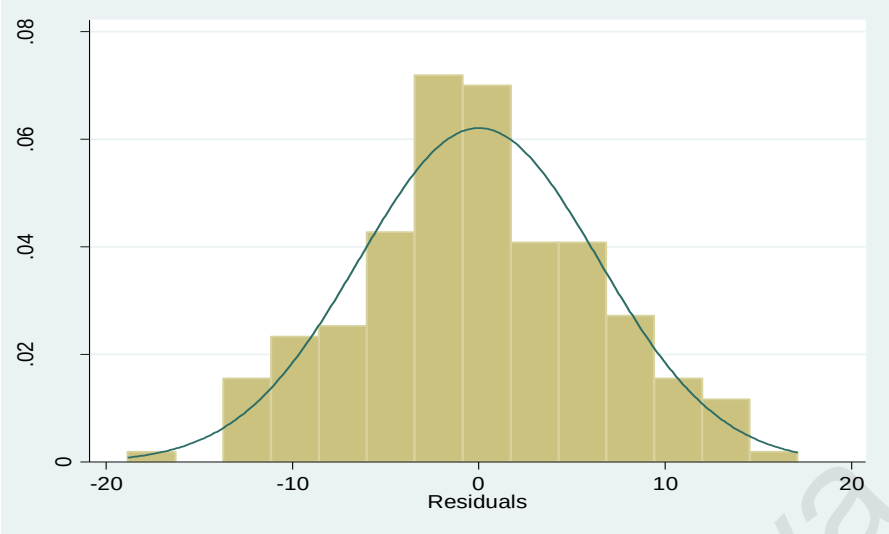

Figure 4.4: The histogram showing normal distribution

The histogram shows the residuals are normally distributed, making the assumption of normality is met.

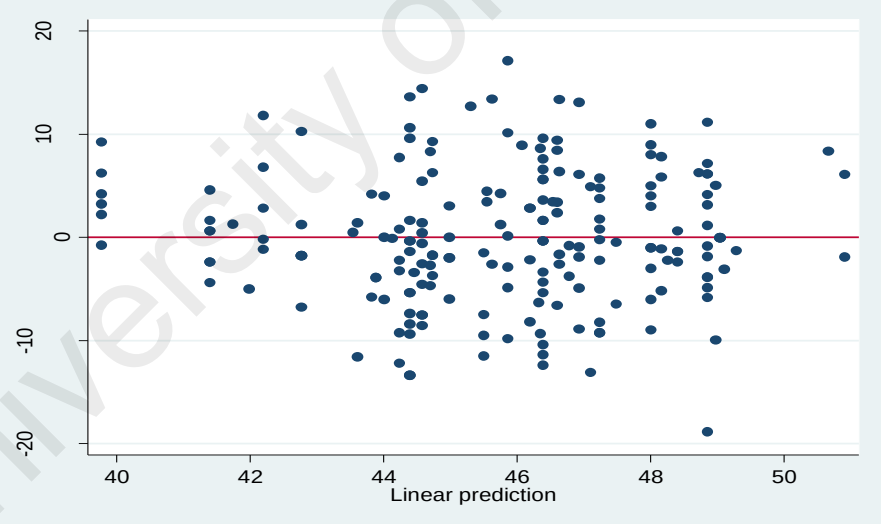

Figure 4.5: The variation in attitude scores

11.6 % of the variation in attitude scores is explained by SK Lemoi, R square = 0.116. Students in SK Lemoi are 4.83 points lower in oral health attitude score compared to students in SK Terisu (b: -4.80; 95%CI: -7.99, -1.76.)

4.4 Oral Health Behaviors (OHB) of the OA Children

4.4.1 Distribution of OHB items of the OA Children

The final section of the questionnaire involved questions on OA children's oral health and related behaviours. This section contains 9 questions. Table 4.12 shows the OHB items and their distribution among the sample population.

More than half of OA children (55.1%) brushed their teeth 2 times a day, and 28.6% brushed more than 2 times a day. As a result, a large majority of OA children (83.7%) brushed teeth at least 2 times a day. A smaller proportion brushed once a day (15.9%). Majority of OA children used toothpaste two times per day while brushing their teeth (63.9%) while 16.3% used toothpaste more than 2 times per day. As a result, 80.2% used toothpaste at least 2 times per day when brushing their teeth. Only 18.5% used toothpaste once a day when brushing teeth.

The majority of OA children (62.6%) had never used anything other than a toothbrush to clean their teeth. The balance of 38.4% had experience using other than a toothbrush to clean their teeth. Few OA children (1.3%) smoked 2 – 3 times a week and once in 2 – 12 month (1.3%). A large majority of OA children (96.0%) were non-smokers.

Regarding betel nut chewing behavior, 83.3% had betel nut chewing habit while another 16.7% had never experienced chewing betel nut. More OA children chewed betel nut once a day (30.4%), while 20.7% chewed betel nut 2 times a day, and 16.3% more than 2 times a day. Fewer OA children (7.5%) chewed betel nut 2 – 3 times a week and once a week (6.6%).

When OA children were asked about their sugary drinks intake, 35.2% reported that they consumed sugary drinks once a day, 27.8% consumed more than 2 times a day, and 26.0% consumed two times a day. Fewer OA children consumed sugary drinks 2 – 3 times a week (4.0%) and once a week (4.0%). On sugary foods intake, more OA children (33%) consumed sugary foods such as ice cream, cakes, candy and chocolate more than

2 times a day, 23.8% consumed sugary foods once a day, while 23.3% consumed 2 times a day.

Next, the question asked about mouth rinsing after eating. More OA children (31.7%) rinsed their mouth 2 times a day, 22.9% rinsed more than 2 times a day, and 21.1% rinsed their mouth once a day. Few OA children (16.3%) never rinsed their mouth after eating. On the final question on OHB items, the OA children were asked about the frequency of visiting a dentist. A large majority of OA children (97.8%) went to see a dentist once in 2 – 12 months while another 2.2% never visited a dentist.

Table 4.12: Distribution of OHB items of the OA children (n=227)

No	OHB items	> 2 times a day n (%)	2 times a day n (%)	Once a day n (%)	2-3 times a week n (%)	Once a week n (%)	Once a month n (%)	Once in 2-12 month n (%)	Never n (%)
1	How often do you brush your teeth?	**65 (28.6)**	**125 (55.1)**	36 (15.9)	1 (0.4)	-	-	-	-
2	How often do you use toothpaste when brushing your teeth?	**37 (16.3)**	**145 (63.9)**	42 (18.5)	1 (0.4)	-	-	-	2 (0.9)
3	How often do you use anything other than a toothbrush to your clean teeth?	**3 (1.3)**	**9 (4.0)**	**13 (5.7)**	**21 (9.3)**	**20 (8.8)**	**3 (1.3)**	**16 (7.0)**	142 (62.6)
4	How often do you smoke cigarettes?	**1 (0.4)**	**-**	**2 (0.9)**	**3 (1.3)**	**-**	**-**	**3 (1.3)**	218 (96.0)
5	How often do you chew betel nuts?	**37 (16.3)**	**47 (20.7)**	**69 (30.4)**	**17 (7.5)**	**15 (6.6)**	**2 (0.9)**	**2 (0.9)**	38 (16.7)
6	How often do you drink sugary drinks / carbonated drink?	**63 (27.8)**	**59 (26)**	80 (35.2)	9 (4.0)	9 (4.0)	2 (0.9)	2 (0.9)	3 (1.3)
7	How often do you eat sugary foods such as cakes / candy / chocolate / ice cream?	**75 (33)**	**53 (23.3)**	54 (23.8)	13 (5.7)	15 (6.6)	6 (2.6)	8 (3.5)	3 (1.3)
8	How often do you rinse your mouth after eating?	52 (22.9)	72 (31.7)	48 (21.1)	**4 (1.8)**	**7 (3.1)**	**4 (1.8)**	**3 (1.3)**	**37 (16.3)**
9	How often do you see a dentist?	-	-	-	-	-	-	222 (97.8)	**5 (2.2)**

4.4.2 Analysis of selected OHB items

Table 4.13 shows the results of OA children's OHB who had good score, moderate score and poor score on selected behavior items. There were 5 selected items included in the analysis. The selected behavior items were frequency of tooth brushing, frequency of using toothpaste while brushing, frequency of smoking, frequency of betel nut chewing and frequency of mouth rinsing after eating.

Overall, majority of OA children had good behavior on 4 out of 5 selected behavior items. Item 1 asked about frequency of tooth brushing. The majority of OA children had good score (83.7%) on this item while 15.9% had moderate score. The second item refers to frequency of using toothpaste while brushing. The majority of OA children (80.2%) had good score on this item while 18.5% and 1.3% had moderate and poor score, respectively.

In terms of smoking, majority also had good score on this item (96.0%) and only 4.0% had poor score. However, when it comes to betel nut chewing habit, majority of OA children scored poorly (83.3%). Only 16.7% had good score on the item. For the final item on mouth rinsing after eating, more than half (54.6%) of OA children had good score, while 24.2% and 21.1% (n=48) had poor score and moderate score, respectively.

Table 4.13: Analysis of selected OHB items

No	OHB item	Good score n(%)	Moderate score n(%)	Poor score n(%)
1	How often do you brush your teeth?	190 (83.7)	36 (15.9)	1 (0.4)
2	How often do you use toothpaste when brushing your teeth?	182 (80.2)	42 (18.5)	3 (1.3)
3	How often do you smoke cigarettes?	218 (96.0)	NA	**9 (4.0)**
4	How often do you chew betel nut?	38 (16.7)	NA	**189 (83.3)**
5	How often do you rinse your mouth with water after eating?	124 (54.6)	48 (21.1)	55 (24.2)

NA = not applicable

[a]OHB items: 1=Tooth brushing; 2=Used of fluoride toothpaste; 3=Smoking; 4=Betel nut chewing; 5=Mouth rinsing after meal

[b]The cut off points are based on literature for tooth brushing frequency and fluoride use (Davies et al. (2003); The American Dental Association (ADA), 2012), soft drinks and sweets intake (Watt et al., 2003).

[c]The effect of betel nut based on study by Trivedy et al. (2002) The oral health consequences of chewing areca nut. Addiction Biology, 7: 115

4.5 Development of Oral Health Education Module for OA Schoolchildren

An oral health education module is proposed aiming to improve the oral health of the OA schoolchildren in CH. The objective of the modules are:

1. To produce OA schoolchildren who are aware of personal dental care.
2. To produce OA schoolchildren with no active dental disease including caries and periodontal disease.
3. To produce OA schoolchildren who will attend regular dental checkup.
4. To produce OA schoolchildren who are aware of the effect of sugary foods and drinks and risky habits on oral health such as smoking and betel nut chewing.

This OHE module is developed based on the Doktor Muda Program (DMP) with some adaptations to suit the OA schools' settings. In late 1980s, the DMP was introduced in primary schools in Peninsular Malaysia. This programme is a smart partnership between the Ministries of Health and Education. DMP is a child-to-child peer-led HP programme where a group of schoolchildren called Doktor Muda (DM) or 'young doctors' are empowered to deliver health education and conduct health-related activities at school. The target population are school teachers, OA school children, their parents and the canteen operators. The activities will focus on 3 levels, i.e. Content, Implementation and Evaluation.

The results from the present study were used as a reference to develop the OHE module specific for OA schoolchildren. Some of the content have been given greater focus based on the study findings. Smoking and betel nut chewing habits become two of the main focuses in this OHE module because of the life style and cultural aspects surrounding the habits. Also a large majority of OA children have been exposed to the habits at very young age. The OHE should be exposed as early as pre-school children to give them early exposure on the factors and determinants of oral health.

The content of the OHE module will consist of 2 aspects. The oral health knowledge and practical aspects. The target population will be trained about the oral health content and practical skills related to oral health. The OHE module comprises general knowledge on oral diseases including caries, gum disease and oral cancer; the risk factors for the respective disease; the signs and symptoms; diets and their effects on oral health and the high risk habits. Meanwhile the practical aspect comprises oral hygiene methods and prevention of caries and periodontal disease.

CHAPTER 5: DISCUSSION

5.1 Response Rate

In Malaysia, only a few studies have been published on the oral health knowledge, attitudes and behaviours of 11-12 year old school children (Yusof & Jaafar, 2013) & (Cheah et al. (2010)). Similar studies on OA children have been lacking. The present study provided valuable information related to the OA children's OHK, OHA and OHB of similar age group.

The response rate was high at 91.2%. There were several reasons identified as the contributing factors for the high responses rate in this research. One of the reasons was school-based approach where data collection was conducted in OA schools. Direct access to the student's record in schools was an advantage in getting the favorable sample. All the students who had attended the school on that day were included and for those who missed school on the day of data collection, they were excluded. Another contributing factor was because the majority of the 11-12 year old OA children live in the school dormitory. Support from the school teachers was another factor in promoting the program to the students. The sample size was large enough to represent OA children who attending OA schools in Cameron Highland.

The pre-survey visits to the schools were important. During the visits, information about the schools and OA children was obtained to decide on the inclusion and exclusion criteria. Apart from developing effective communication, invitation letters and consents forms were delivered to the parents through the schools. This was to provide sufficient time for the schools and parents to understand the objective and method used in this study. The main inclusion criteria in this research was OA children aged 11-12 years old (standard 5 and 6) attending OA primary schools in Cameron Highland. Secondly, both parents of the children must be from Orang Asli descendent. The complete profile of the OA children was collected from the schools to make sure the OA children fulfilled the

inclusion criteria. The main reason of selecting children from OA school was because to ensure the finding would represent OA community without any interference from non-OA people.

5.2 Socio-demographic characteristics of sample population

This study included an approximate equal number of males and females and more of the children were in Standard 5 compared to those in Standard 6. There were significant differences between total students in Standard 5 (66.5%) and 6 (33.5%). The school teachers reported that only a small group of students would continue to Standard 6 because they were not interested in education, inattentive at school, and they also dislike UPSR examination.

Demographic information on father's occupation showed that most of fathers were working as farmers because in Cameron Highland the main activity is farming. They plant and sell vegetable to generate income. Apart from farmers, more OA fathers worked in a private sector. A number of private companies open a new dam construction project and have given more jobs opportunities to this OA communities. Some worked as truck drivers and construction worker. A small group of OA parents were self-employed. Some collected forest products such as honey, herbs and selling handicrafts. In term of OA mother's occupation, the majority of OA mothers were not working and full time housewives. More OA mothers worked as farmers together with their husbands. They planted and sold vegetables to generate income. In terms of levels of education, most OA parents had education up to secondary schools. This was because most of OA schools in Cameron Highland have dorm facilities for their students. This provided opportunity for OA children to continue their education at higher levels. Some OA parents had no formal education or were illiterate (never attended schools). Lack of transportation from home to schools, the route from home to the school was not in good condition. Many had to go

through the forest area to go to school. It was also one of the contributing factors of why many OA parents were illiterate. Study proven that approximately 40.0% of indigenous peoples live close to or within forested areas (Masron et al., 2013).

Demographic information about total family income showed that more OA families had less than RM500 total family income every month. Total family income have a significant correlation with the type of occupations. Most of the parents worked as farmers and income generation depended on the yield of the land. Those OA parents who worked in private sector received low pay. For those parents who collected forest products such as honey, herbs, etc., their income was not regular and depends on the results of hunting on that day. Meanwhile, for parents who run a small business of selling handicrafts on the roadside also depends on the sales on that day. The handcraft that they made will be bought by a tourists who stopped by.

5.3 Oral health Knowledge, Attitude and Behaviours

5.3.1 Oral Health Knowledge (OHK)

There are several analyses conducted to assess the OHK of the OA children in this research. The first analysis was to see the proportions of OA children with good, moderate and poor scores on OHK items. It was found that the majority of OA children had poor score on 7 out of 9 OHK items, representing 77.8% of the OHK items. It was thought that lack of exposure on caries, gum disease and oral health had led to lower OHK. Knowledge about various aspects of oral health such as tooth decay (caries), gum disease (periodontal disease), effect on teeth of sugary food and drinks intake, betel nut chewing and smoking was poor.

Majority (65.6%) of the OA children were not aware that sugary food and beverage cause tooth decay. This result was higher compared to study among 5 – 16 year old Indigenous student in Chepang, Nepal whereby only 50.0% of them did not know that

sugar can caused tooth decay (Dixit et al., 2013).This result was also higher compared to study by Wong et al. (2001) among 12 years old urban and rural children in China did not know that sugary food and beverage cause tooth decay with 18.0% and 39.0% respectively. This could be due to lack of exposure on diet that affect oral health, food pyramid and effect of nutrition on body. Most of the time, they ate all kinds of foods without considering the impacts on the body's metabolism.

Majority of the OA children also lacked knowledge on dental plaque as the causative factor for gum disease (76.2%) and were unaware that bleeding gums is a sign of gum disease (68.7%). These prevalence were higher compared with the prevalence among 12-15 year old rural children in Shaanxi, China where only 46.3% were unaware that bacteria was the causative factor for gingivitis (Gao et al., 2014). The prevalence in the current study was also higher compared with the prevalence among 12-14 year school Qatari children where only 48.4% were unaware about dental plaque (Al-Darwish et al., 2015). The OA children might experience gum bleeding while brushing teeth, but this sign would most likely be ignored as it is painless and more importantly because of lack of knowledge on the disease. Small black spots or holes on the teeth indicating caries would most likely be ignored due to the lack of knowledge on the disease. They would be unaware of the disease until it has reached the advanced stage leading to pain and suffering before the sought for treatment.

When the students were randomly asked about the yellow stain (debris) that appear on the teeth, they didn't have any clue what was plaque and it seems like not really bother their quality of life. These findings were in agreement with a research done by Al-Omiri et al. (2006) among Jordanian school children. The lack of knowledge in periodontal health could reflect the dental health education received from the dental personnel who visited the school.

Betel nut and smoking are high risk oral habits. However, majority of OA children were not aware that this habit can give a bad impact to oral health because they are accustomed to see their parents practicing this habit since they were small. They were assuming that this is a norm habit among their community. Even though there are no specific variable about since when they started to chew betel nut, this research shows that large majority (83.3%) of OA school children had practice this habit. Therefore, it is not surprising when they replied that this habit was started as early as 5 year old. This finding was supported by many studies reported that this betel nut chewing habits was started in a very young age (Lu et al. (1993), Yang et al. (1996), Chen and Shaw (1996) &). Lack of exposure about general knowledge of oral high risk habit among the OA community was became the main reason of large majority had practice this habit.

Smoking are also high risk oral health habits. Large majority (96.0%) of this research was non-smoker. However, there are still a small group of OA school children had practice this habit. The habits were practically seen among OA adults including their parents and they also were assuming this habit is similar with betel nut chewing whereby a norm among their community. Lack of knowledge on harmful effects from smoking did not have a positive impact on OA children. This is supported by the study done by Saub and Jaafar (2001) involving OA group (Semai). They found that smoking with self-made rolled leaves with tobacco inserts and betel nut chewing was very common among teenagers and adult men in this population. Level of understanding of the child would normally think that if that habits have long-term effects, then their parents should have stop the habit from the very beginning. Since there were no actions taken by the adult, it will always emulated by the younger generations.

There were only 2 question in OHK had almost equal percentage among good, moderate and poor score which is knowledge about tooth brushing frequency and brushing using toothpaste. This is because the role of dentists in promoting and

disseminating the knowledge of tooth brushing is essential. The annual dental service in the schools and also the short OHE delivered by the dentist and nurses during the visit was at least giving them a better understanding and awareness about the oral health knowledge.

This study reported that majority of the OA children (51.1%) had poor level of OHK which indicate more than half of the sample population had a very low knowledge of oral health. There are various factors that contributed towards poor level of OHK. Cultural factor was one reason. OA communities have a unique culture. The uniqueness of their culture not only affects the daily lives but also their way of thinking and understanding of the disease. They have an understanding that every disease must come with pain. If there is no pain, then it is not a disease that must be cured. According to Masron et al. (2013) he studied about the OA groups in Malaysia and found that OA community depended on Shaman (Halaak) to provide them with the knowledge of understanding the disease and how to cure the illnesses. This is one of the reasons why modern education including oral health education was not very practical among OA children. As we concerned that early sign of dental caries is painless and late stage of the caries was painful and when it comes to OA communities the way to treat this kind of disease is through Shaman and not through dentist.

The transition of nutrition food industrial company which is more concerned with profit than nutrient content was also become the contributing factor to higher levels of poor OHK among the OA children. This is supported by Yusof et al. (2007) that nutrition transition, as experienced by industrial population, is a phenomenon whereby sugary foods and drinks are more readily available whose high consumption leads to dental caries. Lack of the exposure and nutritional education especially effect on sugary foods and drinks towards oral health also become one of the reasons of poor OHK.

Univariate analysis between OHK score and socio-demographic background of the OA children was conducted to see the relationship between them. However, there were no significant relationship ($p>0.05$) between OHK variables and socio-demographic background. This showed that in this study the levels of OHK were not associated with socio-demographic background. Since there are no significant finding in univariate analysis, multiple regression analysis was not conducted for OHK items.

5.3.2 Oral Health Attitude (OHA)

Several analyses has been carried out to assess the children's OHA. The first analysis is regarding the proportion of OA children with good, moderate and poor score on OHA items. Overall, the majority of OA children had poor score on 6 out of 13 OHA items, representing 46.2% of the OHA items. In assessing the OHA, the questions was divided into 3 categories which is attitude towards tooth brushing, sugary food and drinks and attitude towards chewing betel nuts.

In term of attitudes towards tooth brushing, overall more OA children had moderate score on 3 out of 5 items. The OA children apparently aware that the importance of tooth brushing could raise up the level of confidence and also aware that tooth brushing make their mouth feel fresh. The importance of understanding of tooth brushing was emphasized by the nurses and dentist who come to their schools for annual dental checkup.

However, the attitudes toward sweet food and drinks was below satisfactory level whereby overall OA children had poor score on 3 out of 4 items. The easy access to the foods nowadays had been a disease of affluence became an indicator of deprivation whereby sweet drinks was provided during rest time and availability of the sweet food and drinks outside the schools was become a children favorite. More than half (70.0%) of the OA children had poor score on OHA for "sweet beverage needs to be sold at the

school canteens". The food and nutrition guideline in Malaysia (M. o. H. Malaysia, 2013) has suggested to reduce daily sugar consumption both for adult and children and all school canteens in Malaysia are required to follow the guideline. Apart from Malaysia, guideline for food sold at school canteen in Dubai stated that soft drinks and candies or related junk food containing high sugars are prohibited at school canteen (Almazmi et al., 2011). We found that half of the respondents (59.0%) was aware that sugary beverage is not good for the dental health and give a negative impact to their teeth, however they still practice unhealthy behavior in their routine life.

Chewing betel nuts appears to be a dying habit among the younger generation in Malaysia especially the indigenous children. OA schoolchildren had poor score on 3 out of 4 items in term of attitudes towards chewing betel nuts. They agreed that betel nut will makes their teeth beautiful, betel nuts will added freshness to their mouth and also will not harm their teeth. The reason they had this attitude because of the exposure of the chewing betel nut habit from generation to generation. The lack of understanding of the long term effect were lead to poor attitude.

This study reported that majority of the OA children (61.7%) had moderate level of OHA which indicate more than half of the sample population had a low attitude of oral health. Meanwhile 19.4% of OA children had poor level of OHA which minority sample population had a very low attitude towards oral health. The contribution factors towards moderate and poor level of OHA were similar towards oral health knowledge. The lack of information delivered from the nurses and dentist during the annual dental service could be one of the reason. They nurses and dentist always mentioned about the frequency of tooth brushing per day, effect about the sugary foods and drinks, teaches a proper tooth brushing technique. However, they might be forgot to deliver the effect of betel nut chewing and smoking habits to the OA school children.

Univariate analysis between OHA score and socio-demographic background of the OA children was conducted to see the relationship between them. Based on the results presented, four demographic variables has statistically significant differences in OHA mean total score between its categories, respectively. The variables were gender, school, father's education level and mother's education level. To find out further relationship between OHA and the socio-demographic background, simple linear regression was run to assess the relationship.

Simple linear regression (SLR) and multi linear regression (MLR) analyses with OHA total scores was conducted. Only variable S.K Lemoi was found to have significant impact on OHA with p value = 0.003. This result was shows that location of the OA schools also plays an important role in forming a good attitude. As mentioned earlier in Chapter 4, S.K Lemoi was located in the forested area and it took about 2 and half hour journey by 4 wheel drive. The road condition along the way to this schools only can be assess by 4 wheel drive. Due to the location and difficult to assess it might be the result of significant relationship between OHA and the school variable.

5.3.3 Oral Health Behavior (OHB)

Most of the OA children had satisfactory behaviour on tooth brushing practice. It was encouraging to note that 99.6% of the OA school children brushed their teeth at least daily. This percentage was higher than study reported Indigenous children in Chepang, whereby only 56.0% of them brushed their teeth daily (Dixit et al., 2013). Majority (83.7%) reported to have brushed their teeth at least 2 times daily whose percentage was higher than that reported by (Kaur et al., 2015) among selected urban school children in Kuala Lumpur (75.0%) and reported by WHO in 2008 (44.4%). This can be cause of raised of social knowledge about the oral health such as television advertisements that deliver excellent advice on the oral health care. This study also showed that the percentage

of OA children who brushed at least twice a day was higher compared to data reported from Kuusela et al. (1997) who mentioned that 73.0 – 83.0% of children in Sweden, Denmark, Germany, Austria and Norway brushed their teeth twice a day.

In the present study, it was found 99.1% of the respondents were using toothbrush and toothpaste when cleaning their teeth. This finding is supported by more researchers reported that toothbrush and toothpaste were the most commonly used oral hygiene tools (Kote et al., 2013). The result lower compared to study rural Mangalore City found that 97.6% of 5-12 years old children are used toothbrush and toothpaste to cleaning the teeth (Kamath et al., 2014). Bacteria which appear in the dental plaque can cause demineralization of the teeth enamel causing dental decay. This could be prevented by tooth brushing with fluoridated toothpaste. The importance of educating the OA children on proper tooth brushing technique was a major priority. Encouraging the OA children to brush their teeth twice a day using toothpaste without teaching them a proper and systematically technique is an act of futile.

In term of using device other than a toothbrush to clean teeth, 37.4% (n=85) admitted cleaning their teeth using device other than usual oral hygiene tools. This is higher compared to study done in rural Mangalore City among the 5-12 years old children. About 5.2% reported using other that tooth brushing and toothpaste to cleaning the teeth. They were using “kayu sugi”, finger, charcoal or sand to clean their teeth. Even though there is no scientific evidence the relationship between using other oral hygiene tools to clean teeth and dental caries, this is a very good point to evaluate the reason of using these tools. Other tooth cleaning method need to be introduced to OA children such as flossing. Flossing has been practice a long time ago. In San Francisco 75.0% of the 12-14 year old students used dental floss at least once per day (Walsh, 1985). In Iraq, over half of the students used dental floss once or more a week (Russell et al., 1989). Another study by Al-Omiri et al. (2006) reported that 40.0% of 13 year old school children in Jordan knew

that brushing and flossing helped to prevent gingivitis. However, flossing was not really popular among children in Malaysia because according to study by Cheah et al. (2010), only 11.5% of the secondary school children practiced it. This is another reason why flossing should be introduced and stressed to the primary school children OA children in Malaysia. The reason why this method was not really popular among the children, it might be lack of exposure given about the proper technique and the benefit to oral health care. Study done by Cheah et al. (2010) among the secondary school reported less than quarter of population practicing this habit. This is incomparable to the OA children because they don't even know or aware about this method are one of the method used to clean the teeth.

In terms of frequency of consuming sugary beverage, it is not surprising to note that there was a minority of respondents (1.3%) who reported never eaten any sweet beverages such as sugary foods and drinks and this is slightly lower than that reported by Smyth et al. (2007) (6.0%) among the 12 year old non-indigenous students in Spain. Other than sweet snacks, sugary drinks such as carbonated drinks reported to be the most favorable (89.0%) of the respondents consuming it every day and 35.3% reported they drinked it once per day. This is much higher compare to a study by Cheah et al. (2010) in non-indigenous secondary schools in Sarawak in which only 26.3% of the respondents consumed sugary drinks every day. The students apparently to be more attracted to the taste and appearance of the sugary beverage such as chocolate, candy and carbonated drinks compared to the nutrition food. The availability of the sweet beverages within and outside of the school compound had facilitated the purchasing of the items among the school children.

In this present study, when the OA children were asked about betel nuts chewing habit, majority of the OA children said that they started chewing betel nuts at a very young age. Some of them said that the habit started since they were 5 years old and some of them said maybe younger than 5. They also mentioned that the habits were continued

since then. This random question seemed to be proven because 83.3% of the OA children had experienced chewing betel nut and 30.4 % of them chewed once a day. This finding supported by Ko et al. (1992) whose research found that betel nut chewing was practiced widely, particularly in the aboriginal areas in Taiwan, China. The OA children in this study were only 11 – 12 years old and most of them had started to chew betel nut since the age of 5 and if we calculate the habits has been with them more than 5 years. It is supported by many studies which reported that this betel nut chewing habit started at a very young age (Lu et al. (1993), Yang et al. (1996), Chen and Shaw (1996), Ho et al. (2000). This shows that these children may be influenced by adults especially parents to begin the habit because they have been exposed to the betel nut since they were small. It is also a heritage culture which has been practiced for generations. There are also few of them were mentioned that their parents told them to chew betel nut because ostensibly to avoid being bitten by a snake. However there is no certainty about the statement as possible just to affect their children to start the habit. Study done by Trivedy et al. (2002) was clearly mentioned that areca on its own may play an etiological role in the causation of oral cancer. Based on this finding, exposure of oral health education on effect of chewing betel nuts must be emphasized not only to adults but specifically among OA children because they was accustomed to these habit and changes should be done gradually.

In terms of frequency of smoking, the majority of OA children was not smoked. However, it is not surprising to note that there are minority (4.0%) of the OA schoolchildren had experienced smoker. Tobacco smoking in Malaysia is in many form. The most common is the commercial brand cigarettes that easily found nowadays among the OA communities. There are no data analyzed to compare smoking habits between genders. However, according to study among the OA Semai Tribe in Malaysia, smoking with self-made rolled leaves with tobacco inserts was very common among adult men and

teenagers (Saub & Jaafar, 2001). According to study by Trewin (2004) in the National Aboriginal and Torres Strait Islander health survey 2004- 2005, half of the adult Indigenous population smoked daily or regularly, a level more than twice that of non-Indigenous adults. The perception of OA children towards smoking might be similar with chewing betel nuts habits. The early exposure also could be one of the reasons they had experienced in smoked even they are still too young. Lack of general knowledge and preventive measure about the long term effect of smoking habit also one of the contributing factors of smoking habits.

Regular dental examination every 6 months is recommended by the Ministry of Health worldwide. However, this study found almost all OA children (97.8%) visit the dentist once in 2 – 12 months, meanwhile another 2.2% of OA children never visited the dentist. This could be due to the annual incremental dental program which required all OA children to see the dentist or dental nurses as part of the annual routine check-up. The students who never came for dental examination in schools afraid to get dental treatment. When they know dentists and nurses came to schools, they will purposely be absence from school or even escape during the dental treatment. They also mentioned they were afraid to see blood and claimed that the sound generated by the dental equipment during the dental treatment was too frightening. This may be due to lack of OHK among these OA children that caused these behaviors. Study has shown that parent's attitudes towards dental health influence children's oral health behavior and dental attendance (Jälevik et al., 1999).

A part from being afraid of dental examination, the other barrier of getting dental treatment was the location of the dental clinic. Compared to those who live in the city, accessibility to the dental clinic in rural areas was limited mainly due to transportation problem. The facilities of dental clinic was located far away from their village. This was also because of the low awareness of importance of oral health, thus affects the OA

children oral health. Therefore, providing the proper knowledge regarding a regular dental visit is necessary to OA community especially children because maintaining a regular dental checkup can prevent from a periodontal disease and tooth decay (Biesbrock et al., 2006).

Apart from inaccessibility to dental clinic, the pain coping method used by OA population could be one of the reasons for not needing modern treatment from dental clinic. There is no data how they cope with dental pain, however according to the OA children, they preferred to seek for traditional medication by visiting the Shaman. The Shaman will determine the cause of the disease and provide the traditional herbs and leaves as a medication. This is supported by a research done by Saub and Jaafar (2001) among the Semai OA population who found that they preferred traditional medication compared to modern. In addition, it was also supported by the Commonwealth of Australia 2007 research mentioned that indigenous peoples, particularly in Australia share a holistic understanding of health concepts related to physical health, spiritual, mental, cultural health and all playing an important role (Economic, 2009). Efforts should be made at all levels to increase oral health awareness and improve oral hygiene practices by using the existing public dental health care delivery system or creating new intervention program to making sure effective oral health education is being delivered. This present study has obtained significant items about oral health attitude, knowledge and behavior among the target group and thus initiate to develop a new oral health education module.

Overall, the majority of OA children had good behaviours on 4 out of 5 selected behavior items, representing 80.0% of the selected OHB items. OA people did not have the same access to the preventive measures compared to non-OA population such as fluoridated water and toothpaste, or easy access to dental care. OA people nowadays have the same oral health factors as non-OA people, but do not have the same access to

protection from dental decay. The oral health of OA people has deteriorated alongside general health and is now a significant problem among the OA population.

5.4 Oral Health Education Module

ORAL HEALTH EDUCATION MODULE ("MY HEALTHY SMILE")

Based on the study findings, an OHE module for school health was developed specifically aimed to work within the OA school settings. Important findings related to the OA children's oral health knowledge, attitudes and related behaviors from the current study have been used as baseline information for the module.

This specific oral health education module will be an addition to the existing OHE module delivered annually by the school dental service. From the Annual Report of the Oral Health Division (OHD) MOH in 2014, several OHE materials have been developed by the OHD consisting of Roll–up Banners, Posters and Comics, and oral health pamphlets primarily aimed to promote oral health awareness of school children. In addition, Mouth Cancer Awareness campaign has been routinely carried out throughout the country to persuade children not to smoke, drink alcohol and chew betel nut.

This oral health education module was designed especially for OA children based on the study findings. Since 83.3% of OA children in the study chewed betel nut with a minority who smoked, these aspects of habits will receive a special highlight in the module adjusted to suit this age group. The module development was based on the Dr. Muda Program with adaptations to suit the OA school settings. Selected students will be empowered with oral health knowledge and skills. They, in turn, will conduct oral health promotion activities to their peers in school with the aim to improve school oral health.

	IMPORTANT FINDINGS
Oral Health Knowledge	1. **65.6%** had poor knowledge on item "Consuming a lot of sweet food causes tooth decay" 2. **74.0%** had poor knowledge on item "A hole in the tooth is a sign of tooth decay." 3. **53.7%** had poor knowledge on item "Reducing sugary foods can reduce the risk of tooth decay" 4. **76.2%** had poor knowledge on item "Dental plaque can cause gum disease" 5. **68.7%** had poor knowledge on item "Bleeding gums is a sign of gum disease." 6. **55.1%** had poor knowledge on item "The habit of chewing betel nut is good practice for dental health" 7. **76.7%** had poor knowledge on item "Smoking is bad for the health of gums."
Oral Health Attitude	1. **65.6%** had poor score on item "Sweet foods / drinks: Is good for my teeth." 2. **64.8%** had poor score on item "Sweet foods / drinks: Is my favorite food." 3. **70.0%** had poor score on item "Sweet foods / drinks: Should be sold at the school canteen." 4. **75.8%** had poor score on item "Chewing betel nuts: Makes my teeth look beautiful." 5. **79.7%** had poor score on item "Chewing betel nuts: Adds freshness to my mouth." 6. **74.0%** had poor score on item "Chewing betel nuts: Will not harm my mouth."
Oral Health Behaviours	1. **83.3%** had poor score on item "How often do you chew betel nut?" 2. **4.0%** of the OA children is a smoker.
AIM	To improve the oral health of the OA school children.
OBJECTIVE	To achieve optimum oral health among OA school children (orally fit):

	1. To produce OA schoolchildren who are aware of personal dental care. 2. To produce OA schoolchildren with no active dental disease including caries and periodontal disease. 3. To produce OA schoolchildren who will attend regular dental checkup. 4. To produce OA schoolchildren who are aware of the effect of sugary foods and drinks and risky habits on oral health such as smoking and betel nut chewing.
TARGET POPULATION	1. School Teacher 2. OA school children from pre-school to standard 6 3. Parents 4. School Canteen operators
CONTENT OF OHE MODULE	1. The causes and prevention of caries. 2. The causes and prevention of gum diseases. 3. The causes and prevention of oral cancer. 4. Benefits of healthy teeth and mouth on daily living. 5. Healthy eating for optimum oral health. 6. Oral hygiene education
ACTIVITIES IMPLEMENT	<u>Short term activities:</u> The school teachers, OA parents and school canteen operators will be trained in OHE to increase their oral health awareness and enhance collaboration in the programme to improve school oral health, specifically, the oral health of the OA school children. Time line: 3 months of implementation. <u>Long term activities:</u> Dr. Muda Program: Selected students will be empowered with oral health knowledge and skills. They, in turn, will conduct oral health promotion activities to their peers in school with the aim to improve school oral health. Time line: 6 months of implementation. a. OHE - Smoking, betel nut chewing and oral cancers.

	- Teach students about non-milk extrinsic sugars (NMES) as main cause of dental caries. - Bacteria will metabolize sugars and produce acids which will breakdown the tooth enamel. - Sugars as one of the plaque formation factors. - Dental plaque and gum disease. b. Oral hygiene practice - Empower children with proper tooth brushing and introduce to flossing techniques. - Brushing with fluoridated toothpaste twice per day. - Flossing daily. - Dental visit once per year c. Effect of oral high risk habits - Smoking causes oral cancer. - Betel nuts chewing causes oral lesion d. The importance of healthy mouth on daily living - The concept of oral health-related quality of life
EVALUATION	<u>Short term:</u> 1. Improvement in OHK, OHA and OHB of OA children 2. 6 months after implementation. <u>Long term:</u> Improvement of oral health status, i.e., reduction in caries prevalence, severity, and incidence. Also improvement in oral health-related quality of life.
SUSTAINABILITY	Dr. Muda programme is suitable because: 1. Do not disturb teaching. Teacher only supervise. 2. Do not interrupt normal class teachings. 3. Students conduct the activities. 4. Low cost. **5.** Dr. Muda students will be motivate to conduct the module.

5.5 Limitations of the study

This study has a number of limitations. First, the information on OHK, OHA and OHB was collected using a questionnaire. Some weak students may not fully understand the content, some may under report, and some may provide answers that are favorable but may be misleading. However, the students answered the questionnaire with the researcher's guidance. Thus, any potential error was reduced to as minimum as possible. Also, this questionnaire was developed based on the level of understanding for 11-12 year old OA children. Each of the word had been verified during pre-test study and the items were written at the cognitive level according to their age. This might limit the potential error due to misunderstanding and misinterpretation of the questionnaire by the subject.

Secondly, the study was conducted on OA children from Cameron Highland district. As such, generalization of the results to OA children from different cultural and ethnic background should be done with caution. However, the study findings may provide useful information for OA school children with similar demographic characteristic in the country.

CHAPTER 6: CONCLUSION & RECOMMENDATION

6.1 Conclusion

6.1.1 For Objectives 1 and 2:

i. The 11-12 year old OA children had poor oral health knowledge, attitudes, and selected oral health-related behaviours. The majority had poor scores in 77.8% of OHK items and 46.2% of OHA items. The majority chewed betel nuts ≥1 time/day, consumed sugary/carbonated drinks ≥2 times/day, and consumed sugary foods ≥2 times/day.

ii. There was no significant factor associated with levels of oral health knowledge. However, school location was significantly associated with oral health attitudes (p=0.003) when other factors were controlled.

6.1.2 For Objective 3:

Based on the result of this research, one OHE module was developed and implemented based on the Doktor Muda Program (DMP) which will be adopted to suit the OA schools settings. The content and practical aspects was based on the OA needs. Teaching techniques and learning need to be conducted in more practical way so that the presentation does not always use the same methods. It should involve bilateral relations between the presenter and the students. Suggestion for program improvement, and sustainability included motivation, financial resources, and better collaboration from the respective stakeholders.

6.2 Recommendations

Based on the study, these recommendations are proposed:

i. Development of new OHE module based on the findings on this research can be used for the next study to evaluate the effectiveness. The smart program such as Doktor Muda programme for primary school has been shown to be significant effective to improve children's OHRQoL (Yusof & Jaafar, 2013). This programme should be initiated in all OA schools to promote OA children's OH status, OHRQoL and also promoting a good knowledge, attitude and behaviors among the OA children.

ii. The betel nut chewing and smoking habits was highlighted as high impact items to be reduced. This will become a good intervention study in future.

iii. Community consultation must be carried out in this OA village. The preventions and awareness must be delivered to the parents and guardian to assess the changes in oral health attitude, knowledge and behavior among the OA children. Expanding the coverage area for dental outreach program must be one of the intervention programmes especially to the rural areas such as in SK Lemoi.

iv. Smart partnership between Oral Health Division, Ministry of Health and Ministry of Education to include OHE as one of the health education modules at school also must be one of the future consideration to enhance the services.

v. The schools dental examination must be carried out twice a years instead of once a year as always stressed by the dentist that we should visit the dentist every 6 months.

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