Accessing paediatric dental services in Papua New Guinea

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Abstract

Background

Maintaining healthy teeth is essential for the short and long-term well-being of children. Yet, this is not the case for many children in Papua New Guinea (PNG), with its high prevalence of dental caries and periodontal disease. High rates of oral disease among children in PNG may be due, at least in part, to poor access to services of oral health and including but not limited to, the development of good oral health care techniques and routine practices.

Objectives

The overall aim of the current study is to address current gaps in knowledge by identifying barriers to accessing pediatric dental services for children in PNG, in an effort to support children's oral health. Specific study objectives were to:

1) identify specific barriers to accessing paediatric dental services in PNG
2) determine whether barriers to access, differ by child age groups (1-3-year-olds and 4-6-year-olds), sex (male/female), and/or area of residence (urban/rural)
3) determine parents' understanding of reasons to access dental care for children; and
4) to gather suggestions from families about how to improve access to paediatric dental services in PNG

Methods

Forty parents (aged 19 to 46 years; mean 33.15 years) of children aged 0-6 years (mean 3.75 years) living in the Morobe province of PNG, took part in the research. Parents completed a primarily quantitative survey. Parents also responded to a small number of qualitative questions. Informed, at least in part, by Levesque, Harris and Russell's (2013) model of patient-centred access to healthcare, key areas of focus were Availability and Accommodation, Approachability, Acceptability, Affordability, and Appropriateness. Where appropriate, quantitative responses, analysed using descriptive statistics, examined parents' experiences of accessing paediatric dental services for their children and independent samples t-tests.

Qualitative questions, analysed using thematic analysis, explored parents' awareness of reasons for accessing paediatric dental services and their suggestions for improving service access.

Results

The majority (95%) of parents had not accessed paediatric dental services, 82.5% never received support from health workers, and 70% could not locate a dental clinic. Expenses associated with service provision and transportation were major barriers noted by parents. Most parents reported an absence of dental service in small rural communities and they also lacked knowledge of dental service. The majority (97.5%) of parents had never accessed subsidised dental services. Families living in rural areas reported a significantly greater mean number of barriers compared to families living in urban areas. Overall barriers experienced by parents did not differ significantly by child age (p=0.18) or sex (p=0.77). Parents reported that the main reason that they would seek dental services for their child/children was because of oral disease. Suggestions by parents to improve service access included the availability of dental facilities in rural communities.

Conclusions

Almost all parents had not accessed dental services for their children. Barriers are prominent in rural areas. More parental education is needed about the significance of oral health and regular oral check-ups. Parents suggest that dentists should visit schools and small rural communities to conduct oral health education and provide simple dental treatment. It is clear that more needs to be done to improve dental services for children in PNG.

Table of Contents

List of Figures

List of Tables

List of Appendices

Attestation of Authorship

I hereby declare that this submission is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person (except where explicitly defined in the acknowledgements), nor material which to a substantial extent has been submitted for the award of any other degree or diploma of a university or other institution of higher learning.

	21/05/2020
Signature	**Date**

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Ethics Approval

The current study was approved by the Auckland University of Technology Ethics Committee (Reference number: 19/199) on the 15th of July 2019 (see Appendix A).

Chapter Overview

Chapter One sets the scene for this thesis by providing a brief introduction to PNG, the burdens on its health services, and the importance of good oral health for children.

Chapter two presents a literature review of research examining barriers affecting access to paediatric dental services in PNG and beyond. This chapter also introduces the specific aims of the current study.

Chapter three provides an outline of the methods involved in conducting this study. This includes details of participant recruitment, data collection and analysis. This chapter also provides an overview of a relevant conceptual framework, being Levesque, Harris, and Russell (2013) model of access to health care.

Chapter four presents the results of this study by reporting on barriers to accessing paediatric dental services in PNG, and the role of a child's age, sex and place of residence. Findings also examine parents' knowledge of oral health and suggestions from parents on how to improve access to paediatric dental service in PNG.

Chapter five discusses the results and compares findings with other similar studies. The strengths and limitations of the current research are also acknowledged, along with recommendations for future research.

Chapter 1: Introduction

The most inhabited and biggest nation of all the Pacific Island nations is the independent state of Papua New Guinea (herein referred to as PNG; (Le, Tran, Honda, & Fisher, 2014)). The geography of PNG is significantly diverse because of the vast differences in landform, rainfall, and altitude across the country. A significant number of rural areas are vastly covered by rugged mountain ranges, and fast-flowing and wide rivers (Hanson, Allen, Bourke, & McCarthy, 2001). PNG also has a population incorporating vast cultural diversity. More than 800 languages are spoken in PNG, with more than 700 different cultural groups and tribes that mostly reside in remote rural areas. 88% of the population of PNG live in the rural areas while 12% live in the urban areas (National Statistics Office, 2011) Such geographical and cultural diversity presents significant challenges to the delivery of health care services in PNG, especially in rural areas (L. Crocombe, Siddiqi, & Kamae, 2017; Le et al., 2014; Post Courier, 2018). Alongside low literacy rates, many people in PNG encounter extreme difficulties in accessing health services and health information (L. Crocombe et al., 2017; National Department Of Health [NDOH], 2010).

In terms of significant health issues in PNG, significant burdens on health services and society are due to infectious diseases, and deteriorating maternal and paediatric care (NDOH, 2010). Treatable and preventable diseases in PNG include malaria, pneumonia, diarrhoea, and tuberculosis, with human immunodeficiency viruses (HIV) being the most common causes of death (Urarang, Tim, Ian, & Alan, 2019). Non-communicable diseases such as cardiovascular disease and diabetes are less common but are becoming more prevalent due to increased consumption of processed food rather than traditional foods (NDOH, 2010; WHO, 2016). According to previous studies, the introduction of processed foods to PNG and their increasing consumption has also led to a significant deterioration in the oral health of its residents (Amaratunge, Faru & Molean, 1991; Bandara, 1997; Malden, 1983; Patel, 1990). This has led to oral health becoming one of the most significant health issues in PNG today (L. Crocombe et al., 2017).

The World Health Organisation (WHO) considers oral health as a key indicator of overall health, well-being and quality of life (Petersen, 2003). Oral health encompasses a range of diseases and conditions that include, for example, dental caries, periodontal disease, tooth loss (edentulism), oral cancer, and congenital disabilities such as cleft lip and palate (Petersen, 2003). Good oral health is essential for children's well-being. Healthy teeth support key functions such as speech, smiling, socializing, and eating. Teeth also help provide the form and shape of a child's face (FDI Word Dental Federation, 2015). Good oral health in childhood can also help to prevent halitosis, dental caries, periodontal disease (FDI, 2015; Petersen, 2003), and increase the likelihood of children keeping their teeth into old age.

Obtaining and maintaining healthy teeth requires children to develop good oral health practices. These include effective tooth brushing, flossing and healthy eating habits. Yet, this is not the case for many children, with oral diseases, especially dental caries and periodontal disease, being major diseases in PNG (L. Crocombe et al., 2017). Previous studies in PNG suggest that children have a greater prevalence of dental caries compared to studies in African countries such as Zimbabwe (Chironga & Manji, 1989) and Ghana (Addo-Yobo, Williams, & Curzon, 1991). Periodontal disease among children in PNG is also common, with the Huli Oral Health study reporting that 30% of 6 and 12-year-olds have periodontal disease (Newell, 2002).

Current oral health services available to children in PNG are extraction of tooth decay, extraction of primary teeth that are exfoliating, simple tooth restorations, temporary fillings and orthodontic treatment. These treatments can be accessed through dental clinics in the public hospital (National Department of Health, 2007). On occasion at schools, oral health services such as education and mouth check ups are carried out (Grundy, Dakulala, Wai, Maalsen, & Whittaker, 2019).

The Oral Health Status study of Port Moresby school children by Amaratunge and Pouru in 1987 reported 8.6% of 209 children had periodontal disease (Amaratunge and Pouru, 1987). Another survey by Amaratunge and colleagues (1991) reported 82.5% of 200 children with periodontal disease (Amaratunge et al., 1991). There is also evidence to suggest that 90% of

children in PNG do not practice good oral hygiene (Amaratunge et al., 1991; Amaratunge & Pouru, 1987; Bandara, 1997; Newell, 2002; Slome, Rozier, & Seidel, 1980). Further, PNG has the highest incidence rate of oral cancer in the world (Pollaers, Kujan, Johnson, & Farah, 2017), primarily due to smoking and the common practice of chewing betel nut (Thomas et al., 2007). A previous study reported that betel nut chewing started at a very young age in PNG (Baldwin, Koka, & Power, 2007; WHO, 2012).

Betel nut (also called areca nut), which is mainly found in South Asia and Pacific Islands, is a fruit of the areca catechu palm. When fresh, the fruit inside the green husk is very soft but when it ripens, the fruit hardens and the husk turns yellow (Prabhu et al., 2014; Sharan, Mehrotra, Choudhury, & Asotra, 2012). This fruit with its spice-like flavour, is chewed as a stimulant as it contains a psychoactive substance (Gupta & Ray, 2004). Chewing of betel nut is a major risk factor for oral cancer because the main alkaloid of the areca nut (betel nut); arecoline has carcinogenetic properties (Chuerduangphui et al., 2018; Odell, 2017). In PNG, betelnut chewing is prevalent among children and adults (Baldwin et al., 2007; Ome-Kaius et al., 2015). A study by Baldwin et al. (2007) in PNG reported that 89.6% of 615 participants chew betelnut. While previous research in PNG examining the oral health status of children tend to have been undertaken 10 to 30 years ago, anecdotal evidence suggests that tooth decay is a significant problem in children and that periodontal disease is the leading cause of tooth loss in PNG (L. Crocombe et al., 2017). Together, these figures highlight the importance and need for children in PNG to have improved access to dental services to develop good oral health care practices.

Yet, there appears to have been no prior research identifying the specific types of barriers that families encounter, when attempting to access dental health care for children in PNG. Identifying barriers to dental health care for children in PNG is a vital next step in proposing ways to improve service access. This thesis aims to provide greater insight into some of the barriers encountered by families when trying to access paediatric dental services in PNG.

Chapter 2: Background Literature

Prevalence of oral disease

Internationally, an estimated 90% of people suffer from some form of oral disease in their lifetime (James et al., 2018; Jin et al., 2016). Dental caries occurs due to demineralisation of enamel and dentine (the hard tissues of the teeth) by the conversion of free sugars into organic acids by bacteria in dental plaque (WHO, 2018). Dental caries is the most common dental disease in children. In some developing countries, the prevalence of dental caries in permanent dentition of children is lower than the primary dentition (baby teeth) (Farooqi et al., 2015; Hiremath et al., 2016; Ojukwu, Balarabe, & Akhiwu, 2019; Wyne, Al-Ghorabi, Al-Asiri, & Khan, 2002). The incidence of dental caries in children in developing countries has been expected to increase due to increased intake of sugary products and limited fluoride exposure (Petersen, 2003). Importantly, many of the most common oral diseases, such as dental caries and periodontal disease (defined as a disease that affects the tissues surrounding and supporting the tooth (WHO, 2018)), are preventable (FDI, 2015).

Previous research examining the oral health of children in PNG was undertaken 10 to 30 years ago. This literature review focuses on studies of children's dental health in PNG that were conducted after the 1980s when PNG was beginning to be introduced to refined food (Amaratunge et al., 1991; Bandara, 1997; Malden, 1983; Patel, 1990). In 1985, Newell and colleagues (2002) undertook an oral health study to gain a greater understanding of oral health in the Southern Highlands province (Newell, 2002). Multistage cluster sampling was used to select the participants aged between 6 and 64 years old. A total of 871 oral examinations were conducted using the WHO-approved protocols for basic oral health surveys (WHO, 2013). Findings showed that 98% of people lacked good oral hygiene practice, and 69% had one or more dental caries. The results also showed that 53% of children aged 3-12 years had experiences of dental caries and 97% of children aged 6 and 12 years had poor periodontal health status. Newell and colleagues concluded that access to dental health services was limited in many parts of PNG. It was recommended that treatments such as scaling and polishing

identified as part of this study, including flossing and education on the importance of regular check-ups by dental professionals, must be promoted.

In 1987, Amaratunge and Pouru surveyed and completed oral examinations of 209 grade 2 students with a mean age of 10.37 years and they were from three schools in Port Moresby, PNG (Amaratunge & Pouro, 1987). Results showed that the mean caries prevalence was 0.59, which according to WHO (World Health Organization, 2013) is low. Periodontal disease status of the children was also low, but almost all the students had soft deposits on all surfaces of the teeth. This finding suggests the presence of poor oral hygiene practices (i.e. not practising toothbrushing habits, not visiting the dentist regularly for oral health check-up) among children in PNG.

In 1988, Soo conducted a survey of primary school children in the Western Highlands province of PNG (Soo, 1988). This study aimed to provide data for the planning and evaluation of oral health services in the region. A stratified sampling method was used to recruit 5340 students in the seven districts of the province. Findings from this study revealed that 67 (1%) of the children were free of periodontal disease, but 5273 (99%) of them had poor periodontal health. 2814 (53%) of children in the study were affected by dental caries, but 377 (13.4%) of the children affected by dental caries, had restorations done on their teeth. These findings revealed that all the children lacked the knowledge of practising good oral hygiene.

Amaratunge and colleagues (1991) conducted a survey to determine the oral health of 200 randomly selected students in Port Moresby, PNG (Amaratunge et al., 1991). Students (mean age = 15.4 years, standard deviation (SD) = 1.23) were randomly selected from two schools using class attendance books. This study aimed to determine the presence of periodontal disease and dental caries among adolescents in PNG. Similar to other studies (Amaratunge & Pouru, 1987; Bandara, 1997; Patel, 1990), the estimated prevalence of dental caries was 56% (112 students), and 82.5% (165) of students had periodontal disease. Amaratunge and colleagues concluded that there is a need for dental health education for students and school-based oral health programs to treat children in PNG.

In 1991, an oral health survey in Port Moresby, PNG indicated a high prevalence of caries (A Amaratunge et al., 1991). Estimates suggested that 56% of 12-year-old children had dental caries, with 6% of all children having five or more decayed, missing or filled teeth (dmft), due to dental caries. The periodontal health status of the children was also poor with 195 children (97.5%) having bleeding gums and periodontal disease.

In 1997, Bandara examined the oral health status of 12 to15-year-old children in the Southern Highlands Province of PNG (Bandara, 1997). The main objective of this survey was to obtain essential knowledge about children's oral health status, to determine monitoring and treatment needs and to evaluate current oral health strategies in the province. Using a stratified cluster sampling technique, 555 students were recruited and examined from schools in the three districts within the province. A questionnaire was also given to participating students to find out their views, experiences and habits of oral health. Findings showed that 312 (57%) students had experienced dental caries. More than half of all students required some form of dental treatment in the Southern Highlands province, and 194 (35%) students had periodontal disease. This varies considerably to the other reports because there are differences in oral hygiene practises in different sociocultural groups and the degree of coverage of health education. There were also significant differences in the prevalence of caries between the three districts. Therefore, the authors recommended analysis (detailed examination) of the concentrations of fluoride in the water and suggested that differences across districts may also be due to variations in diet. Adequate exposure to fluoride is an essential factor in the prevention of dental caries (World Health Organization, 2018).

Bandara and colleagues' study, also revealed a potential increase in the prevalence of caries from 30% in an earlier 1985 study (Newell, 2002) to 57% in 1997 (Bandara, 1997). As previously mentioned, it has been suggested that increases in the prevalence of dental caries among children in PNG between 1985 and 1995 may be, at least in part, due to changes in diet from traditional to manufactured foods (Newell, 2002). Such changes may also be due to decreasing availability and access to dental resources and services, and a lack of community health workers to perform oral examinations, make early diagnoses and deliver treatment plans

(i.e. simple extractions), and to run school health outreaches. Research in PNG to date shows a clear need for more oral health education to children and also the parents. Oral health services need to be made more accessible and affordable for children and their families.

The burden of oral diseases

Children's oral health is also an integral part of overall wellbeing (Petersen, 2003; Von Arx & Lozanoff, 2016). Good oral health supports vital human functions (i.e. speaking, smiling, socialising and eating) with a completely functional mouth being critical for all phases of life (Babu & Gomes, 2011; FDI Word Dental Federation, 2015). Associations between children's oral health and their health-related quality of life (QoL) have been widely reported (Alsumait et al., 2015; Duangthip, Gao, Chen, Lo, & Chu, 2020; Geetha Priya, Asokan, & Kandaswamy, 2018; Nemati, Ghasempour, & Khafri, 2016). These types of negative associations with QoL may be due to the undesirable effects of dental problems, especially tooth loss due to dental caries, malocclusions and dental infection (Berhan Nordin, Shoaib, Mohd Yusof, Manan, & Othman, 2019; Granville-Garcia et al., 2018; Kramer et al., 2013; Pulache, Abanto, Oliveira, Bönecker, & Porras, 2016).

Children experiencing dental problems may encounter significant pain, go through problems with eating and become anxious (Gherunpong, Tsakos, & Sheiham, 2004). Children with dental problems may also be absent from school (Jackson, Vann, Kotch, Pahel, & Lee, 2011) due to embarrassment and/or feelings of shame related to their malaligned or discoloured teeth, and may experience bullying and teasing by others (Al-Omari et al., 2014; DiBiase & Sandler, 2001; Seehra, Newton, & DiBiase, 2011). It is known as a serious public health matter because of its likelihood to increase the risk of dental caries in the permanent dentition. This can lead to poor oral health that has adverse effects on the growth and intellectual development of the child (Dolah, Eusufzai, Alam, & Ahmad, 2020).Children may avoid social contact with friends because of their facial appearance (Foster Page, Thomson, Ukra, & Farella, 2013; Pulache et al., 2016). Based on parent-reporting, Martins-Júnior et al. (2013) found that caries during early childhood has adverse effects on oral health-related QoL. These effects included toothache, difficulty in eating and drinking, and sleep disruptions. Limited access to dental services in

childhood is also associated with a greater likelihood of losing adult teeth at a young age (D'Mello, 2011). Dental anxiety can affect patient management and dental attendance and can persist even in adulthood, leading to dental avoidance (Abanto, Vidigal, Carvalho, Sa, & Bonecker, 2017). Together, this evidence clearly shows the potential for poor oral health to adversely impact children's QoL.

Furthermore, poor oral health in childhood can lead to a range of conditions, including halitosis, dental caries and periodontal disease (FDI World Dental Federation, 2015; Peres et al., 2019). Such diseases are associated with increased risks for other long-term health conditions, including diabetes, cardiovascular disease, and dementia (Babu & Gomes, 2011; Craig & Kamer, 2016; Li, Kolltveit, Tronstad, & Olsen, 2000; Peres et al., 2019; Petersen, 2004; Wallace, 2016). One of the common dental conditions among school children is malocclusion which is the change of the ideal alignment of the dental arches (Pulache et al., 2016). Malocclusion may develop and impacts on overall health as a result of premature loss of teeth due to dental caries or traumatic dental injuries (Aldrigui et al., 2011; Carvalho et al., 2013; Mtaya, Astrom, & Brudvik, 2008). Malocclusions and traumatic dental injuries may also have an impact on children's emotional and social wellbeing, including negative psychosocial consequences (i.e. depression and anxiety) and dissatisfaction with personal appearance (Daly, Batchelor, Treasure, & Watt, 2013; Mtaya et al., 2008; Pulache et al., 2016). A systematic review and meta-analysis by Ling, Hai Ming, McGrath, Sun, and Wong (2018) found links between malocclusion (Gill & Naini, 2011) and poor oral health-related quality of life among adolescents. This review was conducted to find the association between malocclusion and the oral health-related quality of life (OHRQL). For this review, studies were selected that used the Child Perceptions Questionnaire (CPQ) to measure OHRQL, and the Dental Aesthetic Index (DAI), Index of Orthodontic Treatment Need (IOTN), and Index of Complexity, Outcome and Need (ICON) to measure malocclusion. According to the review, the negative consequences of malocclusion included limited function of the mouth, and impact on social and emotional wellbeing. For example, adolescents with malocclusion may experience bleeding gums due to difficulty in brushing and flossing all tooth surfaces of their overcrowded teeth, and this can

cause them embarrassment. Certain malocclusions may cause adolescents to feel unattractive; for example, someone with protruding anterior teeth may feel unattractive and may also be teased.

Barriers to accessing paediatric dental care

While not at all examined in PNG, research from other countries provides valuable indicators as to possible barriers to dental service access for children. For example, a leading, internationally recognised barrier to accessing paediatric dental services, is socio-economic status (SES), especially among developing countries and significantly contributes to poor oral health for the paediatric populations (Nicol, Al-Hanbali, King, Slack-Smith, & Cherian, 2014).

Prasanth and colleagues conducted a 3-week cross-sectional study of 323 12-year-old children in Nellore City, India to determine the utilisation of dental services among the children (Prasanth, Reddy, Kumar, Gomasani, & Athuluru, 2019). Participants were randomly selected from 8 different schools, and data collection was done using a questionnaire. The sample included 151 (46.8%) males and 172 (53.2%) females. The findings from this study showed that barriers to the utilisation of dental services were: no perceived need (28.2%), fear of the dentist (10.8%), location of clinic (1.9%), fear of injection (17%) and noise from dental equipment (1.5%). The study authors concluded that there was low utilisation of dental services by the students.

Comassetto et al. (2019) carried out a cross-sectional study of 560 children with the ages between 0 and 5 years old (Comassetto et al., 2019). Parents responsible for the children were handed questionnaires to fill, and an oral examination was done on their children by experienced dentists. The objective of this study was to determine the access and factors in connection to dental visits of children in the city of Porto Alegre, Brazil. The findings showed that 382 children never visited a dental clinic. The key barriers to parents seeking dental treatment were: no perceived need (48.7%), no access to the health centre (15.8%) and lack of interest from parents (12.1%). The study concluded that accessing oral health services for early

childhood was low and that it is essential to promote oral health among children and their families.

Hachombwa, Malambo, and Anthony (2017) conducted a cross-sectional study of 353 students aged 11-20 years of age attending Chifubu secondary school in Ndola, Zambia (Hachombwa et al., 2017). Random selection of the students was conducted, and data collection was done using a self-administered questionnaire. This study was conducted for the determination of awareness and perception of oral health care and how they influence the utilisation of oral health care. The findings from the survey show that there was no perceived need for dental service (31.2%), distance to the clinic was a problem (17.3%) as was the cost of the treatment (15%). The study recommended regular oral health awareness campaigns.

Onyejaka, Folayan, and Folaranmi's (2016) cross-sectional study of 1,406 children (aged 8 to 11 years) found that dentists saw 791 (56%) children (Onyejaka, Folayan, & Folaranmi, 2016). However, 615 (43.7%) children who were seen at the first visit could not be located for dental care follow up over a 12-month period. Families of participating children who were revisited for follow up at 12-months were asked why they did or did not access dental health care services. Time was the main barrier to accessing paediatric dental services, with 292 (43%) parents stating that they had no time to access dental services. The authors concluded that time was a key barrier to service access, even across different socio-economic groups. Interestingly, low SES families were more likely to have time to access dental care than higher SES families.

Eigbobo and Obiajunwa (2016) conducted a cross-sectional study of 200 students (aged 12-15 years, 102 (51%) females) to investigate barriers to accessing dental services among school children in Port Harcourt, Nigeria (Eigbobo & Obiajunwa, 2016). Two hundred students participated in this study. Most commonly reported barriers to access dental services included a perceived lack of need (64.3%), expensive dental treatment costs (10.1%) and access to dental clinic meaning dental clinics are not nearby (5.4%).

Priyadarshini, Puranik, and Uma (2015) conducted a cross-sectional study of 6 to 12- year-old students in Bangarpet taluk, Karnataka, India (Priyadarshini et al., 2015). A sample size of 420

was obtained by using the multistage sampling method. An equal number of the sample was divided between the urban and rural regions. Data was collected using a 14-item validated questionnaire. This study aimed to determine the factors in association with the utilization of oral health services among the children of Bangarpet taluk. The findings from the survey showed that barriers to oral health services that were commonly reported by participants included: the need for multiple appointments for dental treatment (60%), dental procedures affecting parents' work (57%), parental fear of injection (55%), dental treatment being time-consuming (55%), fear of dental treatment (48%), expensive transportation (48%), no dental clinic nearby (40%), painful dental treatment (40%), and no time for a dental visit (36%).

Valencia and colleagues' (2014) qualitative descriptive study included semi-structured interviews with caregivers (community mothers who volunteer their services for new parents) and focus group interviews with 37 biological mothers of the children (Valencia et al., 2014). Barriers to accessing paediatric dental care included low SES, poor maternal education, the geographical location of the service provider (distance from work and also the transport fares), and difficulty in scheduling appointments. Child age was also a barrier, as dentists were reported to refuse treatment of very young children (6 years and younger) because of concerns about children’s behaviour during the visit and the potential need for additional time for these consultations. Of those parents who were eligible for subsidised government support for paediatric dental services, there were reports of negative feedback which means that their appointments are sometimes rejected by their contributory scheme or services delayed. Parents also reported dissatisfaction in the level of care provided by dental professionals, being similar to the way they treat adults. Parents said that they would prefer their children to be treated more age-appropriately.

Amin, Perez and Nyachhyon in 2014, conducted a quantitative survey of 795 parents of children aged between 1 and 19 years of age in Canada (Amin, Perez, & Nyachhyon, 2014). The aim was to assess parents' knowledge of the benefits of dental health care programs, their use of dental services, and the type of dental services accessed by their children in the past 12-months. Key barriers to dental services for their children included parents not having any perceived need

for dental treatment of their children (51%), and parents' lack of knowledge of the dental services covered by the Alberta Child Health Benefit (35.1%). One third (35%) of parents did not have any knowledge about paediatric dental services. Other commonly reported barriers included: a lack of availability or lack of subsidised services (7.8%), language barriers (7%), and transportation (6%). Interestingly, nearly 5% of parents in the survey also reported a personal fear of dental services.

Denloye and colleagues conducted a cross-sectional study of 457 school-aged children in Ibadan, Nigeria, to determine the factors affecting their utilisation of oral health services (Denloye, Ajayi, Bankole, & Bamidele, 2010). The sample size of the study was achieved by using the multistage sampling method from the list of schools in Ibadan. The data collection was done by the students completing the self-administered questionnaire given to them. Four hundred fifty-seven secondary school students between 8 and 16 years old participated in the study. 217 (47.5%) were male students and 240 (52.5%) were female students. The findings showed that 392 (85.8%) of the students never visited the dentist, while 63 (13.8%) had visited the dentist. Two (0.4%) of the students did not respond to the question about dental visit. The barriers to the dental visits were: no perceived dental problem (82.8%), the students were not taken by parents (7.7%), financial problem (4.4%), do not know the location of dental clinic (4.4%) and no information of regular dental visits (0.8%).

Gross-Panico and Freeman (2012) conducted a survey of 34 parents/guardians of children from birth to 18 years of age, who were treated at the Catholic Health East West Valley Children's Dental clinic in Chandler, Arizona, United States of America (USA) (Gross-Panico & Freeman, 2012). Parents who attended the clinic during November in 2008 participated in the survey. Findings from the study showed that 16 (47.1%) of the parents mentioned that cost of the treatment was the most important barrier, 4 (11.8%) parents stated that this inconvenience to time was also a significant barrier and 6 (17%) parents said that distance travelled to the clinic was also a problem.

Akaji and colleagues (2007) conducted a cross-sectional study of 502 secondary school students aged between 10 and 19 years of age in the Nigeran state of Lagos (Akaji, Oredugba, & Jeboda, 2007). They used the multistage sampling method to select students from four secondary schools in the rural and urban regions of the state to determine the utilisation of the dental care services among the students 12-months and the reasons for the dental services among the students who had utilised or have never utilised the dental services. A self- administered questionnaire was used to collect data. The findings from the study showed that 75 (14.9%) students had visited the dental clinic in the previous 12-months. But 427 (81.5%) students never visited the dental clinic, and their main barriers were: no dental problems (77%), no parental support (12.6%), lack of knowledge of dental clinic (4%), no time for dental visits (2.1%), financial reasons (1.9%), not bothered bout their oral health (0.5%) and some feared dentists (0.5%). 18 of the 75 students who attended the dental clinic were dissatisfied with the treatment and did not make any follow-up dental visit. Their reasons were because they waited for too long before being seen (27.8%), they experienced painful treatment (27.8%), inconvenient appointment (16.6%), and the dental personnel were rude (5.6%). In conclusion, a school oral health program needs to be developed, which will include oral health awareness and encouraging students to undertake routine dental visits.

Kelly, Binkley, Neace, and Gale (2005) conducted eight focus groups in the United States, with a stratified random sample of 76 parents of children aged 4 to 12 years (Kelly et al., 2005). The sample included parents of African American and white ethnic groups who had or had not accessed paediatric dental services in the past two years. Identified barriers included difficulties locating medical providers, a lack of knowledge about dental care, fear of additional costs for medical insurance, the challenge of finding Medicaid providers, and concerns about the attitudes of dentists not accepting their health benefit card. Parents who had used Medicaid dental services for their children mentioned that they encountered racial and ethnic discrimination, negative treatment from the staff and felt that they were a low priority. Barriers reported by parents who had not accessed paediatric dental care included a lack of knowledge about standards of care and a perceived lack of control of their child's oral health behaviour. A belief

that dental care is less significant than medical care, and doubtfulness and confusion about medical insurance for oral health services, were also reported. Some ethnic differences were also observed. Parents of African American ethnicity reported their fears about visiting the dentist, being too busy for appointments, and having a lack of assistance from family or friends to support access to dental care for their children.

Chhabra and colleague (2012) conducted a cross-sectional study of 653 parents of 1-4-year-old children attending the Department of Paedodontics and Preventive Dentistry, Krishna Dental College and Hospital, India (Chhabra & Chhabra, 2012). Using a questionnaire, this study aimed to assess parents' knowledge, attitude and beliefs of oral health and care of their children. Findings revealed some barriers to accessing dental care for children: including fear of the dentist (55%) (this may be due to different cultural beliefs in different coutries and the knowledge and awareness of dental visits in different countries), expensive dental treatment (10.3%), problems accessing dental clinic (8.6%), time limitations (7.7%) and cultural beliefs in association with dental treatment (15.9%). The study concluded that the importance of oral health can be emphasised by minimising the barriers to attending oral health care and providing accessible and affordable oral health services.

Eslamipour and colleague's (2015) descriptive study aimed to identify access barriers among 390 parents of 6 to 14-year-old children in Isfahan, Iran (Eslamipour, Heydari, Mousavizadeh, & Ghayor, 2015). Using a questionnaire and conducting interviews, findings showed that the main barriers to accessing oral health services for their children were the high cost of dental services, limited dental insurance coverage and child's dental fear. A similar cross-sectional study was conducted by Roshanak and colleagues in 2018 to assess the barriers to access oral health services for children and the service satisfaction viewpoint of parents' referrals to dental clinics in Tehran City, Iran (Roshanak, Fatemeh, & Alireza, 2019). Participants included 262 parents who completed a study questionnaire. Findings from this study showed that the key barriers to accessing paediatric dental services were inadequate dental insurance coverage, length of time in waiting rooms, and costs of dental treatment.

Momeni and colleagues conducted a qualitative study with the aim to obtain the insights of Iranian mothers in regards to barriers to maintaining and improving oral health with their children (Momeni, Sargeran, Yazdani, & Shahbazi Sighaldeh, 2019). Fifty-eight Iranian mothers with children in school, participated in focus group discussions and semi-structured interviews. Identified barriers at the organisational level included expensive dental services, inadequate insurance and lack of a nearby dental clinic. At the provider level, most mothers stated that the dentists were hesitant to treat their children, there was no client-centric approach and necessary information was not provided by the dentist. At the family level, barriers were insufficient money to afford dental treatment, lack of parent knowledge about oral health, and anxiety and fear of dental treatments. This study concluded that oral health education is one way to defeat barriers.

Folayan and colleagues (2013) conducted a cross-sectional study aimed at determining factors that restrict the utilisation of paediatric dental health service (Folayan, Ozeigbe, Oyedele, & Ola, 2013). School students (n = 139) aged between 9 and 12 years were eligible to take part in the study. Students completed structured questionnaires for data collection. Findings from the study showed barriers to utilisation of dental services by the students and they are: no pain (50.7%), no perceived need (28.3%), parents not interested (10.1%) and unable to afford dental treatment (1.4%). It was concluded that oral health education is essential to increasing oral health service utilisation and attempts must be created to strengthen preventive dental treatment.

Walker and colleagues conducted eight focus group meetings comprised of Latino parents (Walker et al., 2017). The parents were recruited by identification of recent attendees of the La Plaza who required oral health care and also by the announcement of the study on the community radio station asking for interested parents to partake. One hundred and thirty (130) parents (100 females and 30 males) were included in the study. Findings from the study showed that parents mentioned the main barriers that inhibit their child's oral health are finances, such as the high cost of dental services and their inadequate income and insurance, to be able to afford dental treatment for their child. Other main barriers were the lack of availability of services in the community and also transportation to access the services.

Summary

Dental studies in PNG 10 to 30 years ago revealed that the most common oral diseases in children were dental caries and periodontal diseases. The children also lacked oral hygiene practice. School-based dental programs to improve the oral health status of the children, was a common recommendation. Good oral health in a child with will have a positive impact on their QoL. Studies from other countries revealed that the most common barriers highlighted from these studies are: dental treatment costs, transport costs, distance to dental clinic, lack of subsidised dental service, lack of knowledge of dental service, long waiting time, no perceived need and fear. Further investigation is also required into the barriers that prevent or impede parents in PNG from accessing dental care for their children. This is so that recommendations and suggestions can be pointed out to overcome these barriers to improve dental access for children and to improve their oral health.

The study of barriers to accessing paediatric dental services can be informed using a conceptual model of service access.

A conceptual model of patient-centred access to healthcare

Access to healthcare is defined as the process or likelihood of getting near to a place or people (Cambridge Dictionary, n.d). Previous studies have adopted varying definitions and theories about access to health care services. Penchansky and Thomas (1981) defined access as a concept representing the degree of fit between the clients and the system (Penchansky & Thomas, 1981). They viewed access as specific areas of fit between the population and the health care system. Specific areas of access included availability, accessibility, accommodation, affordability, and acceptability. Saurman (2016) later argued that one dimension from the Penchansky and Thomas theory of access was missing, being awareness (Saurman, 2016). Saurman argued that awareness is important to access and should be considered as a part of the theoretical framework. Levesque et al. (2013) defined access as "…the opportunity to identify needs, to seek health care services, to reach, to obtain or use health care services and to actually have the need for the services" (page 4). The current thesis is, in part, informed by the conceptual framework offered by Levesque and colleagues (Levesque et al., 2013). Each

dimension of this conceptual model of access to health care is now outlined, with an overview of the model provided in Figure 1.

Approachability

Approachability refers to the extent that individuals who are dealing with their health problems can find some form of current health facilities that are nearby and that is effective in the person's wellbeing. Services such as clinics or health care centres can make themselves more approachable to the society surrounding them. This can be managed through information in the form of brochures, posters, social media or radio and television advertisements (Levesque et al., 2013).

Acceptability

The acceptability dimension of the Levesque framework is in relation to the culture and the society of the people requiring the service. The service provider should be acceptable to the individuals. An example would be the sex of the health service provider. In some societies and cultures, women would prefer female workers to treat them than have males see them (Levesque et al., 2013).

Availability and Accommodation

Availability is related to the situation to the extent that a service is physically reachable and able to be accessed when needed. This dimension of access requires sufficient facilities and human resources with adequate capability to provide services. An example would be a well-equipped dental clinic located in a community with a dental professional practising in the area. When there is an uneven supply of the resources across all health care systems, then there are restrictions on the availability of services (Levesque et al., 2013). There are three perspectives that availability of healthcare can be viewed from: that is the location of the services, if the services and needs are suitable, and willingness to serve the people in a certain community (Wallace & MacEntee, 2012).

Affordability

Affordability of health care services is a reflection of the financial capability of individuals to spend resources and time accessing suitable services (Hjortsberg & Mwikisa, 2002; Levesque et al., 2013). This dimension of access is used widely in the health care sector. People who live in poverty or who are marginalised, are often unable to pay for most services, whereas other people who can afford the services, can pay for the services provided (Gulliford et al., 2002; Levesque et al., 2013). An example is a study conducted in Kentucky USA, in which their findings showed that one of the key barriers to accessing dental care for children are expenses associated with dental treatment (Kelly et al., 2005). The ability to afford dental service or insurance for dental services is a known barrier to individuals with low-incomes (Wallace & MacEntee, 2012).

Appropriateness

Appropriateness refers to the extent to which services meet the needs of patients and the quality of the services provided. The appropriateness of accessing a service depends on the individual who uses the services. An appropriate service should lead to satisfied health outcomes (Levesque et al., 2013). Guay (2004) states that accessing appropriate oral health services by poor and marginalised individuals is a complex issue that will take an indefinite period of time to solve.

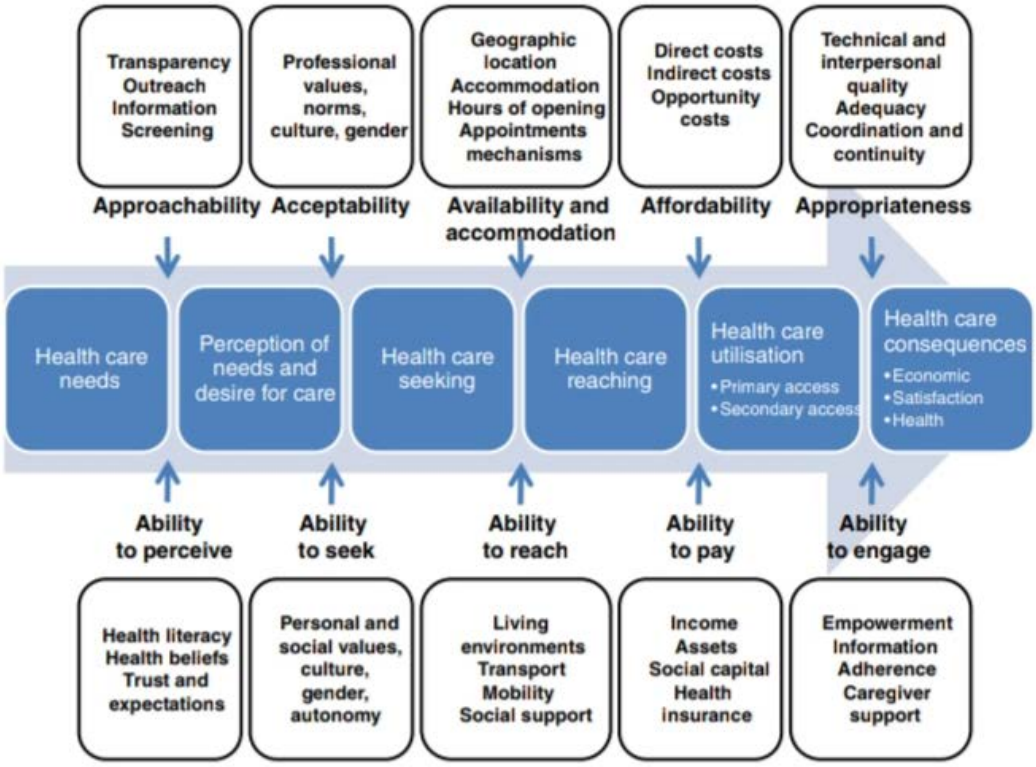

Figure 1. Framework of access to healthcare (reproduced with permission from (Levesque et al., 2013)).

Together, the above research suggests that key barriers to accessing paediatric dental services include: low SES, the geographical location of dental services, difficulty accessing subsidised dental care, and a lack of knowledge about the importance of good oral health care for children. Yet, the specific barriers to accessing paediatric dental services in PNG are yet to be determined.

Current study aims

This study aims to address current gaps in knowledge by identifying barriers to accessing paediatric dental services for children in PNG, in an effort to support children's oral health.

Specific study aims were to:

1. Identify specific barriers to accessing paediatric dental services in of PNG;
2. Examine whether barriers to access differ by child age groups (1-3-year-olds and 4-6-year-olds), sex (male/female), and/or area of residence (urban/rural);
3. Determine parents' understanding of children's oral health; and

4. Gather suggestions from families around how to improve access to paediatric dental services in PNG.

Chapter 3: Methods

Design

The current study is a primarily quantitative, cross-sectional (urban/ rural) survey based on parent-reported data. Quantitative research is a method that uses scientific and mathematical data to understand a problem by the investigation of the relationship among the variables with the intent for explanation, prediction and phenomenal control (Creswell & Creswell, 2018). A small number of qualitative questions are also included. This research is informed by a holistic conceptual framework developed by Levesque, Harris, and Russell (2013), examining the following aspects of access to paediatric dental services: Approachability, Acceptability, Availability, Affordability, and Appropriateness.

Approvals

Ethical approval for this study was gained from the Auckland University of Technology Ethics Committee (AUTEC, reference number 19/199) (Appendix A). All study processes complied with the Helsinki Declaration of 1975. Approval for data collection from Morobe Provincial Health Authority was given by word of mouth. Prior to the collection of any study data, written informed consent was obtained from all participating parents.

Study criteria

For inclusion in this study, adults (18 years or older) needed to be:

a) the parent of a child or children aged between 0-6 years at the time of the survey
b) residing (defined as living in a location for more than one year) in the Morobe province of PNG to ensure feasibility
c) English speaking or speaking Pidgin English, and
d) able to provide written informed consent. Parents living in Morobe Province for less than one year and those who did not speak English or Pidgin English were excluded.

Sample characteristics

A total of 40 parents completed the study survey. Table 1 presents an overview of the characteristics of participating parents and their children. Of those parents who took part, 28

(70%) were females and 12 (30%) were males with a mean age of 33.15 years and standard deviation (SD) of 6.74 years. An equal number of parents were from the rural (n = 20, 50%) and urban (n = 20, 50%) areas of the Morobe province in PNG. More than two-thirds of parents (67.5%) were originally from the Nawaeb district of the Morobe Province. Fourteen (35%) parents had completed primary school, and fourteen (35%) had completed high school education. In terms of employment status, 28 (70%) parents were unemployed. The majority of children were female (n = 27, 67.5%), with a mean age of 3.75 years (SD = 1.67) at the time of survey completion.

Table 1. Sample characteristics of children and parents

	Total sample (n = 40)	Urban residents (n = 20)	Rural residents (n = 20)	Test statistic	P value
Child characteristics					
Mean (SD) age (years)	3.75 (1.67)	3.35 (1.61)	4.25 (1.61)	t (40) = -0.35	0.73
Sex					
Female	27 (67.5)	14 (70.0)	13 (65.0)	X2 (1, n = 40) = 0.11	0.73
Male	13 (32.5)	6 (30.0)	7 (35.0)		
Parent characteristics					
Mean (SD) age (years)	33.15 (6.74)	31.80 (6.27)	34.50 (7.08)	t (1, n = 40) = 1.52	0.13
Sex					
Female	28 (70.0)	14 (70.0)	14 (70.0)	X2 (1, n = 40) = .00	1.00
Male	12 (30.0)	6 (30.0)	6 (30.0)		
District of origin					
Nawaeb	27 (67.5)	8 (40.0)	19 (95.0)	X^2 (7, n = 40) = 14.28	0.04
Bulolo	1 (2.5)	1 (5.0)	0 (0.00)		
Finschafen	0 (0.0)	0 (0.00)	0 (0.00)		
Huon	2 (5.0)	2 (10.0)	0 (0.00)		
Kabwum	1 (2.5)	1 (5.0)	0 (0.00)		
Lae	1 (2.5)	1 (5.0)	0 (0.00)		
Markham	2 (5.0)	2 (10.0)	0 (0.00)		
Tewae-Siassi	1 (2.5)	1 (5.0)	0 (0.00)		
Other	5 (12.5)	4 (20.0)	1 (5.0)		
Education level					
No formal schooling	2 (5.0)	1 (5.0)	1 (5.0)	X^2 (4, n = 40) = 9.857	0.04
Primary school completed	14 (35.0)	4 (20.0)	10 (50.0)		
High school partially completed	4 (10.0)	1 (25.0)	3 (15.0)		
High school completed	14 (35.0)	8 (57.1)	6 (30.0)		
College/University degree	6 (15.0)	6 (100.0)	0 (0.0)		
Current employment status					
Full-time	10 (25.0)	9 (90.0)	1 (10.0)	X^2 (2, n = 40) =8.686	0.01
Unemployed	28 (70.0)	10 (35.7)	18 (64.3)		
Self-employed	2 (5.0)	1 (50.0)	1 (50.0)		

Procedures

Participant recruitment

The survey was administered in the rural and urban areas of Morobe province in PNG. Study posters to raise awareness of the study and invite participation were placed on noticeboards. Announcements about the study were also made during church and market gatherings. Potential participants, upon sighting the advertisement and/or hearing about the study, were invited to enquire more about the study by approaching the lead researcher in-person. Once the potential participant had contacted the researcher and had shown interest in the study, brief screening was undertaken to check key inclusion criteria (i.e. parent and child's age, duration of living in the study area). If key criteria were met, a study information sheet and consent form were provided in person. Each person could choose whether to review an English or Pidgin English version of the study information sheet and consent form, to read through carefully and ask questions in person, if in doubt.

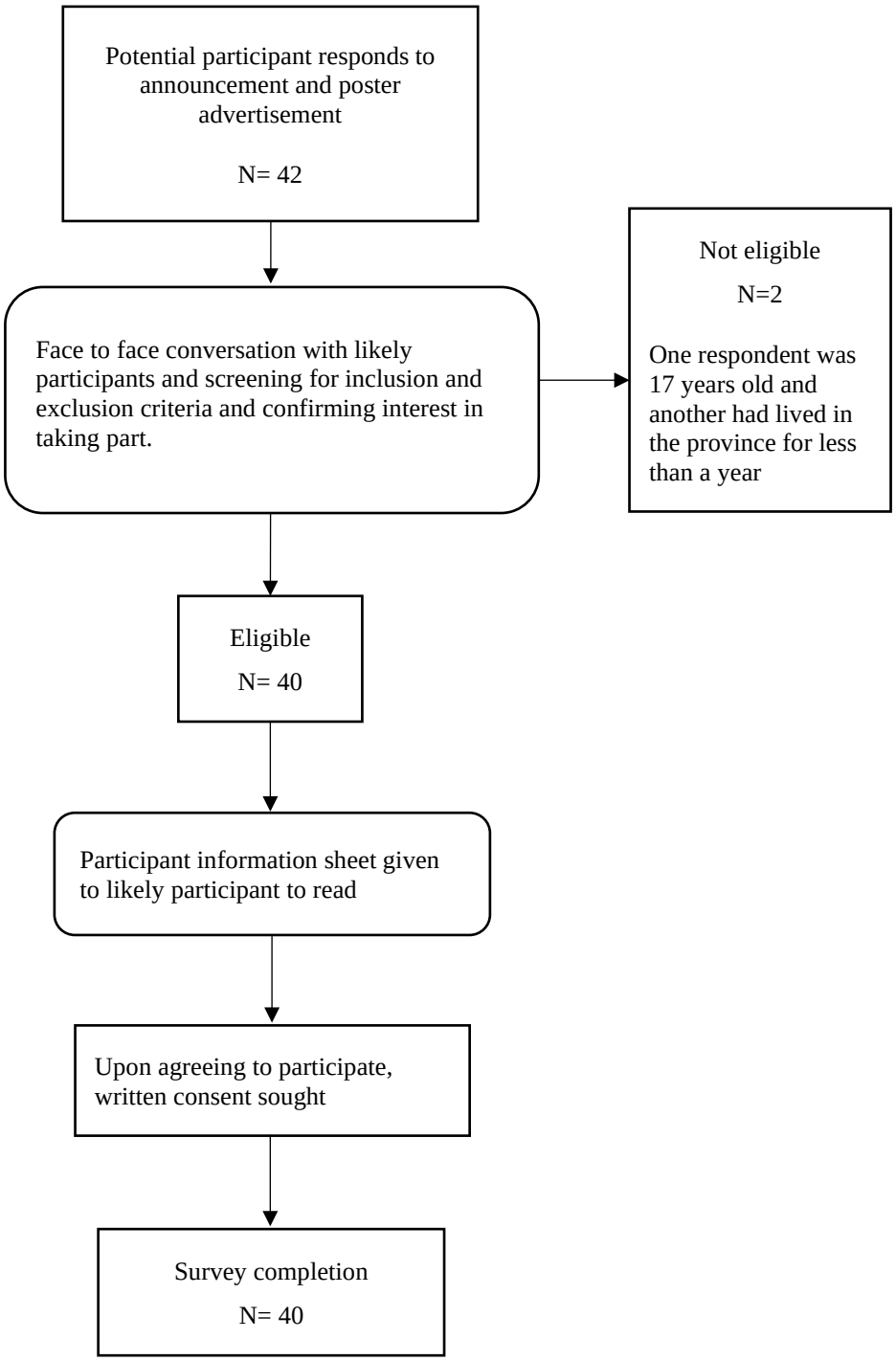

Figure 2. Overview of recruitment.

Survey development and validation

To check that conceptual elements and the meaning of content remain consistent, translation processes were followed to create Pidgin English (Tok Pisin) versions of all study information sheets, consent forms and the study survey (Abu-Ghazaleh et al., 2011; Tyupa, 2011). Text in each document was developed in English. Next, text in each document was translated into

Pidgin English by the researcher, who is from PNG and speaks fluent Pidgin English (Tok Pisin). Pidgin English in PNG is commonly called Tok Pisin (Velupillai, 2015). Once translated, both English and Pidgin English versions of the study forms were submitted to the institutional ethics committee (AUTEC) for approval.

Survey administration

Potential study participants were visited in their private residences. Upon arrival at the house, each potential participant was given a brief overview of the study by the researcher (thesis candidate). Some of the key points discussed were the likely duration of the survey (20-30 minutes), potential benefits of the research, and the importance of knowing about barriers to accessing dental services to help support better oral health care for children in PNG. The importance of preventing and treating oral disease in children was also discussed. The study information sheet and consent forms were provided and reviewed together with the researcher (see Appendices C and F – Information Sheet and Consent form). An opportunity was provided at the start of each home visit for potential participants to ask any questions they had about the study.

Before the collection of any study data, potential participants were invited to provide their written informed consent. One copy of the consent form was retained by the researcher and another copy of the consent form was retained by each consenting study participant. Then, each participant was invited to receive either the English or the Pidgin English version of the survey questionnaire. Each survey was presented in a semi-structured interview style, with most participants preferring the survey questions and response options to be read aloud by the researcher.

At the end of each home visit, participants received a small Koha ($20 shopping voucher) as a token of appreciation to acknowledge their time and contributions. All interviews were conducted by the researcher. All participant recruitment and data collection were completed over a 6-week period between August and September 2019.

Demographic information

Study-specific questions were used to collect demographic information about each participating parent (age, sex, ethnicity), child (age, sex), and family (size, composition, and education as a proxy measure of SES).

Experiences accessing paediatric dental services

Assessment of parents' experiences of accessing paediatric dental services for their child/ren in PNG was informed by the Levesque, Harris and Russell (2013) model of patient-centred access to healthcare. Using study-specific questions, many were adapted from oral health studies and health reports (European Patients Forum, 2016; Hemani, Rauf, Noori, & Faisal, 2017; Navoneiwa Linjewile–Marealle, 2017; Yaghoubi, M., & Mohammadi, 2017). Parents were asked to provide dichotomous (yes/no) or Likert scale ranging from 1 (Always) to 5 (Never), with higher scores meaning more barriers had been encountered. The difference in the number of questions in the Methods and Appendix D is due to the reason being that some questions in the questionnaire were similar and some questions were redundant in terms of addressing the key study aims, so were not included in the final analysis. Responses were based on parents' experiences of dental services for children in terms of the following criteria:

Accessibility and **Approachability** were assessed using the following four questions to determine parent's knowledge of child dental services and the location of the dental clinic.

1. "Are there any community health workers in your village or nearby who helped to let you know about the dental services that are available for children?"
2. "Have you seen any written information about dental services for children?"
3. "If so, was it provided in your language?"
4. "Have you been provided any information about how to access dental services for children or about the types of services that are provided?"

Availability and Accommodation were assessed using the following five questions to determine the availability of local dental services for children:

1. “Are there any dental services for children available in your village?”;
2. "Were you able to find out where dental services for children are located?”;
3. "Has a doctor ever referred your child to see a dentist?”;
4. "Do the hours of opening suit your needs?”;
5. "Are there any dental services available in your village?”

Affordability was assessed using the following three questions focused on the economic cost of dental treatment:

1. “Does it typically cost at the dentist when you take your child along?”
2. “Do you (or would you) need to pay for transportation to take your child to the nearest dentist?”
3. “Have you ever accessed subsidised dental service for your child/ren?”

Acceptability was accessed using the following two questions to capture parent’s impressions about the suitability of services for their family:

1. “If you have accessed any dental services for your child/ren, were services acceptable to you and your family in terms of your cultural values and beliefs?”
2. “Did the service providers interact appropriately with your child given their age?”

(APPROPRIATENESS)

Parental knowledge of reasons to access pediatric dental services

Parents' knowledge of reasons to access children’s dental services, beyond toothache, was assessed using the following question/s – “What is one thing or reason apart from toothache that would cause you to bring your child/ren to the dental clinic?”

Suggestions for improving access to pediatric dental services

Open-ended questions captured parents' suggestions to make accessing dental services easier for families. For example: “Have you got any suggestions on how we can make it easier for families to access dental care for children?”

Quality Control

Before the collection of any study data, the researcher undertook two practice interviews with a friend. During practice interviews, some mistakes in the delivery of the questionnaire were highlighted and subsequently corrected. These are rewording of some questions and rearranging sections of the questionnaire . Before undertaking any data analysis, it is essential to double-check for errors because it is easy to make inaccuracies when entering data into the data set (Pallant, 2016). Therefore, before analysing data, all entered data were double-checked against participants' responses recorded on the hard copy questionnaires.

Safety procedures

Researcher safety in the community was supported by a safety protocol for community-based research that has been developed with study supervisors and based on proven strategies from other health research undertaken at AUT. Examples of safety strategies included engaging in a phone conversation when arranging an interview, confirming the physical address for the visit, and asking about any potential risks at the property (i.e. dogs, nature of the entrance to the property). Additional safety strategies included letting University supervisors and someone in PNG know the physical location and expected duration of each visit, always having a charged mobile phone, and plenty of petrol in the researcher's vehicle.

Data management

Data for all study participants were recorded on hard copy paper versions of the survey and then entered into Statistical Package for the Social Sciences (SPSS) (Brace & Snelgar, 2000; Pallant, 2016). Information from all participants was kept confidential. This was achieved by each participant being assigned a unique participant registration number and study identifier. Knowledge of the process for assigning study identifiers was limited to the researcher and University supervisors to maintain confidentiality. All relevant study registration numbers and identifiers were recorded on the front page of all study documentation.

All data and participant information will be stored for 10 years in a locked cabinet at AUT in Auckland, New Zealand by the primary supervisor of the study. After 10 years, all electronic

information will be deleted, and paper forms will be shredded and destroyed according to University protocol. Data access was limited to the author of the current thesis and the study supervisors. All analyses were undertaken using SPSS version 25. Any missing data were recorded as such in SPSS and coded as '99' to avoid interference in the analysis.

Statistical Analysis

Following data cleaning and tests for normality, descriptive and parametric or non-parametric inferential statistics, as appropriate, were used to determine barriers to accessing paediatric dental services in PNG.

For Aim 1, descriptive statistics were used to determine the frequency and percentage of identified barriers (Pallant, 2016). The scores of the Likert scale in each question were summed to determine the overall level of access.

For Aim 2, independent samples t-tests were used to determine if the presence of barriers differed across age (1-3 years, 4-6 years), sex (male, female) and residence (urban, rural) groups. The mean level of access in the results section (Table 2) shows the mean of the number of parent-reported barriers, across all types of barriers, for each group.

For Aims 3 and 4, thematic content analysis was used to determine parents' understanding of children's oral health and examine parents' suggestions for improving access to paediatric dental services). Thematic content analysis involves the identification of themes and categories that arise from study data (Burnard, Gill, Stewart, Treasure, & Chadwick, 2008). The initial step in this process involved reviewing questionnaires and highlighting the words and phrases that were mentioned. In the second stage, the words and phrases were grouped together according to their similarities. Then they were grouped again into sub-themes. From the sub-themes, the main themes emerged. This analysing process was also reviewed, analysed and the scripts were also explored by Dr Manorika Ratnaweera, who is a suitably experienced researcher, dentist, and second supervisor of the current study.

Sample size

Forty participants were deemed sufficient to enable a preliminary examination of barriers to paediatric dental services in the Morobe province of PNG. To detect a difference between two groups with a sample of 30 (i.e., 15 in each group), with 80% power, an alpha level 0.05, the resulting effect size would be 0.51. That is if looking at a 2x2 contingency table with a binary variable. As a rule of thumb, an effect size between 0.3 and 0.6 is considered a moderate effect size. Therefore, it was decided that a sample size of 40 (i.e., 20 in each study group [urban/rural residents]) would be sought to achieve slightly better, moderate effect sizes (0.44 for a 2x2 contingency table with a binary variable, and an effect size of 0.55 for Likert scale variables) (Murphy, Myors, & Wolach, 2009; Pallant, 2016). This sample size was also feasible within the scope of a Master's thesis.

Chapter 4: Results

Barriers to accessing paediatric dental services (Aim 1)

Accessibility and Approachability

Figure 3 shows that the majority of parents (n = 33, 82%) had not received support from a community health worker to access dental services for their child/ren. Similar proportions of parents had never received written information about dental services (n = 33, 82%) and/or had never been provided with any information about how to access paediatric dental service or the types of services that are provided (n = 34, 85%). Thirty-six parents (90%) had never received written information in their own language.

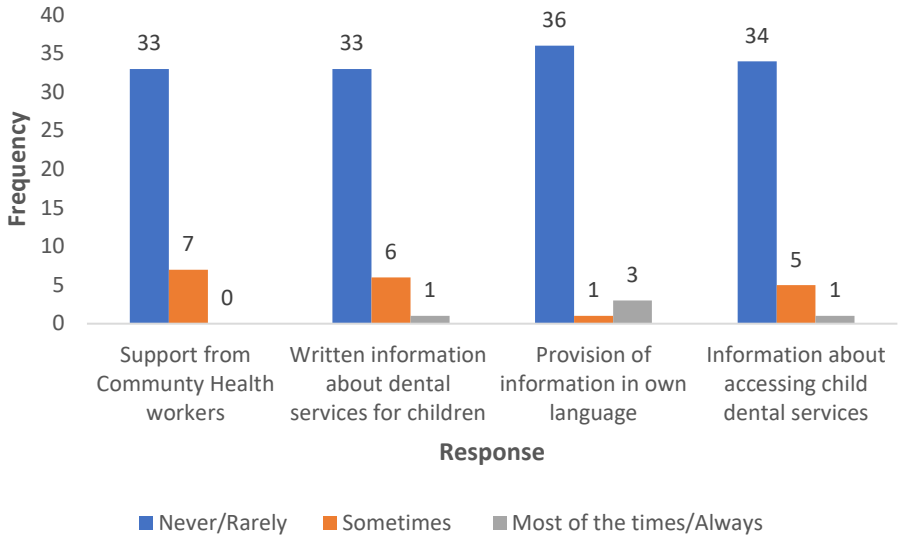

Figure 3. Parent-reported accessibility and approachability of paediatric dental health services

Availability and Accommodation

Figure 4 shows the availability dimension of accessing paediatric dental health service by parents. Twelve (30%) parents only could find out the location of the dental services for children. Three (7.5%) of parents had experienced a child being referred to a dentist. Twenty-five (62%) parents stated that the opening hours of dental services was not suitable for their child's dental needs. Nearly all parents (n = 39, The highest number (39, 97%) stated that there was no dental service in their area.

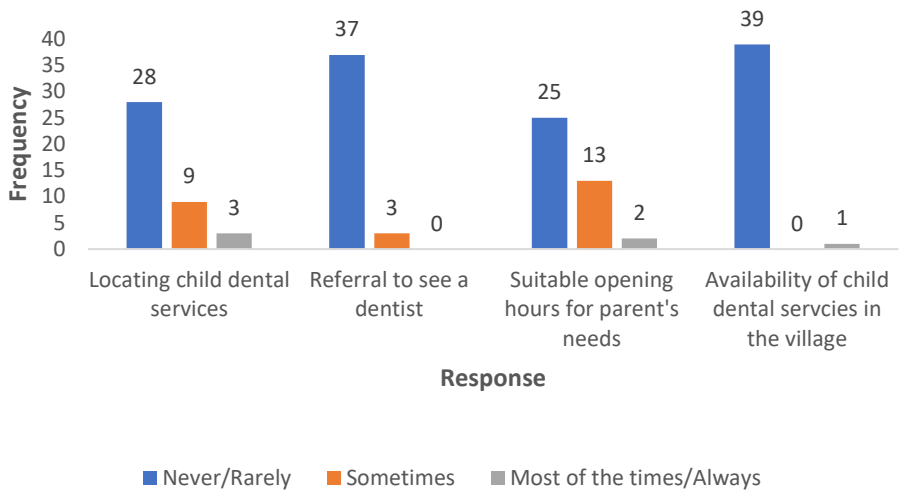

Figure 4. Parent-reported availability of paediatric dental health services

Affordability

Figure 5 shows the affordability of accessing child dental healthcare. Twenty-nine parents (72.5%) reported that it is costly at the dental clinic. Twenty-seven (67%) parents reported they would have to pay for transportation to take their child to the nearest dental clinic. Nearly all parents (n = 39, 97%) reported a lack of access to subsidised dental care for their child/ren.

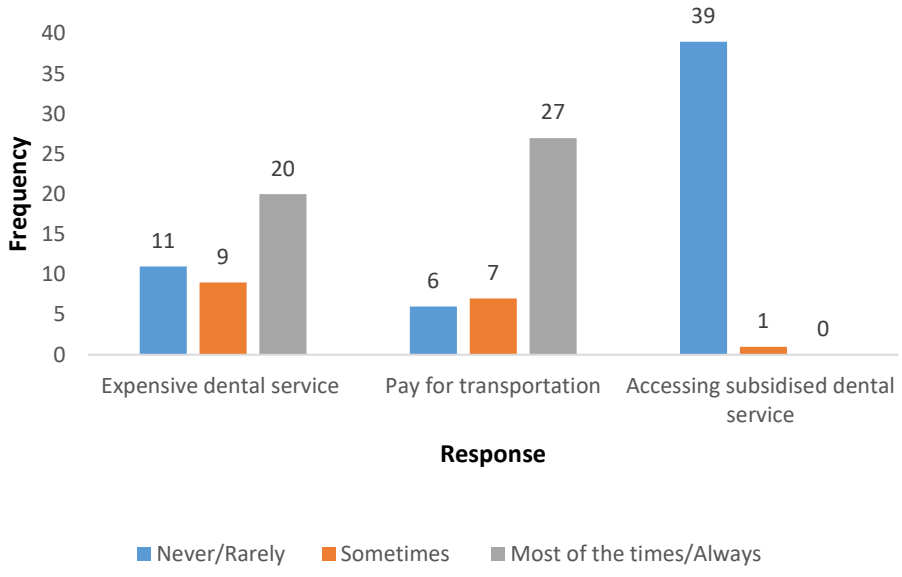

Figure 5. Parent-reported affordability of paediatric dental health services

Acceptability

Figure 6 shows how acceptable the parents found the child dental service they accessed. Almost all (n = 38, 95%) parents reported that the paediatric dental services were acceptable in terms of their family values and beliefs. Twenty-five (62.5%) parents reported that the dental professional interacted appropriately with their child given their age.

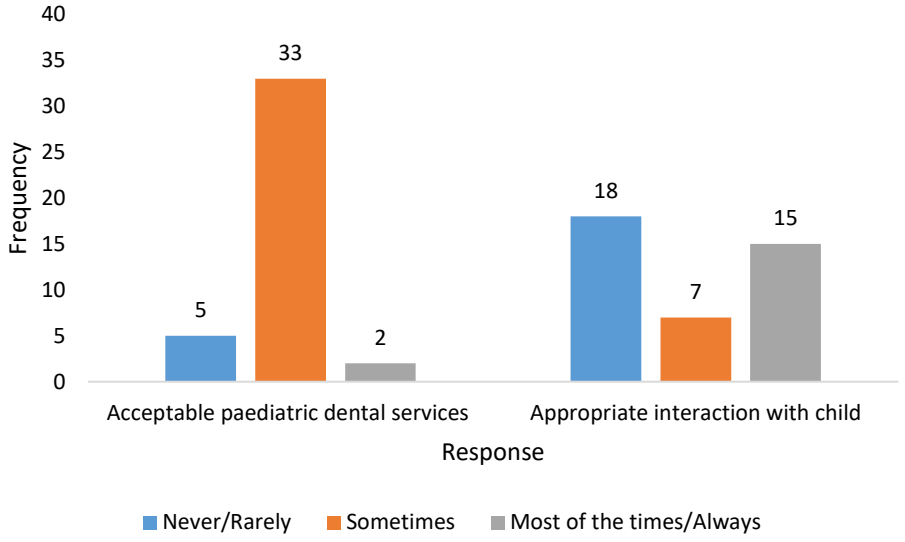

Figure 6. Parent-reported acceptability of paediatric dental health services

Paediatric dental service access by age, sex, and resident groups (Aim 2)

As shown in Table 2, independent sample t-tests were conducted to compare the mean number of barriers reported by parents across specific child age (1-3 years and 4-6 years), sex (male, female) and area of residence (urban, rural) groups. There were no significant differences in the mean scores for the child age groups (1-3 years [M = 57.26, SD = 10.14] and 4-6 years [M = 60.95, SD = 6.44], p = 0.18). There were no significant differences in the mean scores for male (M = 59.77, SD = 9.40) and female (M = 58.92, SD = 8.36, p = 0.77) children. T-test analyses revealed a statistically significant difference in mean level of access between urban (M = 54.25, SD = 9.00) and rural (M = 64.15, SD = 3.92) residents, with fewer overall barriers reported by parents living in urban areas (p <.01).

Table 2. Mean number of parent-reported access barriers by child age, sex and resident groups

Groups	N	Mean (SD) Barriers	Test statistics	P value
Child age group (years)				
1-3 years	19	57.26 (10.14)	-1.358	0.18
4-6 years	21	60.95 (6.44)		
Sex				
Male	13	59.77 (9.40)	0.29	0.77
Female	27	58.93 (8.20)		
Area of residence				
Urban	20	54.25 (9.00)	-4.50	<0.01
Rural	20	64.15 (3.92)		

N = number. SD = standard deviation

Parental knowledge of reasons to access pediatric dental services (Aim 3)

Table 3 presents parents' responses to the question “What is one thing or reason apart from toothache that would cause you to bring your child to the dental clinic for a visit?" The majority of the parents reported that they would bring their child/ren to the clinic because they have tooth decay and discoloured teeth or a hole in their tooth. Other parents mentioned that would bring their child to the clinic if their child/ren have swollen gums and face, mobile tooth about to fall out, if their child’s teeth are crowded or malaligned. Dental emergencies such as trauma to the teeth is also one reason the parents gave to visit the dental clinic.

Table 3. Main themes, sub-themes, codes and example statements for reasons for dental visit

Main theme	Sub-theme	Codes	Example statements
Knowledge	Oral diseases	Dental caries	"Tooth decay in child's tooth causes me to take child to the dental clinic." (Female parent aged 21)
			"Child has rotten tooth" (Female parent aged 37)
			"When child has tooth decay and discolouration of tooth" (Female parent aged 40)
		Periodontal disease	"Swollen gums in my child's mouth would cause me to bring my child to the clinic" (Female parent aged 26)
			"Swollen gums in my child's mouth" (Male parent aged 45)
		Malocclusion	"Malaligned teeth" (Female parent aged 31)
			"Deformed teeth growth" (Male parent aged 38)
			"Sore mouth or malaligned teeth" (Female parent aged 41 years)
		Trauma	"She had an accident and broke her tooth" (Female parent aged 28)
		Abscess	"Swollen face or discoloured teeth" (Female parent aged 19)
		Oral cancer	"Mouth cancer or sore mouth is one of the main reasons" (Female parent aged 24)
	Tooth mobility	Exfoliating tooth	"My childs birth tooth was hanging from the socket" (Female parent aged 26 years)
			"When my child has moving teeth" (Male parent aged 30 years)
	Regular exam	Dental check-ups	"When my child wants to go to the clinic for check up on her tooth" (Female parent aged 32)
			"Medical check up to prevent dental cause" (Male parent aged 29)

Parent suggestions to improve access (Aim 4)

Table 4 presents responses to the question; "Have you got any suggestions on how we can make it easier for families to access dental care for children?" The majority commented that there should be a dental facility in the village rural hospital to make it easy for parents to access dental service for their children. Other responses to this question included oral health check-ups

at schools, cost of services to be reduced, and increased education to raise awareness about oral diseases and the availability of dental services.

Table 4. Themes, sub-themes, codes and example statements for improving access

Main themes	Sub-Themes	Codes	Example Statements
Suggestions	Availability	To have more facilities	"Government should make it easy for people to access service. There should be dental clinics in little ward areas." (Female parent aged 26 years)
			"Community can ask the health centre officer to ask the dental providers to visit the area and treat the children there" (Female parent aged 30 years)
		Regular exams	"Do regular check-ups (quarterly) at health centres." (Female parent aged 31 years)
		Check-ups at school /other facilities	"Visit schools and advice parents for dental check-ups." (Male parent aged 31 years)
	Affordability	Cost/fee of services/travel to be reduced	"Cutting down the costs of dental check-up or appointment, building more dental clinics, decreasing Colgate and tooth brush prices." (Female parent aged 24 years)
			"Minimise the dental cost, more dental clinic needed in remote villages, dental services be made available at all times" (Male parent aged 29 years)
	Knowledge	Awareness about the facilities	"Awareness and dentists to make visits to the area to treat children." (Female parent aged 32 years)
			"Create posters on how to access services and also for parents to help their children take care of their teeth" (Female parent aged 27)

Chapter 5: Discussion

The objective of this study was to identify the barriers that prevented or impeded young children's (0-6 years) access to dental services in PNG and to see if barriers differ according to children's age, sex, and/or area of residence. We also sought to gain some insight into parents' understanding of children's oral health, and gather suggestions from families about how to improve access to paediatric dental services in PNG, in an effort to identify opportunities to better support children's oral health. This chapter includes a discussion of key study findings, including links with previous research, oral health implications, limitations and recommendations for future research. One of the key findings from this study was that 95% of parents had not accessed paediatric dental services for their child/ren in PNG. Some of the reasons were because parents reported having no knowledge of any dental services for their children due to a lack of information. Other barriers to access included services being unapproachable, inaccessible, unavailable, costly, and/or considered unacceptable by parents.

In terms of knowledge about how to access dental services for children, most parents (82.5%) in the current study never received any support from community health workers on how to access dental services, and 70% could not locate a dental clinic. Anecdotally, the only public dental clinic in the city was under construction and there were no signs indicating the whereabouts of the temporary clinic. Lack of support and limited knowledge are commonly reported problems in different countries, for parents trying to access services for their children. Gerreth and Borysewicz-Lewicka (2016) conducted a sociomedical study in Poland, which found that parents of children with intellectual disability had no information about the dental treatment of their child (Gerreth & Borysewicz-Lewicka, 2016). Shekhawat, Chauhan, and Gourh (2017) in India, found that 73.6% of the patients at a dental check-up lacked knowledge about who to see for oral health-related issues. In contrast, 88.4% of participants in a study by Eslamipour, Heydari, Ghaiour, and Salehi (2018) mentioned that they had knowledge on how to find a dentist (Eslamipour, Heydari, Ghaiour, & Salehi, 2018). Kakade and colleagues (2017) in India also reported high levels of knowledge about the nearest dental clinic, with 96.5% of the villagers being well informed about the dental clinic within their reach (Kakade et al., 2017). A

quantitative study in Nigeria by Denloye and colleagues (2010), found that only 4.4% of the students mentioned that they had no knowledge of the location of any dental clinic (Denloye et al., 2010). A study in Jordan by Obeidat, Alsa'di and Taani (2014) stated that 3.1% of the adults found it difficult to locate the dental clinic.

Evidence of high levels of knowledge about service access differs significantly from the findings of the current study. The studies by Denloye et al. (2010) and Obeidat, Alsa'di, and Taani (2014) may have found higher rates of knowledge about the importance of dental services as oral health studies had previously conducted in the study areas, along with the presence of oral health check-up patrols. These earlier studies included education from the research team about the importance of oral health and how to access services. Denloye's Nigerian study may have reported a high level of knowledge about dental clinics as the study was conducted in secondary schools located in the metropolis (urban) area. This is a similar pattern of findings to the current study, where better access to services was reported among families living in urban (rather than rural) areas.

Another barrier to parents accessing the paediatric dental services in PNG was an absence of services in the local community. In contrast, a report by Shekhawat et al. (2017) in Bihar, India found that only 10% of adults reported a lack of dental services in their community and high levels of accessibility to dental services with mobile dental vans are regularly used to provide dental care for the poor. The Indian Railway also provides free medical and dental treatment for the rural population in India. Accessibility may be a more pressing barrier in PNG because the only dental clinic in the study area was located in the main hospital in the city. Dental facilities were not available within small, rural communities. Furthermore, funding is not available in PNG to assist dentists to conduct regular dental check-ups, treatment, and provide oral awareness to the wider population. The dental training in PNG was shutdown for 20years before 2005. There is only one dental school in the country. Therefore there is a shortage of dental professionals. Most privinces have only two dentists (L. Crocombe et al., 2017; Leonard Crocombe, Siddiqi, Khan, & Bettiol, 2019; Grundy et al., 2019).

Parents in the current study also reported expense as a major barrier to service access. Costs associated with children's dental care are a commonly reported barrier (Eslamipour et al., 2015; Kelly et al., 2005; Onyejaka et al., 2016; Valencia et al., 2014). Similar to the current study, Eslamipour and colleagues' descriptive study in Iran, found that 60% of the parents reported high costs as a key barrier to accessing dental services (Eslamipour et al., 2015). In contrast, a Nigerian study found that only 10% of students surveyed could not access dental service because of financial constraints (Eigbobo & Obiajunwa, 2016). This may be due to dental treatment being free or at a minimal cost to students at their government facility.

In addition to the cost of dental services, parents in the current study also reported transportation costs as a key barrier to access. Transportation costs are a commonly reported barrier to service access in both quantitative and qualitative studies (Leite, Hudson, West, Carpenter, & Andrews, 2013; Priyadarshini et al., 2015). Ajayi and Arigbede (2013) found that transportation cost was one of the barriers to utilising dental services in South West Nigeria. A qualitative study by Valencia et al. (2014) in Columbia also reported that mothers found it costly to travel to the dentist. In contrast, some studies have reported few transportation difficulties. For example, Lewis, Robertson, and Phelps (2005) in Columbia, United States of America (USA) found that only 5% of the parents reported transport as a barrier to accessing dental services. Those studies, including the current study, reporting transportation as a barrier to service access, may include families residing in rural areas who do not have access to local services and cannot afford transport to services in urban areas.

Furthermore, in terms of costs, findings from the current study showed that a majority of parents never accessed subsidised dental services. This is because there is no dental insurance or Medicaid or Government subsidy scheme in PNG for parents to receive assistance to pay for the cost of dental treatment. Most parents do not have private insurance for dental health or even medical health. In addition, all dental services in PNG must be paid for before receiving treatment (Grundy et al., 2019; Pacific Islands Legal Information Insittute, n.d). Similarly, Eigbobo and Obiajunwa (2016) study in Nigeria found that oral health is a minor concern under the country's National Health Insurance Scheme and parents pay for the treatments out of their

pockets. In contrast to findings of the current study, a qualitative study by by Kelly (2005) in Kentucky, USA found that low-income caregivers access Medicaid for their child's dental treatment (Kelly et al., 2005). Thus, government subsidies make it better and easier for people to access dental services. For example, a study in Alberta, Canada reported that 88.3% of adults considered the health benefit program helpful in terms of providing dental services. Adults stated they would not have accessed dental service without the health benefit program (Amin et al., 2014).

In terms of barriers to services by age, sex, or area, the current study found that families living in rural areas reported significantly more overall barriers to accessing services access services than those living in urban areas of PNG. There are several possible explanations for this result. Parents living in urban areas are mostly working-class people who can afford dental services and parents in rural areas are mostly villagers who cannot afford dental services. According to the National Statistical Office (2015), a high proportion of the rural population in PNG (62.1% of persons ten years old and over) are subsistence farmers (gardening/fishing for own use) and a high proportion of the urban population (53.4% of persons over ten years old and over) have salaried employment. Dental clinics are more likely to be located in the city therefore urban parents can more readily travel to a clinic, with greater availability of affordable and regular transportation services. In contrast, families in rural, village settings must wake up very early in the morning to catch a truck that is travelling into the city and is associated with greater costs. There were no differences in service access by a child's age or sex, as found in other studies (Camerini et al., 2020; Comassetto et al., 2019).

Qualitative analyses of Parental knowledge about the reasons for accessing paediatric dental services revealed three main themes. Parents reported oral diseases, such as dental caries and periodontal disease, as the main reason for seeking dental care for children. Almost all parents reported that they would bring their child/ren to a dental clinic because of oral diseases. However, only a few parents mentioned that they would take their child to the dentist for regular oral health check-ups. Similarly, a study in Saudi Arabia found that only 27% of the children visited the dental clinic for check-ups while the dominant reason for dental visits was toothache

(71.5%) (Murshid, 2016). Another study in Bengaluru, India also found that dental pain, dental caries, unevenly placed teeth and trauma were found to be significant reasons for dental visits, but only 4% of children visited the clinic for an oral health check-up (Subramaniam & Reghuvaran, 2019). Likewise, in Puducherry, India, Sanguida found that 33% of parents visited paediatric dental services due to their child's tooth decay but only 7% visited for a routine check-up (Sanguida et al., 2019). Consistent with findings of previous studies, parents seem to have limited awareness of the importance of on-going regular maintenance of children's oral health. Rather, children are brought to the clinic only because of complaints and not for regular oral health check-ups.

Together, these findings highlight a clear need for improved parental awareness of oral diseases and their potential impact on children's QoL Educating parents about the importance of maintaining their child's oral health is required. This can be achieved in PNG by promoting oral health awareness to parents during school meetings, presentations and demonstrations at women's or men's church group meetings, at community areas such as marketplaces and events around the community. For example, the Colgate Palmolive Company in PNG provides free oral health kits consisting of a toothbrush and toothpaste to people who take part in their toothbrushing programs. This initiative is organised by service providers in collaboration with Colgate Palmolive in PNG (EMTV Online, 2016; Loop PNG, 2019). In China, a mass media event called 'Love-teeth-day' (LTD) was launched by the health authorities to develop oral health awareness, dental attitudes and individual abilities amongst Chinese parents (Kandelman, Arpin, Baez, Baehni, & Petersen, 2012). Noaman and Rauf (2017) in Iraq suggested implementing continued oral health awareness and introducing oral health education programs in the schools' education syllabus in cooperation with the country's Health Ministry (Noaman & Rauf, 2017). These types of widespread government-level initiatives may also benefit families in PNG. In summary, parents must be educated about the importance of oral health and regular or routine oral health check-ups.

Importantly, the current study also sought parents' suggestions on ways to improve access to dental services for their children in PNG. The main suggestion was to have more dental

facilities in the community and to have a dentist visit small rural hospitals in the villages to treat children. The setting up of a dental clinic in a community would be an expensive task. Dental equipment and instruments are very expensive to purchase. Upon visiting the health centre, the dentist can also promote awareness about oral disease and oral hygiene practices. A qualitative study by Navoneiwa Linjewile–Marealle (2017) mentioned that participants were not able to read therefore they preferred a dental professional giving oral health education to the people (Navoneiwa Linjewile–Marealle, 2017). Kelly, Binkley, Neace, and Gale's (2005) qualitative study found that effort should be given to educate caregivers about the importance of oral health and recommended school-based dental education programs for children.

A further suggestion by parents in the current study mentioned that posters and brochures must be created to provide information about accessing dental services and also to assist parents to teach their children to practise good oral hygiene. A study by Calota and colleaguesstated that the Dental Association in Portugal distributed brochures and posters in support education on oral hygiene (Calota, Armean, & Cucu, 2019). Another suggestion from parents in the current study is for dental teams to visit schools in the community and also villages in the rural areas to speak to students, conduct oral examinations of students, and do simple dental treatments such extractions and simple tooth fillings. A review by Vashishtha et al. (2014) reported that mobile dental units could be used for the provision of oral health care and education to the rural and underserved populations. Another study in Malaysia reported that 67% of students were satisfied with the school dental service provided by the mobile dental team, that conducted simple dental treatment upon visiting (Othman & Razak, 2010). Another study in India reported that a dental outreach program in the rural areas of India was conducted and the patients were mainly students with dental problems that needed simple extractions and fillings (Vashisth, Gupta, Bansal, & Rao, 2012). Thus, parents suggested to have dental facilities in small communities, an effective dissemination of oral health information in the form of posters and brochures in the community and regular school dental visits, would improve access of dental services.

Oral health implications

Findings from the current study clearly show a need to address barriers and make it easier for parents to access dental services for their children in PNG. There is currently no National Oral health Policy in PNG to implement plans for better access to paediatric dental services. An article has reported that a non-profit foundation is being established to supply PNG-province funded dental treatment. This funding could assist dental clinics to better access to dental services (Leonard Crocombe et al., 2019).While widespread improvements may require Government and policy level changes, there are some actions that could be taken by dentists in PNG to address the stark findings of this study. For example, to make services more accessible, dentists could visit schools and villages regularly to raise awareness of oral health and provide oral health education to children and the wider community. If funding for school visits is a barrier, a volunteer or a village or ward councillor could be trained to talk to people about oral hygiene practices. These may include, for example, basic tooth brushing techniques and education around how often children should brush their teeth. The volunteer or a village or ward councillor should also be trained to talk to people about oral diseases and their impact on the QoL. Also, dentists and dental therapists could train local community primary health care workers in the village to conduct basic oral health check-ups and undertake simple dental procedures such as extraction of very mobile teeth. Before a training course is planned or a feasibility study is to be undertaken, the dental professional should seek approval from the PNG Medical Board.

More information about how to access dental service should also be given to the parents. This can be done through posters and information available in Pidgin English for widespread reading and comprehension. Dentists could also talk with schools to include oral health education in their curriculum as well. The teacher can talk about a healthy mouth and then talk about oral diseases and how to prevent these diseases. Oral hygiene practises could also be taught in schools. In Australia, for example, Aboriginal Health Workers (AHW) were trained to provide oral health education to parents in the rural community of Australia (Smith, Blinkhorn, Moir, Brown, & Blinkhorn, 2016). They were trained to understand the knowledge of the dental caries

process and factors that cause it and how to prevent dental caries. The training of skills and knowledge about toothbrushing with toothpaste and the toothbrushing techniques were taught as well. The AHWs reported that they were confident to give oral health education and make an early diagnosis of dental caries after their training. In Germany, there has been evidence of success using a peer tutoring programme (Reinhardt, Löpker, Noack, Klein, & Rosen, 2009). Fourth graders in a school were taught how to brush their teeth by a dental hygienist. Then these fourth-graders, in a one-on-one manner, demonstrated toothbrushing techniques to the first graders and asked them to follow their example. In comparison to oral health education strategies, training others offers a setting to aid confidence-building for the child to take control of their own oral health behaviour (Reinhardt et al., 2009). A mobile dental vehicle could also be arranged or funded to visit small communities and villages and treat children. Dental vans were used to regularly visit the rural, poor and needy population of India (Shekhawat, Chauhan, & Gourh, 2017). In Texas, USA, fully equipped mobile dental vans with portable dental facilities are used to visit communities and provide free oral health service for low-income children (Jackson et al., 2007). In New Zealand, there are also mobile dental units in schools providing free dental treatment (Ministry of Education, 2020; New Zealand Herald, 2013; Waitemata District Health Board, 2020). To conclude, for PNG, regular dental outreaches to villages and oral health promotion will make it feasible for parents to access dental services for their children.

Limitations

The current study is not without limitations. First, the sample size is small. It would be better to have a larger sample size to better represent the study population and reduce risks associated with bias, such as respondent bias, non-response bias, selection bias and volunteer bias (Fowler & Lapp, 2019; Groves et al., 2009; Kelley, Clark, Brown, & Sitzia, 2003; Sedgwick, 2013). Secondly, the study was conducted in only one of PNG's 23 provinces. It would be better to extend to other provinces as well so that the results would be more generalisable to the population of PNG. It is important to acknowledge that findings of the current study are unlikely to be generalisable to all families in PNG. This is due to the cultural and geographical

diversity of PNG. Each of the 23 provinces have different cultural groups with diverse culture and beliefs. Therefore, some findings and recommendations from the study may not be applicable nationally. And thirdly, the age range should ideally cover all children and not only 0-6-year olds. Including a wider age range would provide greater insight into access barriers encountered by families of younger and older children.

Future research

In addition to addressing the limitations noted above, future research could also examine associations between the prevalence of dental caries and access to paediatric dental services in PNG. Further avenues to reduce access barriers may be identified by interviewing dentists and getting their views about how to improve the utilisation of dental services in PNG and how to overcome the barriers. Furthermore, a qualitative study about the barriers to accessing paediatric dental services could be conducted to provide more in-depth information about families' experiences of trying to access paediatric dental service.

Conclusion

Key barriers for families trying to access dental services for children in PNG are multifaceted, and especially prominent in rural areas. More parental education is needed about the importance of oral health and routine oral check-ups. Parents recommend that dentists should visit schools and small communities to conduct oral health education and provide simple dental treatment. Together, it is clear that more needs to be done to improve access to dental services for children in PNG, and to support children’s long-term term QoL and well-being.

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Appendices

Appendix A: Ethical approval

Auckland University of Technology Ethics Committee (AUTEC)

Auckland University of Technology
D-88, Private Bag 92006, Auckland 1142, NZ
T: +64 9 921 9999 ext. 8316
E: ethics@aut.ac.nz
www.aut.ac.nz/researchethics

15 July 2019

Kelly Jones
Faculty of Health and Environmental Sciences

Dear Kelly

Re Ethics Application: **19/199 Enablers and barriers to accessing paediatric dental services in Papua New Guinea**

Thank you for providing evidence as requested, which satisfies the points raised by the Auckland University of Technology Ethics Committee (AUTEC).

Your ethics application has been approved for three years until 15 July 2022.

Standard Conditions of Approval

1. The research is to be undertaken in accordance with the Auckland University of Technology Code of Conduct for Research and as approved by AUTEC in this application.
2. A progress report is due annually on the anniversary of the approval date, using form EA2, which is available online through http://www.aut.ac.nz/research/researchethics.
3. A final report is due at the expiration of the approval period, or, upon completion of project, using form EA3, which is available online through http://www.aut.ac.nz/research/researchethics.
4. Any amendments to the project must be approved by AUTEC prior to being implemented. Amendments can be requested using the EA2 form: http://www.aut.ac.nz/research/researchethics.
5. Any serious or unexpected adverse events must be reported to AUTEC Secretariat as a matter of priority.
6. Any unforeseen events that might affect continued ethical acceptability of the project should also be reported to the AUTEC Secretariat as a matter of priority.

Please quote the application number and title on all future correspondence related to this project.

AUTEC grants ethical approval only. If you require management approval for access for your research from another institution or organisation, then you are responsible for obtaining it. If the research is undertaken outside New Zealand, you need to meet all locality legal and ethical obligations and requirements. You are reminded that it is your responsibility to ensure that the spelling and grammar of documents being provided to participants or external organisations is of a high standard.

For any enquiries, please contact ethics@aut.ac.nz

Yours sincerely,

Kate O'Connor
Executive Manager
Auckland University of Technology Ethics Committee
Cc: egahanao@gmail.com; Manorika Ratnaweera

Appendix B**:** Research poster

Enablers and barriers to accessing paediatric dental services in Papua New Guinea

Be part of a study looking at factors that help or prevent children from accessing dental services in Papua New Guinea in an effort to better support children's oral health.

- Are you aged 18 years or older?
- Are you a parent living with a child or children aged between 0-6 years old?
- Have you lived in Morobe Province, Papua New Guinea for more than 6 months?
- Are you able to speak English or pidgin?
- Are you able to provide written consent?

If you answered YES to the questions above, you may be suitable for participating in this study.

We can provide you with information about the study to help you decide if you would like to take part.

CONTACT US TO FIND OUT MORE:

PHONE: 73930151

Participant Information Sheet

Date Information Sheet Produced:

04/04/2019

A: Project Title

Enablers and barriers to accessing paediatric dental care in Papua New Guinea

An Invitation to participate

I am Elsie Gahanao and I am a student at Auckland University of Technology, and I am inviting you to take part in this study looking at ways that prevent children from accessing dental services and factors that make it possible for them to access dental services in Papua New Guinea. before you make a decision on whether you would like to participate, you should understand why the research is being conducted and what it will involve. This Information Sheet will help you decide if you'd like to take part. It sets out why we are doing the study, what your participation would involve, what the benefits and risks to you might be, and what will happen after the study ends. When we next speak, we will go through this information with you and answer any questions you may have.

If you agree to take part in this study, you will be asked to sign a study Consent Form that will be provided separately to this document. You will be given a copy of this Participant Information Sheet and the Consent Form to keep. This document is 4 pages long. Please take time to read through the information carefully and ask questions if you do not understand. Take time to decide whether you would like to take part or not.

B: What is the purpose of this research?

The objective of this study is to determine the ways that prevent children from accessing dental services and factors that make it possible for children aged 0-6 years in Papua New Guinea in an effort to better support children's oral health.

The findings of this research may be used for academic publications and presentations.

C: How was I identified and why am I being invited to participate in this research?

You have received this participant information sheet because you have contacted me.

I am looking for people who are:

- aged 18 years or older
- a parent of a child or children aged between 0-6 years at the time of the survey
- have lived in Morobe Province, Papua New Guinea for more than 1 year
- are able to speak English or pidgin
- are able to provide a written consent

D: How do I agree to participate in this research?

Your participation in this research is voluntary (it is your choice) and whether or not you choose to participate will neither advantage nor disadvantage you. You are able to withdraw from the study at any time. If you choose to withdraw from the study, then you will be offered the choice between having any data that is identifiable as belonging to you removed or allowing it to continue to be used. However, once the findings have been produced, removal of your data may not be possible.

E: What will happen in this research?

If you are eligible and would like to take part, a time will be arranged for a member of the study team to meet with you in person. This could be at your home or another suitable location such as a meeting area in the village. This should take about one hour. The researcher who will be asking these questions has been specially trained for this project.

When a researcher comes to visit you, you will have the opportunity to ask any questions you may have about the study. The researcher will check a few details with you to confirm that you are eligible to take part. If you are happy to take part and are eligible, the researcher will ask you to sign the consent form. Then the researcher will ask you some questions about your current circumstances (such as employment), and about your health and well-being. There will also be questions about your experiences accessing dental care for your child/ren, including any barriers or facilitators that you may have encountered. The researcher will also ask you if you have any suggestions about how access to dental services for children could be made easier for you and your family. The interview should take no more than one hour to complete. You are welcome to take breaks if needed during the visit and may have a family members or friend with you for support if you like.

We aim to finish this study by the end of 2019.

F: What are the discomforts and risks?

There are some risks to taking part in this study. Some of the questions asked in the study may make you feel upset about some aspects of your experiences, and/or may make you feel uncomfortable or embarrassed in some way. You can take a break at any point and do not have to answer any questions you do not wish to.

G: What are the benefits?

By taking part in this research, you are helping University researchers to identify enablers and barriers to accessing dental services for children. This information may help to identify ways to make it easier for families in Papua New Guinea to access dental care for their children. This research will also benefit the researcher in acquiring the Master of Health Science Qualification.

H: How will my privacy be protected?

All identifying information about you will be kept confidential. Your responses to survey questions and contact details will remain strictly confidential, unless information is revealed that indicates you or someone else is at risk. No material that could personally identify you will be used in any reports or discussions about this study. You will be able to access information collected about you as part of the study if you wish to do so.

Upon completion of the study your records will be stored for 10 years. Paper copies of the survey and your responses will be stored by University personnel in a locked cabinet at AUT University in Auckland. These forms will be stored separately to hard copies of consent forms which will be stored in a locked filing cabinet. All electronic information about the study will be stored in password protected files. Any identifying information will not be shared outside of the research

team without seeking your permission. After 10 years all your electronic information will be deleted, and paper forms will be shredded and destroyed with the university confidential waste.

I: What are the costs of participating in this research?

The cost to you will be your time. That includes time for the interviews. Each participant will receive a $20 food voucher at the end of the interview as a token of appreciation.

J: What opportunity do I have to consider this invitation?

You will be given a week to think about the invitation to participate in the study. Your participation in the study is voluntary and you are free to decline participation at any time. Before you decide you may want to talk about the study with other people, such as family, friends, or healthcare providers. Feel free to do this.

K: Will I receive feedback on the results of this research?

After we have looked at all information collected as part of this study, then we will send you a one-page summary of results if you would like to receive them.

L: What do I do if I have concerns about this research?

Any concerns regarding the nature of this project should be notified in the first instance to the Project Supervisor, Dr Kelly Jones, kelly.jones@aut.ac.nz, phone +64 7 838 4257

Any concerns regarding the conduct of the research should be notified to the Executive Secretary of AUTEC, Kate O'Connor, *ethics@aut.ac.nz* , phone +64 9 921 9999 extension 6038.

M: Whom do I contact for further information about this research?

You are also able to contact the research team as follows:

Researcher Contact Details:

You may contact Elsie Gahanao on the following local Papua New Guinea phone number +67 573 930 151, or email at sxn9640@aut.ac.nz

Project Supervisor Contact Details:

You can contact the lead investigator, Kelly Jones, by emailing kelly.jones@aut.ac.nz or telephoning +64 7 838 4257 or +64 21 246 0587. Please note the telephone numbers provided are New Zealand numbers.

Please keep this Information Sheet and a copy of the Consent Form for your future reference.

Approved by the Auckland University of Technology Ethics Committee on *type the date final ethics approval was granted*, AUTEC Reference number *type the reference number*.

Appendix D: Questionnaire

Project Title:

Enablers and Barriers to accessing Paediatric Dental Services in Papua New Guinea

Participant Questionnaire

Registration Number

Participant Initials

Date

Survey questionnaires

Socioeconomic status

1. What level of education have you completed?

☐ No formal schooling
☐ Less than primary school
☐ Primary school completed
☐ Secondary school completed
☐ High school completed
☐ College/ University completed
☐ Postgraduate degree

2. What is your current employability status?

☐ Full time employment.
☐ Part time employment
☐ Unemployment
☐ Self-employed
☐ Retired

3. What is your occupation ? ……..

---

1. Approachability

1.1 There are community health workers in your village or nearby who help let you know about dental services that are available for children

☐ Strongly agree
☐ Agree
☐ Undecided
☐ Disagree
☐ Strongly disagree

1.2 Have you seen any written information about dental services for children?

☐ Never
☐ Rarely
☐ Sometimes
☐ Most of the times
☐ Always

1.2.1 If so, was it provided in your language.

☐ Strongly disagree
☐ Disagree
☐ Neutral
☐ Agree
☐ Strongly agree

1.3 Have you been provided any information about how to access dental service for children or about the types of services that are provided?

☐ Never
☐ Rarely
☐ Sometimes
☐ Most of the times
☐ Always

---

2 Acceptability

2.1 Were services acceptable to you and your family in terms of your cultural values and beliefs?

☐ Unacceptable
☐ Slightly unacceptable
☐ Neutral
☐ Slightly acceptable
☐ Acceptable

2.2 If requested, were you able to be seen by a dentist of a preferred gender?

☐ Female
☐ Male
☐ Other

2.3 How culturally appropriate was the service you received?

☐ Inappropriate
☐ Slightly inappropriate
☐ Neutral
☐ Slightly appropriate
☐ Appropriate

2.4 someone was able to speak with you in your local language.

☐ Strongly disagree
☐ Disagree
☐ Neutral
☐ Agree
☐ Strongly agree

---

3 Availability

3.1 Thinking of accessing dental health, how difficult or easy was it to obtain the dental service?

☐ Very difficult
☐ Difficult
☐ Moderate
☐ Easy
☐ Very easy

1.1. You have been able to find out where dental services for children are located?

☐ Strongly disagree
☐ Disagree
☐ Neutral
☐ Agree
☐ Strongly agree

3.3 Has a doctor ever referred your child to a see a dentist?

☐ Almost always
☐ Often
☐ Sometimes
☐ Seldom
☐ Never

3.3 If referred, were you able to get an appointment at a suitable time?

☐ Almost always
☐ Often
☐ Sometimes
☐ Seldom
☐ Never

3.4 there are dental services for children available in your village

☐ Never
☐ Rarely
☐ Sometimes
☐ Often
☐ All the time

3.5 How many minutes/hours do you have to travel to reach a dental service?

☐ Less than an hour
☐ 1 hour
☐ 2 hour
☐ 3 hours
☐ More than 3 hours

3.6 You are able to make an appointment when needed

☐ Strongly disagree
☐ Disagree
☐ Neutral
☐ Agree
☐ Strongly agree

3.7 Do the hours of opening suit you needs?

☐ Not at all
☐ Very little
☐ Well
☐ Very well
☐ Perfectly

---

4. Affordability

4.1 How much does it typically cost at the dentist when you take your child along?

☐ Inexpensive
☐ Slightly inexpensive
☐ Neither
☐ Slightly expensive
☐ Expensive

4.2 You need to pay for transportation to take your child to the nearest dentist

☐ Strongly disagree
☐ Disagree
☐ Neutral
☐ Agree
☐ Strongly agree

4.3 Have you had to take time away from paid work to take a child to the dentist?

☐ Never
☐ Rarely
☐ Sometimes
☐ Often
☐ All of the time

4.4 Have you had to pay for childcare for other children while you took a child to the dentist?

☐ Never
☐ Rarely
☐ Sometimes
☐ Often
☐ All of the time

4.5 Were you able to access subsidized services?

☐ Never
☐ Rarely
☐ Sometimes
☐ Often
☐ All of the time

---

5. Appropriateness

5.1. Have you taken your child to the dental clinic during the past year?

☐ No
☐ Yes

5.1.1.If NO, why haven't you gone to the dentist to treat your child's tooth problem? High cost of dental service:

☐ Strongly disagree
☐ Disagree
☐ Neutral
☐ Agree
☐ Strongly agree

5.1.2 Fear of dental procedures:

☐ Strongly disagree
☐ Disagree
☐ Neutral
☐ Agree
☐ Strongly agree

5.1.3 Not having enough time to go to the dentist:

☐ Strongly disagree
☐ Disagree
☐ Neutral
☐ Agree
☐ Strongly agree

5.1.4 I don't feel the need to go to the dentist:

☐ Strongly disagree
☐ Disagree
☐ Neutral
☐ Agree
☐ Strongly agree

5.2 If you have taken your child to the dentist in the past year, how satisfied were you with the service?

☐ Very satisfied
☐ Satisfied
☐ Neither Satisfied nor dissatisfied
☐ Dissatisfied
☐ Very dissatisfied

5.3 Did service providers interact appropriately with your child given their young age?

☐ Inappropriate
☐ Slightly inappropriate
☐ Neutral
☐ Slightly appropriate
☐ Appropriate

5.4 Does your child have any disabilities?

Yes ☐
No. ☐

5.4.1 If so, were any additional needs met at the dentist (i.e. physical needs, access ramps, etc)?

☐ Never
☐ Rarely
☐ Sometimes
☐ Often
☐ All of the time

5.5 Did you receive any follow-up contact from the dental service?

☐ Never
☐ Rarely
☐ Sometimes
☐ Often
☐ All of the time

5.6 How would you feel if your child had a dental visit tomorrow?

☐ Relaxed
☐ Uneasy
☐ Tense
☐ Anxious
☐ Panic

6. Have you got any suggestions on how we can overcome the barriers to access dental care for children?

7. What are some experiences that you had with the dentist that has prevented you from bringing your child to the dental clinic?

8. What is one thing or reason apart from toothache that would cause you to bring your child to the dental clinic for a visit?

9. Do you have any spiritual or cultural beliefs that prevent you from going to the dentist? Can you tell me more about it?

Appendix E**:** Abbreviations

Abbreviations	**Name**
AHW	Aboriginal Health Workers
AUT	Auckland University of Technology
AUTEC	Auckland University of Technology Ethics Committee
CPQ	Child Perceptions Questionnaires
DAI	Dental Aesthetic Index
HIV	Human Immunodeficiency Virus
ICON	Index of Orthodontic Treatment Need
IOTN	Index of complexity, outcome and Need
NDOH	National Department of Health
OHRQL	Oral health-related quality of life
PHC	Primary Health Care
PNG	Papua New Guinea
SES	Socio-economic status
SPSS	Statistical Package for the Social Sciences
USA	United States of America
WHO	World Health Organisation

Appendix F**:** Consent Form

For use when interviews are involved.

Project title: ***Enablers and barriers to accessing paediatric dental services in Papua New Guinea***

Project Supervisor: ***Dr Kelly Jones***

Researcher: ***Elsie Gahanao***

- ○ I have read and understood the information provided about this research project in the Information Sheet dated ……/……/…….
- ○ I have had an opportunity to ask questions and to have them answered.
- ○ I understand that notes will be taken during the interviews and that they will also be audio-taped and transcribed.
- ○ I understand that taking part in this study is voluntary (my choice) and that I may withdraw from the study at any time without being disadvantaged in any way.
- ○ I understand that if I withdraw from the study then I will be offered the choice between having any data that is identifiable as belonging to me removed or allowing it to continue to be used. However, once the findings have been produced, removal of my data may not be possible.
- ○ I agree to take part in this research.
- ○ I wish to receive a summary of the research findings (please tick one): Yes○ No○

Participant's signature: ……

Participant's name: ……

Participant's Contact Details (if appropriate):

……

……

……

……

Date:

Approved by the Auckland University of Technology Ethics Committee on type the date on which the final approval was granted AUTEC Reference number type the AUTEC reference number

Note: The Participant should retain a copy of this form.

Appendix G**:** Letter seeking approval to conduct survey in Morobe Province, PNG.

Elsie Gahanao
1K Hillcrest Avenue
Auckland, New
Zealand

24/07/2019

Grant Muddle
Chief Executive Officer
Angau Memorial Hospital
P.O. Box 457
Lae 411
Momase Region

Dear Sir,

RE: REQUEST FOR APPROVAL TO CONDUCT SURVEY IN MOROBE PROVINCE

My name is Elsie Gahanao and I am a student at Auckland University of Technology and as part of my masters qualification, I am doing a research project titled ***Enablers and barriers to accessing pediatric dental care in Papua New Guinea***. I have chosen Morobe Province to conduct my research.
In my research I will be conducting interviews with parents of 0-6 year old children around Lae city and Boana Station in Nawaeb District. My sample size will be 50 participants, 25 in Lae city and 25 in Boana.

The objective of this study is to determine the ways that prevent children from accessing dental services and factors that make it possible for children aged 0-6 years in Papua New Guinea in an effort to better support children's oral health.
The findings of this research may be used for academic publications and presentations.

My ethics application has been approved by the Auckland University of Technology Ethics Committee.

Therefore, I humbly write to request for your approval to conduct my survey interviews in Morobe Province.

Kindest r[redacted]ds

Elsie Gahanao

Cc: Director Medical Services -Dr Ruso Perone

Cc: Dental Officer- Dr Seth Yalamu

Note:

Approval for data collection was given by word of mouth from the Morobe Provinicial Health Authority

Appendix H: Safety protocol of researcher

SAFETY OF RESEARCHERS IN THE PNG COMMUNITY

Assess the situation on the phone before you visit

- Engage in phone conversation when arranging an interview, confirm the physical address and gather information to make an assessment about the risks of the visit
- Consider the physical area / location you are visiting
  - E.g. do they have dogs (you can ask owners to shut the dogs in other room)
  - Ask if other people be in the house during the interview?
  - Ask if there is anything you should be aware of e.g. sticky gates, entrance round the back of the house, poor lighting, slippery steps, or uneven paths.

Always let someone in PNG know where you are going

- Notify a colleague in PNG of the intended visit or planned itinerary
  - leave your contact details
  - name address and phone number of the participant you are visiting
  - the expected start and finish time of the visit
  - Inform them that you will phone them after the assessment has finished. Make sure that you then call them once you are safe (e.g. have driven around the corner from the location)
  - If the researcher has not called at the expected time, the researcher should be called to ensure all is going ok (ie. It may just be the assessment has taken longer than expected). A new check in time should be arranged. If contact cannot be made with the researcher, the participant should be contacted to ask if the researcher is there or what time they left. Attempts to contact the researcher should keep being made until it is confirmed that they are safe. E.g. contact the researchers family member or other alternative contact to check that they are safe. (colleagues must be given alternative contact details for a family member or similar)
  - If there remains concern about a researcher, the police should be contacted.

- Make sure that you have a mobile phone with you at all times (and that the battery is charged).
- Keep your phone on (it can be on silent to avoid disturbances)
- If the location of the assessment is changed, you must let a colleague know

Always let your AUT supervisors know where you are going

● Details of all interviews must be entered onto the Outlook Web App calendar booking system PRIOR to the session (including physical location, and expected start and finish times)

● Use the Buddy System - ALWAYS make sure at least two people know where you are going (i.e. send a calendar booking to both of your supervisors)

Preventing risky situations

- Once you arrive at the location, just take a bit of time to observe your surroundings. If the environment appears unsafe, kindly suggest meeting at another location.
- Keep your shoes on when entering a property (this is an AUT safety policy) so that you can quickly get away if need be. Any removal of shoes (i.e. for cultural reasons) is at your discretion.
- Keep your keys somewhere that they are easy to get to if necessary (e.g. in a pocket or in your hand)
- Park outside the property on the road if possible to enable you to get away quickly if needed (you could be blocked in on a driveway).
- If you are going to an area with no mobile phone coverage, take someone with you if possible or make allowances for your estimated end of the visit to enable to reach an area with phone coverage to check in. Check that you know where you are going and arrive early to the appointment and familiarise yourself with the local area beforehand.
- Avoid wearing excessive jewellery or clothing that could easier catch on something
- Make sure you have plenty of petrol in your car
- Keep valuables out of sight in your car

Managing risky situations

If after your initial assessment you feel uneasy about a visit, discuss it with colleague or supervisor to ensure you take the necessary action

- If you feel that there are potential risks or you feel uneasy about a visit, take someone with you (it is best to inform the participant of this beforehand, you could always advise the participant that this is for in-house training purposes)
- If you need help call a colleague and use the code phrase “please can you tell Mrs Brown I’ll be late”.
- Ensure any confidential documents are on your person or locked in the boot (glove compartment)
- Try and sit sideways near an exit (so you can see anyone entering or leaving the property) or position yourself between the participant and the exit.
- If a person is very agitated when you arrive or if you hear shouting or screaming, make an excuse and leave (such as I am short of time today or have been doubled booked so have to attend another interview).
- Consider holding the interview in another location such as a public place (at the university, private room at a library or hospital/medical centre) so help is quickly on hand if required.
- Try not to show if you are nervous as this may unsettle a participant.
- If someone becomes aggressive during the interview, remain calm. Speak firmly and confidently with matter of fact statements but with a soft tone to avoid escalating the situation.

The following additional protocols have been implemented to minimise any risk to researchers while working in the community –

- Details of all assessments must be entered onto the Outlook Web App calendar booking system PRIOR to the visit (including participant registration number, physical location of the assessment, and expected start and finish times)

- If a booking is arranged at short notice and unable to be added to the calendar, text or phone research coordinator or a colleague to let them know where you are going

- Should there be ANY concerns around safety, ensure another person attends the assessment with you

- If you ever feel unsafe during an interview then leave IMMEDIATELY

- If you feel uncomfortable visiting a property DO NOT ENTER and discuss with your supervisors by email or they can phone you at a given number

- Use the Buddy System - ALWAYS make sure at least two people know where you are going (i.e., study management via the calendar system and a family member)

Summary

If you feel uneasy or unsafe at any time, finish the interview and leave. Your safety must always be the priority. Your supervisors should be informed of any situations that have made you feel uncomfortable as soon as possible.