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# Treatment provision by general dentists in Mauritius, with particular reference to prosthodontic treatment

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# Treatment provision by general dentists in Mauritius, with particular reference to prosthodontic treatment

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Submitted in partial fulfilment of the requirements for the degree MSc(Dent).

**DECLARATION**

I, Deeksha Devi Abelak declare that this research report is my own work. It is being submitted for the degree of Master of Science in Dentistry at the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination at this or any other university.

Signed  this 11th day of September, 2017

## ABSTRACT

**Introduction:** Research into service provision by general dentists has recently emerged in the literature. This can provide information on the relationships between dentist, practice, and patient factors, which may help identify aspects such as barriers to care and can potentially improve outcomes of care. Studies have been limited to only a few developed industrialised countries. None have been conducted in a developing country such as Mauritius which as an island economy has its own types of services, health funding, and a variety of different dental practices. This study set out to describe the provision of dental services by dentists in Mauritius, with particular reference to the treatment of tooth loss.

**Methods and Materials:** Data were captured by means of a questionnaire. The first set of questions described the dentist and practice characteristics. The next set of questions was about the procedures carried out by the dentist, grouped into disciplines. In addition, the respondents were asked to state any areas in which they would like to improve their skills. The final set of questions asked the respondents to give treatment options for two clinical scenarios and provided an opportunity for open responses.

**Results:** The treatment options provided were dependent on a range of dentist, practice and patient factors, with considerable interrelations among those aspects. The predominant factor was practice type, where major differences were seen between services provided in the public and private sectors. There was a high frequency of extractions and lack of prosthodontic services in the public sector where patients receive treatment for free. The private practices focused more on curative treatment with little emphasis on prevention. There are few dental specialists in Mauritius (defined mainly by having obtained a Master's degree in a discipline), and the respondents identified several areas for their continuing professional development.

**Conclusion:** Mauritius would appear to have a population with high disease risk in terms of oral health. The underlying factor behind most of the decisions made towards service provision was the patient's ability to afford treatment. Other factors such as years in practice, postgraduate training and insurance coverage, all had a significant impact on the services provided. The scarcity of insurance coverage might indicate an inadequate funding dedicated to dental dare among insurance providers. There was a high demand among the respondents for CPD training programmes in the realms of prosthodontics (a field with a low frequency of service provision), followed by oral surgical procedures. The infrequency of tertiary procedures in the Mauritian practices showed that the majority of the Mauritian population was not benefiting from recent and current advancements in dentistry.

## ACKNOWLEDGEMENTS

I would first like to thank my research supervisor, Professor Peter Owen, whose help and guidance has been indispensable throughout. I am also grateful towards the dentists who participated in this survey and thus made this research report possible. Finally, I would like to express my deepest appreciation towards my parents, sister and close friend who helped me with data collection and provided their continuous support.

# TABLE OF CONTENTS

**ABSTRACT** ..... iii

**ACKNOWLEDGEMENTS** ..... v

**TABLE OF CONTENTS** ..... vi

**LIST OF TABLES** ..... viii

**LIST OF FIGURES** ..... ix

**CHAPTER 1. INTRODUCTION AND LITERATURE REVIEW** ..... 1

**CHAPTER 2. AIMS AND OBJECTIVES** ..... 5

**2.1 AIMS** ..... 5

**2.2 OBJECTIVES** ..... 5

**CHAPTER 3. MATERIALS AND METHODS** ..... 6

**CHAPTER 4. RESULTS** ..... 10

**4.1 RESPONSE RATE** ..... 10

**4.2 DENTIST CHARACTERISTICS** ..... 10

**4.2.1 Demographics of respondents** ..... 10

**4.2.2 Country of study** ..... 11

**4.2.3 Postgraduate training** ..... 12

**4.3 PRACTICE CHARACTERISTICS** ..... 13

**4.3.1 Practice type** ..... 13

**4.3.2 Presence of specialists** ..... 13

**4.3.3 Payment models** ..... 13

**4.4 TREATMENT PROVISION** ..... 14

**4.5 TRAINING REQUIREMENTS** ..... 16

**4.5 RESPONSES TO CLINICAL SCENARIOS** ..... 20

**4.5.1 Treatment options chosen** ..... 20

**4.5.2 Reasons given for selecting the treatment options** ..... 21

**4.6 THE ASSOCIATION BETWEEN DENTIST AND PRACTICE FACTORS AND THE FREQUENCY WITH WHICH THE DIFFERENT TREATMENTS ARE PROVIDED IN GENERAL PRACTICE** ..... 24

**4.6.1 Gender** ..... 24

**4.6.2 Age and years in practice** ..... 25

**4.6.3 Formal training programmes** ..... 26

**4.6.4 Attendance of CPD programmes** ..... 27

**4.6.5 Possession of a post-graduate diploma or degree** ..... 28

**4.6.6 Dental Association membership** ..... 29

**4.6.7 Practice type** ..... 29

**4.6.8 Presence of specialists** ..... 32

**4.6.9 Payment methods** ..... 32

**4.7 THE ASSOCIATION BETWEEN DENTIST AND PRACTICE FACTORS AND TREATMENT OPTIONS IN THE SCENARIO QUESTIONS** ..... 36

**4.8 THE ASSOCIATION BETWEEN THE FREQUENCY WITH WHICH THE DIFFERENT TREATMENTS ARE PROVIDED IN GENERAL PRACTICE AND THE TREATMENT OPTIONS IN THE SCENARIO QUESTION** ..... 38

**CHAPTER 5. DISCUSSION** ..... 42

**5.1 FREQUENCY OF TREATMENT PROVISION** ..... 42

**5.2 MANAGEMENT OF CLINICAL SCENARIOS** ..... 43

**5.3 THE ASSOCIATION BETWEEN DENTIST FACTORS AND FREQUENCY OF TREATMENT PROVISION** ..... 46

**5.4 THE ASSOCIATION BETWEEN PRACTICE FACTORS AND FREQUENCY OF TREATMENT PROVISION** ..... 48

**5.5 THE ASSOCIATION BETWEEN DENTIST AND PRACTICE FACTORS, FREQUENCY OF TREATMENT PROVISION AND MANAGEMENT OF THE CLINICAL SCENARIO** ..... 51

**5.6 THE ASSOCIATION BETWEEN PATIENT FUNDING, FREQUENCY OF TREATMENT PROVISION AND MANAGEMENT OF THE CLINICAL SCENARIO** ..... 52

**5.7 CPD COURSES IN MAURITIUS** ..... 54

**5.8 LIMITATIONS** ..... 55

**CHAPTER 6. CONCLUSION AND RECOMMENDATIONS** ..... 56

**REFERENCES** ..... 58

**Appendix 1: The questionnaire** ..... 62

**Appendix 2: Ethical clearance** ..... 69

# LIST OF TABLES

Table 1. Areas/ disciplines of dentistry in which respondents would like CPD training to improve their skills .....18

Table 2. Reasons given for selection of treatment options for the two clinical scenarios .....22

Table 3. Associations between practice type (public vs private) and treatment procedures ...30

## LIST OF FIGURES

Figure 1. Respondents' age distribution....10
Figure 2. Distribution of the time in practice of respondents....11
Figure 3. Distribution of the country of study....12
Figure 4. Modes of payment of the respondents' patients....14
Figure 5. Frequency of treatment provided by respondents....15
Figure 6. Distribution of the disciplines to which respondents refer....16
Figure 7. Distribution of disciplines in which CPD training is required by respondents....17
Figure 8. Treatment options the dentists would most likely carry out to replace a missing central incisor and missing lower first molar....20
Figure 9. Treatment options selected by the dentists after being grouped....21
Figure 10. The significant associations between gender and certain procedures.....25
Figure 11. Association between time in practice and placement of amalgam fillings, extractions, implant prostheses and veneers....26
Figure 12. Association between formal training programmes and use of complete dentures and implants....27
Figure 13. Association between presence of a postgraduate diploma in Implantology and placing implants....28
Figure 14. Associations between practice type (public vs private) and treatment procedures....31
Figure 15. Association between the self-payment model and frequency of surgical periodontology....33
Figure 16. Association between the co-payment model and surgical periodontology, immediate dentures and implants (surgical)....34

Figure 17. Association between the pay-and-claim model and conventional complete dentures .....35

Figure 18. Association between the insurance-paid model and metal-based RPDs.....35

Figure 19. Association between practice type and the RPD, FPD and ‘no treatment’ options for the upper central incisor .....36

Figure 20. Association between practice type and choice of the RPD, FPD and ‘no treatment’ options to manage the lower first molar .....37

Figure 21. Association between self-funded patients and the treatment options FPD and implant .....38

Figure 22. Association between frequencies of procedures carried out in practice and a RPD as a selected option to manage the upper central incisor (UCI).....39

Figure 23. Association between frequencies of procedures carried out in practice and a FPD as a selected option to manage the upper central incisor (UCI).....40

Figure 24. Association between frequencies of implants placed in practice and the selection of an implant to manage the upper central incisor (UCI) .....41

# CHAPTER 1. INTRODUCTION AND LITERATURE REVIEW

Research into service provision by general dentists has recently emerged in the literature. It has the potential to offer a useful set of indicators which can provide information on the relationships between dentist, practice, and patient factors. By providing information on these relationships, such aspects as barriers to care can be identified and can potentially improve outcomes of care.

In the late 1980s and early 1990s, increasing numbers of graduating dentists were female, and studies were based mainly on analyses of their practice patterns (Tillman and Horowitz 1983; Niessen et al 1986; Wilson et al 1988; Price 1990; Brown and Lazar 1998). Later studies were less gender-biased. An example was a study carried out to identify dentist-related factors that might influence prosthodontic treatment. It was found that decision making for prosthodontic treatment in Sweden was influenced by factors such as gender and whether the dentists were working in the private or public health sectors and it was recommended that patient-related factors should also be explored (Kronström et al 2000). Private practitioners not only spent more of their time doing prosthodontic work, but also produced more fixed prosthodontics than dentists employed in the public sector with the latter reporting a higher production of removable dentures. Furthermore increased years in the profession increased the probability by 5% for a high production of single crowns and fixed partial dentures (FPDs) for each additional year in the profession (Kronström et al 2000).

Gender-based practice patterns were the subject of an analysis of the dental benefits claims data in Washington, USA and revealed no gender differences in terms of the number of procedures per patient, income per patient, or income per day of work (del Aguila et al 2005).

There was, however, a difference in the number of days worked between male and female dentists, with females working approximately 10% less.

A seminal paper in this area looked at dentist, practice and patient factors by surveying a random sample of Australian private general dentists. Multiple interactions between all these factors were found: for example, the dentist-patient relationship impacted on the services provided in terms of the dentists' attitudes toward their patients; an urban practice was more likely to emphasise preventive care, whilst a rural practice was more likely to undertake more prosthodontics; solo practice was associated with lower diagnostic rates, but higher rates of prosthodontic services (Brennan and Spencer 2005).

A survey of prosthodontic services provided by general dentists in Virginia, USA showed that a large percentage did not provide implant placement (94%), orthodontic appliances (80%), or periodontal surgical services (83%). Operative dentistry restorations comprised the largest percentage of time per category of service (32%), followed by diagnostic and treatment planning services (17%), and fixed prosthodontics (17%). Regarding removable prosthodontics, maxillary and mandibular removable partial dentures were the most common while tooth-supported complete overdentures were the least common (Janus et al 2007).

Many general dental practitioners in Wales in 2010 reported confidence at providing more routine forms of prosthodontic care such as removable partial dentures (RPDs) (acrylic and metal-based) and bridges but they were not confident in providing implants (Patel et al 2010). This study also highlighted, uniquely in the literature, the fact that treatment options for missing teeth were largely influenced by funding arrangements: privately funded patients were more likely to be offered a fixed bridge or implant replacement of a missing upper first

molar for example, whereas state-funded patients were more likely to be offered no treatment (Patel et al 2010).

A comprehensive survey of general dentists in the National Dental Practice-Based Research Network of the USA found that the most frequent procedures carried out were restorative and aesthetic procedures, extractions, removable prosthetics and non-molar endodontics. Molar endodontics, implants and non-surgical periodontics were carried out regularly but less frequently, and they were rarely involved in orthodontics and periodontal surgery (Gilbert et al 2015). As with previous studies, several characteristics seemed to have varying degrees of association, such as dentist gender, age, year of graduation, training after dental school, type of practice, presence of a specialist in the same practice, and insurance status of the patients. Private practices were more likely to provide "higher-end" services, such as restorative care and aesthetically-focused restorative care, endodontics, implants, and orthodontics. This would appear to be linked to the insurance coverage enjoyed by the patients (Gilbert et al 2015). This was also found to be the case in the Australian study, where insurance status was associated with service patterns (Brennan and Spencer 2005).

The rapid introduction of a range of technologies in dentistry has brought about changes in the provision of dental treatment (Lamster and Eaves 2011). An example of this is the now widespread use of imaging techniques such as in cone beam computed tomography (CBCT) and the application of computer aided design and computer aided manufacturing (CAD/CAM) in operative dentistry and prosthodontics (Fasbinder 2006).

It is therefore important to understand what patterns of service provision are emerging in the dental care provided by general dentists and what factors predominantly contribute to

treatment planning and decision making in order to assist with improving service delivery and treatment outcomes. Furthermore, oral health is fundamental for the general health of individuals. Hence, it is important to recognise structural barriers to oral care so that they can be addressed in order to improve oral health, and therefore the well-being of the population.

All of the studies thus far have been limited to only a few developed industrialised countries. None have been conducted in a developing country such as Mauritius which, as an island economy, has its own types of services, health funding, and a variety of different dental practices. Therefore this study set out to identify patient, dentist and practice characteristics of general dental practices in Mauritius.

# CHAPTER 2. AIMS AND OBJECTIVES

## 2.1 AIMS

To analyse the relationships between dentist, practice and patient characteristics and the frequencies of each of the dental procedures provided in general practice, and to compare the reported management of a prosthodontic clinical scenario.

## 2.2 OBJECTIVES

- To determine the distribution of some demographic characteristics of the dentists
- To determine the distribution of practice type and funding information provided on patient payment characteristics
- To analyse the frequency of provision of dental procedures
- To seek correlations between the frequency of treatment provided and dentist, practice and patient factors
- To determine the treatment of choice for tooth loss
- To relate the treatment of choice to the frequency of treatment provided and to the dentist and practice factors
- To make recommendations for continuing professional development for dentists practising in Mauritius

# CHAPTER 3. MATERIALS AND METHODS

Data were captured by means of a questionnaire (Appendix 1). The names, addresses and phone numbers of the 348 dentists registered in Mauritius were obtained from the office of the Dental Council of Mauritius. Questionnaires were posted to the dentists, with a cover letter stating the purpose of the study, informed consent forms, and a stamped, addressed return envelope.

Ethical approval was granted by the Human Research Ethics Committee of the University of the Witwatersrand (clearance number M160702, Appendix 2) and permission from the Ministry of Health & Quality of Life of Mauritius was granted in order to be able to send out questionnaires to dentists in the public sector.

Most of the questions were closed-ended. The first set of questions described the dentist and practice characteristics. The following demographics of the dentist were collected: gender, age, years in practice, country/university where graduated, postgraduate training, CPD course attendance and dental association membership. Regarding the practice factors, the following information was collected: type of practice (private/public), number of locations practicing, number of dentists in practice, specialists in the practice and the funding arrangements for patients.

The next set of questions was about the procedures carried out by the dentist, grouped into prevention; restorative; endodontics; periodontal therapy; orthodontics; surgery; fixed and removable prosthodontics; implant dentistry; and other procedures. The dentists were asked to indicate the frequency with which they performed the specific procedures. They were also

required to mention the procedures they refer to other practitioners. In addition, the respondents were asked to state any areas they would like to improve their skills in.

The final set of questions gave treatment options for two clinical scenarios (a 35 year old male patient presented with a missing maxillary central incisor and a missing mandibular first molar) and provided an opportunity for open responses. The respondents were asked to specify from a list of treatment options provided, which ones they would be more likely to carry out in each case. The scenarios indicated that all other teeth were either sound or had sound restorations and that the patient was healthy with no parafunctional or adverse social habits.

The questionnaire was piloted using seven dentists with different characteristics - different age groups and practice type (in public and private practice). There was feedback about the length of time to complete the survey, and suggestions concerning the wording of some questions. Appropriate changes were made, and the revised questionnaire returned. All found the revisions easier to complete, and took half the time of the initial questionnaire.

The questionnaires were given a record number in order to identify non-respondents while maintaining the confidentiality of respondents. Non-respondents were called as a reminder after 4 weeks. Some of them asked for the questionnaire to be posted again or emailed. Amongst the 348 dentists who were sent the questionnaires, 7 had retired, 13 were abroad, 4 were sick (thus not practicing) and 4 only did administrative work (for example, as superintendent). Nineteen regarded themselves as specialists providing services only in their respective fields (the Dental Council of Mauritius allows dentists with a full time MSc degree to register as specialists) and one dentist had recently passed away. These 48 dentists were

excluded. Some registered specialists were practising all aspects of dentistry as evident from their responses, so were not regarded as specialists for the purposes of this survey. Some dentists mentioned that they were not comfortable disclosing the information asked in the survey and would thus not participate. Four weeks after the second round of posting and emailing, non-respondents were called again. A driver was appointed to collect the questionnaires from the practice of those dentists who found it an issue to post them back. The researcher personally handed in the questionnaires to some of the dentists and collected them in order to obtain an adequate sample size. A total of 150 questionnaires were eventually received.

*Sample Size*

Based on the worst-case (for sample size) estimates of 50%, 5% precision and the 95% confidence level, a sample size of 169 would be required. The actual sample size of 150 corresponds to a precision of 5.7% (rather than 5.0%), but this is considered acceptable for a study of this nature (Daniel 1999) and a reasonable representation of the population.

Sample size for prevalence was determined using the formula:

$$n = \frac{Z^2 P(1-P)}{d^2}$$

where n = sample size,

Z = Z-statistic for the chosen level of confidence,

P = expected prevalence or proportion

d = precision

*Statistical Analysis*

Data analysis was carried out using SAS (version 9.4 for Windows). The 5% significance level was used. Categorical variables were summarised by frequency and percentage and

illustrated by means of bar charts. Continuous variables were summarised by the mean, standard deviation, median and interquartile range, and illustrated with histograms. The relationship between the frequency of provision of each of the dental procedures and dentist, practice and patient factors was determined by the Chi-squared test. Fisher's exact test was used for 2 x 2 tables or where the requirements for the Chi-squared test could not be met. The strength of the associations was measured by Cramer's V and the phi coefficient (Cohen 1988).

The following scale of interpretation was used:

| | |
|---|---|
| 0.50 and above | high/strong association |
| 0.30 to 0.49 | moderate association |
| 0.10 to 0.29 | weak association |
| below 0.10 | little if any association |

# CHAPTER 4. RESULTS

## 4.1 RESPONSE RATE

Forty-eight dentists were excluded and 150 responses were received from the 300 questionnaires distributed, giving an acceptable response rate of 50% (Daniel 1999).

## 4.2 DENTIST CHARACTERISTICS

### 4.2.1 Demographics of respondents

The proportion of male dentists practicing (63%) was almost twice that of female dentists (37%). The age of the respondents and their years in practice followed a similar trend, as shown in Figures 1 and 2. There was a predominance of dentists in the age group 30-40 years (43%); in terms of length of time in practice, the majority of the respondents had been in practice between 5 and 14 years (42%).

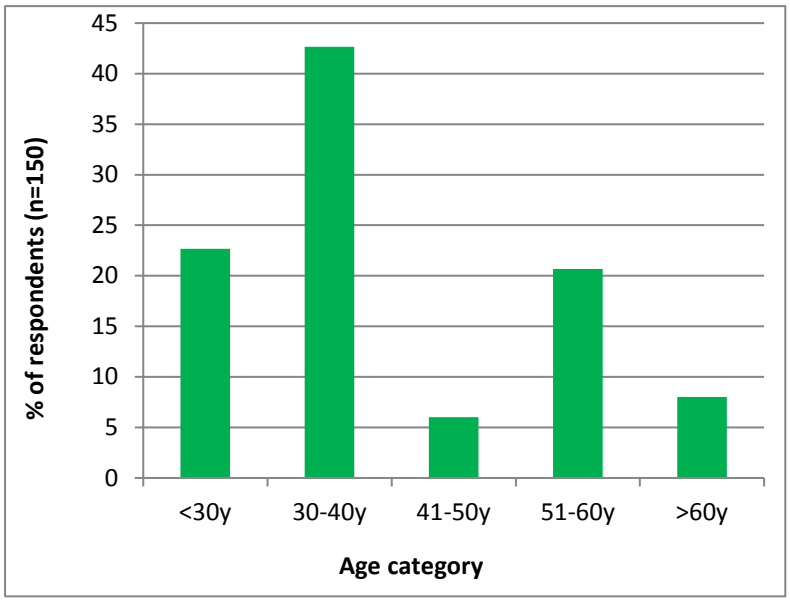



Figure 1. Respondents' age distribution

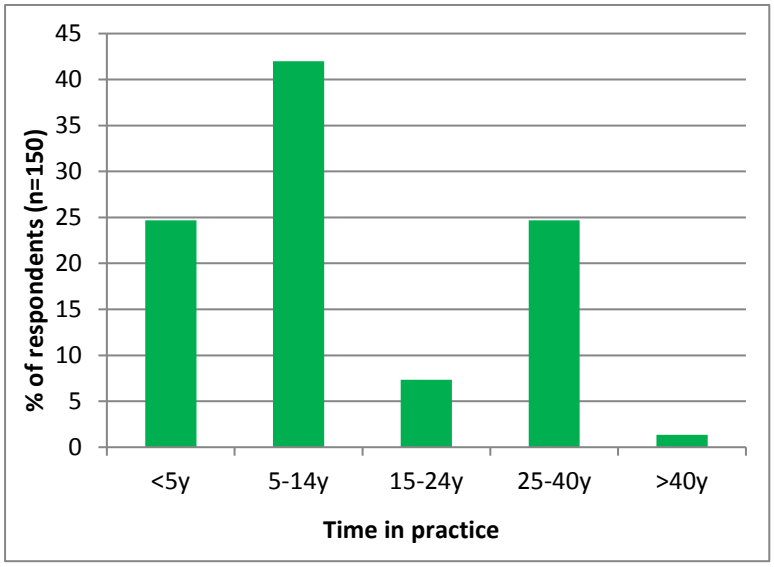



Figure 2. Distribution of the time in practice of respondents

### 4.2.2 Country of study

The predominant country of study was Mauritius (31%), followed by Russia, France, and India, as shown in Figure 3. The most popular university was Mauras College of Dentistry (20%), followed by Sir Seewoosagur Ramgoolam (SSR) Medical College (11%), both found in Mauritius. The Mauras College of Dentistry and SSR Medical College are affiliated to the Bhavnagar University in India and University of Mauritius respectively, which are the awarding institutions. These two colleges, however, have recently been closed down.

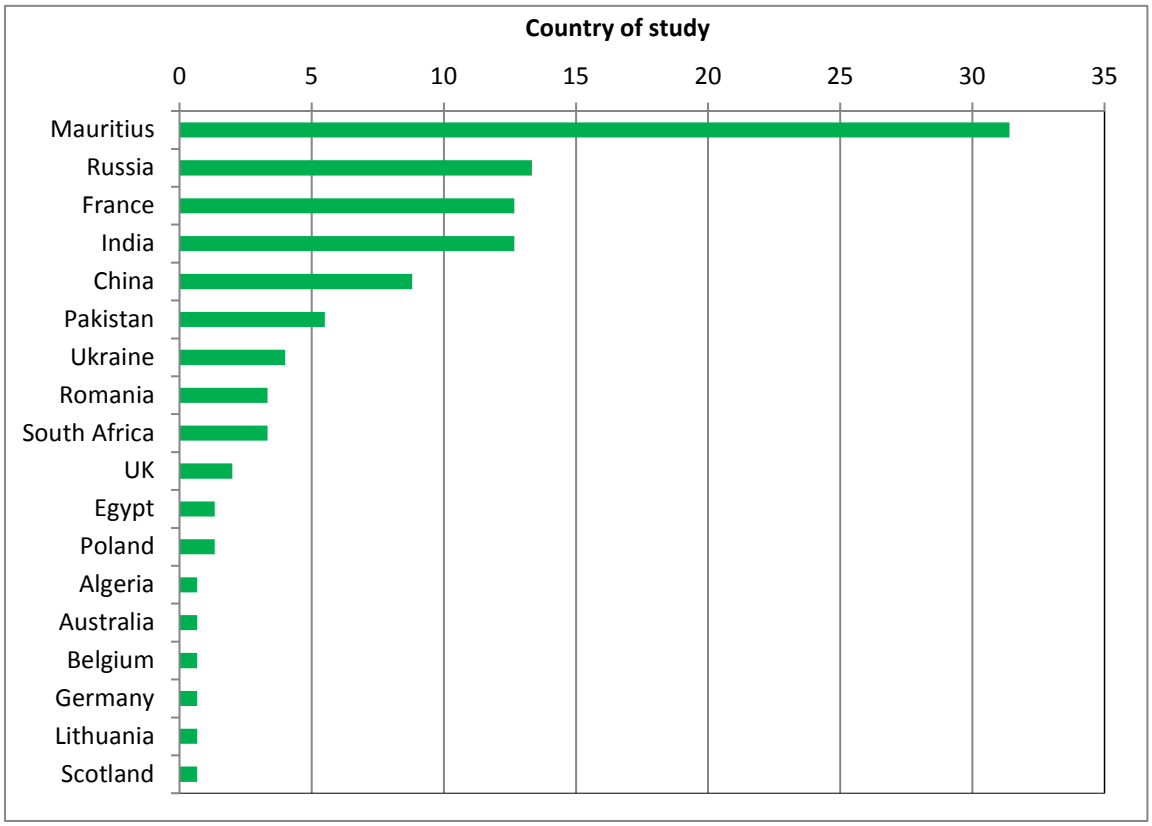



Figure 3. Distribution of the country of study

### 4.2.3 Postgraduate training

The postgraduate training of the responding dentists consisted mostly of CPD courses (69%). An MSc course was taken by 19% and 13% had a postgraduate diploma, of which the diploma in implantology was the most predominant (74%). Twenty-three percent of the respondents reported having had no formal postgraduate training. The respondents were, in general, frequent attendees of CPD courses, with 42% attending courses more than 3 times per year. Only 4% did not attend CPD courses.

Sixty-five percent of the respondents were members of at least one dental association. Within these 98 respondents, the most popular associations were MDA (Mauritius Dental

Association) (61%) and ADP (Association of Dental Professionals) (40%) followed by SIRO (Société d'Implantologie et Réhabilitation Orale) (8%), SMEDEF (Société des Médecins et Dentistes de l'école Française de l'Ile Maurice) (7%) and GMDOA (Government Medical & Dental Officers' Association) (4%).

## 4.3 PRACTICE CHARACTERISTICS

### 4.3.1 Practice type

Regarding practice type, 82% of the respondents were in private practice and 17% worked in the public sector. Two dentists worked in both sectors. The predominant trend was for solo practice in both the private (78%) and public sectors (82%). Of the 28 private practitioners who worked in group practices, 54% worked with one other dentist. Most of the respondents (72%) worked in a single practice location.

### 4.3.2 Presence of specialists

Only 27% (n=41) of the respondents reported that there were specialist/s available as part of their private practice or public clinic. Among these, MFOS specialists dominated by being accessible in 68% of these practices, followed by orthodontists at 61%, then endodontists at 44% and finally prosthodontists at 7%. These percentages do not add up to 100% because some respondents indicated the presence of more than one specialist type, especially in the public sector.

### 4.3.3 Payment models

With regards to the payment modes of patients, all the public clinic doctors indicated that all their patients do not pay. The private practitioners were asked to specify the percentage of their patients in each of four categories. The collective results grouped into these categories

are shown in Figure 4. The most prevalent payment models were self-payment (no insurance), followed by payment by the patient with claim-back from the insurance. Co-payment by the patient and insurance, and insurance-direct payments were infrequent.

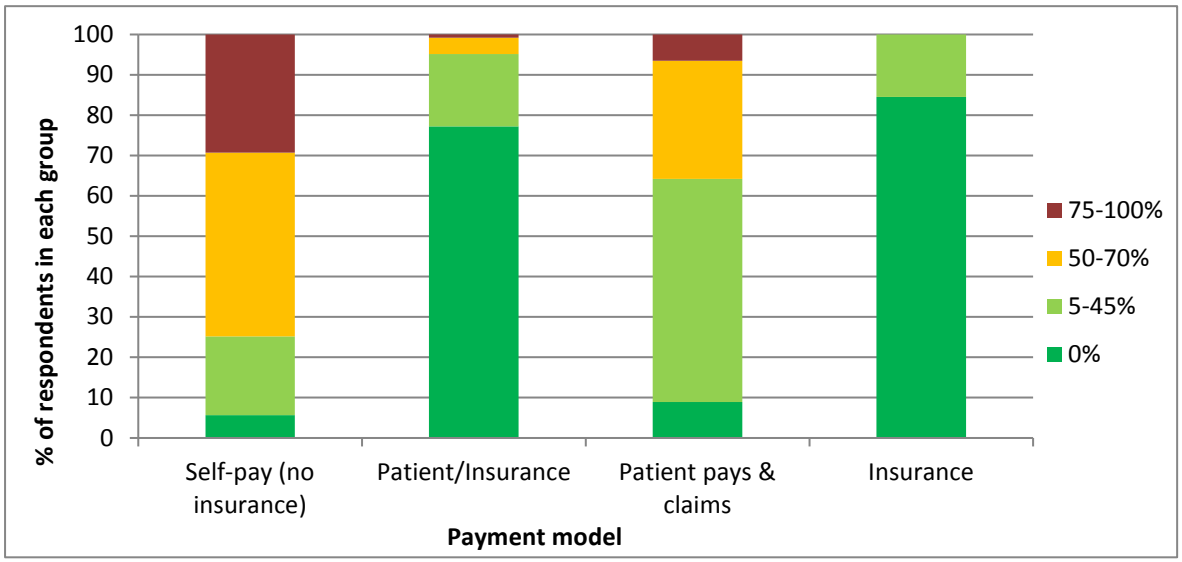



Figure 4. Modes of payment of the respondents' patients

## 4.4 TREATMENT PROVISION

The frequency of provision of the different treatment procedures carried out by the respondents is illustrated in Figure 5. The most common procedures were composite/glass ionomer fillings, non-surgical periodontology (scaling/root planing), extractions and endodontic therapy. The least common were maxillofacial prosthodontics, CAD/CAM restorations, implants and tooth-supported overdentures.

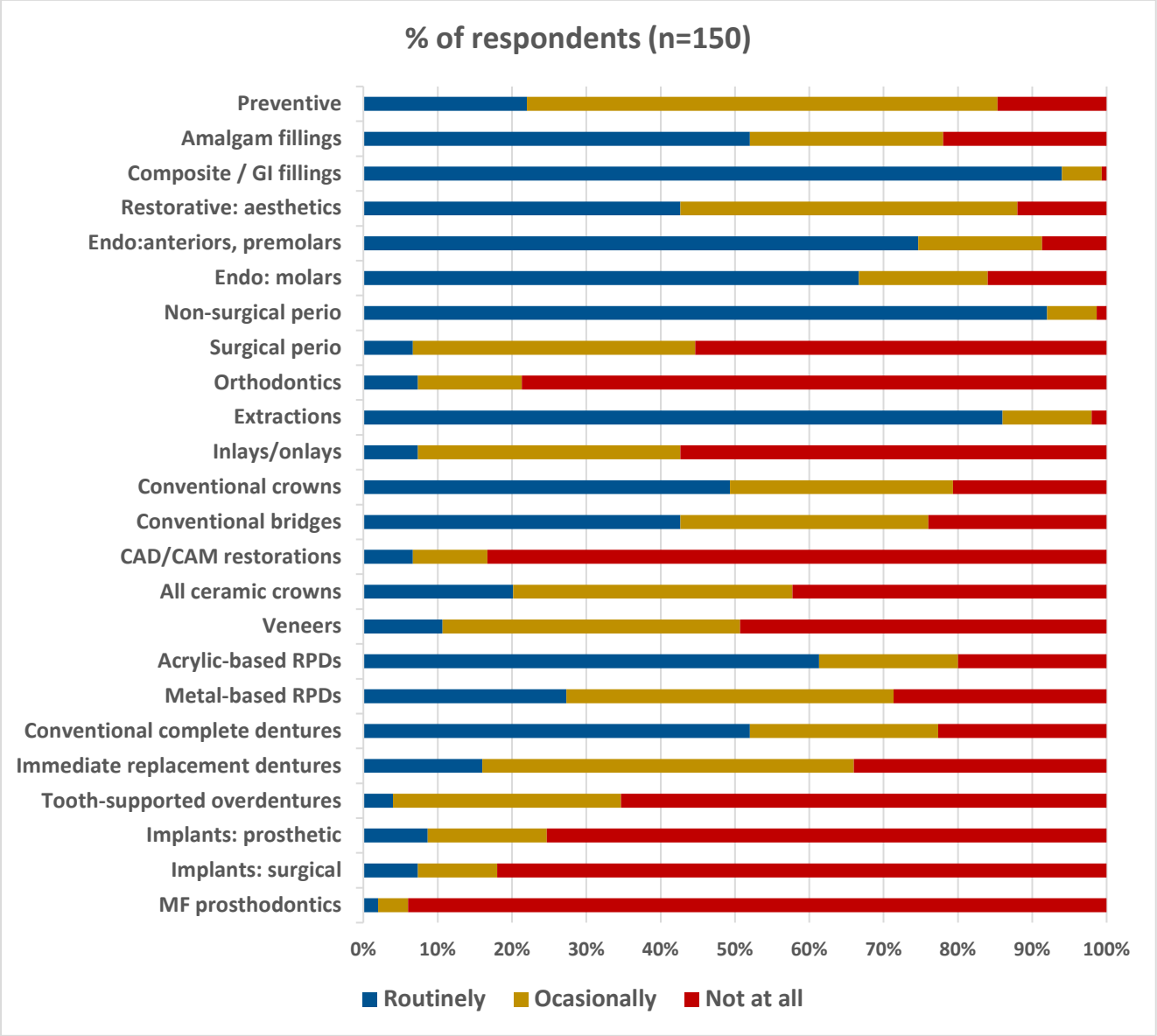



Figure 5. Frequency of treatment provided by respondents

In terms of the frequency of referrals, surgical referrals were the most frequent (37%), followed by Orthodontics (28%), Endodontics (12%), Prosthodontics (7%) and Periodontology (2%) (Figure 6).

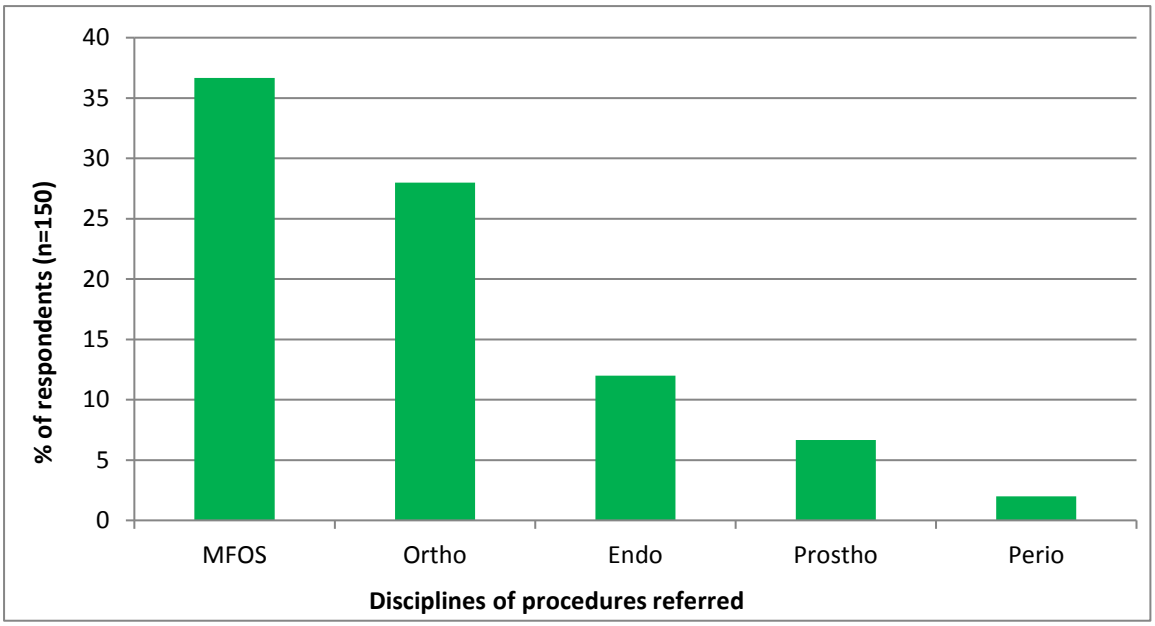



Figure 6. Distribution of the disciplines to which respondents refer

Among the 55 respondents who referred for surgical procedures, 43 did so for surgical extractions, especially of impacted third molars. 12 specified referring for complicated cases and 7 only for the lower impacted third molars. Fifteen respondents referred for the surgical placement of implants, and 5 referred for surgical removal of cysts. Endodontic referrals were mostly for molars, while for Prosthodontics, the 10 respondents referred mostly patients with TMJ disorders. The 3 dentists who referred for Periodontology indicated that it was for periodontal surgery and grafts.

### 4.5 TRAINING REQUIREMENTS

The areas/disciplines of dentistry in which the respondents felt they required CPD training is shown in Figure 7. The most common CPD training requirements were in Prosthodontics and MFOS (37% and 32% respectively).

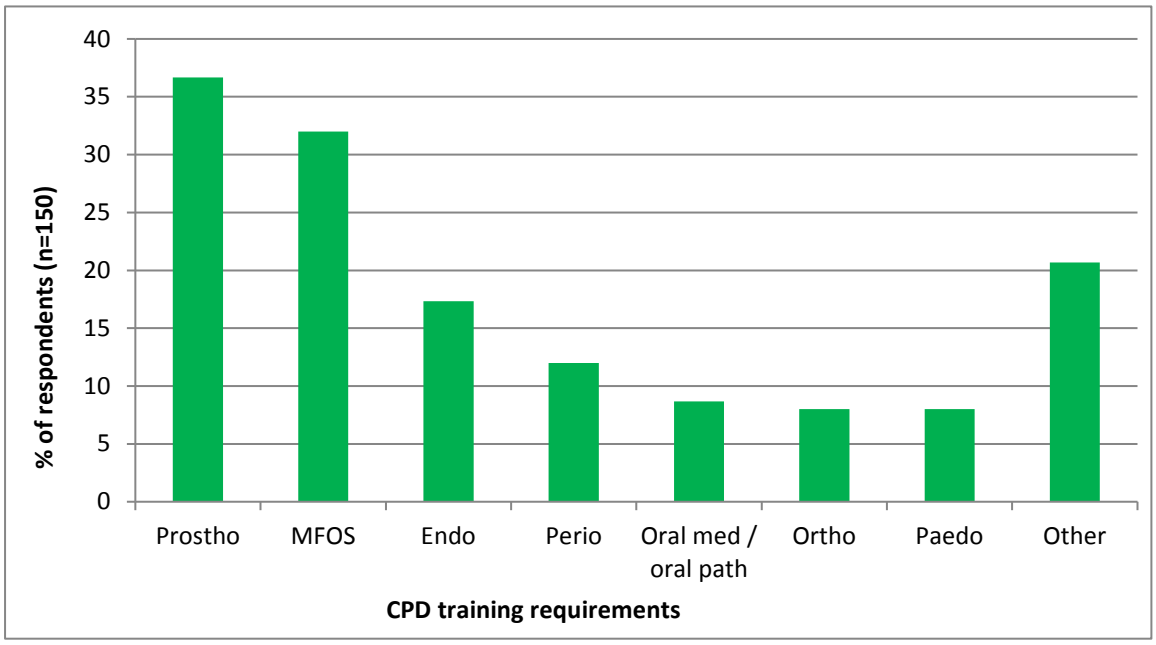



Figure 7. Distribution of disciplines in which CPD training is required by respondents

In order to develop the appropriate CPD programmes, the respondents were asked to list the areas/disciplines of dentistry in which they would like to improve their skills. Table 1 provides information about their responses.

Table 1. Areas/ disciplines of dentistry in which respondents would like CPD training to improve their skills

| Areas/Disciplines of dentistry for CPD courses | | Frequency |
|---|---|---|
| Prosthodontics | Aesthetic dentistry | 17 |
| | Fixed prosthodontics | |
| | o Crown & bridge (including preparations) | 7 |
| | o CAD/CAM | 5 |
| | o Veneers | 6 |
| | o Inlays and onlays (indications and preparations) | 2 |
| | Removable prosthodontics | |
| | o RPD | 1 |
| | o Complete dentures | 2 |
| | o Tooth supported overdentures | 1 |
| | Implant supported prostheses | 3 |
| | Smile Design | 3 |
| | Full mouth rehabilitation | 3 |
| | Restoration of Endodontically treated teeth (post and core) | 3 |
| | Occlusal equilibrium | 2 |
| | TMJ disorders & management | 2 |
| | Latest updates, new techniques | 2 |
| | Alternatives to complete dentures (more comfortable options) | 1 |
| | Everything | 1 |
| | Mentioned field but did not specify | 10 |
| | | |
| MFOS | Implants | 18 |
| | Extraction of impacted third molars | 13 |
| | Management of medically compromised patients | 8 |
| | Management of OAF/OAC | 5 |
| | Management of extraction and surgical complications | 2 |
| | Apicectomy | 2 |
| | Minor surgeries (Cyst removal, frenectomy) | 2 |
| | Biopsies | 2 |
| | Antibiotic prophylaxis | 1 |
| | Everything | 3 |
| | Mentioned field but did not specify | 8 |
| | | |
| Endodontics | New techniques (especially obturation) | 2 |
| | Management of endodontic complications (perforations, ledging, canal transportation, retrieval of broken instruments) | 2 |
| | Management of difficult canals (calcified, curved) | 2 |
| | RCT in molars | 1 |
| | Mentioned field but did not specify | 21 |
| | | |

| Areas/Disciplines of dentistry for CPD courses | | Frequency |
|---|---|---|
| Periodontology | Surgical periodontal therapy | 2 |
| | o Hard and Soft tissue grafting | 3 |
| | o Gingivectomy | 2 |
| | o Crown lengthening | 1 |
| | Periodontal regeneration | 1 |
| | Mentioned field but did not specify | 10 |
| | | |
| Oral Medicine and Oral Pathology | Diagnosis and management | 2 |
| | Swellings in the oral cavity | 1 |
| | White lesions and ulcers | 1 |
| | Oral manifestations of systemic diseases | 1 |
| | Mentioned field but did not specify | 8 |
| | | |
| Orthodontics | Corrections of minor malocclusions | 1 |
| | Fixed orthodontics | 1 |
| | Mini implants in orthodontics | 1 |
| | Mentioned field but did not specify | 9 |
| | | |
| Paediatric Dentistry | Pulpotomy & Pulpectomy | 2 |
| | Mentioned field but did not specify | 9 |
| | | |
| Others | Management of medical emergencies (eg syncope, anaphylactic shock) | 7 |
| | LASER | 9 |
| | New dental materials and technological advances in dentistry | 6 |
| | Pharmacology (eg antibiotics, NSAIDs) | 3 |
| | Pain management | 3 |
| | Practice management | 3 |
| | Disinfection, sterilization and barrier techniques | 2 |
| | Medico-legal issues and the system in Mauritius | 2 |
| | Stem cells in dentistry | 1 |
| | Patient psychology, Management of uncooperative patients | 1 |
| | Radiology relevant to dentistry | 1 |
| | Systemic diseases | 1 |
| | Diet and preventive treatment | 1 |

## 4.5 RESPONSES TO CLINICAL SCENARIOS

### 4.5.1 Treatment options chosen

Regarding the management of the missing upper central incisor and missing lower first molar, the respondents were asked to indicate the treatment options they would most likely carry out, as illustrated in Figure 8.

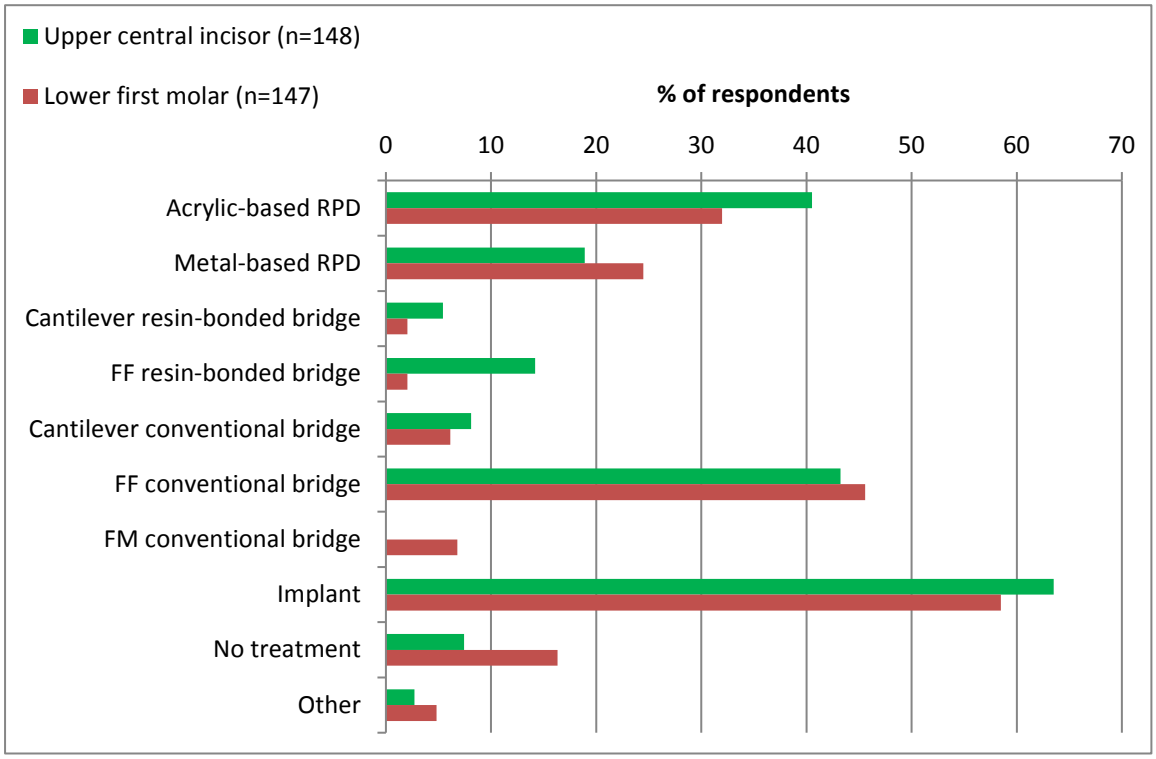



Figure 8. Treatment options the dentists would most likely carry out to replace a missing central incisor and missing lower first molar

In both cases the most popular procedure was implant, followed by fixed-fixed conventional bridge and removable partial dentures. When the treatment options were classed such that the removable partial dentures and fixed partial dentures were respectively grouped together, a similar pattern was observed (Figure 9).

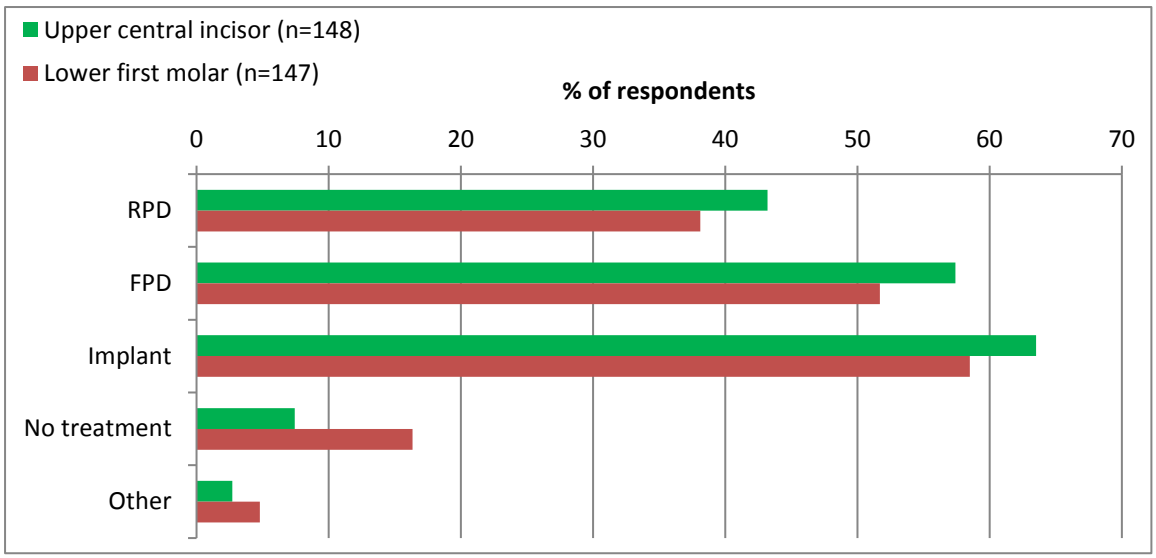



Figure 9. Treatment options selected by the dentists after being grouped

### 4.5.2 Reasons given for selecting the treatment options

Reasons for the choices for the upper central incisor were given by 135 respondents and 124 gave reasons for their choices for the lower first molar case. The major reasons have been summarised in Table 2 with the relative percentages of respondents who stated selecting those choices.

Table 2. Reasons given for selection of treatment options for the two clinical scenarios

| OPTION | REASON | % CHOICE FOR INCISOR | % CHOICE FOR MOLAR |
|---|---|---|---|
| **Acrylic RPD** | Cost (Cheapest/ If patient cannot afford other options) | 91 | 90 |
| | Is only a temporary option | 10 | 8 |
| | Simple and quick procedures involved | 5 | 8 |
| | Conservative (no preparation of adjacent teeth) / Non-invasive | 3 | 5 |
| | Provides lip support | 2 | |
| | Adequate aesthetics | 2 | |
| | Adequate function | 2 | 5 |
| **Metal RPD** | Cost relative to more expensive options | 50 | 38 |
| | No preparation of adjacent teeth | 18 | 14 |
| | More comfortable and easier to adapt than acrylic | 32 | 24 |
| | More support, retention, stability than acrylic RPD | 7 | 10 |
| | Non-invasive (if patient is unwilling for surgery) | 7 | |
| | Adequate aesthetics | 4 | |
| | Stronger and lasts longer than acrylic | 25 | 14 |
| | If patient is allergic to acrylic | 4 | 3 |
| **Implant** | Only if patient can afford (most expensive option) | 34 | 29 |
| | No preparation of adjacent teeth | 38 | 41 |
| | Best aesthetics | 23 | 13 |
| | Highest survival rate | 11 | 11 |
| | Fixed so adaptation better | 18 | 20 |
| | No speech problem, difficulty eating or lowered self-esteem as with RDP) | 2 | 4 |
| | Easier to clean than bridge | 3 | 4 |
| | Better retention and support than bridge | 4 | 5 |
| | No alveolar bone loss as with bridge | 2 | 4 |
| | Indication for a healthy young patient | 11 | 3 |
| | Long-term, permanent option | 2 | 1 |
| **Fixed-fixed conventional bridge** | Cheaper than implants | 21 | 19 |
| | Only if patient can afford | 19 | 12 |
| | Good aesthetics | 38 | 21 |
| | Good function | 3 | 7 |
| | Good retention and support from abutments | 19 | 22 |
| | High survival rate | 16 | 16 |
| | Fixed so adaptation better | 29 | 19 |
| | Strong prosthesis and less likely to break | 10 | 14 |
| | No speech problem, difficulty eating or lowered self-esteem (as with RDP) | 2 | 3 |
| | If patient is unwilling for surgery | 12 | 10 |
| | If adjacent teeth already have or require large restorations or endodontics | 6.9 | 10 |

| OPTION | REASON | % CHOICE FOR INCISOR | % CHOICE FOR MOLAR |
|---|---|---|---|
| **Fixed-fixed resin bonded bridge** | Cost (If patient cannot afford implants or other bridges) | 33 | 20 |
| | Minimal preparation of adjacent teeth | 47 | 20 |
| | Not appropriate as debonding likely | | 40 |
| | Fixed so adaptation better | 14 | |
| | Good aesthetics | 14 | |
| | Good function | 5 | |
| | No surgery required | 5 | |
| | Good stability and support | 10 | 20 |
| | Stronger than cantilever | 5 | |
| | Temporary option during 2-stage implant procedure | 10 | |
| **Cantilever conventional bridge** | Cheaper than fixed-fixed bridge or implant | 42 | |
| | Good aesthetics | 33 | 10 |
| | Only one tooth needs to be prepared | 25 | 20 |
| | If abutment tooth already restored and other tooth sound | 25 | |
| | Fixed so adaptation better | 17 | |
| | Adequate support and retention from 1 abutment | 17 | |
| | No surgery required | 8 | |
| | High success rate | 8 | |
| **Cantilever resin-bonded bridge** | Cost (If patient cannot afford implants or other bridges) | 44 | 25 |
| | Minimal preparation of adjacent tooth | 22 | |
| | Good option for just 1 missing tooth | 11 | |
| | Good aesthetics | 11 | |
| | If patient needs a quick fix | 11 | |
| | If patient agrees to risk of debonding | 11 | |
| **Fixed-moveable bridge for molar** | More conservative, preparations need not be parallel, cementations easier | | 14 |
| | Most effective, comfortable | | 14 |
| | If patient can afford | | 14 |
| **No treatment** | If patient did not mind | 1 | |
| | Will refer to prosthodontist | 8 | 4 |
| | Molar not in aesthetic zone | | 26 |
| | If patient can function without replacement | | 26 |
| | If patient unwilling to pay | | 13 |
| | Patient could not afford or not insured | 13 | 13 |
| | No prosthodontic services in public institutions | 50 | 26 |

In addition to the tabulated reasons, two respondents specified that they were not trained in the procedure for the fixed-moveable bridge for the molar and so could not provide it. Six dentists working for the state indicated that prosthodontic services were not offered in the public sector.

## 4.6 THE ASSOCIATION BETWEEN DENTIST AND PRACTICE FACTORS AND THE FREQUENCY WITH WHICH THE DIFFERENT TREATMENTS ARE PROVIDED IN GENERAL PRACTICE

In order to provide for meaningful associations and because of small group sizes, some of the variable categories were combined and/or omitted for these and subsequent analyses. These were:

- Age: the top 3 categories were combined
- Time in practice: the top 3 categories were combined
- CPD course attendance frequency: Less than once a year, and once a year, were combined.
- Practice type: "both" was omitted
- Self-pay model: the two lowest categories were combined.
- Patient/insurance co-payment model: the three highest categories were combined.
- Patient pays & claims model: the two lowest, and the two highest, categories were combined.

### 4.6.1 Gender

There were significant associations but of moderate and weak effect size between gender and some of the procedures (Figure 10). More male dentists placed inlays/onlays and implants (prosthetics and surgical procedures) and were involved in surgical periodontology and orthodontics. In all of these procedures, the proportion of females who did not perform these treatments at all was higher than the proportion of males. For all the graphs with effect sizes, the following applies: the effect sizes are marked S, M, W, or N as follows:
Effect sizes: 0.50 and above: high/strong association (S); 0.30 to 0.49 moderate association (M); 0.10 to 0.29: weak association (W); below 0.10: little if any association (N)

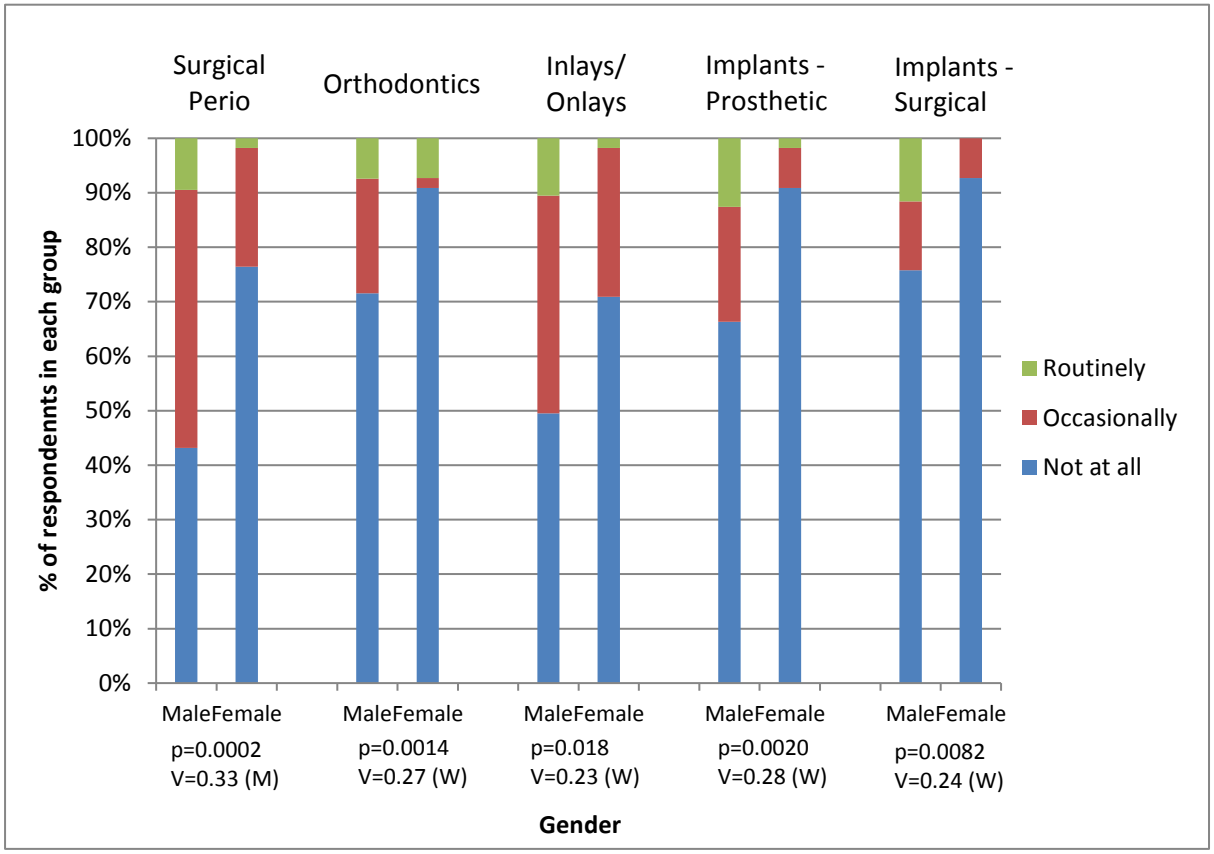



Figure 10. The significant associations between gender and certain procedures.

### 4.6.2 Age and years in practice

There were significant but weak associations between amalgam fillings and both the age category ($p = 0.0047$, $V = 0.21$) and the years in practice of the respondents. The use of amalgam fillings appeared to be more popular with older dentists as well as with increasing time in practice. A similar trend regarding the amount of time in practice was seen with the prosthetic part of implants, although this treatment is generally not as common as amalgam fillings (Figure11). Extractions followed an opposite pattern, where they were done less routinely by those in practice for more than 14 years than those in the other groups. The trend for veneers was also different, where they were predominantly carried out occasionally by

respondents with less than 14 years in practice compared with those having more than 14 years of experience.

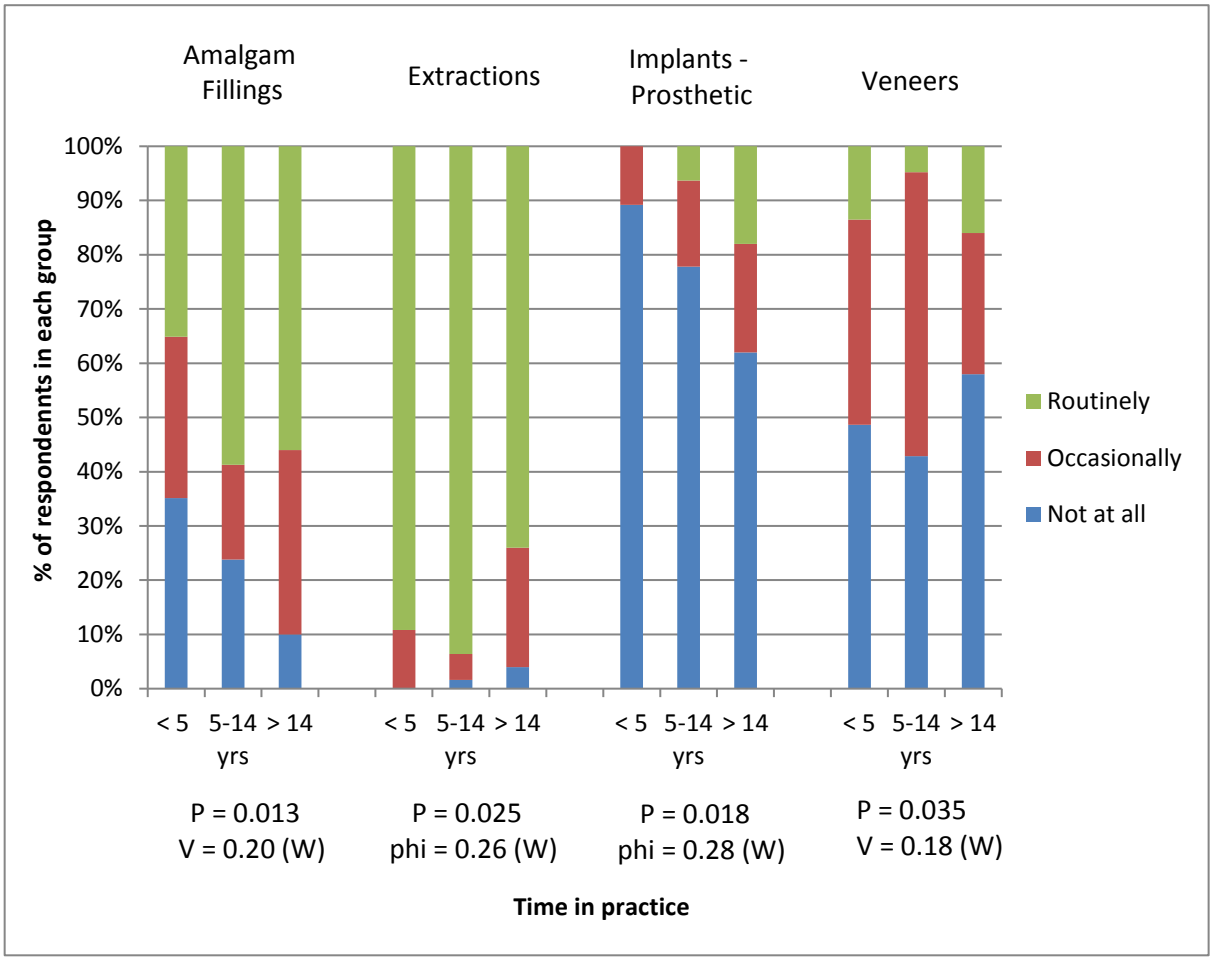



Figure 11. Association between time in practice and placement of amalgam fillings, extractions, implant prostheses and veneers

### 4.6.3 Formal training programmes

There were significant but weak associations between the presence/absence of a formal training programme and frequency of use of conventional complete dentures, and the prosthetic phase of implants (Fig. 12). The response of a frequency of “occasionally” for complete dentures was greater in those who had no formal training programme, and a higher proportion of those did not do implant dentistry at all, compared with the other respondents.

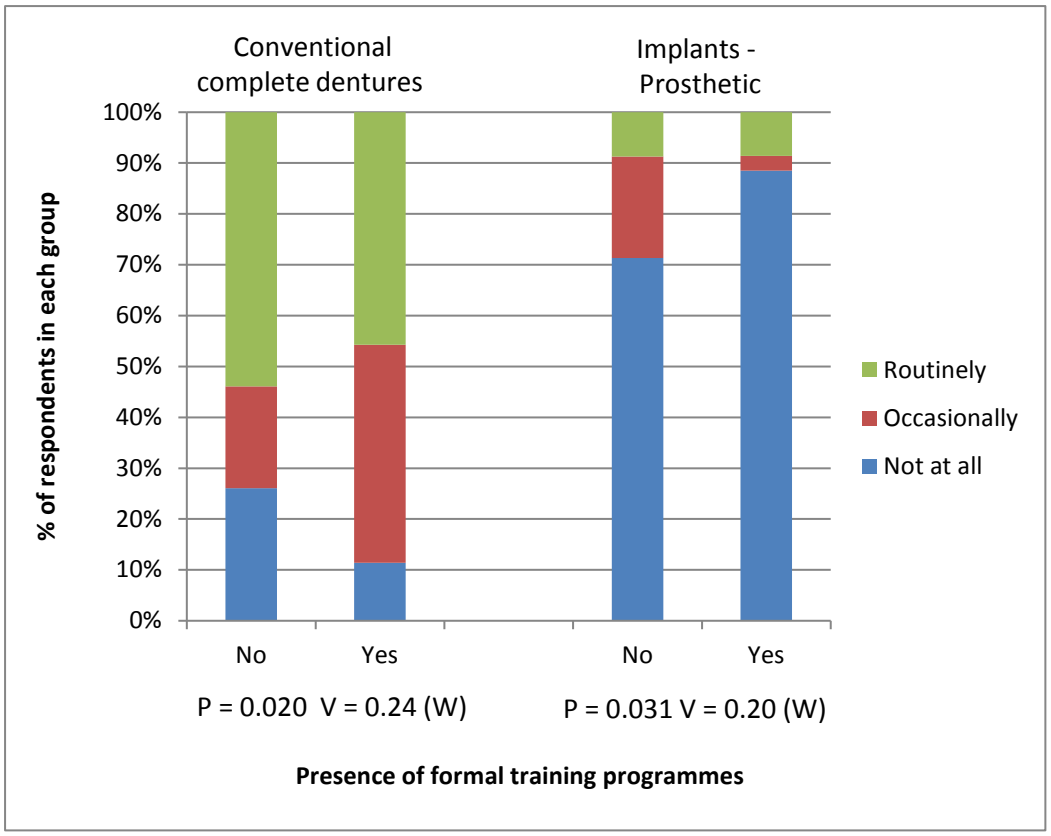



Figure 12. Association between formal training programmes and use of complete dentures and implants

### 4.6.4 Attendance of CPD programmes

The only significant association (p = 0.045) was between attendance at CPD programmes and the use of routine scaling and polishing as represented by the category “non-surgical perio”, but this association was weak (phi = 0.21). In addition, there was a significant but weak association (p = 0.043, V = 0.19), between the frequency of CPD course attendance and preventive dentistry. Increasing frequency of attendance was associated with increasing frequency of provision of preventive dentistry measures. It is likely that these are just random associations, as does occur with weak effects in surveys of this nature.

### 4.6.5 Possession of a post-graduate diploma or degree

There were significant moderate associations between implant placement, surgical periodontology and orthodontics and the relevant courses attended. A higher proportion of those who had no formal training programme did not place implants at all, compared with the other respondents. Those who had a postgraduate diploma in Implantology did more prosthetic and surgical procedures for implants routinely/occasionally rather than not at all, compared with those without the diploma (Figure 13). Among the 25 dentists who placed implants (surgical or prosthetic part) occasionally, four also reported having done a course in Implantology (one of them specified it being a 3-month course) while one of them did an MSc in MFOS. The dentists who placed implants routinely were fewer (13): one had done a course in Implantology, one an MSc in MFOS and two did their MDS in MFOS but practised in all areas of dentistry.

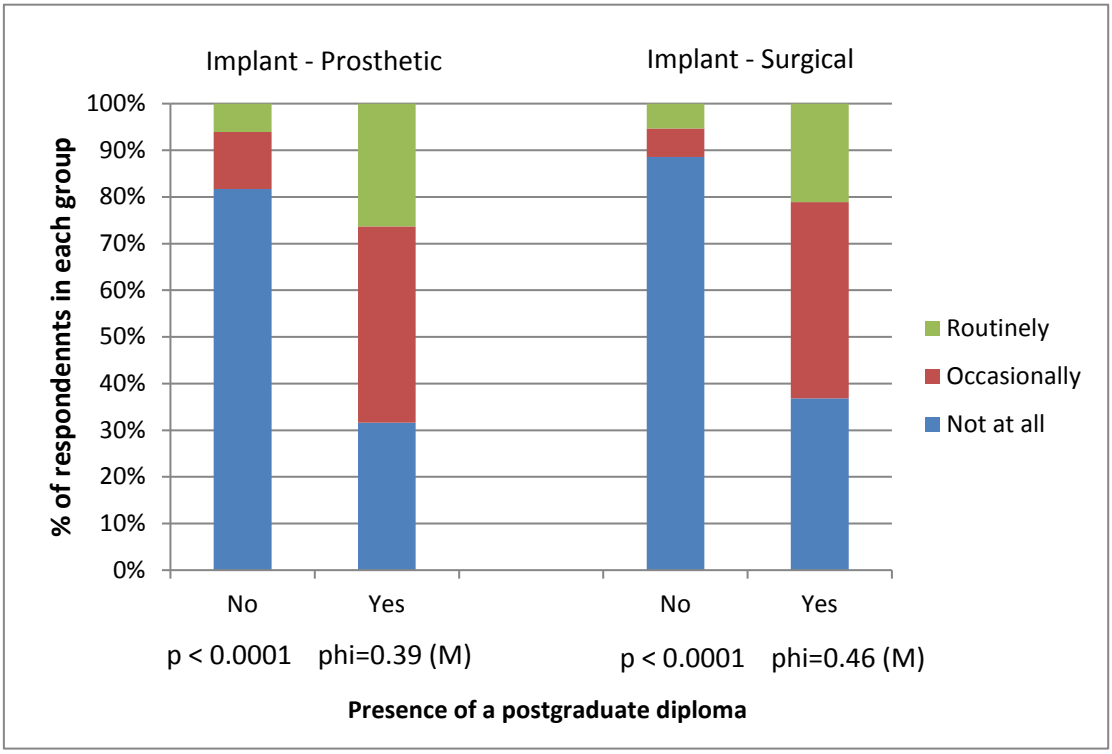



Figure 13. Association between presence of a postgraduate diploma in Implantology and placing implants

Those who had a postgraduate diploma in surgical periodontology were more likely to be doing this treatment occasionally rather than not at all, compared with those without the diploma. Although the number of responding dentists doing orthodontics occasionally were twice those doing it routinely, none had any formal postgraduate training in that field. However, among those practising it routinely, two had done a basic course in Orthodontics, two had a postgraduate diploma, two had an MSc and one had an MDS in Orthodontics but was practising in all fields of dentistry.

Five respondents carried out procedures in maxillofacial prosthodontics occasionally, one being an MFOS specialist and another an Orthodontist. The two respondents carrying out these procedures routinely are a MFOS specialist and a Prosthodontist. All 6 of these specialists practice in all fields of dentistry.

### 4.6.6 Dental Association membership

The only associations (significant, weak) found were between membership of an association and the provision of acrylic-based removable partial dentures and immediate replacement dentures which clearly was a random effect that has little meaning and was not explored further.

### 4.6.7 Practice type

There were significant associations between practice type and the procedures shown in table 3 and figure 14.

Table 3. Associations between practice type (public vs private) and treatment procedures

| TREATMENT PROCEDURE | SIGNIFICANCE (p value) | EFFECT | EFFECT SIZE |
|---|---|---|---|
| Endodontics anterior/premolar | 0.0001 | V = 0.59 | Strong |
| Endodontics molar | 0.0001 | V = 0.59 | Strong |
| Inlays/onlays | 0.0001 | V = 0.83 | Strong |
| Conventional crowns | 0.0001 | V = 0.83 | Strong |
| Conventional bridges | 0.0001 | V = 0.75 | Strong |
| Acrylic-based RPDs | 0.0001 | V = 0.85 | Strong |
| Metal-based RPDs | 0.0001 | V = 0.67 | Strong |
| Conventional complete dentures | 0.0001 | V = 0.78 | Strong |
| Immediate replacement dentures | 0.0001 | V = 0.60 | Strong |
| Preventive dentistry | 0.0002 | V = 0.34 | Moderate |
| Amalgams | 0.0001 | V = 0.39 | Moderate |
| All ceramic crowns | 0.0001 | V = 0.48 | Moderate |
| Veneers | 0.0001 | V = 0.43 | Moderate |
| Tooth-supported overdentures | 0.0001 | V = 0.33 | Moderate |
| Restorative: aesthetics | 0.0041 | V = 0.27 | Weak |
| Prosthetic phase of implants | 0.0041 | phi = 0.26 | Weak |
| Surgical phase of implants | 0.0031 | phi = 0.21 | Weak |

Those procedures with strong associations were all practised more routinely in private than in public practices. All-ceramic crowns, veneers and tooth-supported overdentures, were also (moderate effect) more routinely carried out privately, and preventive dentistry and amalgam fillings were more routine in public practices. Aesthetic restorations and implants (prosthetic and surgical aspects) were (weak effect) more common privately. The procedures that were not carried out in the state hospitals were numerous and they were all in the prosthodontic discipline.

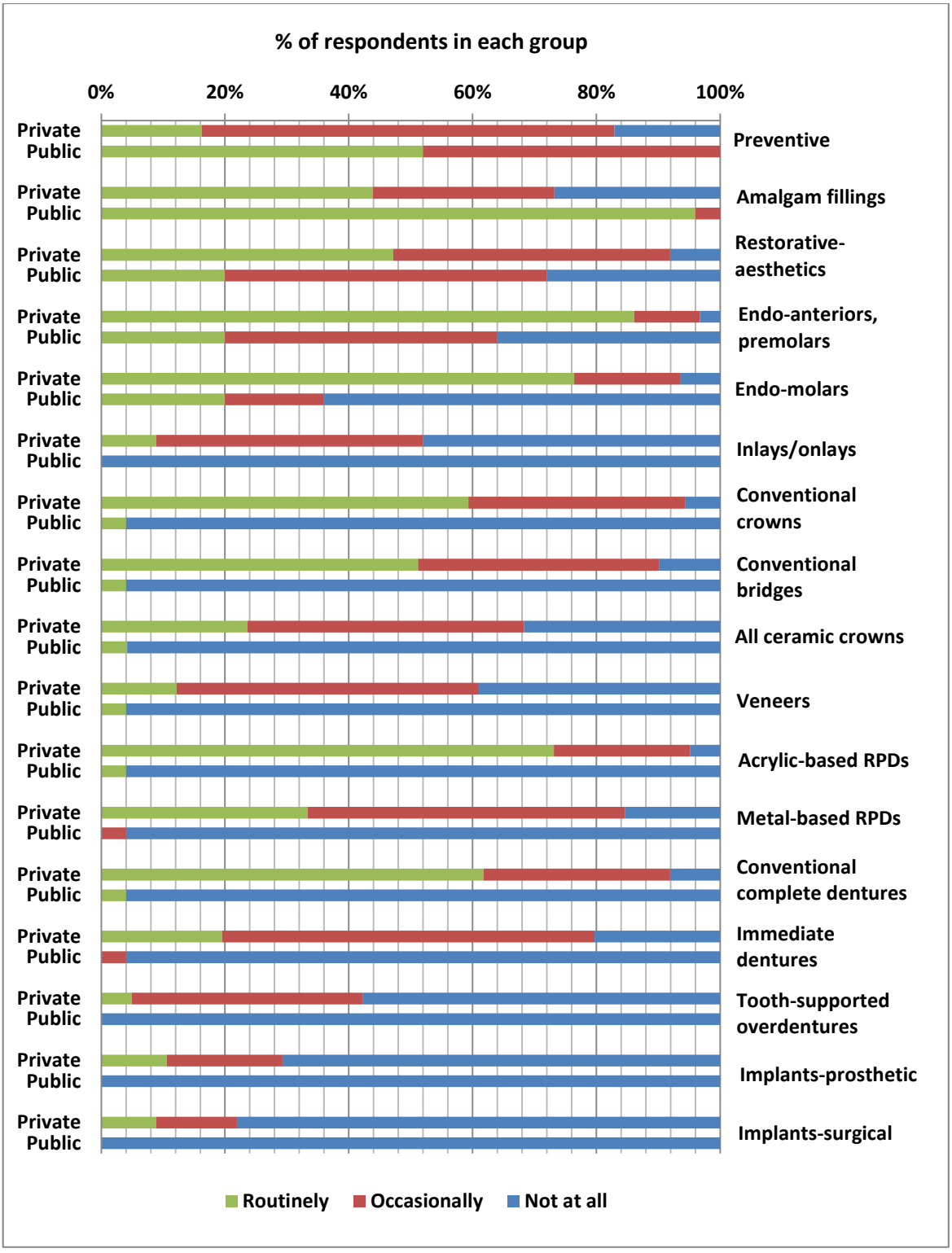



Figure 14. Associations between practice type (public vs private) and treatment procedures

### 4.6.8 Presence of specialists

There were significant but weak associations between the presence/absence of specialists and conventional crowns (p = 0.021 V = 0.23), acrylic-based RPDs (p = 0.036 V = 0.21), and surgical placement of implants (p = 0.031 phi = 0.23). With reference to conventional crowns and acrylic-based RPDs, there was a higher proportion of those respondents who had specialists in their practices/clinics not doing these procedures at all rather than occasionally, compared with those practices who did not have specialists. With reference to the surgical placement of implants, there was a lower proportion of respondents not doing this at all rather than routinely and who had specialists in their practices.

### 4.6.9 Payment methods

The payment models discussed in this section apply only to private practices; patients who visit public institutions do not pay because public health care is completely sponsored by the State. A significant, moderate, association was found between self-payment (no insurance) and surgical periodontology (p = 0.028 phi = 0.30). This treatment modality was lower in practices with a higher proportion of self-paying patients, as shown in Figure 15.

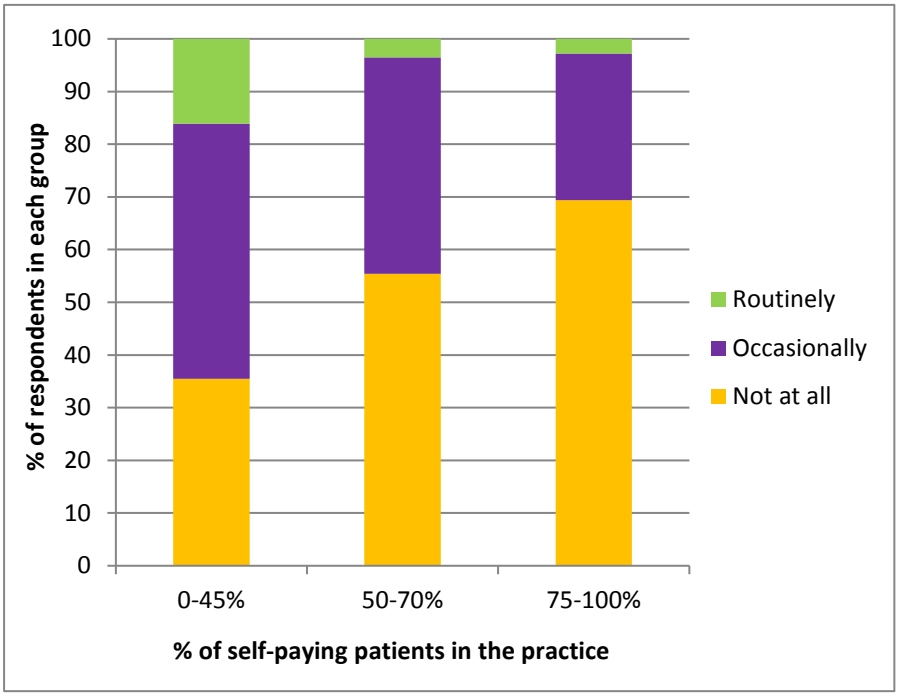



Figure 15. Association between the self-payment model and frequency of surgical periodontology

Co-payment by the patient and insurance was significantly (moderate) associated with surgical periodontology and the surgical aspect of implant placement. The association between this payment model and immediate replacement dentures was significant but weak. These three treatment modalities were more frequent in practices with a higher proportion of co-paying patients (Figure 16).

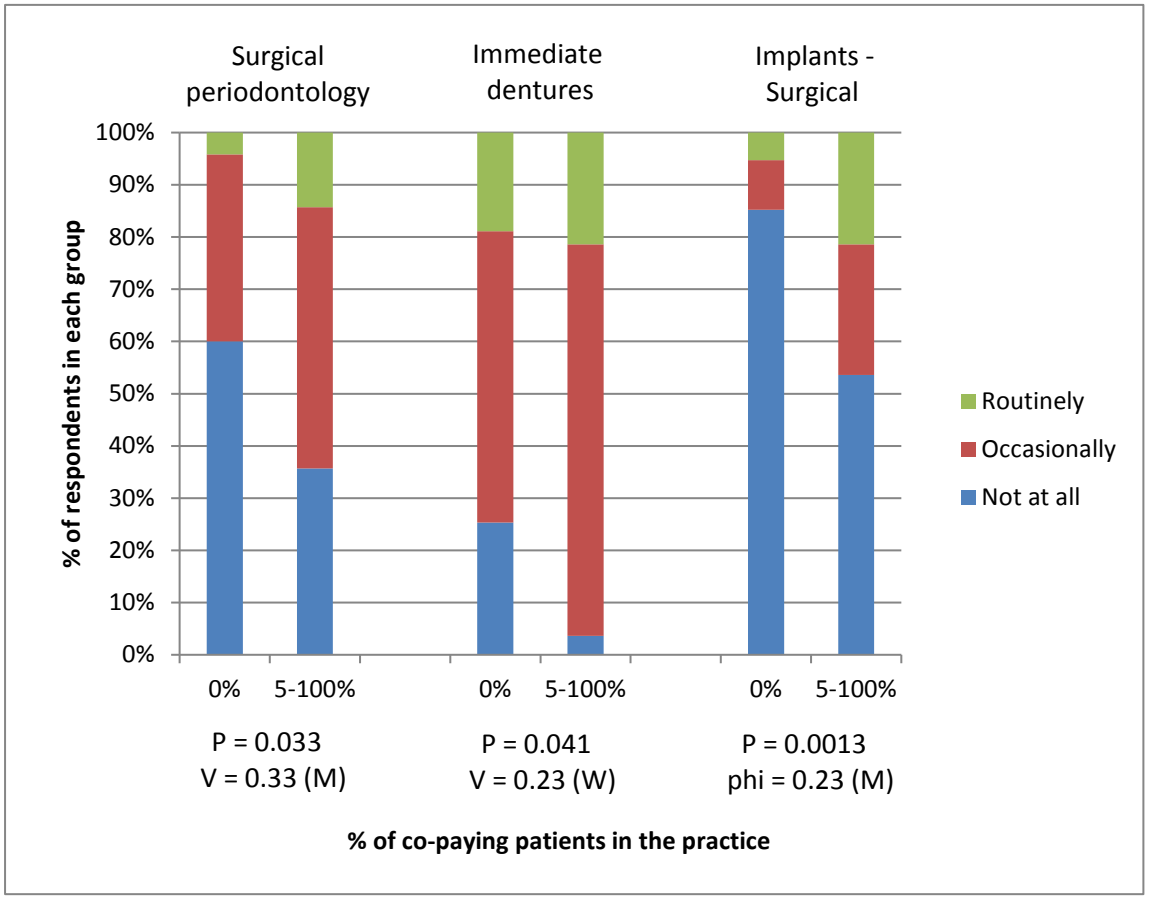



Figure 16. Association between the co-payment model and surgical periodontology, immediate dentures and implants (surgical)

In cases where the patients paid and claimed back from their insurance, there was a significant but weak association ($p = 0.025$ $V = 0.25$) with conventional complete dentures, which were more occasional in practices with that payment model (Figure 17).

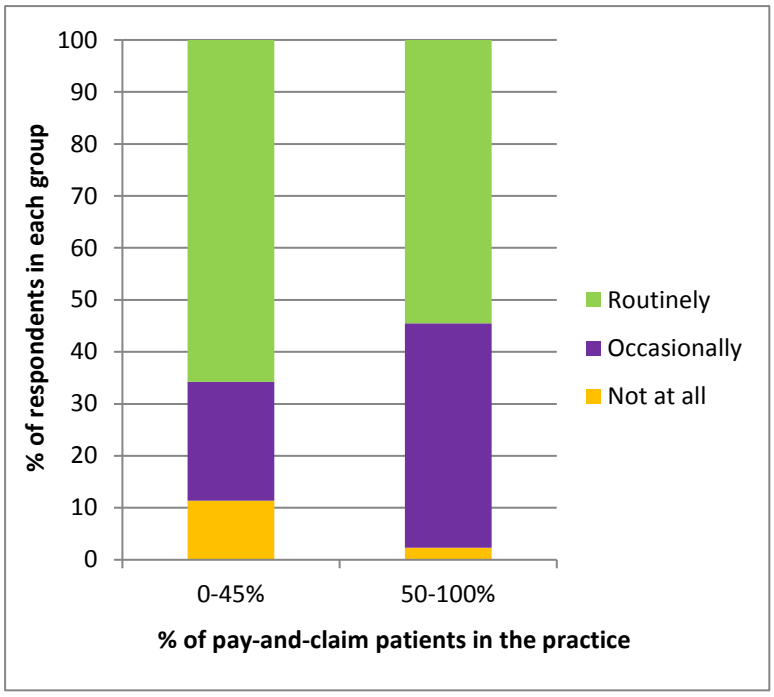



Figure 17. Association between the pay-and-claim model and conventional complete dentures

There was a significant and moderate association (p = 0.0007 V = 0.34) between payment received solely by insurance and metal-based RPDs delivered by the practices. This treatment was less favoured in practices with a higher proportion of patients who were completely covered by insurance (Figure 18).

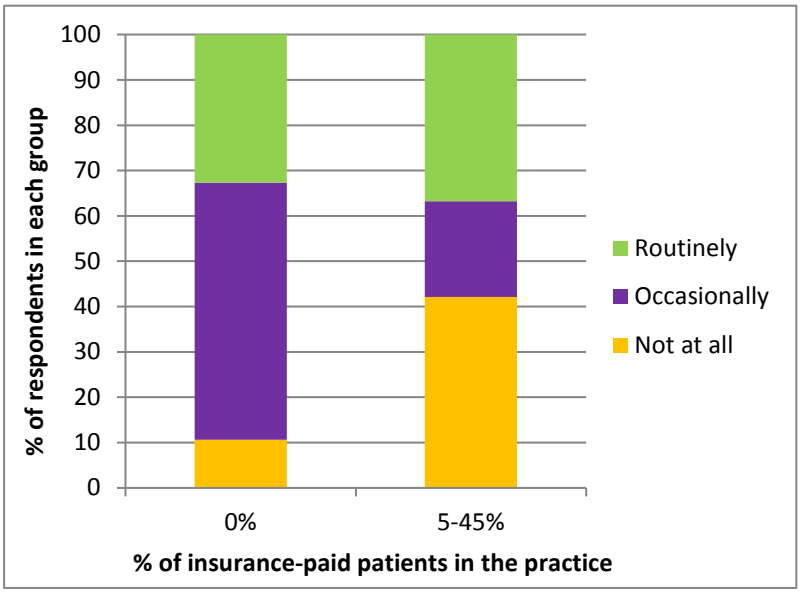



Figure 18. Association between the insurance-paid model and metal-based RPDs

## 4.7 THE ASSOCIATION BETWEEN DENTIST AND PRACTICE FACTORS AND TREATMENT OPTIONS IN THE SCENARIO QUESTIONS

Significant but weak associations were found between the presence of a postgraduate diploma and the choice of implants to replace both the maxillary central incisor and the mandibular first molar. In both cases, those with a diploma were more likely to select the implant and vice versa. There were also significant and weak associations between the practice type and the use of removable partial dentures, fixed partial dentures and the 'no treatment' options for both teeth. Overall, those in the public sector recommended a lower proportion of treatment selection compared with private practice, as illustrated in Figures 19 and 20. The trend across the 3 groups of treatment options illustrated was similar for both the upper central incisor and lower first molar. Among private practitioners, for both teeth, FPD was the most popular option while 'no treatment' was the least common. In contrast, there was a predominance of dentists in the public sector selecting the 'no treatment' option.

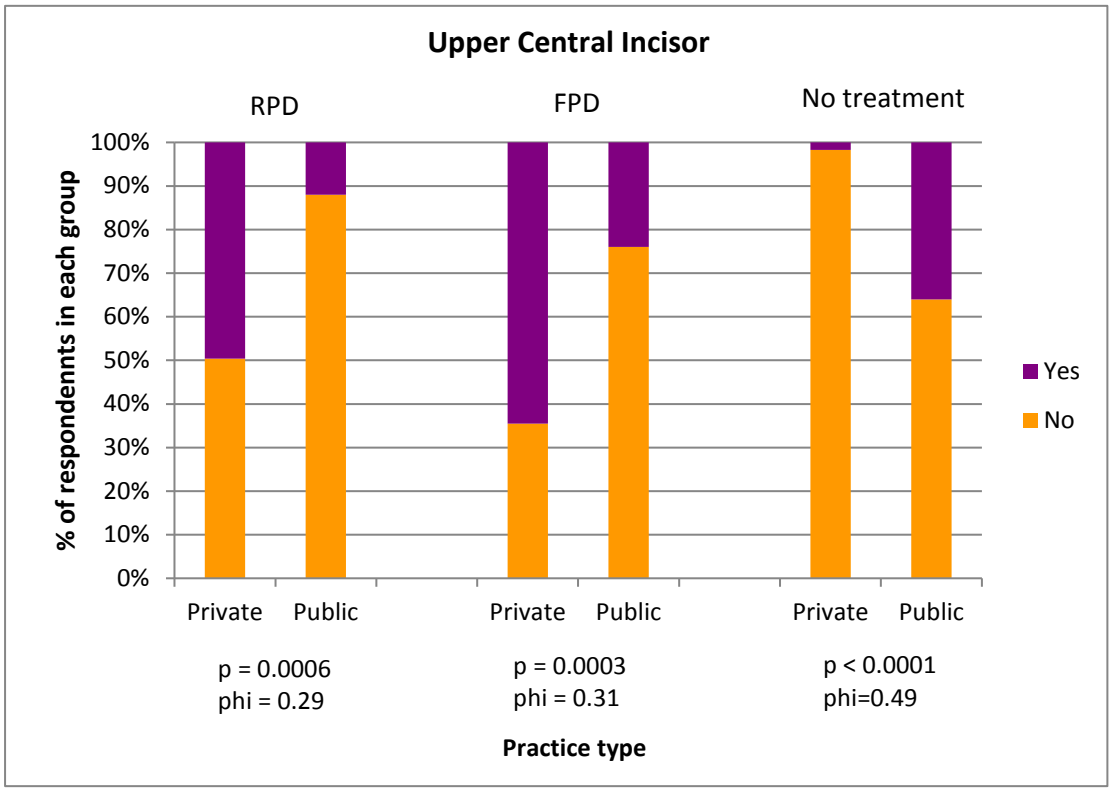



Figure 19. Association between practice type and the RPD, FPD and 'no treatment' options for the upper central incisor

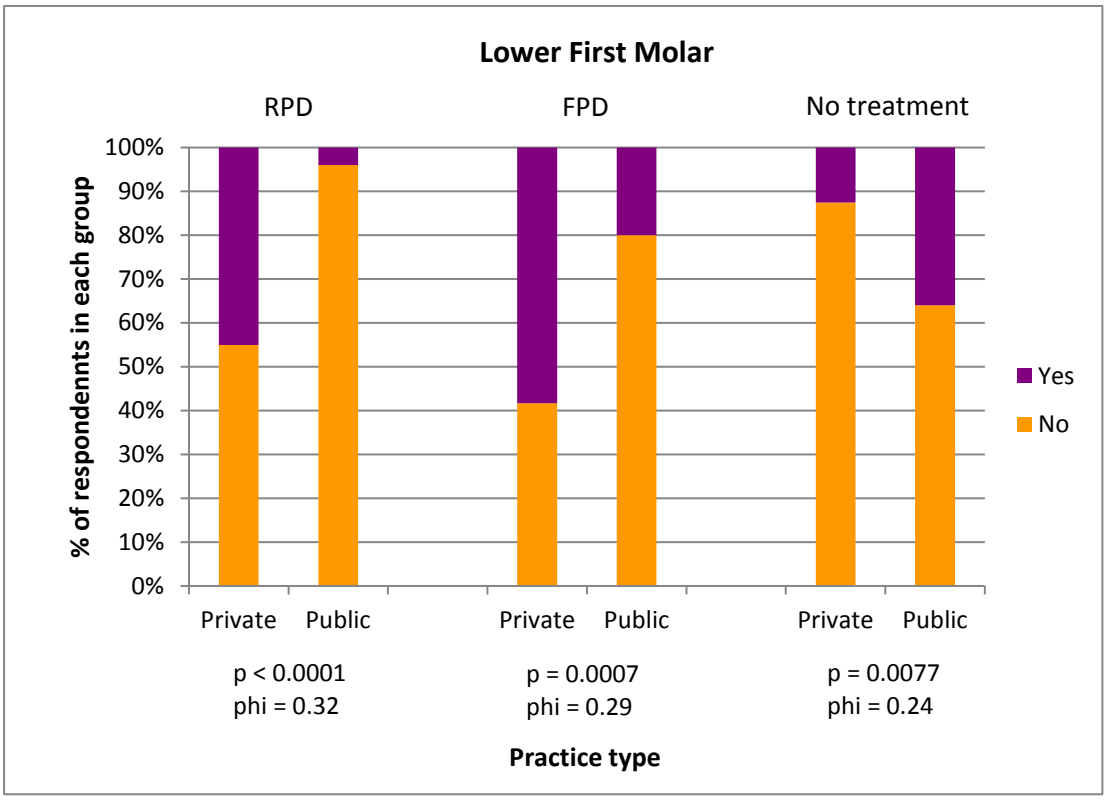



Figure 20. Association between practice type and choice of the RPD, FPD and 'no treatment' options to manage the lower first molar

The presence of a specialist as part of a practice was significantly associated (weak) with a lower proportion of FPD selection for both teeth and a higher proportion of implant selection for the lower first molar. An increasing proportion of patients who were self-funded in private practice was significantly associated (weak) with a higher proportion of FPD selection for the upper central incisor and a lower proportion of implant selection for both teeth (Figure 21).

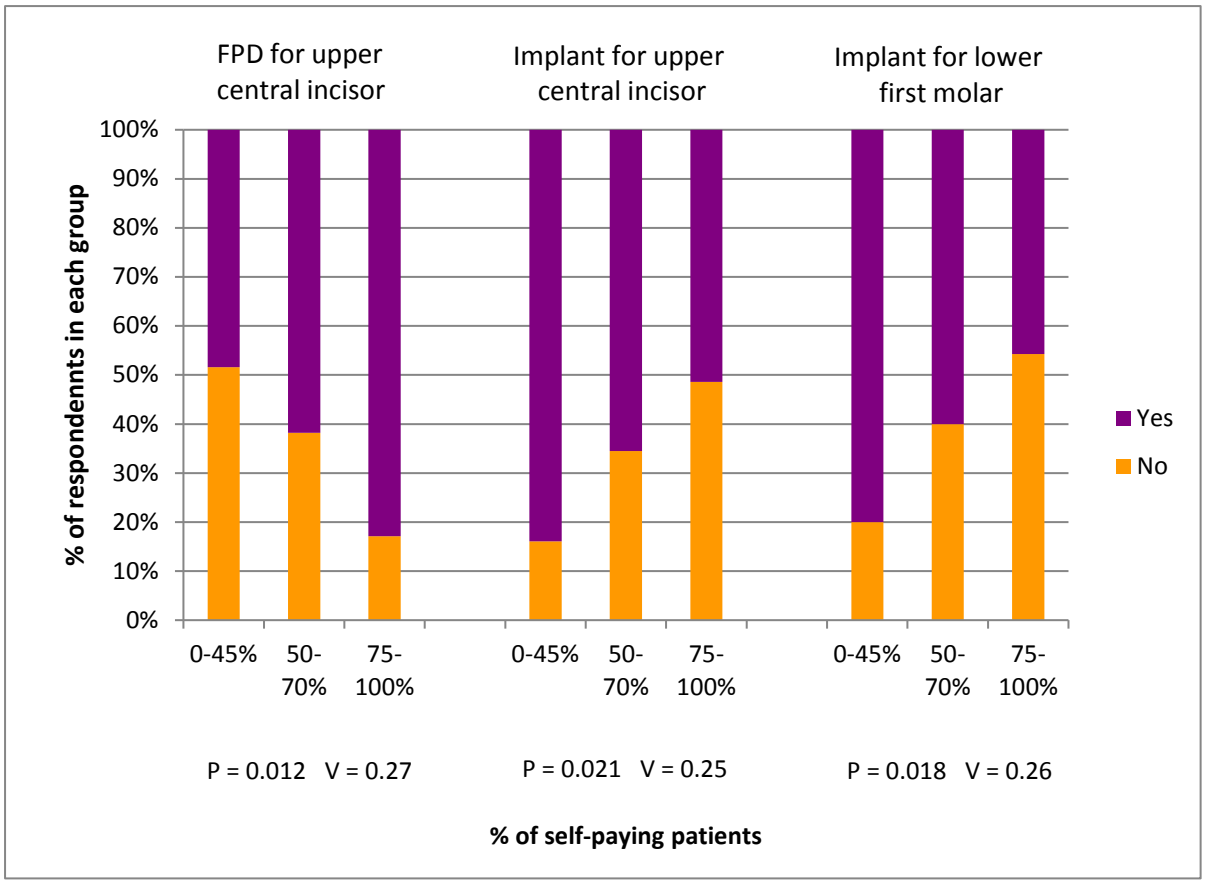



Figure 21. Association between self-funded patients and the treatment options FPD and implant

## 4.8 THE ASSOCIATION BETWEEN THE FREQUENCY WITH WHICH THE DIFFERENT TREATMENTS ARE PROVIDED IN GENERAL PRACTICE AND THE TREATMENT OPTIONS IN THE SCENARIO QUESTION

In order to replace the upper central incisor, the choice of RPD was significantly associated (moderate) with an increasing provision of removable dentures (partial or complete) in practice. The FPD and implant selection followed a similar trend, where they were associated significantly (with moderate effect) with increasing placement of bridges and implants respectively in practice. About half of the respondents who were offering acrylic-based RPDs, metal-based RPDs and conventional bridges routinely would manage the upper central incisor with a removable partial denture. However, only about 10% of those who place implants routinely would opt for a removable partial denture to replace that tooth (Figure 22).

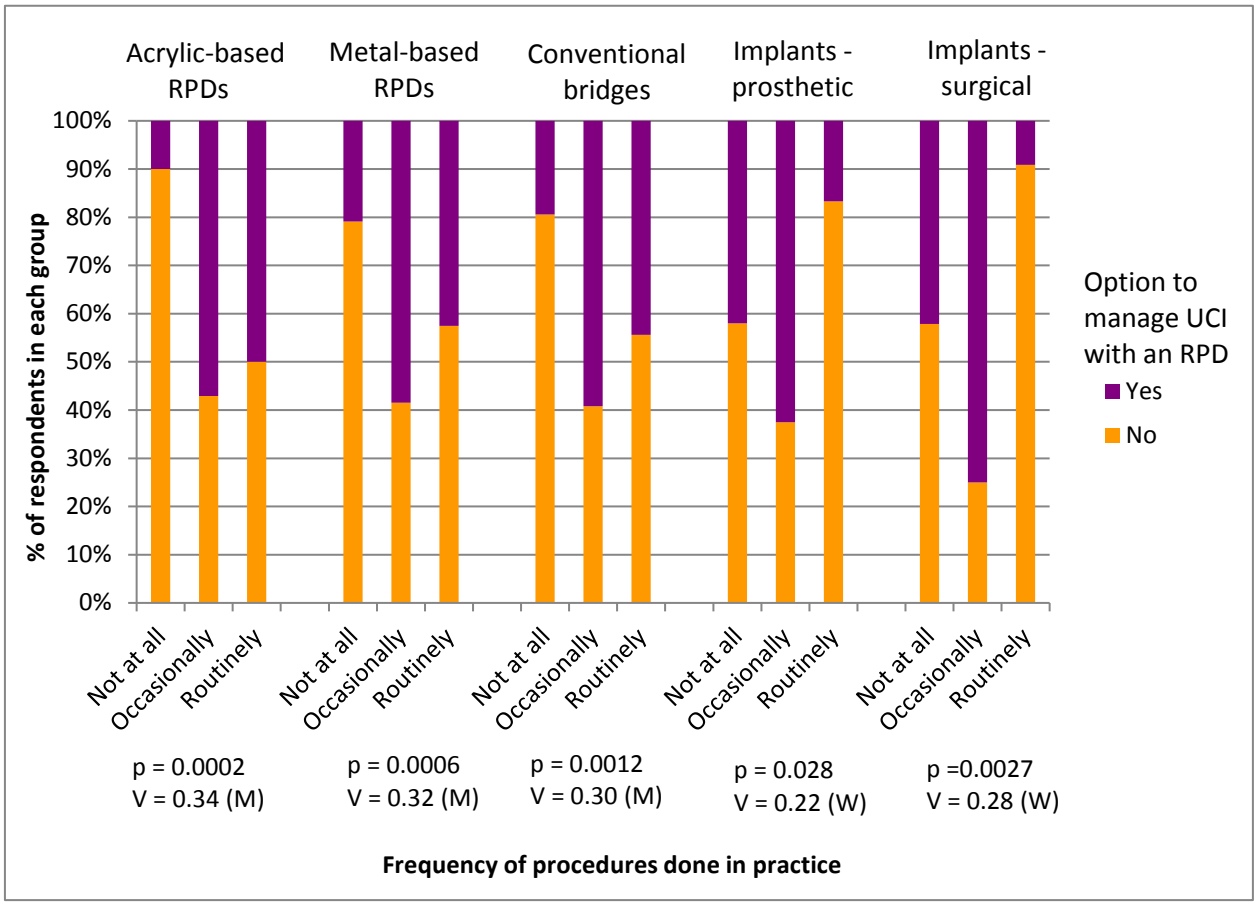



Figure 22. Association between frequencies of procedures carried out in practice and a RPD as a selected option to manage the upper central incisor (UCI)

A similar pattern could be seen where a fixed partial denture was selected to replace the upper central incisor. About 65% of those respondents were providing conventional bridges routinely in their practice, 70% and 55% respectively were offering acrylic-based and metal-based RPDs. Here as well only about a tenth of the respondents were placing implants routinely in their practice (Figure 23).

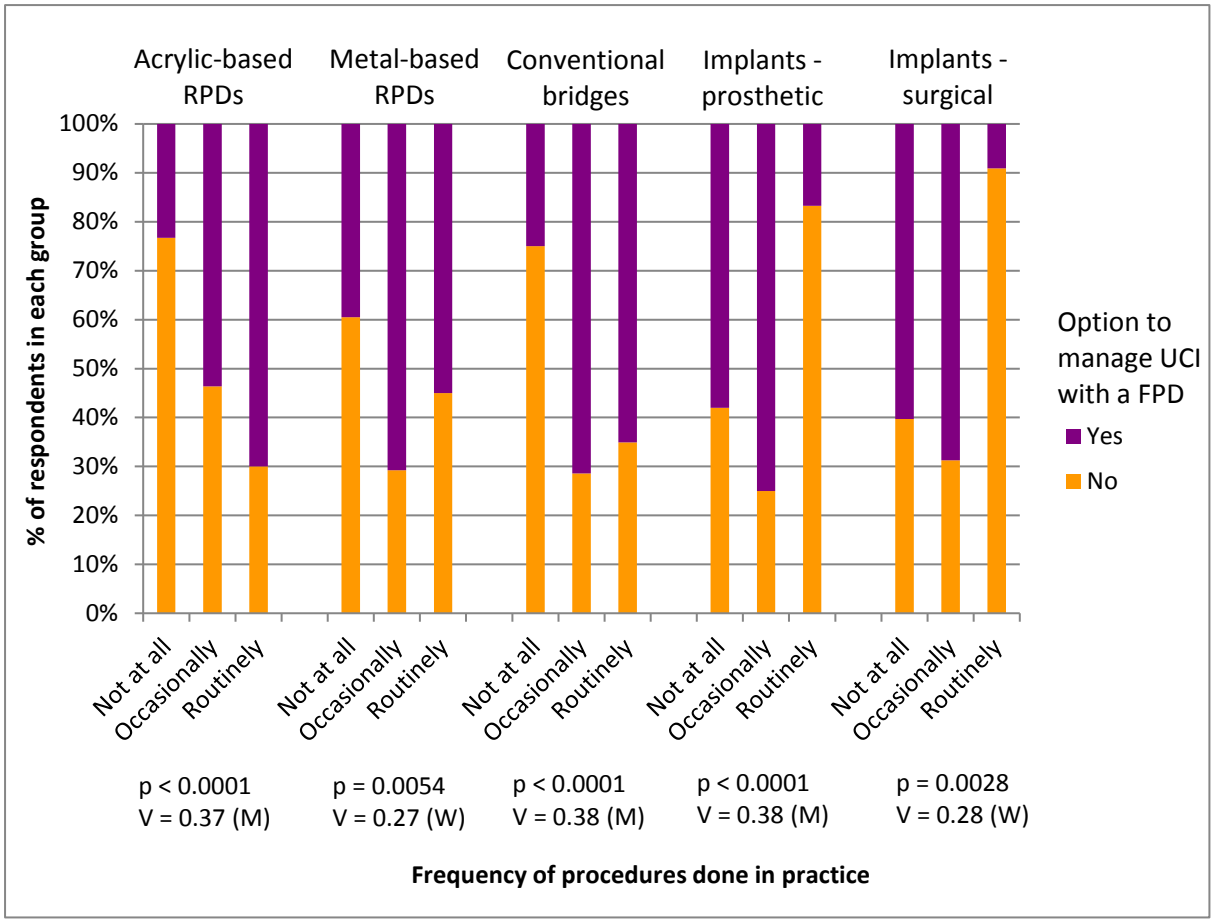



Figure 23. Association between frequencies of procedures carried out in practice and a FPD as a selected option to manage the upper central incisor (UCI)

About 90% of respondents who were doing the prosthetic part of implants occasionally and routinely in their practice would manage the upper central incisor with an implant. All the respondents carrying out the surgical part of implants occasionally and routinely in practice opted for the implant option to replace that tooth (Figure 24).

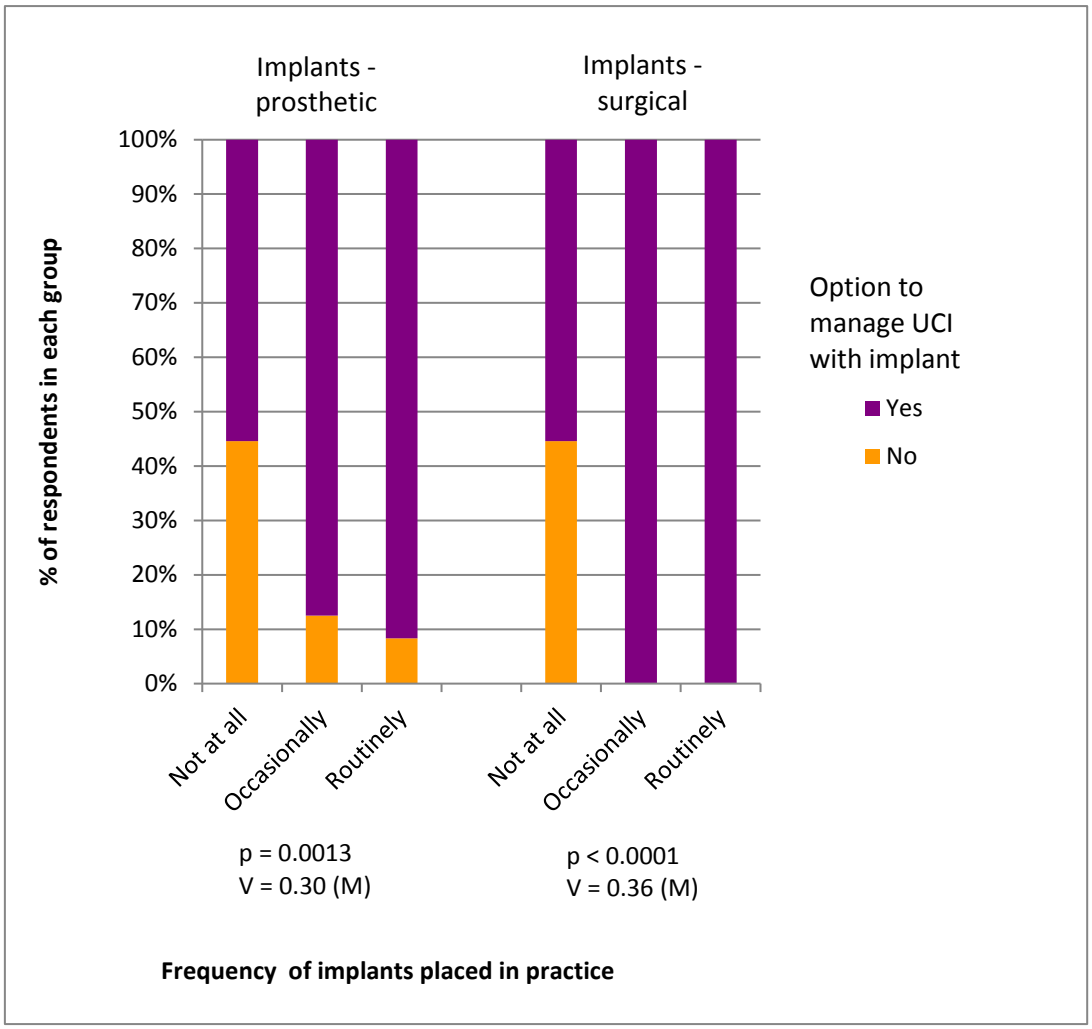



Figure 24. Association between frequencies of implants placed in practice and the selection of an implant to manage the upper central incisor (UCI)

# CHAPTER 5. DISCUSSION

## 5.1 FREQUENCY OF TREATMENT PROVISION

The most popular procedures to be carried out routinely by general dentists were composite/Glass Ionomer fillings (94%) and non-surgical periodontal therapy (basically scaling and polishing) (92%), followed by extractions (86%) and endodontic therapy (75% for anteriors/premolars, 67% for molars). The general dentists who were part of the National Dental Practice-Based Research Network in the USA also reported doing similar procedures (restorative, extractions, non-molar endodontics) routinely (Gilbert et al 2015). However, only 23% of these American dentists did non-surgical periodontal therapy routinely while their output of aesthetic procedures routinely was quite high (59%) compared with 43% in this study. No reasons were given for this.

With regards to prosthodontics in Mauritius, removable prosthodontic services were carried out more routinely than fixed, with acrylic-based RPDs and conventional complete dentures prevailing at 61% and 52% respectively, while conventional crowns and bridges were not far behind, being provided by 49% and 43% of the respondents respectively. Contrarily, in Virginia, patients were receiving fixed prosthodontics more often than removable prosthodontics – FPDs were predominant, followed by metal-based RPDs (Janus et al 2007). These authors explained that general dentists refer few patients to prosthodontists, and thus, spent most of their time in practice carrying out fixed restorations. In Mauritius, as well, there are few referrals to prosthodontists (7%). However, possible reasons for the lower output of conventional crowns and bridges by the Mauritian respondents might be the fact that this area of dentistry was a very common one where they identified the need for CPD training for skill improvement and also that the predominant reason for selecting RPDs in our clinical

scenarios was their lower cost. The present study was in agreement with the predictions that, by 2020, the demand for complete dentures will go up despite the decrease in age-specific edentulism rates (Douglass et al., 2002) and the percentage of partially edentulous patients needing RPDs or FPDs will also increase (Douglass and Watson, 2002).

The services that the Mauritian dentists mostly did not offer were maxillofacial prosthodontics (94%), CAD/CAM restorations (83%), surgical part of implants (82%), orthodontics (79%), prosthetic part of implants (75%) and tooth-supported overdentures (65%). Despite the similarity with the study by Gilbert et al. (2015), where most dentists were not doing orthodontics (68%) and tooth-supported overdentures (65%) there as well, a difference was apparent in the provision of implants. Only 39% of the American dentists were not providing implant services (surgical or prosthetic). In contrast, the Virginia study reported that 94% of their respondents were not placing implants (Janus et al 2007), which is similar to this study, which revealed that not only were 'implants' the most common area where respondents wanted to further their skills through CPD programmes, but cost was also an issue (most expensive option) when managing the clinical scenarios.

## 5.2 MANAGEMENT OF CLINICAL SCENARIOS

The results from these questions differ from those of Patel et al. (2010), in which UK dentists were asked their treatment selections for a missing upper first molar. Whilst those authors found that the fixed-fixed conventional bridge was the most popular treatment selected, in this study there was a preference for the implant option. The least common procedure to be selected by the British dentists was the acrylic-based RPD, whereas with the Mauritian dentists, this treatment option was the third most popular for both the teeth. The second most common procedure was also different: in the UK it was 'no treatment' while in Mauritius it

was the fixed-fixed conventional bridge. The results of that study in the UK were expected to be similar to the Mauritian result for the lower first molar but to differ for the upper central incisor. However, despite the clinical difference between the two teeth, 'no treatment' was only selected by 16% of the Mauritian respondents for the lower first molar compared with 54% for the upper first molar in the UK. There was, nevertheless, a resemblance among the reasons given in both surveys for selecting/rejecting the 'no treatment' option. The most significant difference in the treatment of choice for this study was seen in the case of the 'fixed-fixed resin-bonded bridge' option, where 14% of respondents selected that option to replace the upper central incisor while only 2% selected it for the lower first molar, which is a clinically sound decision.

It is possible, though, that these comparisons are misleading. The question asked of the respondents in this study was to specify the procedure they would be more likely to carry out themselves, but from the responses it was clear that they were about what was the most appropriate option for the patient. Hence a more appropriate analysis would be a qualitative one in terms of the reasons given for their choices. In retrospect, it may have been better to have asked the respondents about what the ideal treatment plan should be compared to what they would actually choose to do for various reasons. From a prosthodontic perspective, they reveal in many cases a departure from conventional prosthodontic practice and in some cases display a fundamental lack of an understanding of prosthodontic principles. For example, a fundamental principle for RPDs is that they should receive tooth support, yet 3 and 5% of respondents suggested that this was not applicable to acrylic-based RPDs. Seven and 10% of those who selected the metal-based RPD for the incisor and molar respectively explained that it would offer more support, retention and stability than an acrylic-based RPD. It could therefore be deduced that some of the acrylic-based RPDs being made in Mauritius were

without clasps and/or rests. Among those who selected the 'other' option, one respondent mentioned the flexible RPD (e.g. Valplast®) to replace the upper central incisor while in the case of the lower first molar, this treatment was recommended by 5 respondents. The reasons given for choosing flexible polymer were that it was "cost-effective, comfortable to patients, conservative (no tooth preparation required) and offered good aesthetics". However, Sharma and Shashidhara (2014) have reported the many disadvantages of this material, including the mechanical bonding between the thermoplastic nylon and acrylic teeth, and the impossibility of tooth support amongst others. Fortunately only one dentist recommended a unilateral denture for the lower first molar as this is not a clinically acceptable option under any circumstance.

In terms of options for the lower molar, the fixed-movable conventional bridge has numerous benefits over the fixed-fixed conventional bridge such as not requiring parallel preparations of the abutments and hence being more conservative (Oakley, 2014), as well as exerting a "stress-breaking" effect by compensating for differential displacement characteristics of the abutment teeth, as well as for the flexure of the mandible (Omar and Wise 1981; Hemmings and Harrington, 2004; Botelho et al. 2017). Nevertheless, it was considered an option by only 7% of the respondents compared with the 46% who opted for the fixed-fixed conventional bridge.

## 5.3 THE ASSOCIATION BETWEEN DENTIST FACTORS AND FREQUENCY OF TREATMENT PROVISION

There have been numerous studies done over the decades describing the patterns between dentist demographics and their service provision. This has not been linked to their place of training, and it was not possible to do this here either, because of the many different countries from which the respondents graduated.

Although del Aguila et al. (2005) found that frequency distributions of the diverse procedures carried out in practice were not different between male and female dentists in Washington, the present study shows that significantly more male dentists are involved in placing inlays/onlays, implants, surgical periodontology and orthodontics. This is in agreement with the results of the survey carried out in Sweden where prosthodontic procedures were more predominant among male dentists (Kronström et al., 2000). However, the rarity of female dentists in Mauritius involved in those higher end dentistry procedures might be related to the fact that although half of the respondents to this survey were female, female dentists make up approximately one third (109) of all registered dentists in Mauritius. In addition, there was a higher number of younger female dentists with less time in practice and the results here showed that these specific procedures were mostly done by older dentists with longer times in practice. For example, none of the responding dentists under 30 years of age or with less than 5 years in practice placed inlays/onlays or implants (prosthetic/surgical) routinely. The percentages of females in that age group (35%) and with that amount of clinical experience (38%) were high as expected. Conversely, most of the dentists placing inlays/onlays or implants (prosthetic/surgical) routinely were above 40 years of age or with more than 14 years of clinical experience. Female dentists in those two categories comprised only 18% in each. The reason for that trend regarding implants might be because of the 8 respondents who were placing implants routinely and who had some postgraduate training in implant dentistry,

none were under 30 years old or in practice for less than 5 years and 5 were above 40 years of age and had been practising for more than 14 years. However, the small number of respondents is a limitation and the explanations for these trends remain conjecture.

Amalgam fillings were also more commonly carried out among older dentists and with increasing time in practice. The reason for the frequent use of amalgam was studied in Great Britain and the respondents there mentioned its superiority in terms of wear resistance, ease of manipulation and value for money compared with composites, compomers, resin modified glass ionomers and glass ionomers, while aesthetically it was the most inadequate (Burke et al., 2003). The current trend towards cosmetic dentistry, patients' expectations of aesthetic restorations and the amalgam debate regarding mercury toxicity, have led to a decreased provision of amalgam fillings in many practices. Burke et al. (2003) reported a decline in the use of amalgam among 50% of the dentists while 44% revealed stability in its use over a period of five years. It would be a reasonable assumption that the older dentists would be the ones more hesitant to change their practice in that sense, but further investigations would be required to confirm that.

A contrasting trend was seen with extractions, where the dentists with more than 14 years of experience were extracting teeth less routinely compared with other groups. This is in accordance with a study from the United States, in which dentists who graduated earlier did fewer extractions but more procedures in periodontal surgery (Gilbert et al., 2015). Although an increase in the frequency of periodontal surgery relative to increased experience was not a statistically significant finding in the present study, that pattern was nevertheless evident. There was also a similar association between postgraduate training and dental services provided, in that dentists who had no further training were less inclined towards placing

implants or doing periodontal surgery and orthodontics. When examined further, among those offering implant and orthodontic services routinely, were respondents who had an MSc or an MDS in the relevant field. This suggested that the MSc or MDS provided the dentists with more knowledge and practice compared to the postgraduate diploma, which was the most common form of postgraduate training regarding implantology among the respondents.

## 5.4 THE ASSOCIATION BETWEEN PRACTICE FACTORS AND FREQUENCY OF TREATMENT PROVISION

Previous studies have demonstrated considerable differences between private and public practices in terms of service provision, especially regarding prosthodontics, and the same trends were observed in this survey. Among the dentists working in the public sector, there was a consistency in their responses for the frequency of treatment they carry out. However, there was one exception, and considering the nature of the answers, that respondent seemed to have been working in both sectors. Since the responding dentists working in both sectors were not considered for the cross-tabulations between these two variables due to the small group size (n=2), that particular respondent, whom we assume didn't select the correct practice type (both), was also omitted for explanatory purposes. It could therefore be deduced that all the dentists working for the state were not doing any fixed or removable prosthodontic work, unlike in other countries, where prosthodontic services in the public sector were still provided despite being less common and more inclined towards removable appliances (Kronström et al., 2000). In Mauritius this is most likely because of the resource constraints in the public sector, which is common cause in other developing countries, including South Africa.

Interestingly, extractions and non-surgical periodontal therapy (including scaling and root planing) were carried out routinely by all the respondents working in the public sector. The

high frequency of extractions probably implies that most patients presented for emergency care and might also reveal a lack of resources in the public sector. Structural barriers, such as cost of dental treatment privately, created a reliance on the state-funded services by the lower socio-economic groups. A recent study in Australia had explored the public dental service and described how the system's limitations brought about a vicious cycle. Access problems to public clinics, such as extended waiting times, lead to a deterioration of oral health and increased need for emergency care. This influenced the dentists to opt for the rapid solution of extractions (Luzzi and Spencer, 2009). In Mauritius, the extraction routine with no option to replace the extracted teeth through prosthodontics is almost certainly worsening the oral health outcomes of that part of the population that seeks public services only. However, the fact that preventive services were more common in the public clinics compared with private practices implies that there were attempts at preventing the situation from getting even worse. An Australian survey also found that dentists in public clinics performed a higher percentage of extractions but lower percentage of preventive care compared with private practitioners (Brennan, Luzzi, and Roberts-Thomson, 2008). In Mauritius, the types of preventive treatment provided should be further explored and related to oral health outcomes.

The private practices offered a wider range of services, with an inclination towards certain higher-end procedures, such as endodontic treatment, aesthetic restorations and orthodontics, a similar finding to those of Gilbert et al. (2015). The question which asked the dentists to indicate the frequency of other procedures not listed in the questionnaire was under-reported, (22% response rate), but included such treatments as placing cavity varnish; managing fractures; biopsies; bleaching; paediatric dentistry; mucous cyst removal; and apicectomies. Concerning prosthodontics, procedures reported were mouthguards (for bruxism/anti-snoring); post and cores; full mouth rehabilitation; Richmond crowns; and smile design.

Regarding the availability of specialists as part of their practice, 41 respondents indicated their presence. There was a consistency here as well among those working in public institutions, where 13 revealed having specialists present, 11 of which specified having specialists of 3 different disciplines (orthodontist, endodontist, and MFOS) while 2 indicated their presence in 2 different disciplines (orthodontist and endodontist). Since no prosthodontic services were provided in the public clinics, the state did not employ prosthodontists. This is a concern as endodontically treated teeth require permanent restoration to improve their longevity, and such restorations in posterior teeth should have cuspal coverage (Stavropoulou and Koidis, 2007).

In the private sector, there was a predominance of MFOS specialists, who were part of 17 dental practices. However, 6 of them were being referred only implants and might have been wrongly classed as specialists for having an additional postgraduate degree. Nine private practitioners specified having orthodontists as part of their practice, 4 had endodontists while 3 had prosthodontists. According to Gilbert et al. (2015), a specialist on site would make the general dentist less inclined to carry out procedures in that discipline. This was confirmed in Mauritius where the respondents who had a specialist in the MFOS field available at their practice were not placing implants (surgical), except for 2 of them, who had an MDS in MFOS and a PDD in Implantology respectively, and probably counted themselves as a specialist. Similarly, most of those who had an orthodontist as part of their practice did not do any form of orthodontics. The only exceptions were the 1 respondent who did orthodontics occasionally and 2 others who had an MSc and an MDS respectively in Orthodontics and possibly counted themselves as specialists as well. The practices with a prosthodontist only

had an occasional or no output of fixed prosthodontics from those respondents, except for the one dentist who had an MSc in prosthodontics.

## 5.5 THE ASSOCIATION BETWEEN DENTIST AND PRACTICE FACTORS, FREQUENCY OF TREATMENT PROVISION AND MANAGEMENT OF THE CLINICAL SCENARIO

The selections made by the respondents related closely to what they would do in practice. The higher frequency of RPDs, FPDs and implants carried out in practice was significantly associated (with a moderate effect size) with their respective increased selection as treatment choices for the clinical scenarios. The cross tabulations demonstrated that all the respondents who place the surgical part of implants occasionally and routinely would replace both teeth in our scenario with implants, and those doing the prosthetic part of implants occasionally and routinely in practice also selected this option. Some respondents who did not place implants in practice but yet selected it as a treatment of choice stated they would refer the case to a practitioner who does. This was pointed out by 18% and 16% of those choosing an implant to replace the upper central incisor and lower first molar respectively.

A similarity between this study and the one by Patel et al. (2010) was that a greater number of dentists in the public sector were offering no treatment for the missing teeth compared with private practitioners. Moreover, the latter were more likely to opt for FPDs, confirming the previous study's results where conventional bridgework was the most common. The difference was that the dentists working for the NHS in the UK were providing prostheses to patients, although these were predominantly acrylic-based RPD (cheapest), while in Mauritius there was no prosthodontic output from the public clinics. A few dentists working for the state found it unfair towards the patients, who were denied options to treat their

complete/partial edentulism. Thirteen percent of the respondents who completed the open-ended question inviting comments, suggested that dentists in the public sector should be given the opportunity to provide prosthodontic and endodontic treatment.

It would seem that there is a culture of being conservative and preserving sound tissue amongst the respondents. This was not only reflected in their reasons for the selection made in the clinical scenario, but 19% of the respondents who made additional comments also pointed out that no replacement was available that could be as good as natural teeth, which should therefore be preserved as far as possible. They were, additionally, looking forward to further research into ways to sustain the maximum natural dentition and one respondent highlighted the needs for tissue culture (stem cells) and implantation. Although a few of the respondents were keeping up with advancements in the dental field, the majority were not engaged in treatment options like CAD/CAM and implants. This could be due to the lack of training in those areas and/or the cost of equipment, which might explain why the younger dentists were not carrying out these procedures. Contributory patient factors might include the high cost of treatment or a reluctance to spend on certain procedures when there are other cheaper options.

## 5.6 THE ASSOCIATION BETWEEN PATIENT FUNDING, FREQUENCY OF TREATMENT PROVISION AND MANAGEMENT OF THE CLINICAL SCENARIO

The results confirmed a significant relationship between insurance coverage of patients and the treatment they would receive, as indicated by previous studies. High-priced procedures were not commonly done in practices where the patients were mostly self-funded. With a higher proportion of co-paying patients (insurance paid partly), there was an increased provision of surgical periodontal therapy and implants.

Since cost was the major factor that determined the treatment option to replace the missing teeth, it was expected that the patient's funding would also have a role to play. Private practitioners who had a larger volume of self-paying patients making up their practice were less likely to place implants for the replacement of both teeth because of the financial burden on the patient. Although a greater proportion of respondents with such practice would replace the upper central incisor with a FPD, the majority indicated that they would do so if the patient could afford that treatment. They further commented that if the patient could not, their next option would be a RPD, being the cheapest. Or even 'no treatment' (mainly for the lower first molar) since the patient would not feel the need to invest when it is neither an aesthetic issue nor a problem to function without one molar. 'No treatment' was, as expected, the leading selection among dentists in the state-funded public practices, where no prosthodontic treatment was offered.

The complete funding of dental services by the state is probably the reason behind the consistency in the nature and frequency of services provided by all the dentists working in public institutions. Gilbert et al. (2015) made similar deductions when they explained that patients with public insurance or who were dependent on free or discounted services were provided with lower-end service options. The authors also found that patients who were covered by private insurance were more inclined towards receiving highly aesthetic restorations and endodontic therapy. However, since most of the respondents (85%) in Mauritius indicated that none of their patients were entirely covered by private insurance, this aspect could not be significantly associated to the frequency of procedures.

In addition, when the respondents were given the opportunity to make further comments, 44% of them specified that despite their opinions on the ideal treatment plan and advice about

the best option, the final decision would be made by the patient and most of the time it was determined by their financial status and/or insurance coverage.

### 5.7 CPD COURSES IN MAURITIUS

In 2016, it became compulsory to obtain CPD points in order to qualify for the annual registration with the Dental Council of Mauritius. Previously, attendance at dental conferences was quite low, with the same group of enthusiastic dentists present at most of them. However, the new law has ensured an upsurge in attendance at CPD accredited lectures. This explained why the majority of respondents attended CPD courses more than 3 times a year. Nevertheless, frequent attendance did not necessarily mean that more knowledge was gained. Some CPD courses available in Mauritius extended over an entire weekend while others consisted of only a one-hour lecture, which should therefore be attended more frequently. It could be noted that the procedure most commonly referred (extraction of wisdom teeth) was the third most common topic to be listed as a requirement for CPD courses. The most popular area in which the respondents felt they required skills was implants and this explained the high number of respondents not placing implants at all.

Among the respondents who attempted the last open-ended question, 19% commented on the recent law about CPD points. There were critiques that the Dental Council of Mauritius was being unfair by not accepting CPD courses done overseas when the ones that were being offered in the country were overpriced or overbooked. They further added that despite the law being a good initiative, the lack of diverse CPD accredited courses available made it compulsory to “run around for points instead of focusing on learning objectives and practising better dentistry”. Another comment worth mentioning was that the law applied to all dentists working in both the private and public sectors, yet Ministry of Health organised

free CPD lectures for its staff working in public institutions to which the private practitioners were not invited. A few respondents also applauded this survey since they believed it would provide a good indication of the level of dentistry being practised in Mauritius and help to focus on the areas of need for CPD programmes.

## 5.8 LIMITATIONS

A survey of this nature necessarily garners extensive information, which is always useful when such a survey is first administered to a population. Statistical associations can be sought between almost every variable, but have been limited here, to those associations that it was felt might yield the most useful information. However, statistically significant associations *per se* are not sufficient an indication to draw conclusions from, and hence the effect size becomes important. But it must be recognised that with weak effects, even though with strong significance, some of these associations may just be random associations, and have to be interpreted with caution.

# CHAPTER 6. CONCLUSION AND RECOMMENDATIONS

This study has provided a picture of the dental procedures practised in Mauritius in 2016 and an inferred indication of the oral health of the population. Overall, there was a wide range of services provided, from tertiary to primary dentistry. The treatment options provided were dependent on a range of dentist, practice and patient factors, with considerable interrelations among those aspects. The most apparent determining factor was practice type, where major differences were seen between services provided in the public and private sectors. The reasons behind the high frequency of extractions and lack of prosthodontic services in the public sector should be investigated in order to be able to manage the increasing edentulism (complete and partial) that this is inevitably creating. Such surveys have been done in many countries and help identify the barriers towards efficient dental care. Policies will need to be reviewed in order to manage this problem. The private practices, on the other hand, seem to be focusing on curative treatment with little emphasis on prevention. This problem should also be explored so that private practitioners can shift their practices towards disease prevention.

Mauritius would appear to have a population with high disease risk in terms of oral health, which would be hardly possible to bring down without adequate prevention practices and proper management interventions. Nevertheless, the underlying factor behind most of the decisions made towards the service provision remained the patient's socio-economic background and ability to afford treatment. This would seem to determine whether the patient would opt to go to a private practitioner or a state-funded public clinic. Other factors cannot be ignored, such as years in practice, postgraduate training and insurance coverage, all of

which had a significant impact on the services provided. The scarcity of insurance coverage might indicate an inadequate funding dedicated to dental care among insurance providers.

The need for postgraduate training in order to carry out certain procedures might reveal shortcomings in those areas in the undergraduate curriculum. There was a high demand among the respondents for CPD training programmes in the realms of prosthodontics (a field with a low frequency of service provision), followed by oral surgical procedures. The infrequency of tertiary procedures in the Mauritian practices showed that the majority of the Mauritian population was not benefiting from recent and current advancements in dentistry.

It is therefore recommended that:

1. A survey of this nature be conducted on a regular basis
2. The Mauritian government be encouraged to examine the funding mechanisms for their state oral health services to move more towards prevention, and especially to the prevention of such extensive exodontia that seems to be occurring.
3. The Mauritian Dental Council should revise its CPD policies to be more enabling and developmental to correct the perception of its possible punitive nature.
4. Expertise should be sourced from other countries for conducting CPD courses, and even for Diploma courses where much if not all of the theoretical input could be done online.

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## Appendix 1: The questionnaire

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**Department of Oral Rehabilitation**

228

**Research Report Questionnaire**

TOPIC: Treatment provision by general dentists in Mauritius, with particular reference to prosthodontic treatment

OBJECTIVE: This study investigates the association between the different treatment modalities provided by dentists in Mauritius and dentist-related factors, with an emphasis on prosthodontic treatment. The findings will give an indication of the needs of the Mauritian population, as well as the need for continuing education programmes for dental practitioners.

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*Please answer ALL the questions. Place a cross in the selected box, or write your answer in the space provided. Any information obtained in this survey will remain confidential.*

**Gender:** Male ☐ A1
Female ☐ A2

**Country of graduation:** ..... A3

**University:** ..... A4

**Age:** Below 30 years ☐ A5
30–40 years ☐ A6
41 – 50 years ☐ A7
51 – 60 years ☐ A8
Above 60 years ☐ A9

**Years in Practice:** Less than 5 years ☐ A10
05 – 14 years ☐ A11
15 – 24 years ☐ A12
25 – 40 years ☐ A13
More than 40 years ☐ A14

**Postgraduate Training:** *(Mark all that apply)*

☐ No formal training programme A15

☐ Continuous Professional Development programmes A16

☐ Postgraduate diploma *Please specify:* A17

.....

☐ Master of Science *Please specify:* A18

.....

☐ Other training *Please specify:* A19

.....

**How frequently do you attend CPD courses?**

☐ < Once a year A20
☐ Once a year A21
☐ 2-3 times a year A22
☐ >3 times a year A23

Other: .....

**Are you a member of a dental association?**

Yes ☐ A24 *Please specify:*.....

No ☐ A25

**Type of Practice:** Private ☐ B1

Public ☐ B2

Both ☐ B3

**Number of different practice locations where you work:** ..... B4

**If Private, are you in solo practice?** Yes ☐ B5 No ☐ B6

If not, how many are in your group practice? ..... B7

**If Public, how many dentists work in your clinic?** ..... B8

**Are there any specialists parts of your practice / clinic?** Yes ☐ B9 No ☐ B10

If Yes, what disciplines ..... B11

and how many? ..... B12

*The following questions are intended to provide information about the characteristics of your patients.*

**How do your patients pay for their treatment, and what percentage of these patients make up your practice?** (Please ensure that the percentages indicated sum to 100%)

They pay me themselves from their own pocket without insurance ☐ .....% B13

I get partly by the patient and partly by their medical insurance ☐ .....% B14

The patient pays me but claims some back from their insurance ☐ .....% B15

The bill is paid entirely by private insurance ☐ .....% B16

The patients don't pay, I work in a public clinic ☐ .....% B17

**Please give any other information about your patients that that may be relevant to this survey:** B18

*Please estimate the frequency of treatment provided depending on the number of the procedures carried out, on average, in a year.*

**Use the following table to indicate whether the frequency is "Not at all", "Occasionally", or "Routinely".**

| Procedures | Frequency | | |
|---|---|---|---|
| | Not at all | Occasionally | Routinely |
| **Preventive:** fissure sealants, fluoride treatment etc. | | | |
| **Restorative:** | | | |
| Amalgam fillings | | | |
| Composite, glass ionomer fillings | | | |
| **Restorative procedures done only for aesthetics:** Composites, direct veneers | | | |
| **Endodontic therapy:** | | | |
| Anteriors, Premolars | | | |
| Molars | | | |
| **Non-surgical periodontal therapy** (includes scaling / root planing) | | | |
| **Surgical periodontal therapy** (gingivectomy, gingival graft) that you do yourself | | | |
| **Orthodontic treatment** that you do yourself | | | |
| **Extractions** (surgical and non-surgical) | | | |
| **Fixed prosthodontics:** | | | |
| Inlays and onlays | | | |
| Conventional crowns | | | |
| Conventional bridges | | | |
| CAD/CAM restorations | | | |
| All ceramic crowns (non CAD/CAM) | | | |
| Veneers | | | |
| **Removable prosthodontics:** | | | |
| Acrylic-based removable partial dentures | | | |
| Metal-based removable partial dentures ("chrome-cobalt"/ "Stellite") | | | |
| Conventional complete dentures | | | |
| Immediate replacement dentures | | | |
| Tooth-supported overdentures | | | |
| **Implants:** prosthetic procedures (crowns, overdentures) | | | |
| **Implants:** surgical procedures for implants | | | |
| **Maxillo-facial prosthodontics** (e.g. obturators) | | | |

| Procedures | Frequency | | |
|---|---|---|---|
| | Not at all | Occasionally | Routinely |
| **Other procedures** you feel are not covered by the above: | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| **Procedures that you refer:** please specify: | | | |
| | | | |
| | | | |
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| | | | |

**Are there any areas / disciplines of dentistry you would like to improve your skills in? Please list these below, as this information would be very useful for the development of CPD programmes:** c1

*Please read the following clinical scenario and select the options you would be more likely to carry out in your routine practice. Please give reasons for your choices.*

**A patient presents with a missing upper central incisor and a missing lower first molar. All other teeth are present and are either sound or have sound restorations. The patient is a healthy 35 year-old male, with no parafunctional or social habits.**

| Treatment options | UPPER CENTRAL INCISOR | |
|---|---|---|
| | Select | Please give reason(s) |
| Acrylic removable partial denture | | |
| Metal removable partial denture (Stellite) | | |
| Cantilever resin-bonded bridge | | |
| Fixed-fixed resin-bonded (Maryland) bridge | | |
| Cantilever conventional bridge | | |
| Fixed-fixed conventional bridge | | |
| Implant (surgical placement and restoration) | | |
| No treatment | | |
| Other | | |

| Treatment options | LOWER FIRST MOLAR | |
|---|---|---|
| | Select | Please give reason(s) |
| Acrylic removable partial denture | | |
| Metal removable partial denture (Stellite) | | |
| Cantilever resin-bonded bridge | | |
| Fixed-fixed resin-bonded (Maryland) bridge | | |
| Cantilever conventional bridge | | |
| Fixed-fixed conventional bridge | | |
| Fixed-moveable (precision attachment) conventional bridge | | |
| Implant (surgical placement and restoration) | | |
| No treatment | | |
| Other | | |

Thank you so much for taking the time to complete this questionnaire.

Please let us know if you would like a copy of the final report.

Yes ☐ C1 No ☐ C2

Please feel free to make any other comments: C3

**Appendix 2: Ethical clearance**

R14/49 Dr Deeksha Abelak

## HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)

## CLEARANCE CERTIFICATE NO. M160702

| | |
|---|---|
| **NAME: (Principal Investigator)** | Dr Deeksha Abelak |
| **DEPARTMENT:** | Oral Rehabilitation<br>Mauritius |
| **PROJECT TITLE:** | Treatment Provision by General Dentists in Mauritius, with Particular Reference to Prosthodontic Treatment |
| **DATE CONSIDERED:** | 29/07/2016 |
| **DECISION:** | Approved |
| **CONDITIONS:** | South African Human Research Ethics Committees (HRECs) have no standing outside South Africa.<br>Ethics approval is also required from local HRECs in Mauritius |
| **SUPERVISOR:** | Prof CP Owen |
| **APPROVED BY:** | Professor P Cleaton-Jones,Chairperson, HREC (Medical) |
| **DATE OF APPROVAL:** | 12/08/2016 |

**This clearance certificate is valid for 5 years from date of approval. Extension may be applied for.**

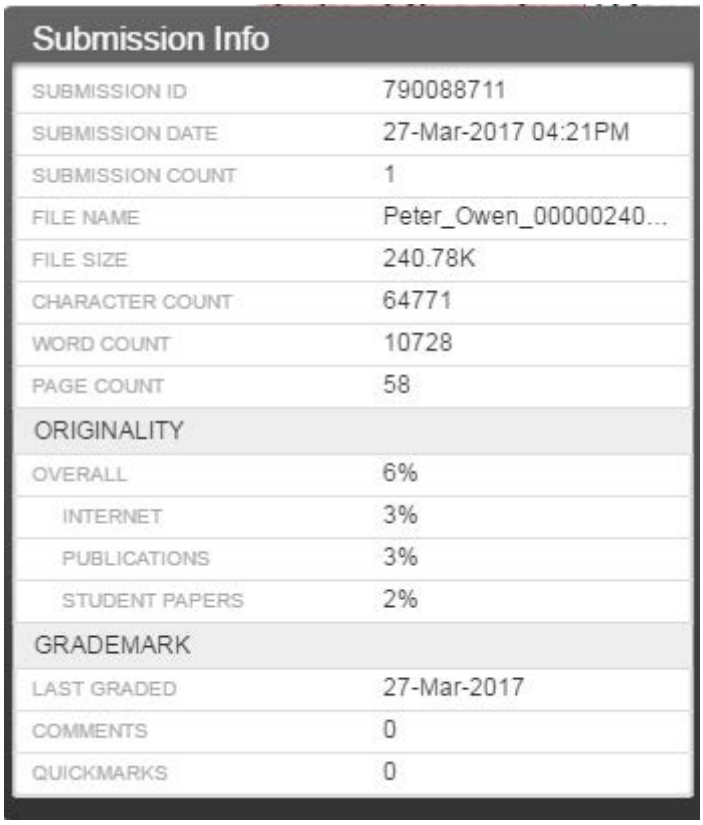
**DECLARATION OF INVESTIGATORS**

To be completed in duplicate and **ONE COPY** returned to the Research Office Secretary in Room 10004, 10th floor, Senate House/3rd Floor, Phillip Tobias Building, Parktown, University of the Witwatersrand. I/we fully understand the conditions under which I am/we are authorized to carry out the above-mentioned research and I/we undertake to ensure compliance with these conditions. Should any departure be contemplated, from the research protocol as approved, I/we undertake to resubmit the application to the Committee. **I agree to submit a yearly progress report**. The date for annual re-certification will be one year after the date of convened meeting where the study was initially reviewed. In this case, the study was initially reviewed in July and will therefore be due in the month of July each year.

Principal Investigator Signature Date

**PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES**

**Appendix 3: Turnitin report**



Submission Info

| | |
|---|---|
| SUBMISSION ID | 790088711 |
| SUBMISSION DATE | 27-Mar-2017 04:21PM |
| SUBMISSION COUNT | 1 |
| FILE NAME | Peter_Owen_00000240... |
| FILE SIZE | 240.78K |
| CHARACTER COUNT | 64771 |
| WORD COUNT | 10728 |
| PAGE COUNT | 58 |
| ORIGINALITY | |
| OVERALL | 6% |
| INTERNET | 3% |
| PUBLICATIONS | 3% |
| STUDENT PAPERS | 2% |
| GRADEMARK | |
| LAST GRADED | 27-Mar-2017 |
| COMMENTS | 0 |
| QUICKMARKS | 0 |