

**SADA**

THE SOUTH AFRICAN  
DENTAL ASSOCIATION

*A series of masks*



Images contributed from the private collection of Prof GH Sperber, Edmonton, Canada.



new

HELPS REBUILD  
& STRENGTHEN  
YOUR ENAMEL



**Specialized Enamel Protection**  
Rebuilds, Restores, Refreshes

**No.1 DENTIST RECOMMENDED  
BRAND FOR SENSITIVE TEETH\***



\*IPSON Expert Performance Tracking 2020

GlaxoSmithKline Consumer Healthcare South Africa (Pty) Ltd. 57 Sloane Street, Bryanston, 2021. Reg. No.: 2014/173930/07. For any further information, including safety information, please contact the GSK Hotline on +27 11 745 6001 or 0800 118 274. Trademarks are owned by or licensed to GSK group of companies. Refer to carton for full use instructions. Promotion Number: PM-ZA-SENSO-21-00017.

new



# HELPS REBUILD & STRENGTHEN YOUR ENAMEL



No.1 DENTIST RECOMMENDED  
BRAND FOR SENSITIVE TEETH\*



## Specialized Enamel Protection Rebuilds, Restores, Refreshes

\*IPROS Expert Performance Tracking 2020

GlaxoSmithKline Consumer Healthcare South Africa (Pty) Ltd. 57 Sloane Street, Bryanston, 2021. Reg. No.: 2014/173930/07. For any further information, including safety information, please contact the GSK Hotline on +27 11 745 6001 or 0800 118 274. Trademarks are owned by or licensed to GSK group of companies. Refer to carton for full use instructions. Promotion Number: PM-ZA-SENO-20-00123

15852

**EDITORIAL OFFICE**

**Managing Editor**

Prof NH Wood

**Editorial Assistant**

Mr Dumis Ngoepe

Email: [ngoeped@sada.co.za](mailto:ngoeped@sada.co.za)

**Sub-editors**

Prof N Mohamed

Prof P Owen

Prof L Sykes

Prof J Yengopal

Please direct all correspondence to:

South African Dental Association

Private Bag 1, Houghton 2041

Tel: +27 (0)11 484 5288

Fax: +27 (0)11 642 5718

Email: [info@sada.co.za](mailto:info@sada.co.za)

**Editorial Board**

Dr P Brijlal: University of the Western Cape

Prof T Dandajena: Private Practice USA

Prof W G Evans: University of the Witwatersrand

Dr H Gluckman: Private Practice

Dr M Hellig: University of the Witwatersrand

Prof B Kramer: University of the Witwatersrand

Prof AJ Louw: University of the Western Cape

Dr N Mohamed: University of the Western Cape

Prof J Morkel: University of the Western Cape

Prof MPS Sethusa: Sefako Makgatho Health Sciences University

Prof L Shangase: University of Pretoria

Prof L Sykes: University of Pretoria

Prof AW van Zyl: Private Practice

Prof NH Wood: Sefako Makgatho Health Sciences University

**SADA OFFICE BEARERS**

**National Council**

**President:** Dr RR Naidoo

**Vice-President:** Dr APL Julius

**SADA Board of Directors**

**Chairperson:** Dr R Putter

**Vice-chairperson:** Dr N Osman

Dr SJ Swanepoel

Dr SY Pieters

Dr FC Meyer

Dr EK Naidoo

Mrs C Wessels

Mr H Keshave

Mr KC Makhubele (CEO)

**EDITORIAL**

The importance of continuing professional development - *NH Wood* 178

**COMMUNIQUE**

Dentist bringing malicious prosecution proceedings against patient - *SADA Legal and Corporate Services* 179

**RESEARCH**

The orthodontist's views regarding academic education in cleft lip and palate as well as craniofacial deformities in South Africa - *E Ghabrial, K-W Bütow* 181

A preliminary inquiry on the association between pre-admission assessments and academic performance of first year dental technology students' within a South African university of technology - *A Vahed, S Naidoo, D Singh* 187

Audit of the workload in a maxillofacial and oral surgical unit in Johannesburg - *K Sukha, M Mabongo* 194

Compulsory community service for dentists - Opportunity for meaningful reform - *ML Machete, LN Makwakwa, PD Moipolai, DP Motloba* 201

Tooth loss in relation to serum cotinine levels - A cross-sectional study from the Belville South area in South Africa - *F Kimmie-Dhansay, CC Pontes, U Chikte, RT Erasmus, AP Kengne, TE Matsha* 207

Our Front Cover for this Issue...

The theme for the Front Cover of the South African Dental Journal this year showcases various types of masks. Masks have been admired and worn throughout the world for centuries and play an integral part of many activities including customary rituals, cultural events, battles, entertainment, and for protection. The cover for May features a series of masks, the images of which were contributed by Prof GH Sperber, Edmonton, Canada from his private collection.



Published by:



On behalf of:



**SADA OFFICE BEARERS**

**Chairpersons of Board Sub-Committees**

Audit & Risk Committee: Dr N Osman  
 Strategy, Ethics & Remuneration Committee: Dr SY Pieters  
 Dental Practice Committee: Dr SJ Swanepoel

**Chairperson of DDF Board of Trustees**

Dr B Beilinson

**PRODUCTION OFFICE**

E-Doc CC,  
 a Division of Life-Long Learning Solutions CC  
 Tel: +27 (0)10 020 1013

**Publisher and Project manager**

Mr René Smulders

**GENERAL AND ADVERTISING ENQUIRIES**

Mr René Smulders  
 Email: rene@edoc.co.za

**Design and Layout**

Ms Reine Combrinck  
 Email: production@edoc.com

**Website smalls advertising / CPD Enquiries and**

**Member contact detail update**

South African Dental Association  
 Tel: +27 (0)11 484 5288  
 Email: info@sada.co.za

# CONTENTS

**CLINICAL WINDOW**

What's new for the clinician? - Excerpts from and summaries of recently published papers - *V Yengopal* 218

**RADIOLOGY CASE**

Maxillofacial Radiology 190 - *J Walters* 222

**ETHICS**

Is it better to be good or to do good? - *LM Sykes, GP Babiolakis, GW Evans* 223

**CPD**

CPD questionnaire 226

**AUTHOR GUIDELINES**

Instructions to authors and author's checklist 230

**CLASSIFIEDS**

www.sada.co.za - Smalls advertising placement procedure and rules 234

**Editorial, Advertising and Copyright Policy**

Opinions and statements, of whatever nature, are published under the authority of the submitting author, and the inclusion or exclusion of any medicine or procedure does not represent the official policy of the South African Dental Association or its associates, unless an express statement accompanies the item in question. All articles published as Original Research Papers are refereed, and articles published under Clinical Practice or Reviewed Notes are submitted for peer review.

The publication of advertisements of materials or services does not imply an endorsement by the Association or a submitting author, should such material feature as part of or appear in the vicinity of any contribution, unless an express statement accompanies the item in question. The Association or its associates do not guarantee any claims made for products by their manufacturers.

While every effort is made to ensure accurate reproduction, the authors, advisors, publishers and their employees or agents shall not be responsible, or in any way liable for errors, omissions or inaccuracies in the publication, whether arising from negligence or otherwise or for any consequences arising therefrom.

**Accredited by the Department of Education**

SADJ is published 10 times a year by E-Doc CC, a Division of Life-Long Learning Solutions CC, on behalf of The South African Dental Association. © 2021 Life-Long Learning Solutions CC.

Published by:



On behalf of:



**SADA**  
 THE SOUTH AFRICAN  
 DENTAL ASSOCIATION



# SADA

DENTAL & ORAL HEALTH  
VIRTUAL CONGRESS  
AND EXHIBITION

Back to the Future: Excellence in Dentistry 27-29 AUGUST 2021



27-29 AUGUST 2021

SAVE THE DATE!

Register at

[www.sadacongress.co.za](http://www.sadacongress.co.za)



# The importance of continuing professional development

SADJ May 2021, Vol. 76 No. 4 p178

**NH Wood**  
Managing Editor of the SADJ



As healthcare professionals we find ourselves in a dynamic field that constantly evolves and pushes the knowledge frontier ahead of us. This is accompanied by the steady development of new skills, procedures and techniques.

This requires of us to keep up with these developments, to improve and develop ourselves, and to learn new things. If we fail to do this, we will become irrelevant, lose track with the latest developments, and may even end up providing harmful treatment to our patients.

Our professional training is aimed at creating lifelong learning. We have been empowered by receiving the foundational knowledge and skills to facilitate our entry into the profession. The skills we received further serve to guide us towards seeking answers to daily challenges, and to expand our skillset according to the need in any particular scenario. We have to access a variety of resources to achieve the required self-development, whether electronic, conferencing or other similar interactions, or even furthering formal qualifications.

Continuing professional development (CPD) is achieved in different ways. Ideally CPD activities should be engaging and must serve the intended purpose. For that reason, it must be monitored and occasionally audited. Similarly, CPD providers must be held to a high standard and be accountable for administering such an important task. This will ensure that it achieves its intended purpose.

It is for this reason that all CPD activities must undergo detailed scrutiny, and proof of monitoring or assessment must be recorded and submitted for verification, and finally, accreditation. An ethical responsibility also resides



with the accreditor to certify that the CPD activity is of a sufficient standard and intensity to ensure that learning takes place.

The formalization of CPD activities may be controversial to some. On the one hand it provides healthcare regulators the surety that practitioners remain current, valid and up to date. It ensures development of individuals within a given profession and safeguards the patient and community.

On the other hand, some find this process tedious, controlling and suggestive of mistrust in the practitioner. Whatever the view, the practitioner remains with the professional and moral obligation to continue to improve and to develop. We must embrace the career-long effort to ensure that patients benefit from current and relevant procedures and knowledge, that we contribute to the progression of the knowledge frontier, and that we impart this to those who come after us. It must also be considered that in order to influence policy and decision making, one has to be abreast of current developments within your scope of practice.

Continuing professional development should not be seen as a waste of time or effort, but rather as an opportunity to improve and to contribute to the profession, to the patients, and to society. It is our responsibility to ensure we maintain competency within our profession.

We present to you the May edition of the 2021 South African Dental Journal and thank our contributors for sharing their valuable knowledge with us all.

# Dentist bringing malicious prosecution proceedings against patient

SADJ May 2021, Vol. 76 No. 4 p179 - p180

SADA Legal and Corporate Services

The improper use of the complaints process or legal proceedings by patients has been an ongoing issue for practitioners for several years and fast becoming more acute. Any member of the public may lay a complaint against a treating dental professional. Sometimes, these complaints are without merit, vexatious and frivolous or they strangely arise outstanding fees are claimed and the patient seeks to find some fault with the treatment rendered by the practitioner.

Nevertheless, the dental professional is expected to respond to such complaints, in writing, and to address the cause of the complaint or prepare reports for their indemnity organization in an effort to defend summons claiming damages or criminal prosecution and complaints lodged with the regulator.

The powers of the HPCSA are wide, and can include fines and a complete prohibition from practicing, should a dental professional found to have acted unprofessionally. We all appreciate the day-to-day pressures of working in dentistry, so imagine the additional stress for any doctor going through a complaints process (regardless of the final outcome). This must have an impact, not just on their current job, but on their career and their personal life.

Doctors are under immense pressure in the workplace - hours worked, antisocial work times, variety of patients, fear of complaints, and the stigma of "confessing" to errors. When doctors do slip up or are thought to be acting unprofessionally, the process of going through fitness-to-practise-style proceedings will take a further psychological toll. The process is not assisted when the regulator is not particularly efficient in conducting and finalizing proceedings, which in most cases can take two years or more sometimes at the end of the process finding the practitioner not guilty.

Furthermore, the Preliminary Committee of inquiry is not particularly efficient in their consideration and dismissal of frivolous and vexatious complaints. If they are happy with the practitioner's explanation, no further action is taken and the registrar will advise the patient accordingly. In such circumstances, doctors may not sue patients unless they can show that the patient acted by malice or an improper motive.

On the other hand, if the Preliminary Committee is not satisfied with the practitioner's explanation, they may recommend that matter may be referred to the Committee. However, if the preliminary committee is not satisfied with the doctor's explanation, it may ask the

doctor to appear before it to give evidence or decide to refer the case to a professional conduct inquiry which can take an inordinate of time to conclude.

## Practitioners suing their patients

The question often raised by practitioners is whether it is ever justified for doctors to sue their patients (or for their lawyers to advise them to do so), where they have successfully defended allegations made against them in criminal or civil cases, or in disciplinary hearings by the Health Professions Council of South Africa (HPCSA). Sometimes doctors were advised to be cautious about suing their patients because this may generate more bad publicity than occurred when the patient originally complained about or sued the doctor.

Doctors against whom a criminal or civil case or complaint to the HPCSA has been withdrawn or dismissed may not sue a patient who instituted such a case or complaint for defamation unless it can be proven that the patient's conduct was based on malice. 'Malice' means that the person making the report did not have an honest belief when making it, but acted out of spite or an improper motive.

Doctors who wish to sue patients for malicious prosecution or abuse of civil proceedings must show that such patients acted intentionally with 'malice' and 'without reasonable and probable cause'. The courts will usually award costs to doctors who successfully defend cases against their patients.

Often times when responding to complaints submitted against them at the Health Professions Council of South Africa (HPCSA), dental practitioners feel that patients (and the public in general) have free reign to submit any complaint they so choose, leaving the dental practitioner with the arduous task of responding to the complaint and with the possibility of being exposed to a serious sanction being imposed upon them. The practitioner is then required to comply with the terms of cover provided by their professional indemnity provider or insurer and satisfy the conditions of cover. Furthermore, the dental practitioner finds further frustration in that they have no right of recourse against the person that complained about them.

## Supreme Court of Appeal decision

A recent Supreme Court of Appeal judgment of *Holden v. Assmang Limited* may change this landscape and open a door to dental practitioners (and perhaps even

to their insurers) to institute a claim for malicious prosecution against the complainant.

The complaint was against a clinical psychologist with the HPCSA which matter had been an ongoing argument for a number of years. A complaint was lodged in June 2008 for gross breach of her professional ethics by acting out the scope of her practice.

A comprehensive response was submitted on 29 September 2008 and a further response on 26 November 2008. After being summoned to appear before the Committee of Preliminary Inquiry on 30 October 2009, for a consultation, on 13 November 2009, she had been found not guilty of any unprofessional conduct and that no further action would be taken against her. She instituted action against her former employers for malicious prosecution.

Although there were four requirements of malicious prosecution, the court look at one requirement "prosecution failed".

What is of interest is that the recognition by the Court that malicious prosecution claims are ordinarily seen in respect of criminal prosecutions, it can also include civil proceedings and proceedings before statutorily created professional tribunals. The HPCSA is such a tribunal.

The SCA recognized that the decisions that the HPCSA makes in respect of disciplinary proceedings can have far-reaching consequences for the medical practitioners involved.

In the instance of the practitioner, the SCA noted that she could have lost her licence to practice should she have been found guilty of gross professional misconduct. Furthermore, the Court noted that the HPCSA utilizes a system that has all the same characteristics of a criminal proceeding, including punitive sanctions.

As such, disciplinary action by the HPCSA against its members is viewed by the court as a prosecution. However, what remains to be seen is whether the practitioner's claim for damages as a result of the malicious prosecution against her former employers will be successful.

#### What does this mean for dental practitioners?

From the SCA judgment it has been established that the Court considers disciplinary proceedings instituted against a practitioner at the HPCSA to be akin to criminal prosecution, and that, in order for a claim for malicious prosecution by way of the submission of a complaint to the HPCSA to be successful, it would have to meet the four requirements of malice, namely:

- a). that the defendant set the law in motion (instigated or instituted the proceedings);
- b). that the defendant acted without reasonable and probable cause;
- c). that the defendant acted with 'malice or animus iniuriandi'; and
- d). that the prosecution has failed.

What the judgment demonstrates is that there is a right of recourse available to dental practitioners who feel like they have been needlessly persecuted by patients or members of the public.

In this regard, it must be understood that receiving a complaint, especially from a statutory body such as the HPCSA, is often very stressful for the practitioner, and responding thereto and dealing with a complaint can be a costly exercise.

Ordinarily, when a dental practitioner is required to respond to a HPCSA complaint, if they are indemnified, who then appoints an attorney to assist in preparing the response. Should the practitioner not be insured, they will either prepare the response themselves (which takes time out of his or her practice) or he or she will appoint an attorney to assist them at a cost.

Once the response is submitted, the practitioner often has a lengthy wait to determine whether there is an adverse finding against them (as can be seen from the above case, where the delay was over a year. Thereafter, if no adverse finding is made, the matter is resolved and the prosecution has failed.

However, if there is an adverse finding together with a sanction, the practitioner can either accept it or reject the finding and proceed to a disciplinary hearing, if the practitioner is not referred to a disciplinary hearing directly.

Should the matter proceed to a disciplinary hearing, the dental practitioner will be represented by an attorney and, if they so choose, an advocate as well. There is a significant amount of preparation that is done in the lead-up to a disciplinary inquiry, that not only incurs significant legal costs but also time out of the practitioner's practice.

Then at the disciplinary hearing, which proceeds like a criminal prosecution, the practitioner is also required to be present. If the practitioner is found not guilty at a disciplinary inquiry, the prosecution would also have failed.

Whilst in the above case the practitioner's claim was against a company, there is no restriction as to who the claim for malicious prosecution can be instituted against including private individuals.

Patients, members of the public, companies, and, in some instances, disgruntled family members, complain about dental professionals to the HPCSA with impunity whilst being of the understanding that whatever the outcome of the complaint, it will have no negative consequences for the complainant. However, it would appear that the above case may change the status quo.

Kind regards,

**SADA Legal and Corporate Services**

#### References

1. Holden v. Assmang Limited (1277/2019). ZASCA. 2020; 145.

# The orthodontist's views regarding academic education in cleft lip and palate as well as craniofacial deformities in South Africa

SADJ May 2021, Vol. 76 No. 4 p181 - p186

E Ghabrial<sup>1</sup>, K-W Bütow<sup>2</sup>

## ABSTRACT

### Background

Orthodontists are essential members of a craniofacial team (American Cleft Palate-Craniofacial Association Team Standards Committee).<sup>1</sup> Because cleft lip/palate (CLP) and craniofacial deformities (CFD) vary in severity and facial growth patterns, treatment is complex and lengthy and requires collaboration among different disciplines. Consequently, orthodontists need specialised training in this field to reach the treatment goals of good facial growth, aesthetically acceptable appearance, and dental occlusion. Therefore, it becomes increasingly important to provide adequate training for orthodontists, so they can not only provide efficient treatment but can also undertake a leadership role in the field.

### Objectives

To obtain information regarding:

- the CLP and CFD academic education of orthodontists the professional services that orthodontists offer to CLP and CFD patients
- the educational and training needs of orthodontists in this field

### Method

A 54-item online survey to collect quantitative data was conducted by means of an interview, using a randomised sample of orthodontists attending the annual scientific conference of the South African Society of Orthodontics.

### Author affiliations:

1. **Emad Ghabrial:** *BchD, MchD (Orthod.), PhD*, Discipline of Dentistry, School of Health Sciences, University of KwaZulu-Natal, KwaZulu-Natal, South Africa.  
ORCID Number: 0000-0002-7213-9760
2. **Kurt-W Bütow:** *MChD (MFOSurg), DrMedDent PhD DSc (Odont) FCMFOS, FIBCSOMS*, Discipline of Dentistry, School of Health Sciences, University of KwaZulu-Natal. Professor and Head of Department Emeritus, and former Head of the Cleft Lip and Palate Clinic of the University of Pretoria, Pretoria, South Africa.  
ORCID Number: 0000-0002-7213-9760

The research paper is a part of fulfilment PhD degree at Discipline of Dentistry, School of Health Sciences, University of KwaZulu-Natal.

### Corresponding author: Emad Ghabrial

Discipline of Dentistry, School of Health Sciences, University of KwaZulu-Natal, KwaZulu-Natal, South Africa.

Email: emad.ghabrial@up.ac.za

### Author contributions:

1. **Emad Ghabrial:** Principal author - 70%
2. **Kurt-W Bütow:** Second author - 30%

### Results

The questionnaire was completed by 53 orthodontists, 54.6% of whom had more than 10 years of professional experience. Of the respondents, 84.8% experienced some clinical exposure in this field during their postgraduate education.

Treatment for CLP and CFD patients was offered by 92% of the professionals, but only 21.7% had high confidence in their expertise in treating CLP/CFD patients. Of the respondents, 88% agreed there was a need to improve CLP and CFD education, and the majority recommended fellowship training and certified courses. The rest suggested continuing-education workshops.

### Conclusion

Most of the orthodontists provided treatment for both CLP and CFD patients despite some of them lacking confidence in treating such cases. The majority agreed that there is a strong need to establish an educational strategy to meet the needs of orthodontists who treat CLP and CFD patients. The respondents suggested that programmes such as fellowship training, degree courses, certified courses, and continuing education workshops could be used.

### Keywords

Orthodontics, cleft palate, cleft lip, multidisciplinary, education, professional development, survey.

## INTRODUCTION

A multidisciplinary team approach for managing patients with cleft lip/palate (CLP) and craniofacial deformities (CFD) has been advocated by practitioners.<sup>2-4</sup> The orthodontist has become an essential member of multidisciplinary teams, according to the American Cleft Palate-Craniofacial Association team guideline.<sup>1</sup> Orthodontist is actively involved in the life of a patient born with a CLP/CFD from birth to adulthood. This may include infant pre-surgical orthopaedics, early mixed dentition treatment, dentofacial orthodontics, and preparation for alveolar bone graft procedures and pre-prosthetic and surgical orthodontics.<sup>4</sup> Consequently, orthodontic treatment is considered a core service in the management of CLP

and CFD.<sup>5-6</sup> The orthodontist role within the craniofacial team has been widened to include the holistic approach of diagnosis and treatment planning. Consequently, they are involved in record taking of the overall treatment and the outcomes. Therefore, the orthodontists provide essential data for participation in inter-center comparisons of treatment outcomes and implement a quality control system for CLP/CFD care.<sup>7-9</sup>

For many years, researchers and practitioners have understood the need to enhance academic education and clinical experience in CLP and CFD to provide quality management and improve access to care for all patients and their families.<sup>10-12</sup> One of the earliest attempts to evaluate education in the CLP field was made by Lass et al. (1973)<sup>13</sup>, who assessed students' exposure to CLP treatment by means of a questionnaire.

Their main finding was that there was a lack of clinical exposure and basic theoretical education. Even though children with deformities' health and well-being depend on the clinical expertise of those who serve them.<sup>14</sup> Berkowitz<sup>15</sup> and McCarthy<sup>16</sup> recommend further education for orthodontists in CLP/CFD to enable them to provide adequate care.

The quality of care of all patients is inevitably influenced by the adequacy of the treatment he or she receives.<sup>17</sup> Cleft lip/palate and craniofacial deformities patient treatment relies on the teaching and exposure that the student received at university and the knowledge gained throughout the practitioner's career.<sup>18</sup> It is necessary to obtain information about orthodontists' education in the CLP/CFD field and determine what training/instruction those learners receiving. Therefore, continuous evaluation by practitioners of the education and training of orthodontists is necessary to obtain their views on improving educational resources.<sup>19</sup>

## METHOD

Ethical permission was obtained from the Humanities and Social Sciences Research Ethics Committee of the University of KwaZulu-Natal. The research survey was completed by South African orthodontists using an online questionnaire to investigate their education and their services to CLP/CFD patients. The researcher developed a quantitative research tool consists of a 54-item structured questionnaire. Qualtrics Research Suite survey software was used to capture and analyse the data. The questionnaire was designed to collect quantitative data using a Likert-type scale. Two students' volunteers perform data gathering. Respondents were selected through a Systematic Random Sampling when coming out of the lecture room during the South African Orthodontic Society's annual scientific meeting. Consent to participate was obtained from each respondent before completing the questionnaire.

### Questionnaire design

The questionnaire consisted of four sections: the first determined whether the participants were accepted for inclusion in the study as a South African qualified orthodontist. The second section collected the level of

knowledge and experience of and services provided by the participants. In the third section, their educational needs and preferences regarding further education were determined. The last section collected demographic data, including title, gender, age, degree(s), and location by region.

### Selection of participants

Two students interviewed a random sample of orthodontists at an annual scientific conference of the South African Society of Orthodontics. Regarding sample size, the author used the literature information.<sup>20-21</sup> The sample size was reviewed upward, from the literature information to 46.4% of the Medpages<sup>22-23</sup> register of practising orthodontists, to account for a possible sampling error of 15%.

### Distribution

The researcher received permission from the South African Society of Orthodontics to randomly interview orthodontists, using an online questionnaire, during an annual scientific congress. The questionnaire was developed and piloted by a conveniently selected sample of practitioners. It was subsequently revised based on their responses to ensure data was captured appropriately.

### Data analysis

The data was captured using Excel 2013. The data was later converted into Stata 15s (string) format. The analysis undertaken was descriptive summary statistics presenting frequencies and associated percentages. No other analytical tools were used because no hypothesis was being tested.

## RESULTS

The questionnaire was completed by 53 orthodontists, representing most of South Africa's provinces (Fig. 1). Of these practitioners, 54.6% had more than 10 years of professional experience (Fig. 2). In the basic knowledge questions about CLP, 52% of the respondents were uncertain of the correct answers. When asked about their educational experience, 84.8% stated that they had clinical exposure during their postgraduate education, and 72.9% had participated in multidisciplinary meetings in the course of their degree. A total of 89.8% gained their knowledge from textbooks and received their information by means of lectures (didactic input) (Fig. 3).

Even though 92% of the respondents offered treatment to both CLP and CFD patients, only 30.4% of them participated in multidisciplinary teams. Regarding the services provided according to patients' age group, 35.7% offered orthodontic treatment for 11-18-year-old patients, and 28.2% provided services to 7-10-year-olds. Only 10.2% offered services to infants and children between the ages of four and six. When the respondents were asked about the facility where CLP patients were consulted and treated, the following locations emerged: private practice (38.3%), academic hospitals (33.3%), and government hospitals (19.7%). Only three of the respondents offered their services at charity organisations.

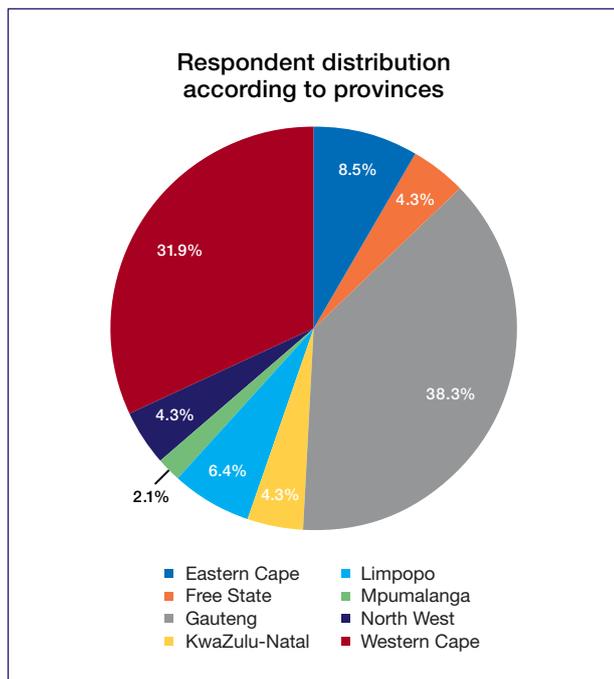


Figure 1. Respondent distribution according to provinces.

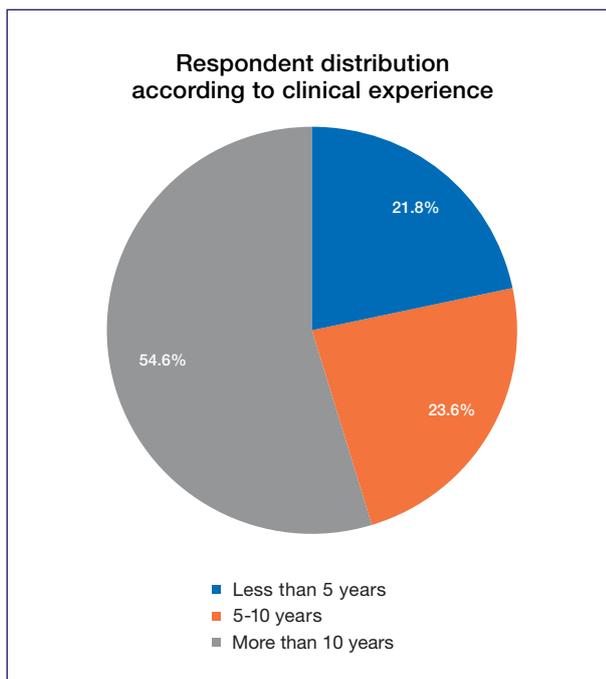


Figure 2. Respondent distribution according to clinical experience

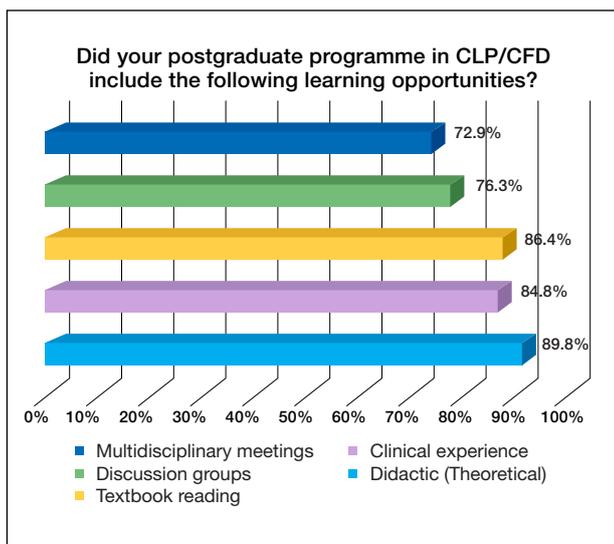


Figure 3. Did your postgraduate programme in CLP/CFD include the following learning opportunities?.

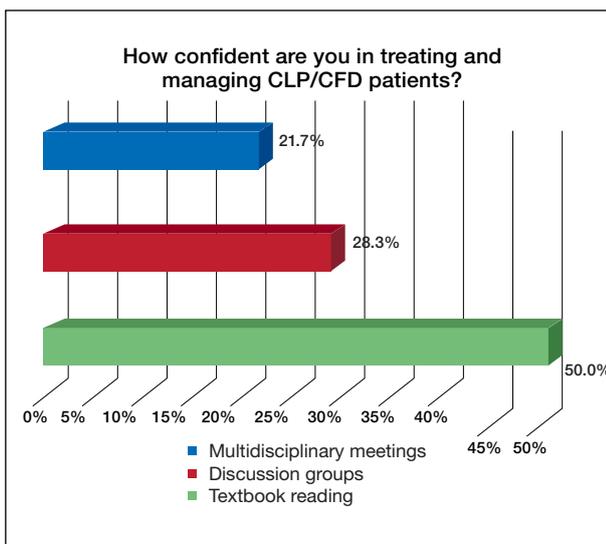


Figure 4. How confident are you in treating and managing CLP/CFD patients?.

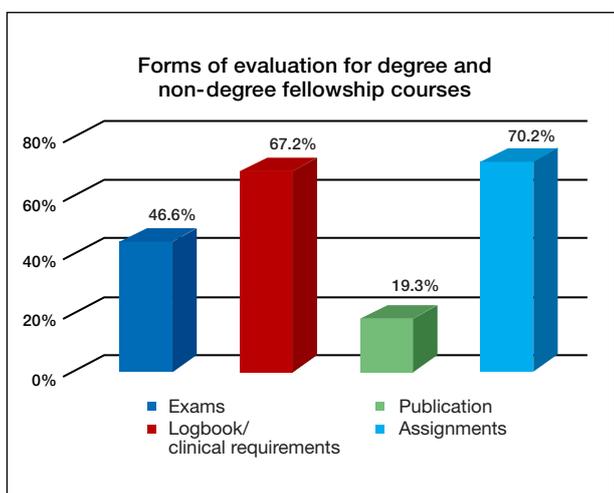


Figure 5. Forms of evaluation for degree and non-degree fellowship courses.

When the service provider respondents were asked to indicate a scale of 11-0, they were confident in treating CLP and CFD patients. Fifty percent admitted having low confidence, 28.3% were moderately confident, and only 21.7% stated that they were highly confident in treating CLP/CFD patients (Fig. 4).

They also acknowledged that the CLP/CFD treatment is challenging and requires special training. They indicated that special training is needed due to the multidisciplinary approach (37%), the lengthy treatment (30.4%), and patients' socio-economic situation (28.5%). A few respondents cited the emotional issues in the open-ended questions, and CLP/CFD poor oral hygiene added to the treatment challenges.

Almost all the respondents agreed on the need to improve the academic education offered to CLP/CFD ortho-

dontic care providers, and 91.3% recommended dedicated educational training programmes in that field. Of the respondents, 50% would like to further their knowledge, 27.5% were unsure, and the rest said they needed no additional training.

When participants were asked about the preferred method of education,

- the majority (41%) recommended fellowship training.
- 30.8% recommended short courses.
- 26.9% recommended degree courses; and
- only 1.3% considered that participation in a multidisciplinary clinic is sufficient to gain the required knowledge (Table 1).

Fellowship training	41.0
Degree course	26.9
CPD courses	30.8
Voluntary participation in multidisciplinary team	1.3

Participants identified interest, passion, and the prospect of joining a multidisciplinary team as the most significant reasons for enrolment in CLP- and CFD-dedicated courses. When asked about the goals and objectives of the educational programme(s), the participants suggested that the focus should be on diagnosis, treatment planning, clinical skills, and a multidisciplinary approach.

Of the respondents, 67% recommended keeping a logbook of the cases treated in clinical training, as well as preparing assignments. A total of 46.5% suggested participating in examinations, and 19.3% proposed a published article as effective evaluation methods for certificate courses (Fig. 5).

## DISCUSSION

This study is important because there has never been researching into the extent of orthodontists' training in CLP/CFD care in South Africa. Academic education and training of practitioners can predict access to adequate care for patients with CLP/CFD.

A series of surveys of orthodontics education programmes have been undertaken, but these were administered to students.<sup>24-25</sup> In the current study, attention was given to information obtained from orthodontists with varying years of experience, from different locations and places of employment, to overcome postgraduate student limitations in clinical experience.

In line with Nobel et al.,<sup>26</sup> most of the participants of this study had formal training in treating patients with CLP and CFD. Despite this, respondents expressed the need for further training and clinical exposure to better prepare to provide services to such patients.

Several previous academic education' surveys<sup>27</sup> used e-mail or postal questionnaires. Few studies used incentives to improve the response rate.<sup>28</sup> This study achieved a 46.4% response rate using interviews with attendees at their annual scientific congress,<sup>29</sup> which is a statistically valid amount.<sup>30</sup>

This study found that participants had adequate CLP/CFD theoretical education and some clinical exposure during their postgraduate programme that prepared them to offer treatment to CLP/CFD patients. This contrasts with Pannbacker et al.,<sup>31</sup> who found that legally qualified practitioners to provide treatment know very little about these deformities.

This investigation revealed a desire on the part of orthodontists for developmental and dedicated educational programmes in managing patients born with CLP and CFD, in line with the findings of Noble et al.<sup>26</sup> Of the respondents, 41% recommended a fellowship (matching the current trend in different parts of the world).<sup>16</sup>

The majority of the respondents suggested that the training emphasises discussions and clinical contact, with evaluation through formal examinations and a logbook recording clinical hours. This could be linked to a clinical fellowship programme in line with the standards set by the American Dental Association for accredited fellowship programmes.<sup>32</sup>

As stated by Schoenbrunner et al.,<sup>33</sup> comprehensive CLP/CFD training can only be offered by a multidisciplinary affiliated centre, where a high volume of craniofacial procedures is performed by specialists in the field. Furthermore, centres that offer craniofacial orthodontics and surgery fellowships demonstrate the strongest relationship of success among CLP/CFD centres.<sup>34</sup>

Regarding candidate selection, the respondents suggested that criteria should include a professional degree(s), the number of years qualified, and possibly even an admission examination. However, the respondents did not consider other requirements, such as research experience and publications, to be significant in candidate selection.

The findings contrast with the results of Grewal et al.,<sup>35</sup> that candidates published in a scientific journal are a good indicator of those who would be effective to be a candidate for further education. Otherwise, the respondents recommended research input as a part of the course objective and the evaluation of all candidates.

## CONCLUSION

As the orthodontist's field expands, there is less training in uncommon problems like CLP/CFD during their postgraduate education. Orthodontists may be confronted with the need to provide services that they are not highly confident in performing. Therefore, orthodontists need to have advanced training to reach proficiency in providing CLP/CFD care.

This study shows a demand from the participants for advanced education and training in the CLP/CFD fields, and a desire for academic institutions to adopt educational strategies and provide subspecialty courses like the traditional postgraduate diploma or in an online degree format. Such training can provide orthodontists with the knowledge and confidence to provide correct care to CLP/CFD patients and play a fundamental role in multidisciplinary teams by investigating treatment outcomes and implementing quality control measures.

## Limitations

This survey represents those orthodontists' opinions attending an annual scientific conference in September 2017 who were randomly selected and willing to be interviewed. Those orthodontists who did not participate in the study may have different views.

The study could be benefited from testing the hypothesis "information and training done in the postgraduate programme is adequate to provide treatment service to CLP and CFD patients."

## Acknowledgments

The authors would like to thank the Gerald Gavron Research Fund of the South African Society of Orthodontics for financial support, SAS Olorunju PhD, the Biostatistics Unit of the South African Medical Research Council for providing statistical support, and Professor FA de Wet (Professor Emeritus and previous Deputy Chairperson of the School of Dentistry) for proofreading the manuscript.

## Appendix 1

The dataset supporting the conclusions of this article is not currently available, as it is part of the researcher's PhD thesis. The questionnaire used to collect the data is available from the corresponding author on request.

## Declaration

This article is based on a study done by the researcher in partial fulfillment of his PhD thesis.

## Authors' contribution

Prof. K-W Bütow is the author's PhD supervisor; the researcher conceptualised and designed the PhD study. The researcher collected and analysed all the data. Both authors contributed to writing and editing the manuscript and approved the final version.

## Funding

The PhD project was funded by the SA Society of Orthodontics Gerald Gavron Fund. The funding sources were not involved in the design of the study, data collection analysis, interpretation of results, or writing the manuscript.

## Conflicts of interest

The authors declare no conflict of interest.

## References

1. Strauss RP. Cleft palate and craniofacial teams in the United States and Canada: A national survey of team organization and standards of care. The American Cleft Palate-Craniofacial Association (ACPA) Team Standards Committee. *Cleft Palate Craniofac J.* 1998; 35(6): 473-80.
2. Bütow KW. Treatment of cleft lip and palate. Part V: The clinic and the multidisciplinary approach to cleft lip and palate cases. *J Dent Assoc S Afr.* 1984; 39(8): 543, 5.
3. Marks M. A teamwork approach to cleft palate rehabilitation in South Africa. *S Afr J Commun Disord.* 1960; 7(2): 8-10.
4. Santiago PE, Grayson BH. Role of the craniofacial orthodontist on the craniofacial and cleft lip and palate team. *Semin Orthod.* 2009; 15(4): 225-43.
5. Auslander M, Brown A, Dalston R, Elmendorf E, Elster B, Jones M, et al. Parameters for evaluation and treatment of patients with cleft lip/palate or other craniofacial anomalies. *Cleft Palate Craniofac J.* 1993; 30 (Suppl.).
6. Long Jr RE, Semb G, Shaw WC. State of the art - orthodontic treatment of the patient with complete clefts of lip, alveolus, and palate: Lessons of the past 60 years. *Cleft Palate Craniofac J.* 2000; 37(6): 533.
7. Prah-Andersen B. Controversies in the management of craniofacial malformations. *Semin Orthod.* 2005; 11(2): 67-75.
8. Vig KW, Mercado AM. Overview of orthodontic care for children with cleft lip and palate, 1915-2015. *Am J Orthod Dentofacial Orthop.* 2015; 148(4): 543-56.
9. Pruzansky S. The role of the orthodontist in a cleft palate team. *Plast Reconstr Surg.* 1954; 14(1): 10-29.
10. Dabed CC, Cauvi DL. Survey of dentists' experience with cleft palate children in Chile. *Cleft Palate Craniofac J.* 1998; 35(5): 430-5.
11. Gadbury-Amyot CC, Simmer-Beck M, McCunniff M, Williams KB. Using a multifaceted approach including community-based service-learning to enrich formal ethics instruction in a dental school setting. *J Dent Educ.* 2006; 70(6): 652-61.
12. Kobes HR, Pruzansky S. The cleft palate team - a historical review. *Am J Public Health Nations Health.* 1960; 50(2): 200-5.
13. Lass NJ, Gasperini RM, Overberger JE, Connolly ME. The exposure of medical and dental students to the disorder of cleft palate. *Cleft Palate J.* 1973; 10(56): 306-11.
14. Parameters for evaluation and treatment of patients with cleft lip/palate or other craniofacial differences. *Cleft Palate Craniofac J.* 2017; 55(1): 137-56.
15. Berkowitz S. Teaching orthodontic residents and clinicians about cleft palate treatment. *Am J Orthod Dentofacial Orthop.* 2010; 138(2): 127.
16. McCarthy JG. Development of craniofacial orthodontics as a subspecialty at New York University Medical Center. *Semin Orthod.* 2009; 15(4): 221-4.
17. Berkowitz S. The need to establish an online cleft palate teaching program for orthodontic residents and practicing orthodontists. *Am J Orthod Dentofacial Orthop.* 2010; 137(5): 577.
18. McDonald J, Adamidis J, Eaton K, Seeholzer H, Sieminska-Piekarczyk B. A survey of postgraduate (specialist) orthodontic education in 23 European countries. *Br J Orthod.* 2000; 27(1): 83-98.
19. Kern DE, Thomas PA, Hughes MT. Curriculum development for medical education: A six-step approach. 2<sup>nd</sup> ed. Baltimore, MD: Johns Hopkins University Press. 2009.
20. Modi N, Ross E. The current practices, training and concerns of a group of hospital-based speech therapists working in the area of dysphagia. *The South African Journal of communication disorders.* 2000; 47: 3-14.
21. Thandeka M, Penelope F, Robin J. Are South African speech-language therapists adequately equipped to assess English Additional Language (EAL) speakers who are from an indigenous linguistic and cultural background? A profile and exploration of the current situation. *South African Journal of Communication Disorders.* 2016; 63(1): e1-5.

22. Medpages, South Africa: [updated 7 Sep 2016; cited 28 July 2017]. Available from: <https://www.medpages.info/sf/index.php?page=services>.
23. Manana PN, Kuonza L, Musekiwa A, Koornhof H, Nanoo A, Ismail N. Feasibility of using postal and web-based surveys to estimate the prevalence of tuberculosis among health care workers in South Africa. *PloS one*. 2018; 13(5): e0197022.
24. Adeyemi TA. Cleft lip and palate care in Nigeria: Current status of orthodontic residents' training in the management of children with cleft lip and palate. *J Craniofac Surg*. 2015; 26(4): 1106-8.
25. Keim RG, Sinclair PM. Orthodontic graduate education survey. *Am J Orthod Dentofacial Orthop*. 2002; 121(1): 2-8.
26. Noble J, Karaiskos N, Wiltshire WA. Future provision of orthodontic care for patients with craniofacial anomalies and cleft lip and palate. *World J Orthod*. 2010; 11(3): 269-72.
27. Pannbacker M, Lass NJ, Scheuerle JF, English PJ. Survey of services and practices of cleft palate–craniofacial teams. *Cleft Palate Craniofac J*. 1992; 29(2): 164-7.
28. Bedwinek AP, Kummer AW, Rice GB, Grames LM. Current training and continuing education needs of preschool and school-based speech-language pathologists regarding children with cleft lip/palate. *Lang Speech Hear Serv Sch*. 2010; 41(4): 405-15.
29. Flanigan TS, McFarlane E, Cook S, editors. Conducting survey research among physicians and other medical professionals: A review of current literature. Proceedings of the Survey Research Methods Section, American Statistical Association. 15 May, 2008; 1: 4136-47. Available from: <https://pdfs.semanticscholar.org/097a/47c2221285aa0529300a1add9015844edc35.pdf>.
30. Asch DA, Jedrzejewski MK, Christakis NA. Response rates to mail surveys published in medical journals. *J Clin Epidemiol*. 1997; 50(10): 1129-36.
31. Pannbacker M, Lass NJ, Starr P. Information and experience with cleft palate: Students, parents, professionals. *Cleft Palate J*. 1979; 16(2): 198-205.
32. Accreditation Standards for Clinical Fellowship Training Programs in Craniofacial and Special Care Orthodontics. Commission on Dental Accreditation. American Dental Association 2013. Available from: [https://www.ada.org/~media/CODA/Files/ortho\\_fellowship.pdf?la=en](https://www.ada.org/~media/CODA/Files/ortho_fellowship.pdf?la=en).
33. Schoenbrunner AR, Dalle Ore CL, Lance S, McIntyre J, Jones M, Gosman A. Effect of surgeon volume and craniofacial fellowship training on cleft palate complication rates. *Ann Plast Surg*. 2017; 78 (5 Suppl 4): S229-S32.
34. Plana NM, Massie JP, Stern MJ, Alperovich M, Runyan CM, Staffenberg DA, et al. The drivers of academic success in cleft and craniofacial centers: A 10-year analysis of over 2000 publications. *Plast Reconstr Surg*. 2017; 139(2): 450-6.
35. Grewal NS, Spoon DB, Kawamoto HK, Jones NF, Da Lio AL, Crisera C, et al. Predictive factors in identifying subspecialty fellowship applicants who will have academic practices. *Plast Reconstr Surg*. 2008; 122(4): 1264-71.

## Do the CPD questionnaire on page 226

The Continuous Professional Development (CPD) section provides for twenty general questions and five ethics questions. The section provides members with a valuable source of CPD points whilst also achieving the objective of CPD, to assure continuing education. The importance of continuing professional development should not be underestimated, it is a career-long obligation for practicing professionals.



### Online CPD in 6 Easy Steps

1. Go to the SADA website [www.sada.co.za](http://www.sada.co.za).
2. Log into the 'member only' section with your unique SADA username and password.
3. Select the CPD navigation tab.
4. Select the questionnaire that you wish to complete.
5. Enter your multiple choice answers. Please note that you have two attempts to obtain at least 70%.
6. View and print your CPD certificate.

# A preliminary inquiry on the association between pre-admission assessments and academic performance of first year dental technology students' within a South African university of technology

SADJ May 2021, Vol. 76 No. 4 p187 - p193

A Vahed<sup>1</sup>, S Naidoo<sup>2</sup>, D Singh<sup>3</sup>

## ABSTRACT

### Introduction

The use of selection, diagnostic, proficiency, placement, admission, manual dexterity and aptitude tests can reportedly predict students' academic success. Predictive admission procedures help to reduce dropout rates, improve academic performance, increase success rates, and selectively exclude applicants who are unlikely to be successful in the course. There is an absence of research, however, in this area of work in Dental Technology.

### Aim

To examine the association between pre-admission assessments and Dental Technology students' academic performance in a South African University of Technology.

### Design

A quantitative and cross-sectional study design was used.

### Methods

The target populations were the 2018 and 2019 first-year Dental Technology students. Retrospective data extracted from academic records and programme files were statistically analysed to measure the correlations against students' academic performance.

### Results

Despite there being no significant differences between pre-admission tests and students' academic performance, there were significant positive correlations between first-year university subjects.

### Conclusions

There are indications of horizontal coherence between the discipline-specific subjects in the first-year Dental Technology curriculum.

Examining the association between pre-admission tests and students' academic results through to graduation, together with the horizontal and vertical alignments of all subjects in the undergraduate Dental Technology curriculum, can facilitate the learning pathways for students to succeed academically at universities.

### Keywords

Manual dexterity tests, dental technology, curriculum coherence, cognitive abilities, psychomotor skills.

## INTRODUCTION

The Council on Higher Education (CHE)<sup>1</sup> reported that despite a marked increase in student enrolment in South African higher education institutions in the last 15 years, students are still academically underprepared.

The CHE report critically highlighted that students need to be guided into the curriculum pathway "that will offer them the best opportunity to succeed".<sup>1</sup> Several scholars

### Author affiliations:

1. **Anisa Vahed:** *DTech*, Senior Lecturer, Department of Dental Sciences, Durban University of Technology University of Pretoria, Pretoria, South Africa.  
ORCID Number: 0000-0002-0164-9114
2. **Subhadranalene Naidoo:** *MSc*, Senior Lecturer, Department of Radiography, Durban University of Technology, Durban, South Africa.
3. **Deepak Singh:** *MSc*, Senior Lecturer, Department of Physics, Durban University of Technology, Durban, South Africa.

### Corresponding author: Anisa Vahed

Department of Dental Sciences, Dental Technology Programme, Durban University of Technology (DUT).  
P.O. Box 1334, Durban, South Africa, 4001.  
Email: anisav@dut.ac.za

### Author contributions:

1. **Anisa Vahed:** Conceptualising, planning and execution of the project, data collection, and writing of the final report - 33.3%
2. **Subhadranalene Naidoo:** Assisted with the conceptualisation of the project, data interpretation and writing of the final report - 33.3%
3. **Deepak Singh:** Assisted with the conceptualisation of the project, conducted statistical analysis and interpreted results, and assisted in writing the final report - 33.3%

have therefore reiterated that entry-level assessments, such as diagnostic, proficient, placement and manual dexterity tests are required in the current educational climate.<sup>2-7</sup>

There are ongoing debates on the extent to which selection, diagnostic, proficiency, placement, admission, manual dexterity, and aptitude tests can predict student academic success.<sup>8-15</sup> Arguably, predictive admission procedures can reduce dropout rates, improve academic performance, increase success rates, and selectively exclude applicants who are unlikely to be successful in the course.<sup>16-18</sup>

Furthermore, the aforementioned authors have unanimously indicated the value of predictive admission tests in providing rich information on the profile of students and informing curriculum design. The lack of these tests could therefore place students at risk of not completing their courses successfully. In turn, this has cost implications for both the student and the university.

Despite the burgeoning literature<sup>3-5,19-21</sup> demonstrating the predictive value of manual dexterity tests, there is an absence of research on the predictive value of pre-admission tests for South African student dental technicians. Moreover, there is no consensus regarding the best predictive test or tests for admission into Dental Technology, which is a laboratory-based practice that requires students to have fine motor skills, hand-eye co-ordination and spatial perception.<sup>4,5</sup>

From a higher education perspective, Vahed, McKenna and Singh elaborated that “the distinctive characteristics of Dental Technology is that it has both theoretical (or know-why) and practical (or know-how) knowledge”.<sup>22</sup> Admission into Dental Technology training programmes at South African Universities of Technology (UoTs) are therefore based on a combination of cognitive and psychomotor tests.<sup>3,19,23</sup> The aforementioned scholars have further argued the efficacy of manual dexterity tests as a screening instrument for the early indications on prospective students’ competencies, skills and knowledge. This enables academics to gain knowledge on students who will require additional academic development and support to succeed.

The Dental Technology programme at the Durban University of Technology (DUT), where this study was conducted, largely entails completing a set of theory and manual dexterity tests, which assess the “ability to use the hands in a skilful and coordinated way”.<sup>24</sup> Student interviews follow thereafter. Regardless of this comprehensive process, the 2011-2014 cohort throughput rates for the National Diploma in Dental Technology ranged between 10-50% (data provided under the auspices of the Siyaphumelela project by DUTs Department of Management Information, specifically via an email from K Parker, PhD (koo@dut.ac.za) in February 2020). These are below the faculty and the national norms.

In attempting to address the unacceptable throughput rates, selection and manual dexterity tests in Dental Technology were extensively re-vised in 2017 and 2018. It is against this background that predicting variables to

increase students’ academic success in the Dental Technology programme is believed to be imperative. This also critically responds to the recent South African Dental Technicians Council (SADTC) accreditation report, which recommended that the department “carry out retrospective research on the data of the last several years, to determine if there are any associations between test scores and subsequent success or otherwise”.<sup>25</sup>

Using a retrospective and descriptive cross-sectional study within a quantitative framework, the aim of this study was to examine the association between first-year Dental Technology students’ academic results and various pre-admission measures. The objectives of this retrospective study were to:

1. Determine the relationship between biographical variables (i.e. gender, age, and home language) with students’ academic performance in selected first-year Dental Technology subjects.
2. Correlate school performance of individual subjects (i.e. Mathematics, Physical Science and English) with students’ academic performance in selected first-year Dental Technology subjects.
3. Determine the predictive value of Dental Technology Manual Dexterity Tests (DTMDT) with students’ academic performance in selected first-year Dental Technology subjects.
4. Determine the predictive value of the Standardised Assessment Test for Selection and Placement (SATAP) with students’ academic performance in selected first-year Dental Technology subjects. It should be noted that SATAP aims to identify students who might be at risk of under-performing and who require appropriate institutional support and/or interventions, such as intensive tutorials.<sup>2</sup>

It is envisaged that the retrospective data will provide significant prospective interventions such as using the results to improve the criteria and design of future pre- and post-admission processes. This could lead to the early identification of students who are at risk of failing. Furthermore, the results could provide early insights on students’ intellectual and academic profiles, which according to Scholtz and Allen-Ile “act as a basis for curriculum design”.<sup>2</sup>

## METHODOLOGY

### Study design and sampling

A post-positivism (or logical empiricism) paradigm within a quantitative and descriptive cross-sectional study design was used. The purpose of cross-sectional studies is to ascertain the “prevalence of a phenomenon, situation, problem, attitude or issue, by taking a cross-section of the population”.<sup>26</sup>

Post-positivism is knowledge that is produced through testing proposals based on precise observation and measurement that is verifiable. Personal biases and prejudices of the researcher and participants are reduced, as objectivity is achieved by using multiple measures and observations to gain a clearer understanding of what is happening in reality.<sup>27</sup>

Generally, there are two entry routes into the Dental Technology programme: namely, through the mainstream programme and through the extended curriculum programme (ECP). The minimum time for completion of the National Diploma qualification is three years for mainstream students and four years for ECP, as their first year of study extends over two years.

The total sample population consisted of the 2018 (n=46) and 2019 (n=26) registered first year Dental Technology students at DUT. In 2018, there were 25 mainstream and 21 ECP students whereas in 2019 there were 16 mainstream and 10 ECP students.

**Data collection and analysis**

The following data were retrospectively extracted from academic records and programme files located in the Dental Sciences department at DUT.

**Independent variables**

1. The 2017 and 2018 Grade 12 school-leaving results for the subjects are outlined in **Table 1**.

Although subject to some debate in the literature,<sup>28,29</sup> the predictive power of school-leaving results as a measure of students succeeding academically in universities continues to be used.

2. Students’ scores from their portfolio of work, which comprised of:
  - 2.1. A biographical questionnaire that comprised of five open-ended questions. Questions 1 - 4, which centred on health and recreational activities, are single items with responses averaging 1-2 lines of text. Question 5 however, has 12 sub-sections (i.e. 5.1 to 5.12) with responses averaging 3-5 lines of text. These questions focussed on parents’ occupation, describing the work of a dental technician, and personal attributes in terms of strengths and areas of development.
  - 2.2 A sketch of a tooth.
  - 2.3 A photograph of a ‘Coca-Cola, tomato sauce, or spice’ bottle carved from a Sunlight® soap bar. Corroborating with the finding of Oweis, Ereifej and Abu Eid<sup>30</sup> and Nayak, Sahni, Singhvi et al’s.<sup>31</sup>, the sketch and carving are used to create an early awareness for students of the kinds of psycho-

motor skills required in dental technology undergraduate programmes. According to Segura, Halabi and Navarro<sup>24</sup> “psychomotor skills are involved in procedures that are required to co-ordinate sensorial information with muscular response, as well as hand-eye synchronisation with hand and feet muscles motion, using a variety of dental instruments.”

3. The DTMDT scores for four sections, namely, Drawing, Tooth Carving, Stone Block and Essay. Two independent Dental Technology examiners assessed each section using 5-point Likert Scale rubrics from five (excellent) to one (poor). The mean of both examiners’ scores provided the final score per section. Essentially, these sections tested students’ visual-spatial skills, ability to work with their hands, listening, communication, and the ability to follow instructions.
4. The SATAP results for Maths A, Maths B, Science and Academic Literacy.

**Dependent variables**

5. The 2018 and 2019 results for Tooth Morphology (TMOR 101 - focuses on cognitive and psychomotor skills), Oral Anatomy (OANA 101 - centres on cognitive abilities), and Applied Dental Technology (APDT 101 - tests psychomotor skills). A critical point is that student throughput rates for the above subjects continues to be low and therefore these subjects are identified as “at risk” at both faculty and university levels (as per email communication from K Parker in February 2019).

Following the collection of the various predictors or independent variables (biological profile, Grade 12 results, DTMDT and SATAP) and outcome measures or dependent variables (students’ academic results for TMOR 101; OANA 101; and APDT 101), data was statistically analysed (SPSS® Version 26.0). Descriptive measures included the use of frequency and cross tabulation tables. Inferential statistics, which determines the differences and/or relationships between the variables, was conducted using Analysis of Variance (ANOVA), as the numerical data were normally distributed. Multiple Regression analyses and Pearson’s correlation tests were used to measure the relationship between pre-admission variables and first-year university results. Results were considered significant for p<0.05. A measure of reliability was performed using the mean total inter-item correlation (mean r=0.55).

**Table 1.** School leaving subjects.

National Senior Certificate (NSC) Requirements		Senior Certificate (SC) Requirements		
Compulsory Subject	NSC	Compulsory Subject	Higher Grade	Standard Grade
	Rating			
English (home) or English (1st additional)	3	English	E	C
Physical Sciences and/or Mathematics or Mathematics Literacy	3	Physical Science	E	B
	6			
And two 20 credit subjects (not more than one language)	3	Mathematics	E	B

**Note:**

- NSC rating of 3 and 6 is an achievement level between 40-49% and 70-79%, respectively.
- SC Grade B, C and E is an achievement level between 70-79%, 60-69% and 40-49%, respectively.

## RESULTS

In determining the relationship between biographical variables and first-year academic performance in Dental Technology (Objective 1), **Table 2** summarises the descriptive statistics of the biographical data. There were no significant differences in the number of males and females and students from the mainstream programme and ECP.

Significant differences existed across other variables, particularly highlighting that the programme constituted a higher number of African students with English as a second language. Inevitably, more students completed the portfolio because it was a critical component of the application process. Nearly two-thirds of the students had selected Dental Technology as either their first or second pre-university choice of programme.

Generally, the mean scores of the selected first-year Dental Technology subjects for ECP students were higher than the mainstream students (**Table 3**). In particular, the mean scores of the mainstream male students who were younger than 20 years old and ECP female students older than 22 years were above 52% for Tooth Morphology (TMOR 101) and Oral Anatomy (OANA 101) subjects. Regardless of gender and age, both mainstream and ECP students mean scores for Applied Dental Technology (APDT101) are below 50%. These trends are also observed when using ANOVA Analyses (**Table 4**).

Multivariate tests were used to determine which pre-admission variable affected students' performances in Tooth Morphology, Oral Anatomy and Applied Dental Technology. Partial eta squared was deemed appropriate because the dependent variable was numerical and the independent variables were categorical.

**Table 2.** Descriptive statistics.

(n = 72)		Frequency	Percent	p-value
Gender	Male	32	44.4	0.346
	Female	40	55.6	
Ethnicity	African	60	83.3	< 0.001
	Indian	10	13.9	
Programme	White	2	2.8	0.239
	ECP	31	43.1	
English Language	Mainstream	41	56.9	0.002
	First	23	31.9	
School Leaving Results	Second	49	68.1	-
	Senior Certificate	72	100.0	
Portfolio	Yes	60	83.3	< 0.001
	No	12	16.7	
Pre-University Choice	First	23	31.9	0.010
	Second	24	33.3	
	Third	19	26.4	
	Fourth	6	8.3	

**Note:**

- NSC rating of 3 and 6 is an achievement level between 40-49% and 70-79%, respectively.
- SC Grade B, C and E is an achievement level between 70-79%, 60-69% and 40-49%, respectively.

As illustrated in **Table 4**, the blue highlights indicate that the pre-admission measures (independent variables) had a small effect on students' academic results for TMOR 101; OANA 101; and APDT 101 (dependent variables). Similarly, the green represents a medium effect and the yellow implies a large effect on the dependent variable by the independent variables.

**Table 3.** Comparison of gender and age against students' performances in selected first-year dental technology subjects.

Programme	Independent Variables	Dependent Variables: Dental Technology First-Year Subjects					
		Tooth Morphology TMOR 101					
		Age Group	Mean	Standard Deviation	Standard Error of Mean	95.0% Lower CL for Percentile 95	95.0% Upper CL for Percentile 95
ECP	Male	< 20	-	-	-	-	-
		20 - 22	51.25	21.98	10.99	43.00	84.00
	> 22	42.00	-	-	-	-	-
Mainstream	Female	< 20	-	-	-	-	-
		20 - 22	49.89	16.36	5.45	58.00	69.00
	> 22	53.83	6.94	2.83	57.00	64.00	
ECP	Male	< 20	53.00	-	-	-	-
		20 - 22	41.00	20.53	7.76	51.00	69.00
		> 22	34.25	15.48	7.74	36.00	55.00
	Female	< 20	-	-	-	-	-
		20 - 22	47.75	11.45	4.05	48.00	67.00
		> 22	45.67	22.59	13.04	48.00	67.00

Programme	Independent Variables	Applied Dental Technology APDT 101					
		Age Group	Mean	Standard Deviation	Standard Error of Mean	95.0% Lower CL for Percentile 95	95.0% Upper CL for Percentile 95
		ECP	Male	< 20	-	-	-
20 - 22	48.00			-	-	-	-
> 22	-		-	-	-	-	
Mainstream	Female	< 20	-	-	-	-	
		20 - 22	-	-	-	-	-
	> 22	-	-	-	-	-	
ECP	Male	< 20	46.00	-	-	-	-
		20 - 22	35.40	11.46	5.12	40.00	50.00
		> 22	36.50	9.26	4.63	40.00	44.00
	Female	< 20	-	-	-	-	-
		20 - 22	48.86	5.46	2.06	51.00	57.00
		> 22	44.00	16.97	12.00	32.00	56.00

Programme	Independent Variables	Oral Anatomy OANA 101					
		Age Group	Mean	Standard Deviation	Standard Error of Mean	95.0% Lower CL for Percentile 95	95.0% Upper CL for Percentile 95
		ECP	Male	< 20	-	-	-
20 - 22	36.00			8.66	5.00	31.00	46.00
> 22	40.00		-	-	-	-	
Mainstream	Female	< 20	-	-	-	-	
		20 - 22	45.33	12.25	4.08	51.00	60.00
	> 22	54.83	9.06	3.70	61.00	66.00	
ECP	Male	< 20	56.00	-	-	-	-
		20 - 22	38.88	13.70	4.84	50.00	54.00
		> 22	39.25	17.86	8.93	46.00	53.00
	Female	< 20	-	-	-	-	-
		20 - 22	48.89	6.85	2.28	51.00	62.00
		> 22	50.00	6.56	3.79	51.00	56.00

Correlation analyses, which measures “the closeness of the linear relationship between the defined variables” and defines the pattern of existing relationships known as regression analysis, revealed no significant correlation.<sup>32</sup> In particular, no significant correlation existed between DTMDT scores (Objective 3) and SATAP results (Objective 4) against the students’ performances in the selected first-year Dental Technology subjects, respectively.

A noteworthy point, however, is that there is a significant positive correlation between university subjects. For instance, Mainstream students’ results showed a significant relationship between APDT 101 and TMOR 101 ( $r=0.867, p<0.001$ ), OANA 101 and TMOR 101 ( $r=0.687, p<0.001$ ), and OANA 101 and APDT 101 ( $r=0.766, p<0.001$ ). Similarly, ECP students’ results showed a significant relationship between OANA101 and TMOR101 ( $r=0.881; p<0.001$ ).

As illustrated in Table 5, the linear regression analyses performed for Objective Two revealed no significant non-zero coefficients ( $p>0.05$ ) between the independent and dependant variables (TMOR 1010; APDT 1010; and OANA 101). Notably, all of the variance inflation factors (VIF) were less than the standard of 4, implying little multicollinearity.

There is only one significant p-value that is the influence of English Home Language on TMOR101 ( $p=0.039$ ). The p-value, however, becomes non-significant ( $>0.05$ ) after adjusting for mainstream and ECP groups. This indicates that the predictive power is not affected by the interplay of predictors. All unstandardised coefficients (B) are negative. Even though the p-values are not significant, it does indicate a trend that there is an inverse relationship between the dependent variable and the independent variables (school subjects).

### DISCUSSION

This study sought to determine if there are any associations between Dental Technology students’ pre-admission scores and first-year students’ academic results. The section below discusses the results per research objective, recommends directions for future research and reports on the study’s limitations.

From Tables 3, 4 and 5 it can be inferred that the pre-admission measures are weak predictors for success in first-year Dental Technology subjects, particularly in terms of the skillset and prior knowledge needed to succeed in the programme. These results are consistent with the findings from previous studies.<sup>16,20,21,29</sup>

**Table 4.** Multivariate analyses.

Factors	Dependent	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta-squared ( $\eta_p^2$ )
Gender	TMOR101	129.252	1	129.252	0.709	0.428	0.709
	APDT101	40.206	1	40.206	0.742	0.418	0.742
	OANA101	142.530	1	142.530	0.848	0.388	0.848
Age	TMOR101	209.158	2	104.579	0.574	0.588	0.574
	APDT101	61.486	2	30.743	0.567	0.591	0.567
	OANA101	444.272	2	222.136	1.322	0.326	1.322
English Home Language	TMOR101	0.308	1	0.308	0.002	0.968	0.002
	APDT101	0.906	1	0.906	0.017	0.901	0.017
	OANA101	39.611	1	39.611	0.236	0.642	0.236
Gender * Age	TMOR101	784.000	1	784.000	4.301	0.077	4.301
	APDT101	196.000	1	196.000	3.616	0.099	3.616
	OANA101	462.250	1	462.250	2.752	0.141	2.752
Gender * English Home Language	TMOR101	372.181	1	372.181	2.042	0.196	2.042
	APDT101	104.533	1	104.533	1.928	0.208	1.928
	OANA101	78.948	1	78.948	0.470	0.515	0.470

a). R Squared = .768 (Adjusted R Squared = .402)  
 b). R Squared = .804 (Adjusted R Squared = .497)  
 c). R Squared = .619 (Adjusted R Squared = .020)

**Table 5.** Linear regression analysis (Dependent Variable: TMOR 101)

Model	Independent Variables	Unstandardized Coefficients B	Std. Error	Standardized Coefficients Beta	t	Sig.	Collinearity Statistics Tolerance	VIF
1	(Constant)	251.516	79.734	-	3.154	0.016	-	-
	English Home	-1.756	0.691	-0.740	-2.542	0.039	0.790	1.267
	Maths	-1.627	0.789	-0.583	-2.061	0.078	0.837	1.195
	Physical Science	-0.240	0.732	-0.089	-0.328	0.753	0.911	1.098
2	(Constant)	250.634	86.266	-	2.905	0.027	-	-
	English Home	-1.709	0.826	-0.721	-2.070	0.084	0.642	1.556
	Maths	-1.603	0.870	-0.575	-1.843	0.115	0.801	1.248
	Physical Science	-0.257	0.801	-0.095	-0.322	0.759	0.885	1.130
	Mainstream/ECP	-1.545	11.847	-0.042	-0.130	0.900	0.759	1.318

Moreover, and from the analyses of gender and age against students' performances in selected first-year dental technology subjects (Table 3), it can be inferred that completing an additional year to the three-year formal mainstream programme enable ECP students to improve their performance in the 'know-why' theory and 'know-how' laboratory-based subjects. Notwithstanding this however, the mean score of <50% for APDT 101 supports the need for more rigorous DTMDT, which must be reviewed and revised continuously to ensure that pre-admission tests are developed to function for its intended purpose. Consistent with Poole, Catano and Cunningham, the robust monitoring between the theory and practical components of pre-admission tests facilitates more valid and reliable admission procedures to be developed.<sup>12</sup>

Concomitantly, it is recommended that socioeconomic and psychosocial variables be considered as previous predictive validity studies revealed that these variables positively correlate with academic performance.<sup>6,7</sup>

In addition, it can be inferred that proficiency in Grade 12 school-leaving subjects such as Mathematics and Physical Science do not necessarily translate to success in first-year university subjects. This supports Stemler's<sup>15</sup> argument that measures of achievement such as school-leaving results are an excellent starting point, however, these results tend to measure only a narrow range of student abilities. Rooy and Coetzee-Van Rooy<sup>28</sup> have therefore advised that students who are admitted into universities with school-leaving results below 65% will require additional support to succeed academically.

The higher number of African second language English students (Table 2) in the Dental Technology programme further suggests that concerted efforts are being made by DUT to address equity and redress, which are high on the South African higher education agendas.

Contrary to being an essential practice-specific pre-requisite for Dental Technology, the correlations between the DTMDT and SATAP results with first-year students' results in TMOR 101, OANA 101 and APDT 101 were weak. As argued by Schwibbe et al.,<sup>4</sup> a factor possibly contributing to this is that psychomotor measures such as DTMDT do not predict performance in tests with theoretically rich content such as TMOR 101 and OANA 101.

This does not explain the weak correlation between DTMDT and APDT 101, however, both of which predominantly focus on psychomotor skills. Presumably, this could be a consequence of other contributing factors such as students' personal qualities, teaching and learning strategies used, and non-cognitive factors (student motivation and learning behaviour).

Analogous to Schwibbe et al.<sup>4</sup> and Alhadlaq et al.,<sup>13</sup> a significant limitation of this study is that it only assessed the relationship between pre-admission variables and selected first-year subjects. A recommendation therefore is that future research considers a longitudinal and mixed methods study to examine students' academic results through to graduation.

This is to include a deeper theorisation on the interactions between cognitive, non-cognitive and psychomotor abilities in the acquisition of laboratory-based techniques.

Even though pre-admission measures were not predictors of first-year Dental Technology students' academic performance, the positive correlations between the selected first-year subjects indicate that there is horizontal alignment or coherence between discipline-specific subjects within the first-year curriculum. Vahed, McKenna and Singh's<sup>22</sup> study further supports this. They revealed that Tooth Morphology and Oral Anatomy provide the underpinning conceptual knowledge needed to produce and repair (applied knowledge) various dental appliances taught in Applied Dental Technology. For instance, the above authors elaborated that students acquire knowledge on the structural and functional anatomy of the muscles of mastication and facial expression, which is the intellectual field of the Oral Anatomy discipline. This knowledge underscores Applied Dental Technology, which is the field of laboratory-based practice.<sup>22</sup>

Ultimately, the aim of the Dental Technology programme is to provide an appropriate balance in training students for the field of professional practice through APDT 101 while educating them on various disciplinary knowledge such as TMOR 101 and OANA 101. In view of the earlier recommendation to examine students' academic results from first year to graduation, a concurrent examination on the horizontal and vertical alignments of the subjects in the Dental Technology undergraduate curriculum will further serve to provide in-depth understanding of the extent to which students are learning the required knowledge and skills needed for industry. Herein is an area for further research, especially as Dental Technology programmes across South African UoTs are currently revising their undergraduate curricula.

## CONCLUSION

Although the various pre-admission assessments used were not predictors of first-year Dental Technology students' academic performance, a salient finding is that there are indications of horizontal coherence between discipline-specific subjects within the first-year curriculum.

Examining the association between pre-admission tests and students' academic results through to graduation is critical, especially as Dental Technology programmes nationally are realigning their curricula according to the revised South African National Qualifications Framework. This combined with a closer analysis of the horizontal and vertical coherence of all subjects in the revised undergraduate Dental Technology curriculum can facilitate the learning pathways for students to succeed academically in universities.

## References

1. Council on Higher Education. A proposal for undergraduate curriculum reform in South Africa: The case for a flexible curriculum structure. Pretoria: CHE Press, 2013.
2. Scholtz D, Allen-Ile COL. Is the SATAP test an indicator of academic preparedness for first year university students? *South African Journal of Higher Education*. 2007; 21(7): 919-39.
3. da Costa Neves T, Garcia PPNS. Use of manual dexterity tests in dental education. *Journal of advances in medicine and medical research*. 2018; 27(12): 1-7.
4. Schwibbe A, Kothe C, Hampe W, Konradt U. Acquisition of dental skills in preclinical technique courses: influence of spatial and manual abilities. *Advances in health sciences education theory and practice*. 2016; 21(4): 841-57.
5. Lugassy D, Levanon Y, Pilo R, Shelly A, Rosen G, Meirowitz A, Brosh T. Predicting the clinical performance of dental students with a manual dexterity test. *PLoS One*. 2018; 13(3): e0193980.
6. van Herpen SGA, Meeuwisse M, Hofman WHA, Severiens SE, Arends LR. Early predictors of first-year academic success at university: pre-university effort, pre-university self-efficacy, and pre-university reasons for attending university. *Educational Research and Evaluation*. 2017; 23(1-2): 52-72.
7. Zekarias Z, Aba-Milki N, Mikre F. Predictors of academic achievements for first year students. The case of Wolaita-SODDO University, Ethiopia. *European Scientific Journal, ESJ*. 2015; 11.
8. Dabaliz AA, Kaadan S, Dabbagh MM, Barakat A, Shareef MA, Al-Tannir M, Obeidat A, Mohamed A. Predictive validity of pre-admission assessments on medical student performance. *International journal of medical education*. 2017; 8: 408-13.
9. Wadee AA, Cliff A. Pre-admission tests of learning potential as predictors of academic success of first-year medical students. *South African Journal of Higher Education*. 2016; 264-78.
10. Evans JG, Dirks SJ. Relationships of admissions data and measurements of psychological constructs with psychomotor performance of dental technology students. *J Dent Educ*. 2001; 65(9): 874-82.
11. Migliaretti G, Bozzaro S, Siliquini R, Stura I, Costa G, Cavallo F. Is the admission test for a course in medicine a good predictor of academic performance? A case-control experience at the school of medicine of Turin. *BMJ Open*. 2017; 7(11): e017417.
12. Poole A, Catano VM, Cunningham DP. Predicting performance in Canadian dental schools: the new CDA structured interview, a new personality assessment, and the DAT. *J Dent Educ*. 2007; 71(5): 664-76.
13. Alhadlaq AM, Alshammari OF, Alsager SM, Neel KAF, Mohamed AG. Ability of admissions criteria to predict early academic performance among students of health science colleges at King Saud University, Saudi Arabia. *Journal of Dental Education*. 2015; 79(6): 665-70.
14. Simpson PL, Scicluna HA, Jones PD, Cole AM, O'Sullivan AJ, Harris PG, Velan G, McNeil HP. Predictive validity of a new integrated selection process for medical school admission. *BMC Medical Education*. 2014; 14(1): 86.
15. Stemler SE. What should university admissions tests predict? *Educational Psychologist*. 2012; 47(1): 5-17.
16. Chow AK, Milos NC. Admission criteria as predictors of student success in a dental hygiene program. *Journal of Dental Education*. 2019; 83(2): 183-7.
17. Rowland KC, Rieken S. Rethinking dental school admission criteria: correlation between pre-admission variables and first-year performance for six classes at one dental school. *Journal of Dental Education*. 2018; 82(4): 411-6.
18. Plouffe RA, Hammond R, Goldberg HA, Chahine S. What matters from admissions? Identifying success and risk among canadian dental students. *Journal of Dental Education*. 2018; 82(5): 515-23.
19. Ballard RW, Hagan JL, Cheramie T. Relationship between hand-skill exercises and other admissions criteria and students' performance in dental school. *J Dent Educ*. 2015; 79(5): 557-62.
20. Beier US, Kapferer I, Ostermann H, Staudinger R, Dumfahrt H. Impact of a novel dental school admission test on student performance at Innsbruck Medical University, Austria. *J Dent Educ*. 2010; 74(5): 531-8.
21. Arnold WH, Gonzalez P, Gaengler P. The predictive value of criteria for student admission to dentistry. *European Journal of Dental Education*. 2011; 15(4): 237-43.
22. Vahed A, McKenna S, Singh S. Linking the 'know-that' and 'know-how' knowledge through games: a quest to evolve the future for science and engineering education. *Higher Education*. 2016; 71(6): 781-90.
23. Evans J, Henderson A, Johnson N. The future of education and training in dental technology: designing a dental curriculum that facilitates teamwork across oral health professionals. *British Dental Journal*. 2010; 208(5): 227-30.
24. Segura C, Halabi D, Navarro N. Design and Validation of a Basic Dental Psychomotor Skills Test for Novice Dental Students. *Journal of Dental Education*. 2018; 82(10): 1098-104.
25. The South African Dental Technicians Council. Accreditation of education and training programme for dental technicians and dental technologists. 2018.
26. Kumar R. *Research Methodology: A step-by-step guide for beginners*. 4<sup>th</sup> ed. London: SAGE Publications Inc., 2014.
27. Panhwar DAH, Sanuallah Ansari D, Shah A. Post-positivism: An Effective Paradigm for Social and Educational Research. 2017: 253-60.
28. van Rooy B, Coetzee-Van Rooy S. The language issue and academic performance at a South African University. *Southern African Linguistics and Applied Language Studies*. 2015; 33(1): 31-46.
29. Mashige KP, Rampersad N, Venkatas IS. Do National Senior Certificate results predict first-year optometry students' academic performance at university? *South African Journal of Higher Education*. 2014; 28(2): 550-63.
30. Oweis Y, Ereifej N, Eid RA. Students' Perceptions of Dental Anatomy Course at The University of Jordan. *Journal of Dental Education*. 2015; 49(3): 147-54.
31. Nayak M, Sahni P, Singhvi A, Singh A. The perceived relevance of tooth carving in dental education: Views of practicing dentists and faculty in West India. *Education for Health*. 2014; 27(3): 238-42.
32. Taylor R. Interpretation of the Correlation Coefficient: A Basic Review. *Journal of Diagnostic Medical Sonography*, 1990: 35-9.

# Audit of the workload in a maxillofacial and oral surgical unit in Johannesburg

SADJ May 2021, Vol. 76 No. 4 p194 - p200

K Sukha<sup>1</sup>, M Mabongo<sup>2</sup>

## ABSTRACT

### Introduction

Maxillofacial and oral surgical (MFOS) audits are able to provide data to both current and prospective patients regarding the quality of care an institution is capable of providing. The more frequently performed MFOS procedures can be determined and the allocation of funding and resources can therefore be achieved more appropriately.

### Aims and objectives

To conduct an audit to evaluate the workload and scope of practice of the MFOS unit of the Charlotte Maxeke Johannesburg Academic Hospital (CMJAH) for the year 2015 by quantifying MFOS conditions and the respective treatment modalities.

### Design

The study was retrospective and cross-sectional.

### Methods

Data was retrieved from the patient logbook of the unit which was then entered into a Microsoft Excel Spreadsheet. Pie graphs and bar charts representing the data were then generated.

### Results

A total of 1 750 patients were treated in the unit. The male to female ratio was 1.3:1 and the majority of these patients were in their 3<sup>rd</sup> and 4<sup>th</sup> age decade. Most patients required a tooth extraction mainly for an impacted 3<sup>rd</sup> molar.

### Conclusions

Dentoalveolar surgery was the most commonly performed procedure followed by the treatment of facial fractures. Pathological and other MFOS conditions were

less commonly encountered. The CMJAH MFOS unit treats a high volume of patients according to comparisons with global studies.

## INTRODUCTION

Johannesburg is the capital city of the Gauteng Province, which is the economic hub of the Republic of South Africa. The Charlotte Maxeke Johannesburg Academic Hospital (CMJAH) based in Parktown is one of the teaching hospitals of the Faculty of Health Sciences of the University of the Witwatersrand, Johannesburg.

The hospital's Maxillo-Facial and Oral Surgical (MFOS) department/unit treats a wide spectrum of diseases, injuries and defects affecting the head, neck, jaw bones, face and the hard and soft tissues of the oral cavity. These procedures are performed under both local and general anaesthesia. The unit manages patients referred from healthcare facilities in Gauteng as well as surrounding provinces and also treats citizens of the Southern African Development Community (SADC) countries that lack the necessary skilled professionals, facilities and resources.

Clinical/surgical audits are widely used as a strategy for improving professional practice. Healthcare providers upon given feedback that their clinical practice is below standard are forced to modify that practice. A paper that reviewed a total of 140 studies concluded that audits lead to small but potentially important improvements in professional practice.<sup>1</sup> A systematic review of surgical audits identified an important relationship between surgical audits and reducing the cost of healthcare by facilitating the provision of information and transparency on the performance of hospitals.

This knowledge allows for improvement in the quality of care, which then leads to fewer complications and ultimately less cost.<sup>2</sup> Auditing provides information regarding the more frequently performed procedures within a surgical unit. A stricter control can thus be kept on the purchasing of instruments and consumable items as more funding can be allocated to the more commonly used products.

## LITERATURE REVIEW

A number of audits conducted in various parts of the world have been reported in literature. A five-year audit of the MFOS department of Calabar Teaching Hospital

### Author affiliations:

1. **Kamal Sukha:** BDS (Wits); MSc (Dent) (Wits), Dentist in Private Practice, South Africa.
2. **Mzubanzi Mabongo:** STD (Unitra); B Dent (Medunsa); BDS (Wits); MChD (MFOS)(UWC); Cert. Orofacial pain (Rutgers, USA); FCFS (Bangalore, India), Head of Department, Department of Maxillofacial and oral surgery, University of Pretoria, Pretoria, South Africa. ORCID Number: 0000-0001-9060-3996

**Corresponding author:** Kamal Sukha  
Dentist in Private Practice, South Africa.  
P.O. Box 709, Lenasia, 1820.  
Email: dr.ksukha@gmail.com

### Author contributions:

1. **Kamal Sukha:** Principal author - 50%
2. **Mzubanzi Mabongo:** Second author - 50%

in Nigeria revealed that a total number of 1,437 patients were treated from 2005 to 2009.<sup>3</sup> Adebayo et al. reported results of another audit that was conducted in a Military hospital in Port Harcourt, which is part of the Niger Delta region of Nigeria.<sup>4</sup> Both hospitals received referrals from a broad surrounding geographic area but the hospital in Port Harcourt supposedly only treated Nigerian military personal, explaining its lower patient volume.<sup>3,4</sup> Adebayo et al. also found that the majority of patients treated at the Port Harcourt hospital could not afford specialised care, hence the low percentage of procedures that were actually performed.<sup>4</sup>

An audit in the Muhimbili National Hospital in Dar es Salaam found that 456 patients visited the MFOS unit for treatment over a period of six years.<sup>5</sup> The authors considered this volume as significantly high even though the population of Tanzania is currently estimated at 51.04 million and the hospital was the only centre providing specialist MFOS services in the country.

Asian studies comparatively reveal a much higher number of individuals who required MFOS treatments. A study at the Dhaka Dental College showed a total number of 768 patients who were treated in the year 2012.<sup>6</sup> Researchers of the Kyber College of Dentistry in Peshawar, Pakistan similarly found that a high number of patients were seen in the hospital's MFOS unit.<sup>7</sup> A total number of 2,764 patients were treated over a two-year period (January 2006 to December 2007) at an average of 1,382 patients per annum.

The studies cited above show that smaller volumes of patients are managed in African nations as compared to certain Asian countries.<sup>3-7</sup> One can attribute the high volumes of patients in Asian nations due to their extremely high populations. The Nigerian authors Adebayo et al. suggest that their low patient volume was attributed to a lack of centres that are able to provide MFOS treatments.<sup>4</sup> They also deduced that more patients actually had MFOS conditions during those five years but due to the lack of skilled professionals and appropriate screening, referral was not possible.

The study of most significance was a six-month comparison of the MFOS departmental statistics at the Chris Hani Baragwanath Hospital also in Johannesburg (CHBH) for the years 1987 and 2007.<sup>8</sup> Damtew et al. studied how MFOS practice had changed in South Africa over a period of 20 years in terms of both patient numbers and spectrum of conditions. A total number of 609 patients were treated in the MFOS unit during the first six months of 2007. This number had increased from 445 in the year 1987.

As far as conditions are concerned, Islam et al. of the Dhaka Dental College reported that maxillo-facial injury was most common followed by pathological and infective conditions.<sup>6</sup> Uddin et al., whose audit was at the same institution found that the incidence of cleft lip and palate was considerably high.<sup>9</sup> Even though both Nigerian studies described trauma-related conditions as the highest incidence in their facilities, there were also a considerable number of pathologic cases ranging from fibro-osseous lesions, salivary gland tumours, cysts, both

odontogenic and non-odontogenic tumours as well as septic conditions such as osteomyelitis.<sup>3,4</sup>

The British Association of Maxillo-Facial and Oral Surgeons First National Audit report in September 2010 presented a very broad scope of practice for specialists in the United Kingdom.<sup>10</sup> The majority of participants practiced dentoalveolar surgery which included the removal of impacted wisdom teeth, trauma-related procedures e.g. open reduction with internal fixation (ORIF) of the mandible, and minor oral medicine procedures such as the treatment of lichen planus.

More than 80% of British surgeons were also involved in managing benign salivary gland tumours and cutaneous basal cell carcinomas. Surveys into changing trends in the scope of MFOS practice in Australia during 1990 and 2000 revealed that dentoalveolar surgery was the most commonly performed procedure in both eras.<sup>11,12</sup> Brennan et al. observed that there was an increase in the rate of provision of services per specialist visit in the year 2000 as compared to 1990.<sup>11</sup>

There were significantly higher numbers of treatments of MFOS pathology, reconstructive surgery, implantology, bone grafting and orthognathic procedures by dual qualified surgeons (those who held both medical and dental degrees).<sup>10-12</sup> The scope of practice in other parts of the world was much broader compared to Africa, as the treatment of congenital deformities and oral malignancies were more commonly practiced.<sup>3-12</sup>

## METHODS AND MATERIALS

The research report is a retrospective, cross-sectional study of patients managed in the Maxillo-Facial and Oral Surgical (MFOS) unit of the Charlotte Maxeke Johannesburg Academic Hospital (CMJAH). The sample size consists of all patients (in-patients and out-patients) treated in the unit over a one-year period (1<sup>st</sup> January 2015 to 31<sup>st</sup> December 2015).

Data was retrieved from the statistics of the CMJAH MFOS department which included a theatre logbook for cases treated under general anaesthesia and a patient register for cases treated under local anaesthesia at the Wits Dental Hospital (located in the CMJAH). The data collected was comprised of patient age, gender, month of procedure, diagnosis of condition, anatomical site of condition (for trauma and pathology) and the treatment/procedure performed. The data was entered into a Microsoft Excel Spreadsheet where graphical representation was generated.

The diagnosis of MFOS conditions was categorised into the following:

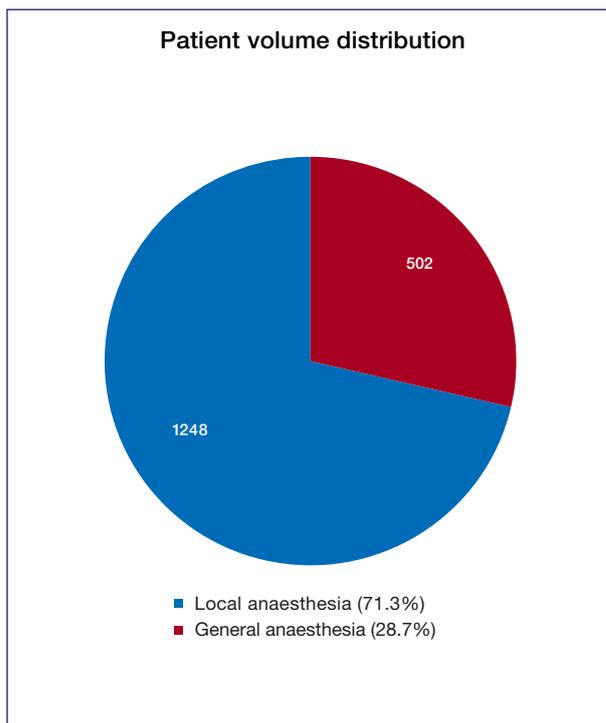
1. **Trauma:** This includes fractures of the facial skeleton and lacerations of facial and oral soft tissues as a direct result of trauma.
2. **Pathology:** including all tumour and tumour-like conditions including cystic lesions of the jaw bones and oral soft tissues.
3. **Teeth requiring extraction:** This includes all impacted, carious and mobile teeth. Also includes teeth extracted prior to radiation therapy. NB: The patient

number and not the number of teeth extracted was recorded.

4. **Sepsis:** including all abscesses, cellulitis and necrotic conditions.
5. **Post-operative complications:** This includes all dry/septic sockets, oro-antral communications, displacement of teeth into ectopic areas and septic hardware after ORIFS (infected fractures).
6. **Temporo-mandibular joint disorders (TMD)** including ankylosis and bruxism resulting in trismus and myofascial symptoms.
7. **Facial deformities and malocclusions.**
8. **Edentulous/partially edentulous patients** requiring implants.

Treatments/procedures performed were categorised as follows:

1. Treatment of fractures of the facial skeleton either by open reduction with internal fixation (ORIF) or by closed reduction with inter-maxillary fixation (CRIMF).
2. Dentoalveolar surgery including the simple extraction of carious and mobile teeth as well as the surgical removal of impacted and unerupted teeth and full/partial dental clearances prior to or during radiation therapy.
3. Oral soft tissue surgery.
4. Incisional and excisional biopsies.
5. Incision, drainage and debridement of sepsis.
6. Jaw reconstruction/bone grafts.
7. Orthognathic and orthodontic surgery.
8. Mandibular resections.
9. Temporo-mandibular joint (TMJ) surgery.
10. Implant placement.
11. Treatment of post-operative complications including the treatment of dry sockets, closure of oro-antral communications, removal of teeth displaced into the antra and removal of septic hardware and wires.



**Figure 1.** Pie chart demonstrating the volume distribution of patients treated in the unit based on the type of anaesthesia administered.

## Ethical considerations

An application was made to the University of the Witwatersrand Committee for Research on Human Subjects (Medical) who approved the research protocol unconditionally (Clearance Certificate Number M160744). Permission for using the hospital and Wits Dental School's statistics was sought from the School of Oral Health Science Hospital Research Committee.

## RESULTS

### Workload

A total number of 1,750 patients were treated as elective cases in the CMJAH MFOS unit for the year 2015 (1<sup>st</sup> January till 31<sup>st</sup> December). Five hundred and two patients (502) were treated under general anaesthesia and 1,248 were treated as day cases under local anaesthesia. The distribution of patients with regard to treatment under general and local anaesthesia is presented in Figure 1.

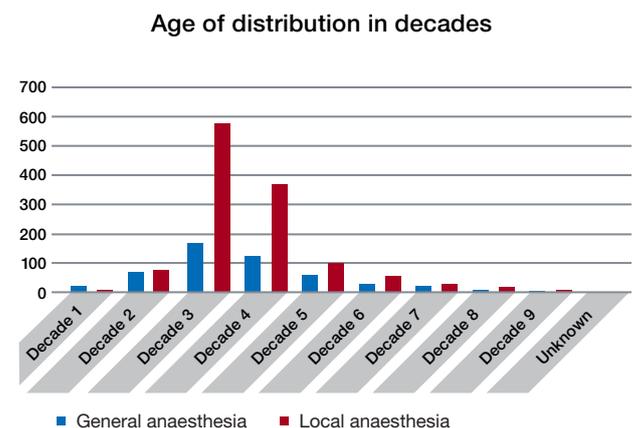
### Gender

A total number of 995 (56,8%) males and 755 (43,2%) females were treated in the unit during the year 2015 at a ratio of 1.3:1. For the 502 patients treated under general anaesthesia, 345 were males and 157 were females at a ratio of 2.2:1. The 1,248 patients treated under local anaesthesia, on the other hand had a relatively equal gender distribution at a ratio of 1.1:1.

### Age

The age range of patients treated in the unit was from the 1<sup>st</sup> to the 9<sup>th</sup> decade with a mean age of 31,5 years (31,2 years for general anaesthesia and 31,8 years for local anaesthesia). Patients in their 3<sup>rd</sup> and 4<sup>th</sup> decades were more commonly seen under both general and local anaesthesia.

The two extremes of age (very young and very elderly) had a very low frequency. There were 18 patients from both categories whose age was unrecorded and could not be traced due to unrecorded file numbers in the patient register. Figure 2 graphically demonstrates the distribution of patients according to their age group and volumes.



**Figure 2.** Bar graph demonstrating the age distribution in decades.

**Conditions**

The percentage distribution of MFOS conditions are graphically represented in Figure 3. A certain percentage of patient conditions were not recorded in the patient register. This category is labelled as “unknown” and comprised 3,7% of all conditions. One patient developed general anaesthetic complications after the induction phase and could not be operated on. This category is labelled as “cancellations” in Figure 3 and comprised 0,4% of all conditions.

**Pattern of trauma and tumour/ tumour-like conditions**

The percentage distribution of the specific anatomical sites that were affected is graphically demonstrated in Figures 4 and 5 below. Certain patient records (2,4%) had unrecorded anatomical sites labelled as “unknown” on Figure 5. Sites for pathological conditions that were biopsied and treated under local anaesthesia are not included as they were not recorded in the patient register.

**Procedures/treatments**

The percentage distribution of all procedures performed (both under general and local anaesthesia) is graphically demonstrated in Figure 6. Some procedures were not documented and represented 0,8% of the total.

Note that the quantity of procedures/treatments exceeds the total volume of patients as multiple procedures were performed on certain patients.

**DISCUSSION**

The volume of patients treated in the CMJAH MFOS unit during 2015 seems to be significantly high (1,750 patients). Although no direct comparison can be made, as an audit of this nature has never previously been undertaken in the unit, anecdotal evidence suggests that the volumes have always been high which are comparable globally to audits conducted in Asian nations.<sup>5-7</sup>

Damtew et al. reported an increase in the patient volume at the CHBH due to the significant growth of the population within Johannesburg and the influx of foreign nationals from surrounding African countries.<sup>8</sup> These factors could apply to the CMJAH as both hospitals are about 20 km apart. A study also demonstrated how there is an average delay of 20 days at the CMJAH between an injury (facial fracture) and its treatment.<sup>19</sup> This is further evidence of the high patient volumes.

The majority of these patients were treated under local anaesthesia due to the intense patient volume. It is simply not possible for all these cases to be treated under general anaesthesia. Patient comfort and satisfaction for dentoalveolar surgery, sepsis drainage as well as incisional and excisional biopsies can be attained through effective local anaesthesia. The treatment under local anaesthesia reduces the pressure placed on the elective theatre slate and allows for substantially more patients to be treated. It also allows preference for the more severe cases to be treated under general anaesthesia.

The majority of patients treated in the unit were in their 3<sup>rd</sup> and 4<sup>th</sup> decade with a mean age of 31,5 years. This result concurs with a study that found how the majority of individuals require 3<sup>rd</sup> molar surgery after the age of 20.<sup>14</sup> Maxillofacial trauma was shown to occur in individuals of the same age group in western societies and the author attributed alcohol abuse predominantly in this group as a pivotal factor in the increased number of road accidents and incidents of interpersonal violence globally.<sup>15</sup>

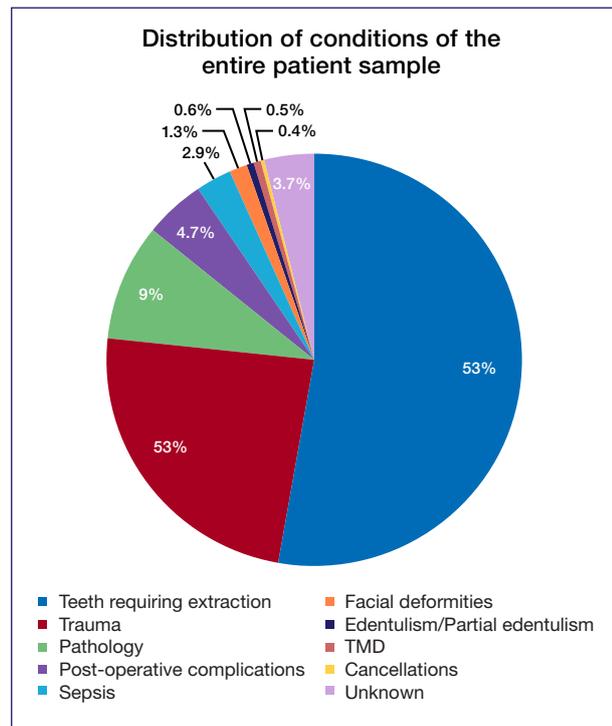


Figure 3. Pie chart demonstrating the distribution of conditions of all patients seen in the unit.

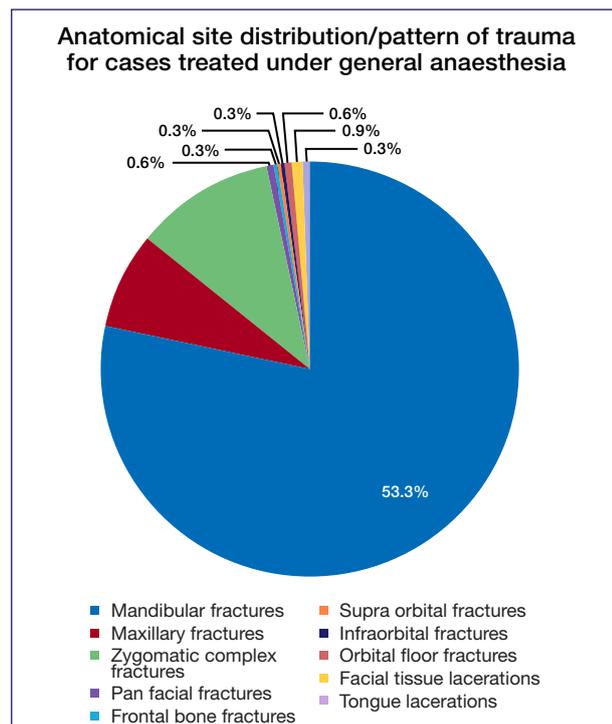


Figure 4. Pie chart demonstrating the anatomical site distribution/pattern of trauma for cases treated under general anaesthesia.

In South Africa, mandibular fractures occurred mainly in patients between the age of 20 and 40 at the CMJAH according to Desai et al.<sup>16</sup> The paper also noted that 86% of these patients who were treated in this unit during a six-month period in 2004 were victims of interpersonal violence.

The male to female ratio for the entire sample was 1.3:1. The majority of global trends suggest that males are more commonly affected by maxillo-facial conditions.<sup>3-8</sup> Lee et al. described trends where males more commonly sustained facial fractures due to higher involvement in interpersonal violence and motor vehicle accidents.<sup>15</sup>

The majority of procedures performed under local anaesthesia included dentoalveolar surgery primarily for surgical removal of the 3<sup>rd</sup> molar. There is however no conclusive evidence that identifies whether males or females more commonly undergo 3<sup>rd</sup> molar surgery. According to a study conducted in Pakistan by Khan et al., males were more likely to undergo surgical removal of impacted wisdom teeth. These authors do however state that studies conducted in Malaysia and Saudi Arabia showed contrary results.<sup>14</sup> These conflicting findings can be attributed to various factors such as the difference in geographic areas and the diverse ethnicity of the area's citizens.

Fifty three percent (53%) of the entire patient sample required tooth extraction/s, which predominantly included 3<sup>rd</sup> molar surgery. Traumatic facial injuries were also very prevalent. Audits conducted in Africa demonstrate how MFOS surgeons frequently treated facial fractures.<sup>3,4,5,8,9,17,18</sup>

This is contrary to Asian studies where specialists are more involved in treating pathological conditions.<sup>6,7,9</sup> The high volumes of trauma seen in the CMJAH unit is due to South Africa's high incidence of violent crime and road accidents.

Pathological conditions occurred in 9% of the patients in this audit. Specific tumour types were not included as part of the study. Anecdotal evidence suggests that a high prevalence of ameloblastomas affecting the mandible occur frequently in the unit. This supports our finding that the majority of pathological lesions occurred in the mandible. The management of malignant conditions such as squamous cell carcinomas were commonly performed in Bangladesh.<sup>6,9</sup>

A British study also reported that head and neck oncologic conditions were treated by maxillofacial and oral surgeons.<sup>10</sup> According to the CMJAH policy however, malignancies are not directly treated in the unit. A full dental clearance if indicated is requested by either the oncology or ENT surgery departments, which subsequently provide direct management in terms of surgery, radiation or chemotherapeutic treatments.

Post-operative complications and sepsis were relatively low. Damtew et al. also reported a slight decrease in sepsis from 8% in 1997 to 6% in 2007 at the CHBH.<sup>8</sup> A possible explanation for this observation is that most patients are now self-aware and educated with regard

to their health and seek treatment before conditions progress to severe sepsis. We also assume that the incidence of HIV-related deaths has also decreased in South Africa from 2005 due to the rollout of anti-retroviral medication.<sup>19</sup> This view is supported by an American study which found that the epidemiology of sepsis in patients with HIV has changed significantly with advancements in HAART (highly active antiretroviral therapy).

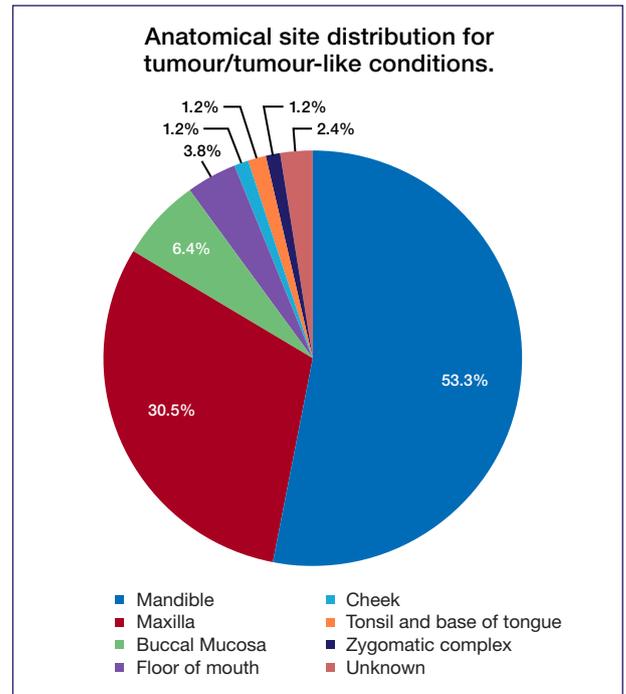


Figure 5. Pie chart demonstrating the anatomical site distribution for tumour/tumour-like conditions.

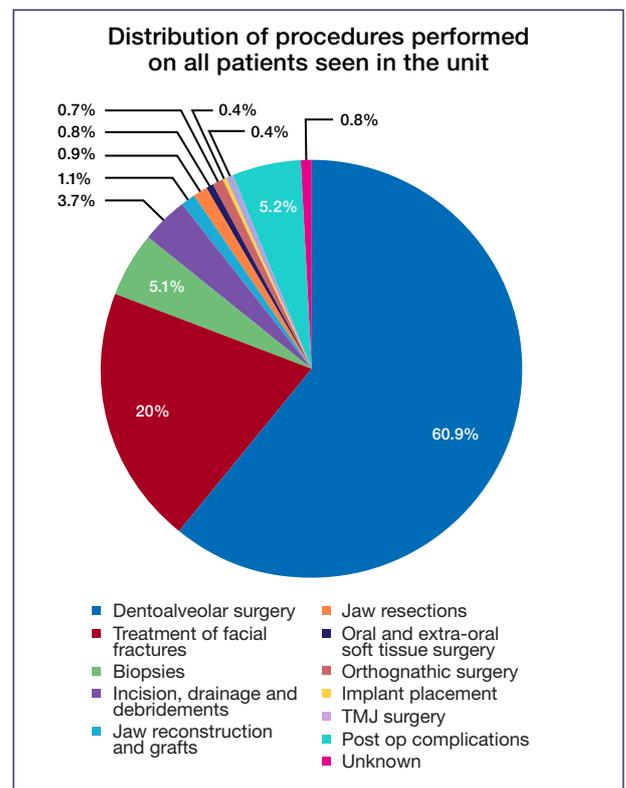


Figure 6. Pie chart demonstrating the distribution of procedures performed on all patients seen in the unit.

These authors found a decrease in ICU admissions of HIV patients with septic conditions and an increase in survival rates.<sup>20</sup>

Isolated conditions such as facial deformities, edentulism and TMD were not commonly encountered by the unit and only treated under general anaesthesia. We suspect that these conditions were seldomly encountered due to exorbitant costs associated with their treatment, particularly for implant placements.

Dentoalveolar surgery, which included 1,162 procedures, was the most commonly performed treatment type on the entire patient sample. This elevated procedure type can be credited to the increased number of patients who required 3<sup>rd</sup> molar surgery and other complicated tooth extractions. Developed nations like Australia also confirm a high prevalence of dentoalveolar surgery in their institutions.<sup>11,12</sup>

Brennan et al. reported dentoalveolar surgery rates of as high as 60-70% of all procedures performed by MFOS surgeons in Australia, followed by trauma surgery which ranked a very distant second.<sup>11</sup> ORIFS performed under general anaesthesia constituted 55% of all facial fractures treated. ORIFS are normally indicated in patients with severe injuries and severe displacement to restore previous anatomic relationships. Edentulous and partially edentulous patients also benefit from ORIFS as they have a lack of stable occlusal contacts for closed reductions.<sup>21</sup>

The indications of CRIMF include moderate displacement of the fractured fragments and a presence of stable occlusal contacts. The pattern of trauma in the unit revealed that the mandible was the most commonly fractured bone. Lee of the University of Christchurch found that the mandible was commonly fractured after traumatic incidents especially in cases of interpersonal violence, which could explain our finding.<sup>15</sup>

The zygomatic bone was fractured in 10,8% of patients followed by the maxilla at 7,5%. This pattern explains why a significant number of CRFMS for mandibular fractures and certain maxillary fractures could be carried out. Isolated fractures of the orbital floor and orbital rim were treated by ORIF.

Biopsy of tumour/tumour-like conditions was performed on 5,1% of individuals. There is an atypical pattern where 9% of the total sample of patients presented with a pathological lesion and only 5,1% of these lesions were biopsied. We again speculate that a certain number of patients were referred to specialists in other medical disciplines for definitive management of their conditions and biopsies were not performed on them.

The frequency of orthognathic surgery and implant placements were low. Global studies from developing nations suggest that implant placements were not commonly performed due to the high costs involved.<sup>3-9</sup> Bezerra et al. in a Brazilian hospital also reported a low incidence of dental implant placements between the years 2000 and 2006. It was also noted that patients within the private healthcare system more commonly received den-

tal implants due to them being able to afford the exorbitant costs associated with the procedure.<sup>22</sup>

Similarly, implant placements at the CMJAH were not frequently done due to financial implications associated with components purchased from the manufacturer. Jaw resection normally performed to remove tumours such as ameloblastomas, fibro-osseous and cystic lesions and the subsequent re-constructive surgery were infrequently performed due to a lack of patients presenting with these conditions.

## CONCLUSION

According to global workloads and trends, the CMJAH MFOS unit treats a significantly high number of patients. The scope of MFOS practice in the unit is relatively broad but the frequency of advanced procedures can be considered as insufficient. Future studies should consider data that includes the private sector to establish a broader national trend.

## Recommendations

1. The Department of Health needs to consider activation and budgeting for the previous MFOS units in other government hospitals (Thembisa, Leratong, Natalspruit and Helen Joseph) to reduce the workload of the current operating units.
2. The Department of Health also needs to consider revising its current budget to the hospital. An increase in funds would improve resources and allow for more advanced MFOS to be practiced.
3. The workload of the unit could be reduced by training more dental practitioners in primary healthcare procedures such as the treatment of mandibular fractures and dentoalveolar surgery. This would free up time for registrars to broaden their scope of MFOS practice and also decrease the waiting time for patients.
4. For the adequate training of registrars, a certain amount of time should be dedicated to consultants in private practices who are more commonly perform advanced MFOS procedures.
5. A trauma fellowship could be included in the current teaching curriculum due to the high prevalence of trauma-related injuries and procedures.
6. Record-keeping within the unit needs to be improved possibly by computerisation to decrease the incidence of incomplete records and allow simplicity for future surgical audits.

## References

1. Ivers N, Jamvedt G, Flottorp S, et al. Audit and feedback: effects on professional practice and healthcare outcomes. The Cochrane database of systematic reviews. 2012; 13: CD000259.
2. Govaert JA, van Bommel ACM, van Dijk WA, et al. Reducing healthcare costs facilitated by surgical auditing: A systematic review. World Journal of Surgery. 2015; 39: 1672-80.
3. Anyanechi CE, Saheeb BD. Audit of the demographic patterns of oral and maxillofacial surgical cases in a Nigerian teaching hospital. International Journal of Medicine and Health Development. 2011; 16: 18-27.

4. Adebayo ET, Ajike SO, Abite MG. Audit of oral and maxillo-facial conditions seen at Port Harcourt, Nigeria. *Annals of African Medicine*. 2008; 7: 29-34.
5. Moshy J, Hamza O, Moshiro C. An audit of 6 years of oral and maxillofacial surgical conditions admitted for interventional treatment at Muhimbili National Hospital, Dar es Salaam - Tanzania. *East and Central African Journal of Surgery*. 2012; 17: 95-101.
6. Islam MA, Haider IA, Uzzaman MH, Tymur FR, Ali MS. One year audit of in-patient department of oral and maxillo-facial surgery Dhaka Dental College Hospital. *J Maxillofac Oral Surg*. 2016; 15: 229-35.
7. Rehman B, Din QU. Two years audit of maxillofacial surgery department at Khyber College of Dentistry, Peshwar. *Pak Oral Dent J*. 2009; 29: 13-8.
8. Damtew MM. Changing trends in maxillo-facial and oral surgery at Chris Hani Baragwanath Hospital: A comparison between two time periods in 1987 and 2007. <<https://wiredspace.wits.ac.za>> [Accessed 2 February 2017].
9. Uddin N, Ahmed MU, Haider IA, Moral AKMS. Annual clinical audit of Indoor, Dhaka Dental College and Hospital (January 2004 to December 2005). *Bangladesh Journal of Dental Research and Education*. 2015; 5: 37-9.
10. Rogers SN, Lowe D. British Association of Oral and Maxillo-facial Surgeons first national audit in support of revalidation. *Br J Oral Maxillofac Surg*. 2011; 49: 478-9.
11. Brennan DS, Spencer AJ, Singh KA, Teusner DN, Goss AN. Practice patterns of oral and maxillofacial surgeons in Australia: 1990 and 2000. *Int J Oral Maxillofac Surg*. 2004; 33: 598-605.
12. Ricciardo P, Bobinskas A, Vujcich N, Nastri A, Goss A. Survey of Australasian oral and maxillofacial surgeons 2011 - scope and workforce issues. *Int J Oral Maxillofac Surg*. 2015; 44: 1569-73.
13. Porter M, Lownie M, Cleaton-Jones P. Maxillofacial injury: a retrospective analysis of time lapse between injury and treatment in a South African academic maxillofacial and oral surgery unit. *S Afr J Surg*. 2013; 51: 138-42.
14. Khan M, Mehbhoob B, Shajahan K. Extraction of wisdom teeth under general anaesthesia - A study. *Journal of Kyber College of Dentistry*. 2014; 5: 20-4.
15. Lee K. Global trends in maxillofacial fractures. *Cranio-maxillo-fac Trauma Reconstr*. 2012; 5: 213-22.
16. Desai J, Lownie JF, Cleaton-Jones P. Prospective audit of mandibular fractures at the Charlotte Maxeke Johannesburg Academic Hospital. *S Afr J Surg*. 2010; 48: 122-6.
17. Oginni FO, Oladejo T, Alake DP, Oguntoba JO, Adebayo OF. Facial bone fractures in Ile-Ife, Nigeria: An update on pattern of presentation and care. *J Maxillofac Oral Surg*. 2016; 15: 184-90.
18. Oginni FO, Ugboko VI, Ogundipe O, Adegbehingbe BO. Motorcycle-related maxillofacial injuries among Nigerian intra-city road users. *J Oral Maxillofac Surg*. 2006; 64: 56-62.
19. Statistics South Africa. <<http://www.statssa.gov.za>> [Accessed 2 February 2017].
20. Mayr F, Yende S, Angus D. Epidemiology of sepsis. *Virulence* 2014; 5: 4-11.
21. Chircanovic BR. Open vs. closed reduction: Comminuted mandibular fractures. *Oral Maxillofac Surg*. 2013; 17: 95-104.
22. Bezerra MF, Avelar RL, de Oliveira RB, Studart-Soares EC, Pretto MS. Assessment of the oral and maxillofacial surgery services in a teaching hospital. *The Journal of Craniofacial Surgery*. 2011; 22: 50-3.

## NOTICE of the 21<sup>st</sup> ANNUAL GENERAL MEETING (AGM) of The South African Dental Association NPC (SADA)

Notice is hereby given that the 21<sup>st</sup> Annual General Meeting of Members (AGM) of The South African Dental Association (SADA) NPC, will be held on Thursday, 10 June 2021 at 18h00, which will be conducted virtually and electronically on this date through the Zoom virtual meeting platform or similar digital platform. The Agenda with any supporting documents for the meeting will be posted on the SADA website.

SADA is *your* Association and *your* voice counts.

**KC Makhubele**  
Chief Executive Officer  
April 2021



**SADA**  
THE SOUTH AFRICAN  
DENTAL ASSOCIATION

# Compulsory community service for dentists - Opportunity for meaningful reform

SADJ May 2021, Vol. 76 No. 4 p201 - p206

ML Machete<sup>1</sup>, LN Makwakwa<sup>2</sup>, PD Moipolai<sup>3</sup>, DP Motloba<sup>4</sup>

## ABSTRACT

### Introduction

Previous studies indicate that the delivery of the compulsory community service (CS) programme was far from the intended objectives. It is plausible that the intended vision of the programme for the young graduates to "...develop skills, acquire knowledge, behaviour patterns and critical thinking that would help in their professional development and future careers." may not be realizable.

### Objective

This study evaluated the extent to which CS programme enabled CS dentists to develop clinical skills.

### Methods

A national cross-sectional study was undertaken on CS dentists. Adapted visual analogue scale (VAS) assessed the frequency of work performed and levels of skills or competency acquired.

### Results

A total of 217/235 dentists participated, (response rate of 92.34%). The clinical work undertaken and skills/competence acquired were positively correlated; [Mean (SD)= 1.10 (0.326), 1.10 (0.359);  $r=0.945$ ,  $p<0.000$ ,  $n=217$ ]

respectively. This finding validates the associated loss of skills and competence because of lack of clinical exposure during CS. Specialised dental procedures were never or rarely performed during CS (89.5%). Similarly the level of skills acquired during CS was minimal.

### Conclusion

CS in its present form disrupts continuing education and the development of learning and clinical skills. These cohorts of dentists have entered independent practice less prepared; may fail to provide quality care to the public. The CS programme is regressive, and requires urgent review and reform.

### Keywords

Compulsory community services, competence, clinical skills, scope of practice, specialised dentistry.

## INTRODUCTION

The moral and legal basis for the introduction of compulsory community service (CS) for health professionals is undebatable. The passed legislation (Republic of South Africa, 1997)<sup>1</sup> saw medical professionals deployed across the country especially in rural and remote health centres in the country.<sup>3</sup> For dentists, the first cohort was placed in July 2000.<sup>4</sup> It was envisaged that "...the young graduates would develop skills, acquire knowledge, behaviour patterns and critical thinking that would help in their professional development".<sup>2</sup> Almost two decades later, only a singular study documented the experience of dentists after four years of the initiation of CS.<sup>6</sup>

It remains unclear whether this programme has achieved its intended goals or not. The evaluation of CS reveals a dichotomy of views, with proponents hailing the programme as successful in reducing oral health inequity and increasing access to care.<sup>6,8</sup> Antagonists, assert that the programme perpetuates supervised neglect of inexperienced young doctors and dentists, which could contribute to harm of patients.<sup>2,6,12</sup> In addition, these novice practitioners are expected to function in under resourced settings without guidance and support.<sup>2</sup>

Multiple studies have indicated that the implementation challenges remain unresolved. Reports show that provision of appropriate accommodation, support, infrastructure, materials and consumables remain inadequate. Nevertheless, health professionals continue to be successfully placed in areas of need.

### Author affiliations:

1. **Motimedi L Machete:** BDS (UL), MDS (SMU), Registrar (MDent), Department of Community Dentistry, School of Oral Health Sciences, Sefako Makgatho Health Sciences University (SMU), Ga-Rankuwa, South Africa.  
ORCID Number: 0000-0002-0218-8428
2. **Nokukhanya L Makwakwa:** MPH (UL), M Dent (Comm Dent) (SMU), Specialist Community Dentistry, Department of Community Dentistry, School of Oral Health Sciences, Sefako Makgatho Health Sciences University (SMU), Ga-Rankuwa, South Africa.  
ORCID Number: 0000-0001-5669-795X
3. **Pusetso D Moipolai:** MDent (Pros)(Wits) MEd (Wits), Head of Clinical Department, Department of Prosthodontics, School of Oral Health Sciences, Sefako Makgatho Health Sciences University (SMU), Ga-Rankuwa, South Africa.  
ORCID Number: 0000-0003-0388-5898
4. **Pagollang D Motloba:** MDent (Comm Dent) (Medunsa), MBL (UNISA), Head, Department of Community Dentistry, School of Oral Health Sciences, Sefako Makgatho Health Sciences University (SMU), Ga-Rankuwa, South Africa.  
ORCID Number: 0000-0003-1379-7576

### Corresponding author: Motimedi L Machete

Department of Community Dentistry, School of Oral Health Sciences, Sefako Makgatho Health Sciences University (SMU), Ga-Rankuwa, South Africa.

Email: lesley.machete@smu.ac.za

### Author contributions:

1. **Motimedi L Machete:** Principal author - 40%
2. **Nokukhanya L Makwakwa:** Second author - 20%
3. **Pusetso D Moipolai:** Third author - 10%
4. **Pagollang D Motloba:** Fourth author - 30%

The challenges persist to date for all dentists participating in CS. Financing and allocation of adequate resources remains a serious impediment to the provision of comprehensive oral health services. Anecdotal evidence suggests that health service managers do not prioritise oral health, relegating this service to management of pain and sepsis in a majority of facilities. This status quo is a stark contradiction of the founding principles of the programme to ensure that the "... provision of health services would improve for all citizens."<sup>6</sup> For the levels of skill and expertise acquired during training, most dentists maybe underutilised and over paid for the complexity of work they perform.

The objective of this study was to evaluate the extent to which CS provided an opportunity for dentists to undertake complex dental procedures, as per the scope of practice and training received. In other words, to what extent has CS programme enabled dentists to hone their clinical skills and competence in "specialised dentistry"? This term "specialised dentistry" is used loosely to include a set of clinical procedures that would not be routinely performed by dental therapists or oral hygienists as per their gazetted scopes of practice.

We hypothesize that despite the CS programme being well intentioned, socially justifiable and morally admirable; it remains clinically regressive to the participating dentists. Which begs the question whether the CS programme in its present form, should continue or should be reviewed and reformed to realize its objectives.

## MATERIAL AND METHODS

### a). Study design

A nation-wide descriptive cross-sectional study was undertaken on dentists who had completed community service in South Africa and who graduated from South African universities.

#### Study participants

All dentists who were deployed in CS since its inception in 2000 to 2015 were eligible to participate in the study. South Africans who completed their dental education outside the country were excluded from the study.

#### Sample size determination

A total of 235 participants were required for the study, based on the following assumptions: precision of 95%, margin of error at 5% and study effect of 15%<sup>6</sup> (proportion of dentists not satisfied or knowledgeable about community service). The sample size estimation was based on a finite population of approximately 3000 dentists. The four schools of dentistry in the country graduate around 50 dentists per year for 15 years, giving a total of 3000 community service dentists.

#### Sampling and recruitment of participants

Several strategies were used to develop a sampling frame for this study: (i) the national and provincial oral health managers provided a list of present and past CS

dentists in their jurisdiction; (ii) the clinical managers and the present CS dentists reviewed and updated the information of their previous employees. (iii) The graduation lists were sought from dental schools for the period of the study. These lists were harmonised to create a comprehensive sampling frame from which participants were recruited. Given that, some contact details were missing or not current, the researchers used the snowball technique to enrol more participants into the study. Dentists were included in the study only if they consented and were willing to complete the questionnaire.

#### Data collection

A structured questionnaire was emailed to all participants in the updated mailing list. A follow up email was sent within two weeks to remind participants, thereby improve the response rate. The data collection tool comprised of four sections, which evaluated the demographics, the complexity at which clinical procedures were done, the perceived level of clinical skills, competence acquired, and challenges faced during CS.

For the demographic variables the response options, were Yes or No, and a Likert scale with four responses (Emphatic yes; Yes; No; and Emphatic no) for questions evaluating challenges. The participants rated frequency of clinical procedures performed and skills acquired using the adapted visual analogue scale (VAS). The VAS score ranged from zero (0) to ten (10).

The score of zero indicates the least or no intensity and ten (10), the greatest intensity. In this study, the score of zero was indicative of no clinical activity or procedures done; and no skills acquired or competence gained. The score of ten represents the greatest intensity, or full involvement in clinical activities and greatest skills acquired, resulting in attainment of competence.

For ease of interpretation, the scores for clinical activity were further categorised as follows:

- (0-2) = Never/rarely.
- (2-4) = Sometimes.
- (4-6) = Often.
- (6-8) = Very often.
- (8-10) = Always.

Similarly, the level of skill acquired and or competence level achieved was categorised as follows:

- (0-2) = Not at all/minimal.
- (2-4) = Slight.
- (4-6) = Moderate.
- (6-8) = Much.
- (8-10) = Greatest or much more.

#### Data analysis

Data were captured and cleaned in Microsoft Excel, and analysed in Statistical Package for Social Sciences (SPSS) ver.24. Measures of central tendency and dispersion were computed for the numerical variables and proportions for categorical variables. Pearson's correlation coefficient was computed to measure the relationship between the frequency at which procedures were undertaken and the level of skill or competence

developed as a consequence. ANOVA was undertaken to assess differences in outcomes (frequency of procedures and level of skills acquired) by year of community services, gender, race, institution.

## RESULTS

### Socio-demographic profile of participants

A total of 217/235 dentists participated in the study, giving a response rate of (92, 34%). The mean age of 32.94 (5.184), and range of 27 years (Min 23: Max 50) were recorded. The majority of participants were below 35 years of age (69.7%), female (58.6%), black African (78.0%), unmarried (78.3%) and (62.6%) were currently employed in the public sector (Table 1).

### Intensity or level at which procedures were undertaken during community service

Community service dentists infrequently performed duties as per their scope of practice. According to (Table 2), 89.9% of the time dentists never or rarely undertook any specialised dental procedures. Most visibly no Orthodontics was performed (100%), Prosthodontics (95.4%), Periodontics (92.6%), Endodontics (91.7%) and Maxillo Facial and Oral Radiology (90.3%).

Procedures that were undertaken relatively more often to always included Maxillo Facial and Oral Surgery (12.4%). However, these procedures were limited to suture placement and removal (33%), drainage of abscesses (32%), removal of impactions (14.3%), intermaxillary fixation (13.1%) and biopsy taking (7.6%). Largely, CS dentists spent fractionally less time performing specialised dentistry during the CS period, which was limited to less complex Maxillo Facial and Oral Surgery procedures.

### Level of clinical skills (competence) acquired during community service

According to the adapted VAS (Table 3), CS dentists did not retain their clinical skills and competence in special-

**Table 1.** Demographic characteristics and educational status.

Variable	Frequency=217 n (%)
≤ 35	151 (69.7)
>35	66(30.3)
<b>Gender</b>	
Male	90(41.3)
Female	127(58.6)
<b>Race</b>	
Black African	169(78)
Coloureds	6(2.8)
Indians	25(11.4)
Whites	17(7.8)
<b>Current employment</b>	
Public Sector	136(62.6)
Private Sector	49(22.8)
Academic institutions	30(13.8)
Unemployed	2 (0.8)
<b>Marital status</b>	
Married	47(21.7)
Unmarried	170(78.3)
<b>Year of qualification</b>	
2000-2005	44(20.1)
2006-2010	86(39.7)
2011-2016	87(40.2)

ised dentistry during CS. For example, for the procedures that were performed most frequently, i.e. Maxillofacial and Oral Surgery, was scored,  $\bar{X}$  (95% CI) = 1.56 (1.44:1.69). This means the average level of skill acquired or competence developed ranged between 0-2; that is minimal.

For other dental specialities, the levels of competence gained was equally dismal, most notably in orthodontics = 1.00 (1.00:1.01) and prosthodontics = 1.08 (1.03:1.13).

This indicates grave regression in the clinical skills and competence of CS dentists, when compared to the pre-graduate years. Overall, the level of competence and clinical skills honed during CS was non-existent, negligible and unsatisfactory.

**Table 2.** Frequency at which specific procedures were undertaken during community service.

Procedures	X (95%CI)	Visual Analogue Scale (VAS)				
		Never/rarely	Sometimes	Often	Very often	Always
Maxillofacial and Oral Surgery	1.56 (1.44:1.69)	64.5	23.0	5.5	5.5	1.4
Maxillofacial and Oral Radiology	1.18 (1.09:1.27)	90.3	4.6	3.2	0.5	1.4
Endodontics	1.15 (1.07:1.23)	91.7	4.6	1.4	1.4	0.9
Periodontics	1.09 (1.04:1.14)	92.6	6.5	0.5	0.0	0.5
Prosthodontics	1.07 (1.02:1.12)	95.4	3.7	0.0	0.5	0.5
Orthodontics	1.00 (1.00:1.00)	100	0.0	0.0	0.0	0.0
Overall Procedures	1.10 (1.05:1.14)	91.2	7.8	0.9	0.0	0.0

**Table 3.** Level of clinical skills acquired during community service.

Procedures	X (95%CI)	Visual Analogue Scale (VAS)				
		Not at all/minimal	Slight	Moderate	Much	Greatest or much more
Maxillofacial and Oral Surgery	1.55 (1.43:1.68)	65.4	21.7	6.9	4.1	1.8
Endodontics	1.17 (1.09:1.25)	89.9	6.5	0.5	3.2	0.0
Maxillofacial and Oral Radiology	1.18 (1.10:1.26)	89.9	5.5	2.3	1.8	0.5
Periodontics	1.09 (1.04:1.14)	92.6	6.5	0.5	0.0	0.5
Prosthodontics	1.08 (1.03:1.13)	94.5	4.6	0.0	0.5	0.5
Orthodontics	1.00 (1.00:1.01)	99.2	1.4	0.0	0.0	0.0
Overall Skills Acquired	1.10 (1.05:1.15)	91.7	6.5	1.8	0.0	0.0

The results (Table 4) demonstrate highly significant positive correlation between procedures performed [Mean (SD)= 1.10 (0.326), 1.10 (0.359);  $r=0.945$ ,  $p<0.000$ ,  $n=217$ ]. This finding validates the association between work not done and loss of clinical skills and competence across the specialities.

It can be concluded that the lack of clinical work in specialised dentistry might have contributed to the loss of clinical skills and competence. Community service dentists ought to be exposed to a variety of critical and complex clinical cases, in order to improve and or sustain their critical thinking, clinical skills and competence.

### Challenges experienced during community service

Approximately 66.1% of CS dentists were satisfied with the placement process. Over half (57.1%) of the participants indicated that the placement process was fair and that they were allocated to their place of preference (55.9%). Just over half of CS dentists (53.5%) were not satisfied with the accommodation provided.

Very few (33.9%) CS dentists indicated that the facilities were conducive and 31% indicated that the equipment was adequate to enable effective provision of clinical services. Most dentists (54.7%) were not supervised and almost a quarter (24.8%) were the only dentist in the facility.

Community Service dentists reported having adequate training going into placement (84.6%). There was a mismatch between the level of training received and type of service provision during CS. The overall perception of CS by dentists was ambivalent (49.6%).

### Association of demographic characteristics and outcomes of community service.

The frequency at which “specialised” dental procedures were performed during community services did not differ significantly with critical demographic variables. Similarly, there were no statistically significant differences in the levels of clinical skills acquired during community service based on gender, race, training institutions, site and year of community services (Table 6).

**Table 6.** Association of demographic characteristics and outcomes of community service.

	Mean (SD)	Procedures performed	Skills/Competence
<b>Period (CS)</b>		X (SD)	X (SD)
(2000-2005)		00.88 (0.855)	0.83 (0.915)
(2006-2010)		1.12 (1.130)	1.12 (1.098)
(2011-2015)		0.85 (0.898)	0.88 (0.998)
Anova (P value)		1.808; 2; 0.1664	1.7299; 2; 1.000
<b>Gender</b>		X (SD)	X (SD)
Male		0.96 (0.911)	0.92 (0.897)
Females		0.99 (1.053)	0.99 (1.107)
Anova (P value)		0.04731; 1; 0.828	0.242; 1; 0.6226
<b>Institution</b>		X (SD)	X (SD)
UP		0.95 (0.952)	0.93 (1.003)
Wits		0.73 (0.539)	0.72 (0.527)
UWC		0.87(0.881)	0.84 (0.962)
UL/Medunsa/SMU		1.06 (1.090)	1.04 (1.111)
Anova (P value)		0.9055; 3; 0.4392	0.8357; 3; 0.4756
<b>Site of Comm Serve</b>		X (SD)	X (SD)
Public Sector		0.89(0.87)	0.87(0.896)
Military		3.28(1.336)	3.28(1.483)
Anova (P value)		55.6855;1;0.0000	52.7558;1;0.0000

**Table 4.** Correlation between the frequency procedures performed and skills acquired.

	Frequency Procedure	Skills/Competence acquired	r	p-value
Endodontics	0.82 (1.410)	0.85 (1.504)	0.976	0.00
Maxillofacial and Oral Surgery	2.16 (1.853)	217 (1,876)	0.936	0.00
Maxillofacial and Oral Radiology	0.76 (1.504)	0.75 (1.490)	0.984	0.00
Periodontics	0.48 (1.132)	0.41 (1.089)	0.915	0.00
Prosthodontics	0.32 (0.952)	0.35 (1.023)	0.986	0.00
Orthodontics	0.02 (0.162)	0.3 (0.240)	0.960	0.00
Overall	1.10 (0.326)	1.10 (0.359)	0.945	0.00

**Table 5.** Challenges experienced by dentists during community service.

Variables(x)	Yes n (%)	No n (%)
<b>Placement/allocation process</b>		
Were you satisfied with your placement?	143 (66.1)	74 (33.9)
Was the process of placement fair?	124 (57.1)	93 (42.9)
Were you placed where you actually wanted to be placed?	121 (55.9)	96 (44.1)
<b>Condition of service</b>		
Was accommodation provided?	150 (68.9)	67 (31.1)
Were you happy with the accommodation?	101(46.5)	116 (53.5)
<b>State of clinic readiness</b>		
Were the facilities conducive to provide an effective service?	74 (33.9)	143 (66.1)
Was the equipment adequate to enable you perform your duties	67 (31.1)	150 (68.9)
<b>Supervision and orientation process</b>		
Were you oriented before your programme started?	112 (51.6)	105 (48.4)
Were you the only dentist in the facility?	54 (24.8)	163 (75.2)
Was clinical supervision adequate?	119 (54.7)	98 (45.3)
<b>Educational preparation</b>		
Has dental education prepared you for CS?	184 (84.6)	33 (15.4)
Overall perception	108 (49.6)	109 (50.4)

## DISCUSSION

### Critical assessment of validity of the results

Two major threats affect the validity of study findings: (i) chance or random error, and (ii) bias or systematic error.

#### Role of chance

Our study population consisted of 217 participants which is comparable to similar studies among compulsory community service in South Africa.<sup>6,9</sup> Additionally, sample size was determined for this study in order to minimise the possibility of random error. The nature of our data analysis was simple and largely descriptive or hypothesis generating. This type of data analysis does not predispose our results to statistical error because of multiple analysis (Bonferroni correction). We can therefore conclude that our results may not be adversely affected by random error or chance, as a prerequisite for most analytical statistical analysis.

#### Role of bias

Bias or systematic error occurs when a single or multiple factors distort the data and ultimately the research outcomes. Bias occur due to systematic error in the design (retrospective vs. prospective vs. concurrent), conduct (selection of participants; data collection and measurements); and analysis of a study. This descriptive cross sectional study is prone to selection and recall bias. The methodology selected for this study, was meant to minimize and control these threats to validity.

**(i) Selection bias:** First, we incorporated records from extensive and wide range of databases to develop an inclusive and comprehensive database. In order to reach all possible participants, given missing and incomplete personal details (details, emails and cell phones numbers etc.), the snowballing technique was used to track and update the list of possible participants extending over 15 years.

The snowballing could probably result in findings that are systematically different from the population with respect to its demographics and research outcomes (objectives). If selection bias exists, it results in a lack of external validity - that is, the extent to which the study results can be generalised to the population that the sample is meant to represent. The probable difference in the demographics is valid to the extent that it affects the research outcomes (level of skills acquired; intensity of clinical work done).

The analysis of variance indicated that there are no systematic differences in the outcomes of community service by age, race, gender and other causal factors (Table 6). We could conclude that the differences in the biographical variables are not causal to the research outcomes and the results could have external validity.

**(ii) Recall bias:** The period of community service was regarded as the most significant factor affecting recall. We hypothesised that those who completed their community service earlier could have less recall, more so, if the events under study were less pronounced. The presence of this

differential recall could invalidate the results. To minimise recall bias in design we incorporated questions from previous studies.<sup>6,9</sup> In addition, the intensity at which procedures were done and perceived level of skills attained were assessed using a more specific scale, the VAS rather than Likert Scale. Relatively fewer dentists completed community service between 2000-2005 (19.4%), compared to 39.6% and 40.1% in 2006-2010 and 2011-2015 respectively. Therefore, the impact elapsed time on bias in our study was significantly minimal (Table 6). Overall, the study had limitations, but the results are significantly consistent to provide reliable findings, which could be cautiously generalised.

#### Comparisons of the findings with published literature

Since the introduction of the CS programme for medical doctors and dentists, other professional groups have lobbied for inclusion in this national programme. Notwithstanding the huge interests in the programme, anecdotal reports confirm the persistence of serious human resources and logistical challenges.

These problems have hampered the clinical development of the novice practitioners and quality of services provided. To date, no study has evaluated the impact of the CS programme on the clinical and professional development of the participating dentists. Twenty years later, this study sought to evaluate the nature and extent to which the clinical benefits are conferred to dentists during CS.

Specifically, this study assessed whether the programme provided any opportunity for the dentists to continue to hone their clinical skills and improve their clinical decision-making and competence following graduation. Based on the pre-graduate training and the scope of practice it is expected that dentists would during the CS year, continue to undertake the majority of clinical procedures for which they have been trained. Suffice to say that CS dentists would largely be involved in specialised dentistry to ready them for independent practice. The term "specialised dentistry" refers contextually to clinical procedures that would not be routinely performed by dental therapists or oral hygienists as per their gazetted scopes of practice. This would involve largely rehabilitative oral health services in disciplines such as maxillofacial and oral surgery, prosthodontics, orthodontics, periodontology and endodontics.

The findings indicate that over time the quality of services rendered during CS deteriorated due to poor support and limited resources. In 2002, Naidoo and Chikte<sup>5</sup> reported that 74% of the facilities were conducive to provide oral health services. Four years on, only 65% of the services were ready.<sup>6</sup> Fifteen years later, one in every three (33.9%) of the practices are viable for provision of comprehensive services. This signifies a massive 55.6% attrition and decay in critical clinical infrastructure and resources. Similarly, the rate of decline was observed regarding the availability of appropriate and functional equipment; from 76% (2002) to 31.1% (2017). Due to these challenges, little or no specialised dental services were undertaken. The impact of the aging infrastructure and lack of critical armamentarium has had a devastating impact on the CS programme for dentists.

According to the education literature, development of clinical competence is a function of lifelong structured learning process. Hence, the need for deliberate focus of competency-based education on the essentials that students must be able to do on their own, and during their early careers through continuing, self-directed and ongoing education.

According to Chambers<sup>11</sup> competency is achieved through the transfer of learning from teachers to learners. It is only through continuing education that higher levels of competency will be achieved and sustained. Ideally, a mandatory vocational programme like CS, if well implemented should provide opportunity for novice dentists to achieve desired levels of competence. During this period, dentists would progress predictably, as they manage complex cases under strict supervision. These individuals would integrate their learning and skills in a comprehensive manner, in preparation for independent practice.

It is evident that CS in its present form disrupts continuing education and interrupts the development of learning and clinical skills. Given the minimal clinical exposure, these cohorts of dentists, are most likely to enter independent practice less prepared, yet expected to provide quality care to the unsuspecting public.

### Limitations of the study

The study was undertaken over a 15-year period, which might be prone to recall bias. This shortcoming was addressed by using VAS which has more intervals (1 to 10), thereby allowing participants to respond with greater precision. Compared to other measures of perception or experience like the Likert scale, the VAS improves the ability to separate the signal from the noise.

Additionally, a considerable number of dentists are still in the public sector and continue to experience the same, if not, worse clinical conditions as existed during their CS years.

### CONCLUSION

Based on our findings, CS for dentists is regressive, resulting in loss of clinical skills and competence. The program fails to prepare the graduates for future work in independent practice, which is a serious indictment on the programme. For the target population, the CS programme entrenches and perpetuates inequality in oral health. During undergraduate training the, indigent and deserving communities are deemed as 'interesting', 'complex' and 'available' cases. However, once in community service, the skills that are acquired by the graduates are not put to service of these communities. Paradoxically, the huge investment in training these graduates is not realised. Overall, the programme is regressive, akin to Pyrrhic victory, whichever way one looks at it.

### Recommendations

In the present form, CS for dentists poses serious moral, ethical and administrative challenges. This program, while well intentioned, should be reorganised, reformed, or disbanded. To reclaim the moral, social and educational credibility, as initially intended, this program requires ge-

nerous allocation of critical resources. Alternatively, the following measures should be put in place:

1. **Resources** - Allocation of sufficient resources (human, financial and infrastructural) are critical in ensuring that services are well run, and dentists can provide a full array of specialised dental care. In so doing, dentists will be exposed to complex cases and be able to hone their clinical skills and competencies.
2. **Supervision and support** - Clinical competency continuum dictates that novice dentists learn from experienced clinicians in order to improve their clinical skills and competence. Therefore, it is imperative that CS dentists are provided with adequate support and leadership when they enter the profession.
3. **Radical overhaul** - In line with the impending National Health Insurance (NHI) programme, the CS programme cannot continue as a dentist-centric programme. Therefore, an appropriately reformed CS programme must include all categories of oral health care workers, based on need and the services they provide in a well-structured referral system. This will provide ample opportunities for dentists to focus on the specialised dental services, while other cadres undertake preventive and restorative work.

### References

1. Republic of South Africa, 1997, Medical, dental and supplementary health service professions Amendment Act, 1997 (Act No. 89 of 1997; Notice No. 1644 of 1997), Government Gazette 390 (18504), Government Printers, Cape Town. [Google Scholar].
2. Reid SJ, Conco D. Monitoring the implementation of community service. In: Crisp N, Ntuli A, editors. South African Health Review 1999. Durban: Health Systems Trust; 2000. [cited 12 September 2018]. URL:<http://www.hst.org.za/publications/South%20African%20Health%20Reviews/sahr1999.pdf>.
3. Reid SJ. Compulsory community service for doctors in South Africa - an evaluation of the first year. SAMJ. 2001; 91(4): 329-36.
4. Reid S. Community service for health professionals. South African Health Review. Durban: Health Systems Trust. 2002: 135-60.
5. Naidoo S, Chikte U. Community Dental Service - the first year. SADJ. 2002; 57(5): 193-6.
6. Naidoo S. Community dental service - four years on: communication. SADJ. 2007; 62(6):250-3.
7. Reid S, Peacocke J, Kornik S, Wolvaardt G. Compulsory community service for doctors in South Africa: a 15-year review. S Afr Med J. 2018; 108(9). doi:10.7196/ SAMJ. 2018.v108i9. 13070.
8. Hatcher AM, Onah M, Kornik S, Peacocke J, Reid S. Placement, support, and retention of health professionals: National, cross-sectional findings from medical and dental community service officers in South Africa. Human resources for health. 2014; 12(1): 14.
9. Govender S, Brysiewicz P, Bhengu B. Perceptions of newly qualified nurses performing compulsory community service in KwaZulu-Natal. Curations. 2015; 38(1): 1-8.
10. Raosoft Incorporation: Raosoft Sample Size Online Calculator. 2004; (cited 2017 March 15). Available from: <http://www.raosoft.com/samplesize.html>.
11. Chambers D W. Dental curriculum and accreditation - means, ends, and the continuum. Dent Education. 1996; 60: 816-20.
12. Khan N, Knight S, Esterhuizen, T. Perceptions of and attitudes to the compulsory community service programme for therapists in KwaZulu-Natal. SAJCD. 2009: 56,22.
13. Calculator.net: Sample size calculator. 2008; (cited 12 Feb 2016) available from: <https://www.calculator.net/sample-size-calculator.html>.

# Tooth loss in relation to serum cotinine levels - A cross-sectional study from the Belville South area in South Africa

SADJ May 2021, Vol. 76 No. 4 p207 - p215

F Kimmie-Dhansay<sup>1</sup>, CC Pontes<sup>2</sup>, U Chikte<sup>3</sup>, RT Erasmus<sup>4</sup>, AP Kengne<sup>5</sup>, TE Matsha<sup>6</sup>

## ABSTRACT

### Introduction

Tooth loss constitutes a major public health challenge, sharing common risk factors with non-communicable diseases.

### Aims and objectives

To report the relationship between tooth loss and serum cotinine levels in a population sample of mixed ethnic heritage from the Belville South area in South Africa.

### Design

Cross-sectional epidemiological study.

### Methods

Subjects were invited from 2014 to 2016 according to a consecutive sampling technique and all those who met the inclusion criteria were included.

### Results

In all, 1876 individuals were included, being 1416 females (75.5%), with a combined average age of  $49.5 \pm 15.3$  years. In total 46.7% of the sample was edentulous, with females presenting a higher proportion than males (50.7% vs. 34.1%,  $p < 0.001$ ).

The relative risk (RR) of being edentulous was higher for females (RR=1.8, 95% CI=1.35-2.41,  $p < 0.001$ ) and for participants with cotinine levels 15-299 ng/ml (RR=1.37, 95% CI=1.02-1.83,  $p = 0.04$ ) and  $\geq 300$  ng/ml (RR=1.51, 95% CI=1.09-2.08,  $p = 0.01$ ). Maxillary incisors and mandibular molars were the most prevalent missing teeth.

### Conclusions

The burden of tooth loss is high in the studied population sample, as well their unmet needs for dental care. Female gender, tobacco exposure, and aging were associated with partial and total edentulism.

### Keywords

Tooth loss, edentulism, edentulousness, epidemiology oral conditions, serum cotinine.

## INTRODUCTION

Optimal oral health is an essential part of systemic health. Worldwide, oral diseases constitute a burden for 3.5 billion people, being the most common non-communicable diseases (NCDs).<sup>1</sup> Following dental caries and periodontal disease, tooth loss is the third most prevalent oral condition in the world.<sup>2</sup> Loss of natural teeth can lead to physiological and psychosocial limitations, impairment, disability, and handicap, particularly in the absence of prosthetic replacement, having a strong impact on oral health-related quality of life (OHRQoL).<sup>3</sup>

A dentition with less than twenty teeth provides limited oral function, affecting chewing, speech, alveolar bone, and facial structures.<sup>2</sup> Besides the local effects, complete edentulism has also been associated with nutritional deficiencies,<sup>4</sup> gastrointestinal changes,<sup>5</sup> kidney disease,<sup>6</sup> cardiovascular disease,<sup>7</sup> and increased mortality rates.<sup>8</sup>

### Author affiliations:

1. **Faheema Kimmie-Dhansay:** *BSc BChD PDD PDD MSc MSc*, a). Division of Research and Higher Degrees, University of the Western Cape, Cape Town, South Africa.  
b). Division of Epidemiology and Biostatistics, Department of Global Health, Stellenbosch University, Cape Town, South Africa.  
ORCID Number: 0000-0003-2919-6193
2. **Carla C Pontes:** *DDS, MSc, PhD*, Division of Health Systems and Public Health, Department of Global Health, Stellenbosch University, Cape Town, South Africa.  
ORCID Number: 0000-0002-9337-3783
3. **Usuf Chikte:** *BChD, MSc (DPH), MDent (Community Dentistry) PhD*, Department of Global Health, Stellenbosch University, Cape Town, South Africa.  
ORCID Number: 0000-0002-7985-2278
4. **Rajiv T Erasmus:** *MBBS, FMC.Path, FCPATH (SA), DABCC (Am Board Certified), DHSM (Natal)*, Division of Clinical Pathology, Stellenbosch University, Cape Town, South Africa.  
ORCID Number: 0000-0001-6831-4215
5. **Andre P Kengne:** *MD, PhD*, Non-Communicable Diseases Research Unit, South African Medical Research Council, Cape Town, South Africa.  
ORCID Number: 0000-0002-7213-9760
6. **Tandi E Matsha:** *PhD*, Cardio-metabolic Health Research Unit, Department of Biomedical Sciences, Faculty of Health and Wellness Science, Cape Peninsula University of Technology, Bellville, Cape Town, South Africa.  
ORCID Number: 0000-0001-5251-030X

### Corresponding author: Usuf Chikte

Department of Global Health, Stellenbosch University, Cape Town, South Africa.

Email: [umec@sun.ac.za](mailto:umec@sun.ac.za)

### Author contributions:

1. **Faheema Kimmie-Dhansay:** conceptualization, methodology, formal analysis - 16.6%
2. **Carla C Pontes:** methodology, writing - original draft, review and editing - 16.6%
3. **Usuf Chikte:** conceptualization, methodology, resources - 16.6%
4. **Rajiv T Erasmus:** conceptualization, data curation, funding acquisition - 16.6%
5. **Andre P Kengne:** project administration, validation, resources - 16.6%
6. **Tandi E Matsha:** investigation, funding acquisition, data curation, resources - 16.6%

Tooth loss remains a major public health challenge, constituting a debilitating and irreversible consequence of untreated caries and periodontitis in most cases.<sup>9</sup>

Oral conditions, including tooth loss, share important behavioural and social risk factors with other NCDs, such as unhealthy diet, consumption of tobacco products, and alcohol.<sup>10</sup> Socioeconomic inequalities also affect oral diseases and tooth loss, with disadvantaged communities being particularly affected despite global improvements.<sup>10</sup>

In 2010, 158 million people (2.3% of the global population) were edentulous. Prevalence of severe tooth loss reduced between 1990 and 2020 from 4.4% to 2.4%. Global incidence also decreased from 374 cases per 100 000 person-years in 1990 to 205 cases per 100 000 person-years in 2010.<sup>2</sup>

Over the last decades, there has been a decrease in the prevalence of edentulism in developed countries, however, there is limited data on tooth loss in developing countries, where health inequality remains high.<sup>11</sup> In South Africa, the last national survey from 1988/1989 reported a prevalence of 51.6% of edentulism for adults of mixed ancestry aged 35-44 years, from which 3.5% did not have dentures.<sup>12</sup> To our knowledge, no studies have evaluated tooth loss in relation to serum cotinine levels and few epidemiological studies have reported tooth loss in the country, mostly through self-reported data.<sup>11,13</sup>

Cotinine constitutes the main metabolite of nicotine, a highly addictive chemical found in tobacco products.<sup>14</sup> Given its long half-life, serum cotinine levels have been successfully validated and used in scientific studies as a biomarker for tobacco exposure.<sup>15</sup> The present study included a convenient sample from the Belville South, a disadvantaged community located in the Western Cape Province in South Africa, characterized by a mixed ethnic background. Epidemiological data on tooth loss is essential to define treatment needs for public health policies.<sup>2</sup> This study aimed to present epidemiological data on the relationship between tooth loss and serum cotinine levels in relation to age and gender for the Belville South area.

## MATERIALS AND METHODS

### Sample

This study was part of the Cape Town Belville South Vascular and Metabolic Health (VMH) study, which evaluated non-communicable diseases in the Belville South Community, Western Cape, South Africa, as described previously in detail.<sup>16</sup>

The Ethics Committee of the Faculty of Health and Wellness Sciences of the Cape Peninsula University of Technology provided ethical permission for the study (N14/01/003a) and it was conducted in agreement with the Declaration of Helsinki.

Subjects were invited from 2014 to 2016 according to a consecutive sampling technique and all those who met the inclusion criteria were included after signing the informed consent to participate in the study.

The inclusion criteria were: subjects 18 years or older with a mixed ethnic background (defined according to the South African Population Registration Act No. 30 of 1950, repealed in 1991) living in the Belville South area. The exclusion criteria included subjects requiring prophylactic use of antibiotics, with intellectual disabilities, with cancer, undergoing renal dialysis, pregnant, or those who were too ill or unable to give written consent. This study is STROBE compliant.

### Clinical examination

One trained dental examiner used a portable dental chair with a portable overhead LED light to record clinical data. Standard infection control measures from the Centre for Disease Control were followed. Present and missing teeth were recorded for each patient and the use of dentures was recorded through a questionnaire. Third molars were not included in the study as their inclusion is optional. A reliability assessment was performed between the examiner and a calibrator through the Cohen's kappa statistic, with a  $\kappa$  (kappa) score of 0.79 for decayed, missing, filled teeth, as reported previously.<sup>17</sup>

### Extent of tooth loss and posterior occluding pairs

The extent of tooth loss was calculated as described previously:<sup>2</sup> edentulous (no teeth present), severe tooth loss (1-9 teeth present), moderate tooth loss (10-19 teeth present), and functional dentition ( $\geq 20$  teeth present). The number of posterior occluding pairs was also recorded (presence of the tooth pairs 14/44, 15/45, 16/46, 17/47, 24/34, 25/35, 26/36, and 27/47). Shortened dental arch (SDA) was classified as the number of teeth present from 15-25 and 35-45.

### Serum cotinine levels

A fasting blood sample was collected for each participant and kept cold until being transported to an accredited laboratory. The samples were processed and evaluated for serum cotinine levels using a chemiluminescent assay (Immulite 1000, Siemens), as described previously.<sup>18</sup> Cotinine constitutes the principal metabolite of nicotine, and it has been used as a biomarker for tobacco exposure due to its long half-life.<sup>15</sup> The cut-off value of 15ng/ml was used in the current study to differentiate smokers from non-smokers, according to results from previously published literature.<sup>14,19,20</sup>

### Statistical analysis

Normality assumption of missing teeth variable was assessed through the Shapiro-Wilk test, which indicated that the data was skewed ( $p < 0.001$ ). For categorical data, chi-square tests were employed, whereas for continuous data, Mann-Whitney and Kruskal Wallis tests were employed.

Variables were presented as percentage proportion or mean and standard deviation (SD) in relation to age group, gender, and serum cotinine levels in order to comply with the standard presentation of data from WHO and to allow for comparison to other studies.

A multinomial logistic regression, which is the regression analysis used when the dependent variable is nominal with 2 or more levels, was used to explain the relationship between tooth loss category (dependent variable: edentulous, severe and moderate tooth loss and functional dentition), age, gender and serum cotinine category (independent variables).

Multinomial logistic regression was favoured over an ordered logistic regression since the proportional odds assumption was not met.<sup>21</sup> Functional dentition was used as the reference category. Data were analysed using the Statistical Package STATA 15 (Stata Corp LP, College Station, TX, USA, 2017). The significance level was defined at 5%.

## RESULTS

The study consisted of 1888 individuals, from which 12 presented missing data. In total, 1876 individuals were included in the analysis, from which 1416 were females (75.5%) and 460 (24.5%) were males. The average age of the participants was 49.5 ± 15.3 years (range 18-91). Data was evaluated according to the following age group categories: >24 years (n=117, 6.2%), 25-34 years (n=274, 14.6%), 35-44 years (n=271, 14.5%), 45-54 (n=407, 21.7%), 55-64 (n=491, 26.2%) and ≥65 years (n=316, 16.8%).

### Extent of tooth loss

In total, 46.6% (n=875) of the sample was edentulous, 5.5% (n=104) had severe tooth loss (1-9 teeth present), 19.0% (n=357) had moderate tooth loss (10-19 teeth present) and 28.8% (n=540) had a functional dentition. Only 4% (n=77) of the sample had all teeth present and 41.7% presented a shortened dental arch (SDA).

Edentulousness was associated with gender, with 50.7% of females being edentulous, as compared to 34.1% of males (p<0.001, Figure 1). It was also as-

sociated with age group, with the highest proportion for the group aged 65 and above (84.8%, n=268) and for the 55-64 years group (74.1%, n=364).

With regards to edentulous participants, 12.9% (n=113) had no dentures, 87.0% (n=761) had upper and lower dentures and 0.1% (n=1) had top dentures. There was no association between use of dentures and gender (Table 1, p>0.05).

	No dentures % (n)	Upper and lower dentures % (n)	Top dentures % (n)
Males	14.0% (22)	85.4% (134)	0.6% (1)
Females	12.7% (91)	87.3% (627)	0
Total	12.9% (113)	87.0% (761)	0.1% (1)

Males had higher proportion of moderate tooth loss (22.6% n=104) as compared to females (17.9%, n=253, p=0.02). Moderate tooth loss was also associated with age group, with highest proportion observed in the group 35-44 years (35.1%, n=95, p<0.001).

In terms of severe tooth loss, the proportion was higher for males as compared to females (7.6% vs. 4.9%, p=0.03). Severe tooth loss was associated with age group, with the group 45-54 years presenting the highest proportion (9.6%, n=39, p<0.001).

There were more males with a functional dentition than females (35.7% vs. 26.6% p<0.001). For the youngest group (<24 years), 85.5% had a functional dentition and it decreased with aging, dropping to only 2.8% for the oldest group (n=9, p<0.001).

The average number of teeth lost per person was 9.1 ± 6.6 when edentulous participants were excluded (Table 2). There were no statistically significant differences between males (9.2 ± 6.9) and females (9.1 ± 6.4). The average number of teeth lost increased with aging, with the

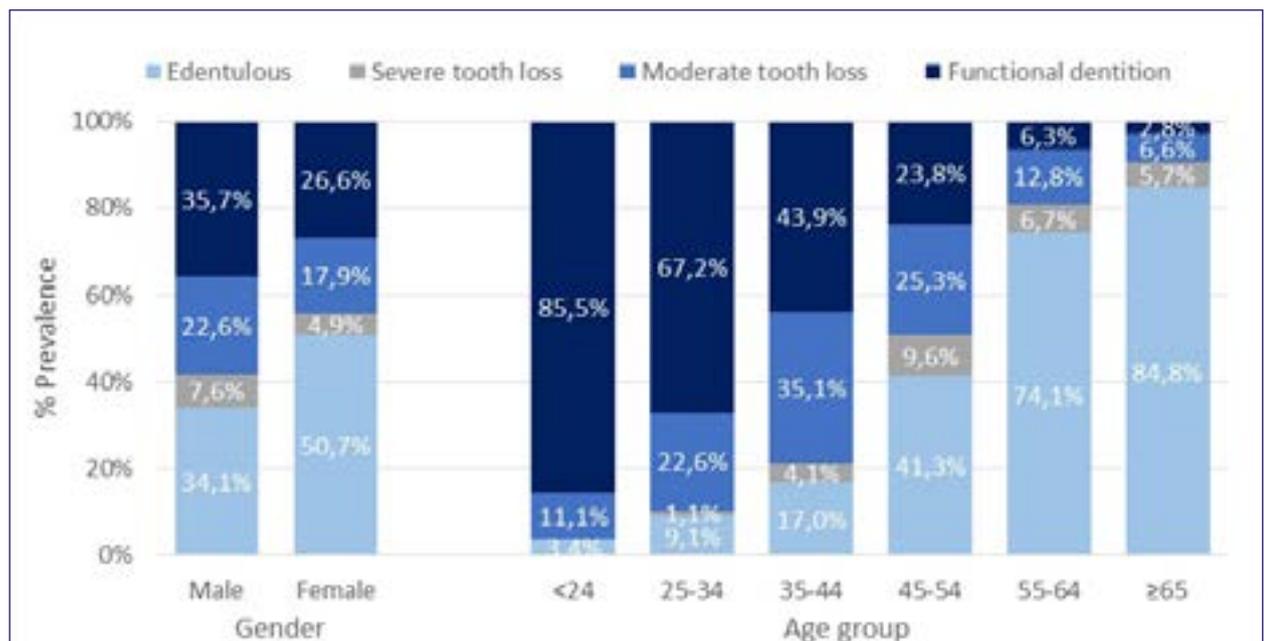


Figure 1. Extent of tooth loss according to gender and age group.

youngest group (<24 years) presenting 3.9±3.6 teeth lost and the oldest group presenting 15.4±6.4 teeth lost (p<0.001. Table 2). The average number of missing teeth was nearly double for the maxilla, as compared to the mandible (6.1±4.7 vs. 3.1±3.0, respectively. p<0.001).

**Table 2. Average number of missing teeth and posterior occluding pairs according to gender, age group, jaw, and tooth type. SD=standard deviation. \*p<0.001.**

		Missing teeth		Posterior occluding pairs	
		Mean	SD	Mean	SD
Total		9.1	6.6	4.2	2.40
	Male (n=303)	9.2	6.9	4.1	2.60
Gender	Female (n=698)	9.1	6.4	4.2	2.40
	<24 (n=113)	3.9	3.6	6.2	2.00
Age group*	25-34 (n=249)	6.0	4.8	5	2.50
	35-44 (n=225)	8.8	5.4	3.5	2.50
	45-54 (n=239)	11.2	6.7	1.9	2.30
	55-64 (n=127)	13.9	6.6	0.7	1.50
	≥65 (n=48)	15.4	6.4	0.3	0.90

**Patterns of tooth loss**

The four maxillary incisors were the most frequently missing teeth in this sample (55.8%-54.6% Figure 2), together with mandibular first molars (53.3-54.0%). Lower incisors and canines were the least missing teeth (5.5-8.6%).

There was no statistically significant difference between males and females regarding the average number of missing teeth according to tooth types (Figure 3).

Average number of missing teeth increased with increasing age group for all tooth types (Figure 4). In the youngest group (<24 years), incisors had the highest average for missing teeth (1.7±2.0). For the oldest group (≥65 years), molars were the most commonly missing teeth (5.6±2.1).

**Posterior occluding pairs**

On average, dentate individuals had 3.3±2.9 pairs of posterior occluding teeth and it decreased from 6.0±2.2 for the youngest group to 0.7±1.3 for the oldest group (Table 2). On average, males had 3.4±2.9 and females had 3.2±2.9 posterior occluding pairs.

When edentulous participants were excluded, 30.3% (n=303) of the sample had no posterior occluding pairs, 31.3% (n=313) had 1-4 pairs and 38.3% (n=384) had 5-8 pairs (Figure 5). The number of occluding pairs was not associated with gender, but it was associated with age group (p<0.001, Figure 6).

From the youngest (<24 years) to the oldest age group (≥65 years), there was a drastic decrease in the proportion of 5-8 posterior occluding pairs, from 80.3% to 3.6%. The number of participants without posterior occluding pairs increased from 4.3% in the youngest group to 72.8% in the oldest group.



Figure 2. Prevalence of tooth loss according to tooth number in the maxilla and in the mandible.

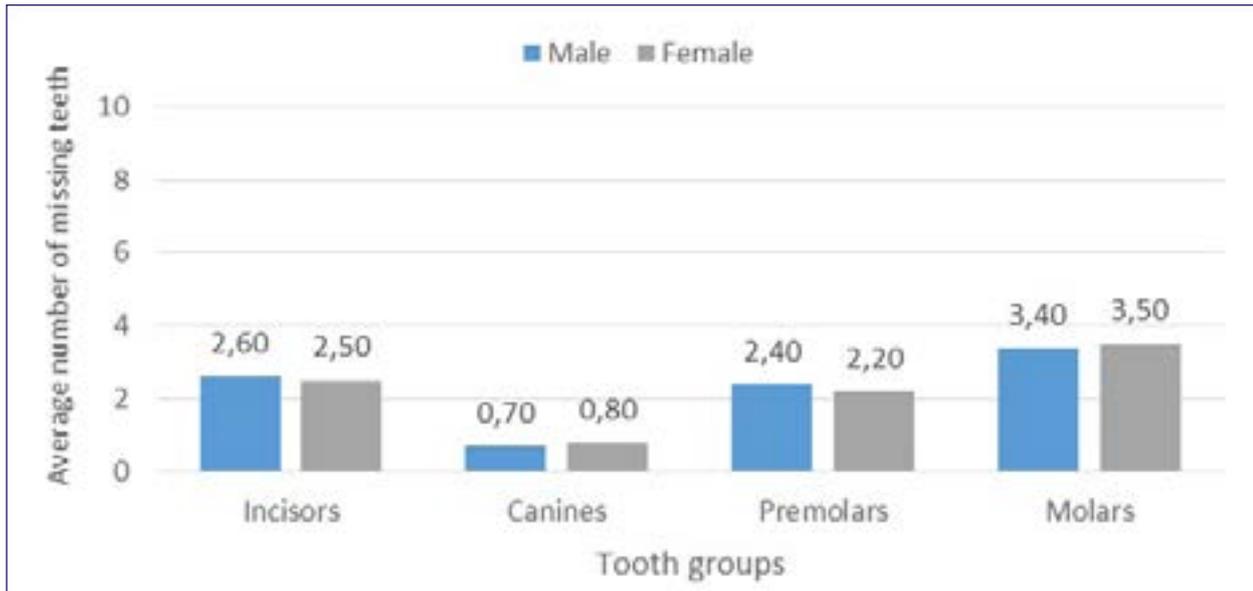


Figure 3. Average number of missing teeth according to tooth group by gender.

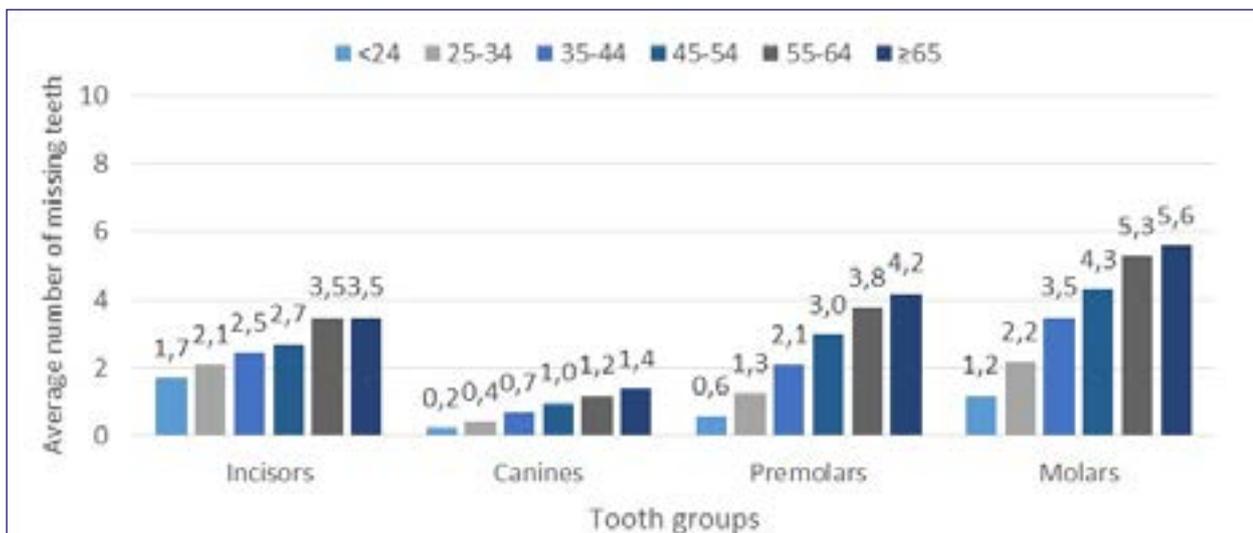


Figure 4. Average number of missing teeth according to tooth group by age group.

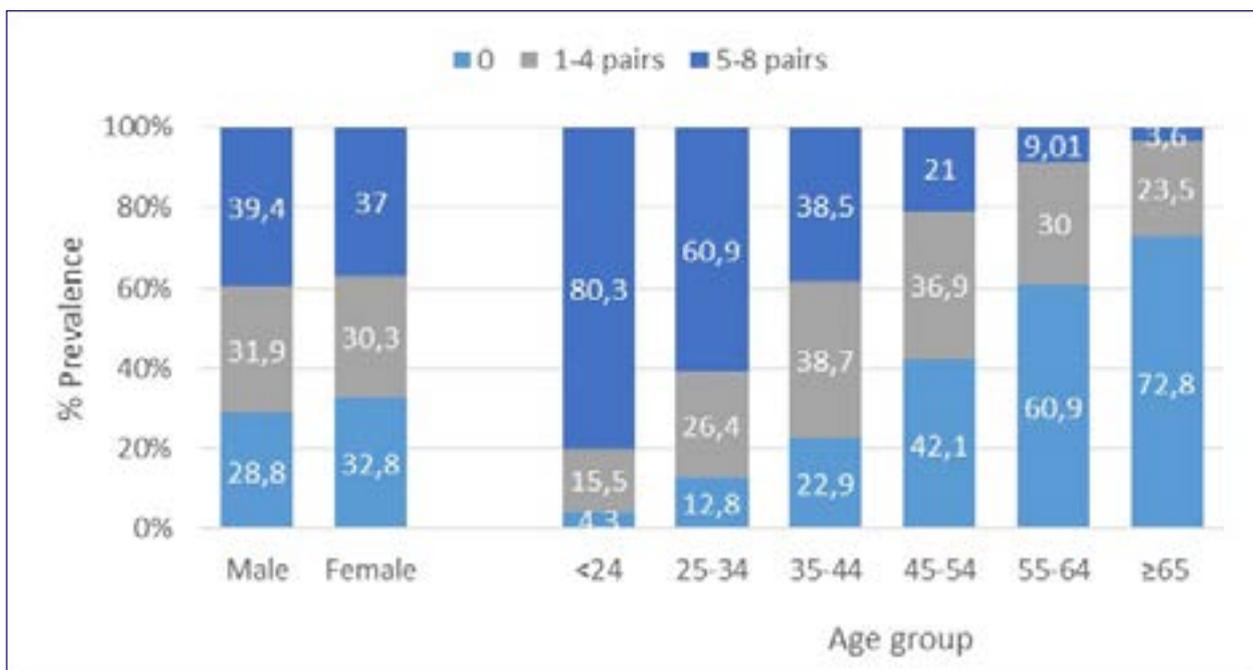


Figure 5. Prevalence of different categories of posterior occluding pairs according to gender and age group (p<0.001).

### Serum cotinine

Serum cotinine levels were measured in 1814 participants and categorized as <15ng/ml and  $\geq$ 15ng/ml. From those, 51.0% had serum cotinine levels below 15ng/ml (n=924) and 49.0% (n=890) had levels  $\geq$ 15ng/ml. Serum cotinine  $\geq$ 15ng/ml was observed in 59.7% of all men and 45.6% of all women.

Regarding age group, serum cotinine levels  $\geq$ 15ng/ml were observed in 61.3% of the youngest group, 65.8% of the 25-34, 57.0% of the 35-44, 52.0% of the 45-54, 44.2% of the 55-64 and 27.5% of the oldest group.

Cotinine categories were associated with tooth loss status, with most edentulous participants having cotinine levels below 15 ng/ml (56.6%, n=479, p<0.001) and most participants with severe tooth loss presenting cotinine levels  $\geq$ 15ng/ml (n=54.8%, n=284, p=0.002. Figure 6). There was no statistically significant association between posterior occluding pairs and cotinine categories.

### Logistic regression analysis

The expected risk for being edentulous was higher for females. The relative risk of being edentulous, for females was 1.8 (95% CI [1.35 to 2.41], p<0.001, Table 3) when compared to males.

The expected risk of being edentulous was higher for participants with higher cotinine levels. The relative risk of being edentulous for serum cotinine levels  $\geq$ 300ng/ml was 1.51 (95% CI [1.09 to 2.08], p=0.01, Table 3) and 1.37 (95% CI [1.02 to 1.83], p=0.04) for serum cotinine levels 15-299 ng/ml, as compared to cotinine levels <15 ng/ml.

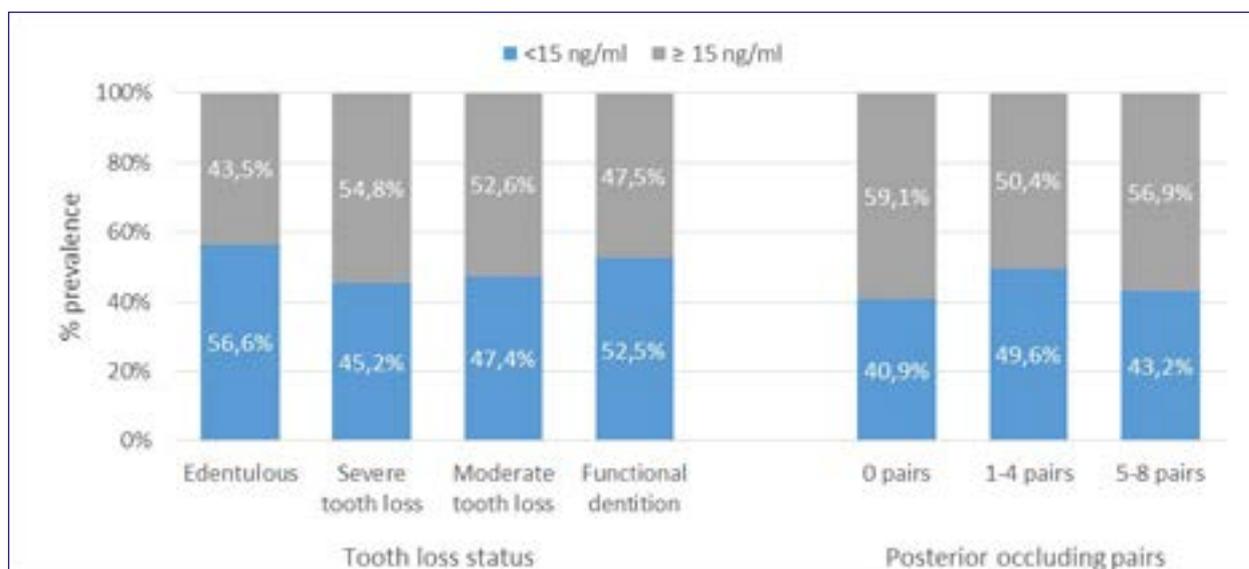
With a one-unit increase in age, there was an increase in the relative risk for participants being edentulous, having severe or moderate tooth loss.

**Table 3. Multinomial logistic regression for tooth loss status with functional dentition as the reference category. RR: relative risk, SE: standard error, CI: confidence interval.**

Tooth Loss Category	RR	P-value	95% CI	
<b>Edentulous</b>				
Females	1.81	<0.001	1.35	2.42
Cotinine categories				
15 - 299 ng/ml	1.37	0.04	1.02	1.83
$\geq$ 300 ng/ml	1.51	0.01	1.10	2.08
Age	1.12	<0.001	1.11	1.13
Constant	0.001	<0.001	0.00	0.00
<b>Severe tooth loss</b>				
Females	0.68	0.20	0.39	1.20
Cotinine categories				
15 - 299 ng/ml	1.83	0.05	0.99	3.43
$\geq$ 300 ng/ml	1.11	0.79	0.50	2.47
Age	1.07	<0.001	1.05	1.09
Constant	0.003	<0.001	0.00	0.01
<b>Moderate tooth loss</b>				
Females	0.94	0.71	0.70	1.28
Cotinine categories				
15 - 299 ng/ml	1.09	0.60	0.79	1.52
$\geq$ 300 ng/ml	1.24	0.26	0.86	1.78
Age	1.03	<0.001	1.02	1.04

### DISCUSSION

To our knowledge, this is the first study reporting tooth loss in relation to serum cotinine levels in South Africa. Edentulism was highly prevalent and associated with female gender. It increased remarkably from the age of 45 and about 13% of edentulous participants had no dentures. Around 30% of the sample had a functional dentition, with a higher proportion in males. Maxillary incisors and mandibular molars were the most frequent missing teeth. One-third of all dentate participants had no posterior occluding pairs. Serum cotinine levels that suggest smoking were observed in approximately half of the sample and high cotinine levels were associated with edentulousness and severe tooth loss.



**Figure 6.** Serum cotinine categories according to tooth loss status (p<0.001 for edentulous group, p=0.002 for severe tooth loss group) and number of posterior occluding pairs.

According to the South African national survey from 1988/89, the overall proportion of edentulism was 12.6%, with a much higher proportion among adults aged 35-44 years with a mixed ethnic background (51.6%).<sup>22</sup> Considering the present finding that 46.7% of the sample was fully edentulous, total tooth loss remains a burden in the country, particularly for the population with a mixed ethnic background. In a study from Petersen & Ogawa (2012), the authors reported the proportion of edentulism in subjects aged 65-74 in upper-middle-income countries to be 35%, which is remarkably lower than the nearly 85% proportion reported for this age group in the current study.<sup>9</sup>

The worse situation of edentulism among females reported in this study (50.7% of females vs. 34.1% for males) was comparable to the previously reported prevalence from the 1988/89 National Survey (57.4% of females, vs. 41% of males) and is in accordance with studies from other middle-income countries, such as Brazil<sup>23</sup> and Indonesia.<sup>24</sup>

It is likely that both biological, behavioural, and cultural factors influence the higher levels of tooth loss in females, including hormonal effects in the periodontium, higher caries, and extraction rate.<sup>25</sup> In the present study, only 4% of the sample had all their teeth present, which is lower than the 6.6% reported in the last epidemiological South African national survey from 1988/89.<sup>26</sup>

Less than one-third of the sample had a functional dentition, defined as the minimum number of natural teeth present required for maintenance of masticatory function and quality of life.<sup>27</sup> The striking decrease in the number of participants with a functional dentition after the age of 55 in this study suggests decreased quality of life and the chewing ability for the majority of participants in these age groups.

A study from Brazil reported the prevalence of functional dentition in participants aged 35-44 years to be 54.6%, which is somewhat comparable to the 43.9% reported in the present study for this age group.<sup>28</sup> The authors also reported a higher prevalence of functional dentition in males, similarly to the present study.

Loss of posterior teeth can have a great impact on function. Having five or fewer posterior occluding pairs has a negative impact on oral impact on daily performance (OIDP) index.<sup>29</sup> One third of the dentate sample included in the current study had no posterior occluding pairs and another one-third had 1-4 pairs, suggesting a reduced oral function for the majority of the sample.

The patterns of tooth loss in this study show that maxillary incisors were the most frequent missing teeth in younger participants. In older groups, first mandibular molars and maxillary incisors were the most frequent missing teeth. Extraction of healthy maxillary incisors has been reported previously as a common practice among the population included in the study, as part of gang activity and social factors.<sup>25</sup>

Nearly half of the sample in this study had serum cotinine levels compatible with smoking. Cotinine has been

considered a reliable biomarker for tobacco exposure.<sup>30</sup> While severe tooth loss was positively associated with higher serum cotinine, edentulousness was negatively associated with cotinine levels. From the observed trend of decreased cotinine levels with increased age, it can be speculated that as oral health deteriorates through tooth loss, tobacco consumption decreases.

Several predisposing factors can explain the high prevalence of edentulism observed. Lower-income has been linked to 2.5 higher odds of having tooth loss in comparison to higher income and low socioeconomic status has been associated with worse health behaviours and lack of access to dental care.<sup>31</sup> Furthermore, high exposure to tobacco is also remarkable in the studied population, which is not only a risk factor for oral conditions, such as periodontal disease, tooth loss, and oral mucosal lesions, but is also a crucial risk factor for other NCDs, such as diabetes, cardiovascular disease, cancer, and respiratory diseases.<sup>32</sup>

The extraction of healthy maxillary incisors in communities of mixed ethnic ancestry in the Western Cape in South Africa has long been recognized as a common dental modification that also contributes to the high prevalence of missing teeth.<sup>33</sup> In future studies, it would be interesting to evaluate a potential contribution of hypodontia to the burden of tooth loss in South Africa.

Replacement of missing teeth in individuals without a functional dentition is important to improve masticatory function, nutritional status, and quality of life in general.<sup>29</sup> Social determinants of health also need to be addressed in order to improve the oral health status of disadvantaged communities.<sup>10</sup> Implementation of strong tobacco prevention programs in middle-income countries such as South Africa needs to become a priority in terms of addressing common risk factors for tooth loss and other NCDs to improve quality of life.<sup>9</sup> Promotion of oral health for this neglected population requires urgent attention in terms of policy-making.

### Limitations

The high number of female participants can point to selection bias. Since clinical examination took place during working hours, employed males were likely hindered from participating. Because tooth loss is largely the end result of long-lasting dental and periodontal disease, estimates of associations between outcomes and exposures are difficult to establish through cross-sectional designs. Furthermore, the inclusion of potential confounders for tooth loss, such as alcohol consumption, oral hygiene habits, systemic conditions, and the exact cause for tooth extraction would have been beneficial.

The current study focused on a population group of mixed-ancestry, hence the results cannot be extrapolated to the entire South African population. Considering the heterogeneous prevalence of edentulism within countries and the lack of updated epidemiological data on tooth loss in South Africa, it is relevant to obtain data on other population groups in the country, particularly for underprivileged communities. In future studies, the relation between tooth loss and systemic diseases and

conditions should be evaluated, considering the impact of edentulism on general health.

Lastly, recent epidemiological studies in the UK and US have used serum cotinine cut-off values as low as 3ng/ml to distinguish between smokers and non-smokers.<sup>30</sup> In the current study, the traditional cut-off value of 15ng/ml was used and the lowest value detected was 10ng/ml. Future studies should employ assays that have a lower detection range, as they can be valuable for detecting second-hand smoke.

## CONCLUSIONS

Findings from the present study indicate that the burden of tooth loss is high in the studied population sample, as well their unmet needs for dental care. Female gender, tobacco exposure, and aging were associated with partial and total edentulism. The common approach to modifiable risk factors for NCDs, such as tobacco interventions, combined with access to preventive and restorative treatment has the potential to improve oral health status in this population sample.

## Acknowledgements

We would like to thank all the participants of this study.

## Source of funding

This project is the result of funding provided by the Medical Research Council of South Africa in terms of the MRC's Flagship's Awards Project SAMRC-RFA-UFSP-01-2013/VMH, received by TM. The funders had no role in study design, data collection, and analysis, decision to publish, or preparation of the manuscript.

## Declaration

The authors declare no conflict of interest.

## References

1. Peres MA, D Macpherson LM, Weyant RJ, et al. Oral diseases: a global public health challenge. *The Lancet*. 2019; 394: 249-60. Doi: 10.1016/S0140-6736(19)31146-8.
2. Kassebaum NJ, Bernabé E, Dahiya M, et al. Global Burden of Severe Tooth Loss. *J Dent Res*. 2014; 93: 20S-28S. Doi: 10.1177/0022034514537828.
3. Ortiz-Barrios LB, Granados-García V, Cruz-Hervert P, et al. The impact of poor oral health on the oral health-related quality of life (OHRQoL) in older adults: the oral health status through a latent class analysis. *BMC Oral Health*. 2019; 19: 141. Doi: 10.1186/s12903-019-0840-3.
4. Carlsson GE, Jansson J-O, Österberg T, et al. Edentulism associated with obesity: a study of four national surveys of 16 416 Swedes aged 55-84 years. *Acta Odontol Scand*. 2010; 68: 360-7. Doi: 10.3109/00016357.2010.514721.
5. Abnet CC, Qiao YL, Dawsey SM, et al. Tooth loss is associated with increased risk of total death and death from upper gastrointestinal cancer, heart disease, and stroke in a Chinese population-based cohort. *Int J Epidemiol*. 2005; 34: 467-74. Doi: 10.1093/ije/dyh375.
6. Fisher MA, Taylor GW, Shelton BJ, et al. Periodontal Disease and Other Nontraditional Risk Factors for CKD. *Am J Kidney Dis*. 2008; 51: 45-52. Doi: 10.1053/j.ajkd.2007.09.018.
7. Holmlund A, Holm G, Lind L. Number of teeth as a predictor of cardiovascular mortality in a cohort of 7,674 subjects followed for 12 years. *J Periodontol*. 2010; 81: 870-6. Doi: 10.1902/jop.2010.090680.
8. Holm-Pedersen P, Schultz-Larsen K, Christiansen N, et al. Tooth loss and subsequent disability and mortality in old age. *J Am Geriatr Soc*. 2008; 56: 429-35. Doi: 10.1111/j.1532-5415.2007.01602.x.
9. Petersen PE, Ogawa H. The global burden of periodontal disease: towards integration with chronic disease prevention and control. *Periodontol* 2000. 2012; 60: 15-39. Doi: 10.1111/j.1600-0757.2011.00425.x.
10. Watt RG, Daly B, Allison P, et al. Ending the neglect of global oral health: time for radical action. *Lancet*. 2019; 261-72. Doi: 10.1016/S0140-6736(19)31133-X.
11. Kallemba A, Preet R, Stewart Williams J. Common risk factors and edentulism in adults, aged 50 years and over, in China, Ghana, India and South Africa: Results from the WHO Study on global AGEing and adult health (SAGE). *BMC Oral Health*. 2016; 17. Doi: 10.1186/s12903-016-0256-2.
12. van Wyk PJ, van Wyk C. Oral health in South Africa. *Int Dent J*. 2004; 54: 373-7. Doi: 10.1111/j.1875-595X.2004.tb00014.x.
13. Peltzer K, Hewlett S, Yawson AE, et al. Prevalence of loss of all teeth (Edentulism) and associated factors in older adults in China, Ghana, India, Mexico, Russia and South Africa. *Int J Environ Res Public Health*. 2014; 11: 11308-24. Doi: 10.3390/ijerph11111308.
14. Benowitz NL, III PJ, Ahijevych K, et al. Biochemical verification of tobacco use and cessation. *Nicotine Tob Res*. 2002; 4:149-59. Doi: 10.1080/14622200210123581.
15. Al-Bayat F, Baharuddin N, Abdulla M. The relationship between serum cotinine levels and periodontal status. *Online Journal of Biological Sciences*. 2010; 10(2): 54-9.
16. Matsha TE, Hassan MS, Kidd M, et al. The 30-year cardiovascular risk profile of South Africans with diagnosed diabetes, undiagnosed diabetes, pre-diabetes or normoglycaemia: the Bellville, South Africa pilot study. *Cardiovasc J Afr*. 2012; 23: 5-11. Doi: 10.5830/CVJA-2010-087.
17. Chikte U, Pontes CC, Karangwa I, et al. Dental caries in a South African adult population: findings from the Cape Town Vascular and Metabolic Health Study. *Int Dent J*. 2020; 70(3): 176-82.
18. Matsha TE, Soita DJ, Hassan MS, et al. Three-year's changes in glucose tolerance status in the Bellville South cohort: Rates and phenotypes associated with progression. *Diabetes Res Clin Pract*. 2013; 99: 223-30. Doi: 10.1016/j.diabres. 2012. 10.018.

19. Bunaes DF, Mustafa M, Mohamed HG, et al. The effect of smoking on inflammatory and bone remodeling markers in gingival crevicular fluid and subgingival microbiota following periodontal therapy. *J Periodontal Res.* 2017; 52: 713-24. Doi: 10.1111/jre.12438.
20. Jarvis MJ, Tunstall-Pedoe H, Feyerabend C, et al. Comparison of tests used to distinguish smokers from nonsmokers. *Am J Public Health.* 1987; 77: 1435-8. Doi: 10.2105/AJPH.77.11.1435.
21. Lee E. Ordinal Logistic Regression and its Assumptions - Full Analysis. Available at: <https://medium.com/evangelinelee/ordinal-logistic-regression-on-world-happiness-report-221372709095>.
22. van Wyk PJ, van Wyk C. Oral health in South Africa. *Int Dent J.* 2004; 54: 373-7.
23. Ribeiro CG, Cascaes AM, Silva AER, et al. Edentulism, severe tooth loss and lack of functional dentition in elders: A study in Southern Brazil. *Braz Dent J.* 2016; 27: 345-52. Doi: 10.1590/0103-6440201600670.
24. Pengpid S, Peltzer K. The prevalence of edentulism and their related factors in Indonesia, 2014/15. *BMC Oral Health.* 2018; 18. Doi: 10.1186/s12903-018-0582-7.
25. Russell SL, Gordon S, Lukacs JR, et al. Sex/gender differences in tooth loss and edentulism. Historical perspectives, biological factors, and sociologic reasons. *Dent Clin North Am.* 2013; 317-37. Doi: 10.1016/j.cden.2013.02.006.
26. Government of South Africa. The dental caries status of the coloured population in the major metropolitan areas of the republic of South Africa. National Oral Health Survey, South Africa 1988/89. Department of Health. 2004.
27. WHO: Oral health surveys: basic methods - 5<sup>th</sup> edition. WHO. 2016.
28. Koltermann AP, Giordani JM do A, Pattussi MP. A associação entre aspectos individuais e contextuais na dentição funcional de adultos do Rio Grande do sul, Brasil: Um estudo multinível. *Cad Saude Publica.* 2011; 27: 173-82. Doi: 10.1590/S0102-311X2011000100018.
29. Ferreira RC, Kawachi I, Souza JGS, et al. Is reduced dentition with and without dental prosthesis associated with oral health-related quality of life? A cross-sectional study. *Health Qual Life Outcomes.* 2019; 17: 79. Doi: 10.1186/s12955-019-1149-2.
30. Kim S. Overview of cotinine cutoff values for smoking status classification. *Int J Environ Res Public Health.* 2016; 13(12): 1236. Doi: 10.3390/ijerph13121236.
31. Seerig LM, Nascimento GG, Peres MA, et al. Tooth loss in adults and income: Systematic review and meta-analysis. *J Dent.* 2015; 1051-9. Doi: 10.1016/j.jdent.2015.07.004.
32. Glantz S, Gonzalez M. Effective tobacco control is key to rapid progress in reduction of non-communicable diseases. *Thw Lancet.* 2012; 1269-71. Doi: 10.1016/S0140-6736(11)60615-6.
33. Friedling LJ, Morris AG. Pulling teeth for fashion: dental modification in modern day Cape Town, South Africa. *SADJ.* 2007; 62: 106, 108-113.

## Do the CPD questionnaire on page 226

The Continuous Professional Development (CPD) section provides for twenty general questions and five ethics questions. The section provides members with a valuable source of CPD points whilst also achieving the objective of CPD, to assure continuing education. The importance of continuing professional development should not be underestimated, it is a career-long obligation for practicing professionals.



### Online CPD in 6 Easy Steps

- 1 Go to the SADA website [www.sada.co.za](http://www.sada.co.za).
- 2 Log into the 'member only' section with your unique SADA username and password.
- 3 Select the CPD navigation tab.
- 4 Select the questionnaire that you wish to complete.
- 5 Enter your multiple choice answers. Please note that you have two attempts to obtain at least 70%.
- 6 View and print your CPD certificate.

**new**

HELPS REBUILD  
& **STRENGTHEN**  
YOUR ENAMEL





**No.1 DENTIST RECOMMENDED BRAND FOR SENSITIVE TEETH\***

**Pronamel optimised formulation:<sup>1,2</sup>**

- ▶ High fluoride availability
- ▶ No polyvalent metal ions
- ▶ Neutral pH
- ▶ No phosphates
- ▶ No SLS<sup>‡</sup>
- ▶ Low abrasivity

**Specialized Enamel Protection  
Rebuilds, Restores, Refreshes**

<sup>‡</sup>Sodium lauryl sulphate; <sup>1</sup>IPSOS Expert Performance Tracking 2020

References: 1. Mason SC. *J Clin Dent* 2009, 20(6):175-177. 2. Layer TM. *J Clin Dent* 2009, 20(6):199-202.

<sup>16239</sup> GlaxoSmithKline Consumer Healthcare South Africa (Pty) Ltd. 57 Sloane Street, Bryanston, 2021. Reg. No.: 2014/173930/07. For any further information, including safety information, please contact the GSK Hotline on +27 11 745 6001 or 0800 118 274. Trademarks are owned by or licensed to GSK group of companies. Refer to carton for full use instructions. Promotion Number: PM-ZA-SENSO-21-00032.

# What's new for the clinician?

## - Excerpts from and summaries of recently published papers

SADJ May 2021, Vol. 76 No. 4 p218 - p221

Compiled and edited by V Yengopal

### 1. The effect of two different irrigation needles on post-operative pain after pulpectomy in primary molar teeth: A randomized clinical study

G Topçuoğlu, HS Topçuoğlu, E Delikan, S Çaliskan. The effect of two different irrigation needles on post-operative pain after pulpectomy in primary molar teeth: A randomized clinical study. *Int J Paediatr Dent.* 2020; 30: 758-63.

#### INTRODUCTION

Pulpectomy is a conservative treatment approach for preventing the premature loss of primary teeth that can result in loss of arch length, insufficient space for erupting permanent teeth, impaction of premolars, and mesial tipping of molar teeth adjacent to the lost primary molar.<sup>1</sup> Pulpectomy is a procedure which involves removal of the roof of pulp chamber in order to gain access to the root canals which are debrided, shaped, disinfected, and obturated later with a resorbable material. As a result, the tooth can be maintained in the arch without vital pulp tissue, without compromising the function of the tooth.<sup>1</sup> The most common complications associated with pulpectomy, post-operative pain (PP) and/or swelling, commence after treatment. These are always unpleasant experiences for both patients and clinicians. The apical extrusion of infected debris or irrigation solution during the canal preparation or irrigation procedure may worsen the inflammatory response and cause periradicular inflammation and postoperative pain.<sup>1</sup>

It is well-documented that the type of irrigation method affects the amount of apically extruded debris (AED) in permanent teeth. No study has evaluated the effect of different needle types on the intensity and duration of PP after pulpectomy in primary molars. Topçuoğlu and colleagues<sup>1</sup> reported on a trial that sought to compare the intensity and duration of postoperative pain after pulpectomy using open-ended needles (OEN) versus side-vented needles (SVNs) in primary upper molars.

**Veerasamy Yengopal:** *BChD, BScHons, MChD, PhD, Community Dentistry Department, School of Oral Health Sciences, University of Witwatersrand, Medical School, no. 7 York Road, Parktown 2193, South Africa.*  
ORCID Number: 0000-0003-4284-3367  
Email: veerasamy.yengopal@wits.ac.za

#### MATERIALS AND METHODS

Fifty participants for each group were selected to participate in this trial. Patients were considered for inclusion if they had an upper primary molar teeth requiring pulpectomy; had no history of taking analgesics and antibiotic 12 hours before the pulpectomy; were cooperative patients in ages ranging from 6 to 9 years; had an absence of internal or external pathologic root resorption; had sufficient coronal tooth structure and had teeth with at least 2/3<sup>rd</sup> roots remaining. Patients were excluded if they had teeth with greater than grade 1 mobility, systemic disease or special healthcare needs.

Only asymptomatic upper primary molar teeth with a diagnosis of pulp necrosis caused by carious exposure were included in the study. Periapical radiographs was taken to examine the periapical status of the teeth.

One hundred participants were randomized into two groups according to the type of irrigation needle used during pulpectomy by a trained dental assistant who was blinded to the study. The dental assistant recorded the participant number and group number on paper.

Once the patient entered the facility and it verified the fulfillment of the inclusion criteria, the list was checked for verification of the group to which the participant would be assigned. Patient-related factors, such as age and sex, and pre-operative tooth-related factors were registered.

Pulpectomy procedure for all patients was performed by an experienced operator, who was blinded to the aim of the study. The participants were also blinded.

The pulpectomy was carried out using a standardized procedure. After application of a topical anaesthetic, the tooth was anaesthetized with 4% articaine with 1:200 000

epinephrine. Following rubber dam isolation, caries was removed and the endodontic access cavity was opened. The necrotic pulp was ultimately confirmed by the absence of haemorrhage in the canal. The working length (WL) was determined using an electronic apex locator. The WL of each root canal was set at 1 mm shorter than the '0.0' mark on the apex locator.

In both groups, the root canals were shaped using Revo-S files at a speed of 300 rpm, up to size 35. In the open-ended needle (OEN) group, canals were irrigated with 5 mL 1% sodium hypochlorite (NaOCl) using a syringe and a 30-G OEN placed 2 mm short of the WL during the canal preparation.

In the side-vented needle (SVN) group, canals were irrigated with 5 mL 1% NaOCl using a 30-G double SVN placed 1 mm short of the WL during the canal preparation. The canals were then dried and obturated with Vitapex paste. The paste was inserted into the canals using a lentulo spiral at low speed. The quality of the canal filling was evaluated by periapical radiography, and the teeth were then permanently restored. The occlusion was checked.

A questionnaire was given to the participants' parent(s) to note the postoperative (PP) intensity of their children at six, 12, 24, 48, and 72 hours, and finally one week after the pulpectomy. All participants and their parents were trained to use the pain intensity scale by a researcher blinded to the groups.

To ensure standardization, the pain intensity at each time interval was noted by the participant under the supervision of the same parent. In cases of severe pain, the parent was advised to administer the ibuprofen (if contraindicated, paracetamol), which was prescribed at the end of the session. PP was measured using a four-point pain intensity scale (verbal rating scale) where 0 meant no pain; 1-slight pain; 2-moderate pain and 3-severe pain. These were linked to faces which the child has to choose.

## RESULTS

The differences between the groups as regards demographic data and quantity of analgesic medication intake were not significant ( $P > .05$ ). Three participants (two participants from the OEN group and 1 participant from the SVN group) were excluded from the study because they did not come to the recall visit.

There was no difference concerning the distribution of treated teeth between the groups ( $P > .05$ ). Over-filling was observed in three participants in the OEN group and in four participants in the SVN group ( $P > .05$ ). The mean postoperative scores at 6, 12, and 24 hours were significantly higher in the open-ended needle (OEN) group than in the side-vented needle (SVN) group ( $P < .05$ ).

At 48 hours, 72 hours, and 1 week, there was no significant difference between two groups concerning PP intensity ( $P > .05$ ). In both groups, the highest PP intensity was recorded 6 hours after the treatment, with the pain decreasing over time.

## CONCLUSIONS

The researchers concluded that Root canal irrigation with a side vented needle (SVN) caused less postoperative pain (PP) compared to the use of an open ended needle (OEN) at the first 24 hours. The intensity of the PP in the SVN group was also significantly less when compared to the OEN group.

### Implications of practice

The side vented needle appears to provide better outcomes as regards postoperative pain when compared to the open-ended needle. As this is often a traumatic procedure for the child, any procedure that reduces the risk for adverse events such as postoperative pain should be considered.

### Reference

1. Topçuoğlu, G, Topçuoğlu, HS, Delikan, E, Çaliskan, S. The effect of two different irrigation needles on post-operative pain after pulpectomy in primary molar teeth: A randomized clinical study. *Int J Paediatr Dent.* 2020; 30: 758-63.

## 2. Single versus two-implant mandibular overdentures using early-loaded titanium-zirconium implants with hydrophilic surface and ball attachments: 1-year randomized clinical trial

GP de Resende, LM Jordão, JA de Souza, M Schimmel, CR Leles. Single versus two-implant mandibular overdentures using early-loaded titanium-zirconium implants with hydrophilic surface and ball attachments: 1-year randomized clinical trial. *Clinical Oral Implants Research*. 2021; 32: 359-68.

### INTRODUCTION

The mandibular overdenture retained by two implants (2-IOD) has been considered an effective treatment option to improve the retention and stability of a conventional denture. A number of professional bodies and consensus reports in the field of prosthodontics as supported the view that the restoration of the edentulous mandible with a conventional denture is no longer the most appropriate first choice prosthodontic treatment.

There is now overwhelming evidence that a two-implant overdenture should become the first choice of treatment for the edentulous mandible as there was a substantial body of evidence that has demonstrated that patients' satisfaction and quality of life with implant supported mandibular overdentures is significantly greater than for conventional dentures. However, it is also accepted that the two-implant overdenture is not the gold standard of implant therapy but in many setting where resources are available, it should be the minimum standard sufficient for most people, taking into account performance, patient satisfaction, cost and clinical time. In the absence of resources, the conventional mandibular denture remains a viable treatment option to restore chewing function.

Similarly, in the last few years, a series of clinical studies showed that the use of a single midline implant (1-IOD) to retain a mandibular overdenture resulted in positive impacts compared with the conventional denture concerning dental patient-reported outcomes.<sup>1</sup> However there are few published studies that have compared the outcomes of 1- and 2-IODs (implant overdentures).

de Resende and colleagues (2021)<sup>1</sup> reported on a trial that sought to compare the outcomes of the mandibular overdenture retained by one and two implants, by assessing the effects of treatments on patient satisfaction and oral health-related quality of life.

### MATERIALS AND METHODS

This was a parallel two-group randomized clinical trial that targeted fully edentulous patients. For inclusion, eligible edentulous participants had to be healthy and have sufficient bone availability in the anterior region of the mandible for placement of an implant at least 8mm in length.

Exclusion criteria involved any general or local contra-indication for implant treatment, presence of oral condi-

tions that demand additional treatments such as the presence of oral lesions and temporomandibular disorders. Non-collaborative individuals or unable to attend the study appointments for longitudinal data collection were also excluded. The targeted minimum sample size was 48 participants, 24 in each treatment group.

All eligible participants received a new set of complete dentures, fabricated according to a conventional clinical protocol that included preliminary impression with stock trays and irreversible hydrocolloid, final impression with custom trays and zinc-oxide eugenol paste, interocclusal record in centric relation and articulator mounting, teeth arrangement in bilateral balanced occlusion, try-in visit, denture delivery and post-insertion visits for adjustments.

Then, after a minimum 3-month period of complete denture use, participants were invited for baseline data collection and randomly assigned to one of the two treatment groups: overdenture retained by one implant (1-IOD group) or two implants (2-IOD group). Randomization was performed by an external collaborator blinded to group assignment identification.

Assessment of bone dimensions in the interforaminal region was performed using panoramic and lateral cephalometric radiographs. Tissue level Straumann® Standard Plus SLActive® Regular Neck implants, 4.1 mm diameter, were inserted in the mandible midline (1-IOD group) or the lateral incisor-canine area bilaterally (2-IOD group), using a single-stage approach. After insertion, the implants received a 1.5mm height healing cap and suture. The denture was milled to prevent stress to the implants and the patient was instructed to have a soft diet and to restrict the use of the lower denture, when possible. Postoperative care included paracetamol 750mg in case of pain, soft diet, and 0.12% chlorhexidine mouthwash for 1 week.

After a 3-week healing period, a 3.4mm retentive titanium anchor abutment (Straumann) was connected at 35 N.cm with a torque wrench. The corresponding elliptical matrix (Straumann) was incorporated using a chairside procedure for intraoral pickup with self-curing acrylic resin. Then, the patient was instructed about oral hygiene, proper handling of the overdenture, and need for regular recall appointments. All implants were inserted by a single surgeon and the prosthodontic steps were performed by a single prosthodontist.

Participants were assessed at baseline before implant surgery and after 6 and 12 months of overdenture use. Primary outcomes included two dental patient-reported outcomes—satisfaction with the dentures and oral health-related quality of life (OHRQoL) impacts, and the patient's chewing function.

Chewing function was assessed by means of a mixing ability test using a two-colour chewing gum. The participants were requested to chew for 20 cycles in their preferred chewing side and the chewed specimens were collected, rinsed in tap water, and stored in a transparent plastic bag. Then, the specimens were flattened at a 1 mm thickness, and the two sides of the flattened specimen were scanned using a flatbed image-scanning device at a 300 dpi resolution. The image pairs were analysed using the ViewGum© software to measure the variance of the hue (VOH) as the measure of colour mixing. The VOH value ranges from 0 to 1, and the smaller the VOH value, the greater is the colour mixing, which means better chewing function.

## RESULTS

In the first phase of this trial, 65 participants were selected and received a new set of complete dentures. In the second phase, 18 participants (27.7%) were excluded and the remaining 47 participants were assessed at baseline and randomized to the 1-IOD group ( $n=23$ ) or 2-IOD group ( $n=24$ ). The participants' age ranged from 44 to 81 years (mean=65.4; SD=8.5), and 35 (74.5%) were female.

A total of 71 implants were inserted in the two groups (23 in the 1-IOD and 48 in the 2-IOD groups). Implant lengths were 8, 10, and 12 mm, distributed in the 1-IOD group ( $n=6, 12, 5$ ) and 2-IOD group ( $n=28, 14, 6$ ), respectively. A significant difference was found between groups ( $p=.039$ ), since greater proportion of 8 mm implants were inserted in the 2-IOD (58.3%) compared with the 1-IOD group (26.1%). After implant surgery, three participants of the 2-IOD group had early implant failure during the healing phase, one implant failure for each participant. These patients had a new implant inserted after 3 months and early implant loading according to the study protocol. There was no implant failure in the 1-IOD group. Therefore, the overall implant survival rate was 95.7%, and no failure occurred after implant loading. There were missing data from one participant (1-IOD group) who failed to attend to the 1-year follow-up. Moreover, the comparison of implant survival rates between groups (1-IOD=100%; 2-IOD=94.1%) was not statistically significant ( $z=1.188$ ;  $p=.234$ ).

Results concerning the changes in overall OHRQoL scores showed that there was a marked improvement after insertion of new dentures in both groups, as well as at the 1-year follow-up compared to the baseline measurements. Similar results were observed for the specific domains in the OHRQoL tool that was used. There was also significant improvement in patient satisfaction with the mandibular denture for all subscales, except satisfaction with aesthetics. A slight decrease in the satisfaction with the maxillary denture was observed for the 2-IOD group after 1 year.

There was also progressive improvement in chewing function in the 1-IOD group after 1-year compared with the baseline ( $p<.001$ ) and 6-month ( $p=.002$ ) assessments. Improvement in the 2-IOD group was observed from the 6-month to the 1-year follow-up ( $p=.023$ ).

## CONCLUSIONS

The findings from this trial support the use of both 1- and 2-IOD for complete denture wearers, and also support the conclusion that the 1-IOD is an acceptable alternative as a secondary option for the 2-IOD treatment.

## Implications for practice

The results of this trial suggests that treatment outcomes are not fully dependent on the number of implants (1 vs. 2), and the decision between the two treatments may be based on the patient's individual factors and preferences.

## Reference

1. de Resende GP, Jordão LM, de Souza JA, Schimmel M, Leles CR. Single versus two-implant mandibular overdentures using early-loaded titanium-zirconium implants with hydrophilic surface and ball attachments: 1-year randomized clinical trial. *Clinical Oral Implants Research*. 2021; 32: 359-68.

# Maxillofacial Radiology 190

SADJ May 2021, Vol. 76 No. 4 p222

J Walters

The included images depict the most common lesion of odontogenic origin found in the maxillofacial region. What are the important radiological features and what would your provisional diagnosis be?



## INTERPRETATION

The pantomograph (Figure 1) shows an incidental radiopaque mass in the 3rd quadrant. 3D MIP (Figure 2) and a sagittal CBCT slice (Figure 3) indicates an impaction of the maxillary central incisor. A reconstructed PAN (Figure 4) demonstrates a retained 53. With intraoral radiographs (Figure 5 and 6) demonstrating multiple miniature tooth-like structures. These are characteristic representations of compound odontomas.

In 1866 Broca introduced the French term *odontome*, which was initially used to refer to all tumours of odontogenic origin. The English term, odontoma, has subsequently become favoured over the former. Throughout the years' several classifications were presented. In 1971 the WHO defined two types, namely: compound, and complex. Originally known as benign mixed odontogenic tumours. Their tissues and respective cells appear morphologically normal, though lack structural arrangement. This deficiency gave rise to the opinion that they are hamartomatous malformations/lesions rather than true neoplasms.

Their growth potential is more restricted when compared to the complex odontoma. Thought to cease with the end of the tooth forming years. Clinical features are few, which may be limited to a mild firm asymptomatic swelling. Often incidentally discovered during routine radiographic examination or investigation of an unerupted permanent or retained primary tooth. Early lesions appear completely radiolucent. As they mature, internal features range from radiopaque specs to a mass, consisting of a few to several hundred miniature malformed tooth-like structures known as denticles. The encompassing connective tissue capsule appears as a peripheral narrow radiolucent zone, surrounded by a thin sclerotic border similar to a tooth crypt.

More than two-thirds of cases are diagnosed before the age of 20-years-old. Sex predilections are negligible. With a notable preference for the anterior jaws, particularly the maxilla. Treatment consists of conservative enucleation. Sparing adjacent unerupted teeth may be viable based on a favourable prognosis for eruption.

Jaco Walters: BChD PDD (MFR) PGD (OS) MSc (MFR), Department of Oral and Maxillofacial Radiology, Faculty of Dentistry, University of the Western Cape, Tygerberg Oral Health Centre, Francie Van Zijl Drive, Cape Town 7505, South Africa.  
ORCID Number: 0000-0002-0593-6890  
Email: jawalters@uwc.ac.za

## References

1. Langlais RP, Langland OE, Nortjé CJ. Diagnostic imaging of the jaws. Williams & Wilkins. 1995.
2. Reichart P, Philipsen HP. Odontogenic tumors and allied lesions. Quintessence. 2004.

# Is it better to be good or to do good?

SADJ May 2021, Vol. 76 No. 4 p223 - p225

LM Sykes<sup>1</sup>, GP Babiolakis<sup>2</sup>, GW Evans<sup>3</sup>

## ABSTRACT

People have contemplated what it entails to **be good** and to **do good**. Philosophers propose that being good is an idea about yourself or others, while doing good is an action, towards yourself or others. Other theorists feel that those who want to '**be good**' actually want to '**be seen as good**', while those who strive to '**do good**' are more concerned with following some calling or moral character. If we consider the dental situation, it raises the question of whether the motivation to do good should reign over the practical delivery of good dental treatment.

This brings up many new considerations related to being good and doing good, and whether we are looking at good in terms of the practical performance of the clinical work or in terms of addressing the patient's best interests and welfare.

This paper will explore some of the interesting dilemmas that clinicians may face in their daily practices. It aims to raise their awareness of the differences between patients' demands, actual needs, as well as their own philosophy towards treatment provision.

## INTRODUCTION

During a recent exchange of views with some colleagues the concept of what it means to "Be Good" was debated. The question arose as to whether the "good" was in terms of life in general, or dentistry in particular, and who was doing the judging, the person themselves, their peers or their patients?

One interesting comment was, "I'm not interested in dying having been good, I'm interested in dying having done good". This led to further deliberations as to whether



there was a difference between being good and doing good, and if so, which was more important. This paper will explore some of the interesting ideas related to being and doing good from a philosophical standpoint initially, and then with specific reference to us as professionals in dentistry.

### What does it mean to **be** good as opposed to **do** good?

Philosophers have postulated that "being good is an abstraction, an idea about yourself or others, while doing good is an action, towards yourself or others". Being good implies a moral judgment, where you are judging the inner quality of a person, while doing good is a factual judgement about their actions towards themselves or others".<sup>1</sup>

Other theorists felt that being good was (is) a more superficial and materialistic approach that entailed judging the inner quality of someone by the appearance of things. Doing good evaluated a person on a phenomenological level by judging their actions, and not the person.<sup>2</sup> Some academics and truth-seekers disagreed with these ideas, and felt that too many people seemed to occupy themselves with trying to be good but perhaps did not spend as much energy trying to do good.

Those who want to 'be good' could actually be wanting to 'be seen as good', while those who strive to "do good" are not concerned with appearances or how they are seen, but rather with following the calling of their soul and moral character. The former will not be bothered about perceptions of others because they will be busy acting good (in the right way) and putting right what is mis-

#### Author affiliations:

1. **Leanne M Sykes:** BSc, BBDS, MDent, Dip Research Ethics (IRENSA); Dip ESMEA (Univ Dundee), Dip Odont (Forensic Odontology), Department of Prosthodontics, School of Dentistry, Faculty of Health Sciences, University of Pretoria, Pretoria, South Africa. ORCID Number: 0000-0002-2002-6238
2. **George P Babiolakis:** BDS, MSc Dent, PGDip Dent, Part-time Lecturer, Department of Prosthodontics, University of Pretoria, Pretoria, South Africa.
3. **William G Evans:** BDS, Dip (Ortho), Retired specialist and former SADJ Editor.

#### Corresponding author: Leanne M Sykes

Department of Prosthodontics, School of Dentistry, Faculty of Health Sciences, University of Pretoria, South Africa.  
Email: leanne.sykes@up.ac.za

#### Author contributions:

1. **Leanne M Sykes:** Primary author - 50%
2. **George P Babiolakis:** Second author - 30%
3. **William G Evans:** Third author - 20%

placed or unbalanced. In so doing the will also be acting out of the meaning and not the pretext, especially as the appearance of things changes constantly.<sup>2</sup>

Plato proposed the idea of moral absolutism and relativism. He believes that there is a universal standard of morality that encompasses all moral and ethical principles, and in which all actions are either right or wrong. He argues that if this code is used as a criterion for judgment then individuals intentions, and beliefs, as well as intended or unintended consequences of their actions are irrelevant.<sup>3</sup> Other followers of this notion such as Kant add "Act only if you can, at the same time, will that it should become a universal law".<sup>4</sup>

When raising the question of "what is the good", Aristotle suggests that the ethics of this should not be a theoretical discipline, and stresses that we must not look for a list of items that are good. Such a list is easy to compile, and may include, for example, "that it is good to have friends, to experience pleasure, to be healthy, to be honoured, and to have certain virtues such as courage".<sup>5</sup> According to him the difficult and controversial question arises when we ask whether certain of these goods are more desirable than others. His search for "the good" is actually a search for the "highest good", and he assumes that the highest good, has three characteristics: "it is desirable for itself, it is not desirable for the sake of some other good, and all other goods are desirable for its sake".<sup>5</sup>

He purports that no one tries to live well for the sake of some further goal, but rather that "being happy is the highest end, and all subordinate goal - health, wealth, and other such resources - are sought because they promote well-being".<sup>5</sup> He further asks what the "function, task, or work of a human being is", and suggests that it consists in "activity of the rational part of the soul in accordance with virtue, and encompasses both the psychological and biological works".<sup>5</sup> The soul has "distinct capacities which include the nutritive soul, responsible for growth and reproduction, the locomotive soul for motion, the perceptive soul for perception, and so on".<sup>3</sup>

In addition, he states that "human beings are the only species that have not only these lower capacities but a rational soul as well, and what sets them apart from other species, is their capacity to guide themselves using reason".<sup>5</sup> Aristotle also writes that if reason is used well, then humans will live well and be happy.<sup>5</sup> But in order to do anything well they also need to possess virtue or excellence, and only involve themselves in activities that are in accordance with these qualities.<sup>5</sup> He cautions that its not enough to just exist in a certain state or condition of virtuosity, but that living well consists also of actually doing something good and righteous.<sup>5</sup> He proposes that in order to be fully happy one must possess others goods as well, such as "friends, wealth, and power".<sup>5</sup> And one's happiness is endangered if one is "severely lacking in certain of these advantages"<sup>3</sup> (inverted commas for quoted text).

Other philosophers questioned him on this by asking if one's ultimate aim is to be virtuous, then why should it make any difference to one's happiness if they have

or lack these other types of good? His only response was that their virtuous activity would be diminished or defective by their lack, and believed "someone who is friendless, childless, powerless, weak, and ugly will not find many opportunities for virtuous activities over a long period of time, and the little they accomplish won't be of great merit".<sup>5</sup> However he cautioned [iii] that while living well did rely to some extent of good fortune, the highest good, and most virtuous activity, does not come by chance, and each person themselves must take shared responsibility for acquiring and exercising their virtues.<sup>5</sup> These twelve virtues are: **Courage, Liberality, Magnificence, Magnanimity, Ambition, Patience, Friendliness, Truthfulness, Wit, Modesty and Justice.**<sup>6</sup>

Current literature is replete with affirmations and phrases about being good and doing good such as "Those who do good are designed or disposed, sometimes impracticably and too zealously, toward bettering the conditions under which others live". "Life's most urgent question is 'What are you doing for others?'; "Well done is better than well said."; "What you do makes a difference. And you have to decide what kind of difference you want to make"; and "Every man is guilty of all the good he didn't do".<sup>1</sup>

Perhaps we also need to investigate the motivation or intention behind doing good. Is it to make yourself feel better or more inwardly proud? To show others how good your work is? To develop a good reputation and standing amongst your peers? To be popular? To earn good money? To get thanks and applause? Or to truly help and serve patients well? Ultimately it all revolves around intent as Aristotle explains "Eudaimonia is the highest human good, and the only human good that is desirable for its own sake (as an end in itself) rather than for the sake of something else (as a means toward some other end)".<sup>5</sup>

### What does it entail to **be** good and to **do** good in the dental profession, and is there a difference?

Aristotle proposes that the object of every deliberate activity or pursuit is the attainment of some good. In other words "The good is that at which all things aim".<sup>5</sup> However, this concept is too broad to fit the different circumstances that may be encountered in the dental profession, as there are times when it will be the actual activity under scrutiny, whilst in other situations it will be the end product.

It could be argued that the "aim to do good" should be intrinsically superior to the activity or the final outcome. If we then transpose this notion to the clinical situation, it raises the question of whether the motivation to do good should reign over the practical delivery of good dentistry. That brings up a new consideration of the difference between "Being good" and "doing good".

A clinician may "be good" in terms of being knowledgeable, practically skilled, dextrous, well-read, experienced, and practically proficient in terms of patient management. One would expect that they would thus also carry out good work, but does that automatically mean that they are also "doing good"? Let us consider a case in which

a dental practitioner may be tempted to do a greater amount or more extensive procedures than necessary in order to boost their income.

The procedures carried out may be faultless in terms of quality, aesthetics, and functionality, and outwardly the results would be considered a success. The patient too may feel they have been treated well especially if they trust and admire their doctor. However, when one considers that this extent of work was not actually needed, the patient will have suffered several harms in terms of time, costs, biological damage and been deprived the opportunity for fully informed consent. This clinician may thus have “done good” but certainly was not “doing good or being good” ethically.

The sad reality is that they will probably get away with this, as many patients are impressed by slick clinicians with modern equipment and gadgets, who provide rapid, painless treatment, and are prepared to pay considerable sums of money to achieve that perfect white smile. Patients may leave the surgery satisfied that the appointment was kept to time, that there was no pain, and their mouths have been transformed. They may only begin to experience consequences of the over-treatment years later, and may never realise that the clinician was over-treating them.

A contrasting situation is that of the dentists who may not “be good” clinically, but are aware of their limitations, and will operate within their competencies. They may opt to refer the more complex cases to colleagues they trust, and accept the associated financial losses to themselves rather than compromise their patients. While they may not “be good” on the outward practical level, but they also are surely “doing good” and “being good” morally. These scenarios lead back to the very foundations of academic careers. Most teachers hope and believe that their students are inherently good, and that their desire to enter the profession is based on aspirations to achieve Aristotle’s concept of “the good”. The sad reality is that there are those whose objectives become distorted by the attraction or stresses involved in obtaining quotas and/or high grades. They soon learn how to “work the system” to achieve their needs, often using patients as a means to their ends.

Sadly the pattern of behaviour can then continue into their private practices where patients are once again exploited, but this time for financial gain. Ethical dilemmas can also arise when core values are confused, clash or compete, such as when a clinician actually doesn’t know what is the right action to take; when they find it hard to do the right thing; when the wrong choices are very tempting; where it’s possible to justify the wrong actions; or where it may be easy to get away with a wrong doing.<sup>7</sup> Perhaps educators need to revisit their teaching and the undergraduate curriculum. There is no point in having ethics lectures if the issues of patients’ needs, rights, and dignity and the culture of quota chasing are not addressed. In the words of Professor John Lemmer (personal correspondence) “Ethical concepts are imbibed with your mother’s milk”. But now it is the teachers who need to be the parents nurturing an honest and moral philosophical foundation in their trainees.

## CONCLUSION

Every clinician should be their own most severe critic and strive to “to DO good work, do what is good for their patients, be good clinically, and be good morally”.<sup>7</sup> Ultimately we must always aim to **do right; be fair; do good and not cause harm.**<sup>8</sup>

## References

1. Being good versus Doing good. Accessed at :<http://luqmannieto.com/2018/12/being-good-vs-doing-good/#:~:text=Being%20good%20is%20an%20abstraction,you're%20judging%20the%20actions>. Accessed on: 12-03-2021.
2. Don't Just Do Good, Be Good. You can do a million good things, but it's more important to be a good person. Accessed at: <https://www.theodysseyonline.com/good-good>. Accessed on: 12-03-2021.
3. Frede D. Plato's Ethics: An Overview. The Stanford Encyclopedia of Philosophy. 2017 ed. Edward N Zalta (ed). Accessed at: <https://plato.stanford.edu/archives/spr2021/entries/kant-moral>. Accessed on: 27-04-2021.
4. Johnson R and Cureton A. Kant's Moral Philosophy. The Stanford Encyclopedia of Philosophy. 2021 ed. Edward N Zalta (ed). Accessed at: <https://plato.stanford.edu/archives/win2017/entries/plato/ethics> Accessed on: 27-04-2021.
5. Aristotle's Ethics. The Human Good and the Function Argument. Accessed at: <https://plato.stanford.edu/entries/aristotle-ethics/>.
6. Aristotle's twelve virtues, from courage to magnificence, patience to wit. Accessed at: <https://kevinhabits.com/aristotles-12-virtues-from-courage-to-magnificence-patience-to-wit/>. Accessed on: 07-05-2021.
7. Minnaar J. Ethics for Leaders Course. Online course presented by ProEthics, 15 April, 2021. Website: [www.proethics.co.za](http://www.proethics.co.za).
8. Beauchamp TI, Childress JF. 2001. Principles of Biomedical Ethics. New York. Oxford University Press.

# CPD questionnaire

This edition is accredited for a total of 3 CEUs: 1 ethical plus 2 general CEUs

## GENERAL

### The orthodontist's views regarding academic education in cleft lip and palate as well as craniofacial deformities in South Africa

1. Which option is CORRECT.  
Orthodontists can play a lengthy treatment in left lip/palate and craniofacial team:  
A. Providing an infant's plate services  
B. Records taking for clinical audit.  
C. Prepare for the bone graft surgery  
D. Perform conservative dentistry
2. Choose the CORRECT answer. The quality of care of all patients is inevitably influenced by:  
A. Academic education of the practitioner  
B. Exclusive third-party funding  
C. Differences in consultation times between practitioners  
D. None of the above
3. Identify the CORRECT statement.  
The multidisciplinary team approach is essential in the management of CLP/CFD due to:  
A. provision of expensive treatment management  
B. improving treatment outcome  
C. increase the burden of healthcare on caregiver  
D. giving a broader platform to clinicians to improve their skills

### A preliminary inquiry on the association between pre-admission assessments and academic performance of first year dental technology students' within a South African university of technology

4. Which of the following statements is CORRECT.  
Predictive admission procedures can:  
A. reduce dropout rates  
B. improve academic performance  
C. increase success rates  
D. selectively exclude applicants who are unlikely to be successful in the course  
E. All of the above
5. Choose the CORRECT statement.  
Dental Technology is a laboratory-based practice that requires:  
A. fine motor skills  
B. hand-eye co-ordination  
C. spatial perception  
D. fine motor skills, hand-eye co-ordination and spatial perception  
E. hand-eye co-ordination and fine motor skills

6. Select the CORRECT word to complete the sentence.  
Generally, the study revealed that pre-admission measures were \_\_\_\_\_ predictors for success in first-year Dental Technology subjects:  
A. excellent  
B. weak  
C. average  
D. good
7. Select the CORRECT word to complete the sentence.  
The positive correlations between the selected first-year subjects indicate that there is \_\_\_\_\_ coherence between discipline-specific subjects within the first-year curriculum.  
A. vertical  
B. no horizontal  
C. horizontal  
D. no vertical

### Audit of the workload in a maxillofacial and oral surgical unit in Johannesburg

8. Select the CORRECT answer.  
According to the literature, how do surgical audits allow for a reduction in the cost of healthcare?  
A. Audits allow for less transparency of a hospital's performance  
B. Audits provide knowledge, which allows for an improvement in the quality of healthcare leading to fewer complications  
C. Audits identify more commonly performed procedures allowing for stricter control of consumable items  
D. A, B and C  
E. B and C
9. Which of the following options is CORRECT.  
According to the CMJAH hospital audit, the following was not treated in the MFOS unit:  
A. Malignancies  
B. Traumatic facial injuries  
C. Sepsis  
D. TMD
10. Select the CORRECT answer.  
Open reduction with internal fixation (ORIFs) of fractured jaw bones are indicated in patients with:  
A. severe injuries  
B. presence of stable occlusal contacts  
C. no displacement of fractured fragments  
D. All of the above

### Compulsory community service for dentists - Opportunity for meaningful reform

11. Choose the CORRECT statement.  
After the passing of legislation in the Medical, Dental and Supplementary Health Service Professions Amendment Act, No. 89 of 1997. Compulsory community service for dentists:
- commenced immediately in 1997
  - commenced in 1998
  - commenced in 2000
  - commenced in 2001
12. Select the CORRECT answer.  
What are the objectives of compulsory community service?
- To ensure improved provision of health services, especially to rural and underserved areas
  - To redress the injustices of the past and to reduce unemployment rate in South Africa
  - To provide young professionals with an opportunity to enhance their skills, and to acquire knowledge, behavior patterns and critical thinking to assist them in their professional development and future careers
  - None of the above statements are correct
13. Which is the CORRECT answer.  
What makes compulsory community service a legal requirement?
- Constitution of the republic of South Africa
  - Health Professions Council of South Africa policy
  - Occupational Health Safety Act
  - Unemployment Equity Act

### Tooth loss in relation to serum cotinine levels - A cross-sectional study from the Belville South area in South Africa

14. Choose the CORRECT answer.  
Which statement is correct regarding a functional dentition?
- A functional dentition is characterized by the presence of at least 24 teeth
  - A dentition with less than twenty teeth provides limited oral function, affecting chewing, speech, alveolar bone and facial structures
  - Lack of a functional dentition is not considered essential for intake of nutrients
  - It is always necessary to replace lost teeth if there are 24 or less remaining teeth
15. Which of the following statements is CORRECT.  
Regarding edentulism:
- It is still a problem in developed countries, despite the decrease in prevalence over the last years
  - It is a health hazard, as it has been associated with nutritional deficiencies, gastrointestinal changes, and increased mortality rates
  - There is limited data on tooth loss in developing countries, where health inequality remains high
  - All statements are correct
16. Select the CORRECT statement regarding cotinine:
- It constitutes the main metabolite of nicotine in tobacco products, being highly addictive
  - Due to its short half-life, it is not indicated as a biomarker for exposure to tobacco products
  - Cotinine is an addictive chemical only found in cigarettes
  - All statements are correct
17. Select the CORRECT statement.  
Regarding tobacco and oral health:
- It constitutes a critical risk factor for tooth loss and other oral diseases
  - Tobacco cessation programs should be prioritized, particularly in disadvantaged communities with limited access to healthcare
  - Exposure to tobacco can be evaluated through measures of cotinine in serum or urine
  - All statements are correct

### Clinical Window: What's new for the clinician?

18. Select the CORRECT answer.  
Which of the following applies in a pulpectomy?
- Only the root canals are debrided and filled
  - Only the roof of pulp chamber is removed
  - The roof of the pulp chamber and root canals are debrided and filled
  - Can only be done on permanent teeth
19. Choose the CORRECT statement.  
In the Topçuoğlu et al. trial:
- the mean postoperative scores at 6, 12, and 24 hours were significantly higher in the open-ended needle group (OEN) compared to the side-vented needle (SVN) group
  - the mean postoperative scores at 6, 12, and 24 hours were significantly higher in the SVN group compared to the OEN group
  - the mean postoperative scores at 18 hours were significantly higher in the OEN group compared to the SVN group
  - the mean postoperative scores at 18 hours were significantly higher in the SVN group compared to the OEN group
20. Select the CORRECT statement. The results of the de Resende trial suggest that:
- two implants IOD provided superior improvements in patient satisfaction compared to the one implant IOD
  - both 1- and 2-IODs provided similar improvements in patient satisfaction
  - only the conventional denture with no implant improved patient satisfaction
  - neither 1- and 2-IODs provided improvements in patient satisfaction.

**ETHICS****Is it better to be good or to do good?**

21. Which of the following statements is CORRECT.  
Aristotle believed that:
- the highest good is desirable for itself
  - being happy should not be one of our highest goals
  - all other goods are desirable for the sake of the highest good
  - Only A and B above are correct
  - Only A and C above are correct
22. Choose the CORRECT answer.  
According to Aristotle:
- humans have a rational soul
  - humans have the ability to guide themselves using reason
  - to be fully happy humans need other goods such as wealth and power
  - All of the above are correct
  - Only A and B are correct
23. Which answer is CORRECT.  
Harm may be inflicted on a patient if they have been subject to:
- physical damage
  - loss of time
  - lack of informed consent
  - Only A and B above
  - All of the above
24. Which statement is CORRECT.  
A clinician cannot be accused of acting unethically if:
- their core values clash
  - they don't know what is the right action to take
  - they find it hard to do the right thing
  - All of the above are correct
  - None of the above are correct
25. Choose the CORRECT statement.  
It is permissible to perform a wrong action if:
- it will benefit the clinician to do so
  - if the temptation to do so is very strong
  - where it's possible to justify the wrong action
  - All of the above are correct
  - None of the above are correct

**Online CPD in 6 Easy Steps**

The Continuous Professional Development (CPD) section provides for twenty general questions and five ethics questions. The section provides members with a valuable source of CPD points whilst also achieving the objective of CPD, to assure continuing education. The importance of continuing professional development should not be underestimated, it is a career-long obligation for practicing professionals.

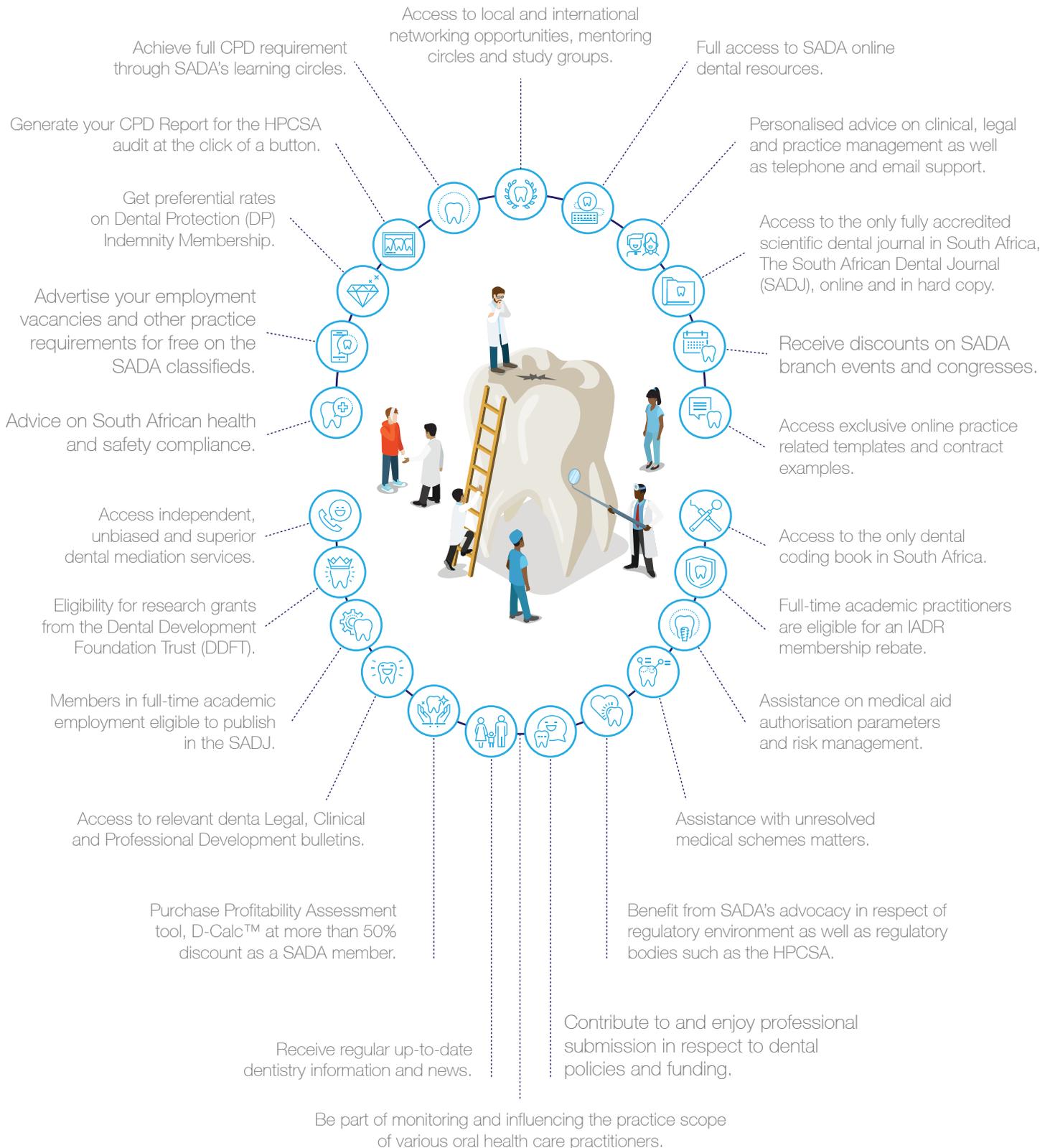


- Go to the SADA website [www.sada.co.za](http://www.sada.co.za).
- Log into the 'member only' section with your unique SADA username and password.
- Select the CPD navigation tab.
- Select the questionnaire that you wish to complete.
- Enter your multiple choice answers. Please note that you have two attempts to obtain at least 70%.
- View and print your CPD certificate.

# BENEFITS OF JOINING SADA

SADA supports its members throughout their time in the profession - from their time as students in the field, straight through their professional careers, and into retirement.

## Our members benefit from the below advantages, amongst others.



# Instructions to authors

Thank you for considering the submission of your work to the Journal for possible publication. We welcome papers which may be Original Research, Clinical Review, Case Reports, Clinical Communications, Letters or Notes.

The South African Dental Journal (SADJ) is a peer reviewed, Open Access Journal, published by the South African Dental Association (SADA). The Journal primarily carries research articles which reflect oral and general health issues in Africa but also publishes papers covering the widest consideration of all health sciences. In addition, items of specific relevance to members of the Association find dissemination through the Journal. The Journal is published ten times each year in electronic format. Hard copy is available by arrangement.

We shall be obliged if your submission is prepared respecting all the details listed in these Instructions. This facilitates our process and ensures more rapid responses to you. Please use and submit the Checklist for Authors supplied on page 233 for confirmation. Thank you.

## Address for submission of articles

The Editorial Assistant, Mr Dumisani Ngoye,  
 South African Dental Journal, South African Dental Association (SADA), Private Bag 1, Houghton 2041, South Africa.  
 Email addresses: sadj@sada.co.za  
 editor@sada.co.za

Please submit the paper in electronic format in Word and Figures separately in JPEG., accompanied by a covering letter signed by the author(s).

## Language

All articles must be submitted in English. Spelling should be in accord with the Shorter Oxford English Dictionary.

All articles must be submitted in English. Spelling should be in accord with the Shorter Oxford English Dictionary.

## Clinical Research

Articles should adhere to the protocols of the Helsinki Declaration: (<https://www.wma.net/policies-post/wma-declaration-of-helsinki-ethical-principles-for-medical-research-involving-human-subjects/>).

## Clinical Trials

Clinical trials should conform to the Consort Statement (Consolidated Statements of Reporting Trials) and Reviews to the PRISMA checklist (Preferred Reporting Items for Systematic Reviews and Meta Analyses) (<http://www.equator-network.org>).

## Authors

Authors should meet the criteria for authorship as in the documents of the International Committee of Medical Journal Editors (ICMJE):

1. Substantial contributions to the conception or design of the work or the acquisition, analysis or interpretation of data for the work, AND
2. Drafting the work or revising it critically for important intellectual content, AND
3. Final approval of the version to be published, AND
4. Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved ([www.icmje.org](http://www.icmje.org)).

- The front page of the manuscript should list the title of the article, the author(s) name(s), and their qualification(s), affiliations and positions held, telephone and fax numbers and address(es), including Email address(es), if available. It is especially important that details of the Corresponding Author should be clearly stated.
- Please submit on the front page a list of up to eight Keywords.
- In the case of multiple authors, the role played and the respective contribution made by each should be recorded. For example: "Principal Researcher- 40%, Writing Article- 30%, Tissue Analysis- 20%, Microscopic Examination- 10%", etc.
- A recent requirement is that authors should be registered with ORCID. This is a number registering you as an Open Researcher and Contributor. Go to the ORCID website home page at <https://orcid.org/> and follow the Three Easy Steps indicated in green. Please submit the ORCID number with your author details.

## Title

To be kept as brief, clear and unambiguous as possible.

## Abstract

The abstract shall consist of not more than 200 words.

For research articles, the summary should be structured under the following headings: Introduction, Aims and Objectives, Design, Methods, Results and Conclusions. Do not include references in the Abstract.

## Text

- Articles should be clear and concise.
- Text should be typed in Times New Roman font, size 11; double-spaced with a 3cm. margin on the sides, top and bottom. Each page must be clearly numbered.
- Please include electronic numbering of lines throughout the document.
- Tables should be clearly identified, using Roman numerals ie. Table I, Table II etc.
- Authors are requested to note and adhere to the current style of the Journal particularly with respect to paragraph settings and headings.

## Length of the article

In general, papers should be between 4000 and 5000 words, although this is flexible. The Editor reserves the right to edit the length of an article in conjunction with the author(s) and SADJ reserves the right to charge for excess/additional pages. The first four pages of original research papers published in the SADJ will be free of charge after which a charge of R500 per page or part thereof will be levied.

## Illustrations/graphics/photographs

- Illustrations/graphics/photographs must be appropriate to the content of the manuscript.
- Digital images with a DPI of at least 300 should be supplied. Photocopies and pdf. files of photographs are not acceptable.
- **Please note:** Figures should be included in the text **and** sent separately in jpg. format.
- The Figure numbers must be in Arabic numerals and clearly identified for each illustration, graphic or photograph. Please remember to record Figure numbers in the text.
- **Permission:** Where any text, tables or illustrations are used from previously published work, permission must first be ob-

tained from the holder of copyright and a copy of the agreement must be submitted with the article. Suitable acknowledgement must be recorded in the article.

### Continuing Professional Development

Please supply **4-5 Multiple-choice Questions (MCQ's)** with 4 or 5 options per question related to your article. Questions must have only one correct answer, and indicate this correct answer clearly.

### References

- References should be set out in the **Vancouver style** and only approved abbreviations of journal titles should be used (consult the *List of Journals Indexed in Index Medicus* for these details at: <http://www.nlm.nih.gov/tsd/serials/lji.html>).
- References should be inserted seriatim in the text using superscript numbers and should be listed at the end of the article in numerical order.
- A reference in the text should appear as indicated: "...as the results of a previous study showed.<sup>23</sup>"
- Where there are several papers referenced, the superscript numbers would appear as: "...previous studies have shown.<sup>3,5,7,9-12,14</sup>"
- Do not list the references alphabetically.**
- It is the author's responsibility to verify each reference from its original source. Please note that an article may be rejected if the referencing is inaccurate.
- Names and initials of all authors should be given unless there are more than six, in which case the first three names should be given, followed by 'et al'. First and last page numbers should be given. Where it is applicable the page numbers should be abbreviated by omitting redundant numbers eg. pages 456 to 478 is recorded as 456-78, and 456 to 459 as 456-9, but 398 to 401 is recorded as 398-401.
- Notice that volume numbers are not given in bold, authors are not linked by 'and' or '&', and the year of publication appears after the name of the journal. No item should appear in italics except for foreign terms, eg *in vivo*.

### Journal references should appear thus:

Smith NC, Haines A. The role of the dentist in public health promotion. *Br Dent J.* 1983; 298: 249-51.

### Book references should be set out as follows:

Terblanche N. Principles of Periodontology, 4<sup>th</sup> ed. London: Butterworth, 1985: 96-101.

Weinstein L, Swartz MN. Pathogenic properties of invading microorganisms. In: Sodeman WA, Smith RT, eds. *Pathologic Physiology: Mechanisms of Disease*. Philadelphia: WB Saunders, 1974: 457-72.

Manuscripts accepted but not yet published may be included as references followed by the words 'in press'.

'Unpublished observations' and 'personal communications' may be cited in the text but not in the reference list.

### Declaration

All sources of funding, possible financial interest/s or incentives in products or services mentioned in the article must be disclosed. Authors are kindly requested to read and sign the attached declaration on **page 232**.

No articles that have been published previously, or that are currently being considered for publication elsewhere, will be accepted. Authors are kindly requested to verify that their article complies with this condition.

### Ethics

Where relevant, authors should indicate whether their research has been approved by the Ethics Committee of their Institution or by other research ethics committees.

### Conflict of interest

Authors must disclose their involvement with any company either owned by them or from which they have received a grant or remuneration or with which they have an association, and must declare any other personal interest they may have which would constitute a Conflict of Interest. These may include personal relationships, academic competition, or intellectual beliefs. Should there be no applicable Conflicts of Interest this should also be so stated. The statement will be included at the end of the text.

### Copyright

The South African Dental Journal is a peer reviewed, Open Access Journal, adhering to the Budapest Open Access Initiative: "By 'open access' to this literature, we mean its free availability on the public internet, permitting any users to read, download, copy, distribute, print, search, or link to the full texts of these articles, crawl them for indexing, pass them as data to software, or use them for any other lawful purpose, without financial, legal, or technical barriers other than those inseparable from gaining access to the internet itself. The only constraint on reproduction and distribution, and the only role for copyright in this domain, should be to give authors control over the integrity of their work and the right to be properly acknowledged and cited." <https://access.okfn.org/definition/index.html>

The Managing Editor reserves the right to decline articles, photographs or illustrations where products or services are mentioned that are not appropriate.

### Submission

The paper should be submitted in one file including all Tables and Figures and their accompanying Legends. Figures should also be submitted separately file in JPEG. format.

Please submit the paper in electronic format in Word along with separate Figures in JPEG. format to: [sadj@sada.co.za](mailto:sadj@sada.co.za) and to [neil.wood@smu.co.za](mailto:neil.wood@smu.co.za), accompanied by a covering letter and the Declaration on **page 232** signed by the author(s).

### Galley proofs

Changes/corrections to the proofs supplied to authors **must** be returned to the publishers by email or by fax and not over the telephone. Galley proofs must please be returned to the publishers within **four days** after receipt thereof.

### Editorial Policy

Authors may also wish to refer to the Editorial Policy of the SADJ available on the SADA website.

### Enquiries

Enquiries regarding Journal matters can be directed to Mr Dumi Ngoepe, Editorial Assistant, at SADA headquarters on: Tel: +27 (0)11 484 5288, Fax: +27 (0)11 642 5718, Email: [sadj@sada.co.za](mailto:sadj@sada.co.za)

# Declaration by Author/s

Title: \_\_\_\_\_

Author/s: \_\_\_\_\_

**I/We, the undersigned confirm and declare that:**

1. This manuscript is my/our original work and I am/we are the owner/s of this manuscript and possess rights of copyright.
2. I/we confirm that this manuscript has not been published previously and it is not currently considered for publication elsewhere. Has this article been submitted to any other journal and if so, has it been rejected?  
**YES**  **NO**
3. For no consideration or royalty, I/we hereby assign, transfer and make over to SADA all the rights of copyright, which have or will come into existence in relation to this manuscript.
4. I/we waive in favour of SADA or any successors in title any moral rights which may be vested in me/us.
5. The manuscript does not constitute an infringement of any copyright and I/we indemnify SADA against all loss or damage, from any cause arising which SADA may sustain as a result of having been granted copyrights to the manuscript.
6. The research has been approved by the Ethics Committee of my/our institution/s or the Ethics Committee/s of other accredited research facilities.
7. I/we have disclosed in my/our Acknowledgments all sources of funding, possible financial interest/s or incentives in products or services mentioned in the paper.

..... Initial(s) and Surname	..... Signature	..... Date
..... Initial(s) and Surname	..... Signature	..... Date
..... Initial(s) and Surname	..... Signature	..... Date
..... Initial(s) and Surname	..... Signature	..... Date
..... Initial(s) and Surname	..... Signature	..... Date
..... Initial(s) and Surname	..... Signature	..... Date



# Author's Checklist

Have you read the Instructions to Authors?

Are you submitting electronically?

Have you provided all author information including first names, affiliations, qualifications, positions held, Department and Institution, ORCID number, contact details?

Is the first author under the age of 35 on submission of the article?

Have you provided all details of the Communicating Author?

Have you submitted questions for the CPD section? (four or five multiple choice, one correct answer)?

Have you submitted details of the contribution of each author... can be percentage or descriptive... or both?

Have you confirmed the status of your paper in terms of any Conflict of Interest?

Have you submitted the Clearance Certificate number when Ethical permission has been required to undertake research or to publish data?

Does the paper adhere to the format requested in Instructions to Author?

Are the references quoted according to Journal policy, both in the text and in the list of references?

Have all authors signed the Letter of Submission?



# Smalls advertising and placement procedure

- All smalls advertisements are restricted to a **maximum 100 words** per advertisement.
- All advertisement requests are required in writing, **submit to [abayman@sada.co.za](mailto:abayman@sada.co.za)**, with full contact details of the advertiser which should include:
  - ◆ the wording of the advertisement as you require it to be published;
  - ◆ the members professional number; (will not be published);
  - ◆ the members contact details (will not be published).
- Advertisement **lifespan is two weeks** from the date of upload.
- Advertisements to be **repeated follow the same process** as the original placement request.
- All advertisements which **exceed a word count of 100** words will be forwarded to our **publishers E-Doc** for further processing as a potential advertisement to be placed in the SADJ electronically or as website advertising. E-Doc will contact you thereafter regarding your requirements.
- **SADA Members** may place advertisements at no cost providing their annual membership fees are either paid in full at the time of their request or a debit order request has been lodged.
- **Non-SADA Member** advertisers will be charged R25 per word for placement of their advertisements.
- Advertisement must be paid in full prior to uploading on the web platform.
- Invoice may be settled telephonically with the use of a credit card to prevent delay of placement.
- **Telephonically processed** payments will result in uploading of advertisement within **24 hours** of settlement.
- Advertiser remains liable for placement costs should payment be dishonoured and invoice remains unpaid.

---

#### Contact details:

Ann Bayman  
 South African Dental Association  
 Tel: +27 (0)11 484 5288  
 Email: [marketing@sada.co.za](mailto:marketing@sada.co.za)



[www.sada.co.za](http://www.sada.co.za)

---







**SADA**  
THE SOUTH AFRICAN  
DENTAL ASSOCIATION