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THE SOUTH AFRICAN
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## *Sausage Tree (Kigelia Africana)*

The sausage tree (Kigelia africana) is easily recognizable by its large, sausage-shaped fruits that dangle from long stalks. These fruits can grow up to 60 cm in length and are not only visually striking but also highly useful. In traditional African medicine, the fruit is used to treat a variety of ailments, such as skin conditions, digestive issues, and respiratory problems. The wood of the tree is durable and used for crafting, while its flowers attract bats and birds, aiding pollination. However, the fruit is not typically consumed raw due to its toxicity, requiring special preparation for safe use.

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# The business of care: Rethinking profitability in private dental practice

SADJ SEPTEMBER 2024, Vol. 79 No.8 P409-411

Prof NH Wood, Managing Editor, SADJ - BChD, DipOdont(MFP), MDent(OMP), FCD(SA), PhD

In the fast-paced world of private dentistry, the drive for success has never been more intense. Dentists today face a complex balancing act: maintaining profitability while staying true to the core values that define the profession. The push toward high-revenue procedures and commercial training programmes has reshaped many practices, but at what cost? Are we, as practitioners, slowly drifting away from the fundamental purpose of dentistry: caring for the oral health needs of all patients, especially those most vulnerable? This editorial invites you to reflect on the evolving landscape of private practice, urging a return to the roots of ethical, patient-centred care, without sacrificing the future of your business. The question is not whether profitability matters, but whether it can co-exist with integrity in a profession grounded in trust and compassion.

## The ethical foundation of dentistry

At its core, the practice of dentistry is built upon a strong ethical foundation that prioritises patient welfare and the provision of quality care. The World Dental Federation (FDI)[1] and the Health Professions Council of South Africa (HPCSA)[2] outline clear ethical guidelines that emphasise patient-centred care, integrity and professional accountability. According to these codes, the primary responsibility of a dentist is to place the needs and interests of their patients above all else, ensuring that decisions made in treatment planning and execution are in the best interest of patient health and wellbeing.

However, the increasing commercialisation of healthcare systems – including dentistry – has introduced financial pressures that may challenge these ethical principles. This trend is not unique to South Africa, as research has shown that healthcare professionals globally are being influenced by market-driven models that incentivise high-cost procedures. A study by Favaretto and colleagues (2021)[3] explored how digitisation and commercialisation within healthcare affects clinical decision-making, finding that economic incentives can sometimes lead practitioners to prioritise profit-generating treatments over necessary but less lucrative care. In the context of dentistry, this may manifest in the form of overtreatment or focusing on elective, high-cost cosmetic procedures that may not be aligned with the essential oral health needs of the patient.

In South Africa, the disparities in access to dental care further exacerbate this challenge. Vulnerable populations often struggle to receive basic dental services, while more affluent patients have access to high-end cosmetic or elective treatments. This growing inequality in care highlights the tension between maintaining financial viability and adhering to the ethical responsibility to provide equitable care. Studies have shown that private practitioners face unique pressures to remain profitable, which may lead them to focus on higher-margin procedures, sometimes at the expense of community-oriented care.

Despite these pressures, the core ethical values of dentistry remain unchanged. Upholding patient-centred care, maintaining transparency in decision-making and contributing to the broader oral health of society are paramount. As private practices navigate the complexities of the current healthcare landscape, it is crucial for dental professionals to ensure that their financial goals do not compromise their ethical responsibilities.

## The financial realities of today's dental practice

Operating a private dental practice today presents a complex web of financial pressures. Between rising overheads, investment in advanced technologies and maintaining competitive services, many practitioners find themselves walking a fine line between maintaining financial viability and adhering to the ethical responsibility of providing patient-centred care.

The increasing adoption of advanced dental technologies, such as CAD/CAM systems, 3D imaging, lasers and digital health records, has significantly improved patient outcomes and practice efficiency but has also led to substantial operational costs for practitioners. The high cost of acquiring and maintaining such technologies adds financial strain, especially for small and independent practices. While these tools enable more precise diagnostics and personalised treatment plans, they also create the need for constant investment in training and updating equipment, thus driving up the cost of running a practice.[4]

Research also shows that dental practitioners often face intense competition in the private sector. A study on competition in dental practices by Holtmann and Olsen (2012)[5] found that to stay competitive, many dentists feel compelled to offer high-margin services, such as cosmetic procedures, implants and orthodontics. While these services are lucrative, they can overshadow the provision of essential dental care for broader communities, particularly for low-income patients who may not be able to afford such treatments. This creates a dilemma where profitability can sometimes take precedence over the core values of dentistry, which emphasise equitable care and community welfare.

In South Africa, the socioeconomic disparities further complicate this balance. Many people rely on the underfunded public sector for dental care, but for those who seek private services, the high costs can be prohibitive. While affluent patients have access to premium treatments, the majority of South Africans struggle to afford basic dental services in the private sector, exacerbating the country's overall health inequity.[6]

Despite these pressures, private practitioners could innovate by offering more affordable care models. Tiered pricing, flexible payment plans and partnerships with public health initiatives are potential ways for dentists to serve a broader patient base while maintaining their financial stability. Would it be out of line to ask such a question? The financial realities of private practice create challenges for dentists in maintaining profitability without compromising their ethical obligations. As practices adapt to new technologies and the pressures of a competitive market, it is crucial for practitioners to remain mindful of their responsibilities to the community and strive for a balance between financial success and patient-centred care.[7]

## The role of commercial training programmes

Commercial training programmes and industry partnerships play an increasingly prominent role in shaping the practices of private dental professionals. These programmes often focus on enhancing the profitability of private practices by promoting high-margin treatments such as cosmetic procedures, dental implants and orthodontic services. While these programmes can offer valuable skills and knowledge, there is growing concern that they may inadvertently shift the focus of practitioners away from essential, community-oriented care towards more financially driven treatments.

Continuing professional development (CPD) in dentistry has increasingly been shaped by industry stakeholders. While CPD is vital for skill development and keeping pace with advances in dental technology, industry involvement can sometimes lead to the promotion of specific, high-revenue procedures that align with commercial interests rather than patient needs. For example, courses heavily sponsored by dental implant manufacturers may emphasise the use of implants even in cases where more affordable, conservative treatments could suffice.[8]

This commercialisation of professional training poses an ethical dilemma. Private practitioners, particularly those who run their own clinics, often face significant financial pressures, making it tempting to adopt practices that generate higher revenue at the cost of ignoring the broader health needs of the community. The growing emphasis on elective procedures, driven by commercial training, can exacerbate the divide between affluent patients and those unable to afford these costly treatments.[9]

It is crucial for private practitioners to critically assess the influence of commercial training programmes and strive to balance profitability with their ethical obligation to provide comprehensive care to all patients, especially vulnerable populations. Professional organisations, such as the South African Dental Association (SADA), can play a vital role by ensuring that CPD courses maintain a focus on patient-centred care and public health needs, while still incorporating the latest technological advances in the field.

## Reaching vulnerable populations

One of the key ethical imperatives in dentistry is the responsibility to provide care that addresses the needs of all populations, not just those who can afford high-end treatments. However, the growing commercialisation of private dental practice often results in a disproportionate focus on elective, high-cost procedures that cater to wealthier patients, leaving vulnerable populations underserved. This is particularly concerning in a country like South Africa, where socioeconomic disparities create significant barriers to accessing essential oral healthcare.

There are stark differences in access to dental care across various socioeconomic groups in South Africa. Low-income populations and those living in rural areas face significant barriers to accessing even basic dental services, largely due to the high cost of private care and the underfunded state of public healthcare.[6] This creates a situation where affluent patients have access to cutting-edge, high-cost treatments, while a large portion of the population remains unable to afford routine preventive care. The commercialisation of private practice, driven by market forces and industry training programmes, can exacerbate this divide by encouraging dentists to prioritise profitable procedures over essential, community-oriented care.

A related issue is the lack of preventive care initiatives targeted at vulnerable populations. Studies show that preventive care is one of the most cost-effective ways to address the burden of oral disease, particularly in low-income communities. However, the financial pressures faced by private practitioners, combined with the focus on high-margin procedures, often result in preventive care being deprioritised. A study by Peres et al (2019)[10] discusses how private practitioners can play a more active role in addressing this gap by integrating preventive care into their practice models and working with public health initiatives to reach underserved populations. To address the needs of vulnerable populations, private dental practitioners should consider adopting more inclusive care models.

## Professional integrity and long-term success

Maintaining professional integrity while ensuring long-term success is one of the greatest challenges facing private dental practitioners in today's competitive healthcare environment. As market-driven pressures intensify, dentists may feel compelled to prioritise high-revenue treatments that meet the demands of affluent patients. However, studies indicate that building a practice based on trust, transparency and patient-centred care not only upholds professional ethics but also fosters sustainable long-term success.

Grol (2001)[11] highlights that patient satisfaction and trust are key drivers of practice growth, particularly in dentistry, where personal relationships and care quality heavily influence patient loyalty. Practices that emphasise ethical decision-making, clear communication and genuine patient care often see higher patient retention and referral rates, leading to sustained financial success over time. While cosmetic and elective procedures can be profitable, the true foundation of a successful dental practice lies in its ability to meet the essential health needs of its patients while maintaining transparency about treatment options and costs.

Furthermore, investing in preventive care and focusing on long-term patient outcomes has been shown to be a financially sound strategy. Research by Peres et al (2019)[10] argues that preventive care models, which prioritise patient education and regular check-ups, can reduce the incidence of costly dental interventions in the future, benefiting both patients and practitioners. By focusing on long-term health outcomes rather than short-term profitability, private practitioners can build stronger, more resilient practices that stand the test of time. Ultimately, private dental practitioners must navigate the tension between profitability and professional integrity with a balanced approach. By adhering to ethical standards and focusing on the holistic wellbeing of their patients, dentists can ensure not only the growth of their practice but also their lasting reputation as trusted healthcare providers.

As the landscape of private dentistry continues to evolve, so too must our approach to navigating its complexities. Profitability and professional integrity are not mutually exclusive; they can, and must, coexist. Now is the time for private practitioners to reassess their roles, not just as business owners but as stewards of community health. By embracing patient-centred care, investing in long-term relationships and ensuring that all patients, regardless of socioeconomic status, have access to essential dental services, we can start to reshape the future of dentistry for the better. This is not a call for change directed solely at dentists. All stakeholders (professional associations, commercial partners and educators) must come together to foster a culture that values ethics as highly as it does innovation and financial success. The path forward lies in striking the delicate balance between advancing our profession and preserving the trust that has always been its foundation.

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# The critical role of forensic dentistry: a call for greater awareness and training in South Africa

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**Mr KC Makhubele – CEO, South African Dental Association**

As the CEO of the South African Dental Association (SADA), I find it crucial to highlight the significant yet often underappreciated role of forensic dentistry. This specialised field, which integrates dental science with legal investigations, is indispensable in various contexts such as identifying human remains, analysing bite marks and estimating age. Despite its importance, I believe there is insufficient awareness and training in forensic dentistry within South Africa. This article presents my perspective on the need for increased focus on this field, comparing our situation with international standards and suggesting steps to enhance our capabilities.

Forensic dentistry is vital in numerous scenarios. For instance, dental records are frequently the most reliable means of identifying bodies in cases where other methods fall short due to decomposition, burning or mutilation. Teeth, known for their durability, can survive extreme conditions, preserving critical identification information. Furthermore, bite mark analysis can be pivotal in criminal cases, providing essential evidence that may confirm or exclude potential suspects. Estimating the age of deceased individuals, particularly children and adolescents, also aids significantly in identification and understanding case contexts. In large-scale disasters, forensic dentists are essential in managing and comparing dental records efficiently to facilitate rapid and accurate identification, providing closure to families and supporting legal processes.

In South Africa, the field of forensic dentistry faces several challenges. One major issue is the lack of awareness about its importance and capabilities. This extends to the public and even within the broader medical and legal communities, often leading to underutilisation of forensic dental services. Additionally, training and education opportunities are limited. Despite some available programmes and courses, the number of trained forensic odontologists remains relatively low, partly due to restricted educational resources. Resource constraints further impact our ability to conduct thorough forensic dental investigations, with many forensic laboratories lacking advanced technology and sufficient funding for training and research.

The local importance of forensic dentistry cannot be overstated, particularly given the high frequency of unidentified bodies in South Africa. This issue underscores the urgent need for more trained forensic odontologists. With a higher number of professionals in this field, the identification process could be significantly improved, offering timely and reliable results that aid in bringing closure to families and facilitating legal proceedings. Enhanced training and resources would allow for better management of cases involving unidentified bodies, reducing the burden on other identification methods that may be less effective in certain conditions.

Comparing our situation to international standards reveals significant gaps. Countries such as the US, UK and Australia offer advanced and specialised training programmes in forensic odontology, supported by robust funding, research opportunities and collaboration with law enforcement agencies. Public awareness and recognition of the field's importance in these countries lead to more frequent and effective utilisation of forensic dental services. They also have access to state-of-the-art technology, enhancing their capacity for precise dental evidence analysis through digital radiography, 3D imaging and advanced software.

To elevate forensic dentistry in South Africa, several steps are necessary. We need to increase awareness about the field's role and importance among the public, law enforcement and medical communities. Educational campaigns, seminars and media collaborations can aid in this effort. Expanding educational opportunities is also crucial. Universities and training institutions should offer comprehensive courses and specialised programmes in forensic odontology, supported by scholarships and funding to attract more students. Investing in forensic dental laboratories is essential, ensuring they are equipped with advanced technology and tools for effective investigations. Additionally, international collaboration with forensic dentistry organisations can facilitate knowledge exchange, training opportunities and access to advanced technologies, bridging the gap between our current capabilities and international standards.

Forensic dentistry is an indispensable component of modern forensic science, supporting the identification of remains, bite mark analysis and age estimation. In South Africa, while this field holds significant potential, it faces challenges in awareness, education and resources. By learning from international practices and investing in training and technology, we can enhance our forensic dental capabilities, ensuring this vital field contributes fully to justice and societal wellbeing.

This is my perspective, and I acknowledge it might be limited. However, I believe that a discussion on this, and addressing these issues, is crucial for the future of forensic dentistry in South Africa.

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# Assessing orthodontic treatment outcome of patients treated by orthodontic residents – using the Peer Assessment Rating index

**SADJ SEPTEMBER 2024, Vol. 79 No.8 P413-418**
**JC Julyan[1], H Bellardie[2], A Harris[3]**

## ABSTRACT

### Background
Assessing the degree of improvement is important for establishing the standard of care provided by an individual orthodontist or tertiary care institution.

### Objective
This study aimed to assess the orthodontic treatment outcomes of patients treated by residents in a postgraduate orthodontic programme at a University in South Africa.

### Design
Retrospective assessment of orthodontic treatment outcomes using the Peer Assessment Rating (PAR) index.

### Setting
Department of Orthodontics at a University in South Africa.

### Participants
Patients who completed fixed orthodontic treatment between May 2016 and May 2021.

### Methods
The PAR index was used to assess pre- (T0) and post-treatment (T1) orthodontic study models. Additional outcome measures that were assessed included extraction, non-extraction, orthodontic bracket prescription, impactions, Angle classification and duration of treatment.

### Results
Seventy-four patients were included in the study, with a mean age of 16 years and 6 months, and a sex distribution of 47 (63.5%) females and 27 (36.5%) males. The mean treatment time was 32 months, with a mean weighted score reduction of 28.1 (86%). The sample had 72 (97.3%) patients categorised as "improved" and 2 (2.7%) as "worse or no different". Of the "improved" patients, 52 (70.2%) were "greatly improved".

### Conclusion
The mean percentage weighted PAR score reduction of 86% for the sample reflects a high standard of care provided by the orthodontic residents at the tertiary care centre.

### Keywords
Orthodontics, Occlusal Index, PAR Index, Treatment outcome, Orthodontic residents, Standard of care

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## INTRODUCTION
Orthodontic treatment aims to provide patients with worthwhile improvement in the overall alignment and occlusion of their teeth. In addition, it aims to improve the facial appearance, which contributes to the psychological and physical wellbeing of patients.[1] Continuous assessment of the quality of outcomes is essential for the development and maintenance of optimal standards of orthodontic care.[1] According to Richmond *et al.*,[2] it has been a common practice to grade orthodontic treatment outcomes at study groups, resulting in an increased interest in recent years in the development of techniques or methods to reduce subjectivity when assessing orthodontic outcomes.

Occlusal indices have fulfilled this role in orthodontics and they are used to record traits of malocclusion numerically or categorically, to enlist a degree of objectivity when assessing malocclusions compared to the subjective method.[3] Objective assessment is important in orthodontics and can reflect whether patients finish treatment with a worthwhile improvement in the overall alignment of their teeth, as well as proper occlusion. According to Onyeaso and BeGole,[4] the objective assessment of orthodontic treatment results should not be limited to individual patients but also include the greater proportion of the orthodontist's caseload.

When assessing the treatment outcome of an orthodontist's caseload, a greater proportion of cases should show improvement. The quality of future orthodontic treatment can be improved when individuals grade their treatment results.[2] According to Richmond *et al.*,[2] when different orthodontists use their own set of criteria, it becomes difficult to evaluate orthodontic treatment results accurately. To overcome this subjective evaluation, a standardised objective index for assessing orthodontic treatment outcomes was deemed necessary.

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The Peer Assessment Rating (PAR) index developed by Richmond *et al.*[2] is an example of an occlusal index. It offers orthodontists a reliable and standardised tool to evaluate treatment outcomes. The PAR index is a useful tool when evaluating orthodontic treatment and assessing the standard of care.[5] The reduction in PAR index scores of greater than 70% reflects orthodontic treatment success.[2] Orthodontic success was determined by the percentage reduction in the PAR score or by using a nomogram graph. The PAR index enables clinicians and researchers to evaluate outcomes achieved through orthodontic treatment by relating the study models before and after treatment.[6] The PAR index is an objective assessment tool that allows evaluation of the standard of orthodontic care provided.[2]

## METHODS

### Design

Retrospective assessment of orthodontic treatment outcomes of patients treated by orthodontic residents, using the Peer Assessment Rating (PAR) index.

### Population

The convenience sample comprised 74 patients who were treated with fixed orthodontic appliances by residents between May 2016 and May 2021. The inclusion criteria included patients with no previous history of orthodontic treatment, with good quality pre- and post-treatment orthodontic study models and complete treatment records. The following excluding criteria was used: patients treated by permanent staff members, patients with poor quality or missing orthodontic study models, uncompleted treatments, patients with craniofacial anomalies and patient who underwent orthognathic surgery. Patients with incomplete treatment records and premature removal of orthodontic appliances due to poor oral hygiene or dental concerns were also excluded. All patients were treated by orthodontic residents at the institution under the supervision of qualified orthodontists, who were either full- or part-time faculty members in the Department of Orthodontics at the time.

### Setting

All treatments were performed at one of the South African tertiary care institutions, and treatments were provided by residents in the Department of Orthodontics.

### Intervention

The pre-and post-treatment orthodontic study models and treatment records of patients treated using fixed orthodontic appliances were collected retrospectively. The PAR index was used to determine the success of orthodontic treatment. Additional outcome measures for the treated cases were also assessed using treatment records and included extraction, non-extraction, orthodontic bracket prescription, impactions, Angle classification and duration of treatment.

All PAR index measurements were performed at two different times: before treatment (T0) and after treatment (T1). The measurements included alignment of the maxillary and mandibular anterior segments; buccal occlusion in the anteroposterior, transverse and vertical planes; overbite; overjet; and centerline alignment. The measurements of the pre- (T0) and post-treatment (T1) study models were blinded. Pre-treatment models were measured initially and post-treatment models were measured one month later. The names of patients and treating residents were concealed to exclude bias. The degree of improvement after orthodontic treatment was organised into three categories: "greatly improved", "improved" and "worse/no improvement". Two methods exist for the assessment of orthodontic treatment outcomes using the PAR index: (1) the numerical reduction in the weighted PAR score or (2) using the percentage reduction in the weighted PAR score. A reduction of the PAR score of at least 30% is considered as being an improved case. When there is a reduction of 22 PAR points or more the case is considered greatly improved. High standards of orthodontic treatment refer to situations where the proportion of caseload being "worse/no different" is less than 5% and the mean reduction is above 70%. If the majority of patients are "greatly improved" it suggests that the treating practitioner is providing treatment of a high standard to a large proportion of patients. When the reduction in the PAR score is calculated, the amount of improvement is influenced by the pre-treatment PAR score. Not every patient has a pre-treatment PAR score of 22, which means that a proportion of cases cannot be classified as greatly improved, according to Richmond *et al.*.[2]

### Outcomes

The orthodontic study models were scored by three examiners (principal investigator and both supervisors). The main supervisor underwent training in calibration using the PAR index at one of Prof Stephen Richmond's PAR calibration courses. The study models used were the pre- and post-treatment (at the time of debonding) of each patient in the sample. Patient records, including clinical notes, were retrospectively assessed for other outcome measures. The treatment time was calculated from the application of the orthodontic fixed appliances until their removal.

## DATA MANAGEMENT AND DISPOSAL

Data was collected using a Microsoft Excel spreadsheet to facilitate analysis and graphical output. All patient data were recorded anonymously and presented in aggregate. Any data exported into statistical programs (such as Excel or Stata) was stored in the institutional research data repository.

## ETHICS APPROVAL AND CONSENT

The research protocol was presented to the Higher Degrees Committee and the Biomedical Research and Ethics Committee of the university and was approved as a research project (BM22/4/9). All patients signed an informed consent form stating that their records may be used for academic purposes. All the information obtained was handled with strict confidentiality. Patients were anonymised and each patient was allocated a number – for example, Subject 1. All data was stored on a password protected computer.

## STATISTICAL ANALYSIS

Pre-treatment orthodontic study models were scored initially by all three examiners. To blind the examiners, the post-treatment orthodontic study models were scored a month later. At both pre-treatment and post-treatment scoring, the samples were randomised and anonymised. The complete data set was used by the statistician to assess inter-examiner reliability. Intra-examiner reliability of the pre-treatment and post-treatment PAR scores was carried out by random rescoring of 30 study models, one month after the last scoring session by the examiners.

Inter-and intra-rater reliabilities were assessed using a two-way random-effects model. For the pre-treatment readings, the inter-rater reliability was excellent (ICC 0,87; 95% CI,

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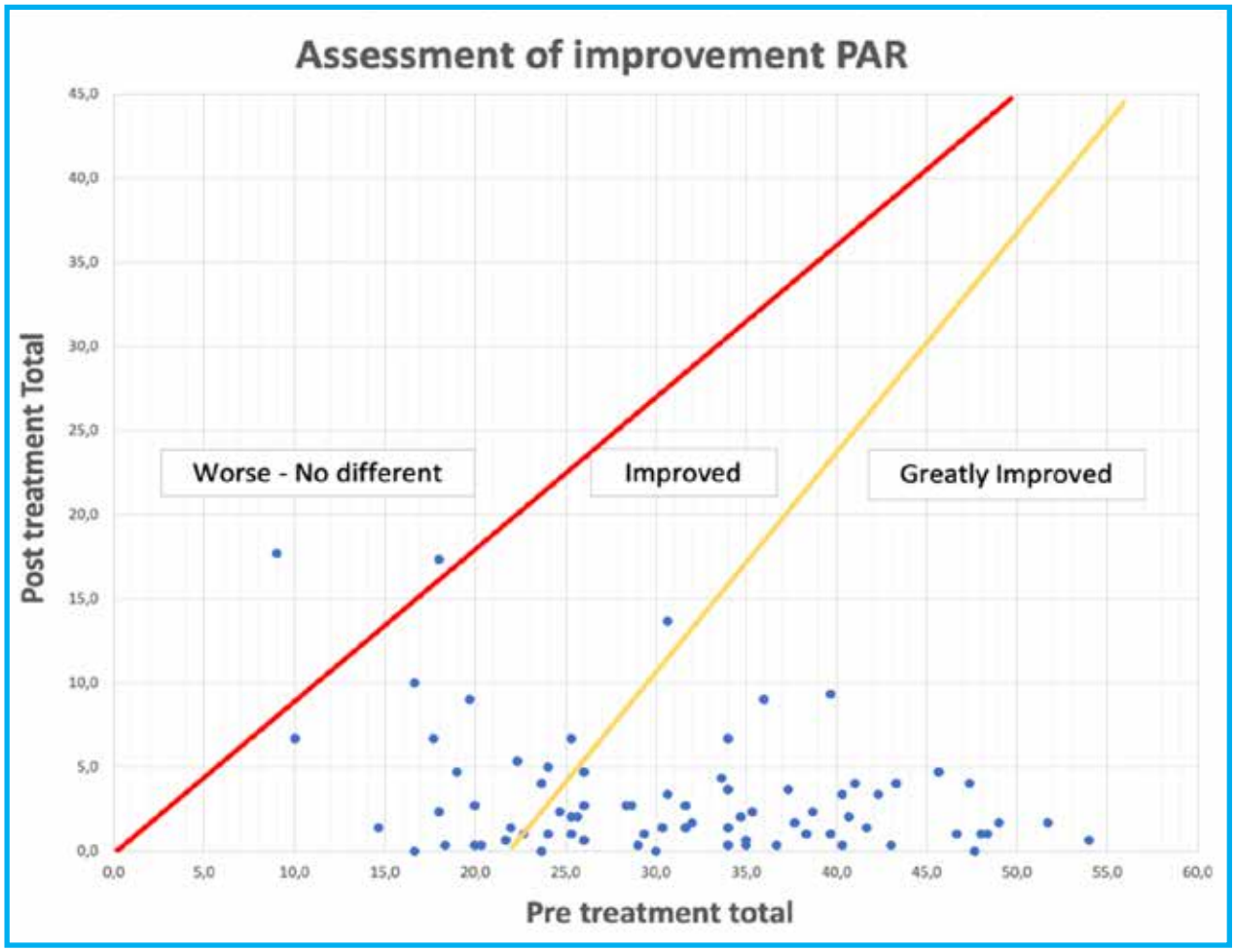


**Figure 1.** Assessment of improvement in Peer Assessment Rating score total for the sample of 74 patients

0,88-0,94) and the intra-rater reliability was moderate (ICC 0,87; 95% CI, 0,76-0,91). The inter-rater reliability (ICC 0,59; 95% CI, 0,65-0,81) and intra-rater reliability (ICC 0,59; 95% CI, 0,18-0,67) of the post-treatment readings were both moderate. For the difference between pre-and post-treatment ratings, the inter-rater reliability (ICC 0,84; 95% CI, 0,85-0,93) and the intra-rater reliability (ICC 0,84; 95% CI, 0,72-0,89) were both excellent.

## RESULTS

### Baseline characteristics

The sample of 74 patients had a mean age of 16 years and 6 months (ranging from 8 years 9 months to 31 years 5 months) at the start of treatment. Of the sample, 27 (36.5%) were male and 47 (63.5%) were female.

Occlusal outcomes of the patient sample (PAR index results)

The mean pre-treatment PAR score was 31,2 (SD 10,38) and the mean post-treatment PAR score was 3,1 (SD 3,60). There was a mean score reduction of 28,1 (SD 11,99). The mean reduction in PAR percentage was 86%, with 97.3% (n=72) of the cases being improved, and of the improved cases 70.2% (n=52) were greatly improved. The percentage of patients showing worse or no improvement was 2.7% (n=2). The results are detailed in both a nomogram and a traffic light bar chart, as suggested by Bellardie[7] (Figures 1 and 2). The cases with improved and greatly improved treatment outcomes constituted 97.3% of the sample, indicating a high standard of orthodontic treatment.

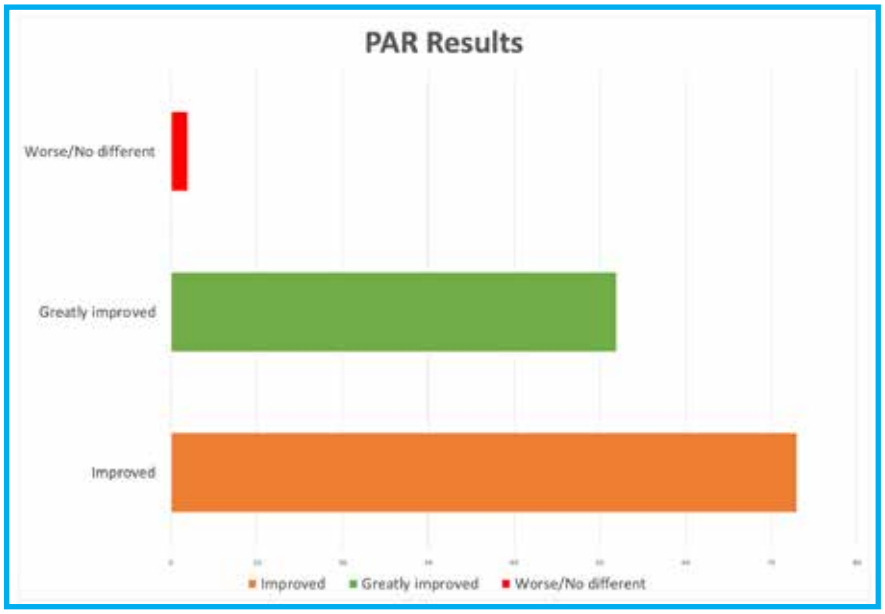


**Figure 2.** Nomogram % as a traffic light bar chart

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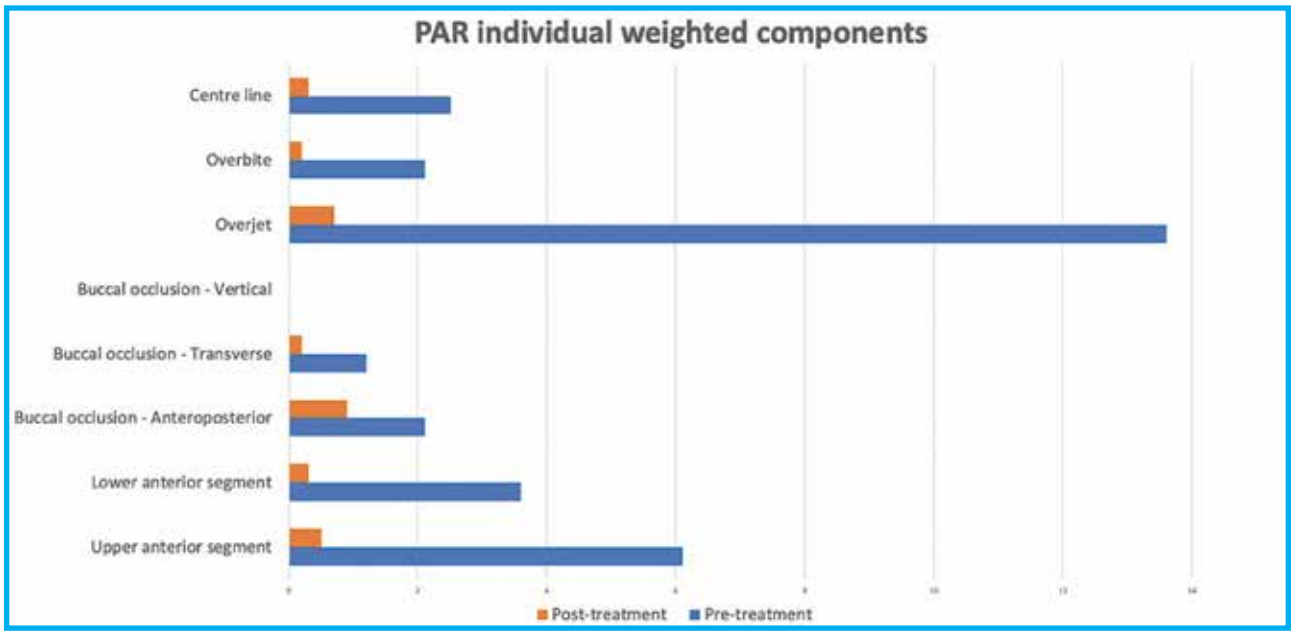


**Figure 3.** Summary of the weighted pre- and post-treatment PAR scores according to eight components of the PAR index

In the pre-treatment group, 14 (18.9%) had PAR scores between 0 and 20, 21 (28.4%) had scores between 21 and 30, and 39 (52.7%) had PAR scores greater than 30. In the post-treatment group, 64 (86.5%) patients had PAR scores between 0 and 5, while 8 (10.8%) had scores between 6 and 10, and 2 (2.7%) had a PAR score greater than 11.

### Results of the individual PAR index components

There was a significant reduction in the maxillary anterior alignment, mandibular anterior alignment, buccal occlusion in the transverse plane, overjet, overbite and midline components of 83.3% to 94.8%. Overjet showed the greatest improvement (94.8%) and buccal occlusion in the anteroposterior plane showed the least improvement (57.1%). The buccal occlusion in the vertical plane component had a zero percent reduction, but also had a zero pre-treatment score, making it insignificant. The upper anterior segment had the highest mean (6,1 ± 3,2) for the unweighted pre-treatment PAR score, and the overjet had the highest mean (13,6 ± 7,5) for the weighted pre-treatment PAR score. In the post-treatment PAR scores, the buccal occlusion in the anteroposterior plane component had the highest mean for both the unweighted and weighted PAR scores (0,9 ± 0,7) (Figure 3).

## ADDITIONAL OUTCOME MEASURES

### Distribution of extraction and non-extraction cases

In 33 patients (44.6%), orthodontic treatment was performed without extractions; in 41 patients (55.4%), orthodontic treatment was performed in combination with extractions. The average reduction in the PAR score was 28,1 (86%) for the non-extraction group and 29,0 (87%) for the extraction group.

### Orthodontic bracket prescription

The appliances used for the sample included McLaughlin, Bennett and Trevisi (MBT) in 38 (51.4%) cases, Alexander in 29 (39.1%) cases and TipEdge in 7 (9.5%) cases. The difference in the PAR reduction scores of the different prescriptions used was not included because the number of cases was not equal and did not represent an accurate score.

### Impactions

When the space for a tooth was less than or equal to 4mm, an impaction was recorded. Impacted canines were recorded in the anterior segment component. In the study sample, 14 (19%) patients had impactions according to the PAR index criteria. The impacted teeth were canines in 12 (86%) and lateral incisors in 2 (14%) cases.

### Angle classification of malocclusion

The study sample comprised patients with Angle Class I (n=26, 35%), Class II (n=35, 47%) and Class III (n=13, 18%) malocclusions. Class II malocclusions were further divided into 26 (74.3%) Class II Division 1 malocclusions and 9 (25.7%) Class II Division 2 malocclusions. The average reduction in the PAR score was 28,6 (86%), 28,5 (87%) and 28,8 (87%) for Class I, II, and III malocclusions, respectively.

### Duration of treatment

The mean duration of treatment for the sample was 32 ± 6,9 months. The minimum treatment duration was 22 months, and the maximum duration was 49 months.

## DISCUSSION

Assessing orthodontic treatment outcomes helps to establish standards of care and set improvement goals, and is useful in postgraduate education clinics. Using the PAR index, a more objective assessment of the final treatment outcome was possible in the present study.

Deguchi *et al.*[6] assessed orthodontic treatment outcomes at two postgraduate orthodontic clinics by using the PAR index. They found an average pre-treatment PAR score of 32 and 28 and post-treatment PAR scores of 7 and 4 for the two postgraduate clinics, respectively. Turbill *et al.*[8] evaluated patients treated with removable appliances and showed mean pre-treatment weighted PAR scores of

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26,94; 26,74; and 24,74 and post-treatment weighted PAR scores of 12,79; 15,19; and 11,40, respectively. The mean pre-treatment PAR score in the present study was 31,2 (SD 10,38) and the mean post-treatment PAR score was 3,1 (SD 3,60), with a mean score reduction of 28,1 (SD 11,99). The pre-and post-treatment PAR scores were comparable to those reported by Deguchi *et al.*[6] The present study showed higher pre-treatment and lower post-treatment PAR scores than those reported by Turbill *et al*.[8] It is noteworthy that the study by Turnbill *et al.*[8] evaluated removable orthodontic appliances whereas, in the present study, patients were treated with fixed orthodontic appliances that provide three dimensional tooth movement. According to Richmond *et al.*,[2,9] the cut-off point for treatment needs according to the PAR score was 10. In the present study, only 1 (1.3%) patient had a pre-treatment score of less than 10, indicating that one patient had a mild malocclusion with a low treatment need.

Not every patient has a pre-treatment PAR score of 22, which means that a proportion of cases cannot be classified as greatly improved, according to Richmond *et al*.[2] In the study by Kerr *et al.*,[10] this was applied to one-third of patients. In the present study, 15 (20%) patients had pre-treatment scores of less than 22 points, resulting in their inability to be classified as greatly improved after treatment.

A score of zero is not always achievable because of the complexity of certain cases. A post-treatment PAR score of 10 or less indicates an acceptable occlusion and alignment, while a score of 5 or less suggests an almost ideal occlusion.[2] In the present study, the number of cases with a final score of zero was 4 (5.4%), less than or equal to five was 63 (85.1%) and more than five was 11 (14.9%). Therefore, a high percentage (90.5%) of cases finished with close-to-ideal occlusions.

O'Brien *et al.*[11] used the PAR index with the British weighting system, to assess 1,630 patients treated by the Regional Consultant Orthodontic Service in England and Wales. They found a mean reduction in PAR score of 67.62% with 8% of patients categorised as worse/no improvement, 48.6% as improved and 43.4% greatly improved. A similar study by Richmond and Andrews[12] in Norway found a mean reduction in PAR score of 78% for 220 patients treated by orthodontists, with only 4% of patients categorised as worse/no different. Dyken *et al.*[13] found a mean percentage reduction in PAR score of 81.7% for graduate students for 51 patients assessed. Richmond[14] assessed 51 consecutively treated cases and found a mean reduction in PAR percentage of 74%, with 8% of the patients categorised as worse/no different, 39% as improved and 53% as greatly improved. Buchanan *et al.*[15] assessed 82 patients who underwent fixed orthodontic treatment with either pre-adjusted Edgewise or Begg appliances and also found a mean PAR reduction score of 74%. The results of the present study revealed that for the sample caseload, the mean reduction in PAR score was 86% with 97.3% (n=72) of cases being improved and 70.2% (n=52) of cases greatly improved. The percentage of patients showing a worse or no-improvement result was 2.7% (n=2). The present study showed more PAR improvement than the literature.[11,12,13,14,15] The reduction in PAR percentage was similar to that reported by Onyeaso and BeGole.[4] This indicates that the residents at this tertiary care centre provided this sample of patients with a high standard of orthodontic care when compared with other similar studies.

It should be noted that the study samples of both O'Brien *et al.*[11] and Richmond and Andrews[12] were significantly larger than those in the present study and the aforementioned studies. This motivates the need for more comprehensive studies in which all consecutive orthodontic treatments are assessed. The studies conducted by Richmond[14] and Dyken *et al.*[13] included patients who underwent orthognathic surgery, which resulted in a higher reduction in PAR scores according to Richmond *et al*.[2] The present study did not include any patients who underwent orthognathic surgery.

The proportion of caseloads that fall into the worse/no improvement category should be consistently negligible and the mean PAR score reduction should be as high as possible for a practitioner to demonstrate a high standard of treatment. In the literature, patients categorised as worse/no improvement were 3%[4,11,12] and 8%.[14] In the present study, 2 (2.7%) patients were in the worse/no improvement category, and both cases were multidisciplinary treatments that still required interventions from other disciplines to establish their final results.

According to Richmond *et al.*,[2] a high treatment standard is achieved when the proportion of cases that fall in the "worse or no different" category is less than 5% and the mean percentage reduction in the weighted PAR score is greater than 70%. A high proportion of cases (>50%) should also fall into the "greatly improved" category.[14] When this is achieved, the practitioner or treatment centre can provide high-quality care to a substantial proportion of patients with a clear need for treatment. The present study achieved these goals by having 2.7% of cases in the worse/no improvement category, a mean PAR reduction percentage of 86%, and 70.2% of cases in the greatly improved category.

## LIMITATIONS

The retrospective nature of this study was a major limitation. Future prospective studies can overcome this limitation by using randomised clinical trials to assess the outcomes of different treatment modalities in larger consecutively treated samples from different treatment centres.

An additional limitation of the present study was the use of study models that were taken on the day of debonding to conduct post-treatment PAR scoring and therefore do not reflect the long-term stability of the treatment outcomes. Future studies should include additional scoring of the patient results during the retention period. This will provide the opportunity to both assess the stability of the treatment results and evaluate different retention protocols to improve the field of orthodontics, which still requires more evidence based on long-term studies.

## FUTURE WORK

The results of this study reflect the treatment outcomes and standard of care of patients treated by orthodontic residents at a tertiary care centre in South Africa. More comprehensive future studies are encouraged to evaluate the standard of care for all consecutively completed treatments in all orthodontic departments or treatment centres in South Africa. The documentation of the reduction in PAR score of all the treated cases in the various departments can subsequently be used in future accreditation meetings to reveal and improve the standard of orthodontic care for public sector

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patients in South Africa. Future prospective studies should also incorporate long-term follow-up measurements during retention to evaluate the stability of the results and standards of the retention protocols used.

## CONCLUSIONS

The results of this study indicate an overall improvement in the treatment outcomes of the study sample. Patients with a clear need for treatment received care of exceptional quality. This is a reflection of the standard of orthodontic treatment at the tertiary care centre.

Documenting the reduction in PAR scores of all consecutively treated patients in the different departments of orthodontics in South Africa should be used in future studies to improve the standard of orthodontic care provided to patients in the public sector.

### Conflict of interest

The authors declare no conflicts of interest.

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# Perceptions of Undergraduate Dental Students Regarding the Teaching and Learning Strategies in Prosthetic Dentistry

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**SN Kabini[1], IS Meyer[2]**

## ABSTRACT

### Introduction

The undergraduate dental students at the higher learning institutes are expected to acquire clinical skills to deliver proper oral healthcare to patients. Various teaching strategies are used by lecturers to teach the students, and these teaching strategies need to be reviewed by obtaining feedback to improve teaching and learning.

### Aims and objectives

To describe the experiences of dental students regarding the teaching and learning strategies being used in the Prosthetic Dentistry module.

### Methods

Final year dental students were asked to participate in the study since they were recipients of teaching and learning in the department of Prosthetic Dentistry. Semi-structured interviews were conducted and the data captured in this study were analysed by means of a six-phase approach to thematic analysis.

### Results

The participants' responses to teaching strategies revealed that students perceived that in preclinical teaching, different teaching strategies were used. However, a few participants perceived some of these strategies were not effective.

### Conclusion

The recommended methods of teaching were those that promoted active student participation. Lecturers in the department of Prosthetic Dentistry use didactic teaching and this may be due to a lack of knowledge regarding other teaching strategies as options in health professions' education.

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**Key words**

Teacher-centred approach, student-centred approach, phenomenological approach, Thematic analysis, Experiential learning

**Author contribution**

Dr SN Kabini 70%
Identification of topic, literature review, write up and data collection.
Ms I Meyer 30%
Reviewing and editing of paper.

## INTRODUCTION AND BACKGROUND

In general, Prosthetic Dentistry is one of the largest components of dental curricula and reaching the outcomes in the module is essential for students to become competent dental practitioners. The Prosthetic Dentistry module consists of theoretical knowledge as well as practical and clinical skills, and students therefore need to gain competency in all the components. Traditional teaching strategies are based on a teacher-centred approach where teachers are the main role players in the delivery of lectures to students.[1] They deliver learning material without actively engaging the students in their learning, who are then expected to reproduce what was delivered in class for them to pass the subject. According to the literature, transformation in teaching and learning led to the development of the teaching strategy that changes the role from a teacher-centred approach to a student-centred approach.[1] During the latter approach, students participate in the instructional learning process, with lecturers functioning as facilitators who help them to develop intellectual skills such as critical thinking and improve their power of reasoning.

Teaching strategies should facilitate future learning, and the beliefs about teaching should be translated into action.[2] Effective teaching strategies should be able to develop pedagogies of social knowledge and collaborative intelligence, create pedagogies of intense engagement, focus on higher order thinking and, finally, promote lifelong and life-wide learning.[3] It is crucial to attain the perceptions of students with regard to teaching strategies used in the Department of Prosthetic Dentistry while aiming to improve students' learning.

Students' perceptions of teaching are utilised globally by faculties and schools to measure performances in institutions that emphasise teaching effectiveness.[4] Some authors believe that students' perceptions are the most valid source of data to evaluate the effectiveness of teaching.[5] The evaluation of teaching effectiveness is important because the evidence produced can be utilised for major decisions regarding the performance of academics.[6] Furthermore, it can provide two kinds of decisions – namely, formative and

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summative. Formative decisions can be used as evidence to improve teaching and learning, while summative decisions can be used to evaluate performances for promotion or renumeration.[6]

Problem statement

Various dental schools use different teaching strategies in the field of Prosthetic Dentistry to facilitate students' development in clinical skills and competency in construction of dental prosthesis. Teaching and learning with regard to removable prosthesis take place from the second year until the final year. On completion, the students should be confident and competent to manage dental prosthesis cases. Confidence in the provision of clinical care is considered an essential educational outcome. Various methods of teaching are used to train undergraduate students in Prosthetic Dentistry. The clinical knowledge of lecturers may be excellent, but the teaching strategies may be outdated. One of the main concerns for lecturers is to ensure that the best education is provided to learners.[7] The teaching strategy of the department needs to be reviewed by obtaining feedback from students. The evaluation of teaching and learning strategies by students is an important part of higher education and it can be used to improve teaching and learning.

## AIMS AND OBJECTIVES

The aims and objectives of the study were to describe the experiences of final year dental students regarding the teaching and learning strategies used in the Prosthetic Dentistry module. Furthermore, to describe the students' understanding of the various teaching strategies and to determine how the current teaching strategies influence students' learning.

## STUDY DESIGN

This study has adopted a qualitative research study with a phenomenological approach which provided experiential understanding of the phenomenon at stake. This approach was extensively utilised as a methodology to understand deeper nuances of a phenomenon in health professions educations from the view of those (final year dental students) who experienced this phenomenon.[7] Phenomenological Research Design usually provides experiential understanding of the phenomenon at stake. Ethical clearance was obtained from both the South African medical and dental universities (HREC Project ID: 15104), since participants were students from the dental university where the study was conducted.

## MATERIALS AND METHODS

Semi-structured interviews were conducted with eight final year dental students. The class is predominantly dominated by young students (from 23 to 24 years). All participants gave consent for the interview to be audio-recorded. Open-ended questions were utilised to enable the participants to further elaborate, thereby enhancing the quality of the data. A discussion schedule was used as a guideline to assist the researcher to maintain focus and to ensure coverage of the research topic.

### Population and sampling

The final year dental students were asked to participate in the study (n=34). This current group of students were recipients of teaching and learning in the Department of Prosthetic Dentistry from their second year of study; therefore, they could provide valuable feedback. Based on the ease of access to potential participants who would be most likely to have the necessary information needed to answer the research questions, eight students were randomly selected as participants in the study. Even numbers of male and female students were randomly invited from the sampling frame of the BDS fifth-year list. This is in line with the proportional random sampling process, which ensured equal gender distribution in the study population. The age and the gender of the participants were collected to describe the study sample.

### Data collection and management

Semi-structured interviews were conducted with eight students in the BDS fifth-year class. All participants were comfortable and gave their consent for the interview to be audio-recorded. The interviews were conducted in a private room. A recording device, a clock, papers and pens were made available in the interview room. The duration of each interview was approximately 15 minutes. Online interviews were offered as an option for those students who were not comfortable; however, all participants opted for a face-to-face interview. Open-ended questions were utilised to enable the participants to further elaborate, thereby enhancing the quality of the data. A discussion schedule was used as a guideline to assist the researcher to maintain focus and to ensure coverage of the research topic (see Table 1). The interviews were transcribed, and the transcriptions were then analysed thematically using an inductive method.[8,9]

**Interview schedule**

1. Welcome and thank you for volunteering to participate in the study.
2. How do you feel about teaching of Prosthetic Dentistry?
   - 2.1 Why?
3. Tell me about your experience regarding the teaching of Prosthetic Dentistry
   - 3.1 How would you describe this experience?
   - 3.2 Can you please elaborate on the teaching strategies used?
   - 3.3 How would you best describe these strategies?
4. Can you elaborate on how lecturers vary their teaching strategies?
   - 4.1 Can you explain further?
   - 4.2 What are your opinions about the teaching strategies used?
5. How do these strategies help you to understand the content?
   - 5.1 How do these strategies influence your learning?

Table 1: Interview questions

## DATA ANALYSIS

The data captured in this study were analysed by means of a six-phase approach to thematic analysis process revised.[9] These steps are familiarisation, coding, generating, reviewing, defining, naming themes and writing up. Thematic analysis has been used in most fields of scholarship in the social and health sciences, and groups any subdiscipline and area where general qualitative research questions about experience, understanding, social processes and human practices and behaviour make sense. NVivo (ver.12) software was used to analyse the data. NVivo is a form of computer-assisted qualitative data analysis software that supports code-based inquiry, searching and theorising, combined with the ability to annotate and edit documents.[10] Different themes were identified according to the categories which were developed.[8] Initially, 15 codes were generated and, eventually, three themes and six subthemes were identified.

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| | |
|---|---|
| **Participant 1** | *"Our course when we start is theory based, and then when we take it to the clinical, starting with the phantom, and then we can proceed to the clinic, working on patients. So, we first do the theory work, and then we practice on the phantom heads, and then we now start dealing with real patients".* |
| **Participant 2** | *"I have seen through me that I have improved a lot throughout the course, from my first year till now, the final year that I was able to learn and apply what I have learnt practically, so, clinically, on the patients. So, it's very, very working. Now I had to link that theory versus the practical, live on the patient."* |
| **Participant 3** | *"I did not really enjoy it, because it was most of the things that you don't get to see and understand. It's just most of theory".* |
| **Participant 4** | *"So, the way they teach us it's beautiful, especially here in SMU, because there is a lot of practicality to what they are saying. It's not just about the way, like they tell us the theory work in class and all that. So immediately after they teach us in class, we are also able to go to the lab, experience what they teach us, get to see the materials, the instruments they talk about, and get to have a feel of what they talk about."* |
| **Participant 5** | *"I honestly didn't know what was happening when I was like looking at, even going to lectures and trying to understand things, I didn't know what was happening, until we actually went into the clinic and then we had a demo case on a patient."* |
| **Participant 6** | *"Well, it's practical. The theoretical part of it and the practical side of it, you can correlate them. It's not something that you just do theoretically without applying it, so you can actually apply it".* |
| **Participant 7** | *"I prefer their teaching because we get more exposure, which is through the phantom, the phantom experience, whereby we work on the simulations, phantom simulations. We do crown preps there and then we get corrections, where we don't understand, we get help."-* |
| **Participant 8** | *"How we received them last year, it was like a contact lecture, so you'd be in a class, and then you will be allowed to participate if you have any questions, and then we would obviously write tests after, like every – like when the work is covered, then we would have tests in between. So, the teaching is divided into two. So it's like theory and clinical. So, we do the theory part, and then we go and practice what we were taught. So, after doing that, that's when we can go and do the work on the patients.* |

**Table 2:** Summery of participants interviews

## RESULTS

The three main themes identified are *preclinical teaching strategies, practical exposure promotes independence in clinicals* and *the use of modified traditional teaching methods*. All themes identified resulted from the data generated by interviewing eight participants. There was, however, considerable overlap between the themes as they related to learning and teaching strategies utilised in the Prosthetic Dentistry module. Themes identified are linked to the experiences, understanding and influences of teaching and learning strategies.

The participants' responses to teaching strategies revealed that students perceived that in preclinical teaching various teaching strategies were used. However, a few participants mentioned that some of these strategies were not effective. Most participants reported that teaching initially emphasised theoretical learning, with some perceiving this emphasis to be overwhelming and difficult to understand. The participants shared that the integration of practical and theory made an easy transition into clinical and voiced that combining the two approaches assisted them in understanding the content. Some of the interview answers are summarised in Table 2 below.

### Theme 1: Preclinical teaching strategies

The participants' responses to the teaching strategies revealed that students perceived that in preclinical teaching, different teaching strategies were used, and a few participants perceived some of these strategies not to be effective. Three sub-themes emerged, namely, *Emphasis on theoretical learning, Integration of theory and practical* and *No longer fearful of prosthetic dentistry*. Preclinical teaching takes place in the fourth year of study where students are actively involved in simulation exercises in the skills laboratory. The main aim is to integrate theoretical knowledge into practice.

### Emphasis on theoretical learning

Most participants reported that teaching initially emphasised theoretical learning. Some perceived this emphasis to be overwhelming and difficult to understand. They found the theoretical information confusing, until it was practically demonstrated in an authentic environment. Some students did not enjoy the theoretical lectures as they did not find it relevant.

> *"I honestly didn't know what was happening when I was like looking at, even going to lectures and trying to understand things, I didn't know what was happening, until we actually went into the clinic and then we had a demo case on a patient." – Participant number 5 (P5).*

> *"I did not really enjoy it, because it was most of the things that you don't get to see and understand. It's just most of theory." – P3.*

### Integration of theory and practical

The participants shared that the integration of practical and theory made an easy transition into clinicals and voiced that combining the two approaches assisted them in understanding the content and concepts. They were able to link the theory to practical which assisted them in constructing the knowledge by engaging the theory into practical experiences and even to the assessment opportunities. They emphasised the value of practical application, specifically on real patients.

> *"I think they should continue doing that on the next coming generation for dental students, because it has really, really worked for me. Like I said, I was able to link what I have learnt through the assessments and the class teachings, and then in the clinic. So, that information I could not forget." – P2.*

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*"Well, it's practical. The theoretical part of it and the practical side of it, you can correlate them. It's not something that you just do theoretically without applying it, so you can actually apply it." – P6, F, 24.*

*"How we received them last year, it was like a contact lecture, so you'd be in a class, and then you will be allowed to participate if you have any questions, and then we would obviously write tests after, like every – like when the work is covered, then we would have tests in between. So, the teaching is divided into two. So it's like theory and clinical. So, we do the theory part, and then we go and practice what we were taught. So, after doing that, that's when we can go and do the work on the patients." – P8.*

*"Our course when we start is theory based, and then when we take it to the clinical, starting with the phantom, and then we can proceed to the clinic, working on patients. So, we first do the theory work, and then we practice on the phantom heads, and then we now start dealing with real patients." – P1.*

### No longer fearful of Prosthetic Dentistry

From a learning experience, participants were initially fearful of prosthetics, but through the integration of theory and practice they became more confident when approaching patients. The students perceived this teaching strategy as enjoyable and assisting them to build their competence and confidence while applying these practical skills on real-life patients.

*"Like the way, their teaching strategy, the way it's structured, it encourages you to want to see more prosthodontics patients than running away from them, because before, we used to be afraid that we can't do certain things. But the way they teach, they encourage you to want to see more cases than the way we perceived pros before." – P1.*

*"At first, it was very overwhelming with the new topics and ideas and landmarks. But once we got more into it and did a lot more practical work, it made a lot more sense, and I really started enjoying it then." – P5.*

*"I have seen through me that I have improved a lot throughout the course, from my first year till now, the final year, that I was able to learn and apply what I have learnt practically, so, clinically, on the patients. So, it's very, very working. Now I had to link that theory versus the practical, live on the patient." – P2.*

## Theme 2: Practical exposure promotes independence in clinicals

Over and above the preclinical teaching strategies, participants felt that being exposed to practical opportunities assisted them to become more independent and build confidence when entering into clinicals. A sub-theme developed, namely demonstration improves understanding.

### Demonstration improves understanding

The participants shared the view that having demonstrations of clinical procedures helped them to understand and assisted with their application when they had to perform procedures on patients. This teaching strategy allowed more exposure for students to receive feedback from lecturers during practical sessions.

*"I saw, like I saw the videos and I saw the pictures, after we had the lectures. I went to the clinic and I saw the demonstration on how things were done, I picked up quite fast. So, like seeing the work and the representation of the work, really did make a difference for me." – P5.*

*"They are more on the practical side, the lectures, making sure that we understand how to apply it, as I said, why I enjoy it. So, they like demonstrating more of how – it's like they are emphasising the need to understand the theoretical part of it by demonstrating the practical side of it." – P6.*

*"The way they teach us, projecting the slides, and then they teach us and then sometimes they can come with some models, and they can show us, if something is too more practical. I feel like with what they teach, they make sure that we understand. They give us more exposure. They explain too much in depth." – P7.*

*"I prefer their teaching because we get more exposure, which is through the phantom, the phantom experience, whereby we work on the simulations, phantom simulations. We do crown preps there and then we get corrections, where we don't understand, we get help." – P2.*

*"So, the way they teach us it's beautiful, especially here in SMU, because there is a lot of practicality to what they are saying. It's not just about the way, like they tell us the theory work in class and all that. So immediately after they teach us in class, we are also able to go to the lab, experience what they teach us, get to see the materials, the instruments they talk about, and get to have a feel of what they talk about." – P4.*

Participant number 4 expressed that having exposure to specialists in the field enhanced their learning.

*"All the theory work they give us, all the lectures we have in the mornings, we had last year, and then all the clinical time they have given us, the way that they give us specialists also in terms of maybe let's say it's a fixed time, they give us specialists. So, for me that's really excellent because you can learn more, you experience more, and you get to have the feel of what is being taught, not just you hear about it". – P4.*

## Theme 3: Use of modified traditional methods

Participants shared that the use of a variety of teaching methods covered different students' learning styles and, as a result, improved their learning. Sub-themes emerged from the analyses, namely the use of different teaching styles and a student-centred approach. These are highlighted below.

### Use of different teaching methods

The participants were exposed to a variety of teaching methods, and these were beneficial for students' learning. Some students mentioned students being actively participative and engaged in the learning process.

*"They teach using a lot of visual aids, like pictures when we were doing survey and design, to classify*

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*and to design. We had a lot of pictures on how different designs can be drawn, and how like different components of the designs are. Then when we were doing fixed work, we had more videos. So, we would watch videos of how a crown or a bridge is prepped, and how the temps are made and stuff, and that's how we'd learn". – P5.*

*"They teach us in different ways of – even if it's the same problem, then they give us alternatives to do. So, it helps, because they are not from the same school of thought, so you get to learn all the alternatives of materials that you can use in the field". – P1.*

*"In second year, we had a demonstration on how to do immediate dentures when a lecturer brought in models, and we trimmed them ourselves, and then like others were like videos and pictures and stuff like that." – P5.*

*"There are those who only come to class, teach, and then after, take questions, and then there are others who prefer to have an engagement in class, in a sort of discussion. They bring it to a peak, we discuss." – P3.*

*"It's basically a thorough explanation through demonstration in the phantom labs, through teaching in the slide shares. So, we can ask questions when we don't understand. You know, it's very, very interesting the way the lecturers teach us is that they teach us through different approaches. Number one, which most of the case is through slide shares, in which they come to the class, explain whatever the topic or the subject that will be discussed for that day, and then when we don't understand we ask questions. And after that, we get assessments in the form of assignments and tests, and then we get assessed, based on that." – P2.*

A participant highlighted that considering COVID-19 and the shift to more virtual teaching, the use of online platforms continued to be used and were integrated as teaching strategies.

*"What I have seen now during COVID, I think the other approach that can happen is to have, also, to record the lectures, so that if you don't, there is something that you missed or you did not understand, then you can go back to that lecture and then try to recap what was happening, then also improve learning out of class." – P3.*

### Student-centred approach

Participants voiced that they preferred when the focus of instruction was on the students, the lecturer was aware of the students and their needs addressed. They also mentioned peer-learning that was incorporated as a strategy and that this enhanced their learning. One-on-one supervision sessions assisted in enhancing their clinical reasoning. This they experienced as a valuable individual growth session. These sessions allowed students confidently to disclose their knowledge gap with their supervisors. Students were also encouraged towards self-directed learning.

*"Personally, I think the latter one is the better one [teaching through discussion], because you get to be more active in class, than just listening to one person talking the entire time. I would prefer the discussion one, where you discuss as a class, because at the end of the day, you get more information, even from – you can also learn from other students, not necessarily from the lecturer. It advances learning because you get to have different views, even from other students." – P3.*

*"The one-on-one sessions, they really help in terms of it's just you and the supervisor. So, they give you that – they open your mind in a way, when you are sitting together, and they also give you that critical thinking element. They ask you like questions, which lead you to answers, they help you in terms of you could have done this here better, better to do it this way, and they can even give you a second chance to do it, if maybe you didn't do it the right way, which you were supposed to do. The way they teach, it is such that the supervisor is able to reach every student at their level, you know. You come to them, one-on-one. They talk to you without anybody, without you feeling ashamed. They don't even belittle you or anything. So, for me, that's beautiful. It's amazing." – P4.*

*"Also, they encourage us to – not to rely on them, so that when we go out there, we are able to deal with prosthodontics problems on our own, they encourage student participation, more than them taking over in the clinic. So, they allow us to own the work that we deliver to the patients". – P1.*

Within a student-centred approach, the use of smaller groups was preferred by participants as they perceived these smaller groups enabled them to have more engagement with lecturers which allowed them more opportunities to ask questions and be supervised during practice.

*"I can say that if maybe they can increase more on the time that they schedule to teach us, and then what else? If they can also maybe when they are showing us practical, maybe they can just divide us into smaller groups, so that we can really understand more than explaining, like when we are 80 to 50, and that can help. I feel that when it comes to maybe a more practical way when we go to the lab, dividing students into smaller groups, according to them and give them more – I don't know, maybe more time." – P7.*

## DISCUSSION

Similar to other studies,[11,12] most participants in this study valued the importance of preclinical teaching, practical exposure and the use of modified traditional teaching methods in enhancing teaching and learning in the Department of Prosthetic Dentistry. All the participants showed understanding of the topic and were willing to engage openly about their perceptions of the teaching strategies used in the Department of Prosthetic Dentistry. Most of the participants were positive about the current teaching strategies. They identified three strategies, namely preclinical teaching, practical exposure and the use of modified teaching methods as beneficial to their learning. The preclinical strategy eliminated the fear of engaging in Prosthetic Dentistry and assisted with translation of theory into clinical practice. The practical demonstrations improved

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their understanding of Prosthetic Dentistry, and the student-centred method of teaching was highly recommended, as it allowed them to actively participate in the learning process. Three themes were identified based on the interview results. The first theme focused on the preclinical teaching strategy that was used in the department of Prosthetic Dentistry. The second theme explored the practical exposure promoting independence when students were exposed to the clinical environment. The third theme refers to the teaching aspect in the department and focuses on the use of modified traditional methods of teaching that were used by the department. The three themes were equally important, and they all played a role in the participants' perceptions regarding the teaching and learning strategies used in the Department of Prosthetic Dentistry.

### Preclinical teaching strategies

The participants emphasised how the department's strategy of applying theoretical teaching, coupled with practical exposure, helped them to integrate theory and practice, and this enabled them to overcome their fear of Prosthetic Dentistry. Some participants did not agree as they seemed to be confused by too many theoretical lectures. Theoretical teaching is crucial as it prepares the students for the preclinical and clinical component of learning.[13] Lecture tutorials in the form of PowerPoint presentations were used by the department to empower students with theoretical knowledge since this is a widely used method of teaching.[14]

The students were predominantly involved in preclinical exercises in the skills laboratory in their fourth year of study. They were exposed to simulation exercises whereby a clinical environment is simulated and procedures that are going to be performed in the clinics are done in the preclinical environment. The skills laboratory has about 60 phantom heads that are used to train students and plastic teeth are used by students to perform procedures. The literature has shown that these exercises are used worldwide to equip students with clinical knowledge.[15] The first objective was to describe the experiences of the final year dental students regarding the teaching and learning strategies being used in the Prosthetic Dentistry module, and the preclinical teaching strategies ties up with this objective. The students highly recommend the simulation exercises and the video recording that were used in the preclinical environment. This theme has also answered the third objective of determining how the current teaching strategies influence students' learning. According to the students, the clinical teaching strategy was beneficial to their learning.

### Practical exposure promotes independence in the clinical setting

The participants emphasised how practical exposure assisted them to acquire independence in clinical by improving their understanding. The students were exposed to practical demonstrations prior to treating patients in the clinics. This enabled them to achieve the autonomy stage that enabled them to routinely treat patients without fear, leading to learner neutralisation.[16] The students participated in various simulation exercises, and this assisted them to improve their clinical skills. According to some participants, they were able to link that knowledge with the expected clinical practice. Furthermore, students were exposed to experiential learning when they started seeing real-life patients after experiencing practical and preclinical exercises in the skills laboratory. These were highly appreciated by some of the participants. Learning and knowledge construction are facilitated through experience and this process of constructing knowledge from real-life experience was a clear demonstration of experiential learning.[17] The experience that was acquired by the students from practical exposure acted as an assimilation to the real-life clinical environment.

### The use of modified traditional teaching methods

The teaching methods that were utilised by the Department of Prosthetic Dentistry encouraged the students to do more in the clinics thereby exceeding the minimum clinical requirements. The students were involved in deliberate practice which improved their learning.[18] The use of visual aids, such as videos and pictures, were some of the methods used by the department and were recommended by the participants. Problem-based learning (PBL) was found to be useful in theme 3 as it assisted the participants with lateral thinking by giving them alternative approaches in managing cases. PBL emphasised the importance of learning about various dental materials, and this was recognised by the participants during case discussions. The participants also valued the importance of peer-to-peer learning as it gave them an opportunity to listen to the views of fellow students.[14] The lecturers who did not encourage student participation and only repeated lecture presentations without students' engagement were not recommended by the participants compared to those lecturers who encouraged students' participation. Hence, the student-centred approach to teaching was highly recommended by the participants. The chairside teaching, which is synonymous to the bedside teaching in medical education, was also one of the recommended methods of teaching. The participants referred to these methods as the one-on-one sessions. They were helpful as it was only the student and the supervisor present, and this was found to improve their critical thinking.

The study has demonstrated that some staff members in the Department of Prosthetic Dentistry often make use of didactic teaching and they seldom use other methods of teaching. This may be due to a lack of knowledge about alternative teaching strategies that can be used in health professions education. Knowing the skills does not translate a lecturer to be a good teacher but applying the appropriate teaching strategy is key to efficient learning.

## STUDY LIMITATIONS

Limitations of a study represent all the weaknesses that might influence the outcomes and the conclusions of a study.[19] In the current study, students may provide inputs that are biased by responding to questions in a more favourable way to the researcher rather than on authenticate response.[20] Confidentiality was ensured and their perceptions were not shared with any staff member. It was emphasised that their participation would not affect their academic ratings

## CONCLUSION

The outcomes of the study are as follows: Although different teaching strategies were used, a few participants perceived some of these strategies were not effective. Theoretical learning was found to be overwhelming and difficult to understand by some participants. The integration of practical and theory made an easy transition into clinical and combining the two approaches assisted the students in understanding the content. The integration of theory

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and practice helped students to become more confident when approaching patients. Demonstration of clinical procedures helped the students to understand and apply the procedures on patients. The utilisation of a variety of teaching styles improved their learning.

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# Online CPD in **6 Easy Steps**

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# Adapting to Change: The Impact of COVID-19 on Dental Education and Its Future

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## ABSTRACT

### Introduction

The COVID-19 pandemic significantly impacted dental education and resulted in unprecedented curricular changes. While virtual teaching enabled theoretical content delivery, practical training was temporarily postponed. Upon resumption, innovative approaches were required to safeguard students, staff and patients.

### Aims and objectives

This study aimed to provide a comprehensive overview of COVID-19's impact on dental education at a South African institution. The objectives were to explore the resultant changes, staff and students' experiences in adapting to the implemented changes, the opportunities for innovation and growth that emerged in response to the pandemic, and the potential long-term implications of these changes for dental education.

### Methods

A qualitative study was conducted. The 2021 and 2022 final year Dental Therapy students were invited to participate in separate, virtual focus group discussions. In 2022, all 12 academic staff members were invited to participate in individual interviews. Among others, participants responded to structured questions regarding pandemic-related changes and how they adapted. Data were audio-recorded with consent, transcribed verbatim and thematically analysed.

### Results

Study participants included eight staff members and two groups of six students. Four pandemic-related themes were identified, namely the sudden shift to online learning and virtual communication, safety protocols, students' wellbeing and long-term implications. Among other findings, home-based learning posed opportunities and challenges for students. Furthermore, the 2021 cohort reported concerns regarding limited clinical training.

### Conclusion

The knowledge acquired by institutions during the pandemic must serve as a foundation for future curricular disruptions. This may be achieved through consultation between institutions and dissemination of information.

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## INTRODUCTION

The COVID-19 pandemic significantly impacted dentistry and dental education, including the delivery. The sudden and extensive outbreak of the virus forced countries across the globe to instate national lockdowns, a period in which local and international travel was restricted, in an effort to reduce its transmission.[1] Although this resulted in widespread closure of institutions,[2] curricular disruptions were minimised through virtual teaching and communication aids such as video conferencing and online discussion platforms.[3] During this time, staff and students engaged in home-based teaching and learning, and were expected to suddenly adapt to these newly-implemented methods.

Upon resuming in-person training, dental schools quickly adapted to new infection control protocols and implemented curricular changes that would ensure the safe and effective delivery of dental education.[1,4] These pandemic-related changes comply with the resilience educational model which will be further elaborated on in this article. This study thus aimed to provide a comprehensive overview of the impact of COVID-19 on dental education at a South African institution. This paper contributes to the broader conversation on the effects of COVID-19 on dental education. It also provides insights for dental educators and administrators as they navigate the ongoing challenges posed by the pandemic and work to ensure the continued delivery of high-quality dental education.

## METHODOLOGY

### Research setting and context

This study was conducted at a South African institution where dental therapy and oral hygiene students are trained. The study was approved by the Humanities and Social Sciences Research Ethics Committee (HSSREC/00002902/2021). Gatekeeper permission was obtained from the registrar. All participants provided informed consent prior to the interviews and focus group discussions. Participants were assured that their anonymity and confidentiality would be maintained throughout the study.

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### Research design
This article is based on a qualitative study that aimed to explore the impact of COVID-19 on dental education at the study site. Data were collected through virtual, structured, individual interviews with dental educators over a period of four months in 2022. Staff members responded to questions about the successful aspects of training, the challenges that were encountered, their perceptions of the teaching methods used during the pandemic and the changes that supported continued teaching and learning during this time. Virtual focus group discussions were conducted with the 2021 and 2022 final year dental therapy students. Participants answered structured questions regarding the successful and challenging aspects of teaching and learning at the institution, support systems for students, their thoughts on blended learning and other teaching methods during the pandemic.

### Participants
Total population sampling was used as all 12 academic staff members within the Dental Faculty were invited, via email, to participate in the study. The goal of this was to explore a diverse range of perspectives and experiences. The information sheet, consent form and demographic details form were all attached to the invitation. All full-time and part-time lecturers and clinical supervisors were included in the study.

Student focus group participants were selected via snowball sampling to prevent biases in the selection process. This also enabled students to participate willingly in the study. An invitation, information sheet, consent form and demographic details form were emailed to the class representative and distributed to all 53 and 39 final year dental therapy students in 2021 and 2022, respectively.

### Data collection and analysis
In total, eight staff members responded to the invitation and agreed to participate in the study. Virtual interviews were conducted with six staff members via the Zoom platform and two participants were interviewed in person at the training site as per their requests. Two virtual focus group discussions were conducted via Zoom, each consisting of six students.

The interviews and focus group discussions were audio-recorded with the participants' consent, transcribed verbatim on Microsoft Word and transferred to Microsoft Exel. Data were analysed using thematic analysis. Initially semantic themes were identified, followed by the data being further catergorised into latent themes (Campbell et al., 2021).[5] Eventually, four overarching themes were identified based on their relevance to the research objectives. The sub-themes were restructured several times to best represent the broader concepts. Braun and Clark (2006) noted that "a theme captures something important about the data in relation to the research question, and represents some level of patterned response or meaning within the data set".[6] This methodology enabled the collection of rich, in-depth data regarding the impact of COVID-19 on dental education, and enabled the researchers to identify patterns and themes across a diverse range of perspectives and experiences.

To ensure the validity and reliability of the findings, the data were analysed by two researchers independently. The researchers met regularly to discuss their findings and to ensure that the analysis was consistent and thorough. Any discrepancies in the analysis were resolved through discussion and consensus.

## RESULTS
### Demographic details
Four staff participants (n=4) were aged between 41 and 50 years old, three (n=3) between 30 and 40 years old, and one (n=1) was 60 years old. Five (n=5) staff members were female and three (n=3) were male. Seven (n=7) participants were dental therapists and one (n=1) was a dentist.

The average age of the student participants was 21 years old. All six participants (n=6) of the 2021 focus group discussion were female. The 2022 group consisted of two males (n=2) and four females (n=4).

### Interviews and focus group discussions
Four pandemic-related themes were identified, namely the sudden shift to online learning and virtual communication (theme 1), safety protocols (theme 2), students' wellbeing (theme 3) and long-term implications (theme 4). Participant identities remained confidential throughout the study and have been replaced by participant numbers (Participant 1 to Participant 8). Quotes by the academic staff are indicated accordingly. Students' quotes are denoted by the term dental therapy, which has been abbreviated to "DT", and the year of study.

### Theme 1: **Sudden shift to online learning and virtual communication**
One major theme that emerged was the shift towards online learning, virtual patient simulations and virtual communication that took place in response to the pandemic. The opportunities and challenges presented by this shift are represented by the following quotes:

> *"… During the pandemic we had to convert or conform to online teaching and learning. It was both a success and a challenge in the sense that we could continue teaching and we couldn't just stop the programme … and we all had to adapt to this new way of teaching …"* (Participant 1, academic staff).

Participant 8 reported that students adapted favourably to the online platform through engagement and interaction with the lecturer.

> *"… When I tried to gauge feedback from the students they also found the platform quite interesting and different. They engaged and interacted quite nicely"* (Participant 8, academic staff).

E-learning expanded horizons and empowered students beyond traditional lectures by encouraging internet exploration and self-study as students were able to access academic content via the online platform.

> *"E-learning is working for me because it made me realise that knowledge and power is not only from lecturers that we have in our university ... But it made me to explore more and familiarise myself with (the) internet and YouTube"* (Participant 6, DT 2021).

> *"Also with the lectures, we recorded them and then got the students to watch it and then we had*

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*discussions with them rather than doing a lecture with them so I think that also helped a bit"* (Participant 4, academic staff).

*"We have our online quizzes … We also have tutorials, we give them self-reading and self-assignments … I think that's what we're doing to actually engage with them and see how much they are actually grasping in terms of theory"* (Participant 8, academic staff).

Challenges associated with online learning included lack of student engagement during online lectures.

*"We can see by the logins, you know the register, that they are probably connected to the lecture but we don't know if they're physically away and physically there and listening to what you are saying so that became a real problem … Also sometimes we ask students questions, they do not even respond"* (Participant 1, academic staff).

During the lockdown, on-campus accommodation services were suspended and students returned to their places of residence. Staff participants acknowledged the challenges presented by students' living conditions while engaging in home-based learning.

According to the students, difficulties were experienced in transitioning from traditional to online learning as students were unfamiliar with the latter. Face-to-face interaction was deemed more engaging as students were often distracted during online lectures. Furthermore, staff valued the physical presence of students during traditional lectures and noted how this benefited their learning.

*"… It was difficult during the pandemic, most of the students were not on campus, even at the residence, so they were at home in a different environment and they shared this home with other people and maybe they do not have access where it can be quiet, where they can answer freely. They do not have a good workstation where they can sit and listen to these lectures or whatever so that became a real problem"* (Participant 1, academic staff).

*"I think that there is a barrier between online learning and classroom learning because throughout our lives we were exposed to sitting down, traditional learning, and having the teacher in front of us. All of a sudden we just have this screen and we're expected to get things done so that's a bit difficult"* (Participant 2, DT 2021).

*"Online learning is new to most students and people interact more when it is face-to-face. With online lectures it is very easy to lose focus"* (Participant 3, DT 2022).

*"In terms of lectures, the face-to-face lectures are definitely better compared to online … I think knowing that a student is present and in front of you carries a lot of weight"* (Participant 6, academic staff).

*"… As much as I do enjoy the online platform, I think maybe a weekly contact class is still necessary for students who are finding it difficult to grasp certain concepts"* (Participant 8, academic staff).

Staff noted that connectivity issues and poor student participation were barriers associated with e-learning.

"*… E-learning is a bit difficult because a lot of students have connectivity problems and there is poor participation"* (Participant 4, DT 2021).

Alternate teaching methods were implemented in the absence of clinical training. Despite the successful efforts to enable continued learning, the use of educational videos was regarded as a compromise.

"The area of the curriculum that suffered was the practical component … besides having reduced access to patients, reduced patient intakes and quotas which were severely affected … we had to use alternate teaching strategies, for example I would make videos of doing CPR or of treating a medical emergency which is not the ideal" (Participant 2, academic staff).

Effective communication was crucial during the pandemic. The successes of these efforts, including how information was disseminated and concerns were addressed, are represented by the quotes below.

Virtual resources were made available to support learning during the lockdown, including lectures and useful websites.

"Amidst the COVID-19 pandemic the University developed the Learn 21 and Learn 22 platforms that were designed for the lecturers, administrators and students … It was the most successful thing that the University could have done … Online study material were made available such as lectures, PDFs, eBooks, PowerPoint presentations, YouTube videos were uploaded, educational websites and apps" (Participant 1, DT 2022).

At the peak of the pandemic, students' interaction with patients was limited due to concerns regarding transmission of the COVID-19 virus. Social media platforms, such as WhatsApp, served as a means of sharing clinical cases with students. Privacy and confidentiality were maintained by censoring patients' identities and confining the shared information to WhatsApp which is end-to-end encrypted. This ensures that communication cannot be accessed by third parties.

*"In clinical training … if there were 5 patients and 10 students in the clinic, the 5 students will get patients and … do a case presentation … Whatever they did in the clinic and what they learned was put in a group chat where all the students in that current year would be. You could put your radiograph up, they could look at that case presentation and comment and ask questions"* (Participant 5, academic staff).

Challenges of virtual communication included data restrictions. Due to the dependence on virtual communication, students required sufficient data to fulfill their academic requirements.

"*Some of us are staying at home, some at residences or private accommodation and not all*

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*those at the private accommodation have WIFI. With the 10GB we get per month they have to communicate, look at the videos and everything. So at the end of the month, they will have no data. They can't communicate with the lecturer, they can't download slides or do anything with insufficient data"* (Participant 1, DT 2021).

**Theme 2: Safety protocols**

The study site adapted their facilities, equipment and policies to maintain safety while providing quality education. This was implemented to protect staff, students and patients. Staff and students wore surgical gowns and two masks while in the clinics. Both groups were also vaccinated and monitored for changes in temperature on a daily basis.

*"Students have been put into clinical groups where they can continue with clinical practice, as well as in the preclinical lab where students are divided into smaller groups. This allows for social distancing and for teaching to go on. Staggered teaching was introduced ... students come in at different times to minimise too many students being in one place"* (Participant 8, academic staff).

"… They enter the clinical area with your face shield, double mask and once you get into your cubicle you put on your PPE (surgical gown). That is only removed once the patient is dismissed and the cubicle is clean. In that way I must say that I've had 0% infections at the peak of COVID during 2020/2021 right up to now …" (Participant 7, academic staff).

"I think also getting the students to vaccinate was part of the program that was implemented to prevent the spread of the pandemic" (Participant 5, academic staff).

"On a daily basis temperatures were checked and records were taken by the sister in charge" (Participant 6, academic staff).

Student safety was also ensured by teaching smaller groups who were present in the lab and clinic at different times of the day.

Curricular changes limited preclinical and community-based training in an effort to reduce transmission of the COVID-19 virus.

*"… Some of the other things that were affected were for example our preclinicals where we had reduced contact unlike in the past where we were able to have more content"* (Participant 2, academic staff).

*"… There were no outreach programmes. Students were not allowed to go into the community and do any extractions or examination of patients and so forth"* (Participant 6, academic staff).

**Theme 3: Students' wellbeing**

The pandemic significantly impacted the mental health and wellbeing of students, which emerged as a theme in the data. Not only did home-based learning present challenges, once training resumed students were expected to fulfill their academic commitments in a reduced period of time.

*"… This is the most stressful semester I ever had during my Varsity life because right now there is a lot of pressure. We are expected to present multiple presentations, followed by assignments, tests and everything at the same time. We are being rushed. On the other hand we are not getting to see enough patients and we are expected to provide or submit portfolios for different modules but with us having to do well with our tests"* (Participant 6, DT 2021).

*"As much as a lot of them would say that we've had 8 months or 2 years to be at home and we're supposed to know all of our stuff … there's a lot of challenges that come with just being at home. It's not like we're learning for 24 hours in a day. So them being understanding … that we are students that are coming from not having exposure to all of the things that we are doing now will help a lot and take a lot of pressure off of us …" (P*articipant 2, DT 2021).

*"Virtual teaching and learning process … it was a whole new experience for teachers and students at the university, so there was some kind of stress and anxiety that was experienced by lecturers and students. The university's counselling unit offered assistance to all stakeholders in terms of psychological distress and also assisted students in a wide variety of ways to maximise their academic successes"* (Participant 1, DT 2022).

**Theme 4: Long-term implications**

The final theme that emerged was the impact of the pandemic-related changes on the future generations of dental professionals.

Students reported concerns regarding graduation due to limited preclinical and clinical training, as well as the reduced number of patients who presented at the training site.

*"Honestly speaking I don't think it's enough to actually qualify. Everything feels so pressured and we have to get things done at this point so we have no choice basically. I don't think the preclinical exposure was enough to go into the clinics"* (Participant 2, DT 2021).

*"I feel like with the clinical training, if you ask me if after this I'd be ready to graduate I really don't think so because we are not seeing enough patients"* (Participant 4, DT 2021).

## DISCUSSION

In response to the pandemic, the University Teaching and Learning Office implemented changes together with staff training. This was then adopted by the Discipline. At the end of the year, module evaluations were conducted and the courses were subjected to an external moderation process.

The curricular changes ensured the safe and continued delivery of content including the global adoption of online teaching methods.[7] This serves as an example of the resilience educational model which, according to AlQashouti et al. (2023), is defined as "the ability of an educational system to withstand and adapt to challenges and to continue the delivery of high-quality education despite these challenges".[3] Nandy et al. (2020) reported that a resilience model supports interaction between "individuals, family and

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the environment", elaborates on the root causes of stress among all stakeholders and may assist institutions in their post- COVID-19 recovery.[8] According to Nandy et al. (2020) resilience is achieved by overcoming crisis, exhaustion and competition by surviving, rebuilding and thriving respectively.[8] The authors of the current study reported that virtual platforms for communication and teaching enabled theoretical content delivery at the peak of the pandemic. Support systems existed in the form of counselling services and data allocation which aided students in their virtual learning endeavours. The safety protocols implemented by the current training site supported rebuilding of the academic programme once face-to-face training resumed. These protocols were identified as a theme and will be elaborated on in this discussion.

Students exclusively engaged in home-based learning during the national lockdown which presented unique challenges for each individual. The 2021 cohort of students were most severely affected by the timing of these changes, as reflected by their feedback. Without detailing the challenges that were experienced during this unprecedented time in their studies, students commented on how lecturers' expectations did not correspond with the reality of studying at home. A South African study by Basson et al. (2022) reported that 59.3% of participants were responsible for household chores, community support, family commitments and part-time employment in addition to their academic commitments during this time.[9] Staff participants of the current study were cognisant of and empathetic about students' personal circumstances and the impact of communal living on their studies. Similarly, AlQashouti et al. (2023) acknowledged that distractions, such as domestic responsibilities, may exist in a "non-educational setting" such as a communal residence.[3] While the majority of participants (91%) in the study by Basson et al. (2022) resided with their families during the national lockdown, 83% experienced moderate to severe anxiety during this period.[9] The respective authors noted that this may be "indicative of a broader dynamic within the family or community that was not the purview of this study".[9] While this was similarly not investigated in the current study, the existing data demonstrates the challenges associated with home-based learning and the possible influence this may have on students' mental health.

As cited by Hakami et al. (2021) the effects of the lockdown included loneliness, loss of freedom, insecurities about the future, uncertainty of recovery and boredom.[10] According to Giallonardo et al. (2020) and Wathelet et al. (2020), this may result in post-traumatic stress disorder, anxiety and psychoses.[11,12] Etajuri et al. (2020) reported that students were concerned about their "emotional health", "being stressed", "social connections" and "loneliness", especially due to the lockdown restrictions that isolated many students at their hostels.[7] Stress was reported as a barrier by the 2021 cohort of students. During this challenging time, various support systems were available at the current study site including the academic staff, academic development officer and Student Support Services. As a further suggestion, the 2021 student participants were in favour of interactive discussions with the staff that would enable disclosure and acknowledgement of their concerns and challenges. Authors Anjali and Vidya (2020), Sa et al. (2021) and Khanagar and Alfadley (2020) recommended counselling sessions and support programmes for staff and students who were experiencing difficulties with their mental health.[13-15]

Students at the current study site identified favourable aspects of e-learning such as recorded lectures and the convenience of accessing study material on the platform. According to AlQashouti et al. (2023) virtual platforms for communication, teaching and assessment, among others, enable "independence, autonomy and self-governance".[3] The postponement of all face-to-face academic activities at the peak of the pandemic redefined the role and responsibilities of students regarding their own learning. Students were solely accountable for their time management and the number of hours dedicated to their studies during the lockdown. At the current study site, the change in lecture format encouraged student-centred learning as students were expected to engage with the available material prior to and in preparation for a class discussion on the topic. Interestingly, students felt empowered to supplement formal teaching with information from the internet such as YouTube videos and case discussions on their social media groups. This may be described by the self-determination theory which, as defined by Ryan and Deci (2017), "elaborates how sociocontextual factors either support or impeded an individual's motivation through fulfilment of their basic psychological needs", namely "autonomy, competence and relatedness".[16]

Despite the positive outcomes of self-directed learning, staff participants raised concerns regarding poor attendance and students' inattentiveness during online interactions. Both staff and students of the current study reported that online learning was impersonal and less engaging than face-to-face lectures. The study by Shah et al. (2021) concluded that student engagement may be stimulated by a learning climate that fulfills the basic psychological needs of students.[2] Furthermore, the authors placed emphasis on the importance of prioritising students' psychological needs for the benefit of their wellbeing, as a means of improving their online learning experience and building resilience for future disruptions to learning.[2] While the current study site provided students with an allocation of data, internet connectivity was often unstable and varied depending on their area of residence. Sarwar et al. (2020) reported challenges relating to online learning such as limited internet access and poor student-teacher engagement.[17] Studies by Wang et al. (2021) in China and John and John (2021) in South India concurred with these findings.[18,19]

Face-to-face teaching was preferred by students as this method was familiar and they were more focused when physically attending lectures. Face-to-face lectures were also considered more engaging than the online format and enabled lecturers to identify students who did not understand the content. Despite participants' preference for traditional, classroom-based lectures, the use of blended learning was considered as an effective method of incorporating online learning into the curriculum rather than being implemented in isolation. Kim et al. (2008) defined blended learning as the combined implementation of in-person and online teaching.[20] While this method requires access to technological devices and stable internet connection, self-directed learning was encouraged by "enhancing student autonomy and motivation".[21,22] Students in the study by Løset et al. (2022) similarly supported the resumption of face-to-face teaching after the pandemic and "asynchronous video lectures" [23] which are pre-recorded and accessible at students' convenience rather than at a scheduled time.

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As reported by participants of the current study, the delivery of the medical emergencies module was affected due to restricted contact with students and patients. Lecturers created and shared videos that demonstrated relevant content to students. According to Machado et al. (2020), various forms of social media such as Facebook, YouTube, WhatsApp and Instagram may serve as alternative teaching platforms.[24] The same authors cited a study by Alshiekhly et al. (2015) who supported the use of Facebook when teaching the theoretical aspect of medical emergencies.[25]

As with all forms of teaching, assessments were conducted online. The examiners allocated a time limit for each question in order to prevent students from consulting their notes. While this was understood by students, participants noted that unstable internet connectivity and the limited time available to answer each question presented challenges. Chang et al. (2021) recommended the use of a lockdown browser to prevent students from searching for answers online during their assessments.[1] A further suggestion was to virtually monitor students during their tests through platforms such as Zoom and Google Meet.[13,26]

Preclinical training was severely affected during the pandemic, as reported by the 2021 cohort of participants. Students expressed feeling underprepared due to their limited experience within the laboratory prior to treating patients in a clinical setting. Several solutions have since emerged from the literature as a means of continuing this aspect of training should similar circumstances arise. The use of haptic or virtual reality devices has been supported as a replacement for traditional phantom heads, which are used during preclinical training, and as a means of refining students' dexterity and fine motor skills.[1,27,28] As reported by Gailbourg et al. (2020) and Shrestha et al. (2020), portable instruments and equipment such as manikins may enable students to conduct preclinical training at home.[29,30]

Once contact training resumed, students attended preclinical and clinical sessions in designated groups which limited overcrowding. Safety protocols at the study site included the stringent use of PPE in and around the clinical area, as well as vaccination of students and staff to prevent transmission of the virus. As supported by Meltazou et al. (2021), staff and students were monitored for symptoms daily.[31] Løset et al. (2022) reported that the University of Bergen in Norway implemented "reinforced infection control measures" which included the use of face masks within the faculty, additional infection control equipment and a high standard of hand hygiene.[23] The authors also reported that students, staff and patients who presented with respiratory symptoms were not accommodated in the clinic.[23] The University of Malaya employed similar screenings and prevention measures.[7] The aforementioned institution also ensured that each clinical cubicle was contained, a safe PPE donning and doffing area was created, students only treated one patient per session and that dental materials and equipment were available in a cubicle to "minimise the movement and interactions between students and staff".[7] Sharaf and Kabel (2021) supported the use of a rubberdam during indicated procedures, the use of 70% ethyl alcohol and sodium hypochlorite as disinfectants between appointments and wearing face shields.[32]

Both the 2021 and 2022 cohorts of students reported limited exposure to patients, partly due to a decrease in patient intake and attendance of appointments. Another common concern among the students was their ability to achieve curricular requirements such as clinical quotas amid these challenges. The 2021 cohort expressed concerns regarding insufficient clinical training and resultantly being underprepared as graduates. Students' trepidation regarding the effects of the pandemic on preclinical and clinical training were similarly expressed by participants in the studies by Brondani and Donnelly (2020) and Karaaslan et al. (2020).[33,34] Løset et al. (2022) reported that one in five dentistry students either considered postponing their studies or did so due to limited clinical training, uncertainty and stress relating to the pandemic, lack of training due to quarantine, restricted social interaction and their mental health.[23] According to the same authors, the fourth-year students "were significantly more stressed" as a result of their limited clinical proficiency (p=0.012) and concerned about graduating as competent dentists.[23] Similarly, Loch et al. (2021) reported that students were "concerned about completing clinical and graduation requirements".[30]

While this was not identified as a theme, the reintroduction of community-based learning in 2022 motivated and encouraged students to interact with professionals from varying disciplines and to gain clinical competence in unfamiliar dental settings. The 2022 cohort of students were therefore more confident in their skills and ability to successfully graduate compared to the 2021 cohort. These results may highlight the value and benefits of community-based training within a dental curriculum, a finding which is also supported by the literature.[36-39]

## LIMITATIONS

Since focus group participants were recruited from a single study site, the sample may not be representative of the broader population in the country. Data triangulation was therefore used to overcome sample bias. The researchers conducted a cross-sectional study and curriculum review. These findings were not reported in this article.

The focus group discussions were conducted virtually as opposed to in person, which requires access to a suitable technological device and stable internet connectivity. These restrictions may have prevented interested individuals from participating. Participants' cameras remained off for the duration of the discussions. Flayelle et al. (2022) reported that participants may be distracted by their surroundings, limiting their ability to interact with others. Lastly, non-verbal behaviour such as eye contact and body language were not observable.

## CONCLUSION

This study aimed to provide a comprehensive overview of the impact of COVID-19 on dental education at a South African institution. This was achieved through the student focus group discussions and staff interviews. While the results of this study cannot be generalised due to the use of a single study site, several findings were consistent with the literature. Moreover, the results contribute to the existing understanding of staff and students' experiences during this unprecedented time.

Suggestions for future research may include follow-up studies that investigate the long-term effects of the pandemic on dental institutions and the students who graduated during this period. Further insight is required to understand how the respective graduates have managed the transition from students to dental professionals. This information may also enable institutions to implement curricular changes and

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support systems that benefit future students who encounter similar circumstances.

As highlighted by this study, future studies that investigate students' perceptions of their residential environment and its effects on their mental health may be valuable in understanding underlying challenges and enabling institutions to provide support where needed.

Recommendations from this study include the re-evaluation of a student's role in their academic journey. Through encouragement and empowerment, students should engage in self-directed learning thus redefining the role of the lecturer from the source of information to a facilitator in the learning process.

The advancements in technology should motivate institutions to keep abreast of the latest teaching aids and dental equipment to teach students according to current practice. The implementation of virtual reality simulators or take-home manikins, for example, may limit future disruptions to preclinical training.

Lastly, institutions may consider extended platforms for clinical training, such as local dental practices, that expose students to procedures in the absence of formal training at the institution.

The knowledge acquired by institutions during the pandemic must serve as a foundation for future events that jeopardise the delivery of dental education. A resilient model can play a key role in guiding decision-making and policy development, particularly in terms of staff-student interactions and the implementation of virtual contingency plans to address potential disruptions in the curriculum. As a solution, institutions may also consider embracing innovative and untraditional ways of training students. Furthermore, institutions must find ways to support staff and students academically, emotionally and mentally. Although cited in previous studies, this article further highlights the importance of consultation and dissemination of information among institutions for the progression of dental education.

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### Ethics approval

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### Competing interests

The authors declare they have no competing interests.

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# Online CPD in 6 Easy Steps

**The Continuing 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.**

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# Care and Compassion in Healthcare Provision

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LM Sykes[1]; J Bester[2]

## ABSTRACT

The quality of patient care forms the basis of all doctor-patient relationships. However, it requires more than mere provision of what is necessary to maintain or restore their health, and should encompass an emotional connection, and a desire to help them.

Care covers a wide range of activities and is often seen as the technical and procedural aspects of medicine, while compassion revolves around the relational aspects of patient care. It requires clinicians to be able to express empathy and understanding, share their patients' feelings, be available, communicate, try to provide support and encouragement, and treat them with respect and dignity. This paper discusses care and compassion and explores issues such as whether a person can be taught to care and/or show compassion; if too much compassion could cloud a practitioner's judgement; if it's possible to deliver good care without being compassionate; and whether a person who has never experienced compassion can develop this ability.

Care and compassion are essential components of effective medical practice, and need to be integrated into healthcare. Clinicians should adopt a patient-centred approach that prioritises the patient's values, needs and preferences during their decision-making process. At the same time, they must cultivate emotional intelligence, and identify when they need mental, emotional or physical support.

## INTRODUCTION

In health provision, the quality of patient care forms the basis of all doctor-patient relationships, and can impact the outcomes and effectiveness of the treatment, as well as the patient's overall wellbeing. However, providing good quality care alone may not be enough in terms of treating patients holistically.[1] Jane Cummings, the NHS England Chief Nursing Officer, was one of the first to identify this gap. She tried to formulate a way of describing and "conveying the values which she felt should be part of the culture and practice within healthcare organisations". In 2017, she proposed the "6 Cs model where the Cs refers to the need for Care, Compassion, Courage, Commitment, Communication and Competence.[2,3] This paper will use her model as a basis for the discussion around the need for both care and compassion in all healthcare settings where patients are treated.

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2. Janette Bester – 40%;

### Care and compassion

The Oxford English dictionary defines care as "the provision of what is necessary for the health, welfare, maintenance and protection of someone or something". The definition of compassion is similar but includes "having a strong feeling of sympathy and sadness for the suffering or bad luck of others and a wish to help them".[4] Thus, compassion entails recognising their suffering, and attempting to share their emotional state in order to gain an understanding of how they feel, and then taking action to help. It is a tangible expression of love for those who are suffering or in need.[2] Both care and compassion may share many characteristics, but there are also a number of fundamental differences. From an ethical viewpoint many believe that compassion should be considered as the first ethical principle required in order to deliver quality of care.[5,6]

To explore the characteristics of caring and compassion desired by those who practice medicine, dentistry or allied healthcare services we need to first look at the way in which students are trained. This includes assessing their behaviour when interacting with their teachers, peers and patients, the supervisors' roles in guiding them during all patient interactions, and how all of these may impact on their final conduct and manner of performance in practice.

Caring for someone refers to the act of showing kindness and concern for them. Care in medicine relates to the actions and services that need to be provided to maintain or improve a patient's health. This covers a wide range of activities such as careful clinical examination, formulation of the correct diagnosis, provision of the appropriate treatment including those steps needed to prevent illness (such as vaccines and lifestyle advice), management of chronic conditions, provision of palliative care and/or symptomatic relief, and patient education to inform them about their condition and empower them to manage themselves better. Care is often seen as the technical and procedural aspects of medicine, involving knowledge, skills, and requisite competencies acquired through education and experience (ChatGPT, June 16 2024). Compassion on the other hand goes beyond this and includes the more emotional aspects. The word CARE itself may be expanded upon and used as an acronym for the additional qualities that are needed to turn care into compassion.

**C –** The first **C** entails **C**onnecting with another person during times of suffering and distress, and understanding their suffering and vulnerability. Thereafter there needs to be honest and open **C**ommunication with them using understandable language and delivering the appropriate amount and detail

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of information they will need, at an appropriate time and level. Clinicians also need to be **C**ommitted to their duty to serve and strive to do everything within their power, training, expertise, ability and job description when providing treatment. This includes taking pride in themselves and their work and delivering quality healthcare. **C**ompetence requires that all healthcare providers ensure they are skilled enough to carry out the requisite treatment, to constantly update themselves by attending refresher courses, reading relevant peer reviewed literature, consulting with colleagues, manufacturers or product specialists, and enrolling in regular hands-on training courses when new technology emerges. It also entails them to know if and when to refer their patients to more skilled or competent colleagues. **C** also relates to the need for **C**ompassion and the ability to provide **C**omfort to patients and their families in times of illness. The "sick role" often places patients in a vulnerable position and they value this emotional support as much as the actual therapy or intervention. Finally, **C** also talks to having the **C**ourage to be open and honest when informing patients about their condition. To this end they must tell them the truth about their condition, its aetiology and possible treatment options.

**A –** Refers to paying **A**ttention to the patient when they present with their initial complaint and desires, and how closely these relate to their actual needs. Healthcare professionals are often overwhelmed with the number of patients they are expected to care for, yet they are still expected to give individual attention to each one. They must then present their patients with viable **A**lternatives, explaining the relevant risks and benefits, pros and cons, and time and financial costs associated with each. They need to also ensure they equip and allow the patient to make an **A**utonomous decision as to the chosen treatment and how this may impact their future wellbeing and livelihood. To this end the treating therapist may provide **A**dvice and offer and opinion, but the final decision is still in the hands of the patient, and they need to respect that choice.

**R –** refers to showing **R**espect to patients, by taking the time to listen, and engage with them as individual people and not just as medical cases or conditions. Their behaviour in this regard can often be traced back to how they dealt with patients as a student. Those who viewed patients as a "means to a quota" very often take this mindset forwards into practice where the patient is seen as an entry in an appointment book, a number in the bank balance or a condition to be managed. They forget that patients are people with emotions and feelings on top of their medical ailments.[7]

Medical humility may also form an important part of respect for patients. Coulehan defined it as "unflinching self-awareness; empathetic openness to others; and a keen appreciation of, and gratitude for, the privilege of caring for sick persons".[8] In a study conducted by Ruberton et al (2016), it was found that clinicians who displayed general humility towards their patients were perceived as more effective communicators compared to those who exhibited less humility. This aligns with the concept of humility as a state focused on others rather than oneself. Instead of asserting their authority and potentially alienating patients, humble clinicians demonstrated sensitivity and empathy in their communication.[9]

**E –** relates to the duty to **E**mpower and **E**quip patients to take more ownership of their own health and wellbeing. For this to happen, they need to first **E**ducate patients about their condition, how it developed, how it can be treated, how to maintain their health after treatment, and how to prevent or limit further progression of the ailment. It is closely linked to autonomy, and ensuring that patients have the ability to make sound and appropriate decisions for themselves. Healthcare professionals also need to show **E**mpathy and provide **E**motional support.

Thus, based on the above, we can see that although care and compassion are different, they are also deeply interconnected, and each enhances the other. Caring involves action, while compassion includes the emotional and relational aspects of patient care, of having a connection with them, trying to understand their needs, and then driving actions aimed at meeting those needs. It requires clinicians to be able to express empathy and understanding through sharing the feelings of their patients, being physically and emotionally present and available, being able to communicate on various levels and engage in meaningful conversations, acknowledging patients' concerns, providing support, comfort and encouragement, attempting to alleviate their fears and anxiety, treating them with respect and dignity, and seeing them as individuals with unique and specific needs, desires and values (ChatGPT, June 16 2024).

Providing technically proficient medical services without empathy can make a patient feel like they are not seen or valued as individuals, leading to dissatisfaction and a lack of trust in the healthcare provider. At the same time, expressing empathy and concern without delivering the correct or appropriate medical treatment is clinically, ethically and legally unacceptable. Being able to balance the two is crucial for holistic patient care. Patients who feel understood and respected reportedly have more positive experiences, are generally more satisfied, tend to be more complaint and adhere better to treatment and advice, and ultimately experience improved overall health outcomes. At the same time, healthcare professionals who practice compassion often have greater job satisfaction and enhanced mental and emotional wellbeing (ChatGPT, June 16 2024).

## Further ethical issues to ponder

There are a number of other ethical issues related to care and compassion that can be considered. Most of these do not have definite answers, but are posed as questions that aim to stimulate healthcare providers to introspect and think about the way in which they see themselves, and how this impacts the way they manage and treat their patients.

1. **Can a person be taught to care and/or show compassion, especially if these qualities are not innate in their personalities?**

This issue has been debated widely in the field of child development in the nature versus nurture debate. Some believe that a person's genetic predisposition (nature) guides their behaviour, while others argue that their emotions and actions are moulded by their life circumstances, physical world and the way they are raised (nurture). The arguments generally revolved around "stability" versus "plasticity".[10] However, most recent behavioural epigenetic research has indicated that life experiences can affect gene expression.[11] In other words, "nature is vulnerable to nurture, and there is evidence for bidirectional and interactive effects between parenting and children's characteristics".[12] Children need appropriate experiences during the different phases of

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their development to "support and promote their interest in exploration, experimentation and self-direction".[13] It is believed that exposing a child to nurturing ways that are adapted to their nature will lead to desirable consequences and growth of the individual, and society at large.[14]

Current teaching also revolves around promoting "self-directed learning". A crucial element relates to the guidance and feedback students receive from their tutors. This interface between teacher and learner can enhance, or be detrimental to learning, depending on the mode of delivery.[15] The efficacy will depend on the teacher's ability to appropriately convey the message, as well as the student's ability and willingness to self-reflect, and to adapt when necessary.[16] Immermann believes that students will regulate their learning through self-efficacy, belief and motivation. The aim should be to help learners develop skills such as self-control, metacognitive monitoring, perseverance in trying to successfully complete a task, the ability to reflect on their performance, take responsibility for their own failures, and then adapt accordingly.[17] It goes hand in hand with emotional intelligence which is believed to be necessary in order to attain practical skills, and is based on five key components: self-awareness, self-regulation, motivation, empathy and appropriate interaction with others.[18] The emotional intelligence obtained during undergraduate training may then allow the clinician to be cognisant of interpersonal relationships and have more empathy for their patients.[18] Unfortunately, many medical and dental curricula are overloaded and do not allow time for this reflective process and subsequent engagement. In addition, they are often still discipline-based and quota-centred. This results in uncoordinated care with students addressing biological needs rather focusing on a holistic approach that encompasses the broader biopsychosocial aspects of their and their patients' lives. The risk is that this mindset could be carried into their future practice where the chasing of quota is replaced with an obsessive pursuit for money. In both cases, the patient is a means to an end that benefits them first and foremost.

What makes it challenging to develop and incorporate compassion in healthcare training is that there is a lack of understanding of how compassion is conceptualised by clinicians and patients.[6] In addition, compassion has been linked to the ability to experience emotions evoked by specific thoughts, or from witnessing certain events and/or conditions in others, and in believing that their suffering is a terrible thing. The degree of compassion experienced is, in turn, influenced by a person's preconceived ideas about suffering, their religious or cultural beliefs, their personal experiences and their value systems.[6]

**2. In medicine, does compassion matter as long as the patient gets the correct treatment when needed?**

Compassionate care involves acting with kindness and sensitivity to the suffering of patients, who are often already feeling vulnerable due to the possibility that they could lose their independence, self-respect and control over their own bodies.[19] Krolak believes that "empathetic people are more popular, gain more trust and have a better ability to motivate others".[18] Thus, for a clinician, having these qualities would be beneficial in the doctor-patient relationship where communication and compliance play a key role in treatment outcomes. Goleman believes that the term empathy encompasses three elements, all of which are desired in the doctor-patient situation. These include: having the knowledge of what another person is feeling; as feeling what the other is feeling; and as reacting with sympathy to their pain.[18] (Goleman cited by Krolak.) If we add a fourth element of trying to assist, then empathy would equate to the definition of compassion. It is also believed that "the higher the empathetic skills, the better the patient relationship will be in terms of verbal and non-verbal communication, safeguarding against stereotyping and bettering the patient's levels of satisfaction after their consultations" (13). This could indirectly have a positive effect on the clinician in terms of decreasing their workloads as it was found that the more satisfied the patient, the fewer times they returned for follow-up visits and the less number of complaints they have at these visits.

**3. Can too much compassion prevent a person from delivering the appropriate care, and can it cloud a practitioner's judgement?**

Some clinicians aim to please every patient's needs and desires, no matter how unrealistic the expectations. This is humanly impossible, and runs the risk of affecting them personally. Sykes and Postma (2022) debated the issues around being self-ish, self-less or well-balanced (which they termed being "other-ish"), and how this may relate to the practice of medicine and dentistry. They postulated that healthcare providers who take the patient's illness or dissatisfaction as a "personal failure may become stressed or depressed. They termed those who try too hard to meet all their patients' demands, even at the expense of their own health or pocket, as "selfless givers". Examples of this type of behaviour include practitioners who try to give every patient the best treatment, even for those who cannot afford to pay for it. In these cases they undercharge for their services, sponsor materials or cover laboratory costs, resulting in them being out of pocket. Others concede to patients' desires for treatment times, and may start work very early, finish late and even consult over weekends or on public holidays to accommodate their patients' schedules. In so doing they sacrifice personal relaxation and family time. In extreme cases healthcare providers may be pressurised to carry out more complex procedures than they are trained or certified to handle. This often happens in situations where a patient cannot afford to see a specialist, but still wants to have the procedure done. This places immense stress on an ethically conscious practitioner, who may also have to endure the fear of failure or be responsible for any repercussions of actual failure. While being selfless is admirable, therapists who are relentlessly selfless givers, to the point of neglecting their own interests, can end up doing a greater disservice to themselves and their patients. They run the risk of burning out and/or developing resentment towards their careers. This, in turn, deprives them of energy, and leaves them in a state where they are of no use to the very people they set out to please.[20] This condition has been described as "compassion fatigue", and has been widely discussed in literature. It refers to a healthcare provider's reduced capacity to care as a result of repeated interactions requiring high levels of empathic engagement with distressed patients. Fatigue in healthcare providers can lead to reduced service quality, low levels of efficiency, high attrition rates and, eventually, workforce dropout. These all have a major impact on patient care and outcome. To mitigate the risk of developing compassion fatigue in healthcare providers it is important to educate them on identifying the condition and provide them with the tools to manage and deal with their own mental, physical and emotional health issues appropriately. As stated by Prof

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Flavia Senkubuge (personal correspondence): "There is no honour in NOT taking care of yourself".[20]

**4. Can one deliver good care without being compassionate, and what does a patient value more – the outcomes of the therapy or the manner in which it was delivered?**

Patients have a right and expect to receive high quality, competent care. This entails they be given a comprehensive clinical examination, get an accurate diagnosis, be offered treatment alternatives and understand the risks and benefits of each, make autonomous educated decisions, and then be provided with the best management possible given their circumstances. The clinician also needs to ensure that, as far as possible, all treatment provided is appropriate, and given safely and efficiently. High quality of care helps prevent complications and promotes better and faster recovery (ChatGPT, June 16 2024). At the same time, patients need to feel valued as individuals. Compassionate care recognises the need for emotional and psychological support which can help reduce anxiety, stress and feelings of isolation. Open and empathetic communication channels allow healthcare providers to have a better understanding of patients' needs, leading to more accurate information sharing. It also helps build trust between the patient and their healthcare providers, greater understanding and often to improved adherence to recommended treatment. Compassionate care has been shown to be associated with higher levels of patient satisfaction, less post treatment consultations, fewer incidences of litigation and overall better outcomes. Generally, patients do not value one over the other but rather seek a balance between both. Effective care without compassion can feel impersonal and cold, while compassion without competent care will leave the patent with unmet needs and is legally unacceptable.

**5. Can a person who has never been cared for or experienced compassion be aware of what this entails and can they then learn how to exhibit care and compassion if shown?**

Psychologists believe that compassion can be learnt and cultivated through various practices and approaches. However, the first requisite is that the clinician needs to be aware that they lack this characteristic and must want to develop this attribute. Literature is replete with advice and programmes aimed at bettering oneself. Interventions include practicing mindfulness and meditation to help a person increase self-awareness as well as awareness of others' suffering; practicing focusing on thoughts of goodwill and kindness towards oneself and others; empathy training to better understand and share the feelings of others; developing active listening skills to be able to see situations from another person's perspective; reading and attending workshops that highlight how to identify different perspectives and experiences; volunteering in services to help others; cultivating and building strong supportive personal relationships that emphasise kindness, understanding, mutual respect and compassion; regular reflection on one's own thoughts, feelings and actions; journalling, or taking part in group discussions and mentorship programmes with trusted counsellors or friends; practicing self-compassion which then makes it easier to show the same to others; and learning from compassionate role models (be it historical figures, current leaders, international celebrities or personal acquaintances). By incorporating these practices into daily life, individuals can gradually develop a more compassionate mindset and behaviour.

## CONCLUSIONS

Both care and compassion are essential components of effective medical practice. Care ensures that patients receive the necessary and appropriate medical interventions. Compassionate care is broader and more holistic as it recognises the patient as a whole person and not just a medical condition, and aims to ensure that the interventions are delivered in a way that respects and values their individuality. It addresses their mental and emotional states along with their physical health. To integrate both effectively, healthcare providers should aim to develop communication skills that encompass active listening, and providing empathetic responses that will include giving clear explanations, offering viable alternatives and guiding patients toward making the best decisions about their own health status. They should also adopt a patient-centred approach that prioritises the patient's values, needs and preferences during their decision-making process. At the same time, they need to look after themselves by cultivating emotional intelligence and be able to identify and manage their own feelings and responses, and also be able to identify when they need mental, emotional or physical support.

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# Tertiary Treponematosis of the Nasal Cavity – Oral Medicine Case Book

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## ABSTRACT

Both genital and non-genital treponematoses are overtly similar in pathogenesis, natural history and histologic features. In the head and neck, a relatively small percentage of untreated, infected patients may progress from latency to tertiary disease, with perforation or collapse of the palate and nasal septum. Due to the rarity of tertiary disease and the non-specific histomorphologic features, the disease may go undiagnosed, often with dire consequences. Clinicopathological correlation, a high index of suspicion and a judicious mix of histological and immunohistochemical stains may help the pathologist in arriving at the correct diagnosis. In this article, we report a unique case of nasal treponematosis in a young South African male, discussing the clinical findings, histological features and diagnostic methods of detection.

### Keywords

Tertiary Syphilis, nasal cavity, Treponema pallidum, Immunohistochemistry, Granulomatous inflammation, Treponematosis, endemic syphilis, South Africa.

## INTRODUCTION

The human treponematoses comprise sexually transmitted syphilis and endemic forms of the disease. The etiologic agents of human treponematoses are gram negative bacteria that belong to the genus Treponema. There are three subspecies of Treponema pallidum: T. pallidum pallidum that causes sexually transmitted syphilis, T. pallidum pertenue and T. pallidum endemicum that cause endemic non-sexually transmitted treponematoses; yaws and bejel (endemic syphilis) respectively.[1] Yaws generally occurs in tropical countries, such as Ghana and Indonesia. In contrast, endemic syphilis (bejel) occurs in warm, arid areas (Southern Africa, Kuwait and Saudi Arabia). Endemic treponematoses are usually seen in children and young adults, and are commonly transmitted through food utensils.[2-4]

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The clinical manifestations of sexually transmitted syphilis and endemic treponematoses are commonly divided into early stage (comprising primary and secondary manifestations) and late stage. Early-stage lesions are highly contagious and can persist for weeks to months, or even years.[1] When early lesions resolve spontaneously, patients enter a latency phase that, in many cases, lasts for a lifetime. In a relatively small percentage of untreated patients, however, the infection may progress from latency to tertiary disease, characterised by destructive lesions of skin, bone and cartilage.[1] The pathognomonic head and neck manifestation of tertiary disease is perforation/collapse of the palate and nasal septum, producing the characteristic saddle nose deformity.[5] If left untreated, tertiary syphilis has some of the most devastating clinical manifestations as it exerts its effects on the cardiovascular and nervous system (neurosyphilis).[6]

Proper diagnosis requires, first and foremost, that treponemal disease be part of the pathological differential diagnosis, especially if not clinically suspected.

We report a rare case of nasal treponematosis in a 17-year-old South African male patient and discuss the clinical spectrum of disease along with the diagnostic histopathology.

### Clinical and radiological presentation

An African 17-year-old male patient presented at the Ear, Nose and Throat (ENT) outpatient clinic of Tygerberg Hospital (Cape Town, South Africa) with a unilateral left-sided nasal obstruction, which had been progressively worsening over the course of one month. Additionally, the patient reported intermittent left-sided epistaxis, with no accompanying hyposmia/anosmia, rhinorrhoea, pain, eye changes or neurological symptoms. The patient had no significant past medical history, including no prior surgical procedures in the region or trauma to the nose.

On clinical examination, an exophytic mucosa-surfaced mass was observed bulging into and nearly completely obstructing the left nasal cavity precluding optimal endoscopic evaluation. Flexible endoscopy of the right nasal cavity revealed no extension of the mass into the nasopharynx. The patient also presented with bilateral single, mobile and non-tender upper cervical lymph nodes.

A contrasted CT scan of the paranasal sinuses revealed a soft tissue mass centred in the left anterior nasal cavity, involving the left inferior turbinate and causing saucerisation of the frontal process of the maxilla, maxillary spine and perpendicular ethmoid plate. Importantly, there was no extension of the mass into the maxillary or ethmoid sinuses

**Figure 1**. A contrasted CT scan of the paranasal sinuses demonstrating obliteration of the left nasal cavity by a polypoid lesion. Closer inspection of the CT reveals perforation of the nasal septum.

(Figure 1). The main clinical differential considerations included pyogenic granuloma, nasal polyp and juvenile angiofibroma.

## Histologic features

An incisional biopsy of a representative area was performed under local anaesthesia and the specimen was submitted for histological evaluation. Gross examination revealed a 2.2 x 0.8 x 0.3cm polyp with surface ulceration. Microscopically, the polyp was surfaced by a metaplastic squamous epithelium. The subepithelial connective tissue exhibited a dense non-specific lymphoplasmacytic infiltrate with scattered vague granulomas, consisting of epithelioid histiocytes. Focally, a necrotic background was seen with occasional eosinophils (Figures 2 and 3). Special stains, PAS+D and Methanamine silver were negative for fungi, while Zheel Nielsen (ZN) and Fite were negative for mycobacteria. The plasma cells were strongly immunoreactive for CD138 (Syndecan-1) and PLA (VS38c). Kappa and Lambda in situ hybridisation showed a polycolonal population of plasma cells. CD 56 IHC and EBER in situ hybridisation were negative. Treponema pallidum IHC was positive for spirochetes. The spirochetes were predominantly intraepithelial (epitheliotrophic) with scattered stromal organisms (Figure 4). Based on the histological and immunohistochemical features, a diagnosis of nasal treponematosis was made. The differential diagnosis included sexually transmitted syphilis and endemic syphilis. Due to the relatively young age of the patient at presentation, the possibility of endemic syphilis was favoured. Serological tests, Venereal Disease Research Laboratory (VDRL) and HIV were recommended. However, the patient was subsequently lost to follow-up. Closer inspection of CT images revealed perforation of the nasal septum (Figure 1).

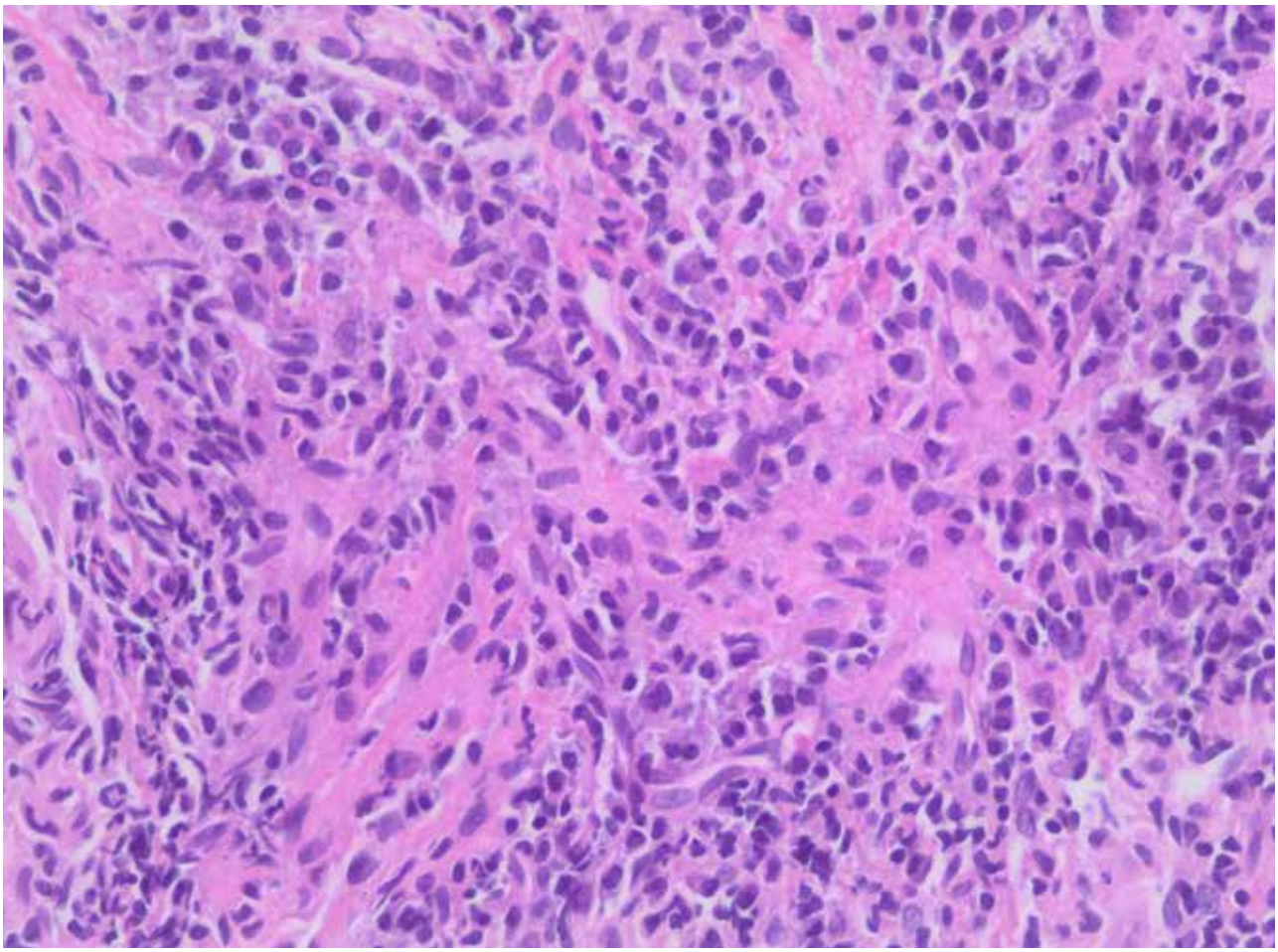

**Figure 2.** A vague granuloma is seen consisting of epithelioid histiocytes, surrounded by a dense plasmacytic infiltrate (H&E, x40)

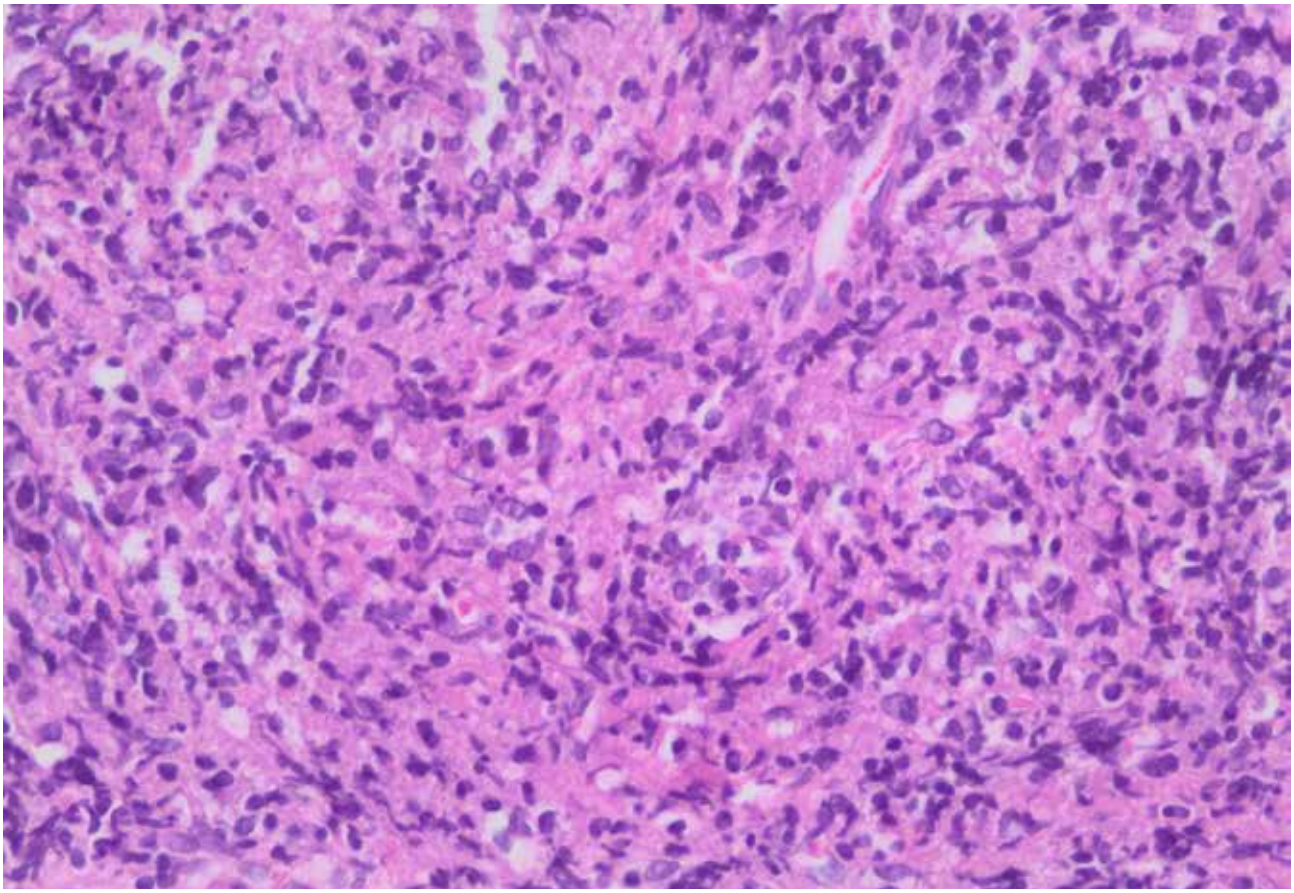

**Figure 3.** Vague granulomatous inflammation with necrotic background with an occasional eosinophil (H&E, x40)

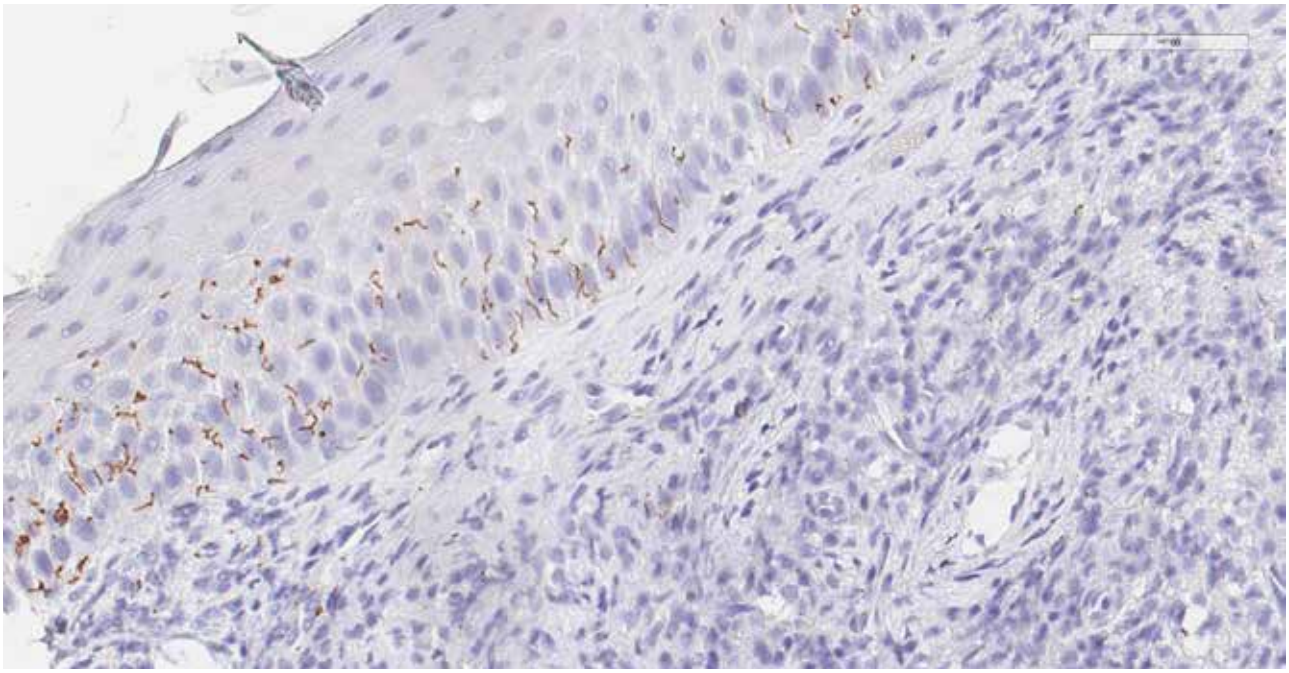

**Figure 4.** Treponema pallidum IHC shows numerous elongated coiled intraepithelial spirochetes. A few stromal spirochetes are also noted (IHC, x40)

## DISCUSSION

In 1948, there were about 50 million cases of yaws, one million cases of endemic syphilis (bejel) and 20 million cases of sexually transmitted syphilis worldwide.[7,8] This prompted the World Health Organization (WHO) and the United Nations International Children's Fund (UNICEF) to lead a screening campaign in 46 developing countries, treating individuals with evidence of active and latent infection with penicillin.[9] By the end of the campaign, the worldwide burden of cases of endemic treponematoses was lowered to 2.5 million cases, a staggering 95% reduction.[9] Unfortunately, these impressive achievements encouraged the WHO to gradually halt the targeted control programmes with resurgence of the endemic treponematoses in many developing countries.[10]

According to the WHO, there were 7.1 million new cases of sexually transmitted syphilis in 2021.[11]

Sexually transmitted syphilis is prevalent in populations seemingly at high risk for contracting a variety of sexually transmitted infections. These populations include men who have sex with men, people who have sex with men who have sex with men, and those who may be immunocompromised for a number of reasons, including oncologic care, but in Africa, particularly prevalent in HIV-positive patients.[12] Transmission occurs vertically and by sexual contact, the latter accounting for 90% of the infections. Additionally, given the introduction of prophylaxis against HIV infection, particularly in developed nations, sexually transmitted infections other than HIV have shown marked increases.[13]

In Southern Africa, endemic syphilis appears to have been prevalent in Southern Zimbabwe, South-Eastern Botswana, Bloemfontein and Western Cape, Northern and Western Gauteng, extending into the Karoo and Northern Cape.[14,15] Endemic syphilis is primarily spread via saliva, especially by contaminated drinking/eating utensils. Direct lesion to skin contact is also important. Overcrowding and suboptimal community hygiene likely play a role. Childhood endemic syphilis provides immunity to sexually transmitted syphilis in adulthood.[14]

Intraoral chancres and mucous patches are characteristic primary and secondary manifestations of sexually transmitted and endemic treponematoses.[16] Chancres are painless ulcers with indurated, well-circumscribed borders and a purple base that appear 2-3 weeks following Treponema pallidum inoculation. Because they are painless, they often go unnoticed and untreated. Intraoral chancres commonly develop on the lips, dorsal surface of tongue and tonsils. The highly infectious chancre-ulcers typically persist for 3-7 weeks. Twelve weeks after the chancre's appearance, and if left untreated, the patient enters the secondary phase of the infection with fever and generalised lymphadenopathy. Head and neck manifestations of secondary disease are hyperplastic coalescing maculopapular lesions (condyloma lata) that develop along the nasolabial folds and "mucous patches".[16,17] Intraoral mucous patches are raised hyperplastic lesions with a grey membrane. Once early lesions resolve spontaneously, the patient enters a latency phase that, in many cases, lasts for a lifetime. In a relatively small percentage of untreated patients, however, the infection may progress from latency to tertiary disease, characterised by granulomatous destructive lesions of skin, bone and cartilage.[1] Destruction of the nasal bony framework and, ultimately, the contraction of fibrous tissue, results in the distinctive saddle nose deformity.[5]

Histologically, the treponematoses present with a non-specific lymphoplasmacytic infiltrate with perivascular cuffing of plasma cells and necrotising granulomatous inflammation. In some cases, the granulomas may be vague or obscured by the dense infiltrate of plasma cells (Figures 2 and 3). As the histological findings are non-specific, the major issue is considering syphilis in the differential diagnosis. A high index of suspicion and clinicopathological correlation are the key to correct histological diagnosis. First and foremost, it is crucial for the practicing histopathologist to be aware of the recent rise in the number of syphilis cases worldwide and the varied symptomatology of the disease in the head and neck region (ulcers, polyps, perforations, mucous patches, etc) to ensure proper diagnosis. If a diagnosis of syphilis is suspected, it is important to alert the clinician to the appropriate additional investigative techniques which will allow a sound diagnosis to be attained. Our study serves to emphasise the importance of clinicopathological correlation in the assessment of a polypoid intranasal mass with septal perforation to remind pathologists of tertiary syphilis as an aetiological factor in destructive midline lesions. The mimicry of several other conditions confounds the specificity of the changes. However, careful scrutiny of all the histopathological features may permit a relatively refined differential diagnosis to be established. The histological differential diagnosis usually includes bacterial (tuberculosis and leprosy) and fungal infections, sarcoidosis, plasma cell neoplasms (eg plasmacytoma) and NK/T-cell lymphoma.[18,19] Mycobacterial and fungal infections should be excluded by special histological stains, namely Zheel-Nielsen (ZN), Fite and silver stains. Sarcoidosis presents with non-necrotising granulomas and hilar lymphadenopathy. A plasma cell neoplasm can be excluded by demonstrating a polyclonal population of plasma cells with Kappa and Lambda IHC or in situ hybridisation (ISH). NK/T-cell lymphoma is a highly aggressive malignancy, endemic to some African and Asian countries, and should be strongly suspected in young African patients with destructive midline lesions. In addition, a vague granulomatous appearance may be seen in some cases of NK/T-cell lymphoma; however, careful microscopic examination shows the presence of highly atypical small irregular lymphoid cells with angiocentricity and angiodestruction, that are positive for EBER ISH and CD56 IHC. Immunohistochemistry with commercial polycolonal antibodies is more sensitive than the silver stain for direct detection of the spirochetes, especially in tertiary disease, where few spirochetes could be present (Figure 4).[20] However, Treponema pallidum IHC cannot discriminate between sexually transmitted and endemic treponematoses. It has been proposed that endemic syphilis is more epitheliotrophic (as seen in present case) than sexually transmitted syphilis (Figure 4). Serological tests such as the Venereal Disease Research Laboratory (VDRL) test are usually used as a screening test.[21] When a patient has a positive VDRL test result, specific treponemal testing should be done to confirm T. pallidum infection. Fluorescent treponemal antibody absorption (FTA-ABS) assay or T. pallidum particle agglutination (TPHA) tests are specific treponemal tests used to confirm the presence of T. Pallidum.[21] Just like Treponema pallidum IHC, serological testing cannot discriminate between sexually transmitted and endemic treponematoses. Clinicopathological correlation is essential. Nevertheless, in regions where sexually transmitted and endemic syphilis coexist, definitive and costly subtyping may not be essential, since both can be easily eradicated by penicillin.

HIV testing is essential in patients with suspected diagnosis of sexually transmitted syphilis. Co-infection is common and certainly a consideration, when unknown HIV status and nascent diagnosis of a suspected sexually transmitted syphilis subtype.[22] Being infected with syphilis enhances the susceptibility of acquiring HIV. The behaviour of syphilis in an HIV-positive individual is much more aggressive than in the HIV-negative patient.[23-24] The progression from primary to tertiary syphilis may occur over several years instead of the usual several decades in the case of HIV-negative individuals. Chancres may be more numerous, larger and deeper. In patients with advanced HIV, secondary syphilis may present as malignant secondary syphilis. This is

characterised by severe ulcerating lesions and gummatous infiltration of mouth, eye, subcutaneous tissue, bone, joints and cerebrospinal system. The likelihood of developing symptomatic neurosyphilis is also dramatically increased, especially uveitis.[26,27]

Antibiotic therapy with a single intramuscular Benzathine penicillin dose of 2.4 million units has remained the mainstay of treatment.[28] A longer duration of therapy is needed for late stage lesions. Local treatment of lesions is advised. Local treatment of the nasal lesions includes clearing the crusts and then regularly clearing the nasal passages with copious alkaline douches one to three times a day and local application of yellow mercury oxide.[5] Due to the destructive nature of the lesions, the patient may be left with a nasal deformity and atrophic rhinitis, necessitating reconstructive surgery once the patient has been cured.

## CONCLUSION

Both sexually transmitted and endemic treponematoses share similar histologic features. The diagnosis of endemic tertiary treponematosis should be suspected in a young patient with histologically positive spirochetal infection as it takes many years or even decades for tertiary lesions of sexually transmitted syphilis to develop. To ensure a proper diagnosis, a cross-disciplinary approach with close collaboration with otorhinolaryngologists and radiologists is highly recommended. Paying particular attention to all histological details allows a relatively refined differential diagnosis to be made.

The histological differential diagnosis of tertiary nasal treponematosis includes a range of necrotising midline lesions, such as tuberculosis, leprosy, mucormycosis and aggressive lymphomas. Treponema IHC is an easy, inexpensive and highly sensitive test that in recent years has replaced dark field microscopy and Warthin-Starry silver staining. Treponema IHC is particularly valuable in the setting of spirochete-poor lesions of tertiary treponemtosis. Treponema-positive patients may require serological testing for other STDs, especially HIV, as co-infected individuals demonstrate an aggressive clinical course.

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**CPD questionnaire on page 452**

**The Continuing 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.**

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# What's new for the clinician – summaries of recently published papers (September 2024)

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## 1. GINGIVAL HEALTH AND RELAPSE TENDENCY OF LOWER FIXED RETAINERS: A RANDOMISED CLINICAL TRIAL

The retention phase after orthodontic treatment is important to obtain stable results.[1] Some degree of relapse after treatment can occur, since teeth have a tendency to return towards their original positions.[1] Studies have shown that that the design of the retainer can influence both gingival health and the tendency for relapse. For instance, multistrand wire retainers are associated with better alignment retention but may also lead to higher plaque accumulation and gingival irritation compared to single-span retainers. Many types of orthodontic retainers are used after orthodontic treatment including removable (acrylic retainers, vacuum-formed retainers) and fixed bonded retainers. The two most used fixed retainers are the thick (0.025 to 0.032 inch) stainless-steel wire bonded solely to the canines and the thin (0.0175 or 0.0215 inch) multistranded wire bonded to the incisors and canines. The latter type is the most preferred fixed retainers as these are bonded to every tooth in the labial segment.[1]

Although the impact of a fixed retainer on the gingival health has been extensively studied,[1] there is very little evidence to determine the effect of the retainers' position on the periodontal health. Moreover, there is no evidence on the effect of retainers' position on their efficiency and failure rate.

Al-Nimri and colleagues (2024)[1] reported on a split mouth randomised clinical trial that sought to study the effect of retainers' position on the periodontal health of the lower anterior teeth, the retention efficacy and the failure rate.

### Materials and methods

This was a single-centre split mouth randomised clinical trial study. Fifty adult patients who provided informed consent were randomly selected from a pool of patients scheduled for debonding of orthodontic fixed appliances who also required bonded retention for the lower labial segment. Inclusion criteria were: medically fit Caucasian patients; patients whose treatment plan did not involve extraction of lower anterior teeth; those patients who had well-aligned lower incisors with normal overjet and overbite. Patients were excluded if they had missing lower anterior teeth; history of previous orthodontic treatment; evidence of active periodontal disease; transposition between lower lateral incisor and canine; patient received scaling and root cleaning after retainer placement; patients with parafunctional habits such as nail biting or abnormal tongue function.

At the debonding visit, each patient received a thorough scaling by the same clinician. The appliance was then debonded and a retainer was attached to all the teeth in the lower labial segment using Transbond LR composite. The retainer has a vertical step in the midline placing half of the retainer in the incisal third and the other half in the middle of the lower labial segment teeth (Fig. 1). A standard procedure for fitting each bonded retainer was applied.

Fig. 1

The patients were asked to attend the clinic immediately within 24 hours if the retainer was debonded from any tooth or fractured. Moreover, the patients were recalled on a monthly basis to check for any fractured or debonded retainers not noticed by the patient.

One year after debonding, all subjects were recalled and the Plaque Index (PI) and the Gingival Index (GI) were recorded for the lower anterior teeth. To obtain the PI score, the buccal, lingual, mesial and distal surfaces of the lower anterior teeth were scored from zero to three. The score for each tooth was the sum of the four surfaces divided by four. To calculate PI on the left and right side of the lower labial segment the PI scores for the lower anterior teeth on each side were averaged.

To obtain the GI, the lingual and buccal GI was scored from zero to three. The GI score for each tooth was the sum of buccal and lingual GI divided by two. The GI scores of the lower anterior teeth were summed and averaged to give a GI score for the lower anterior segment on each side of the retainer.

The secondary outcomes were to assess irregularity index (IRI) of the lower anterior teeth and retainers' failure rate. The IRI was determined by using Little's irregularity index to measure the irregularity of the lower anterior teeth.

### Results

Fifty-six patients who required bonded retention for the lower anterior segment were assessed for eligibility; 50 of them fulfilled the inclusion criteria and were recruited. Seven patients (14%) were excluded as they failed to attend the clinic at the recall visit. Complete data was collected for 43 patients. In 20 patients the incisal part of the retainer was placed on the right side and in 23 patients the incisal part of the retainer was placed on the left side.

The analysed sample consisted of 29 females and 14 males with an average age of 18.2 years. The trial design was split mouth. This design eliminated the effect of patient oral hygiene on the impact of fixed retainers on gingival health; therefore, the need for baseline data of the oral health was not necessary.

The PI and the GI were smaller on the side where the retainer was placed in the incisal third (1.05 and 0.24, respectively) compared to the side where the retainer was placed in the middle of the tooth (1.30 and 0.40 respectively). This difference was statistically significant (p=0.004 for PI) and (p<0.001 for GI).

The PI was significantly smaller on the lingual (p=0.043), mesial (p=0.020) and distal (p=0.016) surfaces of the lower incisors where the retainer was positioned incisally. Moreover, the GI score was significantly smaller on the lingual surface of the lower incisors on the side where the retainer was placed in the incisal third (p<0.001).

The average IRI on the side with incisally positioned retainer (0.07mm) was not statistically different from that on the side where the retainer was placed in the middle of the lingual surface of the lower labial segment teeth (0.11mm, p=0.194, CI -0.25-0.03). The part of the retainer placed incisal debonded in four subjects (9.3%) while that placed in the middle debonded in five subjects (11.6%). The difference was not statistically significant (p=0.52).

### Conclusion

The trial results showed that the placing the lower fixed retainers in the incisal third rather than the middle third improved the oral hygiene and the gingival health in the lingual area of the lower labial segment without affecting the efficiency or the integrity of the retainers.

### Implications for practice

The trial results showed that simple changes in retainer placement had the potential to improve gingival health and oral hygiene without affecting retainer performance.

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## 2. THE DECOMPOSITION AND BLEACHING EFFICIACY OF IN-OFFICE BLEACHING GELS WITH DIFFERENT PH LEVELS: A RANDOMISED CONTROLLED TRIAL

Dental bleaching stands out as one of the most sought-after treatments in cosmetic dentistry. Broadly, there are three main techniques for dental bleaching: in-office, at-home, or a combination of both.[1] The in-office method is recommended for individuals who struggle with tray usage or seek more immediate results. While in-office bleaching requires more time at the dentist's office and may lead to more intense side effects compared to at-home methods, it delivers some whitening degree soon after the first session.[1]

Manufacturers of bleaching products often adopt varying recommendations for applying in-office bleaching gels based on each gel's specific characteristics and the manufacturer's guidelines. Some suggest four cycles lasting 8 min each during a clinical appointment, while others propose three cycles of 15 min each. Additionally, certain bleaching gels are designed for a single application lasting 40 min per clinical session.

The risk and severity of tooth sensitivity (TS) correlate with the duration of the in-office bleaching gel's presence on dental surfaces.[1] Gels with an acidic pH can cause various alterations in the chemical composition, structure and mechanical properties of the teeth and, hence, more side effects. Conversely, gels with neutral or alkaline pH levels tend to result in fewer side effects. This emphasises the importance of examining the kinetics of decomposition profile of in-office bleaching gels on contact with dental structures to determine the most effective application time. Doing so we can prevent unnecessary exposure of the gel to the dental tissues, thereby enhancing the procedure's efficacy, speed and safety, and reducing potential side effects.

Gumy and colleagues (2024)[1] reported on a trail that sought to assess the decomposition rate and pH alterations of in-office HP gels with varying pH levels during in-office bleaching. The null hypothesis of the present study is that there is no significant difference in (1) the kinetics of decomposition of HP and (2) bleaching efficacy of HP gels between different pHs.

### Materials and methods

This was a randomised, double-blind, parallel clinical trial that adhered to the guidelines outlined by the Consolidated Standards of Reporting Trials (CONSORT). The decomposition rate and bleaching efficacy were the dependent variables while the pH of the bleaching gels (pH 5.4, 7.0, 7.7 and 8.0) were the independent variables.

To be eligible for participation in the study, individuals needed to meet specific criteria: they were required to be in good general and oral health, be at least 18 years old, and have incisors, canines and premolars free of caries lesions, restorations or endodontic treatment. Additionally, the baseline Whiteness Index for Dentistry ($WI_D$) of the right superior canine, assessed using a digital spectrophotometer (Vita Easyshade), had to be lower than 20, which represented tooth shade A2 in the Vita Classical shade guide. Exclusion criteria encompassed individuals who had previously undergone bleaching procedures, had dental prostheses or exhibited visible enamel cracks. Moreover, individuals with a history of spontaneous tooth hypersensitivity, severe tooth discoloration like tetracycline staining or fluorosis, and those with a history of bruxism were ineligible. Pregnant or lactating women, as well as patients undergoing orthodontic treatment with fixed appliances, were also excluded from participation in the study.

Before the study, predetermined group allocations were logged onto cards, which were then sealed in opaque envelopes numbered from 1 to 40. Each envelope held information regarding the brand of the respective gel. When a participant met the eligibility criteria and initial evaluations were completed, the envelope was opened, revealing the allocation assignment. This method ensured the allocation concealment during the implementation phase. The examiners were not involved in the bleaching procedures and were consequently blinded to the group assignments. Moreover, in this double-blind randomised

clinical trial, subjects were also kept unaware of their group assignments.

Forty volunteers were randomly assigned across four groups (n=10): gel with **pH 5.4** (Potenza Bianco Pro SS 38%), **pH 7.0** (Whiteness HP Automixx 35%); **pH 7.7** (Whiteness HP Automixx Plus 35%) and **pH 8.0** (Whiteness HP Blue).

The bleaching treatment was administered to all patients by three operators who had undergone calibration. All operators had to perform the bleaching protocol in five patients before the beginning of the study for calibration of all clinical steps. Before the bleaching procedures, all volunteers received dental prophylaxis involving pumice and water applied with a rubber cup, two weeks in advance. Following this, a lip retractor was inserted, and a light-cured resin dam was used to isolate the gingival tissue around the teeth to be bleached. The gingival barrier was individually applied to each tooth and light cured for 20 sec. Subsequently, the assigned bleaching gel was applied in a single 50-min session. This application time was standardised for all materials and determined through randomisation. After completion, the bleaching gel was suctioned using a disposable device, and the teeth were cleaned meticulously with gauze and rinsed thoroughly with water. Two bleaching sessions were conducted, at one-week intervals. Participants were told not to use whitening toothpaste during the study. Instead, they were instructed to use regular toothpaste with fluoride.

For the outcome: Concentration of HP of bleaching agents, the concentration of active HP was evaluated by titration with potassium permanganate at different time intervals: 0, 10, 20, 30, 40, and 50 min at the first session. The bleaching agent was applied first to the premolars and then to the remaining teeth sequentially. Before use, the molar concentration of the potassium permanganate was determined with sodium oxalate. For this study, the concentration obtained was 0.02mol/L.

At each evaluation, an aliquot weighing approximately 0.01g was collected from the premolars with a spatula and weighed on an analytical balance. This amount is equivalent to the gel amount used on each premolar surface. After the removal of the gel, a new layer of HP was placed on the surfaces to not jeopardise bleaching efficacy. Each premolar served as an individual sample, and the gel replaced on its surface was not included in subsequent collections for analysis, meaning that for each time assessment, the collection was done in a different premolar.

The gel was diluted in 20ml of ultrapure water. The diluted bleaching gel was added to 20ml concentrated sulfuric acid 1.0mol/L. The concentration of HP in this solution was determined by titration with 0.02mol/L potassium permanganate. This method was based on an oxidation-reduction reaction and quantifies the amount of HP in the solution. Potassium permanganate was added to the dilute bleaching agent at a rate of 0.1ml/s until a violet colour was observed. The colour change corresponds to the equivalence point when all the HP is consumed.

After each collection, the gel was replaced on the buccal surface of the premolars to avoid colour differences among teeth. The data was presented graphically to observe the changes over time.

For evaluation of the pH change of the bleaching gel, the pH was measured using a pH meter equipped with a circular electrode of 6mm diameter at the same intervals reported in the concentration of HP assessments. Three measurements were taken for each tooth and, subsequently, an average was computed;
For the colour evaluation, two calibrated and trained examiners conducted colour evaluations at specific intervals: baseline, one week after the first bleaching session, one week following the second session, and one month after the bleaching treatment's conclusion. The visual colour assessment employed both the value-oriented shade guide Vita Classical and the Vita Bleached guide 3D-MASTER. Additionally, instrumental colour evaluation was performed using the spectrophotometer Vita Easyshade.

Before spectrophotometer measurement, an impression of the maxillary arch was obtained using condensation silicone (Coltoflax Perfil Cub, Vigodent, Rio de Janeiro, RJ, Brazil) extending to the maxillary canine. To standardise local colour measurement, a 6mm radius window was specifically defined on the labial surface of the silicone guide within the canine area. The three-color parameters: L* (value, 0 [black] to 100 [white]), a* (red-green axis) and b* (yellow-blue axis), were measured using a spectrophotometer.

Colour change was assessed using the Whiteness Index for Dentistry ($WI_D$). Higher positive $WI_D$ values indicated greater tooth whiteness, while lower (even negative) values suggest darker teeth. In addition, $\Delta E_{ab}$ (CIELab) and $\Delta E_{00}$ (CIEDE2000) were calculated.

## Results

Seventy-two participants were examined and 40 were deemed eligible for the clinical study. Gender distribution among the groups was similar as well as baseline colour. The age of patients ranged from 18 to 48 years, with the majority identifying themselves as white.

All participants from the study attended the one-month recall, except one from group pH 7.0 who discontinued treatment before the second session due to intense TS. The data collected from the first session was carried forward for statistical analysis in the intention-to-treat protocol.

Minimal variations, lower than 1%, were observed for the commercial bleaching gels. The pH values of the gels remained consistent with the manufacturers' indications (Whiteness HP Automixx) $7.0 \pm 0.2$, (Whiteness HP Automixx Plus) $7.7 \pm 0.1$, and (Whiteness HP Blue) $8.0 \pm 0.2$, except for the (Potenza Bianco Pro SS) $5.4 \pm 0.4$, which exhibited values lower than those specified by the manufacturer.

All gels displayed a consistent decline in HP concentration over time, regardless of the pH of the in-office gel. Overall, the decomposition rates were approximately 0.20%, 0.14%, 0.10% and 0.13% per minute for the groups pH 5.4, pH 7.0, pH 7.7 and pH 8.0, respectively.

Throughout the 50-min bleaching period, the gel with pH 8.0 and pH 7.7 groups consistently upheld their pH in the basic range, similarly to the gel with pH 5.4, which retained its acidic nature. Conversely, the gel with pH 7.0 exhibited a distinct behaviour, transitioning from a neutral to an acidic pH.

Neither the interaction of the factors bleaching gel vs time nor the main factor bleaching gel was statistically significant ($p>0.05$) in all colour evaluation methods. Only the main factor time assessment was statistically significant ($p<0.05$). The whitening degree of the second session was higher than the first session and equal to the one-month post-bleaching ($p<0.05$). One month after treatment, all bleaching gels demonstrated a significant increase in the whitening degree in all colour assessment methods.

### Conclusion

All bleaching gels kept at least 70% of their HP content after 50 min, suggesting that there is a surplus of HP. They provided similar whitening efficacy one month after bleaching.

### Implications for practice

The results of this trial showed it is possible that lower HP concentrations may be equally effective in achieving desired results while reducing the potential for side effects.

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# Bad-mouthing – Professional reputation of colleagues

SADJ SEPTEMBER 2024, Vol. 79 No.8 P448-449

Mr P Govan – Head of legal, SADA head office

## INTRODUCTION

A new trend is emerging where dentists are voicing their opinions and making comments regarding the dental work done by their colleagues without first consulting one another. Even worse, they are occasionally criticising the patient's prior dentist's work as "less than perfect work".

With disappointing regularity, practitioners who are faced with their patients being informed by their subsequent dentist who has seen fit to make inappropriate remarks of a disparaging nature about their colleagues' treatment.

Sometimes criticisms are made by clinicians who feel that they have a duty to offer their views on treatment provided elsewhere, whenever a patient seeks their professional opinion and advice.

There is also a small minority of clinicians who appear to see themselves as self-appointed arbiters of what does and does not constitute an acceptable standard of care. They are quick to criticise and they invariably recommend extensive "remedial" dentistry – often at considerable cost. These same practitioners, however, seem unable to accept any criticism of their work, or challenge of their opinions.

Such an opinion may be given with the best of intentions, but without knowing all the relevant facts (including what problems were faced by the previous practitioner at the time); such criticisms can only be regarded as uninformed and possibly even irresponsible. As a result, they will usually be judgmental rather than objective and factual.

Practitioners express opinions on treatment for various reasons, for example not losing out on the patient's business, the possibility of carrying out multiple procedures, the previous dentist being a major competitor, personal bias, professional jealousy or rivalry, wounded pride or business or financial dispute and so on.

Understandably, the practitioner referred to will regard such overt (and perhaps gratuitous) criticism as being unnecessary, unethical and possibly even defamatory, whether or not there might be any justification for their criticisms.

### Ethical Rules of Conduct

The Ethical Rules of Conduct in Rule 12 specifically provides that "a practitioner shall not cast reflections on the probity, professional reputation or skill of another person registered under the Act or any other Health Act".[1]

Despite the above ethical rule, practitioners continue to pass comments about their colleagues' treatment to their patients and even other colleagues.

### So what should practitioners do?

Patients consulted by dentists have a great chance they have had dental work done in the past, which means a practitioner may need to contend with a range of techniques and degrees of professionalism. So what should dentists do if a patient complains about "shoddy" dental work or it is clear that previous work is not up to scratch?

Practitioners must remember patients often also have a very poor understanding of what has been happening in their mouth and of their previous treatments, so when a patient provides information on when treatment was done or that it was substandard it is always advisable to be a bit cautious about taking that as the truth.

Practitioners also cannot reliably rely on the information provided by the patient without testing its veracity. There may be other reasons the patient is bad-mouthing the previous dentist – for example, outstanding accounts not settled, abusive behaviour, benefits exhausted, appointments not kept, patients attending a wedding and wanting a quick fix but do not come back for months or years, walk around with temporary fixes or chose less than the ideal situation which subsequently failed and so on.

The simple answer is that dentists should avoid discussing the standard of work of other dentists with patients. If a patient seeks advice from a dentist who is not their usual practitioner about their oral condition, the dentist should endeavour not to say anything which calls into question the integrity of their usual dentist.

If the practitioner encounters something that is not correct, they need to say this professionally and objectively after speaking to their colleagues to get to a full picture. Importantly, this must be done objectively and without apportioning blame.

Even if an opinion is given with the best of intentions, but without knowing all the relevant facts (including what problems were faced by the previous practitioner at the time), such criticisms can only be regarded as uninformed and possibly even irresponsible. As a result, they will usually be judgmental rather than objective and factual.

It is important to understand that good relationships with colleagues and other practitioners strengthens the bond between dentist and patient and enhances patient care. Specifically, it states that good practice involves acknowledging and respecting the contribution of all practitioners involved in the care of the patient, and behaving professionally and courteously to colleagues and other practitioners at all times.

Practitioners are also required to act, at all times, in a manner that upholds and enhances the integrity, dignity and reputation of the profession.

Patients are entitled to know about their dental and oral health, and practitioners have an ethical duty to inform them on an honest and factual basis. If this can be done without denigrating one's colleagues on the basis of hearsay, both patients and practitioners can benefit.

Problems are more likely to arise when comments extend beyond objective clinical opinions and become critically judgmental of a professional colleague. When these comments are fuelled by a personal animosity between the two dentists, with the second dentist perhaps deliberately embellishing and exaggerating the situation, this raises ethical questions about the second dentist over and above any clinical issues surrounding the dentist whose work is under scrutiny.

It is important to bear in mind that things are not always as they appear (or as first related by our patients) and there are two sides to most (if not all) stories.

When reviewing the work of another practitioner, a prudent approach is to describe things in the same way that you would wish to be spoken of yourself, were the roles to be reversed. There is nothing new in dentistry – as in life in general – with regard to the perils of criticising others.

### Risks to patients

If, in the course of your professional life, you see or hear something that leads you to believe that patients could be placed at risk or the quality of their care compromised by the actions or performance of a professional colleague, then you have an ethical duty to take reasonable and appropriate steps to:

- Raise your concerns with the colleague directly, if this is appropriate to the situation;
- Deal with the problem yourself (if this is within your power); and
- Take advice as to how best to manage the situation.

It is also worth remembering that you may be helping a professional colleague to come to terms with, or to deal with, a problem that previously they might not even have acknowledged. Dealing with a problem at a lower level, however awkward at the time, can prevent it from escalating into a situation where the stakes (and the professional consequences) are higher.

If there is a conflict between practitioners on the treatment of patients, every effort should be made to contain them in a manner that:

- Avoids placing patients at risk;
- Maintains the continuity of patient care and safeguards their rights and the quality of the dental care they receive;
- Avoids bringing the profession into disrepute;
- Maintains public confidence in the profession; and
- Treats professional colleagues as they would wish to be treated.

Every effort should be made to manage any differences of professional opinion through appropriate channels and ethically and professionally.

## CONCLUSION

The dental healthcare profession is a noble profession. Dentists must uphold its reputation. The reputation of the profession is important for the public's trust in the profession. Without trust, clinical practice is compromised and the best interests of the patient fall by the wayside.

A negative comment about a colleague said to a patient can create a negative perception of the profession as a whole. Before commenting on a colleague, ask yourself if it will benefit the patient in any way. If not, don't say it.

"A good reputation is more valuable than money." *Publilius Syrus (1st century)*

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**CPD questionnaire on page 452**

**The Continuing 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.**

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MAXILLOFACIAL RADIOLOGY

# Emergent panoramic artefact in dental radiology: Footprint of COVID-19 pandemic

SADJ SEPTEMBER 2024, Vol. 79 No.8 P450-451

**K Tshite**[1]

## CASE

The following patient was referred for a panoramic radiograph for post-operative assessment, following extractions, after which a foreign body was noted below the mandible.

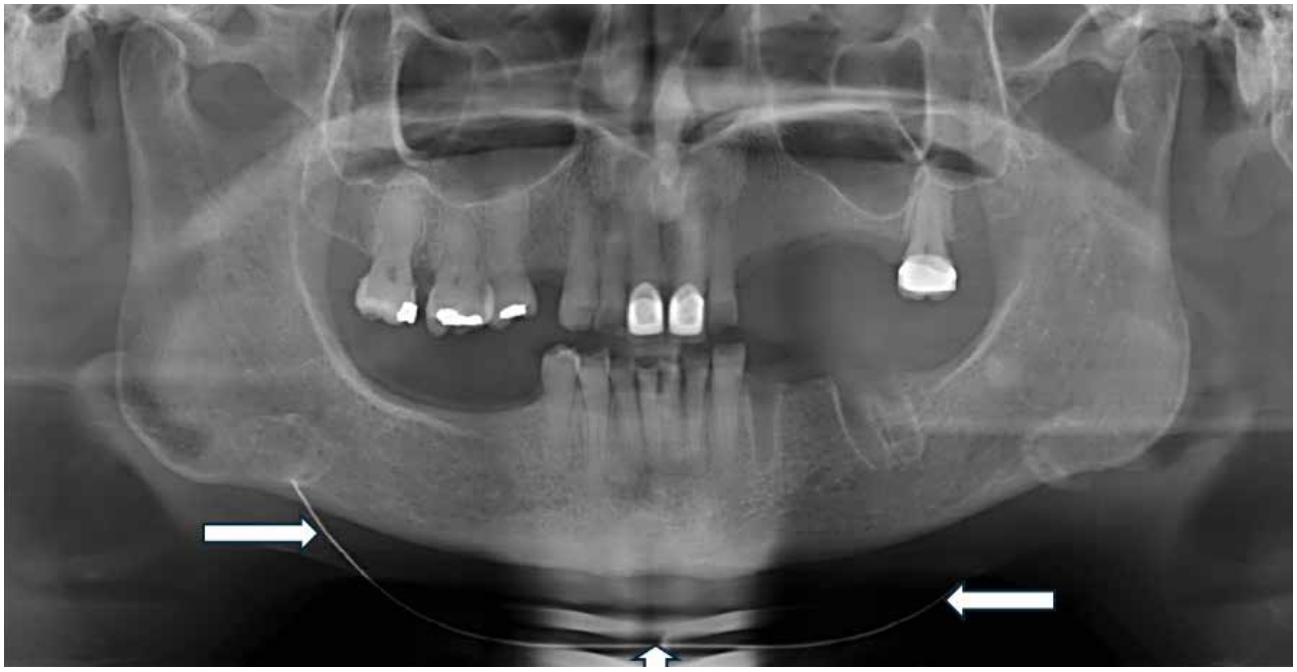

**Figure 1:** A panoramic radiograph taken of a patient wearing a face mask positioned below the mandible.

## INTERPRETATION

The unprecedented educational challenges presented by the COVID-19 pandemic continue to offer opportunities to update, improve and strengthen the dental curriculum. Intra-oral radiographic methods were restricted during the COVID-19 pandemic due to their aerosol-generating nature, which resulted in extra-oral radiographs being predominantly used.[1] The strict usage of face masks during the pandemic, which continues to date, emerged a new patient preparation error in dental radiology.

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**Author's contribution**
Dr Koketso Tshite Primary author – 100%

As seen in figure 1, a panoramic radiograph taken on a patient who did not completely remove the face mask resulted in a thin radiopaque line below the body of the mandible.

Panoramic radiography is a complex projection of the jaws with multiple superimpositions and distortions of anatomical structures, which may be exacerbated by technical errors in image acquisition.[2] It forms part of the tools that are used for general assessment during dental examination.[3] One of its key features is the ability to scan broader anatomical regions with a relatively low radiation dose, including several structures beyond the jaws.[2,4] Panoramic radiography plays a vital role in diagnosis, decision-making and treatment planning; however, structures outside the jaws, incorporated in the final image, may create challenges in radiographic interpretation.[2,4,5] Furthermore, like other imaging methods, a panoramic radiograph is also prone to have low resolution as a result of different factors and situations, such as patient-related issues.[6] These factors are highlighted during clinical training because they may complicate image interpretation.

Dental students are taught about the principles of tomographic movement, emphasising the centre of rotation and all the structures within the focal trough, which appear in

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the final image.[7,8] Although this is not the focus of the paper, students are also taught about the limitations of a panoramic radiograph, particularly its 2-dimensional (2D) representation of 3-dimensional (3D) structures.[3] Due to this limitation, the bucco-lingual extensions of structures cannot be properly assessed. Therefore, a full understanding of image acquisition including its limitations is important.

There are general requirements that are common to all machines, which include *patient preparation, equipment preparation* and *patient positioning.*[7] These requirements are mandatory to ensure quality radiographs of good diagnostic value. Dental radiology textbooks published before the COVID-19 pandemic only state that patients should remove jewellery such as earrings, hairpins, spectacles and dentures before taking panoramic radiographs. When asked to remove face masks before taking a panoramic radiograph, patients usually pull the masks down below the mandible, with the elastic loops still around the ears, resulting in a radiopaque artefact in the final image. These errors usually do not have major impacts on diagnosis, but for updated teaching and training, and to produce high-quality radiographs, students must be taught how to prevent them. Students depend mostly on prescribed textbooks for studying. If some elements or concepts are not covered in them, it unfortunately creates gaps in knowledge.

It is our duty as educators to update the modules in the curriculum to fill these gaps. The purpose of this paper is to revisit and update patient preparation protocols in dental radiology. The metal component in the face masks has been added to the list of patient preparation errors. To optimise learning, copies of radiographs of patients wearing face masks are kept in our radiology unit. They are used in teaching and training, as a supplement to the current prescribed textbooks.

## AUTHORS' DECLARATION

### Funding

This research did not receive any specific grant from funding agencies in the public, commercial or not-for-profit sectors.

### Conflict of interest

The authors declare that they have no conflict of interest.

### Ethics approval

This study was approved by the University of the Witwatersrand Human Research Ethics Committee (Reference no: M240764). All procedures followed the ethical standards of the Helsinki Declaration of 1975, as revised in 2008.

### Acknowledgements

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# CPD questionnaire

## Perceptions of undergraduate dental students regarding the teaching and learning strategies in prosthetic dentistry

1. **Choose the CORRECT option. This is true about traditional teaching strategies**
   - A. Are based on a teacher-centred approach
   - B. Teachers are the main role players in the delivery of lectures to students.1
   - C. Teachers deliver learning material without actively engaging the students.
   - D. All the above
   - E. None of the above

2. **Select the CORRECT statement. Teaching Transformation is characterized by:**
   - A. Changes of role from a student-centered approach to a teacher-centred approach.
   - B. Students do not participate in the instructional learning process
   - C. Change of role from teacher-centered approach to student-centered approach
   - D. All the above
   - E. None of the above

## Care and compassion in healthcare provision

3. **Select the CORRECT statement. Caring in medicine may refer to:**
   - A. The act of showing kindness and concern
   - B. Providing services to improve a patient's health
   - C. Carrying our a careful clinical examination
   - D. Making a correct diagnosis
   - E. All of the above

4. **Which statement is CORRECT. Respect for autonomy entails:**
   - A. Clinicians provide patients with requisite education about their condition
   - B. Clinicians allow patients to decide what treatment they desire
   - C. Clinicians decide the best treatment based on their experience and training
   - D. Only a) and b) above are correct
   - E. None of the above

5. **Select the CORRECT answer, The concept of nature versus nurture in childhood development**
   - A. Relates to a person's date of birth
   - B. Relates to a person's genetic make-up
   - C. Relates to a person's nationality
   - D. Only b) and c) are correct
   - E. Al of the above are correct

6. **Choose the CORRECT option. Krolak believes that:**
   - A. Too much empathy from a clinician will cloud their judgement
   - B. Empathetic clinicians are more popular
   - C. Good clinical skills are more important than being empathetic in medicine
   - D. Clinicians who are too empathetic make patients suspicious and lose trust
   - E. Clinicians can charge more if they provide education to their patients

## Dental education in the time of covid-19: challenges and opportunities for change

7. **Select the CORRECT answer. Which of the following were identified as themes?**
   - A. Sudden shift to online learning and virtual communication
   - B. Safety protocols
   - C. Students' well-being
   - D. Long-term implications
   - E. All of the above

8. **Which option is CORRECT. Safety protocols that were implemented during the pandemic included:**
   - A. An improved standard of PPE (Personal Protective Equipment)
   - B. Vaccination
   - C. The recording of temperatures
   - D. Small group teaching
   - E. All of the above

9. **Select the CORRECT answer. According to the 2021 cohort of students, which of the following was reported?**
   - A. Depression
   - B. Anxiety
   - C. Stress
   - D. Lack of motivation
   - E. All of the above

10. **Choose the CORRECT option. Which method was implemented to ensure the validity of online assessments?**
    - A. Use of a lockdown browser
    - B. A time limit for each question
    - C. Virtually monitoring students
    - D. The use of multiple-choice questions
    - E. None of the above

11. **Select the CORRECT option. Which method was preferred by staff and students?**
    - A. Blended learning
    - B. Contact teaching
    - C. Online teaching
    - D. Alternative teaching methods
    - E. None of the above

## Assessing orthodontic treatment outcome of patients treated by orthodontic residents – using the Peer Assessment Rating index

12. **Select the CORRECT answer. When the reduction in the PAR score is calculated, the amount of improvement is influenced by the pre-treatment PAR score. Not every patient has a pre-treatment PAR score of 22, which means that a proportion of cases cannot be classified as greatly improved. The amount of patients that fell into this category was:**
    - A. 5 %
    - B. 10 %
    - C. 15 %
    - D. 20 %
    - E. 25 %

**13. Which of the following is CORRECT. The percentage of patients that were treated with orthodontics in combination with extractions were:**

A. 31,5 %
B. 42,8 %
C. 49,8 %
D. 55,4 %
E. 61,3 %

## Radiology Corner: emergent panoramic artefact in dental radiology: footprint of covid-19 pandemic

**14. Select the INCORRECT option. Which of the following is NOT a requirement before taking a panoramic radiograph?**

A. Patient preparation
B. Equipment preparation
C. Patient positioning
D. Clinician preparation

**15. Choose the CORRECT answer. Dental students are taught about the principles of tomographic movement, emphasizing:**

A. The centre of rotation
B. The height of the machine
C. Principles of ALARA
D. Radiation protection

**16. Which of the following is CORRECT. The artefact of the metal component in the face mask appears as:**

A. A radiolucent line below the mandible
B. A radiopaque line below the mandible
C. A double image
D. A radiopaque line above the mandible

## Evidence-Based Dentistry: What's new for the clinician

**17. Select the CORRECT statement. Based on your readings of the Al-Nimri paper, which statement is the most correct?**

A. Multistrand wire retainers are associated poor alignment retention and higher plaque accumulation and gingival irritation compared to single-span retainers
B. Multistrand wire retainers are associated with poor alignment retention and lower plaque accumulation and gingival irritation compared to single-span retainers
C. Multistrand wire retainers are associated with better alignment retention but higher plaque accumulation and gingival irritation compared to single-span retainers
D. Multistrand wire retainers are associated with better alignment retention and lower plaque accumulation and gingival irritation compared to single-span retainers

**18. Choose the CORRECT answer. Which of the following best describes a split mouth trail?**

A. The experimental and control groups are separate
B. The patient is the unit of interest and receives both the experimental and control intervention
C. The tooth is the unit of interest and the patient receives both the experimental and control intervention
D. The mouth is split into a right and a left half and one side receives the experimental intervention and the other side receives the control intervention

**19. Select the CORRECT option. Which of the following statements accurately reflects the findings of the Al-Nimri study?**

A. The PI & GI were lower in the incisal third compared to the side where the retainer was placed in the middle of the tooth.
B. The PI & GI were higher in the incisal third compared to the side where the retainer was placed in the middle of the tooth.
C. The PI & GI were similar in the incisal third compared to the side where the retainer was placed in the middle of the tooth.
D. The PI was lower but the GI higher in the incisal third compared to the side where the retainer was placed in the middle of the tooth.

**20. Choose the CORRECT statement. Which of the following statements accurately reflects the findings of the Gumy et al trail?**

A. The results of this trial showed that lower HP concentrations were equally effective in achieving desired results but had more side effects.
B. The results of this trial showed that lower HP concentrations were equally effective in achieving desired results and had less side effects.
C. The results of this trial showed that lower HP concentrations were less effective in achieving desired results and had more side effects.
D. The results of this trial showed that lower HP concentrations were more effective in achieving desired results and had less side effects.

## Ethics: Bad mouthing – professional reputation of colleagues

**21. Select the CORRECT answer. What is a major concern mentioned in the article regarding dentists' comments on their colleagues' work?**

A. It helps improve standards of care.
B. It enhances professional relationships between colleagues.
C. It can be seen as unethical and judgmental.
D. It leads to better patient outcomes.

**22. Which of the following is CORRECT. According to the Ethical Rules of Conduct, what is prohibited for practitioners?**

A. Discussing new dental techniques with colleagues.
B. Making recommendations for additional treatments.
C. Criticizing the professional reputation or skill of another practitioner.
D. Informing patients about their oral health condition.

**23. Choose the CORRECT option. When should a dentist raise concerns about a colleague's work, according to the article?**

A. Only when the patient insists on it.
B. When it can be done respectfully and professionally.
C. Always, to ensure transparency.
D. Only after discussing it with other patients.

**24. What answer is CORRECT. What is a recommended approach when dealing with a patient's complaint about another dentist's work?**

A. Immediately criticize the previous dentist's work to validate the patient's concerns.
B. Be objective and gather all relevant facts before making any statements.
C. Suggest extensive remedial treatments without further investigation.
D. Refuse to offer any comments or opinions.

**25. Choose the INCORRECT option. Which of the following is NOT a reason why practitioners may criticize a colleague's work, as mentioned in the article?**

A. Personal bias or rivalry.
B. Financial disputes or competition.
C. Concern for the patient's well-being.
D. Professional jealousy or wounded pride.

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2. Drafting the work or revising it critically for important intellec-tual content, AND
3. Final approval of the version to be published, AND
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## Title

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

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The abstract shall consist of not more than 200 words.
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- Please include electronic numbering of lines throughout the document.
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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 wil l be levied.

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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.

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- 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.23"
- Where there are several papers referenced, the superscript numbers would appear as: "...previous studies have shown. [3,5,7,9-12,14]"
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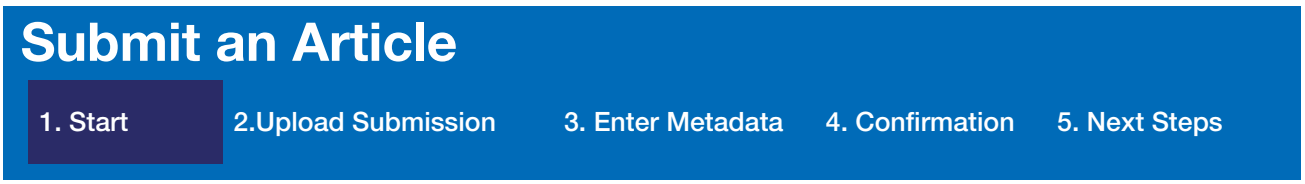


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