



CONCEPTUAL

DENTAL EDUCATION IN SUDAN: CHALLENGES, OPPORTUNITIES, AND THE PATH FORWARD

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PREFACE:

This paper reflects the author's perspective, as she served as the dean of the Faculty of Dental Medicine for nearly four years. The challenges outlined in the text are real and confront dental professionals daily. Some of these challenges are addressed in specific studies, while others require further research to uncover the underlying causes of the difficulties. In this paper, the author proposes several actionable ideas and highlights opportunities for improvement.

ABSTRACT

PURPOSE: Dentistry in Sudan has evolved, with many dental faculties and programmes, significantly increasing the number of graduates. This paper describes the progression of dental education in Sudan, identifies challenges, and proposes opportunities.

APPROACH: This paper combines personal experience with relevant literature from the PubMed, Scopus, and Science Direct databases. We retrieved articles and reports published in English over the last 50 years.

FINDINGS: Sudan faces challenges in dental education as a developing country. Quality education, combined with digital learning, improved infrastructure, reformed faculty and curriculum, expanded internship and postgraduate pathways, enhanced community engagement, and increased accountability, has led the way forward.

VALUE OF THE STUDY: The study provides insights into Sudan's dental education challenges, paving the way for further research.

LIMITATIONS OF THE STUDY: Insufficient relevant published data exists on the topic.

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PRACTICAL IMPLICATIONS: The paper explores opportunities, prompts policy change, and enhances the profession's alignment with the Sustainable Development Goals (SDGs).

KEYWORDS: *Dentistry; Dental Education; Oral health; Community Services.*

INTRODUCTION

Dental education is the science of preparing professionals to promote oral health, prevent diseases, and diagnose and treat oral diseases. Preventable oral diseases remain among the most prevalent health issues, representing a significant challenge and economic burden for many countries, as well as a cause of considerable morbidity for people around the globe (Pereset *al.*, 2019; Kassebaumet *al.*, 2017). Worldwide, approximately 3.5 billion patients are affected by oral diseases, close to half of the global population. As a result, the incidence of oral disease is nearly one billion higher than the combined burden of all five non-communicable diseases (Abodunrinet *al.*, 2023; Dye, 2017).

In Africa, oral diseases afflict over 480 million individuals (Lamloum and Campus, 2024), and in Sudan, oral diseases affect a large number of people (Khalifaet *al.*, 2012).

The high prevalence of oral diseases, with the consequent suffering, challenges, and burden on the public and/or health system, particularly in low- and middle-income countries, has prompted a call to recognise oral health as a global health priority (Pereset *al.*, 2019; Bernabeet *al.*, 2020; Annammaet *al.*, 2024). The role of dental professionals in preventing oral diseases and promoting health is crucial. Competent dentists are a key factor that, if managed effectively, will positively impact the oral health system.

This paper highlights significant challenges that dental education and practice face that negatively affect oral health.

THE HISTORY OF DENTAL EDUCATION IN SUDAN:

Dental education in Sudan began in the early 1970s with a single dental school at the University of Khartoum that continues to graduate a small number of dentists. It started as a school that was promoted to a faculty in the 1990s. In the last decade of the 20th century, several new dental faculties and programmes have been introduced as part of a plan to expand higher education institutions in Sudan, the so-called “higher education revolution”. In this revolution the number of institutes increased from 5 public universities in 1989 to more than 55 universities in 2022, both public and private (Gasim, 2010). Consequently, the number of graduates has increased dramatically, from a local graduate population of below a hundred to thousands in recent years (Sulimanet *al.*, 2023). The increase in number undoubtedly alters the ratio of dentists to population, and reasoning assumes this might positively impact oral health. Is this what happened in Sudan? The answer is perhaps no!

Another part of the plan is to expand coverage by effectively distributing universities nationwide. But does that happen? Unfortunately, the answer is no, as it is clear that most universities are located

in Khartoum state. Location in Khartoum could be due to dangerous and insecure remote areas, an under-developed area, a lack of essential services outside Khartoum, or unfavourable conditions.

Common oral problems include dental caries, periodontal diseases, oral cancer, edentulousness, and trauma, particularly in situations involving armed conflict (Cugati, 2024). Advances in knowledge have transformed oral health from a mere health of teeth and gums to a more comprehensive understanding of the strong link between oral and general health. This link strengthens the concept of promoting oral health as an essential component for general health. The World Health Organization (WHO) indicates that oral health is a gateway to overall health.

DENTAL EDUCATION CHALLENGES:

Challenges During the Study

Dental education is a rapidly evolving and developing science, with new technologies, treatment modalities, and strategies in teaching and practice. As with other health professions, dental education requires a qualified educator, however, the field is unique because it needs heavy and costly training, simulation labs, expensive dental materials, tools, equipment, and specific premises. Therefore, dental education in Sudan faces the following challenges:

1. challenges inherent to dental education everywhere;
2. challenges and obstacles in Sudan; and sadly,
3. challenges that result from the war; perhaps these challenges are still unknown, and the exact damage is indeterminate.

These challenges result in stress, making dentistry a challenging type of education. In a study conducted by Sudanese researcher Nurehuda and presented in IDAR/APR (Seoul 2016), frustrations and dissatisfaction are prominent among all dental professionals.

Global Educational Challenges

Adult education targets three main domains: knowledge, psychomotor skills, and attitude. Inadequate infrastructure, including a lack of modern equipment and advanced simulation labs, negatively affects the students' training and psychomotor skills. Deficient training and compromised skills represent a significant problem, as knowledge and training go side-by-side in dentistry. Therefore, dental education resembles a bird that cannot soar gracefully without its two essential wings: knowledge and training. Yet, the heart, the attitude, empowers this bird to truly take flight!

Specific Challenges for Sudan

Educators: In recent decades, the number of universities has increased, with public universities representing 55% and private universities representing 45% (Lamloum and Campus, 2024). There are approximately 35 dental schools in Sudan (29% governmental and 71% private). The number of dental colleges and schools is incompatible with the number of educators in Sudan. The standard

staff-to-student ratio is 1:8 in clinical training (Hattaret *al.*, 2020). If, by simple estimation, 35 colleges with an average of 70 students have a total number of students of 12,250, there is a need for 1,531 instructors. Faculty shortage is an issue that many schools face in low-income countries (11): in Sudan, this led to sharing educators between colleges. This resulted in a significant deviation from internationally recommended student-teacher ratios. The low number of educators is attributed to different causes, such as “brain drain”, the limited postgraduate programmes compared to the number of graduates, and substantial competition.

In Sudan, only two public institutes have been formally recognised for launching postgraduate programmes in dentistry: the University of Khartoum and the Sudan Medical Specialization Board. Even these programmes are limited to certain specialties, such as maxillofacial surgery, restorative dentistry, periodontics, paedodontics, orthodontics, public health, oral pathology, and, recently, oral medicine and forensic dentistry. In all these programmes, the number of candidates is capped at 20; this is also due to a shortage of educators and supervisors, stemming from the brain drain phenomenon that characterises Sudan and a lack of resources to conduct a highly reputable postgraduate programme. In Sudan, estimates indicate that 60% of health professionals have left the country since the early 2000s (Lamloum and Campus, 2024; Abdallaet *al.*, 2016; Nurelhudaet *al.*, 2018). Another factor that needs to be assessed carefully is the post-war support needs of educators and academic staff.

Curriculum: The dental school’s primary function is to produce professionals who serve the community and enhance oral health. Therefore, the educational process must address the community’s needs and challenges. There is a global shift in contemporary dental education from the traditional curriculum to the competency-based and outcomes-based paradigm (Khanna and Mehrotra, 2019). This comprehensive approach aims to ensure that students acquire, together with knowledge, the competencies necessary for real-life practice. In a recent study, Gareeballaet *al.* (2025) compared the curriculum in different Sudanese dental schools; four adopted competency-based education with various models, despite generally good results regarding the knowledge domain. The results indicated a deficiency in specific areas, such as preparedness for practice management and interdisciplinary integration.

Focusing on the meticulous training of students is crucial, as many believe deficient training will result in poor treatments. Other studies pointed to a significant need to reform the curriculum to improve the competency of students to practice efficiently in a public health setting (Aliet *al.*, 2021). Some schools lack certain necessary subjects, such as forensic odontology, resulting in a lack of knowledge among graduates (Hag Aliet *al.*, 2024). Other deficiencies, such as geriatric care and the poor link between basic and clinical sciences, are common pitfalls (Annammaet *al.*, 2024).

In a rapidly growing area such as dentistry, the research input is small compared to the many colleges in Sudan. The reason could be inadequate knowledge, limited access to literature, lack of funds and/or support from supervisors, lack of time, or curriculum overload (Hassanet *al.*, 2020). This shortcoming indicates the need to vigorously implement research and critical thinking as essential curriculum elements.

Community orientation and services: The three main goals of the universities are education, research, and community services (Benbassat, 2024). Engagement and training within the community are sporadic in the majority of Sudanese dental colleges, and specific activities vary among the different colleges. The distribution of the schools in Sudan is uneven, with most of them located in Khartoum, the capital of Sudan (78%) (Sulimanet *al.*, 2023).

No national strategy or plan is declared to ensure community outreach from all stakeholders, such as the Ministry of Health's preventive department, schools and colleges, community organisations, etc.

Obstacles After Graduation

Internship bottlenecks

Following graduation, graduates face the first big challenge: the obligatory internship programme. It is set and entailed by Sudan's medical council and the Directorate of Health Human Resources in the Federal Ministry of Health. Completing this period is a prerequisite to sitting for the exam and obtaining permanent registration with the Sudan Medical Council. The internship programme comprises six training shifts, including Oral and Maxillofacial Surgery, Periodontics, Paedodontics, Dental Public Health, Conservative and Endodontics, and Prosthodontics, a one-year training under supervision in these dentistry departments (Sulimanet *al.*, 2023). To be enrolled as an intern, the graduate must register on a waiting list and wait for a year, or sometimes two years. The main problems are inadequate training premises and fewer vacancies compared to the many graduates today. As a result, a considerable number of graduates are out of the health system, up to 37%, as Suliman and his colleagues mentioned (Sulimanet *al.*, 2023). During the last six years, political unrest, the COVID-19 pandemic, and the tragic 2023 war in Khartoum have worsened the condition, resulting in a lengthy waiting list of thousands of graduates and a waiting time of more than a year. For instance, the number of intakes in 2019 was 1985 in private schools and 457 in public schools (Sulimanet *al.*, 2023). Most of these schools resumed study after the war in different centres both inside and outside Sudan, and probably a considerable number graduated and are on waiting lists.

This long gap off work frustrates students who spend two years waiting in line, causing them to lose ambition and motivation. Urgent intervention and co-ordination among different stakeholders are needed to fix this.

Limited employment opportunities

After registration, there are scant job opportunities from the Ministry of Health. Given this tremendous number of colleges, the number of registered dentists exceed 8,000. In 2019, 8,964 dentists were registered, of whom 519 were specialists. Of these specialists, in the Ministry of Health, 19 work in states outside Khartoum. Six states have no specialists: the northern, Sennar, southern Kordofan-White Nile, the west, and Middle Darfur. The rest have a specialist or two at most (Sulimanet *al.*, 2023).

Private universities provide opportunities for graduates, and many of them work as teaching assistants at these institutions or in private clinics. Research is needed to determine the pathways of graduates from Sudanese dental schools, including their preferences and obstacles.

Limited opportunities in Postgraduate Education

It is frustrating that competition compromises the chance to progress and attain postgraduate degrees due to the limited opportunities available compared to competitors and resource constraints.

Overcoming challenges and opportunities for improvement

In recent years, the globe has been looking forward to the Sustainable Development Goals' (SDGs) framework launched at the 2015 UN General Assembly and the 2030 Agenda of the United Nations (Cugati, 2024). Sustainable development's three pillars are economic growth, social inclusion, and environmental protection (De Abreuet *et al.*, 2021).

Dental education and practices were not mentioned clearly in the SDG framework, but are closely associated with these three pillars of sustainable development. Oral health is a significant determinant of overall health, and both are closely interconnected, making oral health a prerequisite for general health.

The Fédération Dentaire Internationale (FDI) defines basic dental education as “teaching and learning of dentists to prevent, diagnose and treat oral diseases and meet the dental needs and demands of individual patients and the public”. Therefore, dental education, dentistry, and oral health are aligned. The development and success of the first two must positively impact the latter.

Quality education (SDG 4), good health and well-being (SDG 3), and Partnerships to achieve the Goals (SDG 17) are closely related to dental education and services. However, other SDGs are also related to practice and dental services, such as decent work and economic growth (SDG 8) and reduced inequalities (SDG 10). These should be considered in the plan and protocols to ensure the sustainable goals of prosperity, well-being, and peace for all.

To attain sustainable solutions for the challenges and obstacles that face the dental education, commitment to collaboration and co-ordination between different stakeholders, a strategic plan that makes use of higher education expansion should be put in place. This collaboration should include stakeholders such as the Ministry of Higher Education, the Ministry of Health (both federal and state), and the administration of curative and preventive medicine, the Ministry of Finance, universities and higher education institutions, community and health organisations, and many others.

Dental schools' infrastructure and location

The higher education authority and stakeholders should monitor and evaluate the status of the infrastructure of the dental colleges and schools, especially after the war. Unsuitable or loaned buildings should be fixed. Universities that have been allocated to higher schools, as claimed by many authors, should be relocated as appropriate (Gasim, 2010). The decision to resume, suspend,

or merge with another well-established school should be based on the overall evaluation by the higher education authority and stakeholders.

Universities and institutes have three main goals: educating a new generation, conducting research, and serving the community. The latter requires the distribution of dental schools to ensure community outreach. Stakeholders should carefully study the option of relocating dental schools to other areas outside Khartoum to allow for easy implementation of continuous community dental services and to create opportunities for students to be continuously exposed to the community. It will be difficult in armed conflict areas, but in many other regions it will be possible. This relocation might need an extensive budget, but all stakeholders may play a role.

Curriculum

Curricula represent the foundation that underpins the future educational process and dental practices. There is a global transition from traditional to competency-based and outcome-based education, where the focus moves from teaching to a comprehensive concept of teaching and learning.

The curricula in all dental schools should undergo regular review and reform to match the global advances in dental education. Students are a major stakeholder; their perspective, challenges, and needs should drive this reform (Aliet *al.*, 2021). Moreover, Sudan's curricula should adopt community learning activities such as field trips, allowing students to be more exposed to the community. This community exposure would consequently shape students' attitudes towards the community and fill the gap between knowledge, training, and real-life situations (Holtzman and Seirawan, 2009; Kukreja and Kukreja, 2025). Prevention is a key factor in controlling oral diseases. Moreover, curricula should focus on emerging needs.

Academic Personnel

Staff numbers

Increasing the number of educators could be achieved through two paths:

- a long-term plan to expand postgraduate programmes in Sudan, thereby increasing doctoral opportunities;
- an urgent plan involving the forming of alliances and collaborating with regional institutes, offering a chance to exchange academic staff to ensure knowledge dissemination for undergraduate and postgraduate programmes.

Another solution that can be used cautiously for specific theoretical courses to compensate for inadequate academic staff, is leveraging the advances in digital education by introducing a digitalised educational platform. This platform would reinforce theoretical knowledge and offer virtual demonstration. They should be supported by various universities and operated by academics from inside and outside Sudan.

Support and development

Dental schools in private and governmental institutions are obligated to advance dental education through capacity building, offering postgraduate education, providing scholarships for young researchers, and continuous development and enhancement.

Community services and research

Khartoum is estimated to host 19% of Sudan's total population, reaching an estimated 45 million in 2021. More than 80% live in cities and villages outside the capital. This large population requires meticulous planning by many authorities, and universities should have a prominent role in raising awareness and addressing the needs of the whole community. Many dental colleges should be distributed across the country and ensure community outreach.

The authors suggest creating mobile dental hospitals with a team of specialists and internships that can reach remote areas and contribute to promoting oral health, stressing preventive measures, and raising community awareness. These mobile hospitals can also help advance knowledge and evidence by conducting research.

Dentistry in Sudan necessitates extensive research to determine the prevalence of oral diseases and their impact, highlight problems, and find solutions. The conduct of research will help policy-makers design evidence-based policies and plans. Therefore, a national scheme to advance and improve dental and oral research is needed

Internship

The current internship challenge is a problem that extends beyond the capacity of any single department or organisation, such as human resource administration, to solve. Different entities (governmental and non-governmental) should collaborate to find a sustainable solution for this issue. Ministries including the Ministry of Health, Higher Education, Finance, and Education should strategically plan to utilise human resources to support public health policies and programmes, emphasising oral health promotion and prevention schemes.

The internship programme shifts should be revisited, focusing on prevention and awareness. Public health is one month out of the 12 months in the current internship programme; however, increasing the duration of this shift, supported by the national scheme, will help enforce public awareness and preventive measures. Another plan is to adopt the internship programme by different universities, especially those with good infrastructure. This plan should be accompanied by a strong public initiative in which newly graduated dental professionals should play a role in raising public awareness, health promotion, and disease prevention.

Postgraduate studies

This problem needs brilliant and creative solutions. Postgraduate programmes should be increased to ensure an adequate number of specialists and educators. Expanding this plan is possible through

different paths. To compensate for the lack of supervisors, there should be innovative collaboration with well-established institutes inside and outside Sudan, using human resources to train and educate dental graduates. This would encourage capacity building and progress.

CONCLUSIONS

Oral health is essential for overall health; oral diseases are risk factors for many life-threatening conditions, such as cardiovascular disease, diabetes mellitus, and adverse pregnancy outcomes. Additionally, from an economic standpoint, dental treatment is costly, burdensome for the country, and a significant source of morbidity. Most oral diseases are preventable, and maintaining good oral hygiene is crucial for their prevention.

In conclusion, quality education combined with digital learning, strengthening infrastructure, reforming faculty and curriculum, expanding internship and postgraduate pathways, community engagement, and accountability will positively impact dental education and services.

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BIOGRAPHY



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