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Opportunities and Challenges of Implementing District Health Information Software 2 in Oral Health in Angola: A Narrative Review

Oportunidades e desafios da implementação do district health information software 2 na saúde bucal em Angola: uma revisão narrativa

Oportunidades y desafíos de la implementación del district health information software 2 en la salud bucal en Angola: una revisión narrativa

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ABSTRACT

Oral health is essential to overall health but faces significant challenges in low and middle-income countries like Angola due to inequalities in access to care, worsened by a lack of infrastructure and resources. DHIS2 (District Health Information Software 2) emerges as a viable solution to improve health data management and promote equity in access to dental care. Objective to identify opportunities and challenges in implementing DHIS2 to promote oral health in Angola. The research, conducted according to the Joanna Briggs Institute (JBI) guidelines, used specific descriptors in the PUBMED, SCOPUS, and WEB OF SCIENCE databases, resulting in the selection of 11 studies, which were analyzed through content analysis. The analysis revealed four main categories: 1) oral health as a priority, 2) electronic health systems, 3) benefits and challenges of EHR/POE, and 4) DHIS2's contribution to equity. It is concluded that, although DHIS2 has the potential to optimize data management and support inclusive policies, its implementation requires investments in infrastructure, professional training, and intersectoral support to overcome structural challenges.

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Keywords: DHIS2, oral health, health equity, Angola, electronic health information systems

RESUMO

A saúde bucal é essencial para a saúde integral, mas enfrenta desafios significativos em países de baixa e média renda, como Angola, devido às desigualdades no acesso a cuidados, agravadas pela falta de infraestrutura e recursos. O District Health Information Software 2 (DHIS2) surge como uma solução viável para melhorar a gestão de dados de saúde e promover a equidade no acesso aos cuidados odontológicos. O objetivo geral é identificar oportunidades e desafios na implementação do DHIS2 na promoção da saúde bucal em Angola. Método: A pesquisa, conduzida de acordo com as diretrizes do Joanna Briggs Institute (JBI), utilizou descritores específicos nas bases de dados PUBMED, SCOPUS e WEB OF SCIENCE, resultando na seleção de 11 estudos, analisados por meio de análise de conteúdo. A análise revelou quatro categorias principais: 1) saúde bucal como prioridade, 2) sistemas eletrônicos de saúde, 3) benefícios e desafios do RES/POE, e 4) contribuição do DHIS2 para a equidade. Conclui-se que, embora o DHIS2 tenha potencial para otimizar a gestão de dados e apoiar políticas inclusivas, sua implementação requer investimentos em infraestrutura, capacitação de profissionais e apoio intersetorial para superar desafios estruturais.

Palavras-chave: DHIS2, saúde bucal, equidade, Angola, sistemas eletrônicos de informação em saúde

RESUMEN

La salud bucal es esencial para la salud integral, pero enfrenta desafíos significativos en países de ingresos bajos y medios, como Angola, debido a las desigualdades en el acceso a la atención, agravadas por la falta de infraestructura y recursos. El DHIS2 (District Health Information Software 2) surge como una solución viable para mejorar la gestión de datos de salud y promover la equidad en el acceso a la atención odontológica. Identificar oportunidades y desafíos en la implementación del DHIS2 para la promoción de la salud bucal en Angola. La investigación, realizada de acuerdo con las directrices del Joanna Briggs Institute (JBI), utilizó descriptores específicos en las bases de datos PUBMED, SCOPUS y WEB OF SCIENCE, lo que resultó en la selección de 11 estudios, analizados mediante análisis de contenido. El análisis reveló cuatro categorías principales: 1) salud bucal como prioridad, 2) sistemas electrónicos de salud, 3) beneficios y desafíos del RES/POE, y 4) contribución del DHIS2 a la equidad. Se concluye que, aunque el DHIS2 tiene el potencial de optimizar la gestión de datos y apoyar políticas inclusivas, su implementación requiere inversiones en infraestructura, capacitación profesional y apoyo intersectorial para superar desafíos estructurales.

Palabras clave: DHIS2, salud bucal, equidad en salud, Angola, sistemas electrónicos de información en salud

INTRODUCTION

Oral health is essential for wellbeing and quality of life, playing an important role in population health (Huang & Chang, 2022; Jain et al., 2023; Patel & Gallagher, 2024; World Health Organization (WHO), 2022b). However, oral diseases still represent a major public health problem, affecting approximately 3.5 billion people worldwide, particularly in low- and middle-income countries where access to dental care is limited (Peres et al., 2019; Tu et al., 2023; WHO, 2022a). The World Health Organization (WHO) highlights the need to integrate oral health into primary care systems and develop

effective policies to reduce inequalities in access to care. This integration is even more relevant in contexts like Angola, where economic and structural challenges hinder the implementation of comprehensive public policies for promoting oral health (WHO, 2016, 2022c).

The digitalisation of health systems has emerged as a promising alternative to improve the management and monitoring of reliable health data (Adam & de Savigny, 2012; Hallinan et al., 2024; Sahay et al., 2020). Numerous studies demonstrate, from the perspective of health managers, that electronic health information systems assist in the decision-making process. For example, hospital managers in Portugal consider it a relevant institutional organisational tool used in the decision process (Sanjuluca et al., 2022). Conversely, the difficulties reported by professionals include technical problems, non-specific systems, lack of training, and difficulty in producing effective processes to meet patient demands (Nguyen et al., 2014; Sanjuluca et al., 2022).

Electronic health information systems, such as the District Health Information Software 2 (DHIS2), are widely used in various countries, supporting the collection, analysis, and dissemination of health data (Byrne & Sæbø, 2022; WHO, 2022b). In Angola, the adoption of DHIS2 represents a strategic opportunity to advance in promoting oral health, enabling health managers and professionals to obtain accurate information about the oral health conditions of the population. However, implementing this system involves a series of technical and social challenges that need to be considered to ensure its effectiveness and sustainability.

In Angola, electronic health information systems are implemented and maintained by hospitals without the use of national information systems provided by the Ministry of Health, but the Ministry defines a set of indicators that hospitals need to calculate and submit on paper to the regional government and the national Ministry of Health (Sanjuluca et al., 2022).

This article therefore presents a narrative review whose objective was to identify the main opportunities and barriers in implementing DHIS2 as an electronic information system for promoting oral health in Angola.

METHOD

This narrative review was conducted based on the guidelines of the Joanna Briggs Institute (JBI) (Pollock et al., 2023). The review aimed to map and synthesise the available evidence on the opportunities and challenges in implementing DHIS2 as an electronic information system for oral health in the provincial government health network of Luanda, Angola. The methodology included the stages recommended by JBI:

identification of the research question, search and selection of studies, data extraction and analysis, and synthesis of findings.

The research question guiding the collection and analysis of data was: "What are the opportunities and challenges in implementing DHIS2 as an electronic oral health information system in the provincial government health network of Luanda, Angola?" This question was formulated to explore both facilitators and obstacles in the implementation process of the health information system in the Angolan context, considering social, technological, cultural, and infrastructure aspects.

The search strategy was developed using standardised descriptors and Boolean operators to optimise the scope of selected studies. The search included Medical Subject Headings (MeSH) terms and was conducted with the Boolean operators AND and OR, as follows: "electronic health records" AND "Public Health Dentistry" OR "National Health Programs" OR "Health Promotion" AND "Dentist" (Appendix 1). These descriptors were selected to cover both the area of electronic health systems and public oral health.

The databases consulted were: PUBMED (National Library of Medicine), SCOPUS and WEB OF SCIENCE. The search was conducted comprehensively in September 2024 to ensure the inclusion of relevant studies and avoid biases in article selection.

The inclusion criteria were established to identify relevant and high-quality studies. The inclusion criteria consisted of:

- Studies addressing the implementation of electronic health systems with a focus on oral health and/or public health.
- Articles published in English, Portuguese or Spanish due to the broad coverage of international literature in the field.
- Empirical studies analysing data on challenges and opportunities in implementing digital health systems in low- and middle-income countries, including contexts similar to Angola.
- Studies published between 2019-2024.

Editorials, opinion articles, reviews, studies unavailable for download, and articles whose results were not aligned with the review objective were excluded. Additionally, WHO reports regarding the implementation of DHIS2, as well as public oral health data from Africa, especially Angola, were included.

The article selection was conducted in two stages. Initially, all studies were exported from the aforementioned databases to the Rayyan platform (Ouzzani et al., 2016), a collaboration tool for screening and reviewing studies, used to ensure greater transparency and rigor in article selection.

In the first phase, 99 articles were identified, which underwent an initial screening based on titles and abstracts. The application of inclusion and exclusion criteria resulted in the exclusion of 88 articles, leaving 15 articles for full reading and analysis (Table 1). This screening was conducted independently by two reviewers, who discussed discrepancies until reaching a consensus. Additionally, five governmental documents and WHO reports were included (Table 1).

Table 1.
Articles analysed in full

Authors	Title	Year	Journal
Adibi et al.	Medical and Dental Electronic Health Record Reporting Discrepancies in Integrated Patient Care	2020	JDR Clinical and Translational Research
Benoit et al.	Current state of dental informatics in the field of health information systems: a scoping review	2022	BMC Oral Health
Carvalho et al.	Validation of the Oral Survey-B System for electronic data capture in National Oral Health Surveys	2016	Caries Research
Cavalcante et al.	Computing and Oral Health: Mobile Solution for Collecting, Data Analysis, Managing and Reproducing Epidemiological Research in Population Groups	2020	International Journal of Environmental Research and Public Health
DaSilva, et al.	The Forefront of Dentistry—Promising Tech-Innovations and New Treatments	2022	JDR Clinical and Translational Research
Gesko, et al.	Creating systems aligned with the triple-aim and value-based care	2020	Journal of Public Health Dentistry
Hallinan, et al	Seamless EMR data access: Integrated governance, digital health and the OMOP-CDM	2024	BMJ Health and Care Informatics
Kallio, et al.	Comparing the effectiveness of competition as a method of reminding primary oral health care dentists to record diagnoses with two alternative methods used to enhance the recording of diagnoses in primary health care	2022	International Journal of Circumpolar Health
MINSA	Capsa | Caderno sobre Políticas de Saúde em Angola. FORMAÇÃO PERMANENTE DE RECURSOS HUMANOS DE SAÚDE	2016	
Nguyen, et al.	Electronic health records implementation: An evaluation of information system impact and contingency factors	2014	International Journal of Medical Informatics
WHO/ Africa	Regional oral health strategy 2016–2025: addressing oral diseases as part of noncommunicable diseases	2016	
WHO/ Africa	Promover a Saúde Oral em África	2016	
WHO	Draft global strategy on oral health. Seventy-fifth World Health Assembly, Geneva, 22–28 May 2022.	2022	
WHO	Global oral health status report – Towards universal health coverage for oral health by 2030	2022	
Petersen, et al.	Global application of oral disease prevention and health promotion as measured 10 years after the 2007 World Health Assembly statement on oral health	2020	Community Dentistry and Oral Epidemiology
Sahay et al.	Challenges and opportunities of using DHIS2 to strengthen health information systems in	2020	The Electronic Journal of Information Systems in Developing Countries

	the Eastern Mediterranean Region: A regional approach		
Shea et al.	Providers' preferences for pediatric oral health information in the electronic health record: A cross-sectional survey	2018	BMC Pediatrics
Shmarina et al.	Dental professionals' perception of their role in the practice of oral health promotion: a qualitative interview study	2023	BMC Oral Health
Shmarina et al.	Current state of dental informatics in the field of health information systems: a scoping review	2020	BMC Oral Health
Yansane et al.	Utilization and Validity of the Dental Diagnostic System over Time in Academic and Private Practice	2019	JDR Clinical and Translational Research

The articles selected for full reading were organised and analysed with the assistance of QSR NVivo® 15 software. The analysis was conducted according to the stages of Laurence Bardin's content analysis (2011), with the categorisation of data into emerging themes.

RESULTS AND DISCUSSION

This chapter presents the results of the conducted scoping review, followed by a critical analysis, aligning the findings with the research objective, which sought to understand the opportunities and challenges in implementing electronic information systems to promote oral health in Angola. Based on the content analysis, four categories were identified: (1) Oral Health as a Public Health Priority, (2) Electronic Health Information Systems, (3) Benefits and Challenges of EHR/DER Implementation, and (4) DHIS2's Contribution to Oral Health Equity (Table 2).

Table 2.
Consistency between objectives, categories, indicators and justifications

Thematic Category	Indicators Used	Consistency Justification	Supporting References
Oral Health as a Public Health Priority	Prevalence of oral diseases, global policies (WHO), access inequalities	Relates to the objective of mapping structural and social barriers to promoting oral health. Corresponds to consolidated evidence on global disease burden.	WHO (2016, 2022); Peres et al. (2019)
Electronic Health Information Systems	Use of EHR/DER in low/middle income countries, international experiences, digitalisation indicators	Aligns with the objective of identifying opportunities in using digital technologies. Was founded on literature about EHIS and DHIS2.	Adam & de Savigny (2012); Sahay et al. (2020)

Benefits and Challenges of EHR/DER Implementation	Evidence on interoperability, costs, training, organisational change	Relates to the objective of understanding practical and technical barriers in implementation. Comparative analysis with previous studies supports the category.	Nguyen et al. (2014); Cresswell et al. (2024)
DHIS2's Contribution to Oral Health Equity	Epidemiological monitoring, resource distribution, intersectoral integration	Directly connects to the central objective of evaluating how DHIS2 can reduce inequalities and guide inclusive policies in Angola. Validated by African studies and WHO reports.	Byrne & Sæbø (2022); Reynolds et al. (202

Oral Health as a Public Health Priority

Oral health refers to the state of wellbeing of teeth, mouth, and orofacial structures, enabling essential functions such as chewing, breathing, and phonation, in addition to contributing to self-confidence, wellbeing, and the ability to socialise and work without pain or discomfort (WHO, 2022b). According to the WHO, oral health involves the absence of chronic pain, oral cancers, sores, congenital malformations, periodontal diseases, dental caries, and other conditions affecting the oral cavity (WHO, 2016).

Oral diseases are among the most prevalent non-communicable diseases worldwide, affecting approximately 3.5 billion people, with three out of four of these people living in middle-income countries (WHO, 2022a). In low and middle-income countries, the prevalence of these diseases has increased significantly, with an additional one billion cases in the past 30 years. The lack of access to preventive and restorative oral healthcare intensifies this disease burden, resulting in physical symptoms and functional limitations that impact emotional, mental, and social wellbeing (WHO, 22).

Much of these conditions are preventable with cost-effective preventive interventions and approaches that address common risk factors for various non-communicable diseases, which are especially useful in resource-scarce contexts (WHO, 2022b). Effective prevention includes self-care and evidence-based measures applicable to the general population, tobacco control, alcohol consumption management, and proper oral hygiene (WHO, 2016). However, oral health has historically been neglected on the global health agenda, with the main challenge being ensuring that populations have the knowledge and tools necessary to prevent and treat oral diseases (WHO, 2022b).

To address this reality, the World Health Assembly approved resolution WHA60.17 in

2007, reaffirming the commitment to integrate oral health into primary healthcare and non-communicable disease control (WHO, 2007). Additionally, the Basic Oral Health Care Programme (BOHCP) was established to provide prevention and basic oral healthcare in health facilities with limited resources, focusing on promoting the use of economical fluoride toothpaste (EFT), urgent oral treatment (UOT), and atraumatic restorative treatment (ART) (WHO, 2016). In 2021, the adoption of resolution WHA 74.5 further strengthened the global commitment to oral health, establishing clear goals for 2030 and developing cost-effective interventions that facilitate access to essential oral healthcare (WHO, 2021). However, in Angola, the literature indicates that the oral health situation remains critical: studies conducted in Benguela and Bocoio show high prevalence of missing teeth, high rates of edentulism, and almost universal need for prostheses among the elderly, revealing low access to dental services and the lack of effective policies in the sector (Caconda, 2021; Caconda et al., 2021a). Additionally, recent analyses highlight that, although there is a health system structured in levels, the implementation of national oral health programmes is still incipient, requiring the creation of specific prevention and promotion strategies tailored to local realities (Silva, 2024).

Table 3 illustrates the guiding principles and strategic objectives for strengthening global oral health, highlighting the importance of an integrated public approach that promotes equity and access to dental care (Petersen, Baez, & Ogawa, 2020).

Table 3.
Guiding principles and strategic objectives for strengthening global oral health

Guiding Principles	**Strategic Objectives**
Public health approach to oral health	Oral Health Governance: Improve political commitment and resource allocation for oral health, strengthen leadership, and create intersectoral partnerships.
Innovative workforce models	Oral Health Promotion and Disease Prevention: Empower populations to achieve the best possible oral health and address social determinants.
Integration of oral health into primary care	Workforce in Health: Develop an innovative workforce model and review and expand competency-based education.
Person-centred oral healthcare	Oral Healthcare: Integrate essential oral healthcare and ensure social protection in primary healthcare.
Lifecourse interventions	Oral Health Information System: Improve surveillance systems to provide relevant and timely feedback to oral health decision-makers.
Optimisation of digital technologies	Oral Health Research Agenda: Continuously create and update specific research focused on public oral health.

Inequalities in Access to Oral Health

Health is a fundamental right that enables individuals to actively participate in society and is a fundamental component for the economic and social development of nations. However, health in general, and oral health in particular, still face significant inequalities in various regions of the world, especially on the African continent, where socioeconomic,

cultural, and structural factors limit access to basic care. In low- and middle-income countries, inequalities in access to health services exacerbate the vulnerability of populations to various diseases, making it difficult to promote effective and inclusive health policies.

In the African continent, some areas present high vulnerability to oral diseases due to specific nutritional patterns and social habits of the region (WHO, 2016). Although certain traditional practices benefit oral health, many factors contributing to poor general health are associated with poverty, which is the main determinant of health conditions (WHO, 2016). In 2014, 31 of the 47 African countries were classified by the United Nations (UN) as the least developed, with approximately 80% of the population in a low socioeconomic situation. This reality limits access to healthy food, basic sanitation, and healthcare services, negatively affecting the general and oral health of these populations (WHO, 2016).

The lack of basic oral healthcare services in health systems compromises the quality of life of patients in various African countries, including Angola. Many oral pathologies that could be treated in initial stages are ignored or undiagnosed, either due to the overload of health centres, lack of training for basic interventions, or lack of qualified oral health professionals (WHO, 2016). Oral healthcare services are concentrated mainly in urban centres and private clinics, excluding a large part of the population, especially in rural areas (WHO, 2016). On the African continent, the dentist-to-population ratio is estimated at about 1:150,000 people, compared to 1:2,000 in high-income countries, reflecting a huge disparity in access to dental care (WHO, 2016).

These inequalities in access to oral healthcare services highlight the need for an integrated approach that prioritises oral health within public health, ensuring that the most vulnerable populations receive appropriate and preventive care (Oliveira & Artmann, 2009). This context underscores the importance of implementing policies and health information systems that facilitate the monitoring and equitable distribution of dental services, promoting oral health as an integral part of the right to health.

Electronic Health Information Systems

The category Electronic Health Information Systems (EHIS) explores the characteristics, benefits, and challenges related to the implementation of digital technologies for health data management. These systems, such as DHIS2, represent important advances by

enabling the collection, monitoring, and real-time analysis of data, crucial for agile and evidence-based decision-making in public health (Benoit et al., 2022; Sahay et al., 2020).

The lack of consistent data on health determinants compromises the development of health systems and negatively impacts health outcomes, highlighting the importance of EHIS for improving services and public health policies (Sahay et al., 2020). The role of health information systems is therefore widely accepted worldwide, as they strengthen the quality and safety of care provision by promoting decisions based on reliable data (Adam & de Savigny, 2012; Sahay et al., 2020).

At the Faculty of Dentistry of Alexandria University in Egypt, an electronic oral health surveillance system for preschoolers using DHIS2 was implemented, which demonstrated simplicity in data entry and technical feasibility both in face-to-face and remote modes (Abdelrahman et al., 2024). However, the pilot also revealed limitations related to the need for high-performance devices, stable connectivity, and intensive professional training, factors that could restrict its adoption in countries with less infrastructure. In Angola, a study conducted in hospitals in the Huíla region identified low use of information systems by managers, highlighting weaknesses in data quality and the integration of information into the decision-making process (Sanjuluca et al., 2022). More broadly, reviews indicate that in various African countries, the use of DHIS2 remains predominantly focused on hierarchical reporting of information, without effective incorporation into local health management processes (Byrne & Sæbø, 2022). These examples demonstrate that the implementation of electronic information systems, although promising, faces structural and contextual challenges that need to be considered for a critical analysis of feasibility in Angola.

With the evolution of computer systems and the use of digital tools, Electronic Health Records (EHRs) have advanced significantly since their introduction in the 1960s (Chishtie et al., 2023). Dental informatics, specifically, was introduced by Zimmerman and colleagues in 1968, aiming to improve clinical practice, research, education, and management (Benoit et al., 2022; Chhabra, 2016; Zimmerman et al., 1986). Since then, advances in dental informatics include digital device-assisted diagnostics, 2D and 3D imaging, and computer-aided design and manufacturing (CAD/CAM) processes, as well as technology-guided surgery (Benoit et al., 2022).

Dental Electronic Records (DERs) are key components of EHIS in dentistry, documenting patients' medical and dental history (Benoit et al., 2022). These systems are not mere digitalisations of paper records but interoperable tools that facilitate data

control and storage, support administrative and management processes, and guide public health policies.

To maximise the advantages of DERs, especially regarding communication, aggregation, and (re)use of data, it is fundamental to use standardised clinical coding systems (SCCS), adapted to the dental domain (Atkinson et al., 2002; Benoit et al., 2022). These systems enable machine-readable documentation and computerised comparison of outcomes from different treatments for similar diagnoses.

In the early 2000s, there was no consensus for standardised dental diagnostic nomenclatures. The International Classification of Diseases (ICD), introduced by the WHO, was widely used to track mortality information but proved inadequate for specific dental diagnostics (Benoit et al., 2022; Quan et al., 2008). Similarly, NSMED-TC did not fully meet oral health needs, leading the dental community to develop more adapted terminologies, such as NSDENT, established by the American Dental Association (ADA) in 2007, comprising about 8,000 specific concepts for dental diagnoses and symptoms (Tokede et al., 2013; Yansane et al., 2019). In 2009, the Dental Diagnostic System (DDS) was created, which comprises categories and subcategories for detailed dental diagnostics (Kalenderian et al., 2011; Yansane et al., 2019).

Other systems, such as EZCode, Ontology for Dental Research, and Oral Health and Disease Ontology, were proposed and adapted to meet the specific needs of the dental field (Benoit et al., 2022). The standardisation of terminologies for diagnostics is fundamental to direct appropriate treatments and improve primary healthcare, enabling a more effective and equitable application of oral healthcare services (Kallio et al., 2022; Sporaland et al., 2019).

Benefits and Challenges of Implementing Electronic Health Record/Dental Electronic Record

The objective of implementing Electronic Health Record (EHR) systems is to improve population health, provide optimised services, and reduce costs (Gesko et al., 2020). Over the past 30 years, digital technology, especially EHR, has transformed the planning, provision, and organisation of healthcare services (Gesko et al., 2020). Despite financial incentives and supportive policies, EHR implementation has been slow, and potential benefits such as increased safety and productivity have not yet been fully achieved (Burns, 2024; Nguyen et al., 2014).

In this study, the benefits and challenges of implementing EHR/DER can be directly articulated with the Angolan reality. On one hand, the literature highlights that electronic records favour the standardisation of information, interoperability between care levels,

and epidemiological monitoring in oral health (Cresswell et al., 2024; Nguyen et al., 2014). These potentials align with the need identified in Benguela and Bocoio, where the absence of structured records hinders longitudinal patient follow-up and the formulation of appropriate public policies (Caconda, 2021; Caconda et al., 2021b). On the other hand, the challenges highlighted, such as high implementation costs, lack of training, and resistance from healthcare professionals (Sahay et al., 2020), reflect the barriers observed in the Angolan context, marked by the scarcity of human resources and the concentration of services in urban areas (Silva, 2024). Thus, by relating international literature and local findings, it is evident that the adoption of systems like DHIS2 could contribute to reducing inequalities and strengthening oral health equity, provided it is accompanied by sustainable capacity-building and funding policies.

According to the Accenture report, EHR adoption varied by region between 2010 and 2013: it is estimated to have grown by 9.7% in North America, 7.6% in Asia-Pacific, and 6.6% in Europe, Africa, and Latin America (Burns, 2024; Nguyen et al., 2014). The success of implementation depends on the interaction between technical and social factors, making governance fundamental to ensure that EHR meets the needs of healthcare professionals and citizens, ensuring continuity of care, clinical safety, and cost reduction (Maia et al., 2019). Asthana and colleagues' study (2019) indicates that national success in EHR adoption requires intersectoral participation and active involvement of the Ministry of Health to sustain implementation and maximise benefits.

Studies reveal that critical factors for success and failure in EHR implementation include system development, implementation, and organisational factors, illustrated in Tables 4, 5, and 6 (Cresswell et al., 2024; Nguyen et al., 2014). Among development factors, clarity in planning and design and standardisation of guidelines and a viable minimum infrastructure stand out (Table 4).

Table 4.
Development Factors and Implementation Challenges

Benefits	Challenges	Constraints
Will enable system development (Nguyen et al., 2014).	Construction of a viable minimum infrastructure that evolves over the long term (Cresswell et al., 2024).	System failures, computer errors, and frequent restarts (Nguyen et al., 2014).

Implementation factors focus on interoperability, use, and utility of the system, fundamental to ensuring EHR effectiveness (Table 5).

Table 5.
EHR System Implementation Factors

Benefits	Challenges	Constraints

Interoperability: improvement in information quality and timely access to data (Nguyen et al., 2014).	Incorporation of digital technologies, such as telehealth and smart devices, to enhance the smart hospital (Asthana et al., 2023).	Limited internet access and broadband in rural and remote areas (OFCOM, 2022; Carvalho et al., 2016).
Use and Utility: ease of learning and use, with suggested improvements in usability (Nguyen et al., 2014).	Need for new incentives to encourage technological transition (Cresswell et al., 2024).	Lack of incentives such as electronic reminders and financial bonuses to support adoption (Kallio et al., 2022).

Another essential factor are organisational categories, which involve funding, cultural change, data security, and team workflow (Table 6).

Table 6.
Organisational Categories

Benefits	Challenges	Constraints
Funding: support for development and implementation (Gardner et al., 2023).	Inclusion of cultural change and change management (Nguyen et al., 2014).	Difficulty in providing support due to financial and organisational limitations.
Organisational Cultural Change: need for "clinical informatics translators" for digital capacity-building (Asthana et al., 2019).	Socio-organisational problems at the human-machine interface (Benoit et al., 2022).	Cultural resistance to digitalisation and lack of trust.

Team workflow, training, and digitalisation are fundamental aspects for EHR success, cited as both advantages and sources of challenge (Table 7).

Table 7.
Training, Digitalisation, and Data Security

Benefits	Challenges	Constraints
Training: improvement in proficiency and accuracy of records (Nguyen et al., 2014).	Inadequate training leads to misuse and prevents full use of EHR (Gesko et al., 2020).	Significant costs and time to educate staff on EHR use.
Digitalisation: improvement in information flow and care integration (Hallinan et al., 2024).	Cultural resistance to digitalisation impacts acceptance by professionals (Asthana et al., 2023).	Limitation in information exchange between patients and organisations.

DHIS2's Contribution to Oral Health Equity

DHIS2 is the world's largest health information management system (HIMS), used by Ministries of Health in more than 80 countries, including Angola, as a digital tool to manage health data at the local level (WHO, 2022b). It is a flexible, open-source electronic record system that integrates multiple health services and facilitates data collection and analysis to support decision-making and public health management (Sahay et al., 2020).

Various countries use DHIS2 to create and maintain individual health records, monitoring and tracking patients, conducting disease surveillance, recording immunisations, among other functions. The system allows all data, regardless of programme or care level, to be integrated into a single platform accessible at all levels of the health system. This centralisation facilitates planning, monitoring, and evaluation of health actions, as well

as optimising budgets and operational decision-making, and patient tracking (Byrne & Sæbø, 2022; Sahay et al., 2020).

One of DHIS2's most innovative functionalities is the Tracker, an application that allows individual-level data collection for case monitoring, such as patient medical records, disease outbreak cases, logistics information on products, and even school records (Reynolds et al., 2022). The Tracker provides support for direct monitoring and detailed analysis of these data, facilitating the management of large-scale health programmes and other projects (Byrne & Sæbø, 2022; Reynolds et al., 2022).

In oral health in Angola, DHIS2 presents significant potential to reduce inequalities in care. The system can be used as a dental electronic record, assisting in identifying the prevalence and incidence of oral diseases and monitoring oral health epidemiological indicators. This information can guide a more equitable distribution of professionals and efficient allocation of material and financial resources. Additionally, DHIS2 can inform public oral health policies in Angola, promoting fairer and more effective access to oral healthcare, especially in more vulnerable communities.

Despite DHIS2's potential to promote equity and improve oral health monitoring in Angola, it is important to recognise structural challenges that may limit its effective implementation. The literature points out that the lack of adequate digital infrastructure, connectivity difficulties in rural regions, and inequalities in access to technologies are frequent barriers in low and middle-income countries (Sahay et al., 2020). Additionally, insufficient digital literacy among healthcare professionals represents an additional obstacle, potentially compromising both system use and the quality of collected data (Nguyen et al., 2014). In the Angolan case, studies already indicate limitations in access to basic services and the availability of qualified professionals, reinforcing the need for public policies that integrate investments in technological infrastructure, team capacity-building, and digital inclusion strategies (Caconda et al., 2021b; Silva, 2024). Thus, a balanced analysis of DHIS2 requires considering not only its potentialities but also the material and human conditions necessary for its consolidation.

CONCLUDING REMARKS

The implementation of electronic health information systems, such as DHIS2, represents a valuable opportunity to promote oral health and reduce inequalities in access to dental care in Angola. This study reveals that, despite technological advances and strategic partnerships with international organisations, the effective adoption of these systems still faces structural, economic, and cultural challenges. Oral health, as an essential component of overall health, depends on the monitoring of reliable data and the support

of public policies aligned with the needs of the most vulnerable communities.

The findings of this review indicate that DHIS2 has the potential to transform oral health management in Angola by offering tools that enable the collection, analysis, and strategic use of data. This system can facilitate the equitable allocation of resources and guide more inclusive public health policies, benefiting underserved areas and populations in greater vulnerability. Additionally, the integration of DHIS2 with other information technologies can expand the reach of preventive actions and monitoring, promoting a more efficient and comprehensive approach to promoting oral health in the country. However, such contributions should be understood as conditional prospects, not as consolidated results, since the research did not involve direct empirical evaluation of the implementation. It is also necessary to acknowledge important limitations, such as insufficient technological infrastructure, inequalities in access to connectivity, and gaps in healthcare professionals' digital literacy.

Although DHIS2 shows potential to support oral health equity, any statement about its "transformative" character should be understood as prospective and limited by the methodological scope of this study. As this is a documentary analysis and not empirical field research, the results do not allow confirmation of direct impacts of the system in Angola, but only the raising of hypotheses grounded in the literature. In this sense, it is fundamental to recognise methodological limitations: the absence of primary data restricts the generalisation of findings; the analysis is based on documents and secondary studies, subject to publication biases and information gaps; and comparison with international experiences may not fully reflect local specificities. These restrictions affect the robustness of the presented recommendations, which should be interpreted as preliminary inputs for reflection and not as definitive guidelines. Future empirical research involving managers and healthcare professionals in Angola is necessary to validate and deepen the inferences discussed here.

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