Artículo Original

Decision-making for the treatment of occlusal caries in the Brazilian public health system

Toma de decisiones para el tratamiento de caries oclusales en el sistema de salud público brasileño

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ABSTRACT

Introduction: Caries diagnosis errors have become a public health problem.

Objective: Verify the consistency in terms of decision-making between Brazilian dentists from the country's public health system and the International Caries Detection and Assessment System (ICDAS), and evaluate the influence of professional experience on the management of the decay.

Methods: There are 80 dentists in the public health service of Recife city, Brazil. All dentists were invited to participate in this cross-sectional study. Forty dentists agreed to answer questions about their decision-making in relation to the treatment of occlusal caries in low, moderate and high-risk caries situations. The time of clinical experience, the use of methods for the assessment of caries risk and the lesion activity were also inquired about. The T-test was applied with a significance level of 5 % to compare the correlation between

the International Caries Detection and Assessment System scores regarding the mean age of participants.

Results: The disagreement between the dentists and the criteria used by the International Caries Detection and Assessment System for decision-making were mainly related to the sound surfaces or lesions restricted to the tooth enamel. It was thus verified that lack of consistency for the low-risk condition reached a score of 3 (32 %), while moderate (95 %) and high-risk (85 %) conditions lay at a classification code of 0. The time of professional experience was not considered to have interfered with decision-making on any scale, regardless of the risk condition of the patient ($p > 0.05$).

Conclusions: A divergence in terms of decision-making between dentists of the public health system and the International Caries Detection and Assessment System could be observed, specifically regarding sound surfaces or surfaces with lesions restricted to the tooth enamel. Furthermore, professional experience was seen as not influencing the management of caries.

Keywords: International Caries Detection and Assessment System (ICDAS); occlusal caries; decision-making.

RESUMEN

Introducción: Los errores de diagnóstico de caries se han convertido en un problema de salud pública.

Objetivo: Verificar la concordancia de la toma de decisiones entre los dentistas brasileños del sistema de salud pública del país y el Sistema Internacional de Detección y Evaluación de Caries (ICDAS), así como evaluar la influencia de la experiencia profesional en el manejo de la caries.

Métodos: De los 80 dentistas que existen en servicio público de salud en la ciudad de Recife, Brasil, todos fueron invitados a participar en este estudio transversal. Cuarenta dentistas acordaron responder sobre su toma de decisión en relación con el tratamiento de la caries oclusal en situaciones de caries de bajo, moderado y alto riesgo. El tiempo de experiencia clínica, el uso de métodos para la evaluación del riesgo de caries y la actividad de la lesión también fueron cuestionados. La prueba T, para un nivel de significancia del 5 %, fue aplicada para comparar la correlación entre los escores del Sistema Internacional de Detección y Evaluación de Caries en relación con el promedio de edad de los participantes.

Resultados: El desacuerdo entre los dentistas y los criterios utilizados por el ICDAS para la toma de decisiones se concentró en los códigos de clasificación que representan superficies sanas o lesiones restringidas al esmalte de los dientes. Se verificó así que la falta de consistencia para la condición de bajo riesgo se concentró en la puntuación de 3 (32 %), mientras que las condiciones moderada (95 %) y de alto riesgo (85 %) se concentraron en los códigos de clasificación de 0. El factor tiempo de experiencia profesional no interfirió en la prevalencia de concordancia de la toma de decisión para cualquier escore, independientemente de la condición de riesgo del paciente (p> 0,05).

Conclusiones: Se pudo observar una divergencia en cuanto a la toma de decisiones entre los dentistas del sistema de salud pública y el Sistema Internacional de Detección y Evaluación de Caries, específicamente con respecto a superficies sanas o superficies con lesiones restringidas al esmalte de los dientes. Además, la experiencia profesional no influyó en el manejo de la caries.

Palabras clave: Sistema Internacional de Detección y Evaluación de Caries (ICDAS); caries oclusales; toma de decisiones.

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INTRODUCTION

The diagnosis of carious lesions on occlusal surfaces have become increasingly more complex given the new concepts involving etiopathogenesis of the decay, as well as the unavailability of precise instruments and the lack of consistency of diagnosis methods.[1,2,3,4] Even with the technological developments, a high discrepancy is still observed among the groups of examiners, mainly regarding the treatment of dental caries in occlusal surfaces without cavitation.[5]

The variability of diagnoses may lead to arbitrary decisions, culminating in a public health issue. Invariably, diagnosis errors can conduce to less conservative and irreversible treatments based on a vicious cycle of mistakes and iatrogenesis.[6,7] The causal factors which lead to this discrepancy in diagnoses are: age of the examiner, training, skills, preferences and experience.[8]

However, it is observed that the ideal option for the decision of dental caries treatment is the one that is best suited to the reality and to the individual needs of the patient. Therefore, the several risk factors identified should be assessed and related with the disease, in order to establish the individual risk of caries and thus settle to an individualised treatment plan.[2,3]

The International Caries Detection and Assessment System (ICDAS)[9] has proven to be a promising option for standardising the treatment of caries based on its diagnosis.[10] For such, it is considered mandatory to assess the factors such as the patient's risk of caries, the activities and the extension of the carious lesion, in addition to the traditional approach for cavitation detection.[2] Moreover, the ICDAS indicates the advantages of assessing initial lesions and the possibility of classifying lesions according to their severity and intervention needs.[11]

Thereby, this work was aimed at verifying the concordance of the decision-making between Brazilian dentists from the public health system and the International Caries Detection and Assessment System (ICDAS II), as well as to evaluate the influence of professional experience on the management of the disease.

METHODS

This present research is a cross-sectional study, carried out in the city of Recife, in the Brazilian State of Pernambuco, which was endorsed by the Ethics Committee on research of the Integrated Faculty of Pernambuco (Protocol N. 2.307.072/2017). There are 80 dentists on public health service in Recife city, Brazil. All dentists were invited for this cross-sectional study. Forty dentists agreed to take part in the study after the signature of a free and clarified consent term (FCCT) and an explanation of the research.

Images of the ordinal scale system from the ICDAS were obtained through the official online course platform of the International Caries Detection and Assessment System (https://www.icdas.org/icdas-e-learning-course), with the decision-making being assessed by the interviewees, regarding the low, moderate and high risk of caries, as established by the ICDAS II[9] (Fig. 1). Each score was accordingly explained in terms of the degree of dental tissue involvement and the extension of the lesion. None of the interviewees had received any type of training on the criteria adopted by the ICDAS until that moment.

ICDAS II

Score 0	Score 1	Score 2	Score 3	Score 4	Score 5	Score 6
No visual signs of carious lesions or any enamel defect	First visible changes in the enamel. Visible only after drying with air. Changes in coloration confined to areas of pits	Change in visible enamel even in the presence of moisture. More extensive and not restricted to pits.	Destruction located in enamel without visible dentin, discontinuities of enamel surface	Dark shadow on the underlying dentin, with or without localized destruction of enamel	Clear cavity with visible dentin; cavity that involves less than half the dental surface	Extensive cavity evident in dentin; cavity deep and wide, involves more than half of the tooth
						

Fuente: https://www.icdas.org/icdas-e-learning-course.

Fig. 1 - Images of the different classification scales established by the ICDAS II shown to the respondents during the interview.

Before being questioned about decision-making, the description of each risk condition of caries was given to the respondents. These concepts followed the parameters adopted by the ICDAS II, using the ICCMS™ as a risk assessment tool.[9]

The correlation between decision-making was subject to the correct choice of treatment proposed by the dental surgeons, subsequently being compared with the parameters of decision-making established by the_International Caries Detection and Assessment System. Therefore, the criteria for decision-making stated by the ICDAS[9] were considered gold standard for this research (table 1). Furthermore, the clinical experience was also questioned, as well as whether the patient's risk of caries and the lesion activity had been assessed in the decision-making.

Table. 1 - Decision-making processes established by the ICDAS II for the different codes and caries risk conditions

	Escore 0	**Escore 1**	**Escore 2**	**Escore 3**	**Escore 4**	**Escore 5**	**Escore 6**
Low Risk	Sealant optional	Sealant optional	Sealant optional	Sealant or minimally invasive restoration needed	Minimally invasive restoration	Minimally invasive restoration	Minimally invasive restoration
Moderate Risk	Sealant optional	Sealant recommended	Sealant optional	Sealant or minimally invasive restoration needed	Minimally invasive restoration	Minimally invasive restoration	Minimally invasive restoration
High Risk	Sealant recommended	Sealant recommended	Sealant recommended	Sealant or minimally invasive restoration needed	Minimally invasive restoration	Minimally invasive restoration	Minimally invasive restoration

After having collected the data and categorising the variables, a database was created for statistical analysis using SPSS (Statistical Package for the Social Sciences) version 21. The normal distribution of quantitative data was verified by the Kolmogorov-Smirnov test, with the T-test was applied to compare the parameters of decision-making established by ICDAS with treatment proposed by the dental surgeons taking into account the clinical experience. The statistical tests were carried out with an error margin of 5.0 %, with the descriptive statistics being presented through graphs.

RESULTS

All interviewees acknowledged making use of the patient's individual risk assessment of caries, as well as verifying caries lesion activity aimed at directing clinical decision-making. The average clinical time of the sample was of 22.08 ± 11.56 years.

The data concerning clinical decision-making for low, moderate and high-risk conditions are exhibited in figure 2. It was thus verified that the lack of consistency for the low-risk condition was concentrated at the score of 3 (32,5 % of disagree), %), while the moderate (95 %) and high-risk (85 %) conditions were concentrated at the classification codes of 0. As for the analysis of divergences regarding the type of choice of conduct, it could be observed that the majority of respondents adopted a more invasive conduct when compared to the ones proposed by the ICDAS.

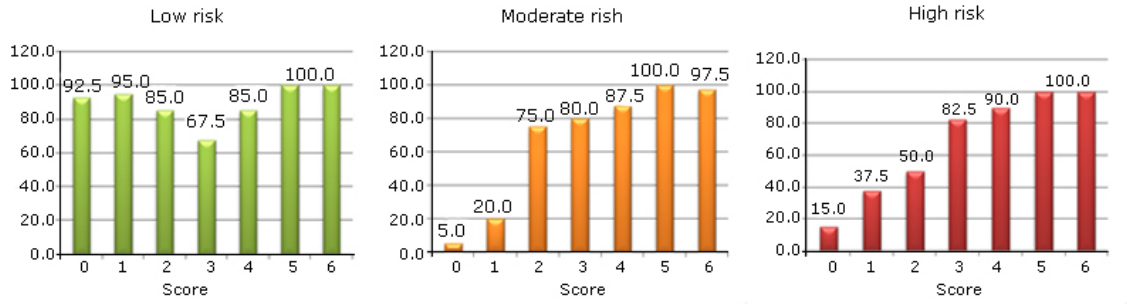

Fig. 2 - Concordance between dentists and the ICDAS on the decision-making of caries lesions on patients considered of low, moderate and high risk.

Table 2 illustrates that the time of clinical experience does not interfere on the prevalence of consistency in any condition on the occlusal surface, regardless of the patient's risk condition (p> 0.05).

Table 2 – Comparison between time of clinical experience and the prevalence of consistency on decision-making in comparison with the parameters from the ICDAS II

Variables	Answer - Low Risk			Answer – Moderate Risk			Answer - High Risk		
	Concordance	Disconcordance	*p*-value *	Concordance	Disconcordance	*p*-value *	Concordance	Disconcordance	*p*-value *
	Mean ± SD	Mean ± SD		Mean ± SD	Mean ± SD		Mean ± SD	Mean ± SD	
Score 0	22.24 ± 11.87	20.00 ± 7.81	0.751	35.50 ± 6.36	21.37 ± 11.38	0.092	19.00 ± 10.04	22.62 ± 11.86	0.487
Score 1	21.71 ± 11.69	29.00 ± 7.07	0.392	25.75 ± 13.73	21.16 ± 11.01	0.321	21.00 ± 12.97	22.72 ± 10.86	0.655
Score 2	21.24 ± 10.76	26.83 ± 15.70	0.280	21.60 ± 10.67	23.50 ± 14.47	0.658	19.20 ± 11.58	24.95 ± 11.08	0.117
Score 3	21.44 ± 12.60	2.38 ± 9.35	0.589	21.16 ± 11.84	25.75 ± 10.19	0.321	21.03 ± 11.68	27.00 ±10.33	0.219
Sscore 4	21.65 ± 11.70	24.50 ± 11.41	0.584	21.77 ± 11.55	24.20 ± 12.74	0.666	21.64 ± 11.41	26.00 ± 13.95	0.481
Sscore 5	22.08 ± 11.56	-	-	22.08 ± 11.56	-	-	22.08 ± 11.56	-	-
Sscore 6	22.08 ± 11.56	-	-	21.62 ± 11.33	40.00 ± **	0.118	22.08 ± 11.56	-	-

* t Student test.
** There is no Standard Deviation.

DISCUSSION

Untreated dental caries remains a challenge to public health in poor communities.[12] In Brazil, as well as in other parts of the world, caries mobilizes a great part of the financial resources in terms of public health applied to odontology.[13,14] This research was carried out using a sample consisting of dental surgeons from the Brazilian public health system, who, mainly, look after the economically deprived community, in which dental caries are widely polarised.[15]

Regarding the management of public resources, limited at times, the conviction of the clinical decision-making is extremely important to avoid over-treatments unsuited to the patient's needs.[16,17] Therefore, the assessment of individual caries risk is proven to be a predictive tool which directs to a more adequate choice of medical conduct, as it is based on the etiopathogenesis of the caries disease.[2,3]

The variety of signs that characterise the different stages of the carious lesions assessed reflect the dynamics of a progressive disease that poses a challenge on its diagnosis, as well as on the consequent clinical decision-making.[18,19] It is worth pointing out that the detection of only the presence or lack of lesion does not take into account the stages of its development or the specific etiopathogenesis of the caries disease, which may thus reflect on treatments unsuitable to the real needs of the patient.[20]

In order to minimise the variability in the management of the carious process, the International Caries Detection and Assessment System (ICDAS II) was developed based on three structuring axes: assessment of the medical and odontological background, intra-oral assessment and data synthesis for clinical decision-making.[9] Several studies[21,22,23,24] have exhibited adequate validation and reproducibility on the evaluation of carious lesions on deciduous and permanent teeth, even when only photography is used for such purpose, which justifies the exclusive use of the assessment tool presented in this study.[25]

When assessing the concordance of the treatment decision in comparison with the parameters established by the ICDAS II (Chart 2), conflicting situations could be observed for the suggestions of treatment of enamel microcavities (Score 3) for all risk conditions. When the risk of caries was considered low, the correlation levels for all classifications were higher than 67.5 %. However, when the risk of caries was considered moderate and high, the discrepancies were concentrated around the scores of 0,1 and 2, varying between 50 % and 95 %.

For a moderate-risk, a discrepancy level of 95 % could be observed for the classification scale of 0 and of 80 % for the scale of 1. As for the high-risk condition, the divergence level for the classification scale of 0 was of 85 %, 62.5 % for the scale of 1 and 50 % for scale 2. These data corroborated with the findings by Oliveira *et al.* ,[11] who affirms that there is a greater difficulty associated with the diagnosis process of dental caries in carious lesions at an initial stage of decay, with the decision-making being consequently more dramatic.

The lack of consensus regarding the treatment proposed, as observed from the data collected, may reflect on the mere subjectivity of a diagnosis process based only on parameters that do not contemplate the complex aetiology of the caries disease, resulting in excessive and inefficient treatments, with a direct influence on the patient's oral health. Thus, based on the results presented, it can be inferred that the inappropriate use of caries diagnosis has posed a threat to patients, who may be submitted to unnecessary invasive dental restoration, inducing a subsequent vicious cycle of restorations, culminating in the complete loss of the dental element.[26]

The results of this research demonstrate a conflicting situation, given that all dental surgeons claimed evaluating the risk of caries and the lesion activity as conditions for their decision-making. A customary paradox can be observed between what is practiced in terms of diagnosis and what is in fact exercised in terms of decision-making. It was possible to verify that, in the face of doubts on establishing the administration of caries lesions, in most cases,

the most invasive treatments are considered a safer alternative, indicating that the concept of health promotion and disease prevention is still not present in the current clinical practice.

According to Diniz *et al.*[27] the correct form of clinical decision-making regarding dental caries may be influenced by multiple factors such as age, medical training, skills, preferences and experience. However, concerning clinical experience, Zandona *et al.*[28] compared the different levels of clinical experience and concluded that this variable did not contribute to the correct use of the criteria established by the ICDAS. This fact corroborates with the findings of this present research about the influence of time of experience on the correct decision-making. No statistical difference could be verified regarding age average and the correct or incorrect correlation with the scale classification adopted by the ICDAS II ($p > 0.05$).

It was possible to observe that there is no consensus among dental professionals that caries lesion is the result of a dynamic and complex process, and that its aetiology is linked to the form of treatment.[18,19] Furthermore, initial lesions on the tooth enamel may be prevented using non-surgical treatments, such as dental remineralisation with fluorinated products, diet control, biofilm removal, as well as pit and fissure sealants, leaving behind the old paradigm that all caries should be restored[29,30].

Conclusions

A divergence on the decision-making among dentists of the Brazilian public health system and the ICDAS regarding sound occlusal surfaces or lesions restricted to the dental enamel could thus be observed. Furthermore, professional experience was seen as not influencing on the management of dental caries.

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Conflicts of interest

The authors declare that they have no conflict of interest.