



Perceptions on using the International Caries Detection and Assessment System (ICDAS) among Malaysian private dentists: a qualitative study

Percepções sobre o uso do Sistema Internacional de Detecção e Avaliação de Cárie (ICDAS) entre dentistas privados da Malásia: um estudo qualitativo

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ABSTRACT

Objective: to explore the perceptions of Malaysian private dentists on the use of the International Caries Detection and Assessment System (ICDAS) in their dental practice. **Material and Methods:** this qualitative study involved individual interviews with twelve general dental practitioners working in the private sector, who has been exposed to ICDAS training during their undergraduate study. Purposive sampling was carried out among private dentists in Malaysia from various states to reflect diversity. The interviews were recorded and transcribed. Data analysis was conducted by thematic analysis. **Results:** five main barriers were identified through the coding process, namely time factors, lack of training, having no effect on treatment planning, charting difficulties, and low patient awareness on prevention. Better training and a strong requirement by the authorities to use this system were identified as the enabling factors. **Conclusion:** private dentists in Malaysia encountered a myriad of challenges in adopting the ICDAS index. Hence, it is necessary to provide adequate training and assistance in understanding the benefits of utilizing the ICDAS system, and computerization of data input.

KEYWORDS

Dental caries; Dental education; Dentists; Patient care; Qualitative research.

RESUMO

Objetivo: explorar as percepções de dentistas particulares da Malásia sobre o uso do Sistema Internacional de Detecção e Avaliação de Cárie (ICDAS) em sua prática odontológica. **Material e Métodos:** este estudo qualitativo envolveu entrevistas individuais com doze clínicos gerais que trabalham no setor privado, que foram expostos ao treinamento ICDAS durante seu estudo de graduação. Uma amostra intencional foi realizada com dentistas particulares na Malásia de vários estados com intuito de refletir a diversidade. As entrevistas foram gravadas e transcritas. A análise dos dados foi realizada pela análise temática. **Resultados:** cinco barreiras principais foram identificadas durante o processo de codificação, ou seja, fatores como o tempo, falta de treinamento, o não planejamento do tratamento, dificuldades de registro e baixa conscientização do paciente sobre prevenção. Foram identificados como fatores facilitadores um melhor treinamento e uma forte exigência das autoridades para usar este sistema. **Conclusão:** dentistas particulares na Malásia encontraram uma infinidade de desafios na adoção do índice ICDAS. Portanto, é necessário fornecer treinamento e assistência adequados para entender os benefícios da utilização do sistema ICDAS e da informatização da entrada de dados.

PALAVRAS-CHAVE

Cárie dentária; Educação odontológica; Dentistas; Atendimento ao paciente; Pesquisa qualitativa.

INTRODUCTION

Dental caries is one of the most common oral diseases that afflict adults and children worldwide. According to the Global Burden of Disease Study 2019, 2 billion individuals suffered from caries of permanent teeth and more than 520 million children suffered from caries of deciduous teeth [1]. Several caries detection and evaluation techniques have been proposed across the globe, but no single standard system has yet to be agreed upon and practised among dentists and researchers [2]. This has rendered comparing caries detection outcomes in epidemiological and clinical investigations challenging. To date, the decayed, missing, and filled (DMF) index developed by Klein, Palmer and Knuston in 1938 remains the most widely used index in epidemiological studies due to its simplicity and acceptability worldwide [3,4]. Nonetheless, the DMF index has a number of flaws, including equal weighting for decayed (D), missing (M), and filled (F) teeth, failure to account for tooth loss for reasons other than decay, and a lack of emphasis on non-cavitated teeth at risk of developing caries [3,5].

To address all these problems, the International caries detection and assessment system (ICDAS) was developed after intensive research and systematic review of existing caries classification and measurement systems by clinicians and academics across Europe and America [6]. ICDAS introduces a novel strategy for measuring dental caries that answers concerns faced by earlier systems, such as which stages of the caries process should be monitored, how to define each stage, how to identify each stage clinically, and how to assure the best examiner reliability [6]. This system has been adopted and recommended for inclusion in the Cariology module for undergraduate dental students in several countries as a benchmark for epidemiological and clinical research [6-8]. It can be inferred that clinical decision-making may be significantly influenced by ICDAS for its substantial correlation with the development of caries. However, there is insufficient evidence to support the adoption of ICDAS into clinical practice and the exact number of dentists who have undergone training in ICDAS is still unclear.

Previously published data on ICDAS has mostly centred on establishing the index's reliability, reproducibility, validity, and

accuracy [9,10]. In a research of West Yorkshire dentists' perspectives and experiences [11], it was discovered that dentists experienced various hurdles in applying it, including a lack of simplicity, financial constraints, and time limitations. Nevertheless, study exploring the barriers faced by clinicians and researchers in using the ICDAS index is still scarce in the literature. Patients in a private dental setting often receive care from several different dentists, and the adoption of a universal caries assessment tool makes it easier for other dentists to monitor the patient's progress or manage any complications that arise later. Additionally, as air drying is a need for the use of ICDAS, it would aid in the identification of caries in the pre-cavitated stage, allowing for the execution of preventative treatment [12]. This is essential since private practices are gradually shifting away from patient-centred treatment and toward a greater emphasis on patients' primary complaints. Therefore, a standardized caries detection system implementation is necessary to improve practitioner communication and to support the use of minimally invasive dentistry to provide each patient with individualised dental care [13].

To the best of our knowledge, no comparable study has been conducted in Malaysia, and it is critical to understand Malaysian dentists' perceptions of the barriers to utilizing the ICDAS index given that Malaysian dental education is shifting from DMFT to ICDAS. Hence, to address this gap, a qualitative study was conducted to explore the barriers, views, and experiences of Malaysian private dentists in using the ICDAS index for caries detection in their dental practices.

MATERIALS AND METHODS

Study design

This qualitative study focused on exploring the perceptions of private dentists in Malaysia when using the ICDAS index. Ethical approval was obtained by a local private university research ethics committee with ethical approval reference: AUHAE/FOD/2022/01. In the present context, a private dentist refers to a private dentist who is a general dental practitioner with a professional dental license who practices dentistry in private settings. The present study was reported following the Consolidated Criteria

for Reporting Qualitative Research (COREQ) checklist [14].

Participants recruitment and the interview process

After a thorough evaluation of the existing literature [11,15,16], a topic guide was created for this study, which was then content validated by a dental public health specialist. Suitable candidates were emailed participant information sheets and requested to contact the research team if they were interested in participating in the study. The information sheets for participants highlighted that participation was voluntary, that the interview would be video-recorded, and that individuals were allowed to withdraw from the study at any point before the results were published.

To represent the study's diversity, purposive sampling was conducted among private dentists practicing in Malaysia from various states. Private dentists who are registered with the Malaysia Dental Council, have a valid annual practicing certificate in Malaysia, and have prior exposure to ICDAS system during their undergraduate studies are deemed eligible for the study. A one-on-one semi-structured interview method was selected to explore in-depth the views and experiences of private dentists on the usage of the ICDAS system. Open-ended questions were asked:

- Are you currently using ICDAS index system in your daily dental practice. If yes/no, why?
- How would you perceive the dental charting system that you are currently practicing as compared to the ICDAS system?
- Do you think that there will be a cultural shift from your normal caries diagnosis practice to using ICDAS?
- Is there any concern or difficulty arise when employing the ICDAS system in your daily dental practice?
- Do you think that ICDAS should be implemented in your practice? If yes/no, why?"

A total of sixteen invitations were sent to eligible participants and twelve of them responded. Verbal and written consent were obtained from the twelve participants who agreed to take part in this study. Before the interview began, the participants were given the chance

to clarify any doubts with the researchers. The interview took place using Zoom Video Communication Software from March 2022 to May 2022. Participants were allowed to join the virtual interview session at any location convenient to them. Each session lasted for around 20 to 30 minutes and the final audio recordings were anonymized and transcribed verbatim. Two facilitators who had prior experience in qualitative research were present during each of the sessions, with WWT leading the discussion and GSSL providing inputs. The facilitators were not known to the participants prior to the study.

Data collection

The researchers met often during the data collection period to discuss the recurrent themes identified during the interview sessions. When all the researchers reached the conclusion that no new themes were emerging, data collection was halted. Data saturation was achieved after interviewing 12 participants.

Data synthesis

Phenomenology was selected as the methodology for this study as it involved the exploration and identification of people's experiences [17]. The data was analysed using thematic analysis. Preliminary coding was carried out by one investigator (WWT) using NVIVO 12 software. A discussion was carried out with other members of the research team (GSSL, HH) to further develop and refine the codes. Any inconsistencies in the coding process were resolved through discussion and verification among all members of the research team.

RESULTS

The characteristics of the study participants are listed in Table I. Five main themes were developed inductively through the coding process namely *time factors*, *lack of training*, *no effect on treatment planning*, *charting difficulties*, and *low patient awareness on prevention*. In a Venn diagram [18], these five themes were linked with an explanatory model to form the conceptual framework of the present study (Figure 1).

Theme 1: Time factors

Most participants mentioned that time factor was the main reason for not using the ICDAS

Table 1 - Participant's characteristics

Participants	Sex	Years in Private Practice	Location of Practice
Participant 1	M	7 months	Johor
Participant 2	F	3 years	Kuala Lumpur
Participant 3	M	1 year	Johor
Participant 4	M	2 years	Sarawak
Participant 5	F	5 months	Kedah
Participant 6	F	3 years	Kuala Lumpur
Participant 7	F	1 year	Sabah
Participant 8	F	1 year	Sarawak
Participant 9	F	1 year	Selangor
Participant 10	F	3 years	Johor
Participant 11	M	1 year	Johor
Participant 12	F	2 years	Johor

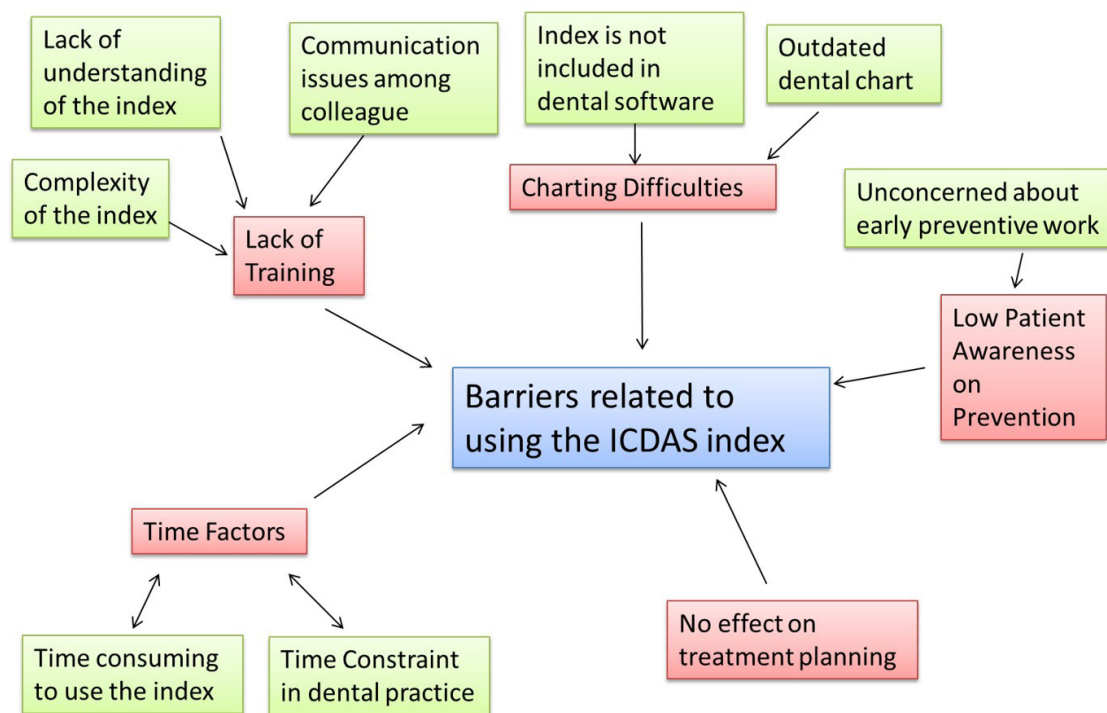


Figure 1 - Conceptual framework of themes with barriers to implementing the ICDAS index among Malaysian private dentists

index in their private practice. The time factor was highlighted in two contexts: time-consuming to use the system and time constraints in the practice. The ICDAS was deemed too time-consuming by the participants.

Participant 5: *"I think ICDAS is more time-consuming also, because you have to air dry every single tooth."*

Participant 6: *"It's [ICDAS] a waste of time to air blow all faces ... if you're considering class one or class two code (code 1 or code 2)."*

Participant 11: *"I think it's [ICDAS] a burden.... If you have to code every single caries in this coding, I think it might be a time-consuming issue."*

Few participants claimed that they were unable to practise the ICDAS index due to time constraints in their practice. This was observed at peak hours or when they had a larger number of patients to attend to.

Participant 1: *"Sometimes for the peak hour, the patient will come back to back. So it's*

really impossible for me to jot down every single moment.”

Participant 9: *“...when I have more patients or when I have some time limitation, I will switch back to using blacks classification, which is a bit more straight forward and yeah, fast for me.”*

Theme 2: Lack of training

Most participants interviewed for this study showed varying degrees of understanding of the ICDAS index. Many expressed their concern for not completely understanding the system: from assessing caries to differentiating each individual code, as well as difficulty in communicating with other colleagues due to lack of training.

Participant 1: *“Maybe the scoring system, I am not really familiar about that [ICDAS].”*

Participant 2: *“Enamel caries is harder to differentiate between 1, 2 and 3..... 1 and 2 [ICDAS codes] is a bit ambiguous.”*

Participant 10: *“Especially between one and two [ICDAS codes], I assume. Yeah. Yeah. The ones that are a bit... a bit... vague area....”*

Participants also remarked on the system's complexity and the resulting confusion when utilizing it.

Participant 7: *“ICDAS is a bit confusing because it's too detailed to describe ... when I was learning ICDAS, the categorization is a bit confusing.”*

Participant 9: *“There's [ICDAS] two digits, right? I think that part is quite confusing.”*

Communication issue among colleagues was cited as a big challenge when using the ICDAS index as some dentists and dental nurses were not trained in using the index.

Participant 9: *“When I use ICDAS I do have colleagues coming to me to ask me what does the code mean. And also my nurse is not trained in ICDAS and they don't really understand.”*

Participant 11: *“For us to simplify our communication and avoid any miscommunication with the... staff or with... the older dentist, we better use a universal system instead of trying to use the new coding and make people confuse.”*

Theme 3: No effect on treatment planning

Most participants believed that using the ICDAS index would have little influence on their treatment planning. As a result, many people have decided not to adopt it in their practice.

Participant 2: *“If it's code 3,4,5 [ICDAS] we still do the same treatment... in terms of treatment planning, I don't think it makes that much of a difference.”*

Participant 3: *“So actually there's not much difference for code 3 and code 4 [ICDAS] the treatment plans.”*

Participant 5: *“If based on just treatment planning, I would say it wouldn't really affect much”*

Participants also did not fully understand the rationale for using the ICDAS index. They felt that regardless of the score, the management would be the same for dental caries.

Participant 1: *“If you suddenly want me to use the ICDAS score, I feel why? Why should I? Can you tell me the exact reason of using it?”*

Participant 7: *“The ICDAS codes from one to six, doesn't really matter to us actually. As long as it's a caries, we need to fill it.”*

Theme 4: Charting difficulties

The use of the ICDAS index by private dentists was further hampered by an issue with an out-of-date dental chart. Participants indicated that using the ICDAS index would leave them with insufficient space to insert all the codes.

Participant 2: *“I don't think there is any dental charting diagram that allows ICDAS coding.”*

Participant 5: *“...our charting form, there is no space to write numbers. There's only the tooth surface. So it was just caries or no caries. So if we want to use ICDAS will become more messy.”*

The ICDAS index was not included in the program for individuals who used a computerized system.

Participant 1: *“The software we are using now didn't include such ICDAS coding in the system.”*

Theme 5: Low patient awareness on prevention

The poor understanding of the ICDAS index among patients also impeded its usage by private dentists. The majority of patients were unconcerned about early preventative treatment and merely wanted their primary problem addressed. As a result, many dentists were put off by the ICDAS index and decided not to utilize it in their practice.

Participant 4: *“When the patient doesn’t care, then the dentist won’t use it [ICDAS].”*

Participant 5: *“...when we do ICDAS, maybe the patients sometimes they’re not very concerned when you tell them about white spot lesion....”*

Participant 12: *“... if you were to propose, say fluoride treatment for a white spot lesion, the patients here won’t take it...”*

Participant 10: *“...patient is not keen to do any of the treatment that you are proposing according to your code [ICDAS].”*

Potential facilitators on the use of ICDAS index

Apart from expressing their views on the barriers to using the ICDAS index, participants also provided suggestions to increase the uptake of such an index among private dentists in their daily dental practice. Few participants claimed that providing more training for the dental team would help to overcome the barriers and enable them to understand the benefits of the ICDAS index.

Participant 6: *“Maybe we can conduct more workshops to let the dentists know, the importance of ICDAS codes...”*

Participant 4: *“What you can do is just to ... keep educating the dentists regarding the system...and provide training.”*

Participant 3: *“I think they [dentists] need more training.”*

It was also highlighted that a strong government execution is required to ensure that this system will be adopted by private dentists in Malaysia.

Participant 3: *“Government needs a strong implementation for this [ICDAS] in every clinic in Malaysia.”*

Participant 7: *“...when they make it [ICDAS], a compulsory thing, only we will use...”*

Participant 12: *“...if they make it into black and white and legally, we have to use it [ICDAS].”*

DISCUSSION

The aim of the present study was to explore the perceptions of the use of ICDAS index among Malaysian private dentists. Since May 2002, the ICDAS Coordinating Committee has gradually improved the ICDAS system to enhance the detection of dental caries even at the non-cavitated stage, supporting more preventative and less invasive caries management in general dentistry [16]. To the best of the authors’ knowledge, the current study is the first of its kind to investigate the perceptions of Malaysian private dentists in using the ICDAS index. The present study has established five theme barrier categories: time factors, lack of training, no impact on treatment planning, charting difficulties, and low patient awareness on prevention. This could help curriculum developers figure out how to tailor current undergraduate dental programs for competency-based dental education in the implementation of ICDAS index while performing dental charting.

Time-consuming to utilize the system and time constraints in practice were sub-themes under time factors. Cleaning and drying the teeth is a prerequisite to using the ICDAS system, which is particularly useful in detecting non-cavitated lesions [19]. One may hypothesize that dentists may not have time to clean and dry every tooth before dental charting in a hectic dental clinic, especially during peak hours. However, a previous study has refuted such a hypothesis stating that dentists only need to spend less than five minutes on average on both adults and children to assess patients’ caries status using the ICDAS protocol including brushing and drying time [15]. Hence, the authors postulate that time factor may become less significant with adequate training and experience among dentists.

ICDAS assessment is a new approach for most dental practitioners. Despite the fact that the majority of the respondents were junior dentists with less than three years of private practice experience, several acknowledged not utilizing ICDAS since they did not obtain explicit guidance

during their undergraduate studies [11]. In tandem, Al Dhubayb et al. [20] discovered that only 23% of the 100 private dentists surveyed used the ICDAS code in their practice, citing a lack of training as a contributing issue. Although ICDAS was established in the early to mid-2000s, several Malaysian dental schools just started using it to replace the DMF index in the curriculum less than 10 years ago [8]. It is heartening, though, that the vast majority of final-year undergraduate dental students in the country felt confident in employing the system in clinical practice, according to recent research [22].

Nevertheless, the ambiguous goal of implementing ICDAS in the clinic could possibly add to the hesitancy among dentists. Several respondents believed that the index would have no influence on the treatment plan if the dental problem was unrelated to the patient's primary complaint. Indeed, a prior study among general dental practitioners in England revealed that a lack of financial incentives deterred private practitioners from utilizing ICDAS in their clinical practice [11]. Some of the challenges to adoption may be addressed by a clear understanding of the system's benefits, such as identifying caries in the pre-cavitated stage. Even though private dentists would probably prefer to perform more financially rewarding treatments, many would still advocate for preventative and conservative procedures for their patients [23-25].

The authors believed that many of the challenges encountered by dentists when implementing the ICDAS code in their daily work are the consequence of an interplay between the theme categories discussed herein. For instance, dentists may find it challenging to effectively record patients' dental status using the index in a timely manner due to a lack of training and charting issues [11]. The charting concerns will be indirectly remedied with proper training, and the existing charts that dentists use may be gradually improved to fit the ICDAS standards. Nonetheless, ICDAS codes may now be recorded using software, allowing for convenient data storage and retrieval at any time [26].

The current evidence has also suggested that caries classification using a modified ICDAS produced favourable intra-rater consistency levels in a cohort of Malaysian dental undergraduates, even among students who had never used the system before [27]. Similar results were obtained

by Ahlawat et al. [8], reporting good to excellent intra and inter-examiner agreement among practitioners at a private Malaysian dental school. Moreover, the merged ICDAS with only three categories for caries severity: initial, moderate, and extensive was introduced in 2013 [16]. This modification acknowledges the time constraints in clinical practice as well as the complexity of the complete six-stage ICDAS codes. It also takes into account that there is little clinical benefit in distinguishing between the two earliest stages of enamel caries (ICDAS 1 and 2), which some practitioners reported to be challenging. Therefore, it is not surprising that once the modified or merged version of the ICDAS system is used, the concern about the difficulties of dental charting and time factor would gradually fade among dental practitioners.

A key theme found in the present study relating to low patient awareness of ICDAS clinical value in caries prevention emphasizes the importance of taking the time to explain clinical findings to patients. This is in line with the patient-centred approach in healthcare, which involves the patient in decision-making through 'informed wishes' [28], which is achieved by patient engagement and clear explanation by the healthcare practitioner [29]. The common themes that emerged from the current research on the facilitators of ICDAS use appear to be twofold: greater training and strong authority directions. Aside from training provided by dental professional bodies, dentists can strive to enhance their skills by utilizing online self-learning platforms [30]. Simultaneously, the clinic's support staff must be capable of aiding dentists in documenting ICDAS stages. Moreover, mandates from government agencies to apply the system may not be practicable or well-received by the dental community, but continual efforts to raise awareness and promote the system's use are prudent [31].

There were several flaws identified in the present research. For instance, since the current study utilized purposeful sampling, the results should be interpreted carefully as generalizability may be restricted. Furthermore, both the interviewer's performance and the questions asked may have the potential to be prejudiced. However, the authors considered that by employing semi-structured interviews to guide interviewer questions, the risk may be effectively addressed. Bias may also arise during

the recruitment process as the participants who responded and agreed to take part in the study may be well versed with the use of the ICDAS index. Nevertheless, the present qualitative findings contribute to the body of knowledge on the ICDAS system's adoption by filling a gap in identifying the hurdles and facilitators to ICDAS implementation among Malaysian private dentists.

CONCLUSION

Private dentists in Malaysia encountered a myriad of challenges in adopting the ICDAS index in their primary care practices, many of which had relatively straightforward solutions. Increasing the acceptance of the ICDAS index among private dentists in Malaysia may be accomplished by offering them adequate training, assisting them in understanding the benefits of utilizing the system, and computerizing data input.

Author's Contributions

WWT: Conceptualization; Methodology; Investigation; Data curation; Writing-original draft. GSSL: Formal analysis; Resources; Data curation; Writing – Review & Editing. HH: Data curation; Writing – Review & Editing.

Conflict of Interest

The authors declared no conflict of interest.

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Regulatory Statement

The study was approved by the Asian Institute of Medicine, Science and Technology (AIMST) University Human and Animal Ethics Committee (AUHAEC) with ethical approval code AUHAE/FOD/2022/01.

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