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ORIGINAL RESEARCH

Validation of the Indonesian version of the graded chronic pain scale revised (GCPS-R) for patients with temporomandibular disorders and orofacial pain

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Abstract

Background: Chronic painful temporomandibular disorders (TMD) are more complex to treat. Early detection and prompt treatment are essential for painful TMD. The Graded Chronic Pain Scale Revised (GCPS-R) is accurate and simple to use in chronic pain assessment, but it has not been validated for use in Indonesian patients. This study aimed to adapt and validate the Indonesian version of the GCPS-R so it can be used to measure chronic pain in patients with painful TMD and orofacial pain in Indonesia. **Methods**: We performed a cross-cultural adaptation of the GCPS-R into Indonesian (ID-GCPS-R) and subsequently assessed its validity and reliability. We assessed validity based on content, face, and convergent validity. We evaluated reliability using internal consistency with Cronbach's alpha. A panel of experts reviewed content validity. Face validity was assessed by testing among 30 respondents. Convergent validity and internal consistency were assessed using 96 respondents. Respondents were individuals with painful TMD or orofacial pain. **Results**: Content and face validity were found to be acceptable, according to evaluation from an expert panel review and study respondents. Convergent validity was demonstrated by statistically significant correlations between chronic pain severity and the Indonesian version of the Oral Health Impact Profile for TMDs (OHIP-TMDs-ID), specifically on physical pain and disability domains, and Visual Analog Scale (VAS) scores (with r ranging from 0.507 to 0.577). Internal consistency analysis yielded a Cronbach's Alpha of 0.871, indicating good internal consistency. **Conclusions**: ID-GCPS-R is a valid and reliable tool in the Indonesian language to be used as a measure of chronic pain in patients with painful TMD and orofacial pain.

Keywords

Temporomandibular disorders; Pain; Chronic pain; Orofacial pain

1. Introduction

Pain is defined as an unpleasant sensory and emotional experience associated with, or resembling that associated with, actual or potential tissue damage [1]. Pain can be categorized as acute or chronic [2, 3]. Chronic pain is defined as pain that persists or recurs for more than 3 months [4]. Chronic pain is associated with anxiety, depression, and decreased quality of life [5, 6].

Dental professionals are responsible for adequately managing pain in or around the mouth, face, and neck [7]. The International Association for the Study of Pain (IASP) defines orofacial pain as pain perceived in the face or oral cavity, caused by diseases or disorders of regional structures, dysfunction of the nervous system, or referral from distant sources [8]. The International Classification of Orofacial Pain (ICOP) classifies types of orofacial pain, such as orofacial pain attributed to disorders of dentoalveolar and anatomically related structures, myofascial orofacial pain, temporomandibular joint (TMJ) pain, orofacial pain attributed to lesion or disease of the cranial nerves, orofacial pains resembling presentations of primary headaches, and idiopathic orofacial pain [9, 10].

Temporomandibular disorders (TMD) produce abnormal, incomplete, or impaired function of the TMJ(s) and/or the muscle of mastication [11]. Signs of TMD can be pain of the TMJ(s), pain of the muscle(s) of mastication, pain in the head & neck region, and limited range of jaw movement [3, 11]. Tools can be used to assess TMD patients, such as the Oral Health Impact Profile for TMDs (OHIP-TMDs) and examination protocols from the Diagnostic Criteria for TMD (DC/TMD) [12–14].

Painful TMD is one of the most common orofacial pains [2], and the severity of chronic painful TMD relates to a decrease in quality of life and general health [15–17]. TMD patients with higher levels of pain also experience comorbid conditions such as pain in other sites, sleep disorders, and increased emotional stress [16, 18, 19]. Thus, early detection and prompt treatment

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are essential for painful TMD, improving prognosis and quality of life while reducing healthcare costs [2, 7, 20].

Graded Chronic Pain Scale (GCPS) is a tool for measuring pain severity developed by Von Korff [21–23]. GCPS is a questionnaire patients can fill out, and the results show the severity of chronic pain (pain intensity and impact on life activities) experienced by patients [21, 22]. The first iteration of GCPS is called Chronic Pain Grade Scale (CPGS) [21], which was later developed into GCPS 2.0 [22]. GCPS 2.0 has been used in multiple studies related to TMD and pain [15, 24, 25] and has been adapted to an Indonesian version. The Indonesian version of GCPS 2.0 is called GCPS-ID, which has been tested for its validity and reliability [26].

Von Korff further developed GCPS into the Graded Chronic Pain Scale Revised (GCPS-R) to identify patients with or without chronic pain and to classify chronic pain severity as mild, bothersome, or high-impact. GCPS-R consists of 6 items, with the first two items (item number 1–2) identify chronic pain and high impact chronic pain for the past three months, the next three items (item number 3–5) identify the severity of chronic pain within the past one week; and the last item (item number 6) is used to identify patients unable to work because of the pain condition. Items 3–5 are called the Pain, Enjoyment, and General Activities (PEG) scales. GCPS-R items are rated on a Likert scale, and the total score is categorized according to chronic pain severity [23].

GCPS-R differs from previous versions of GCPS by specifically identifying high-impact chronic pain [23]. High-impact chronic pain is defined as chronic pain that frequently limits life or work activities [6, 23]. The development of GCPS-R aligns with the need for more precise prevalence estimates and tracking of high-impact chronic pain; therefore, prevention and management costs will hopefully be more effective and efficient [27]. Another improvement of GCPS-R, compared to its previous versions, is that it uses simpler questionnaire items and scoring [23].

So far, GCPS-R has not been adapted and tested for patients in Indonesia. This study was conducted to adapt and validate the Indonesian version of GCPS-R, so that it can be used as an assessment tool for chronic pain severity in patients with painful TMD and orofacial pain in Indonesia.

2. Materials and methods

This cross-sectional study was performed in the Faculty of Dentistry Universitas Indonesia Dental Hospital (Rumah Sakit Khusus Gigi dan Mulut FKG UI/RSKGM FKG UI). Study respondents were patients of RSKGM FKG UI with TMD or orofacial pain. Respondents were recruited using purposive sampling. Inclusion criteria were patients at RSKGM FKG UI with TMD or orofacial pain who were willing to participate in the study and sign informed consent. No specific age restrictions were set during recruitment. For respondents under 18 years of age, written informed consent was obtained from parents or legal guardian prior to recruitment and data collection. Exclusion criteria included prospective respondents who were unwilling to participate in the study, unwilling to sign informed consent, or unable to communicate.

We adapted the GCPS-R into Indonesian using Beaton's cross-cultural adaptation methods [28]. Cross-cultural adaptation was carried out first by translating the GCPS-R into Indonesian. Then a back-translation was made by a different translation team. The translation and back-translation results were then evaluated in a discussion by an expert committee consisting of two FKG UI Prosthodontics department lecturers who are experts in TMD and one FKG UI Prosthodontics specialist student; content validity and the pre-final version of the ID-GCPS-R were then obtained.

The pre-final version of the questionnaire was then tested on 30 respondents to assess face validity. These 30 respondents were patients of RSKGM FKG UI with TMD or orofacial pain. The first author (BVL) used examination protocols from DC-TMD Axis I to diagnose respondents with TMD or orofacial pain. After testing the pre-final version of the questionnaire and obtaining face validity, the expert committee re-evaluated the results. Based on the evaluation, no further changes to the content of the pre-final version of the ID-GCPS-R questionnaire were required, and the final Indonesian version of the Graded Chronic Pain Scale Revised (ID-GCPS-R) was obtained.

Next, data were collected to assess the convergent validity and reliability of the ID-GCPS-R from 96 respondents. These 96 respondents were different from the first 30 and were also patients of RSKGM FKG UI with TMD or orofacial pain. The first author (BVL) also used examination protocols from DC-TMD Axis I to diagnose respondents with TMD or orofacial pain. The sample size was comparable to another validation study of GCPS-R in Turkish patients [29]. We evaluated convergent validity using Spearman's *rho* correlations between ID-GCPS-R scores and OHIP-TMDs-ID results (physical pain and disability section), and between ID-GCPS-R scores and Visual Analog Scale (VAS) results. We used the OHIP-TMDs-ID and the VAS as measures of convergent validity because both measure similar constructs (physical pain, disability, and pain severity) [23, 26, 30].

This study obtained ethical approval from the Dental Research Ethics Committee, Faculty of Dentistry, Universitas Indonesia, numbered 40/Ethical Approval/FKGUI/VI/2022. All respondents provided informed consent to participate. Data collection for this study was conducted within 9 months, from December 2022 to August 2023.

3. Results

This study involved 96 respondents for the analysis of convergent validity and reliability. Of these, 81 respondents were female (84.4%). A total of 89 respondents (92.7%) were aged 18–44 years. One respondent was under 18 years of age. Prior to enrollment and data collection, informed consent was obtained from the respondent's parent. Table 1 provides demographic data and findings on respondents' degree of chronic pain based on the ID-GCPS-R.

After cross-cultural adaptation of the GCPS-R with necessary adjustments, the final ID-GCPS-R was obtained, as shown in Fig. 1.

Using ID-GCPS-R, the degree of chronic pain is determined based on the answers to questions 1 through 5. ID-GCPS-R identifies four grades of chronic pain: Grade 0 (No chronic

TABLE 1. Characteristics of study respondents.

Characteristics	Total (n = 96 respondents)	Percentage
Age Group		
● Below 18 years old	1 respondent	1.0%
● 18–44 years old	89 respondents	92.7%
● 45–64 years old	4 respondents	4.2%
● 65 years old and above	2 respondents	2.1%
Gender		
● Male	15 respondents	15.6%
● Female	81 respondents	84.4%
ID-GCPS-R grading		
● Grade 0—no chronic pain	61 respondents	63.5%
● Grade 1—mild chronic pain	6 respondents	6.3%
● Grade 2—moderate chronic pain	8 respondents	8.3%
● Grade 3—high-impact chronic pain	21 respondents	21.9%

ID-GCPS-R: Indonesian version of the Graded Chronic Pain Scale Revised.

Kuesioner *Graded Chronic Pain Scale Revised* versi bahasa Indonesia (ID-GCPS-R)

1. Dalam 3 bulan terakhir, **seberapa sering** Anda mengalami rasa nyeri?
   Tidak pernah Kadang-kadang Hampir setiap hari Setiap hari

2. Dalam 3 bulan terakhir, seberapa sering rasa nyeri membatasi kehidupan atau aktivitas kerja Anda?
   Tidak pernah Kadang-kadang Hampir setiap hari Setiap hari

Sekarang pikirkan tentang rasa nyeri yang Anda alami selama 7 hari terakhir …

3. **Secara rata-rata**, skala berapa yang paling menggambarkan rasa nyeri Anda?

☐ 0	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7	☐ 8	☐ 9	☐ 10
Tidak ada rasa nyeri									Rasa nyeri terburuk yang dapat dibayangkan	

4. Selama 7 hari terakhir, skala berapa yang paling menggambarkan bagaimana **rasa nyeri mengganggu kenyamanan hidup Anda?**

☐ 0	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7	☐ 8	☐ 9	☐ 10
Tidak ada rasa nyeri									Benar-benar mengganggu	

5. Selama 7 hari terakhir, skala berapa yang paling menggambarkan bagaimana **rasa nyeri mengganggu kegiatan Anda sehari-hari?**

☐ 0	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7	☐ 8	☐ 9	☐ 10
Tidak ada rasa nyeri									Benar-benar mengganggu	

6. Apakah Anda saat ini **tidak bekerja atau menjadi tidak sanggup bekerja** karena rasa nyeri atau kondisi yang dipengaruhi rasa nyeri?
   Ya Tidak

Jika Anda tidak pernah merasakan sakit dalam 3 bulan terakhir, lewati pertanyaan-pertanyaan di atas

FIGURE 1. Final version of ID-GCPS-R.

pain), Grade 1 (Mild chronic pain), Grade 2 (Moderate chronic pain), and Grade 3 (High-impact chronic pain).

Chronic pain grading using ID-GCPS-R begins by first examining the answer from question 1. If question 1 is answered "never" or "sometimes", the pain is categorized as Grade 0. When question 1 is answered otherwise, the answer from question 2 should be examined.

From question 2, if the answer is "almost every day" or "every day", the pain is categorized as Grade 3. Otherwise, examine the answers to questions 3 to 5. Questions 3 to 5 are called PEG scales, and their scores are summarized. When the sum of PEG scales reaches 12 or more, the pain is categorized as Grade 2. Lastly, if the sum of PEG scales is less than 12, the pain is categorized as Grade 1.

The assessment of content validity and face validity yielded satisfactory results based on the expert committee's evaluation and respondents' opinions. Convergent validity assessment using Spearman's *rho* correlation test between respondents' severity of chronic pain and the OHIP-TMDs-ID value (physical pain and disability domain), as well as the VAS score, showed a statistically significant correlation. Results of the Spearman's *rho* correlation test are shown in Table 2.

The correlation coefficient for convergent validity testing was 0.577 for the severity of chronic pain and physical pain; 0.507 for the severity of chronic pain and disability; and 0.512 for the severity of chronic pain and VAS. Reliability testing through internal consistency analysis yielded a Cronbach's alpha of 0.871, indicating good internal consistency. The inter-item correlations indicate that questions 1 to 5 have a moderate to strong correlation, ranging from 0.599 to 0.918. The results of reliability testing can be seen in Table 3.

4. Discussion

4.1 Adaptation of GCPS-R to ID-GCPS-R

The cross-cultural adaptation of GCPS-R to ID-GCPS-R was conducted according to Beaton's methods [28]. This was done to achieve content-based equivalence between the source questionnaire (GCPS-R for an English-speaking population) and the target questionnaire (ID-GCPS-R for an Indonesian-speaking population). Several types of equivalence need to be considered during cross-cultural adaptation: semantic, idiomatic, experiential, and conceptual equivalence. By achieving these types of equivalence, the validity and reliability of the source questionnaire can also be maintained in the adapted version [28].

In the cross-cultural adaptation of this questionnaire, several adjustments were made to the translated questions to achieve equivalence, particularly in terms of semantics and conceptual equivalence. Question 4 was adjusted because its meaning was considered more challenging to understand in Indonesian than in the original English version. After necessary adjustments from panel expert discussion, the questionnaire was then used as the pre-final version and tested for face validity and content validity. After that, the final version of the ID-GCPS-R was obtained and tested for convergent validity & reliability.

4.2 Validity of ID-GCPS-R

Content validity was obtained from the expert committee's evaluation during the cross-cultural adaptation of the ID-GCPS-R questionnaire. After making several adjustments and further evaluation from the expert committee, it was concluded that the ID-GCPS-R questionnaire has good content validity. Several considerations for determining this content validity are (1) the sentences of the ID-GCPS-R questionnaire are considered easy to understand; (2) the sentences of the ID-GCPS-R questionnaire are considered

TABLE 2. Correlation between severity of chronic pain with physical pain, disability, and VAS scores.

	Physical Pain		Disability		VAS	
	r	*p*	*r*	*p*	*r*	*p*
Severity of chronic pain	0.577*	<0.001	0.507*	<0.001	0.512*	<0.001

**Spearman's rho correlation.*
r: correlation coefficient.
p: significance.
VAS: Visual Analog Scale.

TABLE 3. Internal consistency of ID-GCPS-R by means of Cronbach's Alpha.

Questionnaire items	Corrected Item-Total Correlation	Cronbach's Alpha	Cronbach's Alpha if Item Deleted
1. In the past 3 months, how often did you have pain?	0.599	0.871	0.895
2. Over the past 3 months, how often did pain limit your life or work activities?	0.695		0.884
3. What number best describes your pain, or average?	0.861		0.799
4. During the past 7 days, what number best describes how pain has interfered with your enjoyment of life?	0.918		0.784
5. During the past 7 days, what number best describes how pain has interfered with your general activity?	0.908		0.787

capable of distinguishing which respondents experience chronic pain and which do not; (3) the sentences of the ID-GCPS-R questionnaire are considered capable of knowing how severe the pain felt by respondents is; and (4) the sentences of the ID-GCPS-R questionnaire are considered capable of knowing how much the pain felt by respondents affects daily activities.

Face validity was obtained from the prefinal version testing of the ID-GCPS-R. Respondents from the prefinal testing of the ID-GCPS-R questionnaire were asked for their opinions related to this questionnaire. Based on respondents' input from the prefinal testing of the ID-GCPS-R questionnaire, it was concluded that the ID-GCPS-R questionnaire has good face validity. Respondents of the prefinal testing of the ID-GCPS-R questionnaire stated that: (1) the ID-GCPS-R questionnaire is easy to understand in Indonesian; (2) the ID-GCPS-R questionnaire collects information about how long the pain is felt; (3) the ID-GCPS-R questionnaire collects information about how severe the pain felt is; and (4) the ID-GCPS-R questionnaire collects information about the impact of the pain felt on daily life.

The ID-GCPS-R questionnaire showed good convergent validity, based on correlations between chronic pain severity and physical pain, disability, and VAS scores. Chronic pain severity and physical pain showed a Spearman's *rho* correlation coefficient of 0.577; chronic pain severity and disability showed 0.507; and chronic pain severity (ID-GCPS-R) and VAS showed 0.512. The correlation coefficient values of chronic pain severity to physical pain, disability, and VAS indicate a strong positive correlation [29]. These findings suggest that as the severity of chronic pain based on ID-GCPS-R increases, there is an increase in physical pain, disability, and VAS scores from respondents.

4.3 Reliability of ID-GCPS-R

The reliability of the ID-GCPS-R was assessed by analyzing its internal consistency using Cronbach's Alpha calculation. The Cronbach's Alpha calculation yielded a value of 0.871, based on questionnaire items 1 to 5 in the ID-GCPS-R questionnaire. Based on a Cronbach's alpha of 0.871, the ID-GCPS-R questionnaire has good internal consistency. The results of this internal consistency analysis indicate that the ID-GCPS-R questionnaire can be consistently used to evaluate: (1) whether there is chronic pain, and (2) how much the chronic pain felt affects the comfort of life and daily activities. Question item number 6 of the ID-GCPS-R was not included in the internal consistency analysis using Cronbach's Alpha. The reasons are: (1) question item number 6 of the ID-GCPS-R is not an item that determines the degree of chronic pain, and (2) the question format uses a dichotomous yes or no answer. Internal consistency analysis using Cronbach's Alpha is intended for questionnaires with answers on a Likert scale [31].

From "Analysis of Cronbach's Alpha if Item Deleted", we found that removing item number 1 or item number 2 would increase the overall alpha value from 0.871 to 0.895 and 0.884, respectively. Despite this observation, all questionnaire items were retained in the final version of the ID-GCPS-R to preserve validity. Item number 1 assesses the presence of chronic pain, and item number 2 assesses the presence of high-impact chronic pain. These two items are considered necessary; removing either would compromise what the GCPS-R was originally intended for.

4.4 Limitations of this study

The results of this study are not free from the risk of bias. Some biases found in the implementation of this study are misclassification bias and recall bias. Misclassification bias can occur when what is being researched lacks a clear definition [32, 33]. In this study, some respondents have different perceptions in defining pain. Some respondents feel that stiffness or discomfort is not categorized as pain. This difference in perception is estimated to affect the results of filling out the ID-GCPS-R questionnaire, where there may be a decrease in the number of respondents who actually experience chronic pain. This difference in perception is addressed by explaining to each respondent the definition of pain used in this study: "unpleasant sensory and emotional experience associated with actual or potential tissue damage", so respondents understand that feelings of stiffness or heaviness are already categorized as pain.

Recall bias occurs when respondents' memory influences the information they provide [33]. Recall bias can make the data obtained inaccurate or incomplete. In this study, there are questions related to the pain felt during the last three months and the last seven days. Respondents with mild pain may have difficulty remembering exactly how the pain felt during the last three months and the last seven days. This limitation is addressed by instructing respondents to answer the ID-GCPS-R questionnaire questions as honestly as possible based on their pain experience.

In addition to the observed bias risks, this study also identified several other limitations. First, the study population was mostly (92.7%) from the 18–44 years age group. While this finding aligns with the peak prevalence of painful TMD, it can restrict the generalizability of ID-GCPS-R to adolescent or elderly populations. Adolescents may have different pain experience due to ongoing maturation of central nervous system, pain perception & pain processing. Adolescents may also have different interpretation of pain interference (for example, school activities rather than occupational activities). Older adults may present with distinct pain disorders, a higher rate of degenerative disease, or altered pain perception. Future studies should evaluate adolescent and/or elderly populations to confirm the psychometric properties of the ID-GCPS-R across a broader age spectrum.

Second, most participants in this study were female (84.4%). Previous studies found that females were affected more by TMD, but other studies found the opposite [34]. Although TMD is documented to affect females more due to biological and psychosocial differences from males, this may also limit the applicability of the ID-GCPS-R across genders.

Finally, among the participants in this research, a majority (63.5%) fell into the category of grade 0 chronic pain or no chronic pain. However, 36.5% of the respondents were found to experience chronic pain. This finding may affect the sensitivity of the ID-GCPS-R in evaluating higher grades

of chronic pain severity. Future research can be done with patients in specialist pain clinics to evaluate populations with higher chronic pain severity.

Nevertheless, the overall responses to the ID-GCPS-R demonstrated its ability to differentiate between respondents experiencing chronic pain and those without chronic pain. Furthermore, the ID-GCPS-R effectively distinguished the severity of chronic pain experienced by respondents, categorizing it as mild, moderate, or high-impact. The utilization of the ID-GCPS-R for identifying chronic pain across various levels is expected to serve as a diagnostic tool and aid in developing appropriate treatment plans for patients suffering from painful TMD and orofacial pain.

4.5 Clinical implications and future research

Developments in pain metrics suggest the need to update the original GCPS with new test items and grading criteria. These developments include new operational definitions of chronic pain and high-impact chronic pain, simpler test items for assessing chronic pain persistence and severity, and a more general assessment of chronic pain rather than specific, anatomically defined pain assessment. GCPS-R was developed with these developments in pain metrics in mind [23].

ID-GCPS-R is adapted from GCPS-R to hopefully be used by dental professionals in Indonesia as a screening tool to identify chronic pain and assess its severity in patients with TMD or orofacial pain. The first item of ID-GCPS-R is used to identify persons with or without chronic pain. The second item of ID-GPCS-R is used to specify high-impact chronic pain in persons with chronic pain. Items 3 to 5 of the ID-GCPS-R (the PEG scales) are used to differentiate mild and moderate chronic pain. Item 6 of the ID-GCPS-R is used to identify persons unable to work due to pain.

ID-GCPS-R can also be potentially integrated into DC/TMD Axis II assessment protocols in Indonesia. We believe that the ID-GCPS-R's capacity to evaluate chronic pain presence and severity aligns with the objectives of DC/TMD Axis II protocols. Specifically, Axis II assesses psychosocial and behavioral status to identify factors that must be addressed early in treatment to reduce suffering and restore function [14]. However, future studies should investigate whether and how the ID-GCPS-R can be formally incorporated into DC/TMD Axis II assessment protocols.

Dental professionals in Indonesia can also use ID-GCPS-R gradings as a general guide to determine the level of treatment needed for patients with chronic pain. Patients with grade 0 pain (no chronic pain) and mild (grade 1) chronic pain may be treated with relatively straightforward pain therapy by general dentists. Patients with moderate (grade 2) or high-impact chronic pain (grade 3) may be referred to specialists for multidisciplinary and comprehensive pain therapy.

5. Conclusions

The ID-GCPS-R is a valid and reliable tool for measuring the severity of chronic pain in patients with painful TMD and orofacial pain in the Indonesian language. It can be used as a simple, effective tool to screen for, categorize, and measure the impact of chronic pain, ultimately aiding better treatment planning and future research.

AVAILABILITY OF DATA AND MATERIALS

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

AUTHOR CONTRIBUTIONS

BVL—conceptualization, data collection, statistical analysis, writing original draft. IT—conceptualization, study design, expert committee evaluation, critical revision. LKW—conceptualization, study design, expert committee evaluation, critical revision, project oversight. All authors read and approved the final manuscript.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

This study has obtained ethical approval from the Dental Research Ethics Committee, Faculty of Dentistry, Universitas Indonesia, numbered 40/Ethical Approval/FKGUI/VI/2022. All respondents provided informed consent to participate.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

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