

ORIGINAL RESEARCH

Parental knowledge and attitudes regarding emergency management of traumatic dental injuries and associated factors among a Chinese sample: a cross-sectional study

Guangyun Lai¹, Ning Ding¹, Kai Sheng¹, Qin Ding¹, Jiayin Gu^{1,*†}, Jun Wang^{1,*†}

¹Department of Pediatric Dentistry, Shanghai Ninth People's Hospital, Shanghai Jiao Tong University School of Medicine; College of Stomatology, Shanghai Jiao Tong University; National Center for Stomatology; National Clinical Research Center for Oral Diseases; Shanghai Key Laboratory of Stomatology, 200011 Shanghai, China

***Correspondence**

jiaingu1201@126.com
(Jiayin Gu);
junwang0203@126.com
(Jun Wang)

† These authors contributed equally.

Abstract

Background: Traumatic dental injuries (TDI) are considered a public health problem worldwide, especially during childhood. This study aimed to investigate parental knowledge and attitude toward TDI emergency management and associated factors among a Chinese sample. **Methods:** A total of 714 parents of children aged 0–14 years were recruited in this cross-sectional study. Parents were asked to fill out a questionnaire after signing an informed consent according to ethical guidelines. The questionnaire comprised two sections. One section focused on socio-demographic information, and the other was concerned about parental knowledge and attitudes toward TDI emergency management. **Results:** The study had an 88.2% response rate. Finally, the data of 630 participants were analyzed. Among all the respondents, 39.8% of the parents said they knew nothing about TDI emergency management; 62.9% said they knew where to seek professional help for TDI. Only 74 parents would choose fresh milk as a storage medium for avulsed permanent teeth. The interest in learning more about TDI emergency management was significantly associated with parental gender, educational level and family income. Additionally, both children's and parents' previous experience with TDI was strongly correlated with their responses to the question, "Do you know where to seek professional help for dental trauma?". Parents of children who had previously experienced TDI were more likely to believe that it is possible to reattach a fractured tooth piece due to TDI ($p = 0.031$). Among the 444 parents who expressed interest in learning more about the emergency management of TDI, the majority ($n = 311$) preferred to receive the relevant information via the Internet. **Conclusions:** Parental knowledge regarding TDI emergency management was inadequate. Educational programs, especially online resources, are needed to promote public health education on TDI emergency management in China.

Keywords

Traumatic dental injuries; Parent; Knowledge; Associated factors

1. Introduction

Traumatic dental injuries (TDI) could rank fifth if they were included in the list of the world's most frequent acute/chronic diseases and injuries [1]. Moreover, TDI are the second most common oral condition after dental caries [2], affecting approximately 180 million children globally [1]. Dental trauma remains a crucial concern in pediatric oral health.

Evidence has shown that all types of TDI significantly impact the oral health-related quality of life of children and adolescents. These injuries can alter oral function, cause aesthetic and psychological problems, and may even lead children to avoid smiling [3–5]. According to the International Association of Dental Traumatology (IADT) guidelines, the prognosis for TDI is often worse when prompt intervention

is not provided [6, 7]. Delays in treatment can lead to complex procedures, including the potential extraction of the traumatized teeth, which often leaves children and their parents unhappy and regretful for not seeking treatment as soon as possible [8]. Therefore, immediate and appropriate first aid is essential, not only for the long-term survival of the traumatized teeth but also for the overall well-being and emotional health of children and their parents.

Previous research has identified the home as one of the most frequent locations where dental injuries occur [9], making parents often the first responders to take immediate action [10]. Parents must be able to take proactive steps to mitigate the adverse effects of untreated or improperly treated injuries [11]. Therefore, parents' knowledge and awareness regarding the control and treatment of trauma are important for the long-term

success of dental trauma [12].

Numerous studies have investigated parents' knowledge of TDI across various countries and demographic groups [12–17]. Among previous research, which primarily focused on parents' or mothers' knowledge about TDI or specifically dental avulsion, the majority employed self-administered questionnaires through cross-sectional designs, while a few utilized personal interviews [13]. Based on previous findings, recent systematic reviews have concluded that parents' knowledge of TDI is generally quite limited [13, 14]. This lack of knowledge likely contributes to the higher incidence of children with dental trauma receiving specialist care late, resulting in less effective treatment and unfavorable outcomes [14]. In China, while studies have assessed TDI emergency management knowledge among dentists and teachers [18–20], research on parental knowledge of TDI emergency management is limited. Thus, this preliminary study aimed to evaluate the knowledge and attitudes of parents from a sample in East China toward TDI and to evaluate the association between variables like parental age, gender, educational level, residence and previous experience with TDI with the responses. Besides, this study evaluated parents' willingness to learn about TDI emergency management to provide valuable insights for government and dental professionals to develop targeted public health education programs in this area. The null hypothesis was that knowledge and attitudes toward TDI would not significantly differ among parents based on their age, gender, educational level, place of residence or prior experience with TDI.

2. Materials and methods

2.1 Study design and sample selection

The Ethics Committee of Shanghai Ninth People's Hospital approved this questionnaire-based cross-sectional study protocol (No. SH9H-2025-T15-1). The sample size was determined using Power Analysis & Sample Size (PASS) software 16.0 (NCSS, LLC., Kaysville, UT, USA) with a 95% confidence level, a 0.05 margin of error, the proportion of parents who knew about the urgency to seek professional advice after TDI (around 50%) [18], and a 20% non-response rate. The minimum required sample size was 503.

Parents of children aged 0–14 attending the Department of Pediatric Dentistry, Shanghai Ninth People's Hospital, between January and February 2025 were recruited using a convenience sampling. Participation was entirely voluntary. Parents who could not read or write Chinese characters were excluded from the study. There were no other inclusion or exclusion criteria. Written informed consent was obtained before the survey. A total of 714 parents were invited to take part in this study, and they had the option to stop completing the questionnaire at any time.

2.2 Data collection

This study used a structured and self-administered questionnaire modified from a previous study [20]. The questionnaire contained two parts. The first part included sociodemographic characteristics (gender, age, educational level, residence, family income, number of children and mother's employment

status) and the children's and parents' previous experience with TDI. The second part of the questionnaire consisted of 12 questions covering four aspects: prior experience with TDI, self-assessment of knowledge of TDI emergency management, knowledge of TDI emergency management, and attitude toward learning TDI emergency management.

A pretest involving 30 parents was conducted to assess their comprehension of the questions and to identify any grammatical or typographical errors in the questionnaire. The results indicated that no changes were needed. The data collected from these 30 parents were not included in the main study. All the parents completed and returned the questionnaire in the presence of the researcher (JG) in the main study.

2.3 Data analysis

The data collected from the questionnaires were entered into Excel (Microsoft Corp., Redmond, WA, USA). Categorical variables were expressed as frequencies and percentages (%). The tests of significance used were the chi-square test or Fisher's exact test. All data were analyzed using SPSS Statistics software Version 25.0 (IBM, Chicago, IL, USA). Statistical significance was set at $p < 0.05$.

3. Results

Of the 714 parents who received the questionnaire, 84 declined to complete it due to their unwillingness to disclose their family income. The response rate was 88.2% (630/714). Table 1 shows the detailed demographic characteristics of the parents, illustrating that 485 (77%) parents were females, 455 (72.2%) parents belonged to the 31–40 years of age group, and 506 (80.3%) parents were from Shanghai. The mean age of the parents was 37.5 ± 4.56 years. Of the 630 parents, 68.9% were university-educated or above, 76.8% had a family income up to 10,000 Yuan or above per month, and 86.2% of children's mothers had a job. Moreover, 74 (11.7%) parents and 117 (18.6%) children of the included parents had already suffered any traumatic dental injury.

Regarding familiarity with the knowledge of TDI emergency management, 39.8% of the parents said they knew nothing, and only 1.9% said they knew the knowledge very comprehensively. If the child's tooth suffered any TDI, 87.8% of the parents would immediately seek professional help. Concerning dental fractures, less than one-third of the parents thought it was possible to reattach a fractured tooth piece due to TDI. For dental avulsion of permanent teeth, 79.5% of parents considered “immediately—within 30 minutes” the optimal time to take the child to a dental office (Table 2). However, only 7.3% would place the fallen tooth into the socket. Table 3 illustrates parents' responses regarding the preferred medium for storing a fallen-out permanent tooth. A total of 236 parents would store the tooth in saline solution, while only 74 parents chose fresh milk as the storage medium for avulsed permanent teeth. As shown in Fig. 1, among the 444 parents who expressed interest in learning more about TDI emergency management, the majority ($n = 311$) preferred to access the relevant information via the Internet.

TABLE 1. Demographic characteristics and previous experience with TDI of the sample (N = 630).

Variables	N	Percentage (%)
Gender		
Mother	485	77.0
Father	145	23.0
Age (yr)		
≤ 30	35	5.6
31–40	455	72.2
≥ 41	140	22.2
Education level		
Middle school or below	28.0	4.4
High school	58	9.2
College	110	17.5
University	324	51.4
Master or above	110	17.5
Family income per month		
<CNY 5000	33	5.2
CNY 5000–9999	113	17.9
CNY 10,000–19,999	197	31.3
CNY 20,000–29,999	137	21.7
\geq CNY 300,000	150.0	23.8
Residence		
Shanghai	506	80.3
Non-Shanghai	124	19.7
Number of children		
1.0	362	57.5
2.0	248	39.4
≥ 3	20	3.2
Mothers' employment status		
Employed	543	86.2
Unemployed	87	13.8
Previous experience with TDI		
Yes	74	11.7
No	556	88.3
Child's previous experience with TDI		
Yes	117	18.6
No	513	81.4

TDI: traumatic dental injuries.

TABLE 2. Distribution of parents' responses and association with all the variables (N = 630).

	N (%)	Parent gender	Parent age	Education level	Family income	Residence	Number of children	Mothers' employment status	Previous experience with dental trauma	Children's previous experience with dental trauma
		<i>p</i>	<i>p</i>	<i>p</i>	<i>p</i>	<i>p</i>	<i>p</i>	<i>p</i>	<i>p</i>	<i>p</i>
Q1. How much do you know about TDI emergency management?										
Completely nothing	251 (39.8)									
A little/fragmentary	332 (52.7)	0.380	0.067	0.032*	0.733	0.092	0.907	0.525	0.048*	0.293
A lot	35 (5.6)									
Very comprehensive	12 (1.9)									
Q2. Are you interested in learning knowledge of TDI emergency management?										
Yes	444 (70.5)	0.003*	0.237	0.026*	0.042*	0.335	0.550	0.497	0.095	0.308
No	186 (29.5)									
Q3. Do you know where to seek professional help for TDI?										
Yes	396 (62.9)	0.576	0.768	0.001*	0.013*	0.150	0.758	0.066	0.015*	0.004*
No	234 (37.1)									
Q4. When will you take your child to see professional help in case of TDI?										
Immediately	553 (87.8)									
Only if the situation of the tooth does not get better	70 (11.1)	0.346	0.721	0.003*	0.137	0.043*	0.090	0.031*	0.878	0.072
Do not know	7 (1.1)									
Q5. Do you believe it is possible to glue/stick a piece of a tooth that has fractured due to traumatic injury?										
Yes	205 (32.5)									
No	136 (21.6)	0.689	0.086	0.001*	0.030*	0.813	0.587	0.197	0.949	0.031*
Do not know	289 (45.9)									
Q6. If a primary tooth falls out, do you think the tooth can be placed back after the traumatic injury?										
Yes	98 (15.6)									
No	297 (47.1)	0.400	0.511	0.200	0.235	0.549	0.204	0.682	0.153	0.165
Do not know	235 (37.3)									

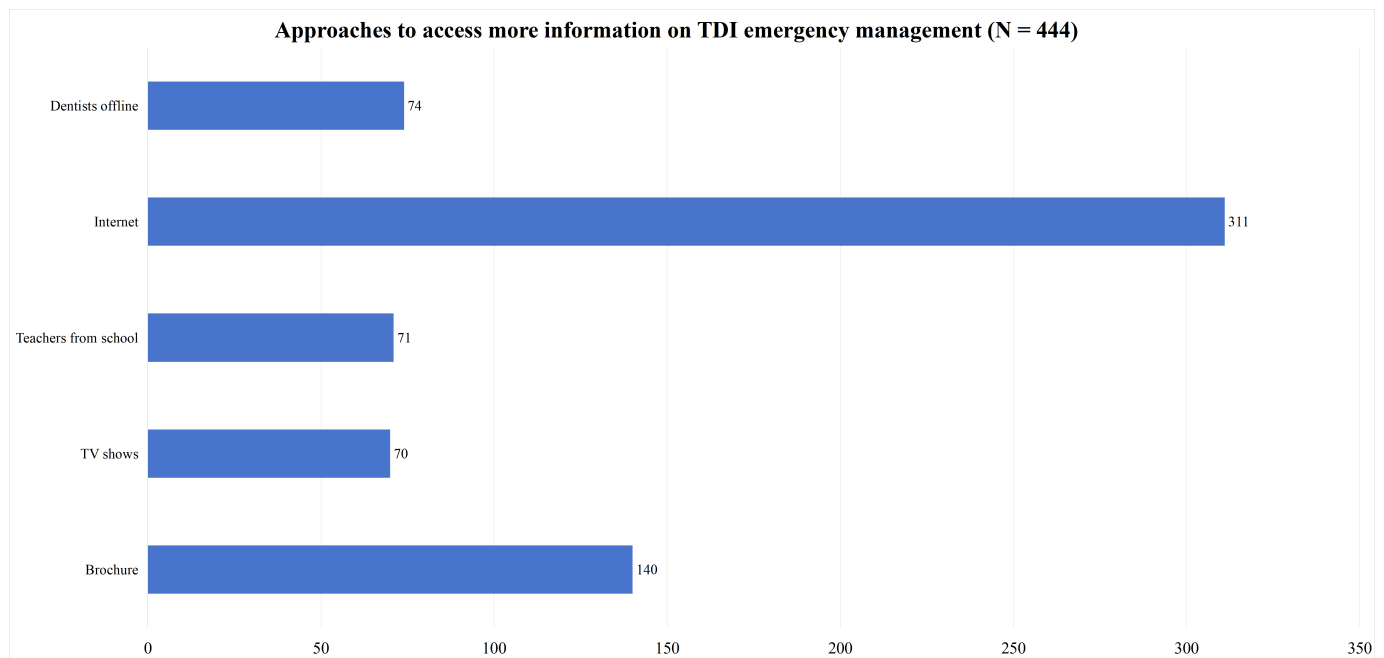
TABLE 2. Continued.

	N (%)	Parent gender	Parent age	Education level	Family income	Residence	Number of children	Mothers' employment status	Previous experience with dental trauma	Children's previous experience with dental trauma
		<i>p</i>	<i>p</i>	<i>p</i>	<i>p</i>	<i>p</i>	<i>p</i>	<i>p</i>	<i>p</i>	<i>p</i>
Q7. What do you think is the best moment to look for professional help if a permanent tooth falls out from your child's mouth completely?										
Immediately (within 30 min)	501 (79.5)									
Within the first 2 h	48 (7.6)									
Within 24 h	43 (6.8)	0.065	0.414	0.466	0.320	0.928	0.034*	0.946	0.041*	0.116
Within 48 h	6 (1.0)									
Only if the situation of the tooth does not get better	12 (1.9)									
Do not know	20 (3.2)									
Q8. What will you do if a permanent tooth falls out from your child's mouth completely?										
Immediately seek professional help with the tooth	484 (76.8)									
Place the tooth into the socket and seek professional help	46 (7.3)									
Seek professional help without taking the tooth	21 (3.3)	0.013*	0.098	0.187	0.043*	0.516	0.271	0.002*	0.470	0.096
Will not see professional help unless the bleeding is out of control	41 (6.5)									
Do not know	38 (6.0)									

*Statistically significant at $p < 0.05$.

TABLE 3. Responses to the question regarding the medium used to store a permanent tooth that falls out (N = 630).

Items	N	%
Tissue paper	332	52.7
Plastic bag/wrap	214	33.97
Saline solute	236	37.46
Fresh milk	74	11.75
Yogurt	3	0.48
Juice	1	0.16
Child's saliva	25	3.97
Alcohol	47	7.46
Water	58	9.21
Others	16	2.54

**FIGURE 1. Responses to the question regarding the approaches to access more information on TDI emergency management.** TDI: Traumatic dental injuries.

The statistical analysis showed that interest in learning more about TDI emergency management was linked to parental gender, educational level and family income. Specifically, mothers were more likely to express interest in learning more than fathers ($p = 0.003$). Parents with higher educational levels ($p = 0.026$) and higher family income ($p = 0.042$) also showed greater interest in acquiring more knowledge compared to others. Parents from Shanghai were more likely to take their children immediately to dental offices ($p = 0.043$). Additionally, mothers' employment status was associated with responses to the question regarding seeking professional help. Parents with one or two children were more likely to consider "immediately—within 30 minutes" as the optimal time compared to those with three or more children ($p = 0.034$). Both children's and parents' previous experience with TDI was significantly associated with the answers to the question, "Do you know where to seek professional help for TDI?".

Furthermore, parents of children who had previously suffered TDI were more likely to believe in the possibility of reattaching a fractured tooth piece due to TDI ($p = 0.031$).

4. Discussion

This study revealed that parents in this sample generally lacked sufficient knowledge in key areas of TDI emergency management, such as attempting self-replantation of avulsed permanent teeth or recognizing the possibility of reattaching a fractured tooth piece. Self-assessment by the parents indicated a very low level of familiarity with TDI emergency management, highlighting their dissatisfaction with their current knowledge. Additionally, the null hypothesis was partially rejected, as all tested variables except parent age were found to be significantly associated with one or more items related to parental knowledge and attitude of TDI emergency manage-

ment.

In this study, 18.6% of parents reported that their children had experienced TDI. This figure is comparable to the overall prevalence of TDI in emergency dental services, which was reported to be 15.4% in a recent meta-analysis [21]. However, we did not collect data on the children's ages and the sites of the accidents when TDI occurred, which is a limitation that needs further investigation.

Among all the TDI cases, crown fractures are the most commonly reported TDI in permanent dentition [2]. According to the current IADT guidelines, crown fractures confined to enamel and dentine can be treated either with a direct composite restoration or an adhesive reattachment of the fractured fragment [22]. Once the fragment is intact, reattachment is often preferred in dental practice. Compared with direct composite restoration, reattaching a fractured fragment can restore the injured tooth with its original anatomy, color and function in less amount of time [23]. Based on the results of this study, less than one-third of the respondents knew the possibility of gluing the fractured fragment to an injured tooth, prompting Chinese dentists or oral health educators to help parents increase the related knowledge and keep the fractured fragment appropriately when they encounter crown fractures happening to their children.

Dental avulsion of permanent teeth remains one of the most severe dental injuries with an unpredictable prognosis [7]. Immediate replantation of the avulsed permanent tooth is the best-recommended treatment at the accident sites. In this study, most parents considered "immediately-within 30 minutes" the optimal time to take the child to a dental office, indicating most of them knew the urgency of seeking professional help in case of permanent teeth avulsion. This finding is similar to that of the study by Cosme-Silva *et al.* [10]. However, only 7.3% of the parents would try to replant the avulsed tooth into the socket before seeing a dentist, which underscores the critical need for parental education and/or access to on-site first aid information. As we did not investigate whether the included parents knew the necessity of immediate replantation and the correct replantation procedures, we could not identify the actual reasons for not replanting the avulsed tooth immediately, which also highlights further study in the future.

In many cases, immediate replantation of a fallen-out tooth is impossible [7]. Thus, minimizing the dry time of avulsed teeth and storing them in a proper medium is pivotal to the survival of replanted teeth [7]. Regarding the appropriate medium for storing a fallen-out permanent tooth before reaching a dentist, we presented participants with nine specific options and one additional open-ended response labeled as "others". Participants were asked to select one or more choices. Among all the participants, 16 selected the "others" option but did not provide any further information. As a result, we were unable to determine the exact meaning behind their choices. However, to ensure the transparency of our findings, we still included these results. The ideal and available storage mediums are milk, saliva and saline in descending order of preference [7]. Nevertheless, over half of the parents would wrap an avulsed tooth in tissue paper, and only 11.7% of the parents would opt for fresh milk as a storage medium. Additionally, concerning an avulsed primary tooth, not replanting is the recommended

treatment. The present study showed that 15.6% of parents still believed an avulsed primary tooth could be put back into the socket, and 37.3% did not know the appropriate treatment. These findings highlight significant gaps in parents' knowledge regarding the emergency management of dental avulsion that need to be addressed.

Regarding the relationship between sociodemographic characteristics and parents' knowledge of TDI emergency management, Cosme-Silva *et al.* [10] revealed that parents with higher education levels and incomes were more likely to possess accurate knowledge of managing TDI emergencies. In our study, parents with higher education levels were more aware of the urgency of seeking professional help and the possibility of reattaching a fractured tooth segment. However, they did not demonstrate advanced knowledge of dental avulsion. This finding is partly consistent with Al Sheeb *et al.*'s [15] research, which showed no association between parents' knowledge of dental avulsion emergency management and their education level. The discrepancy may be due to the significantly higher prevalence of fracture compared to avulsion, resulting in greater parental awareness of fractures via various scenarios. Therefore, further investigation is needed to clarify the relationship between sociodemographic variables and parents' knowledge of TDI emergency management, with a particular focus on specifying the knowledge areas, such as fracture and avulsion, within TDI emergency management.

Prior TDI experience can enhance knowledge of TDI management. Our study found that parents with TDI experience were more likely to know where to seek professional help, a finding that aligns with previous research [24]. Sae-Lim *et al.* [25] demonstrated that parents with TDI experience had 2.38 times higher correct knowledge of permanent teeth replantation. In our study, while parents with TDI experience understood the optimal time to seek help for avulsed teeth, they were not necessarily more willing to replant them immediately. This may be due to their experience being related to other types of dental injuries rather than avulsion. Notably, regardless of prior TDI experience, around 40% of parents knew nothing about TDI emergency management, emphasizing the need for public education in this area.

More than two-thirds of parents were interested in learning more about TDI emergency management. This may imply that educational programs are needed to provide parents with more information on TDI emergency management, improve their awareness, and increase their knowledge. Nearly 80% of the respondents were female, and a significantly higher proportion of mothers than fathers expressed interest in learning more about TDI. This may be attributed to the pronounced gender disparity in the division of family parenting responsibilities in mainland China, where mothers primarily take the bulk of childcare and educational guidance [26]. Regarding the approaches to accessing more information on TDI emergency management, most parents preferred to receive related health information from the Internet rather than from dentists offline. Under the background of informatization, the Internet is increasingly used for health-related purposes and evolves with the ever-changing needs of patients [27]. In 2018, the IADT launched ToothSOS, a free mobile application designed to disseminate information on dental trauma and its management

to the general public. This app serves as a valuable first-aid resource for parents, teachers and others dealing with TDI. It has been reported as an effective training tool for both dentists and non-dentists in the emergency management of TDI [28]. Furthermore, it can also be utilized for educational purposes related to the prevention of TDI [29]. Unfortunately, due to the legal and internet censorship standards, this application is not available in mainland China. Therefore, a professional tool for public health education on TDI, such as an online application, is needed urgently due to the knowledge paucity of TDI emergency management among parents in China, which is shown in this study.

The findings of this study should be interpreted in light of certain limitations. Firstly, our recruitment was limited to parents of children attending a single hospital, which may compromise the representativeness of the sample and limit its generalizability to a broader national population of parents. Additionally, the cross-sectional nature of this study precludes the establishment of cause-and-effect relationships. Future research could incorporate longitudinal studies with multi-center recruitment and stratified sampling to thoroughly assess parental knowledge of TDI emergency management across China, validate our findings and clarify the controversies in the present study. Nevertheless, considering the low level of parental knowledge and awareness regarding TDI uncovered by this study, it is imperative to prioritize public education on TDI emergency management in mainland China.

5. Conclusions

While parental knowledge regarding TDI emergency management was found to be inadequate, the majority of parents expressed a strong interest in learning more about this topic. Since proper advice and correct immediate management by parents present at the accident site can impact the prognosis of traumatic dental injuries, there is a clear need for educational programs, particularly online resources, to enhance public health education on TDI emergency management in mainland China.

ABBREVIATIONS

TDI, traumatic dental injuries; PASS, Power Analysis & Sample Size; IADT, the International Association of Dental Traumatology.

AVAILABILITY OF DATA AND MATERIALS

The data analyzed in this study are available upon request. Please write to the corresponding author.

AUTHOR CONTRIBUTIONS

GYL—wrote the manuscript. ND and KS—collected the data. QD—revised the manuscript. JYG—collected the questionnaire and analyzed the data. JW—contributed to the study design. All authors approved the final version of the manuscript prior to submission. All authors contributed

to editorial changes in the manuscript. All authors read and approved the final manuscript.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

Ethical approval was obtained from the Shanghai Ninth People's Hospital, Shanghai Jiao Tong University School of Medicine (approval program: No. SH9H-2025-T15-1), and all procedures in the study were performed in accordance with the ethical standards of the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. Written informed consent was obtained from the participants before the investigation.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

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