



(RESEARCH ARTICLE)



Handwashing practices and associated socio-demographic factors among primary school students in Cox's Bazar, Bangladesh: A cross-sectional study

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Abstract

Background: Hand hygiene, especially handwashing, is a critical preventive measure against infectious diseases, which pose a significant health burden, particularly in low- and middle-income countries like Bangladesh. Inadequate hand hygiene can exacerbate the spread of diseases, significantly affecting children's health and community wellness.

Aim: This study aimed to evaluate handwashing practices and identify socio-demographic factors affecting these practices among primary school students in Ukhiya, Cox's Bazar, Bangladesh.

Methods: Utilizing a school-based cross-sectional design, the study was conducted across ten government primary schools selected through random sampling. A total of 400 students participated, with data collected via a structured questionnaire focusing on various handwashing scenarios. Handwashing practices were scored, and socio-demographic factors were analyzed using Pearson's chi-square test and logistic regression.

Results: The study found that 75% of students practiced adequate hand hygiene. Factors significantly influencing handwashing practices included the educational level of parents, the quality of school handwashing facilities, receipt of handwashing training, and the student's knowledge about hand hygiene. Notably, students with better-educated mothers and those attending schools with superior handwashing facilities demonstrated better hand hygiene practices.

Conclusion: While a significant majority of students adhered to proper handwashing practices, there remains a need to improve handwashing behaviors among a notable minority. Enhancing parental education, upgrading school handwashing facilities, and ensuring regular hygiene training are essential steps toward bolstering student hand hygiene practices in Cox's Bazar and similar settings.

Keywords: Handwashing practices; Socio-demographic factors; Primary education; Public health; Bangladesh

1. Introduction

Hand hygiene, particularly handwashing, is one of the most effective measures to prevent the transmission of infectious diseases (Hillier, 2020). Globally, poor hand hygiene is a significant contributor to the burden of communicable diseases, particularly in low- and middle-income countries (LMICs) where access to clean water and sanitation may be limited

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(Watson et al., 2019). According to the World Health Organization (WHO), improper handwashing practices are linked to the transmission of pathogens responsible for gastrointestinal and respiratory diseases, which contribute significantly to childhood morbidity and mortality (WHO, 2023). Around the world, 2.3 billion individuals lack access to handwashing facilities with soap and water in their homes (CDC, 2023). Approximately 670 million people have no access to handwashing facilities whatsoever, and 462 million children attend schools without handwashing amenities (CDC, 2023). This reflects a broader trend in low- and middle-income countries (LMICs), where limited access to handwashing facilities and inconsistent hygiene education contribute to poor hand hygiene. For instance, in Colombia, only 36.6% of school children reported consistently washing their hands with soap, and very often after using the toilet, though just 3% always washed their hands for at least 20 seconds (Chittleborough et al., 2012). Similarly, in Bogota, 33.6% of students frequently or always washed their hands with soap and clean water before eating and after using the toilet, while only about 7% reported regular access to soap and clean water at school (Lopez-Quintero et al., 2009). In Vietnam, handwashing practices improved with grade level, rising from 34% among first graders to 67% among seventh graders (Thanh Xuan & Hoat, 2013). In South Africa, over 65% of students washed their hands, with 70.3% in urban schools and 29.7% in rural schools, mostly before meals and after using the toilet (Sibiya & Gumbo, 2013). In Bangladesh, where the burden of diarrheal diseases and respiratory infections remains high, promoting effective hand hygiene is essential, particularly among school-aged children who are a key demographic in the spread of infectious diseases. In Bangladesh, handwashing practices remain a critical public health concern, especially in rural and underserved areas (Dey et al., 2019). A 2022 UNICEF report reveals that over 40% of schools are missing essential sanitation facilities, including gender-segregated toilets with privacy (43%) and basic hygiene services like handwashing stations with water and soap (44%), affecting more than 19 million students (UNICEF, 2022). The report also points out that 7% of schools in Bangladesh lack any WASH (Water, Sanitation, and Hygiene) facilities, leaving over 3 million children attending schools without safe drinking water, toilets, or handwashing stations (UNICEF, 2022). Despite various initiatives aimed at promoting hygiene in Bangladesh, studies indicate that handwashing practices remain suboptimal, especially among school-aged children (Omura, 2024). Inadequate hand hygiene can contribute to the spread of diseases, affecting not only the health of the children but also the community (Gozdzielewska et al., 2022). Additionally, factors such as lack of handwashing facilities, limited knowledge of hygiene practices, and socioeconomic barriers further exacerbate the issue (Chen et al., 2020). The Ukhiya subdistrict of Cox's Bazar faces unique public health challenges, including frequent outbreaks of infectious diseases such as diarrhea and respiratory illnesses (Anwary., 2024). Yet, the current level of adherence to recommended handwashing practices among schoolchildren in this region has not been adequately studied. Understanding the factors that influence handwashing practices among children in this area is essential for designing targeted interventions to improve hygiene behavior. This study aims to address the gap in knowledge regarding the handwashing practices of schoolchildren in Ukhiya, Cox's Bazar, by examining the socio-demographic factors that influence these practices. Given that children spend a significant amount of time in school (Jackson., 2020), it is critical to assess not only their hygiene behaviors but also the role that schools and families play in shaping these practices. By identifying the factors associated with poor handwashing behavior, policymakers, and health authorities can implement more effective hygiene promotion programs tailored to the specific needs of this population.

2. Methodology

The study was carried out in the Ukhiya subdistrict of Cox's Bazar, Bangladesh, utilizing a school-based, cross-sectional design across ten government primary schools. These schools were chosen through a random sampling method. The research was conducted between March and April 2022. A sample size of 400 students was determined using the formula ($n = z^2 pq / d^2$) with a 95% confidence interval and a 5% margin of error. A systematic sampling technique was employed to select participants. Students with learning disabilities and those who were unwilling to participate were excluded from the study. Data collection took place at the schools through interviewer-administered questionnaires. Trained data collectors visited the schools on pre-scheduled dates to gather information. Teachers, as well as the primary and secondary caregivers, present at the time of data collection, assisted in gathering the necessary data. Informed written consent was obtained from all participants before data collection. A pre-tested, well-structured questionnaire was used to ensure the quality and consistency of the data collection process. The questionnaire was structured to assess various aspects of handwashing practices among students. It consisted of 15 closed-ended questions covering different scenarios where handwashing is relevant, such as before/after eating, after handling garbage, using the toilet, after playing, and at school. Additionally, the questions addressed the use of soap and water, the frequency of handwashing, and the importance of drying hands after washing. Data entry and cleaning were performed using SPSS version 26, and the data analysis was conducted using Stata version 13. Handwashing practices were scored based on the responses to the 15 questions. For each correct response, indicating proper handwashing practices, respondents received 1 point. The total possible score ranged from 0 to 15. Based on these scores, respondents were categorized into two groups: poor practice (scores below 11) and good practice (scores of 11 or above). To explore the associations between socio-demographic factors and handwashing practices, Pearson's chi-

square test was employed. Logistic regression analysis was also performed to determine the relationship between handwashing practices and socio-demographic variables. The anonymity and confidentiality of participants were strictly maintained throughout the study.

3. Results

The study was conducted among 400 students, examining various socio-demographic characteristics. The gender distribution was relatively balanced, with 47.5% (n=190) of the students being male and 52.5% (n=210) female. In terms of the educational attainment of the students' mothers, the majority had received some level of formal education. Specifically, 14.2% (n=57) had no formal education, 69.8% (n=279) had education up to the Secondary School Certificate (SSC) level, and 16.0% (n=64) had attained a Higher Secondary Certificate (HSC) or higher level of education. The occupational status of the students' fathers varied. A small proportion, 8.0% (n=32), were unemployed, while 24.8% (n=99) worked as laborers. Meanwhile, 18.0% (n=72) were engaged in business, and the largest group, 49.3% (n=197), were service holders. Regarding the occupations of the students' mothers, a significant majority, 90.2% (n=361), were housewives, whereas 9.8% (n=39) were employed as service holders. The quality of handwashing facilities at the schools was also assessed. It was found that 68.0% (n=272) of the facilities were of poor quality, while 32.0% (n=128) were deemed good. Handwashing training for students or their family members was another key area of focus. The data revealed that 14.5% (n=58) of the respondents or their family members had not received any handwashing training, whereas 85.5% (n=342) had received such training. Finally, the level of knowledge about handwashing among the respondents was evaluated. Students' hand hygiene behavior and awareness were assessed through 16 closed-ended questions on handwashing practices, the importance of handwashing in disease prevention, and hand hygiene in various scenarios. It also explored education on handwashing techniques and the necessity of hand drying post-washing. Based on scoring, it was observed that 9.5% (n=38) had poor knowledge, while a substantial majority, 90.5% (n=362), possessed good knowledge of the subject (Table 01).

Table 1 Socio-demographic characteristics of the students (n=400)

Socio-demographic characteristics	Frequency	Percentage
Gender		
Male	190	47.5%
Female	210	52.5%
Student's mothers' highest education attainment		
No formal education	57	14.2%
Up to SSC	279	69.8%
HSC or above	64	16.0%
Student's father's occupation		
Unemployed	32	8.0%
Laborer	99	24.8%
Businessman	72	18.0%
Service holder	197	49.3%
Student's mother's occupation		
Housewife	361	90.2%
Service holder	39	9.8%
Quality of hand washing facility in school		
Poor	272	68.0%
Good	128	32.0%
Student or their family members received handwashing training		

No	58	14.5%
Yes	342	85.5%
Respondent's level of knowledge on handwashing		
Poor knowledge	38	9.5%
Good knowledge	362	90.5%

The findings indicate that most respondents, specifically 300 individuals, demonstrated a good level of hand washing practice, accounting for 75.00% of the total sample. In contrast, 100 respondents, representing 25.00% of the sample, exhibited a poor level of hand-washing practice. These results highlight a significant proportion of the population with adequate hand washing habits, although a noteworthy minority still practices inadequate hand hygiene (Figure 01).

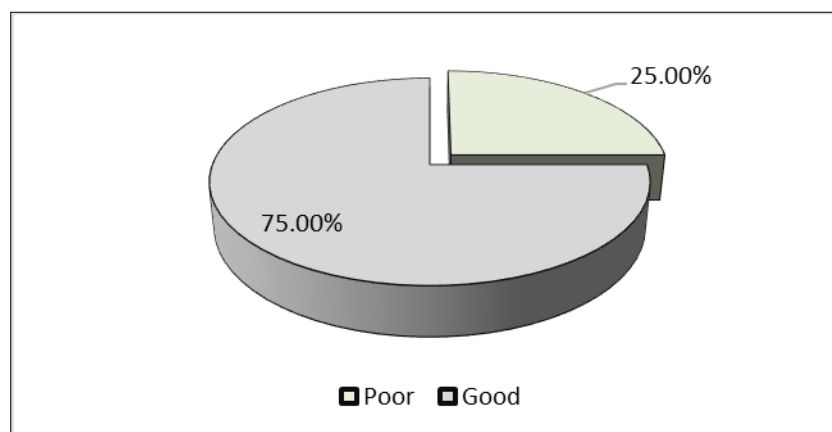


Figure 1 Level of practice of the respondents on hand washing (n=400)

Table 02 illustrates the association between respondents' hand-washing practices and their socio-demographic characteristics. The analysis, involving 400 respondents, evaluates various factors such as gender, parental education and occupation, the quality of hand washing facilities at school, receipt of handwashing training, and respondents' knowledge levels. The statistical significance of these associations was tested using Pearson's chi-square test, with corresponding p-values provided. Out of the total respondents, 47.5% were male and 52.5% were female. Among males, 25.8% exhibited poor hand-washing practices, while 74.2% showed good practices. Similarly, 24.3% of females had poor practices, compared to 75.7% with good practices. The association between gender and hand-washing practice was not statistically significant ($\chi^2 = 0.120$, $p = 0.729$). The education level of the respondents' mothers showed a significant association with hand-washing practices ($\chi^2 = 55.236$, $p < 0.001$). Respondents whose mothers had no formal education were more likely to have poor hand washing practices (63.2%), while those whose mothers had up to SSC or higher education had a lower prevalence of poor practices (20.8% and 9.4%, respectively). A significant association was observed between the father's occupation and the hand-washing practices of the respondents ($\chi^2 = 101.389$, $p < 0.001$). Respondents with fathers who were laborers had the highest proportion of poor hand-washing practices (61.6%), whereas those with fathers who were service holders had the lowest proportion of poor practices (8.1%). The occupation of the respondents' mothers also showed a significant association with hand-washing practices ($\chi^2 = 11.601$, $p = 0.001$). Nearly all respondents with mothers who were service holders (97.4%) demonstrated good hand-washing practices, compared to 72.6% of those with mothers who were housewives. The quality of hand-washing facilities at school had a significant impact on hand-washing practices ($\chi^2 = 22.120$, $p < 0.001$). Students with access to good hand-washing facilities were significantly more likely to have good hand-washing practices (89.8%) compared to those with poor facilities (68.0%). The receipt of handwashing training by the student or their family members was strongly associated with better hand-washing practices ($\chi^2 = 106.715$, $p < 0.001$). Respondents who received handwashing training had a lower prevalence of poor hand-washing practices (15.8%) compared to those who did not receive training (79.3%). The respondents' knowledge level regarding handwashing was also significantly associated with their hand-washing practices ($\chi^2 = 28.264$, $p < 0.001$). Respondents with good knowledge of handwashing practices were more likely to demonstrate good hand-washing practices (78.7%) compared to those with poor knowledge (39.5%). Overall, these results suggest that several socio-demographic factors, including parental education and occupation, the quality of hand-washing facilities, handwashing training, and knowledge levels, significantly influence the hand-washing practices of respondents.

Table 2 Association of respondents' hand washing practice with their socio-demographic characteristics

Socio-demographic variables	Freq. (Perc.)	Level of practice				Pearson chi-square	P-value
		Poor practice (100)		Good practice (300)			
		Freq.	Perc.	Freq.	Perc.		
Gender							
Male	190 (47.5%)	49	25.8%	141	74.2%	0.120	0.729
Female	210 (52.5%)	51	24.3%	159	75.7%		
Student's mothers' highest education attainment							
No formal education	57 (14.2%)	36	63.2%	21	36.8%	55.236	0.000
Up to SSC	279 (69.8%)	58	20.8%	221	79.2%		
HSC or above	64 (16.0%)	6	9.4%	58	90.6%		
Student's father's occupation							
Unemployed	32 (8.0%)	8	25.0%	24	75.0%	101.389	0.000
Laborer	99 (24.8%)	61	61.6%	38	38.4%		
Businessman	72 (18.0%)	15	20.8%	57	79.2%		
Service holder	197 (49.3%)	16	8.1%	181	91.9%		
Student's mother's occupation							
Housewife	361 (90.2%)	99	27.4%	262	72.6%	11.601	0.001
Service holder	39 (9.8%)	1	2.6%	38	97.4%		
Quality of hand washing facility in school							
Poor	272 (68.0%)	87	32.0%	185	68.0%	22.120	0.000
Good	128 (32.0%)	13	10.2%	115	89.8%		
Student or their family members received handwashing training							
No	58 (14.5%)	46	79.3%	12	20.7%	106.715	0.000
Yes	342 (85.5%)	54	15.8%	288	84.2%		
Respondent's level of knowledge on handwashing							
Poor knowledge	38 (9.5%)	23	60.5%	15	39.5%	28.264	0.000
Good knowledge	362 (90.5%)	77	21.3%	285	78.7%		

According to Table 03, students whose mothers had no formal education were more likely to exhibit poor handwashing practices (63.2%) compared to those whose mothers had completed up to SSC (20.8%) or HSC and above (9.4%). In the crude model, students with mothers who attained up to SSC had significantly better handwashing practices compared to those with no formal education (COR = 6.532, 95% CI: 3.546-12.033), and this association remained significant after adjustment (AOR = 3.665, 95% CI: 1.632-8.233). Similarly, students whose mothers attained HSC or above had a higher likelihood of good practice (AOR = 2.279, 95% CI: 0.616-8.428), though this association was not statistically significant. The occupation of the student's father also showed an association with handwashing practices. Students with unemployed fathers served as the reference group. In the adjusted model, students whose fathers were service holders were more likely to have good handwashing practices (AOR = 4.402, 95% CI: 1.589-12.193), while no significant associations were found for laborers or businessmen after adjusting for other factors. Students whose mothers were housewives were more likely to have poor handwashing practices (27.4%) compared to those whose mothers were service holders (2.6%). After adjustment, students whose mothers were service holders had a higher likelihood of good handwashing practices (AOR = 5.292, 95% CI: 0.575-48.676), though the wide confidence interval indicates variability

in this estimate. Schools with poor handwashing facilities were associated with poorer handwashing practices among students (32.0% poor practice), while schools with good facilities had a higher likelihood of students practicing good handwashing (89.8%). The adjusted model showed that students from schools with good handwashing facilities were significantly more likely to practice good handwashing (AOR = 2.177, 95% CI: 1.056-4.491). Students or their family members who had received handwashing training were significantly more likely to exhibit good handwashing practices compared to those who had not received such training (AOR = 5.369, 95% CI: 2.361-12.221). Students with good knowledge of handwashing were significantly more likely to practice good handwashing compared to those with poor knowledge (AOR = 2.902, 95% CI: 1.115-7.553).

Table 3 Logistic regressions of factors affecting handwashing practice among students

Socio-demographic variables	Freq. (Perc.)	Level of practice				COR confidence interval) (95%		AOR confidence interval) (95%	
		Poor practice (100)		Good practice (300)					
		Freq.	Perc.	Freq.	Perc.				
Student's mothers' highest education attainment									
No formal education	57 (14.2%)	36	63.2%	21	36.8%	1		1	
Up to SSC	279 (69.8%)	58	20.8%	221	79.2%	6.532 (3.546-12.033)		3.665 (1.632-8.233)	
HSC or above	64 (16.0%)	6	9.4%	58	90.6%	16.571 (6.108-44.958)		2.279 (0.616-8.428)	
Student's father's occupation									
Unemployed	32 (8.0%)	8	25.0%	24	75.0%	1		1	
Laborer	99 (24.8%)	61	61.6%	38	38.4%	0.208 (0.085-0.509)		0.683 (0.241-1.934)	
Businessman	72 (18.0%)	15	20.8%	57	79.2%	1.267 (0.475-3.381)		1.896 (0.638-5.629)	
Service holder	197 (49.3%)	16	8.1%	181	91.9%	3.771 (1.459-9.745)		4.402 (1.589-12.193)	
Student's mother's occupation									
Housewife	361 (90.2%)	99	27.4%	262	72.6%	1		1	
Service holder	39 (9.8%)	1	2.6%	38	97.4%	14.359 (1.945-105.992)		5.292 (0.575-48.676)	
Quality of hand washing facility in school									
Poor	272 (68.0%)	87	32.0%	185	68.0%	1		1	
Good	128 (32.0%)	13	10.2%	115	89.8%	4.160 (2.221-7.792)		2.177 (1.056-4.491)	
Student or their family members received handwashing training									
No	58 (14.5%)	46	79.3%	12	20.7%	1		1	
Yes	342 (85.5%)	54	15.8%	288	84.2%	20.444 (10.166-41.114)		5.369 (2.361-12.221)	

Respondent's level of knowledge on handwashing							
Poor knowledge	38 (9.5%)	23	60.5%	15	39.5%	1	1
Good knowledge	362 (90.5%)	77	21.3%	285	78.7%	5.675 (2.825-11.400)	2.902 (1.115-7.553)

4. Discussion

This study evaluated the handwashing practices and associated socio-demographic factors among 400 primary school students in Ukhiya, Cox's Bazar, Bangladesh. The findings indicate that 75% of students demonstrated good handwashing practices, while 25% exhibited poor practices. Several socio-demographic factors, including parental education and occupation, quality of school handwashing facilities, handwashing training, and knowledge levels, significantly influenced the handwashing practices of students. A similar study conducted in Colombia found that only 36.6% of school students practiced proper handwashing with soap after using the toilet (Chittleborough et al., 2012). The higher rate of good handwashing practices in this study (75%) compared to Colombia can be attributed to the significant proportion (85.5%) of students in Ukhiya who received handwashing training. In contrast, in the Colombian study, access to handwashing training and hygiene education was more limited, highlighting the importance of targeted educational interventions. The Bogota study reported that only 33.6% of school children practiced regular handwashing with soap before meals (Lopez-Quintero et al., 2009). In this study, better handwashing practices were associated with higher maternal education levels, with children whose mothers had no formal education being more likely to have poor handwashing habits (63.2%). The Bogota study also found a significant relationship between parental education and hand hygiene (Lopez-Quintero et al., 2009), emphasizing the broader role that parental knowledge and awareness play in influencing children's behavior. The quality of handwashing facilities also plays a crucial role in determining hygiene behavior. In this study, 68% of schools had poor handwashing facilities, which was significantly associated with poor handwashing practices ($\chi^2 = 22.120$, $p < 0.001$). This finding aligns with results from a study conducted in India, where schools with inadequate handwashing stations were found to have significantly lower rates of handwashing compliance among students (Khan et al., 2021). In both contexts, improving the availability and quality of handwashing facilities is critical for promoting better hygiene practices. Parental occupation, particularly the father's, showed a strong association with handwashing practices in this current study. Students with fathers who were laborers exhibited a higher proportion of poor handwashing practices (61.6%), while those whose fathers were service holders had a lower proportion of poor practices (8.1%). This is consistent with findings from a study in Nepal, where children from lower socio-economic backgrounds, particularly those whose parents were involved in manual labor, were found to have worse hygiene practices compared to their peers from more affluent backgrounds (Dhital et al., 2024). Handwashing training emerged as one of the most significant factors associated with good handwashing practices in our study ($\chi^2 = 106.715$, $p < 0.001$). Students who had received training were more likely to practice proper handwashing compared to those who had not received any training. A study conducted in Pakistan corroborates this finding, where students who participated in school-based handwashing training programs demonstrated significantly higher compliance with hygiene practices than those who did not receive training (Pradhan et al., 2020). These findings underscore the importance of integrating hygiene education into the school curriculum to improve public health outcomes. The relationship between knowledge of handwashing and actual practice was also highlighted in this study. Students with good knowledge of handwashing practices were more likely to demonstrate good hand hygiene behavior (AOR = 2.902, 95% CI: 1.115-7.553). This association was also noted in a study conducted in Indonesia, where students with a higher level of knowledge about the health benefits of handwashing were more likely to practice it regularly (Pertiwi & Nasiatin., 2022). The link between knowledge and practice reinforces the need for continuous health education to maintain high levels of hygiene behavior. Interestingly, gender was not a statistically significant factor in determining handwashing practices in our study ($\chi^2 = 0.120$, $p = 0.729$), as both boys and girls demonstrated similar levels of compliance with hygiene practices. This contrasts with findings from a study in Nigeria, where girls were found to have significantly better handwashing practices compared to boys (Oluwole et al., 2020). Cultural and societal differences might explain this variation, as gender norms around hygiene and cleanliness may differ between regions. Finally, the association between maternal education and handwashing practice is well-documented in the literature. In this study, children whose mothers had attained up to a Secondary School Certificate (SSC) or higher education were significantly more likely to practice proper handwashing. A similar trend was observed in a study from Ghana, where children of mothers with higher education were more likely to follow proper hygiene practices (Omari et al., 2022). This highlights the importance of maternal education in influencing children's behavior and health outcomes.

5. Conclusion

This cross-sectional study assessed handwashing practices among 400 primary school students in Ukhiya, Cox's Bazar, Bangladesh, and investigated the socio-demographic factors influencing these practices. Our findings reveal that 75% of the students practiced adequate hand hygiene, underscoring the success of hygiene interventions. However, 25% still demonstrated poor handwashing behaviors, highlighting a significant area for improvement. Key socio-demographic factors significantly impacting handwashing practices include parental education and occupation, the quality of handwashing facilities at school, receipt of handwashing training, and the student's knowledge about hand hygiene. Notably, students whose mothers attained higher education levels and those whose fathers held non-labor-intensive jobs were more likely to engage in good handwashing practices. Similarly, access to quality handwashing facilities and receipt of formal handwashing training were strongly associated with better hygiene practices. The study emphasizes the need for targeted educational interventions and improvements in school infrastructure to enhance hand hygiene practices. Ensuring consistent handwashing training and upgrading handwashing facilities could substantially elevate hygiene standards and reduce the transmission of infectious diseases among school children in Cox's Bazar and similar settings. By continuing to focus on these key areas, stakeholders—including educators, health professionals, and policymakers—can significantly contribute to the promotion of public health and well-being in educational settings, particularly within vulnerable populations in low- and middle-income countries.

Compliance with ethical standards

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Regarding this work, the authors disclosed no conflicts of interest.

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Consent for publication

The permission of each author to publish this article has been obtained.

Statement of informed consent

Every individual participant participating in the study gave informed consent.

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