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Peptic Ulcer Diseases among Migrant Workers in Saudi Arabia

Nahlah Alsogaih, Juliann Saquib, Rashid Alshammari, Muneeb Qayyum, Muath Alzughabi, Khalid Alkhiari, Ahmed Dildar, Abdulrahman Almazrou, Nazmus Saquib*

College of Medicine, Sulaiman Al Rajhi University, Al Bukayriyah, Saudi Arabia
Email: *a.saquib@sr.edu.sa

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Abstract

Background: Although migrant workers make up nearly one-third of the Saudi population, there is no data on peptic ulcer diseases (PUD) among them. We aimed to assess the prevalence and risk factors of PUD in a sample of migrant workers in Saudi Arabia. **Methods:** Migrant workers (n = 2123) from seven different occupations (*i.e.*, auto repair, construction, hairdressers, hospital cleaners, poultry factory, restaurants, and city cleaners) from Al Qassim province in Saudi Arabia participated in this cross-sectional study. They were interviewed using a standardized questionnaire on demography, lifestyle, job factors, and chronic health conditions. A worker had PUD if he reported having this condition diagnosed by a physician and was taking medication for it. Binary logistic regression was employed to explore risk factors of PUD. **Results:** The mean age (standard deviation) was 35 ± 9 years. The prevalence of PUD was 4% and varied by occupation, with the highest among auto-repair workers (8.3%) and the lowest among construction workers (1.8%). Lifestyle characteristics such as diet, self-rated health status, smoking, and stress, were significantly associated with peptic ulcers. **Conclusion:** The prevalence of peptic ulcers among migrant workers in Saudi Arabia (4%) was not significantly different from the general population or the global prevalence of 5% - 10%. Further studies are needed to validate these findings.

Keywords

Epidemiology, Migrant Workers, Occupation, Peptic Ulcer Disease, Saudi Arabia

1. Introduction

According to the National Library of Medicine, peptic ulcer disease (PUD) occurs

when gastric acid secretion or pepsin damages the inner lining of the gastrointestinal tract. Peptic ulcers include two types: gastric ulcers, which occur on the inner surface of the stomach, and duodenal ulcers, which occur on the inner surface of the upper portion of the small intestine [1].

The most common causes of PUD are *Helicobacter pylori* infection and the use of acetylsalicylic acid (ASA) and nonsteroidal anti-inflammatory medications (NSAIDs) [2]. A systematic review of the global incidence and prevalence of PUD concluded that there has been a decrease in the incidence and prevalence of PUD over time. Nonetheless, it is still a common condition. Although the management of *H. pylori* infection has improved recently, the use of ASA and NSAIDs has increased at the same time [2].

The literature estimates a PUD prevalence of 5% to 10% among the general population worldwide [3]. The available studies in the Gulf Cooperation Council (GCC) on the prevalence of PUD have examined local populations, but none have represented migrant workers. In these studies, the PUD prevalence was estimated at around 21%, but the prevalence among migrant workers in this region is unknown [4] [5].

Saudi Arabia became a major destination for many expatriate workers from all over the world due to the globalization of the oil and gas industries in the late 1970s. It currently employs 9.2 million foreign workers in the public and private sectors [6]. Since the expatriate workforce accounts for nearly one-third of the Saudi population, it is important to better understand and enhance the overall health of migrant workers. The aim of this study was to assess the prevalence and associated risk factors of peptic ulcers among migrant workers in Al Qassim, Saudi Arabia. This cross-sectional study analyzed data from workers of different occupations and nationalities. We hypothesized that migrant workers would be more likely to report PUD and that PUD would be associated with their working hours, length of stay in Saudi Arabia, occupational type, and nationality. Demographics (age, gender, accommodation type, education, and marital status) and lifestyle characteristics (dietary habits, obesity status, physical activity, sleep quality, smoking status, and stress level) were also assessed as possible risk factors.

2. Methods

2.1. Sample

Between January and May of 2022, a cross-sectional study was conducted among migrant workers in the Al Qassim region of Saudi Arabia. To be included in this study, participants had to be non-Saudi and have worked for at least one year in Saudi Arabia. Participants were selected using a convenience sampling method stratified by occupation. They were recruited from seven occupational groups, including auto-repair workers, city cleaners, construction workers, hairdressers, hospital cleaners, poultry factory workers, and restaurant workers from four different cities in Al Qassim: Ar Rass, Bukariyah, Buraydah, and Onaizah. The recruitment strategy differed among the occupations. For example, research assistants

sought permission from the respective governmental administrations before gaining access to hospital cleaners and city cleaners. For construction and poultry factory workers, the research assistants cooperated with the management offices in private companies for permission to interview their employees. For restaurant workers, hairdressers/barbers, and auto-repair workers, the research assistants visited individual business sites where they obtained consent from business managers and employees. All participants had complete autonomy to accept or decline participation in recruitment and interviews.

2.2. Sample Size

According to Saudi Census data, the Al Qassim region of Saudi Arabia has over 250,000 non-Saudi residents over the age of 18 [7]. Given that the obtained sample size was 2123 and a prevalence estimate of 20% with a 95% confidence interval, the study had a 1.7% margin of error.

2.3. Ethical Approval

This study was approved by the Qassim Ethics Review Committee at the Ministry of Health in Saudi Arabia (No.: H-04-Q-001, 4 January 2023). All enrolled participants signed an informed consent form that included a brief description of the study, their rights, the risks and benefits of participation, and assurances of data confidentiality. Participants provided no personal identification and were assigned a unique identification code.

2.4. Sampling Strategy

The sample was recruited from the Al Qassim region of Saudi Arabia. The sampling strategy was stratified by occupation, and non-random sampling was used within each group. The research assistants contacted relevant companies, obtained approval from the management, and collaborated with them to recruit workers in the construction, city sanitation, poultry factory, and hospital sectors. On the other hand, research assistants had to visit individual shops, salons, and restaurants to recruit autoworkers, hairdressers/barbers, and restaurant workers.

2.5. Study Protocol

The questionnaire was developed in English and translated into Arabic, Urdu, and Bengali. The research team included native speakers of each of the four languages. The survey was translated and back-translated by the team and checked by a third party. Furthermore, the instrument underwent pilot testing in all languages among potential participants for accuracy, clarity, and comprehension. After the pilot testing, only minor modifications were made to the length and order of the questions. Fifth-year medical students of Sulaiman Al Rajhi University worked as research assistants in the fieldwork. They were trained in the sampling, enrollment, and assessment protocol. At the arranged time with the respective management departments, research assistants approached the participants, obtained

informed consent, and conducted interviews using a tablet or laptop. The responses of the participants were directly entered into the Survey Monkey website in the same language. At the end of the interview, the anthropometric assessment took place.

2.6. Outcome

The prevalence of PUD was assessed by asking the participants if they had ever been told by a physician that they had a peptic ulcer. Participants who answered "No" were classified as "not having a peptic ulcer". Those who responded "Yes" and were taking medication for an ulcer were classified as "having a peptic ulcer;" they were additionally asked about the duration of the disease.

2.7. Covariates

The participants were asked about their demographic characteristics, *i.e.*, age, gender, accommodation type, education level, marital status, and nationality. The migrant-specific characteristics included their occupation, years of employment in Saudi Arabia, number of hours worked per day, and number of days worked per week. They also reported lifestyle factors, *i.e.*, dietary habits, obesity status, sleep quality, smoking status, self-rated health, and stress level.

Depending on how long they had worked in Saudi Arabia, participants were classified into four groups: less than 3 years, 3 to 5.9 years, 6 to 9.9 years, and 10 years or more. The weekly work hours were calculated by multiplying the number of working hours per day by the number of working days per week. Total work hours were divided into three categories: recommended (48 hours or fewer per week), overtime (49 to 60 hours per week), and illegal (more than 60 hours per week) [8].

When participants self-reported their dietary habits, they were divided into two categories: excellent/very good/good versus fair/poor. To determine obesity status, we measured height and weight and calculated the body mass index (BMI). Sleep quality was assessed using a 10-point scale ranging from 0 to 10, with 0 being the lowest and 10 being the highest. Scores ranging from 0 to 3, 4 to 6, 7 to 9, and 10 were classified as poor or terrible, fair, good, and excellent, respectively. Smoking status was categorized as never, current, and past.

The Depression, Anxiety, and Stress Scale [9] was used to assess stress, omitting the depression and anxiety components of the scale. The scale contained seven items on each subset of the psychometric assessment. Each item was rated on a four-point scale, with 0 indicating "did not apply to me at all" and 3 indicating "applied to me very much or most of the time". Scores from each subscale were multiplied by two, and recommended cut-off points were used to classify participants as normal, mild, moderate, severe, or extremely severe. The parameters studied were collapsed into binary outcomes. Participants who reported normal or mild stress symptoms were labeled "no stress symptoms", while those who reported symptoms that were moderate, severe, or extremely severe were labeled "moderate or severe stress symptoms".

2.8. Analysis

Data cleaning took place before the data analysis. There were small portions of missing data (8% for the outcome and <1.0% for the covariates), which were imputed using either mean or modal substitution. The bivariate analysis of selected covariates and peptic ulcer status was conducted using chi-square tests. Peptic ulcer prevalence was calculated overall and stratified by occupation and nationality. Logistic regression was used for the multivariate analysis using peptic ulcer as the outcome. In the multivariate model, variables that had a p-value <0.25 in the bivariate analysis were entered as potential covariates. We used a backward selection process in which variables with the weakest association were removed first until the most parsimonious model was selected. Other than covariate selection, the statistical tests were two-tailed with an alpha level of 0.05. The unadjusted and adjusted association odds ratios (OR), 95% confidence intervals (95% CI), and p-values (≤0.05 significance level) are presented. IBM SPSS statistical software version 28 was used to conduct the data analysis.

3. Results

This study included 2123 participants. The participants' mean ± SD age was 35 ± 9 years, with the majority falling between 31 and 40 years old. Men made up 85% of the participants, while 15% were women. About 73% of participants were married, 81% lived with their co-workers, and almost half had completed secondary education. Most of them had been working in Saudi Arabia for either less than 3 years or 10 years or more (see Table 1).

Table 1. Demographic characteristics of migrant workers in Saudi Arabia, overall and by peptic ulcer disease (n=2123).

				Peptic Ulcer Disease		
Variable	**Level**	**n**	**Overall %**	**No (n = 2041) %**	**Yes (n = 82) %**	**P-Value**
Age (years), 35.2 ± 9.3						0.454
	18 - 30	770	36.3	96.9	3.1	
	31 - 40	792	37.3	95.3	4.7	
	41 - 50	443	20.9	96.2	3.8	
	51+	118	5.6	96.6	3.4	
Gender						0.005
	Men	1810	85.3	96.6	3.4	
	Women	313	14.7	93.3	6.7	
Currently Married						0.110
	Yes	1545	72.8	95.7	4.3	
	No	578	27.2	97.2	2.8	
Accommodation						0.044
	Single Room	236	11.1	93.2	6.8	

Continued

	With Co-Workers	1713	80.7	96.6	3.4	
	With Family	174	8.2	96	4	
Education						0.025
	None	335	15.8	97.6	2.4	
	Primary	690	32.5	97	3	
	Secondary	936	44.1	95.6	4.4	
	University and Above	162	7.6	92.6	7.4	
Duration of Stay in Saudi Arabia						0.070
	<3 years	618	29.1	97.1	2.9	
	3 - 5.9 years	374	17.6	95.2	4.8	
	6 - 9.9 years	449	21.1	94.4	5.6	
	≥10 years	682	32.1	96.9	3.1	
Weekly Work Hours						0.232
	Recommended (≤48)	610	28.7	95.2	4.8	
	Overtime (49 - 60)	653	30.8	97.1	2.9	
	Illegal (>60)	860	40.5	96	4	
Occupation						0.008
	Auto Repair	217	10.2	91.7	8.3	
	City Cleaners	403	19.0	95.8	4.2	
	Construction	170	8.0	98.2	1.8	
	Hairdresser	450	21.2	95.8	4.2	
	Hospital Cleaners	422	19.9	96.7	3.3	
	Poultry Factory	78	3.7	96.2	3.8	
	Restaurant	383	18.0	97.9	2.1	
Nationality						<0.001
	Bangladesh	587	27.6	96.4	3.6	
	India/Nepal	546	25.7	98	2	
	Middle East	355	16.7	93.5	6.5	
	North Africa	204	9.6	94.6	5.4	
	Pakistan	244	11.5	98.4	1.6	
	Philippines	153	7.2	94.8	5.2	
	Other	34	1.6	88.2	11.8	

Almost three out of every four participants said they had never smoked before, while the rest were either currently smoking or had smoked in the past. The majority of participants reported having good or excellent sleep (81%) and dietary habits (90.7%). Only a few reported having poor health (7.7%) or severe symptoms of stress (3.6%) (see Table 2).

Table 2. Lifestyle characteristics of migrant workers in Saudi Arabia, overall and by peptic ulcer disease (n=2123).

				Peptic Ulcer Disease		
Variable	**Level**	**n**	**Overall %**	**No (n = 2041) %**	**Yes (n = 82) %**	**P-Value**
Smoking						0.004
	Never	1606	75.6	96.8	3.2	
	Current	422	19.9	95	5	
	Past	95	4.5	90.5	9.5	
Sleep						0.122
	Excellent	572	26.9	97.2	2.8	
	Good	1148	54.1	96.3	3.7	
	Fair	346	16.3	94.5	5.5	
	Poor/Terrible	57	2.7	93	7	
Diet						<0.001
	Excellent/Very Good/Good	1925	90.7	96.7	3.3	
	Fair/Poor	198	9.3	90.4	9.6	
Obesity						0.295
	Normal	848	39.9	96.6	3.4	
	Overweight	915	43.1	96.3	3.7	
	Obese	360	17.0	94.7	5.3	
Self-Rated Health						<0.001
	Excellent	697	32.8	97	3	
	Very Good	654	30.8	97.6	2.4	
	Good	609	28.7	95.9	4.1	
	Fair/Poor/Very Poor	163	7.7	87.7	12.3	
Moderate/Severe Stress						<0.001
	No	2046	96.4	96.6	3.4	
	Yes	77	3.6	83.1	16.9	

In general, 4% of the participants were diagnosed with peptic ulcers. PUD was not significantly associated with age, marital status, duration of stay in Saudi Arabia, weekly work hours, sleep, or obesity status. On the other hand, gender, accommodation type, education, smoking, diet, health status, and stress were significantly associated with peptic ulcers (see Table 1 & Table 2).

The prevalence of PUD was higher in women than in men (6.7% vs. 3.4%, p-value 0.005) and higher in participants who lived alone than in those living with their co-workers or with their families (6.8%, 3.4%, 4%, p-value 0.044). Participants with no education had a low prevalence of PUD (2.4%). The prevalence was lower in participants who had never smoked, had good dietary habits, and had no stress symptoms (see Table 1 & Table 2).

The prevalence of PUD varied by occupation and nationality. Auto-repair workers had the highest rate, and construction and restaurant workers had the lowest. Participants from the subcontinent countries of Bangladesh, India, Nepal, and Pakistan made up the majority of the sample. Middle Eastern participants had the highest prevalence of PUD, while Pakistanis had the lowest (see Table 1).

In the binary logistic regression model, marital status and duration of stay in Saudi Arabia showed no significant association with PUD. However, other factors such as accommodation type, diet, gender, nationality, occupation, self-rated health, smoking, and stress showed significant association with PUD in the univariate model. Women showed twice the odds of PUD compared to men. Participants who had smoked in the past had higher odds for ulcers than those who had never smoked. Participants who reported a poor diet were more likely to report PUD compared to those with an excellent diet. Being moderately or severely stressed or having poor health increased the odds of PUD compared to those with mild/no stress or excellent health, respectively. Auto-repair workers had five times higher odds of PUD than construction workers. Participants from the Middle East had a higher odds ratio for PUD compared to those from Pakistan. On the other hand, participants who lived with co-workers or family had decreased odds compared to those who lived in a single room (see Table 3).

Table 3. Correlates of peptic ulcer disease among migrant workers in Saudi Arabia (n = 2123).

Variable	Level	n	Univariate			Multivariate		
			OR	95% CI	P-Value	OR	95% CI	P-Value
Gender					0.006			0.16
	Men	1810	Reference			Reference		
	Women	313	2.1	1.24 - 3.44		2.0	0.76 - 5.47	
Currently Married					0.112			0.01
	Yes	1545	Reference			Reference		
	No	578	0.6	0.37 - 1.11		0.4	0.23 - 0.83	
Accommodation					0.050			0.025
	Single Room	236	Reference			Reference		
	With Co-Workers	1713	0.5	0.28 - 0.87		1.6	0.81 - 3.04	
	With Family	174	0.6	0.23 - 1.43		0.4	0.15 - 1.0	
Duration of Stay in Saudi Arabia					0.076			0.055
	<3 years	618	Reference			Reference		
	3 - 5.9 years	374	1.7	0.87 - 3.28		1.4	0.66 - 2.77	
	6 - 9.9 years	449	2.0	1.06 - 3.65		1.4	0.69 - 2.67	
	≥10 years	682	1.1	0.56 - 2.01		0.6	0.29 - 1.23	
Smoking					0.006			0.034
	Never	1606	Reference			Reference		

Continued

	Current	422	1.6	0.93 - 2.63		1.7	0.94 - 3	
	Past	95	3.1	1.49 - 6.56		2.7	1.16 - 6.23	
Diet					<0.001			0.04
	Excellent/Very Good/Good	1925	Reference			Reference		
	Fair/Poor	198	3.1	1.84 - 5.36		1.9	1.03 - 3.61	
Stress					<0.001			0.02
	Mild/No Stress < 10	2046	Reference			Reference		
	Moderate/Severe Stress > 10	77	5.8	3.06 - 11.07		2.5	1.15 - 5.37	
Self-Rated Health					<0.001			0.023
	Excellent	697	Reference			Reference		
	Very Good	654	0.8	0.42 - 1.56		0.9	0.44 - 1.81	
	Good	609	1.4	0.76 - 2.49		1.3	0.68 - 2.65	
	Fair/Poor/Very Poor	163	4.5	2.38 - 8.53		2.7	1.29 - 5.70	
Occupation					0.014			0.267
	Auto Repair	217	5	1.46 - 17.39		2.3	0.57 - 9.20	
	City Cleaners	403	2.5	0.71 - 8.48		3.7	0.90 - 15.64	
	Construction	170	Reference			Reference		
	Hairdressers	450	2.5	0.72 - 8.40		1.6	0.39 - 6.88	
	Hospital Cleaners	422	1.9	0.54 - 6.73		2.6	0.58 - 11.41	
	Poultry Factory	78	2.2	0.44 - 11.29		3.3	0.61 - 18.22	
	Restaurant	383	1.2	0.31 - 4.53		1	0.25 - 4.26	
Nationality					0.002			0.031
	Bangladesh	587	2.2	0.76 - 6.55		1.2	0.33 - 4.07	
	India/Nepal	546	1.2	0.39 - 3.91		1.1	0.33 - 3.80	
	Middle East	355	4.2	1.42 - 12.18		4.5	1.31 - 15.12	
	North Africa	204	3.4	1.07 - 10.91		2.8	0.77 - 10.32	
	Pakistan	244	Reference			Reference		
	Philippines	153	3.3	0.98 - 11.19		1.9	0.45 - 7.99	
	Other	34	8	1.90 - 33.66		6.6	1.31 - 32.92	

In the multivariate logistic regression model, gender and occupation were no longer significantly correlated with PUD. On the other hand, marital status became significant; unmarried participants were less likely to report peptic ulcers (OR = 0.4, 95% CI: 0.23, 0.83). Type of accommodation was significantly associated with PUD (p = 0.025); participants who lived with family had decreased odds of peptic ulcers (OR = 0.4, 95% CI: 0.15, 1.0) compared to those who lived alone. Past smokers showed higher odds compared to participants who had never

smoked (OR = 2.7, 95% CI: 1.16, 6.23). Workers with poor dietary habits had higher odds of PUD than those with excellent and good dietary habits (OR = 1.9, 95%: 1.03 - 3.61). Participants with moderate and severe stress had higher odds of PUD than those with mild to no stress (OR = 2.5, 95% CI: 1.15 - 5.37, p = 0.02). Workers who rated their health as good and poor had higher odds of peptic ulcers compared to those who rated their health as excellent (OR = 1.3; 95% CI: 0.68 - 2.65; OR = 2.7; 95% CI: 1.29 - 5.70, respectively) (see **Table 3**).

4. Discussion

This study assessed the prevalence of PUD among migrant workers in Saudi Arabia and whether it varied by demographic variables, lifestyle characteristics, occupation, or nationality. The findings can be summarized as 1) a 4% prevalence of PUD, 2) significant associations with several lifestyle characteristics, such as diet, self-rated health, smoking, and stress, and 3) nationality was significantly associated with PUD after adjusting for lifestyle factors. However, occupation was not significant in the adjusted model.

We only found one study that looked at the prevalence of peptic ulcers among migrant workers. It showed that gastric ulcer, a type of peptic ulcer, was more prevalent among migrant workers than indigenous workers [10]. However, according to a study conducted in Arar, Saudi Arabia, the prevalence of peptic ulcers was 21.9%, which is higher than our prevalence among migrant workers [4]. Although the proportion of migrant workers in the Arar study was not stated, it is likely to be low as the study was community based and over half of the sample were 18 - 25 years old [4]. Salari *et al.* (2022) [11] found a prevalence of 8.4% in their systematic review of the global PUD rate. Another study suggested similar results, with a prevalence of 5 to 10% among the general population worldwide [3].

The significant associations between PUD and lifestyle characteristics, such as diet, self-rated health status, smoking, and stress, were consistent with previous studies. Multiple studies have found that there is a significant relationship between smoking and the development of peptic ulcers [5] [12]-[14]. The significant association between peptic ulcers and diet is supported by Sonnenberg (1988) [15]. We found that being moderately or severely stressed increased the odds of PUD, which is in line with a Danish study that found that high levels of stress raised the risk of being diagnosed with peptic ulcers [16]. According to one study, there is a substantial link between marital status and duodenal ulcers, which are more common in married people [13]. This is consistent with our findings, as unmarried participants were less likely to report ulcers than married participants. There were not many studies to support or contradict our findings on living condition/accommodation type.

In this study, occupation was no longer significant in the adjusted model. This is in contrast with a German study that found type of work was associated with peptic ulcers, with manual laborers more likely to report peptic ulcers than sedentary workers. Since migrant workers, for the most part, are involved in manual

work, an increased prevalence of PUD was observed among those workers [10]. On the other hand, our finding of a significant association between nationality and PUD is supported by the same German study [10]. In addition, being an emigrant from a developed country is one of the risk factors for PUD, according to the National Library of Medicine [1].

4.1. Strengths and Limitations

This study had some strengths and limitations. It had an adequate sample that included various occupations and nationalities in the previously understudied population of migrant workers in Saudi Arabia. One limitation was that the PUD prevalence estimate came from non-random sampling, and therefore, may not represent the true prevalence in the population. Another limitation is that certain known risk factors were not assessed, such as the history of using certain drugs, like NSAIDs. Furthermore, it was not possible to confirm the diagnosis of PUD with medical records or endoscopy because this was a community-based epidemiological study. The results may have misclassification bias; however, the survey provides an initial estimate of peptic ulcer in an understudied population. This cross-sectional study explored associations, so it cannot draw a firm conclusion about temporal or causal inferences. Therefore, the results should be interpreted carefully.

4.2. Implications and Recommendation

This study has identified certain lifestyle risk factors for PUD among migrant workers that could inform company and government policymakers. Factors such as diet, exercise, and stress could be addressed with health promotion campaigns and interventions sponsored by the employers.

4.3. Conclusion

The peptic ulcer disease prevalence among migrant workers found in this survey was similar to published estimates among the general population. Nonetheless, efforts are needed to raise awareness of PUD and the lifestyle factors that were found to be significantly associated with peptic ulcers.

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Data Availability

All data included or relevant to the study are available upon request from the corresponding author.

Authors' Contributions

JS, NS: conception, analysis, and critical revision of the manuscript; NA: drafting of the manuscript; AA: critical review of the analysis and manuscript; RA, MQ, MA, KA, and AD: fieldwork and revision of the manuscript. All authors approved the final version.

Ethical Approval

This study was approved by the Qassim Ethics Review Committee at the Ministry of Health in Saudi Arabia (No.: H-04-Q-001, 4 January 2023), and the study was performed in accordance with the ethical standards as laid down in the 1964 Declaration of Helsinki and its later amendments or comparable ethical standards. Informed consent was obtained from all individual participants included in the study.

Conflicts of Interest

The authors declare that there is no conflict of interest.

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