Medical Science

To Cite:
Alammari ZS, Aljulaymi IS. Foot Health and its Association with Quality of Life Among Adults in the Makkah Region: A Cross-Sectional Study. *Medical Science* 2026; 30: e48ms3829
doi: https://doi.org/10.54905/disssi.v30i169.e48ms3829

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Peer-Review History
Received: 03 September 2025
Reviewed & Revised: 21/September/2025 to 16/February/2026
Accepted: 27 February 2026
Published: 05 March 2026

Peer-review Method
External peer-review was done through double-blind method.

Medical Science
pISSN 2321–7359; eISSN 2321–7367

Foot Health and its Association with Quality of Life Among Adults in the Makkah Region: A Cross-Sectional Study

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ABSTRACT

Introduction: Foot problems are highly prevalent and encompass a broad spectrum of conditions affecting individuals across all age groups. These conditions can substantially impair mobility, limit daily functional activities, and ultimately reduce overall quality of life (QoL). There is insufficient data regarding foot health among adults in the Makkah region, Saudi Arabia. This study aims to assess foot health and its correlation with health -related QoL among adults in the Makkah region, Saudi Arabia. *Methods*: This cross-sectional study executed online from December 2024 to June 2025 by using the Arabic Foot Health Status Questionnaire (FHSQ) and specific SF-36 dimensions. The participants were adults between the ages of 19 and 60. To analyze these data, we use non-parametric tests, Spearman's correlations, and multiple regression. *Results*: 396 participants were included in this study (mean age 36.9± 10.1; 85.1% females), the median FHSQ score was highest for foot function (93.75) and lowest for footwear (58.33). Physical function had the greatest QoL score (80), while vigors had the lowest. (62.5). Males reported better overall foot health ($p=0.011$) and reduced foot pain ($p=0.001$). Better foot health was associated with younger age, being single, and normal BMI ($p<0.05$). Residence, smoking, obesity, female gender, and older age were all individually associated with poor foot health. Foot pain was associated with overall foot health ($r=0645$, $p<0.01$) and foot function ($r=0.641$). *Conclusion*: This study concludes that individuals should follow many strategies to improve foot health and general well-being in adults in Makkah, such as weight control, smoking cessation, and appropriate footwear.

Keywords: Foot; Quality of life; FHSQ; Makkah; Saudi Arabia; Cross-sectional study

1. INTRODUCTION

The foot plays an important part in preserving independence and quality of life (QoL). It is essential for mobility, balance, and weight-bearing. Although bipedalism offers functional advantages, it also causes degenerative changes and mechanical stress in the lower limbs. As degenerative joint disorders are more prevalent in weight -bearing joints than in quadrupedal animals, there is evidence that bipedal walking speeds up locomotor decline (Hendry et al., 2018; Almaawi et

al., 2023). Regarding the close relationship between mobility and quality of life, it is both timely and crucial to understand foot health in the general population.

According to the research Pita et al., (2014) and López et al., (2017), foot problems constitute one of the most prevalent musculoskeletal conditions worldwide, affecting between 61% and 79% of institutional and clinical populations. Their greater public health impact is still poorly understood despite this great prevalence, especially in general populations (Bowling and Grundy, 1997; Barr et al., 2005). In addition to being a common reason for primary care visits, foot problems are frequently chronic, limiting activities, impairing gait and balance, and raising the risk of falls (Nix et al., 2010; Rodríguez et al., 2018).

Epidemiological evidence indicates that foot problems are more prevalent in women and older adults (over 65) (Benvenuti et al., 1995; Rodríguez et al., 2018). Comorbidities such as obesity, diabetes, vascular problems, and depression are often associated with these conditions and aggravate functional limitations and healthcare burden (Woolf and Åkesson, 2008). Additionally, poor footwear and an increased probability of surgical procedures lead to a lower quality of life and greater healthcare costs.

In Saudi Arabia, research on foot health has mostly concentrated on select clinical populations, particularly diabetic patients, whose quality of life is considerably impacted by foot disorders including neuropathy and ulceration (Al Ayed et al., 2020). However, there is no data on foot health in the wider population, and as far as we know, no previous research has examined this condition in adults living in the Makkah area. In order to build protective programs and policies, baseline epidemiological data must be generated.

The Foot Health Status Questionnaire (FHSQ) is a validated measure that is extensively used in clinical and research contexts to evaluate four domains: overall foot health, footwear, foot pain, and foot function (Bennett et al., 1998; Palomo et al., 2019). Furthermore, it uses SF-36-derived domains to assess health-related quality of life, and there is substantial evidence to support its validity and reliability across a range of demographics (Alshami, 2024).

Therefore, the aim of this study was to explore the relationship between HRQoL and adult foot health in the Makkah region of Saudi Arabia. Its specific aims were to: (1) identify the sociodemographic profile of the participants; (2) use validated Arabic questionnaires to evaluate foot health and quality of life; and (3) determine the sociodemographic and lifestyle factors that influence foot health outcomes.

The outcomes of this study will assist the goals of Saudi Arabia's Vision 2030 National Transformation Program, which places a high premium on population well-being and preventive healthcare, and provide data to guide preventative activities and enhance clinical practice (Almaawi et al., 2023).

2. REVIEW METHODS

Study setting and population

This study is a cross-sectional survey that was executed by using an online Arabic survey to gather data (Google Forms) and conducted between December 2024 and June 2025 among adult residents of the Makkah region, Saudi Arabia, who were between the ages of 19 and 60 years and fulfilled the eligibility criteria. Participants were invited to distribute the poll link to their friends, family, and coworkers via social media and other digital communication channels.

Informed consent was indicated when respondents completed the survey after reading the study details, and participation was entirely voluntary. Participants were made aware of their right confidentiality maintained by leaving out any identifying information.

Inclusion and Exclusion Criteria

Those who lived in the Makkah region, were between the ages of 19 and 60, and could understand and finish the Arabic questionnaire were eligible to participate. People under the age of 19, people with cognitive impairments, people with systemic disorders that affect musculoskeletal health (such as diabetes or rheumatoid arthritis), people who have had significant foot or musculoskeletal surgery in the past, pregnant women, and professional athletes were all excluded.

Sample size calculation

Using a 5% margin of error and a 95% confidence level, the sample size was calculated based on the Makkah region's projected population of 8,019,757 people in 2017 (Almaawi et al., 2023). Using a standard Sample Size Calculator, the minimum required sample size was determined to be 385.

Data Collection Procedure

1. An informed consent statement preceded each of the three sections of the self-administered questionnaire.
2. Sociodemographic information: Gender, age, height, weight, BMI, marital status, education level, employment status, occupation, presence and kind of chronic condition, smoking status, and place of residence are all included.
3. Foot health assessment – using the Arabic version of the Foot Health Status Questionnaire (Ar-FHSQ, version 1.03). Four domains were evaluated in the first portion (13 items): foot pain (4 items), foot function (4 items), footwear (3 items), and general foot health (2 items) (Table 1). Except for the footwear domain, which exhibited good reliability (α = 0.70), the Ar-FHSQ showed outstanding internal consistency (Cronbach's α = 0.91–0.92) across domains. The tool has been extensively validated and used in research and clinical settings (Almaawi et al., 2023; Garrow et al., 2004; Alshami, 2024)
4. Generic health-related quality of life (HRQL) – The four extra FHSQ areas of general health, physical activity, social capacity, and vigor are used to measure generic health-related quality of life (HRQL). These domains came from the validated Arabic SF-36 questionnaire 13, 14, which demonstrated great internal consistency (Cronbach's α = 0.71–0.90) and strong item–scale correlations (r > 0.40). Statistical software was used to calculate domain scores, which ranged from 0 (poor health status) to 100 (ideal health status).

Table 1. The Foot Health Status Questionnaire evaluates various aspects of foot health.

Domain	Item	Theoretical construct	Meaning of the lowest score (0)	Meaning of the highest score (100)
Foot pain	4	Type, Severity, and duration. Evaluation of foot pain in terms of type of pain, Severity, and duration	Extreme pain in the feet, and significant if acute	Free from pain, no discomfort
Foot function	4	Evaluation of the feet in terms of impact on physical functions	Severely limited in the performance of numerous physical activities due to their feet, such as walking, working, and moving about	Patients can carry out all physical activities desired, such as walking, working, and climbing stairs
General foot health	2	Self-perception of the feet (assessment of body image with respect to feet)	Perception of poor condition and status of the feet	Perception of excellent condition and status of the feet
Footwear	3	Lifestyle relating to footwear and feet	Great limitations to find suitable footwear	No problem obtaining suitable footwear. No limitations with respect to footwear

3. RESULTS

Sociodemographic Characteristics of Participants

participants' sociodemographic data (N = 396) were illustrated in Table 2. The mean age of participants was of 36.89 ± 10.12 years most of participant (37.6%) were in the range of 39-48 years. Most of them were female (85.1%) and married (63.6%) and lived in Taif City (71.2%) and had a bachelor's degree (66.7%). (95.7) of participate did not smoke and who were overweight (33.6%) and (35.4%) were normal weight and 22.5 were obese, with an average BMI of 25.98 ± 6.37 kg/m2.

Foot Health and HRQoL Scores

The descriptive statistics of the Foot Health Status Questionnaire (FHSQ) and HRQoL scales are provided in Table 3. Foot function had the greatest median score (93.75, IQR=25), whereas footwear had the lowest (58.33, IQR=41.67). Physical function had the highest median in HRQoL (80.00, IQR=50.00), while vitality had the lowest (62.50, IQR=18.75).

Table 2: Sociodemographic characteristics of the studied participants

Sociodemographic variables		**N**	**%**
Age 36.89± 10.12	19-28 years 29-38 years 39- 48 ≥48	108 90 149 49	27.3 22.7 37.6 12.4
Gender	Male Female	59 337	14.9 85.1
Marital status	Single Married Divorced Widowed	122 252 16 6	30.8 63.6 4.0 1.5
Residence	Makkah Jeddah Taif city konfoza another place inside the Makah region	66 32 282 2 14	16.7 8.1 71.2 0.5 3.5
Educational level	Illiterate Read and write Secondary Diploma Bachelor Master's degree or higher	1 4 47 29 264 51	.3 1.0 11.9 7.3 66.7 12.9
Occupation	Unemployed Student Employed/part-time Employed/full-time	98 56 11 231	24.7 14.1 2.8 58.3
Chronic disease	No chronic diseases	396	100.0
Smoking status	Non-smoker Smoker	379 17	95.7 4.3
BMI levels 25.98 ± 6.37	Obese Overweight Normal weight Under weight	89 133 140 34	22.5 33.6 35.4 8.6

BMI: Body Mass Index; Obese BMI ≥ 30; Overweight: BMI 25–29.9; Normal: BMI 18.5–24.9; Underweight: <18.5

Table 3: Descriptive statistics of FHSQ and health-related QoL scales among the participants

		Mean± SD	**Median**	**IQR**	**Minimum**	**Maximum**
FHSQ	Foot pain	68.02±25.24	68.75	37.50	.00	100.00
	Foot Function	85.11±18.99	93.75	25.00	6.25	100.00
	Footwear	57.36±27.48	58.33	41.67	0.00	0.100
	General Foot Health	74.55±23.42	75.00	50.00	0.00	0.100
HRQoL	Physical function	72.53±27.84	80.00	50.00	0.00	0.100
	Vigor	60.44±14.13	62.50	18.75	0.00	0.100
	Social Functioning	74.24±22.47	75.00	46.88		
	General Health	64.96±13.89	66.66	16.67	33.33	100.00

FHSQ: Foot Health Status Questionnaire; HRQoL: Health-Related Quality of Life

Gender Differences in FHSQ and HRQoL

Males reported considerably higher overall foot health (87.50 vs. 75.00, p=0.011) and significantly lower foot pain scores (87.50 vs. 68.75, p=0.001) than females (Table 4). In the HRQoL dimensions, there were no discernible gender differences.

Table 4: Gender differences regarding FHQS and HRQOL scales

		Male Median (IQR)	Female Median (IQR)	Mann-Whitney test (p-value)
FHQS scales	Foot pain	87.50 (31.25)	68.75 (43.75)	0.001**
	Foot function	100 (18.75)	93.75 (31.25)	.135
	Footwear	50 (50)	58.33 (33.33)	.328
	General foot health	87.50 (37.50)	75 (50)	.011**
HRQOL scales	Physical function	85 (45)	80 (50)	.499
	Vigor	62.50 (25)	62.50 (18.75)	.880
	Social Function	87.5 (37.5)	75 (50)	.442
	General Health	66.66(25)	66.66(16.67)	.858

**highly significant at ≤0.01

Sociodemographic Associations with FHSQ

Table 5 presents a comparison of sociodemographic characteristics with the FHSQ scales.

- Age: Younger participants scored significantly higher in foot pain, foot function, and general foot health (p<0.01).
- Marital status: Singles had better scores in foot pain, foot function, and general foot health (p<0.05).
- Residence: Significant differences were observed in footwear scores (p=0.003).
- Occupation: Students reported better foot function (p=0.040).
- BMI: Obesity was associated with significantly poorer foot pain, function, and general foot health (p<0.01).
- Education and smoking were not significantly associated with FHSQ.

Table 5: Comparison between sociodemographic characteristics and FHSQ scales

Socio-demographic variables		**Foot pain**	**Foot function**	**Footwear**	**General foot health**
		Median (IQR)	Median (IQR)	Median (IQR)	Median (IQR)
Age	19-28 years	81.25 (31.25)	100 (18.75)	62.50(41.67)	87.50(25.00)
	29-38 years	75.00 (45.31)	96.87 (20.31)	58.33(50.00)	87.50(37.50)
	39- 48 years	62.50 (40.63)	87.50(31.25)	58.33(33.33)	75.00(37.50)
	more than 48	56.25 (40.63)	81.25 (37.50)	50.00(50.00)	62.50(25.00)
Kruskal-Wallis (P- value)		.000**	.001**	.068	.000**
Marital status	Single	81.25(37.50)	100.00(18.75)	62.50(43.75)	87.50(37.50)
	Married	68.75(42.19)	87.50(31.25)	58.33(41.67)	75.00(50.00)
	Divorced	75.00(46.88)	100.00(31.25)	62.50(75.00)	75.00(43.75)
	Widowed	68.75(46.88)	90.62(45.31)	37.50(50.00)	75.00(62.50)
Kruskal-Wallis (P- value)		.038*	.013**	.216	.010**
Residence	Makah	62.50(31.25)	93.75(25.00)	66.66(33.33)	75.00(50.00)
	Jeddah	87.50(42.19)	100.00(31.25)	75.00(50.00)	87.50(50.00)
	Taif city	75.00(37.50)	93.75(31.25)	58.33(41.67)	75.00(50.00)
	konfoza	75.00(12.50)	93.75(13.00)	50.00(50.00)	81.25(37.50)
	other places inside the Makah region	65.62(45.31)	90.62(23.44)	45.83(43.75)	87.50(53.13)
Kruskal-Wallis (P- value)		.183	.935	.003**	.863

Education	Read and write	78.12(56.25)	87.50(31.25)	58.33(41.67)	81.25(46.88)
	Secondary	68.75(31.25)	93.75(25.00)	50.00(41.67)	75.00(50.00)
	Diploma	75.00(50.00)	87.50(31.25)	58.33(50.00)	75.00(50.00)
	Bachelor	68.75(42.19)	93.75(25.00)	58.33(41.67)	75.00(50.00)
	Master's or higher	81.25(37.50)	100.00(31.25)	75.00(50.00)	75.00(37.50)
Kruskal-Wallis (P- value)		.580	.989	.441	.839
Occupation	Unemployed	75.00(37.50)	93.75(18.75)	58.33(35.42)	75.00(50.00)
	Student	81.25(31.25)	100.00(18.75)	62.50(56.25)	75.00(37.50)
	Employed/part-time	62.50(50.00)	100.00(6.25)	50.00(50.00)	100.00(25.00)
	Employed/full-time	68.75(43.75)	87.50(31.25)	58.33(41.67)	75.00(50.00)
Kruskal-Wallis (P- value)		.059	.040*	.520	.062
Smoking	Non smoker	68.75(37.50)	93.75(25.00)	58.33(41.67)	75.00(50.00)
	Smoker	75.00(43.75)	87.50(31.25)	50.00(58.33)	62.50(50.00)
Mann-Whitney U(P-value)		.763	.507	.297	.366
BMI levels	Obese	56.25(40.63)	81.25(31.25)	58.33(41.67)	75.00(31.25)
	Overweight	75.00(43.75)	93.75(31.25)	58.33(41.67)	75.00(50.00)
	Normal weight	68.75(40.63)	100.00(25.00)	58.33(41.67)	75.00(37.50)
	Under weight	87.50(37.50)	100.00(12.50)	75.00(43.75)	93.75(28.13)
Kruskal-Wallis (P- value)		.000**	.000**	.219	.000

*Statistically significant at P≤0.05; **Highly significant at P≤ 0.01; IQR: Inter Quartile Range

Correlations Between FHSQ and HRQoL

According to Spearman's correlation analysis (Table 6), foot discomfort had a mild link with social functioning (r=0.265, p<0.01) and a substantial correlation with foot function (r=0.641, p<0.01) and overall foot health (r=0.645, p<0.01). Vigor (r=0.099, p=0.048) and social functioning (r=0.257, p<0.01) were strongly correlated with general foot health.

Table 6: Spearman's correlation between FHSQ scales and RAND HRQOL scales

		Foot Pain	**Foot Function**	**Footwear**	**General Foot Health**	**Physical Function**	**Vigor**	**Social Function**	**General Health**
Foot Pain	Correlation Coefficient	-	.641**	.274**	.645**	-0.020	0.005	.265**	-.105-*
	Sig. (2-tailed)		0.000	0.000	0.000	0.693	0.920	0.000	0.036
Foot Function	Correlation Coefficient	.641**	-	.330**	.610**	-0.046	-0.027	.309**	-0.085
	Sig. (2-tailed)	0.000		0.000	0.000	0.366	0.595	0.000	0.092
Footwear	Correlation Coefficient	.274**	.330**	-	.323**	0.012	-0.091	.177**	-0.055
	Sig. (2-tailed)	0.000	0.000	-	0.000	0.809	0.071	0.000	0.271
General Foot Health	Correlation Coefficient	.645**	.610**	.323**	-	0.000	.099*	.257**	-0.006
	Sig. (2-tailed)	0.000	0.000	0.000		0.995	0.048	0.000	0.908
Physical Function	Correlation Coefficient	-0.020	-0.046	0.012	0.000	-	0.015	-0.039	0.094
	Sig. (2-tailed)	0.693	0.366	0.809	0.995		0.761	0.434	0.062
Vigor	Correlation Coefficient	0.005	-0.027	-0.091	.099*	0.015	-	-.101-*	.161**
	Sig. (2-tailed)	0.920	0.595	0.071	0.048	0.761		0.044	0.001

Social Function	Correlation Coefficient	.265**	.309**	.177**	.257**	-0.039	-.101-*	-	-.164-**
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.434	0.044		0.001
General Health	Correlation Coefficient	-.105-*	-0.085	-0.055	-0.006	0.094	.161**	-.164-**	-
	Sig. (2-tailed)	0.036	0.092	0.271	0.908	0.062	0.001	0.001	

*Statistically significant at P≤0.05; **Highly significant at P= 0.01

Regression Analysis for FHSQ Scale Sociodemographic Predictors

A multiple regression analysis was carried out to identify sociodemographic determinants of the four FHSQ domains (Table 7).

- Foot discomfort was significantly predicted by age (B = -0.354, p=0.041), gender (B = -14.71, p<0.001), and BMI (B = -0.421, p=0.050). Higher BMI, female gender, and older age were linked to increased foot pain.
- While other variables were not significant, gender had a negative impact on foot function (B = –6.30, p=0.040), with females reporting lower scores.
- Only residence was a significant predictor of footwear (B = –3.82, p=0.004), suggesting regional variations in footwear satisfaction.
- Age (B = 0.389, p=0.015), gender (B = 10.49, p=0.005), BMI (B = 0.516, p=0.010), and smoking status (B = –15.07, p=0.013) were all substantially correlated with general foot health. Therefore, lower overall foot health was independently predicted by being older, female, fat, and a smoker.

Table 7: Regression analysis for the sociodemographic predictors of FHSQ scales

	Foot pain		**Foot function**		**Footwear**		**General foot health**	
	B	P-value	B	P-value	B	P-value	B	P-value
Age	-.354-	.041*	-.155-	.246	68.556	.208	-.389-	.015*
Gender	-14.71-	.000**	-6.296-	.040*	-.244-	.441	-10.493-	.005**
Bmi	-.421-	.050*	-.179-	.278	3.429	.542	-.516-	.010**
Marital Status	1.39	.580	-1.576-	.418	-.146-	.682	.066	.978
Education	2.02	.201	.805	.508	-1.161-	.636	1.107	.449
Occupation	-1.66-	.143	-1.300-	.136	.836	.251	.067	.949
Smoking State Code	-8.96-	.170	-7.418-	.140	1.455	.601	-15.070-	.013*
Residence	-.67-	.589	-.479-	.616	-3.815-	.004**	-.800-	.487

*Statistically significant at P≤0.05; **Highly significant at P= 0.01

4. DISCUSSION

In this study, adult Makkah residents' foot health and health-related quality of life (HRQoL) were assessed, and correlations with sociodemographic traits were evaluated. While HRQoL was highest for physical function and lowest for vigor, individuals generally reported high foot function ratings but lower happiness with footwear

As the previous articles have shown that demographic factors can influence HRQoL and foot health. Most of the participants had normal or overweight BMI, were married, educated, and female, aged 17 to 18. Unexpected result found that younger participants scored significantly higher on foot pain, foot function, and overall foot health more than older participants, which indicates that musculoskeletal stress and age-related physiological changes may have deteriorated effect on foot health (Thomas et al., 2011).

Men reported less foot pain and better overall foot health than women, which is consistent with data demonstrating that women are more likely to have musculoskeletal issues and foot discomfort, possibly as a result of footwear choices, anatomical variances, and hormonal impacts (Arendt, 2000; Menz and Morris 2005).

Higher BMI, particularly obesity, has been associated with decreased foot pain, function, and overall foot health. This is consistent with previous research associating heavy weight to greater plantar pressure, structural foot alterations, and a higher risk of musculoskeletal diseases (Yoon et al., 2016; Ubillus et al., 2023). These findings emphasize the importance of weight management and preventative interventions in populations with high BMI to preserve optimal foot health.

There are no significant differences in gender variations in HRQoL areas, indicating that although foot health variations, gender may have less effect on overall quality of life in this population (Yoon et al., 2016). There is a significant correlation between foot pain, foot function, and general foot health (Almaawi et al., 2023).

According to multiple regression analysis, age, gender, BMI, smoking status, and place of residence all have a substantial impact on a number of FHSQ domains. Obesity, smoking, older age, and female gender were all independently linked to lower foot health, highlighting the complexities of foot health issues (Canca-Sanchez et al., 2024). These findings suggest useful therapy targets, such as smoking cessation, weight management measures, and footwear education (Lewis et al., 2019).

Clinical implication

The results show the importance it is to perform foot health evaluations in routine clinical practice, especially for at-risk groups including women, the elderly, and people with higher body mass indices. Promoting suitable footwear and lifestyle changes should be part of public health efforts to enhance foot health and overall quality of life (Miikkola et al., 2019).

Limitations

There are various limitations to the study. Because the data were self-reported, response bias could have occurred. The sample was primarily female and came from specific cities, which limits generalizability, and the cross-sectional design precludes causal inference. Future studies should use longitudinal methods and include more varied groups (Miikkola et al., 2019).

5. CONCLUSION

Foot health is highly related to sociodemographic characteristics, including age, gender, BMI, and place of residence; it can have a minor impact on HRQoL. Preventive measures targeting high-risk populations are indicated to preserve good foot health and promote quality of life among adults in the Makkah region.

Acknowledgments

We thank the participants who all contributed samples to the study.

Authors' Contributions

Zainah S. Alammari conceptualized and designed the study, data collection, data interpretation, and manuscript drafting.
Ibrahim S. Aljulaymi contributed to study design, supervised data collection, performed the statistical analysis, and drafted and critically revised the manuscript. Both authors reviewed and approved the final version of the manuscript and agree to be accountable for all aspects of the work.

Informed consent

Written informed consent was obtained from all individual participants included in the study. Additional informed consent was obtained from all individual participants for whom identifying information is included in this manuscript.

Ethical approval

The study was approved by the ethics committee of Taif University, SA, with reference number 46-109 on December 9, 2024.

Funding

This research did not receive any external funding like specific grant from funding agencies in the public, commercial, or nonprofit sectors.

Conflict of interest

The authors declare that they have no conflicts of interest, competing financial interests or personal relationships that could have influenced the work reported in this paper.

Data and materials availability

All data associated with this study will be available based on reasonable request to the corresponding author.

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