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State of nutrition profession in Asian countries and its association with food security, anemia and stunting

Rubina Hakeem[1], Musarrat Jahan[2], Rubina Sabir[3]

[1]Nutrition Foundation of Pakistan, Karachi, Pakistan
[2]College of Human Nutrition and Dietetics, Ziauddin University, Karachi, Pakistan
[3]Department of Nutrition and Health, College of Medicine and Health Sciences, United Arab Emirates University, Al Ain, UAE

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ABSTRACT

Background: The continent of Asia has a vast range of complex nutritional issues ranging from undernutrition and its consequences e.g. anemia, stunting, wasting etc. to overnutrition and its related diseases. Most of the strategies used to combat these health crises are aimed at reducing poverty, increasing food production, and fortifying food. Efforts for identifying sustainable solutions by using existing resources are rare. The reason may be limitations in finding appropriate professional expertise and human resources for these efforts.

Objective: This paper aims to estimate the nutrition profession competence in Asia and to explore its association with food security and the nutrition situation in Asia.

Methods: For comparing State of Nutrition Profession in various countries of Asia four indicators were used: Volume of relevant Research output, Quality of relevant research output, Higher Education opportunities in Nutrition and Country's Membership international nutrition organizations. Data available at relevant websites was used to collect information about these indicators and a composite index was developed to develop a single variable termed Nutrition Competence Index. Data for Gross Domestic Product (GDP) and Nutritional issues were obtained from the website of the World Bank, and data for food security from Impact Economist. Scale level data was transformed as ranks to represent the relative position of various countries in relation to the study variables. Associations between variables were assessed by studying correlations. Regression analysis was done to estimate the relative role of various indicators in determining the outcome.

Results: The study results indicate that the association between Nutrition research activity score and Food Affordability Score (r=.445, P=.038, n=20) and association between Nutrition Professional Activity Score and Food Availability Score (r=.557, P=.007, n=20) were statistically significant even after controlling for GDP. Similarly, Nutrition research activity scores were found significantly linked with rates of anemia under 5-year-old children (R2 = .52, F(5, 22) = 4.932, p = .004) and rates of stunting under 5-year-old children, (R2 = .58, F(5, 19) = 5.321, p = .003).

Conclusion: It is concluded from this study that Nutrition Competence has the potential to reduce the impact of GDP variations on food security and malnutrition globally, but its strength and utilization vary by continent, particularly in Asia.

Keywords: nutrition competence, GDP, food security, nutrition situation, nutritional issues

Corresponding author: Musarrat Jahan
Email: musarrat.jahan@zu.edu.pk

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Introduction

The realization of the importance of good nutrition as an essential factor for human health as well as sustainable development is increasing.[1] The FAO report published in 2019 "Food Security and Nutrition in the World: Safeguarding against Economic Slowdowns and Downturn" clearly demonstrated the association among countries economic status (as assessed by GDP per capita), food security and nutritional status of their populations.[2] It is obvious that the level of GDP translates into the personal income of the population, which is the main determinant of the degree to which the population's needs are satisfied and countries experiencing rapid GDP per capita growth have seen the greatest improvements in food security.[3] Unfortunately, the majority of people with food insecurity lives in the Asian regions.[4] A sharp increment in food security is observed in developing countries during the last 3 decades and it is alarming that highest number of undernourished people lives in Asia and this continent was a home to 55 percent (402 million) of the people in the world affected by hunger in 2022.[5,6] Malnutrition due to limited food availability reflected as stunting and anemia are highly prevalent in Asia.[7]

It is also noteworthy that in addition to the food access, diet itself is also a contributing factor in the development of many chronic diseases including obesity, cardiovascular disease, hypertension, stroke, type 2 diabetes, metabolic syndrome, some cancers, and perhaps some neurological diseases.[8] It is of immense concern that prevalence of these diseases in Asian countries are also escalating that affects the quality of life of people lives in these regions and current studies revealed the metabolic risk factors including obesity, and overweight population mostly with central obesity.[9] To overcome these health crises, strategies employed were largely targeted to reduce poverty to make possible the availability of food to the population, to increase food production, and food fortification to optimize food utilization. The current analysis expands on our earlier investigation into the relationship between food security and nutrition competence and the role of GDP in predicting nutritional issues across Asian countries.[10]

Nutrition professionals play a pivotal role not only in addressing the epidemiological aspects of nutrition-related diseases but also in enhancing access to social, health, and basic services. Consequently, the presence of professionals with an academic background in nutrition within the public health field offers a promising resource for the formulation of action plans aimed at eradicating these nutritional concerns. Furthermore, their involvement in emergency preparedness and response efforts, capacity building, and training initiatives underscores the breadth of their impact. In times of crisis, nutrition professionals can ensure access to nutritious food and essential services, mitigating the effects on nutrition-related health outcomes. Overall, their expertise and engagement are essential for developing targeted and effective action plans that encompass a wide range of social, health, and basic service considerations, ultimately working towards the eradication of nutritional concerns. Certainly, the inclusion of nutritionists in multidisciplinary teams is imperative, given their academic expertise and understanding of diseases linked to diet. Their ability to suggest preventive measures and treatment options adds significant value to such teams.[11]

This study aimed (i) to estimate the nutrition profession competence in Asia, (ii) to explore the association of nutrition competence with food security and nutrition situation in Asia and (iii) to elucidate the potential of nutrition competence in determining the benefit from higher income of countries.

Main Points

- Malnutrition remains a public health problem worldwide despite of several nutritional interventional programs.
- Strategies used to reduce the burden of malnutrition usually focusing on alleviating poverty, food fortification, and supplements provision.
- However, despite all these efforts, the area of nutrition education and research is still not in the limelight.
- This research estimated the nutrition profession competence in Asia and also explored its association with food security and the nutrition situation.
- The findings supports that Nutrition Competence has the potential to reduce the impact of GDP variations on food security and malnutrition globally.

Methodology

Study Variables and Data Resources: This research is based on the use of secondary data in which information about the countries was retrieved from documents and statistics publicly available on the websites of international organizations. In this study, groups of variables related

to GDP and food insecurity as a predictor of nutritional issues in Asian countries as well as to develop nutritional competence were carefully selected. The prime source of data for information about GDP and Nutritional issues (including Anemia in under 5-year child, Hypertension, overweight in Adults and children, severe Wasting Under 5, Stunting Under-5, Undernourished Population and wasting Under-5) in Asian countries is taken from the website of "The World Bank" and information about the indicators to assess the status of food insecurity in these countries was extracted from the website of "Economist Impact".[12,13]

Measurement of Nutrition Profession Index: The estimation of Countries' Nutrition Profession status was done by assessing commitment to and competence in the field of nutrition. "Participation in nutrition activity" and "availability of higher education opportunities in nutrition" indicated commitment while research output and quality of research output indicated competence. Counties were ranked on these parameters in tertiles and sum of scores on these variables was used as Nutrition Profession Index. Higher scores were expected to indicate higher action potential. Validity of the index was judged by using the publication of national food based dietary guidelines as an outcome variable. NPI of countries that have published or not published NFBDG was compared and was found to be significantly higher P=0.029 for countries that have published NFBDG (8.2) as compared to those that have not published NFBDG (6.8).

(i) Nutrition Higher Education Score in which proportion of Higher Education Institutes in a country that are offering nutrition degree programs (Number of institutions offering nutrition/total number of HEIs listed in World higher Education Database) https://www.whed.net/home.php. (ii) Nutrition research Excellence Score: H-Index of all the Scholars from any country that are listed in AD scientific Index as Scientists in the field of Nutrition and Dietetics https://www.adscientificindex.com. (iii) Nutrition research Activity Score: Research output was estimated by comparing the number of scientific publications in the past 5 years in the area of human Nutrition in Google Scholar. The ratio of population to number of publications and Nutrition Research Activity Score (NRAS) was generated by converting this information to normal scores. (iv) Nutrition Professional Activity Score: Information about membership of country's nutrition organizations in international bodies i.e. the International Union of Nutritional Sciences (IUNS), the International Confederation of Dietetic Associations (ICDA) and International Affiliate of the Academy of Nutrition and Dietetics (IAAND) was retrieved from relevant websites and scores were assigned according the number of bodies in which country's nutrition bodies participated.[14,15,16]

Data Analysis: Data was analyzed using SPSS version 20. Scale level data was transformed as ranks to represent the relative position of various countries in relation to the study variables. Countries were categories in groups to study associations with indictors having data as categories. Associations between variables was assessed via Pearson correlation. Multiple Linear Regression analysis was done to estimate the relative role of various indicators in determining the outcome.

Results

1. Nutrition competence in Asia

Status of the Nutrition competence is Asia among six continents were presented as:

(i) State of Nutrition Focus in HEIs in Asia

Table 1 and Table 2 provides basic descriptive statistics of the proportion of HEIs with Nutrition programs in various continents. Results shows that Asia ranked 5th among 6 continents (Table 1) with HEIs with Nutrition programs and among 42 countries in Asia 12 countries are those which does not has the Nutrition programs in their universities (Table 2).

Table 1. Mean proportion of HEIs with nutrition programs in various continents

Continent Name	Africa	Asia	Europe	North America	Oceania	South America
Mean	7.79	7.11	5.62	10.64	7.78	20.90
SD	10.14	8.61	6.32	9.84	10.35	14.11

Table 2. Proportion of countries having various percentage of HEI with nutrition programs

Continent name	None		1 to 10%		>10%		Total	
	n	Row %	n	Row %	n	Row %	n	Row %
Africa	17	34.7%	19	38.8%	13	26.5%	49	100%
Asia	12	28.6%	19	45.2%	11	26.2%	42	100%
Europe	15	35.7%	20	47.6%	7	16.7%	42	100%
North America	6	30.0%	3	15.0%	11	55.0%	20	100%
Oceania	4	57.1%	0	0.0%	3	42.9%	7	100%
South America	2	16.7%	1	8.3%	9	75.0%	12	100%

Table 3. Dietetic research output

Continent name	Dietetic OP level					
	Low DO overall		Medium DO overall		High DO overall	
	Count	Row N%	Count	Row N%	Count	Row N%
Africa	22	40.7%	17	31.5%	15	27.8%
Asia	17	33.3%	16	31.4%	18	35.3%
Europe	11	22.9%	15	31.3%	22	45.8%
North America	13	38.2%	12	35.3%	9	26.5%
Oceania	7	36.8%	9	47.4%	3	15.8%
South America	2	16.7%	4	33.3%	6	50.0%

(ii) Nutrition research output and Excellence in Asia

Dietetic research output

Table 3 represents the distribution of dietetics research output (score based on the ratio of continent's population to number of publications in Nutrition in the past 5 years) across different continents. The table shows the number of dietetic research outputs at three different levels: low, medium, and high. According to the results Africa has highest research output (54) among other continents. Asia has second highest rate of dietetic research output (51) among others in which 17 were at the low level (33.3% of the total), 16 were at the medium level (31.4% of the total), and 18 were at the high level (35.3% of the total). Whereas, least was observed in South America.

Nutrition research excellence

Table 4 shows that countries in continent Oceania actively contribute to promoting Nutrition research than others. Asia ranked 3rd in Nutrition Research excellence with moderate number of researchers in this field (13.44), number of research institute (15.55) and mean H-index of researchers (21.53).

(iii) Nutrition Professional Activity in Asia:

Nutrition profession activity score was measured from number of memberships of country's nutrition organizations in international bodies (IUNS, ICDA and IAAND) (Figure 1) and results revealed that among 51 countries in Asia 25 countries has memberships with Nutrition related international organizations (Table 5).

2. Nutrition competence index:

Overall, all four indicators to assess Nutrition competence in Asia shows a positive correlation (Table 6).

3. Association of nutrition competence with food security and nutrition situation in Asia

Table 7 shows a positive, statistically significant correlations ($p<0.01$and $p<0.05$) were observed between

Table 4. Nutrition research excellence

Reserch parameters	Continents					
	Africa	Asia	Europe	North America	Oceania	South America
	Mean	Mean	Mean	Mean	Mean	Mean
Number of Researchers	6.04	13.44	9.82	31.27	37.33	5.38
Number of Institutions	7.32	15.55	25.15	8.16	23.11	7.68
Mean H INDEX of Researchers*	10.21	21.53	18.32	62.27	65.67	6.50

Table 5. Membership of countries from Asia in international organizations

		Continent						Total
		Africa	Asia	Europe	North America	Oceania	South America	
None	Count	32	26	24	24	17	6	129
	%	59.3%	51.0%	50.0%	70.6%	89.5%	50.0%	59.2%
IUNS	Count	20	13	6	4	0	4	47
	%	37.0%	25.5%	12.5%	11.8%	0.0%	33.3%	21.6%
ICDA	Count	0	3	3	2	0	0	8
	%	0.0%	5.9%	6.3%	5.9%	0.0%	0.0%	3.7%
ICDA-IUNS	Count	2	9	15	4	2	2	34
	%	3.7%	17.6%	31.3%	11.8%	10.5%	16.7%	15.6%
Total	Count	54	51	48	34	19	12	218
	%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table 6. Association between nutrition competence indicators

		Nutrition competence index	Nutrition professional activity score	Nutrition higher education score	Nutrition research excellence score
Nutrition professional activity score	Pearson Corr.	.626**			
	Sig. (2-tailed)	.000			
	N	51	51		
Nutrition higher education score	Pearson Corr.	.599**	.169		
	Sig. (2-tailed)	.000	.283		
	N	42	42	42	
Nutrition research excellence score	Pearson Corr.	.384*	.292	-.077	
	Sig. (2-tailed)	.021	.084	.685	
	N	36	36	30	36
Nutrition research activity score	Pearson Corr.	.486**	.042	.286	.407*
	Sig. (2-tailed)	.000	.777	.067	.017
	N	49	49	42	34

Table 7. Association between countries' nutrition competence and food security indicators in Asia

		Nutrition competence index	Nutrition professional activity score	Nutrition higher education score	Nutrition research excellence score	Nutrition research activity score
Food security score	Pearson Cor.	.568**	.341	.470*	.591**	.214
	N	26	23	19	26	26
Food affordability score	Pearson Cor.	.505**	.191	.487*	.565**	.151
	N	26	23	19	26	26
Food availability score	Pearson Cor.	.543**	.413	.409	.399*	.391*
	N	26	23	19	26	26
Food quality score	Pearson Cor.	.411*	.215	.307	.564**	.053
	N	26	23	19	26	26
Food resilience score	Pearson Cor.	.085	.255	-.041	.101	-.097
	N	26	23	19	26	26

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

Table 8. Association between countries' nutrition competence & nutrition relevant indicators in Asia

	Nutrition competence index	Nutrition professional activity score	Nutrition higher education score	Nutrition research excellence score	Nutrition research activity score
	(Pearson Correlation)				
Anemia Under 5 Child	-.305*	-.251	-.135	-.310	-.451**
Hypertension	-.170	-.237	-.412**	-.264	-.043
Overweight Adults	.217	-.084	.032	.221	.327*
Overweight Child	.181	-.022	.024	.108	.290*
Severe Wasting Under 5	.134	.198	-.077	.321	-.039
Stunting Under-5	-.146	.088	-.358*	.235	-.136
Undernourished Population	.007	-.044	-.218	.240	.254
Wasting Under-5	-.050	.139	-.098	.089	-.341*

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

the Nutrition Competence Index and food security score (r=0.568), Food Affordability Score (r =0.505), Food Availability Score (r = 0.543) and Food Quality Score (r=0.411). Table 7 also indicted the significant positive association (p<0.01) between Nutrition research Excellence Score with Food Security Score (r=0.591), Food Affordability Score (r=0.565) and Food Quality Score (r=0.564) even after controlling for GDP.

Association between Countries' Nutrition Competence & Nutrition Relevant Indicators in Asia are presented in Table 8. After controlling for GDP, It is clear that, hypertension had significant negative correlation with Nutrition Higher Education Score (r=-0.410, P=0.0129) and marginally significant correlation with Nutrition Professional Activity Score (r=-0.321, P=0.055). Undernourishment had significant positive correlation with Nutrition research activity (r=0.371, P=0.026).

Table 9. (a). Nutrition competence variables as predictor of nutritional issues (Anemia)

Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	41.402	4.836		8.560	.000
	GDP.PC	.000	.000	-.405	-1.956	.063
	Nutrition Higher Education Score	-.003	.223	-.002	-.012	.991
	Nutrition research Excellence Score	.177	.210	.141	.842	.409
	Nutrition research activity score	-.117	.053	-.462	-2.226	.037
	Nutrition Professional Activity Score	-2.356	2.614	-.136	-.901	.377
(b). Nutrition competence variables as predictor of nutritional issues (Stunting)						
1	(Constant)	29.969	4.967		6.034	.000
	GDP.PC	.000	.000	-.114	-.605	.552
	Nutrition Higher Education Score	-.388	.226	-.303	-1.713	.103
	Nutrition research Excellence Score	-.075	.197	-.060	-.378	.709
	Nutrition research activity score	-.117	.055	-.449	-2.132	.046
	Nutrition Professional Activity Score	2.184	2.749	.133	.795	.437

Wasting Under-5 had significant positive correlation with Nutrition Professional Activity Score (r=0.333, P=0.046).

The relationship between GDP, Nutrition Competence, and the prevalence of anemia among children under the age of 5 is shown in Figure 2. The data suggests that higher GDP is associated with lower prevalence of anemia, while higher nutrition competence is also associated with lower prevalence of anemia. Additionally, the data shows that there are significant differences in the prevalence of anemia between different GDP and nutrition competence groups. Table 9 (a) and Table 9 (b) shows the Nutrition Competence Variables as predictor of anemia and stunting under five years of age. Nutrition research activity scores predicted Rates of Anemia under 5-year-old children, R2 = .52, F(5, 22) = 4.932, p = .004 (Table 9 a). Nutrition research activity scores predicted Rates of STUNTING under 5-year-old children, R2 = .58, F(5, 19) = 5.321, p = .003 (Table 9 b).

Discussion

Many factors influences the health status of individuals in a population. These factors ranges from country level aspects e.g. GDP.PC, food security conditions, investment in the health care system to household level e.g. dietary practices, hygienic conditions etc. The effect of these elements on health issues has already been extensively studied. The positive impact of economic growth on increased life expectancy and lower infant mortality has already been established.[17]

But besides these, there is also an important element that is still neglected i.e. Nutrition competency. The most common nutrition competencies includes skills in nutrition assessment, the ability to prescribe dietary interventions in the prevention and treatment of disease, knowledge of the role of nutrition in health promotion and disease prevention and knowledge of the social and cultural importance of food, including food consumption trends and current nutrition recommendations.[18] In this study nutrition competencies among various continents were measured on the basis of number of HEI with Nutrition programs, Nutrition research excellence and Nutrition Professional Activity. Our results showed that South America has highest number of HEI among other continents. This continent ranked 4th in the list of by GDP per capita (PPP) provided by International Monetary Fund in 2023. The continent Oceania (ranked 2nd in 2023 list of GDP.PC provided by IMF) has highest score in Nutrition Research Excellence with highest number of researchers, Institutions and mean H INDEX of researchers. As far as continent Asia is concerned, it ranked 5th in having Higher

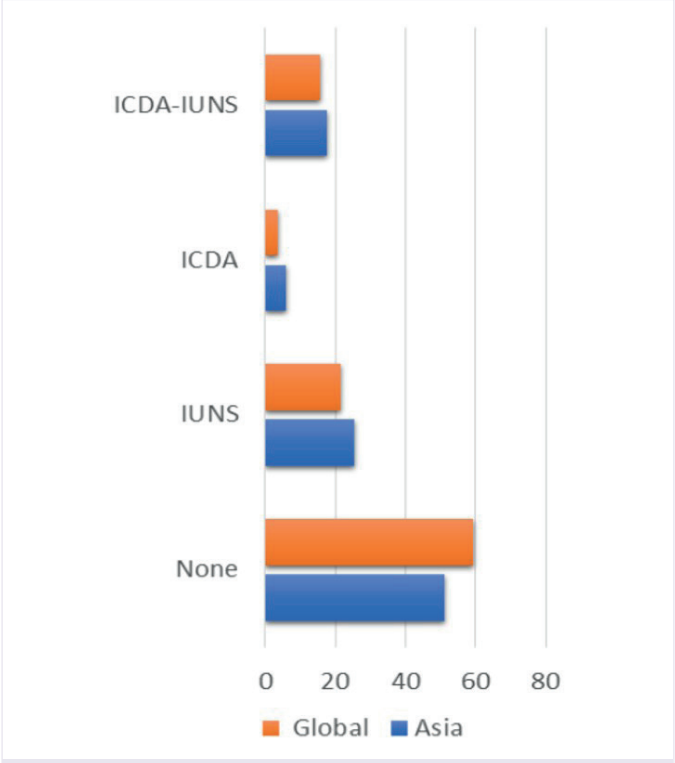

Figure 1. Membership of countries from Asia in international organizations

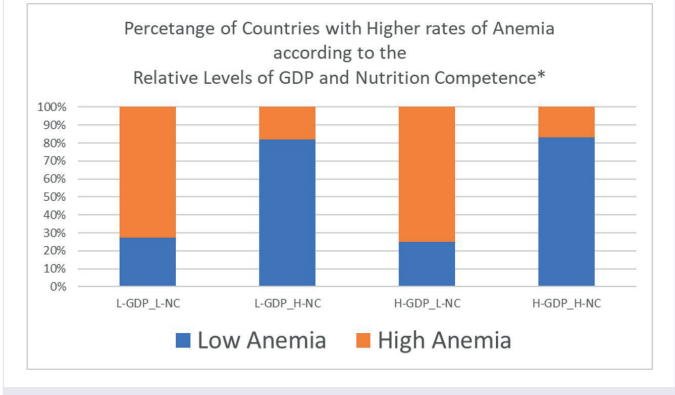

Figure 2. Relationship between GDP, nutrition Competence, and the prevalence of anemia among children under the age of 5

Education Institutes with Nutrition programs among other continents and has second highest rate of dietetic research output with a significant level of memberships in Nutrition related International organizations.

It is obvious from the current study that even countries with low GDP and high Nutrition competence has low rate of anemia in under 5 years old children (Figure 2) as compared to the countries with high GDP but with low nutrition competence. Similarly, our results also suggested that countries with high GDP but low nutrition competence has high ratio of stunting among children under 5 years of age (26.26) as compared to those countries with high GDP but low nutrition competence (10.32). Previous studies clearly demonstrated the effect of nutrition knowledge on prevalence of anemia in pre-school children and stunting in the same age group.[19,20] Our finding indicates that GDP per capita (GDP.PC) has a negative standardized coefficient of -.405, indicating that as GDP per capita increases, the rates of anemia in children decrease. Moreover, the nutrition research activity score has a negative standardized coefficient of -.449, indicating that as the nutrition research activity score increases, the rates of stunting in children decrease. Overall, the results suggest that the nutrition research activity score is a significant predictor for both anemia and stunting rates in under 5-year-old children, while the other variables do not show significant relationships. Our findings provide strong evidence of the positive impact of nutrition research activity on nutritional issues.

Conclusion

Globally and more so in Asia, the Nutrition Competence has potential to decrease the impact of variations in GDP on food security and Malnutrition however there are continent wise variations in strength and utilization of this potential. But presence of NC alone may not give the optimum benefits if there is no assurance of utilization of competence. Challenges in estimation of nutrition competence and flexibilities in human resource management are probably the biggest hindrance in capacity building and capacity utilization.

Strength and Weaknesses

The comprehensive data sources and a multidimensional approach to measuring nutrition competence provide strength in data collection. The use of standardized coefficients and numerical values, such as the negative coefficients for GDP per capita and nutrition research activity score, adds precision to the findings. This quantitative approach enhances the objectivity and reliability of the study. However, limitations can be in the potential data limitations only secondary sources are used, considering the exclusivity of data sources, "The World Bank" and "Economist Impact" might introduce a bias, minimizing subjectivity in scoring, as scoring criteria is missing, which can create the bias, study period is only five years, which can be considered as a limitation.

Ethical approval

The study did not require ethical approval as it was based on secondary data analysis.

Author contribution

The authors declare contribution to the paper as follows: Study conception and design: RH, RS; data collection: RH; analysis and interpretation of results: MJ; draft manuscript preparation: MJ. All authors reviewed the results and approved the final version of the article.

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Conflict of interest

The authors declare that there is no conflict of interest.

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