

Association of Religiosity and Spirituality With Psychological Well-Being Among Breast Cancer Survivors: A Systematic Review and Meta-analysis Protocol

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Abstract

Background:

Breast cancer is the most prevalent malignancy in women worldwide. Apart from its physical consequences, the diagnosis and treatment of breast cancer may substantially affect mental and emotional health. Religiosity and spirituality have been increasingly recognized as relevant coping resources, possibly contributing to resilience, quality of life, and subjective well-being in breast cancer survivors.

Objective:

This systematic review protocol aims to ensure methodological transparency and rigor by describing the planned methods for investigating the association between religiosity, spirituality, and psychological health among women who have survived breast cancer through a systematic review of observational studies.

Methods:

A comprehensive search will be performed across ten electronic databases. Grey literature will be identified through Google Scholar, ProQuest Dissertations & Theses Global, and OpenGrey. The reference lists of all included studies will be screened, and experts in the field will be consulted to identify additional pertinent studies. Eligible studies will include adult women diagnosed with breast carcinoma, regardless of histological subtype or disease stage. The exposed group will comprise women who report religiosity and/or spirituality, whereas the comparison group will include women who receive usual care or who report no religiosity and/or spirituality. The primary outcome will be psychological well-being, while secondary outcomes will include therapy adherence and overall survival. Study selection and risk-of-bias assessment using the ROBINS-E tool will be independently performed by two reviewers. When appropriate, random-effects meta-analysis will be conducted, with effect estimates expressed as odds ratios (ORs) and corresponding 95% confidence intervals (95% CIs).

Registration:

This protocol has been registered in the International Prospective Register of Systematic Reviews (PROSPERO) under registration number CRD420251148635.

Introduction

Breast cancer is currently the most prevalent malignancy among women worldwide. According to estimates from the Brazilian National Cancer Institute (INCA), more than 73,000 new cases are diagnosed annually in Brazil, indicating the substantial epidemiological and socioeconomic burden associated with this disease.(1)

The consequences of breast cancer go beyond its biological manifestations, affecting physical health, psychological well-being, social relationships, and spiritual dimensions of life.(2) Throughout treatment and survivorship, many women experience profound physical and psychological changes that require resilience as well as the development of efficient coping strategies. In this context, spirituality may represent an important source of support by strengthening self-esteem, sustaining hope, and developing a sense of meaning and purpose in life. Increasingly, spirituality has been recognized not only as an individual resource but also as a factor of comprehensive cancer care.(3,4)

Previous studies have suggested that women who engage in spiritual practices or perceive their spiritual lives as meaningful may experience greater psychological strength, improved quality of life, and lower levels of anxiety and depressive symptoms. Faith and belief in a higher power may provide comfort, emotional relief, and a sense of protection, possibly contributing to the maintenance of psychological health throughout the cancer experience.(5–7)

Beyond psychological outcomes, spirituality has also been investigated in relation to adherence to cancer treatment. Previous evidence suggests that faith may support patients in remaining engaged with therapeutic recommendations regardless of the physical and emotional challenges associated with cancer treatment. These findings highlight the potential relevance of spirituality in comprehensive cancer care, particularly during the survivorship phase.(8–10)

From a person-centered care perspective, recognizing patients' spiritual experiences may contribute to more holistic and compassionate healthcare. Incorporating spirituality into clinical care may support psychological well-being, quality of life, and restoration of self-esteem among breast cancer survivors. (11,12) This perspective is likewise aligned with the United Nations Sustainable Development Goals 2030, particularly the promotion of health and well-being.(12)

Despite increasing interest in spirituality within healthcare, important gaps persist concerning its association with psychological health among breast cancer survivors. Moreover, substantial methodological heterogeneity among published studies limits the interpretation and generalizability of the available evidence, underscoring the need for a rigorous, comprehensive synthesis of the literature.

Therefore, this systematic review intends to investigate the association between religiosity, spirituality, and psychological well-being in women who have survived breast cancer, as well as their relationship with adherence to cancer treatment and 5-year overall survival.

Methods

Protocol and Registration

This protocol was developed in accordance with the Preferred Reporting Items for Systematic Review and Meta-Analysis Protocols (PRISMA-P) guidelines (Appendix 1) and was registered in the International

Ethics Statement

Ethics committee approval was not required because this study describes the protocol for a systematic review. The review will use only data from previously published studies and will not involve primary data collection or direct participation by human subjects.

Research Question

This systematic review intends to answer the following research question: "Are religiosity and spirituality associated with psychological health among women who have survived breast cancer?"

The research question was formulated according to the PECOS framework (Table 1).(14,15)

Table 1. Research question based on the PECO acronym.

P (Population)	Adult women diagnosed with breast cancer.
E (Exposure)	Religiosity and/or spirituality, assessed using validated instruments or clearly described measures, including religious involvement, religious/spiritual practices, religious or spiritual coping, intrinsic/extrinsic religiosity, spiritual beliefs, or spirituality-related constructs.
C (Comparison)	Lower versus higher religiosity/spirituality; absence versus presence; reference category defined by the original study; or no explicit comparator when the exposure is analyzed continuously.
O (Outcome)	Psychological outcomes, analyzed separately by prespecified domain.
S (Type of study)	Observational studies.

Eligibility Criteria

Studies will be eligible if they include adult women aged ≥18 years with a diagnosis of breast cancer, regardless of histological or molecular subtype, disease stage (stages 0–IV according to the American Joint Committee on Cancer [AJCC], 2017(16), treatment status, race, ethnicity, or healthcare setting.

Eligible studies must evaluate women reporting religious and/or spiritual practices, irrespective of the type, frequency, or intensity of these practices, including their perceived relationship with God or a higher power.

The comparison group will consist of women who do not report regular religious and/or spiritual practices.

Primary and Secondary Objectives and Outcomes

The primary objective is to systematically evaluate the association between religiosity and spirituality and psychological outcomes among adult women diagnosed with breast cancer. The secondary objectives are to determine whether these associations differ according to the dimensions or measures of religiosity/spirituality, psychological outcome domains, treatment phase, time since diagnosis, disease stage, and study design, and to explore associations between religiosity/spirituality and treatment adherence and overall survival when sufficient evidence is available.

The primary outcome of this systematic review will be psychological health among breast cancer survivors. Psychological well-being will be defined as the emotional, psychological, and mental status of women following breast cancer treatment, including their ability to cope with the disease experience, maintain emotional balance, and preserve a positive perception of life and personal functioning. Outcomes will be assessed according to the definitions, criteria, and measurement instruments adopted by each included study.

Validated instruments assessing depressive symptoms/depression, anxiety, and psychological/emotional distress will be considered eligible as primary psychological outcomes. Secondary psychological outcomes will include resilience, coping, life satisfaction, the psychological/mental component of quality of life, and positive psychological well-being.

Information regarding assessment instruments, timing of outcome assessment, instrument cutoff values, scoring methods, and reported associations between religiosity/spirituality and psychological health will be extracted whenever available.

Continuous outcomes will be synthesized using the mean difference (MD) or standardized mean difference (SMD), whereas dichotomous outcomes will be summarized using the effect estimates reported by the published studies.

Secondary outcomes will include overall survival and treatment adherence.

Overall survival will be defined as the time from study enrollment, baseline assessment, or initiation of follow-up until death from any cause, as defined by each study. Particular attention will be given to studies reporting survival outcomes within five years after breast cancer treatment. Whenever available, survival rates, hazard ratios (HRs), mortality rates, and survival estimates will be extracted.

Treatment adherence will be defined according to the criteria adopted by each study and may include adherence to recommended treatment modalities, completion of prescribed treatment, adherence to adjuvant therapies, and attendance at scheduled follow-up visits after breast cancer treatment. The measures used to assess treatment adherence, along with their reported associations with religiosity and spirituality, will also be extracted.

Study Design

Eligible studies will include observational designs, including cross-sectional, cohort, and case-control studies. Studies must evaluate the association between religiosity and/or spirituality and psychological well-being in adult women who have survived breast cancer. The exposed group must comprise women who report regular religious and/or spiritual practices, whereas the comparison group must include women who do not report such practices. Studies conducted in any healthcare setting, including hospitals, outpatient clinics, community-based settings, and population-based cohorts, will be considered eligible.

Exclusion Criteria

Studies will be excluded if they:

- * include populations other than breast cancer survivors, particularly studies in which psychiatric or neurological disorders represent the primary focus of investigation and may independently influence psychological well-being;
- * do not assess religiosity and/or spirituality;
- * do not evaluate psychological well-being as an outcome;
- * do not include a comparison group;
- * provide insufficient data to assess the association between religiosity/spirituality and mental health;
- * are narrative reviews, systematic reviews, meta-analyses, editorials, letters to the editor, books, conference abstracts, case reports, opinion articles, or clinical guidelines;
- * or fail to supply the full text after three attempts to contact the corresponding author over a six-week period.

Information Sources and Search Strategy

The search strategy was initially developed and then refined in collaboration with a health sciences librarian from the Botucatu Medical School, São Paulo State University (UNESP), Brazil. This process is intended to optimize the search strategy and maximize the number of relevant studies identified. A comprehensive search strategy was subsequently developed and adapted according to the indexing characteristics and search features of each electronic database included in this systematic review (see Appendix 2 for the complete search strategies and corresponding search terms).

A systematic search will be conducted from database inception to the date of the search in the following electronic databases: Embase, MEDLINE (via PubMed), LILACS (via the Virtual Health Library [VHL]), PsycINFO, CINAHL, Scopus, Web of Science, SciELO (via Web of Science), the World Health Organization (WHO) Global Index Medicus, and the Cochrane Library.

The search strategy will be adapted according to the controlled vocabulary, indexing terms, and specific search features of each database. No restrictions will be applied regarding language or publication date.

Grey literature will be searched through Google Scholar, ProQuest Dissertations & Theses Global, and OpenGrey. Google Scholar and OpenGrey will be searched using simplified keyword combinations, as the platforms do not support complex Boolean search strategies comparable to those used in bibliographic databases. The first 200 records retrieved and ranked by relevance for each search query will be screened, consistent with methodological recommendations for incorporating Google Scholar into systematic reviews.

In addition, the reference lists of all included studies will be manually screened to identify potentially eligible studies that may not have been retrieved through electronic database searches.

To guarantee comprehensive identification of available evidence, experts in the field will also be consulted to identify more pertinent publications.

Experts will be defined as authors who have published more than four studies included in this systematic review. Furthermore, studies identified in previously published systematic reviews on the topic will be assessed for eligibility against the predefined inclusion criteria.

Data Management

All records retrieved from electronic database searches will be imported into EndNote Web™ (Clarivate™, Jersey, USA) for reference management.(17) Records identified from different sources will be combined into a single library, where duplicate references will be identified and removed before the study selection process begins. Following deduplication, the remaining records will be exported to Rayyan® (Qatar Computing Research Institute, Doha, Qatar) to support the screening and selection of eligible studies. (18) Title and abstract screening, followed by full-text assessment, will be performed independently by two reviewers (PGTA and LFO) according to the predefined eligibility criteria.

Study Selection

To ensure consistent application of the eligibility criteria, two independent reviewers (PGTA and LFO) will initially conduct a pilot screening of the abstracts of ten studies. This calibration exercise will be performed before initiation of the formal study selection process.

The selection process will subsequently be conducted in two stages. During the first stage, the two reviewers will independently screen the titles and abstracts of all retrieved records, excluding studies that do not meet the predefined eligibility criteria. During the second stage, the same reviewers will independently assess the full texts of all potentially eligible studies to determine final inclusion in the review. Any disagreements regarding study eligibility will be resolved through discussion and consensus. If consensus cannot be reached, a third reviewer (DABB) will adjudicate the decision.

Abstracts and full-text articles published in languages other than English, Portuguese, or Spanish will be translated using the ChatGPT artificial intelligence platform (OpenAI), and the translations will subsequently be reviewed by all authors of this systematic review.(19) The entire selection process will be documented using the PRISMA 2020 flow diagram.(20)

Studies excluded after full-text assessment, together with the corresponding reasons for exclusion, will be reported in a supplementary table entitled Characteristics of Excluded Studies.

Data Extraction

A standardized data extraction form will be developed using Microsoft Excel (Microsoft Office 365®, Microsoft Corporation, Redmond, WA, USA).(21) The variables to be collected will be defined to encompass all components of the PECOS framework. Data extraction will be performed by one reviewer (PGTA) and independently verified by a second reviewer (LFO) using the standardized form specifically developed for this review. All inconsistencies identified during the verification process will be resolved through discussion and consensus. When necessary, a third reviewer (DABB) will be consulted to reach a final decision.

The characteristics of the included studies will be summarized in a descriptive table.

When multiple publications report findings from the same study or duplicate reports are identified, all relevant information will be combined into a single dataset to ensure the most complete representation of the available evidence.

If essential information is missing, the corresponding authors of the original studies will be contacted by email to request additional data. Up to three contact attempts will be made at 15-day intervals. If the requested information cannot be obtained, the data will be considered unavailable, and only the information reported in the published studies will be included in the analyses.

Data Items

The following information will be extracted from each included study:

- * study characteristics, including first author, country, year of publication, study setting, and study design;
- * participant characteristics, including sample size, age, tumor stage, and oncological treatment received;
- * characteristics related to religiosity and spirituality, including religious affiliation, spiritual practices, perceived relationship with God, spiritual well-being, integration of spirituality within daily life, and time devoted to religious and/or spiritual practices;
- * study outcomes, including main findings, authors' conclusions, funding sources, and declarations of conflicts of interest.

Outcomes Prioritization

The primary outcome of this systematic review will be the association between religious and/or spiritual practices and psychological well-being in breast cancer survivors, as assessed using the measurement instruments and evaluation methods adopted in each included study.

Secondary outcomes will include 5-year overall survival and adherence to cancer treatment, as defined and assessed in the individual studies.

Risk of Bias Assessment

The risk of bias of the included studies will be assessed using the Risk of Bias in Non-randomized Studies of Exposures (ROBINS-E) tool, an adaptation of the Cochrane risk-of-bias framework specially developed for observational studies evaluating exposures. ROBINS-E assesses seven domains of bias through a series of signaling questions. Judgments for each domain will be based on responses to these questions and subsequently integrated into an overall risk-of-bias assessment for each outcome, allowing each study to be classified according to its overall risk of bias.(15,22,23)

Risk-of-bias assessment will be performed independently by two reviewers (PGTA and LFO). Before the formal assessment, a calibration exercise involving ten included studies will be done to ensure consistent application of the ROBINS-E tool. Any disagreements will be resolved through discussion and consensus, and, if necessary, a third reviewer (DABB) will adjudicate the final decision.

Summary figures of the risk-of-bias assessments will be generated using the online robvis (Risk-of-bias Visualization) tool.(24)

Data Synthesis and Statistical Analysis

A narrative synthesis will initially be conducted for all included studies. Study characteristics, participant populations, definitions and measurement instruments used to assess religiosity and spirituality, psychological outcome domains, timing of outcome assessments, and reported effect estimates will be summarized descriptively. Extracted data will be organized into standardized Microsoft Excel spreadsheets (Microsoft Office 365®; Microsoft Corporation, Redmond, WA, USA) before statistical analysis.(21)

Studies will be grouped according to study design, exposure construct, psychological outcome domain, and timing of outcome assessment. Cross-sectional and longitudinal studies will be analyzed separately because of differences in temporality and susceptibility to reverse causation. Studies evaluating conceptually distinct psychological outcomes, such as anxiety, depression, psychological distress, resilience, coping, and quality of life, will not be combined within the same meta-analysis unless the constructs and measurement approaches are considered sufficiently comparable.

Quantitative synthesis will be performed when at least two studies are considered sufficiently homogeneous with respect to population, exposure definition, comparator, outcome construct, study design, and effect measure. Meta-analyses will be conducted using R software (version 4.4.2; R Foundation for Statistical Computing, Vienna, Austria).

For continuous outcomes measured using the same instrument, pooled estimates will be expressed as mean differences (MDs) with 95% confidence intervals (CIs). When different validated instruments are used to assess the same underlying construct, standardized mean differences (SMDs) with 95% CIs will be calculated. The direction of scales will be standardized before pooling so that higher values consistently represent either better or worse psychological outcomes. Results reported exclusively as medians with interquartile ranges (IQRs), or outcomes showing substantial skewness, will not be quantitatively synthesized and will instead be described narratively.

For dichotomous outcomes, odds ratios (ORs) or risk ratios (RRs) with corresponding 95% CIs will be pooled separately whenever appropriate. For studies reporting time-to-event outcomes, such as overall survival, hazard ratios (HRs) and corresponding 95% CIs will be synthesized separately from other effect measures.

When religiosity, spirituality, or psychological outcomes are analyzed as continuous variables, correlation coefficients may be pooled when the constructs and measurement approaches are sufficiently comparable. Correlation coefficients will be transformed using Fisher's z transformation before meta-analysis and subsequently converted back to the correlation scale for presentation.

Regression coefficients will be quantitatively synthesized only when the exposure and outcome variables have sufficiently comparable definitions and scaling across studies. Otherwise, regression estimates will be summarized narratively.

Because this review includes observational studies, adjusted effect estimates will be preferred over unadjusted estimates whenever available. The variables included in each study's adjusted model will be extracted and reported. Particular attention will be given to adjustment for potentially relevant confounding factors, including age, socioeconomic and educational characteristics, social support, disease stage, oncological treatment, treatment status, and time since diagnosis. Adjusted and unadjusted estimates will not be pooled together unless considered methodologically appropriate.

Given the anticipated clinical and methodological heterogeneity among studies, all meta-analyses will use random-effects models. Between-study variance will be estimated using the restricted maximum likelihood (REML) method. When appropriate, prediction intervals will also be reported to describe the expected range of effects across comparable populations and settings. Statistical heterogeneity will be assessed using Cochran's Q test, the I^2 statistic, and the between-study variance estimate (τ^2). I^2 values will be interpreted in conjunction with the magnitude and direction of effects, overlap of confidence intervals, number of included studies, and clinical and methodological heterogeneity rather than

according to fixed thresholds alone. Heterogeneity will also be explored through visual inspection of forest plots and, when appropriate, subgroup analyses.(14,15)

When sufficient data are available, prespecified subgroup analyses will explore potential sources of heterogeneity according to: study design (cross-sectional versus longitudinal); psychological outcome domain; instrument or construct used to assess religiosity and spirituality; stage of breast cancer; treatment phase or time since completion of treatment; geographic or cultural setting; and methodological quality or risk of bias.

Sensitivity analyses will be conducted by excluding studies judged to be at high risk of bias and, when applicable, studies reporting only unadjusted estimates. Additional sensitivity analyses may be performed according to study design, exposure measurement, outcome assessment, or other relevant methodological characteristics identified during the review.

Meta-regression may be considered when a sufficient number of studies are available for a given outcome and when clinically meaningful study-level characteristics can be investigated without substantial risk of overfitting.

When quantitative synthesis is not considered appropriate because of substantial clinical or methodological heterogeneity, incompatible effect measures, insufficient data, or substantial skewness of continuous outcomes, findings will be synthesized narratively. Narrative synthesis will consider the direction and magnitude of associations, precision of estimates, consistency across studies, study design, risk of bias, and degree of adjustment for potential confounding.

All statistical analyses will be conducted with methodological support from the Research Support Office (Escritório de Apoio à Pesquisa—EAP) of Botucatu Medical School, São Paulo State University (UNESP).

Assessment of Meta-bias

Potential meta-biases will be assessed whenever appropriate. Publication bias and small-study effects will be investigated when at least ten studies are available for a given outcome, as recommended by the Cochrane Handbook. In these cases, funnel plot asymmetry will be evaluated through visual inspection of funnel plots and Egger's regression test.(25)

Selective outcome reporting bias will be assessed by comparing outcomes described in study protocols, trial registrations, or methods sections with those reported in the published results.

Any differences between prespecified and reported outcomes will be considered when interpreting the findings.

Certainty of the Evidence

The certainty of the evidence for each outcome will be independently assessed by two reviewers (PGTA and LFO) using the Grading of Recommendations Assessment, Development and Evaluation (GRADE)

approach.(26) Any disagreements will be resolved through discussion and consensus, with consultation of a third reviewer (DABB) whenever necessary. The assessment will consider the domains of risk of bias, inconsistency, indirectness, imprecision, and publication bias, as well as additional methodological issues, including the potential for selective outcome reporting.

Because only observational studies will be included, the certainty of evidence will initially be rated as low, with the possibility of being downgraded or upgraded according to GRADE criteria.

This assessment will examine factors such as the magnitude of the effect, consistency of findings, and the presence of a dose–response relationship.

The certainty of evidence for each outcome will ultimately be classified as high, moderate, low, or very low.

A Summary of Findings table will be prepared to present the main outcomes, pooled effect estimates (when available), and corresponding certainty ratings.

Discussion

This systematic review protocol aims to investigate the association between religiosity, spirituality, and psychological well-being in women who have survived breast cancer, as well as their potential relationship with adherence to cancer treatment and 5-year overall survival.

Breast cancer persists as a major global public health challenge, with consequences extending over biological aspects of the disease to affect emotional, social, and metaphysical dimensions of women's lives.(11,27)

As survival rates continue to improve, increasing attention has been directed toward survivorship care and the identification of factors that may promote better adaptation, improved quality of life, and ideal recovery following cancer treatment. Religiosity and spirituality have increasingly been recognized as relevant dimensions of integrated healthcare, particularly in the context of chronic diseases and cancer. (28)

For many individuals, spiritual beliefs and practices may serve as coping resources by fostering hope, supporting meaning-making processes, facilitating emotional regulation, and promoting psychological adjustment throughout the cancer experience. Previous studies suggest that spiritual well-being may be associated with improved quality of life, greater resilience, and reduced psychological distress among patients with cancer and cancer survivors.(3,4)

Nevertheless, despite growing interest in this field, the specific relationship between religiosity, spirituality, and psychological outcomes among breast cancer survivors remains insufficiently understood.(12)

The relationship between spirituality and cancer-related outcomes is complex and likely influenced by multiple factors, including individual beliefs, cultural background, social support, coping strategies, and the instruments used to assess spiritual experiences.(5,6,9,10)

Furthermore, substantial methodological variability exists among published studies regarding the conceptualization and measurement of religiosity, spirituality, and psychological outcomes. This heterogeneity highlights the need for a rigorous and systematic synthesis of available evidence to better understand the magnitude and consistency of these associations.

This systematic review is warranted by the need to consolidate current evidence regarding the relationship between religiosity, spirituality, and psychological outcomes among breast cancer survivors. By critically appraising the existing literature, this review may provide evidence to support healthcare professionals, researchers, and policymakers in developing more comprehensive, person-centered, and compassionate models of care. In addition, this review aims to improve understanding of how religiosity and spirituality may be associated with recovery and social reintegration following breast cancer treatment, contributing to a broader perspective on cancer survivorship. Its academic and societal relevance lies in integrating knowledge from oncology, psychology, and survivorship research while supporting the development of accessible, inclusive, and culturally appropriate care strategies.

Although spirituality has progressively been incorporated into discussions of patient-centered and compassionate care, important gaps remain regarding its clinical relevance in breast cancer survivorship. A better understanding of the relationships among religiosity, spirituality, psychological well-being, treatment adherence, and long-term outcomes may inform the development of more comprehensive survivorship care strategies.(6)

A major strength of this protocol is its rigorous, comprehensive methodology, which adheres to internationally recognized recommendations for conducting systematic reviews. The review will employ a broad search strategy across multiple electronic databases and additional information sources to maximize identification of relevant studies. Furthermore, study selection, data extraction, and risk-of-bias assessment will be conducted independently by trained reviewers, with disagreements resolved through consensus or, when necessary, consultation with a third reviewer. The use of the ROBINS-E tool for risk-of-bias assessment and the GRADE approach for evaluating certainty of evidence further strengthens the methodological rigor and transparency of this review.

Some limitations should also be acknowledged. The diversity of instruments and conceptual approaches used to assess religiosity, spirituality, and psychological outcomes may limit comparability among included studies. Likewise, cultural, social, and religious differences across study populations may contribute to substantial heterogeneity in findings. Because this review will primarily include observational studies, limitations inherent to this design, particularly residual confounding and the inability to establish causal relationships, should be carefully considered when interpreting the findings.

Overall, this systematic review is expected to identify important knowledge gaps and inform future research in breast cancer survivorship. By critically synthesizing available evidence regarding the relationship between religiosity, spirituality, and health outcomes, this review may contribute to the development of more individualized, integrative, and patient-centered models of care for women following breast cancer treatment.

The findings of this review will be submitted for publication in an international peer-reviewed journal and may also be presented at scientific meetings and conferences.

Any substantial amendments to this protocol will be fully documented and transparently reported in the final systematic review publication and, when applicable, updated in the PROSPERO registry.

Declarations

Author contributions

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All authors read and approved this manuscript.

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Declaration of competing interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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