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The Prognostic Value of Absolute GLS in Predicting Chemotherapy-Induced Cardiotoxicity in Breast Cancer Patients: A Systematic Review and Meta-analysis

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Wu, C; Wang, B; Li, Z; Huang, Y.

Corresponding author:
Chen Wu

fishalife@163.com

Author Affiliation:
Department of Ultrasound, The People's Hospital of Danyang, Affiliated Danyang Hospital of Nantong University.

ADMINISTRATIVE INFORMATION

Support - No support.

Review Stage at time of this submission - Completed but not published.

Conflicts of interest - None declared.

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Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 24 July 2026 and was last updated on 24 July 2026.

INTRODUCTION

Review question / Objective To systematically evaluate the prognostic value of absolute global longitudinal strain (GLS) in predicting chemotherapy-induced cardiotoxicity (CTRCD) in breast cancer patients.

Condition being studied The condition of interest in this study is the risk of cardiotoxicity, namely cancer therapy-related cardiac dysfunction (CTRCD), faced by breast cancer patients receiving antineoplastic chemotherapy. The aim is to predict the occurrence of this cardiac complication by assessing global longitudinal strain (GLS) at baseline and during chemotherapy.

METHODS

Participant or population Breast cancer patients aged >18 years receiving chemotherapy.

Intervention The intervention of this study is the antineoplastic chemotherapy received by breast cancer patients, with specific drugs including anthracyclines (e.g., doxorubicin, daunorubicin) and/or trastuzumab, etc. No single chemotherapy regimen is specified; the actual medications used in each included study will prevail.

Comparator The comparator is the comparison between the low-GLS group and the high-GLS group, i.e., to analyze the difference in the risk of CTRCD between the low-GLS group compared with the high-GLS group.

Study designs to be included Study designs to be included: Prospective and retrospective cohort studies.

Eligibility criteria Inclusion criteria: (1) Patients: aged over 18 years, with breast cancer undergoing chemotherapy; (2) Included studies must define CTRCD according to clinical criteria; there are no specific restrictions on the criteria used to define CTRCD; (3) Studies must report the effect size of GLS in predicting CTRCD;(4) Studies must use spot-tracking analysis to assess GLS values before

or during chemotherapy for breast cancer, and must conduct further follow-up to detect CTRCD based on changes in LVEF; it must be possible to extract or calculate four-quadrant data (true positives, false positives, false negatives, true negatives) for assessing predictive value, or data obtained through analytical conversion; (5) Study design: prospective or retrospective cohort studies;(6) Language: Only literature written and published in English or Chinese; (7) Publication date: The search period ranges from the establishment of the database to 31 May 2026.
Exclusion criteria: (1) Case reports, reviews, commentaries or animal studies; (2) Studies with fewer than 30 participants; (3) Insufficient raw data to allow for data extraction; (4) Duplicate publications.

Information sources Data were sourced from PubMed, Embase, the Cochrane Library, Web of Science, Scopus, China National Knowledge Infrastructure (CNKI), the Wanfang Data Knowledge Service Platform (WANFANG) and the VIP database.

Main outcome(s) The primary outcomes are (1) the pooled odds ratio (OR) for the risk of CTRCD between the low-GLS and high-GLS groups; and (2) the diagnostic accuracy of GLS for predicting CTRCD, including pooled sensitivity, pooled specificity, and the area under the hierarchical summary receiver operating characteristic (HSROC) curve.

Quality assessment / Risk of bias analysis The Newcastle-Ottawa (NOS) scale was used to assess the quality of the included cohort studies, evaluating aspects such as participant recruitment, comparability of cohorts and outcome assessment. Each item was scored out of 1 point, with Q5 scoring a maximum of 2 points; the total score ranged from 0 to 9 points, with a score of ≥6 indicating high study quality. A funnel plot was used to assess publication bias in the included studies; a $P < 0.05$ indicated the presence of significant publication bias.

Strategy of data synthesis The I^2 statistic was used to assess heterogeneity between studies; an I^2 value > 50% indicated moderate or greater heterogeneity. Subgroup analyses and meta-regression were conducted to explore potential sources of heterogeneity. Sensitivity analyses were performed using a stepwise exclusion method, with the pooled effect size recalculated after each study was excluded, to assess the robustness of the pooled results.

Subgroup analysis Subgroup analyses were conducted to explore potential sources of heterogeneity among the included studies.Subgroup analyses and meta-regression were conducted to explore potential sources of heterogeneity.

Sensitivity analysis Sensitivity analysis was performed using the leave-one-out approach, recalculating the pooled effect size after excluding each study in turn to assess the robustness of the results.

Country(ies) involved China.

Keywords breast cancer; chemotherapy-induced cardiotoxicity; global longitudinal strain; meta-analysis; prognostic value.

Contributions of each author
Author 1 - Chen Wu.
Author 2 - Bo Wang.
Author 3 - Zheng Li.
Author 4 - Yong Huang.