A Systematic Review of Studies of Biomarkers in Cancer Anorexia-Cachexia Syndrome

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Introduction

Cancer Anorexia Cachexia Syndrome (CACS) is manifested by a group of symptoms including anorexia, weight loss, and muscle wasting.

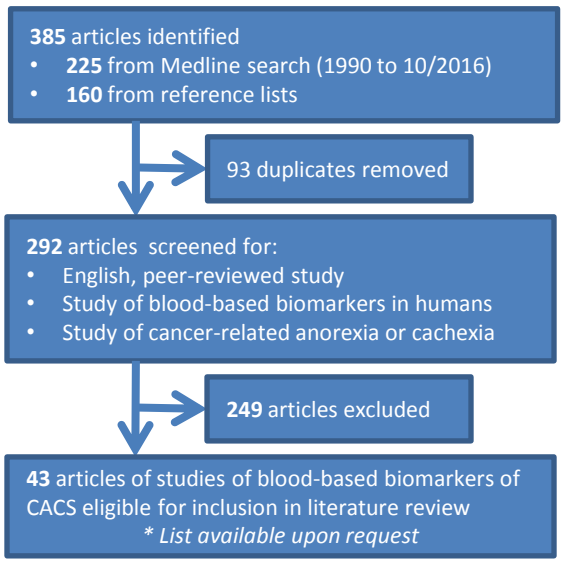
- CACS is generally characterized based on clinical factors, but biomarkers of inflammation, fat metabolism, and muscle metabolism are increasingly being used.
- Some studies have indicated that measurement of blood-based biomarkers of CACS may facilitate diagnosis and the development of effective interventions.

Objective

To systematically review the empirical evidence for blood-based biomarkers associated with CACS.

Methods

- Searched for journal articles from 1990 – October 2016 using search terms of "cancer" and "anorexia" or "cachexia."



Results

Table 1. Summary Characteristics of Studies Included in the Systematic Review

Objectives	Study Designs	Cancer Characteristics	Cachexia Definitions	Samples
• To measure biomarkers of inflammation and/or fat metabolism and/or muscle metabolism • To compare anthropometric measurements or nutritional status with biomarkers of inflammation and/or fat metabolism and/or muscle metabolism • To evaluate association of biomarkers with survival or other cancer-related measures • To evaluate biomarkers as diagnostic or predictive markers of CACS	• Pilot • Powered • Prospective • Retrospective • Cross-sectional • Longitudinal • Descriptive • Comparative • Correlational • Single Cohort • Case control	• Suspected cancer • Unspecified types • Multiple types • Specific types • Unspecified stage • All stages • Specific stages • Unspecified treatment histories • Pre treatment • Post surgery • Post chemotherapy • All treatments concluded	• Undefined • Emaciation and symptoms of anorexia, nausea, fatigue • Weight loss of varying degrees over varying timeframes • Modified Glasgow Prognostic Score (mGPS) • BMI < 20 or 5% reduction since diagnosis or surgery • DEXA indicating sarcopenia • ECOG PS > 1, Grade 1-4 anorexia and weight loss > 10% • Italian Association of Medical Oncology CACS guidelines • 2011 International Consensus CACS Criteria	• 10 to 385 subjects • Inpatient and outpatient populations • Cancer patients, non-cancer patients, and healthy controls

Table 2: Biomarker Characteristics and Associations with CACS

Most Commonly Studied Biomarkers	Key Findings
C-reactive Protein (CRP)	High level reflects severity of CACS and is an indicator of poor prognosis (mGPS)
Interleukin-6 (IL-6)	Elevated levels in cancers where CACS is prevalent and association with CACS parameters
Tumor Necrosis Factor alpha (TNF-α)	Contributes to onset of CACS and muscle catabolism
Interleukin-1 beta (IL-1β)	Associated with CACS parameters
Leptin	Correlation with CACS parameters varied among cancer types
Ghrelin	Correlation with CACS parameters varied among cancer types
Interleukin-10 (IL-10)	Associated with fat catabolism, suppression of muscle synthesis, and worsened prognosis

Conclusions

- Specific biomarkers may be useful and important indicators of CACS.
- Along with other consensus criteria, screening for biomarkers may help clinicians confirm the presence and severity of CACS.
- Our findings also reveal opportunities to standardize research methodology for improved CACS biomarker characterization.