

INTRODUCTION

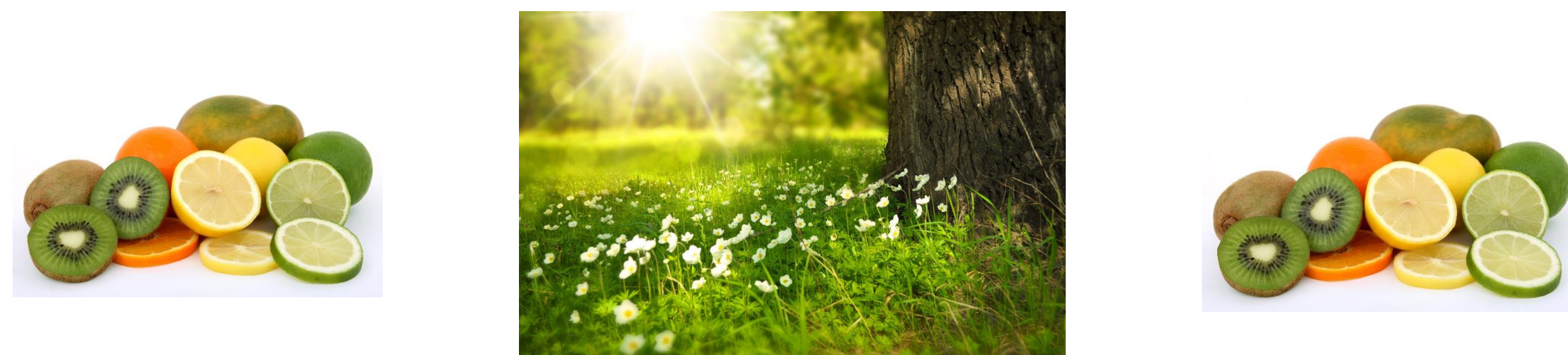
Background & Significance

Vitamin C is a diet-dependent vitamin that provides anti-inflammatory and antioxidant properties, among other uses within the body. Currently, it is not routinely assessed unless in cases of identifying deficiency. It is unclear how much of the population holds suboptimal plasma levels of Vitamin C and how these decreasing levels are associated with diseases containing known inflammatory and autoimmune components.

Lack of Vitamin C assessment, monitoring, and education of the importance may miss people at risk of developing diseases with inflammatory and/or immune components. Populations most at risk are those living in or near food deserts, identified as locations where residents have little to no access to quality nutrition.

Purpose

The purpose of this review is identify the multiple roles of Vitamin C in diseases and ascertain significant associations of decreased plasma Vitamin C to disease, to provide evidence for re-evaluation of Vitamin C deficiency labeling and increased efforts of public health awareness.



METHODS

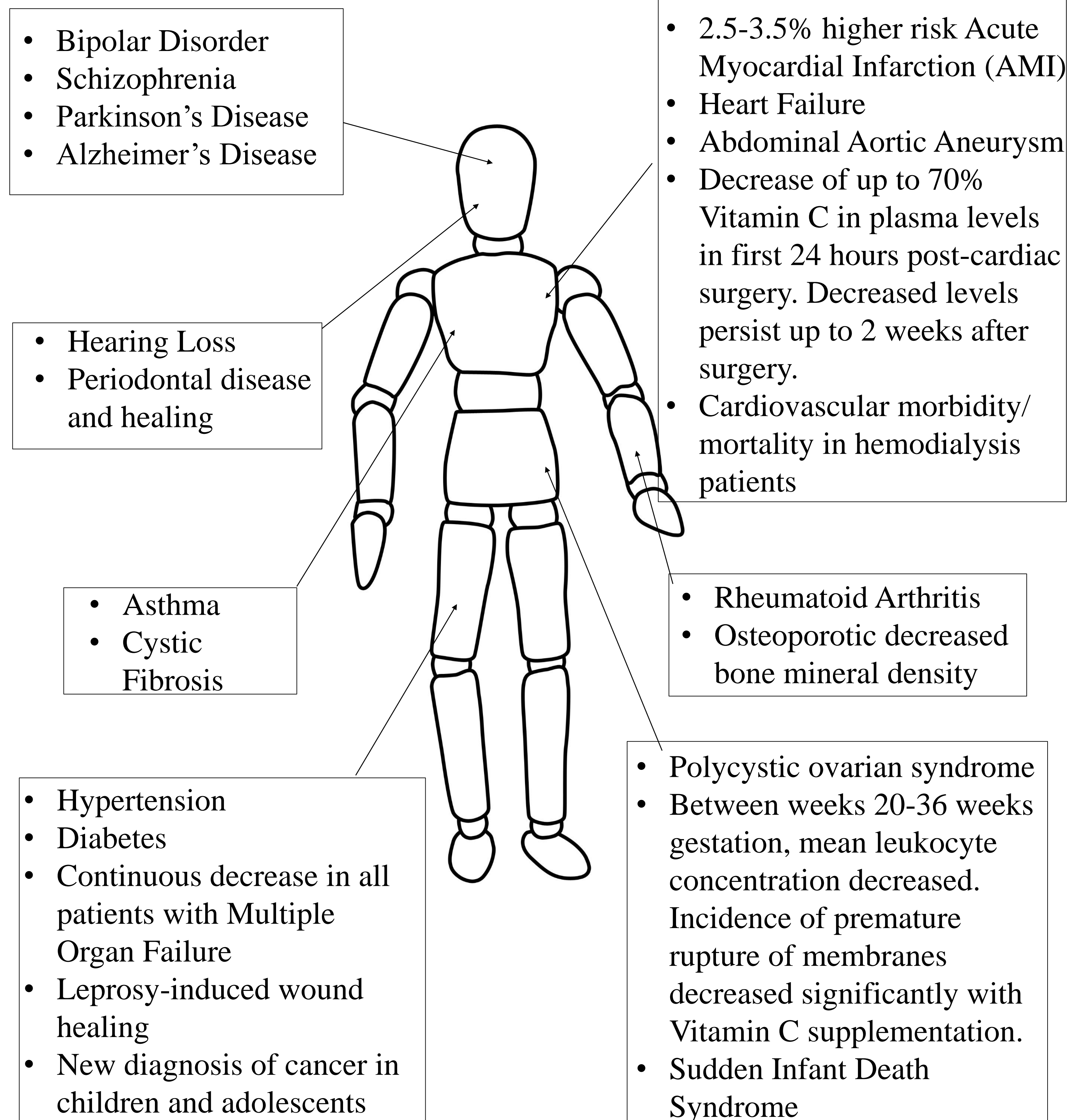
A broad MESH-term inclusive search was initially utilized, with free word searches made for specific diagnoses to capture the most recent and/or strongest evidence available. The initial search yielded 11, 238 titles. After excluding animal/pre-clinical studies, chemistry reports, and descriptive studies, there were 5,674 results. Inclusion criteria of: <5 years old, unless there were <5 studies on a particular subtopic, abstracts available, and studies containing Vitamin C or ascorbic acid solely or in combination with other antioxidants were applied. This first-stage selection narrowed the search results to 1,676 articles. Articles were then selected based on the inclusion criteria of: most recent/strongest evidence for a subtopic (randomized clinical trials, meta-analyses, and systematic reviews of RCTs), and title and abstract appraisal. This second-stage selection yielded 27 articles.

RESULTS

Mechanisms of Action:

- Antioxidation through free radical scavenging and electron donation
- Anti-inflammatory properties
- Supports growth of healthy immune cells in gut microbiota
- Sustains neutrophil motility
- Maintains proliferation of natural killer immune cells
- Allows for body re-use of Vitamin E
- Enhances bioavailability of iron in hemoglobin

Decreased Plasma Vitamin C associated with:



DISCUSSION

Conclusions

Vitamin C has multi-faceted roles within many cellular activities including antioxidation, anti-inflammation, re-uptake of Vitamin E, and increasing the bioavailability of iron absorption. Many disease processes are caused or influenced by chronic inflammation, of which Vitamin C can play a significant role in prevention. Decreased levels of plasma Vitamin C have been associated with multiple chronic illnesses, however it is still unclear just how prevalent suboptimal levels of plasma Vitamin C exist within the population worldwide.

Food deserts have been identified within the United States and pose a greater problem for inhabitants in obtaining quality nutrition needed to prevent chronic disease. Vitamin C is solely diet-dependent and relies on a constant intake for maximum benefit, thus underscoring the importance of increased public awareness and education.



Limitations

- Sparse amount of data correlating mechanism of Vitamin C action in disease to deficient/decreased levels of Vitamin C.
- Insufficient evidence of prevalence of decreased levels of Vitamin C within population.
- Small amount of strongly designed studies generalizable to the population.
- Lack of evidence in areas now recognized as food deserts.

Future Directions

It is possible both that current recommended guidelines for dietary intake may be too low and sub-optimal/deficient people are not adequately identified prior to diagnosis. Healthcare practitioners may be better equipped to prevent disease by assessing and correcting sub-optimal levels of Vitamin C. A recommended revision to the definition of Vitamin C deficiency should examine the decreased levels that may compromise and subvert the immune system's natural defense by identifying marginal and sub-optimal Vitamin C plasma levels during routine assessments. Increased public health awareness would benefit both the general population and residents identified as living in or near food deserts, where nutrition may play a significant role in disease prevention and treatment.