population did not contribute to overall outcome in MDS.

New therapies, translated from growing understanding about the complex molecular mechanisms underlying MDS, are an urgent medical need, expected to change this scenario.

Priscila da Silva Mendonça, PhD
Postgraduate Program in Medical Science Cancer Cytogenomic Laboratory Federal University of Ceará, Ceará, Brazil
University Hospital Walter Cantidio
Brazilian Company of Hospital Services (EBSERH)
Fortaleza, Ceará, Brazil
Ronald Feitosa Pinheiro, PhD
Silvia Maria Meira Magalhães, PhD
Postgraduate Program in Medical Science Cancer Cytogenomic Laboratory Federal University of Ceará, Ceará, Brazil
University Hospital Walter Cantidio
Brazilian Company of Hospital Services (EBSERH)
Fortaleza, Ceará, Brazil

Potential Competing Interests: The authors report no competing interests.

Funding Sources: This study was conducted with partial support from Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq), Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES), and EBSERH.


https://doi.org/10.1016/j.mayocp.2019.10.003

Scurvy: An Unrecognized and Emerging Public Health Issue in Developed Economies

To the Editor: Scurvy is a disease that manifests approximately 3 months after consuming a diet lacking ascorbic acid. Most of the clinical manifestations of scurvy result from defective collagen metabolism, causing degeneration of vascular and perivascular connective tissues and changes in endothelial cells. Consequently, scurvy represents a vessel-mediated bleeding disorder characterized by hemorrhagic gingivitis, petechiae, and subperiosteal and perifollicular hemorrhages. It is crucial to recognize and treat scurvy, as catastrophic fatal hemorrhage, including myocardial and cerebral bleeding, occur in late disease stages. In developed economies, the prevalence of low vitamin C levels (normal range: 23 to 85 µmol/L) is relatively high, ranging between 17% and 26%. However, scurvy is regarded as an uncommon disease, and its features are often not recognized, resulting in delayed treatment and unnecessary investigations.

Over a 12-month period, all patients referred to the Department of Haematology at the Nepean Hospital—a 520-bed teaching hospital of The University of Sydney that provides care for approximately 400,000 people—for investigation...
of bleeding disorders with normal platelet counts and prothrombin and activated partial thromboplastin times, were tested for serum ascorbic acid levels before commencing vitamin C replacement therapy. There were 4 cases of scurvy diagnosed over this period (Table).

The majority of patients were male. Three of the patients described were financially limited by their disability/elderly pensions. Although 2 patients were found to be underweight, consistent with the common understanding that scurvy occurs in the malnourished, the other 2 patients were overweight/obese. Although a normal/high body mass index may reflect an adequate caloric intake, low intake of fresh fruit and vegetables and reliance on relatively cheaper processed foods are risk factors for micronutrient deficiencies in urbanized societies. Indeed, being overweight or obese is correlated

![TABLE. Characteristics of the 4 Patients With Scurvy](image)

<table>
<thead>
<tr>
<th>Case</th>
<th>Age</th>
<th>Vitamin C level</th>
<th>Sex</th>
<th>Risk factors</th>
<th>Symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>37</td>
<td>&lt;5 μmol/L</td>
<td>Male</td>
<td>Smoking</td>
<td>Lower-limb pain/swelling, Ecchymosis, petechiae</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Psychiatric history</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Socioeconomic factors (disability pension)</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>26</td>
<td>8 μmol/L</td>
<td>Male</td>
<td>Smoking</td>
<td>Ecchymosis, petechiae, Gingival bleeding</td>
</tr>
<tr>
<td>3</td>
<td>88</td>
<td>&lt;5 μmol/L</td>
<td>Male</td>
<td>Age, Socioeconomic (elderly, pension)</td>
<td>Ecchymosis</td>
</tr>
<tr>
<td>4</td>
<td>56</td>
<td>12 μmol/L</td>
<td>Female</td>
<td>Socioeconomic factors (disability pension), Smoking, Cancer and chemotherapy</td>
<td>Ecchymosis, Gingival bleeding</td>
</tr>
</tbody>
</table>

![FIGURE. Lower limb photographs of Patient 1 (upper panels) and Patient 2 (lower panels) showing widespread ecchymoses (chevron arrows) and petechial rash (solid arrows).]
with vitamin C deficiency. Scurvy symptoms and signs rapidly respond to 1 to 2 grams of oral vitamin C replacement given for 3 days, followed by 500 mg daily for 1 week. After initial high-dose replacement, vitamin C 100 mg daily is continued for up to 3 months.

Scurvy is a life-threatening condition, however, diagnosis and treatment are often delayed. It is difficult to define scurvy clinically, and in a developed country, many clinicians may not be adequately trained to recognize the condition. The index case patient in this series presented with a lower limb hematoma that was misdiagnosed as deep vein thrombosis, and anticoagulation was inappropriately commenced, placing the patient at significant risk of an adverse bleeding event and the patient in case 2 was subjected to needless magnetic resonance image scanning. Increased awareness of scurvy as a possible diagnosis in this population, and recognition of the distinctive clinical features (Figure A-D), in combination with normal coagulation studies and platelet count resulted in early diagnosis and treatment in cases 3 and 4. Two patients had radiological imaging that was consistent with scurvy, including abnormal marrow changes on T2 turbo inversion recovery magnitude sequences indicating active erythropoiesis and signal enhancement at the periosteum indicative of hemorrhage (Figure E). This significant change in clinical perspective highlights the importance of increasing awareness in the medical community about this often-overlooked diagnosis. Hematologists, to whom patients are referred with bleeding into skin, joints, eyes, and brain of uncertain cause, are required to have a high index of clinical suspicion when these symptoms present in high-risk groups.

The presence of scurvy in any population indicates a significant public health issue that requires a population-wide assessment of vitamin C levels and effective nutritional interventions. Except for infantile scurvy, which was a well-recognized public health problem between 1945 and 1965, scurvy has been an extremely rare disease in developed countries. However, the misconception that scurvy has disappeared is fallacious, and it remains an important public health problem, which has been highlighted by recent cross-sectional, population studies in industrialized nations that show overall prevalence of severe depletion (<11 μmol/L) ranges between 3% and 7%. The prevalence of vitamin C deficiency is higher in smokers, who have up to 3 times the risk and are found in lower socioeconomic groups, with the United Kingdom reporting 26% of men and 16% of women having severe vitamin C deficiencies.

The development and implementation of strategies that maintain adequate vitamin C levels have beneficial effects in addition to the elimination of scurvy. Vitamin C promotes iron absorption, the benefits of which include a reduction in cases of anemia and improved physical and mental capacity. Public health care planning should address high-risk populations, including those in low socioeconomic groups; the elderly; drug and alcohol abusers; persons with food intolerances; those who adhere to fad and fast-food diets; patients with gastrointestinal disorders, psychiatric, neurological disorders, and chronic dental problems; patients with cancer; and patients with chronic renal failure undergoing dialysis. Nutrition education should be an essential component of any intervention to prevent scurvy, considering the most efficient and durable interventions involve communication to educate and modify consumption-related attitudes and practices.

Puja Bhattacharyya, MBBS
Department of Medicine
Faculty of Medicine and Health
The University of Sydney
Nepean Hospital
Kingswood, Australia

John Giannoutsos, MBBS
Department of Medicine
Faculty of Medicine and Health
The University of Sydney
Nepean Hospital
Kingswood, Australia

Guy D. Eslick, DrPH
The Whiteley-Martin Research Centre
The University of Sydney
Penrith, New South Wales, Australia

Stephen J. Fuller, PhD
Department of Medicine
Faculty of Medicine and Health
The University of Sydney
Nepean Hospital
Kingswood, Australia

Potential Competing Interests: The authors report no competing interests.


https://doi.org/10.1016/j.mayocp.2019.10.005

CORRECTION

In the Letter to the Editor titled “A National Needs Assessment of Point-of-Care Ultrasound Training for Hospitalists,” published in the September issue of Mayo Clinic Proceedings (Mayo Clin Proc 2019;94(9):1910-1912), an error was made to the figure. “Pericardial effusion” under the “Pulmonary diagnostics” panel should be “Pleural effusion.”

https://doi.org/10.1016/j.mayocp.2019.10.035