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## **A Case Report on Scurvy and The Role of Vitamin C In Diet**

Sri vamsi krishna, Nabeel Nazeer, Bharath A S, Magesh C

Department of General surgery, Sree Balaji Medical College and Hospital, Bharath Institute of  
Higher Education and Research (BIHER), Chennai, Tamil Nadu, India

Corresponding author: [magesh.gs@bharathuniv.ac.in](mailto:magesh.gs@bharathuniv.ac.in)

**Abstract**

Several cases of scurvy secondary to diet limitations have been reported in the literature. Here we present a six-year-old boy who presented with rash, later developed pain in both lower extremities. After evaluation revealed vitamin C deficiency, he was admitted into an intensive day treatment feeding program. A feeding assessment found he had life-long problems with eating and had a diet that never exceeded ten foods. Across the course of treatment, he learned to eat 29 new foods. At eight-months follow up his body mass index had increased.

**Keywords:** Vitamin C, Cutaneous examination, and intellectual disability

## **Introduction**

Scurvy is the name for vitamin C deficiency. Although vitamin C (ascorbic acid) is found in citrus fruits and vegetables, scurvy has been described as very uncommon or rare in the pediatric population, a recent study examining the scurvy in a large pediatric health care facility identified 32 children with vitamin C deficiency over five years. Of these 32 cases, four children developed scurvy due to a lack of diet diversity, with three having the comorbid diagnosis of autism and one with intellectual disability (Solanki *et al.*, 2011; Harknett *et al.*, 2014; Golriz *et al.*, 2017).

## **Case Presentation**

A six-year-old boy was referred for evaluation of a rash reported to be sensitive to sunlight and had been reoccurring for the last 3 years. Cutaneous exam revealed fine scale on his trunk and extremities as well as small pink flat papules on lower right leg. He was diagnosed with ichthyosis vulgaris and provided with a treatment plan. He was subsequently referred to gastroenterology for decreased appetite. Three weeks later the child presented to the Emergency Department for left knee pain. His mother reported he had experienced bilateral lower extremity pain and had been limping. During the evaluation, he could walk for the physician without reporting pain and no tenderness was reported with palpation. The mother reported he was bitten by a tick about a year ago and that no workup or treatment was conducted. Radiographic scans of the left knee and leg showed no abnormalities. Laboratory testing for Lyme disease was conducted and found to be negative. He was discharged with the diagnosis of tenosynovitis. The child presented again to the Emergency Department the following week for right knee and ankle pain. Reported pain on left calcaneus when asked to bear weight. Migratory arthralgia was noted and further laboratory testing, including a vitamin C level, was ordered. His vitamin C level was found to be  $< 6$   $\mu\text{mol/L}$  (reference range: 23 to 114  $\mu\text{mol/L}$ ). prealbumin level was also low, 13  $\text{mg/dl}$  (reference range: 17–36  $\text{mg/dl}$ ) as was both ferritin 3.8  $\text{ng/ml}$  (reference range: 6.2–137.0  $\text{ng/ml}$ ) and her iron saturation 16% (reference range: 20–55%). Both vitamin A and vitamin D were found to be within the normal reference range. With the diagnosis of the vitamin C deficiency, the child was started on ascorbic acid and referred to the feeding program.

He was born full term by caesarian section with a birth weight of 3.88 kg. There were no prenatal or postnatal complications. No delays in development were noted. At 1 year of age, he transitioned from infant formula to milk and cereal snacks. he never accepted baby food. For 4 years after

transitioning off infant formula his diet consisted of cereal snacks, chocolate pudding, vanilla ice cream, chocolate, and banana. Except for the occasional banana, he never ate fruit, vegetables, or meats. he drank skim milk, water, and, rarely, soda. he refused to taste new foods or drinks. Additionally, at the time of his diagnosis with vitamin C deficiency, his body mass index was at the 1st percentile. He was admitted to an intensive day treatment feeding program based upon her inadequate growth and minimal diet.

During intensive treatment, he learned to eat 29 foods from all food groups through an intervention involving gradual repeated exposure to novel foods (Paul *et al.*, 2007). At one year after completion of intensive treatment, his height had increased by 7.8 cm, and her weight had increased by eight kilograms her body mass index reached the 85th percentile. Across the span of the 1 year after intensive treatment, he continued to be monitored as an outpatient by a feeding therapist who continued to address the child's diet variety and helped the family maintain the gains made during intensive treatment. At all outpatient appointments, a meal was conducted, allowing the therapist to verify the child's consumption of a variety of foods.

## **Results and Discussion**

Every study in the existing literature on scurvy resulting from dietary insufficiency described the use of ascorbic acid to address the Vitamin C deficiency. The case studies describe the rapid and almost complete resolution of all symptoms secondary to the vitamin deficiency in many instances. For the 23% of the children with additional nutrient deficiencies, vitamin C alone would be inadequate for meeting their nutritional needs. While vitamin supplementation can, and does, correct nutrient deficiencies, supplementation does not correct the selective eating patterns of these children, which is the underlying reason the child in the current case study developed scurvy. As demonstrated by the child in this case study, it is possible to address the underlying eating problems which led to vitamin deficiency. It is not known if the failure to address the eating problems underlying the nutritional deficiencies.

Research on children who exhibit more extreme patterns of selective eating have been shown to exhibit these patterns over prolonged periods (Willmott and Bryan, 2008). There is no evidence that children who self-limit their intake to the extent they develop nutritional deficiencies will change their eating patterns without intervention. Even though the presentation of a child with a vitamin C deficiency secondary to either selective eating or parents limiting the child's diet may

not be a common occurrence, it may also not be considered rare. Three other children presented to pediatric hematology for hematological complications and were subsequently diagnosed with scurvy secondary to diet limitations and one child receiving homemade tube feedings presented with scurvy (Kapadia *et al.*, 2016).

While the current study described a child presenting with a vitamin C deficiency and discussed the literature describing cases of scurvy in the pediatric population, nutrient deficiencies are not limited to vitamin C, other clinical presentations involving other vitamin deficiencies, including vitamin A, vitamin B1, and vitamin D have all been reported in children with limited diets. Even though the presentation of children with nutrient deficiencies may not be commonplace for most providers, children at risk for nutrient deficiencies will be seen far more often. In a sample of 422 children referred to our feeding program, 95 ate ten or fewer foods (O'Hara, 2015).

While the case studies and case series in the existing literature all report resolution of the vitamin deficiency the long-term outcomes of these children are unclear. Follow-up information from 6 months or longer after initial treatment of the vitamin C deficiency was reported for only nine children from the existing literature. Based upon our experience with selective eaters more generally, these children remain at risk for additional nutrient deficiencies or problems with weight, either underweight or possibly overweight. The child in the current case study had a limited diet since being weaned, despite regular pediatric care. In the existing literature, reports of contact with pediatric providers prior to diagnosing the vitamin C deficiency were noted in numerous studies (Ali *et al.*, 2014).

There are no indications that children diagnosed with vitamin deficiencies are not receiving regular healthcare. Based upon our experience with the current case and the children referred to our organization's feeding program, we suggest the extent of some children's diet limitations are not always clear to healthcare providers. One large population-based study found 46% of parents identified their children as picky eaters at some point during childhood and picky remitted in two-thirds of cases within 3 years (Baird and Ravindranath, 2015). Picky eating does persist in some children, with one study showing picky eating as a stable trait through age 11. As providers hear about picky eating often and it usually resolves, it may be challenging to differentiate the transient picky eating commonly seen from the selective eating that could result in nutrient deficiencies (Keown *et al.*, 2014).

While the role of dietary limitations on the development of nutritional deficiencies, namely vitamin C, was the focus of this case study and literature review, it is worth mentioning the child in this case study demonstrated a significant increase in her body mass index, increasing from the 1st to 85th percentile in 1 year. Indeed, some of this growth can be attributed to the increased number of calorie-dense foods he learned to eat, we also hypothesize the increased total variety of foods, including fruits and vegetables, also helped with weight gain. It is known that eating a food or limited foods over time results in monotony or a decreased desire to eat this food or foods (Williams *et al.*, 2015). Increasing diet diversity can decrease the effects of monotony and lead to increased weight gain, especially if the diet contains some foods high in energy density. Thus, increasing a child's diet variety can prevent nutritional deficiencies and support adequate intake.

### **Conclusion**

While the child in our case study was a young boy with typical development, our review of the clinical cases of vitamin C deficiency revealed that children with special needs, especially children with autism spectrum disorders, were over-represented. This is consistent with the broader literature on childhood feeding problems, which shows that feeding problems are more prevalent in children with special needs. As children with special needs are more at risk for long-term problems with feeding or eating, healthcare providers may provide additional attention to these children to determine the need for referral to providers to address feeding or eating problems

### **Author contribution**

Sri vamsi krishna, Nabeel Nazeer conceived of the presented idea. Bharath A S and Magesh C encouraged and supervised the findings of this work. All authors discussed the results and contributed to the final manuscript.

### **Acknowledgment**

### **Conflict of interest**

### **Study significance**

Several cases of scurvy secondary to diet limitations have been reported in the literature. Here we present a six-year-old boy who presented with rash, later developed pain in both lower extremities. After evaluation revealed vitamin C deficiency, he was admitted into an intensive day treatment feeding program. A feeding assessment found he had life-long problems with eating and had a diet that never exceeded ten foods. Across the course of treatment, he learned to eat 29 new foods. At eight-months follow up his body mass index had increased.

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