

CASE REPORT

Integrative Therapies for Magnesium and Calcium Deficiency in a Food Insecure, Autism Subject: A Case Report

Jasmine B. Hollywood, DCN, LDN, CNS, CRPS, ORDM

Abstract

Introduction: Individuals facing homelessness with autism spectrum disorder (ASD) are at increased risk for food insecurity. Financial difficulties increase the demand to donate blood plasma to support hardship. Excessive blood plasma donations may lead to micronutrient deficiencies exacerbating deficits derived from poor food habits. Therapies that may support these populations in securing foods and improving lifestyle habits may be diet, supplements, nutrition education, and holistic lifestyle recovery support group.

Case Description: A homeless, 31-yr-old Caucasian female with ASD presenting with magnesium and calcium deficiencies, and ten year history of blood plasma donations sought medical nutrition therapy. Over 6 months and in conjunction with physician

prescriptions, interventions were augmented with magnesium and calcium supporting vegetables; reduction of dairy, fast foods, and ultra-processed foods; nutrition education and holistic lifestyle recovery support group. Upon final visit, the patient had remarkable improvement of nutrition knowledge and food budgeting, in-kitchen housing stability, food access, and stress reduction.

Conclusion: Nutrition education improves nutrition knowledge and food budgeting facilitating food access, while holistic lifestyle recovery support groups can influence healthier living and stress reduction in homeless patients with ASD. Population-based clinical studies should be done to understand the role of these conjunctive therapies to support nutrition practice.

Jasmine B. Hollywood, DCN, LDN, CNS, CRPS, ORDM, Student in the Doctoral of Clinical Nutrition Program, Department of Nutrition and Herbal Medicine, Maryland University of Integrative Health, Laurel, Maryland; True Paleo Inc., Discover Your Greatest Self, Tampa, Florida.

Corresponding author: Jasmine Hollywood, DCN, LDN, CNS, CRPS, ORDM

E-mail address: jhollywood@muih.edu

Introduction

A large degree of homeless women have inadequate intakes of micronutrients including magnesium and calcium.¹ Of total homeless populations, 13% of homeless individuals are documented to have ASD traits.² For many impoverished individuals experiencing low-income and hardship, blood donations are a major source of income to support socio-economic difficulties.³⁻⁵ More importantly, autistic individuals are vulnerable to exploitation and in the presence of homelessness, facing food insecurities, may become a majority of paid blood donors. Inability for homeless individuals to maintain food security and sufficiency and acquire access to a private kitchen could exacerbate their decision to prolonged plasma donation

visits. In this article, a food insecure homeless patient with ASD-type1, with childlike features, is reported to have an extensive history of blood plasma donations and related magnesium and calcium deficiencies.

Patient Case

A 31-yr-old Caucasian female presenting with ASD, history of multiple mental health diagnoses, thyroid problems, insomnia, bone conditions, and mineral deficiencies sought nutrition therapy, food education, and menu planning. The patient initially reported gut complications, skin issues, and lactose intolerance. She also reported long-term exposure to traumatic events and \geq ten-year span of chronic homelessness contributing to inability to maintain: food security and sufficiency, housing stability to acquire access to a private kitchen, and finances to continue supplements and dietary needs required for nutrition-related disease. She later disclosed a ten-year history of donating blood plasma.

History

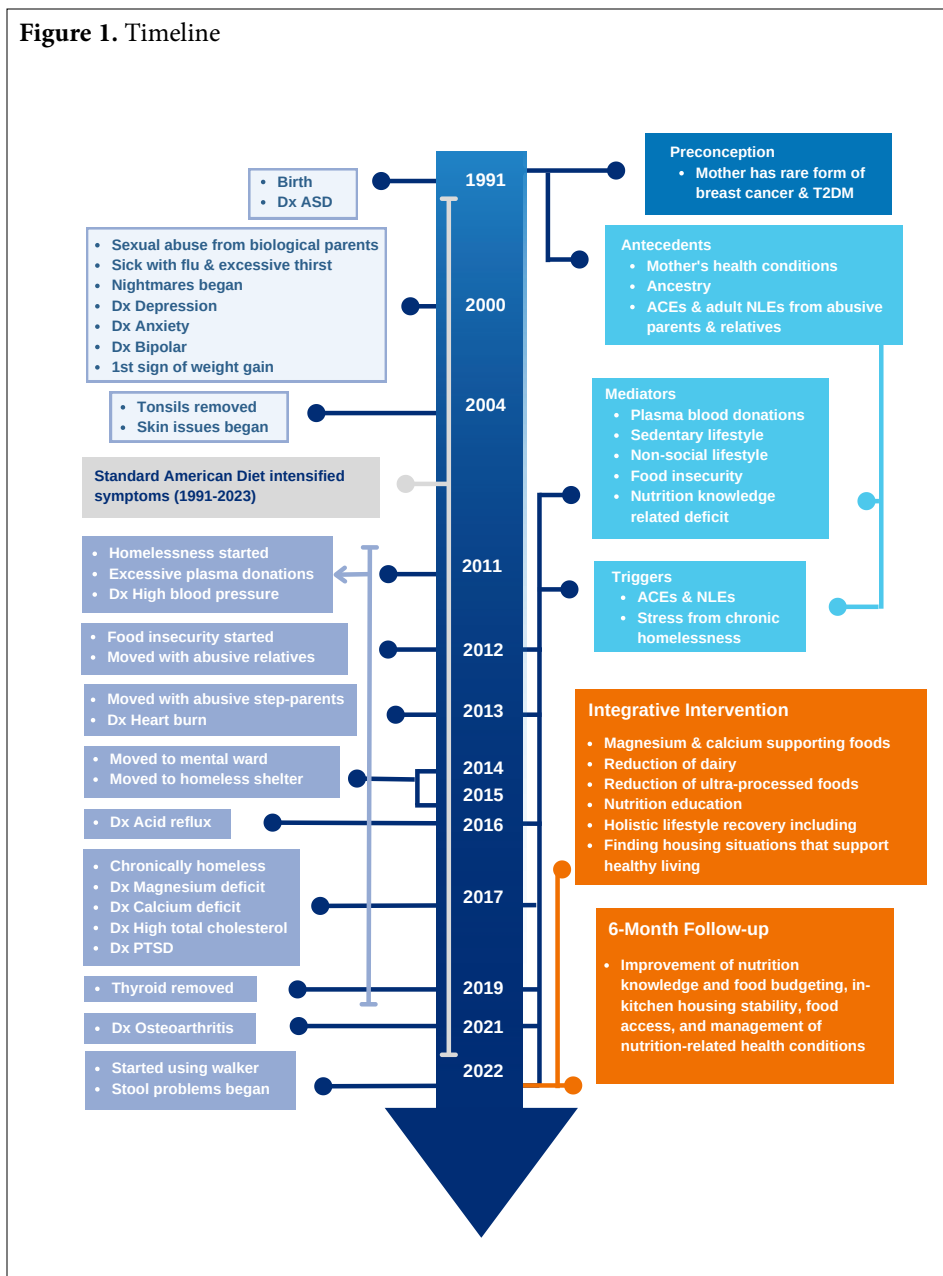
During the initial evaluation the client reported a maternal history of diabetes and a rare form of breast cancer. Her childhood diagnoses included ASD-type1 with childlike features, depression, generalized anxiety

disorder, and bipolar. She disclosed familial abuse over her lifespan beginning with childhood sexual abuse, as well as ongoing early adult physical, psychological, and economic abuse. While living with various relatives, she reported experiencing economic hardship, frequently finding herself homeless without access to food, and utilizing blood plasma donation banks as a primary source of income to support economic needs in addition to government benefits. Other reported adult diagnoses include high blood pressure, gastroesophageal reflux disease, post-traumatic stress disorder, and subsequent thyroid surgery. She further revealed iron issues, a more recent prescription for a walker due to scoliosis and osteoarthritis complications, a diagnosis of magnesium deficiency, and ensuing calcium deficiency.

Clinical Findings

The nutrition focused physical exam determined overweight status (*ht* = 68in, *wt* = 247lbs, *waistline* = 54in, *hip* = 50in, and *BMI* = 37.6) placing her in the class 2 obese category. It was also determined the patient was at high risk for cardiovascular events (*W/H ratio* = 1.08 and *W/Ht ratio* 0.79). Her dietary analysis using Cronometer software determined a low intake of both fruits and vegetables, as well as low magnesium and calcium, which was consistent with physician findings. During initial consultation the client mentioned numerous inability to maintain food access, stating her disability, learning impairments, and physical conditions limited her. A major finding was the client's remarkable ability to achieve consistent visits with health practitioners and receive income from government resources, but inability to budget money and maintain health status due to homelessness and food access issues. She reported impaired ability to prepare meals, nutrition-related knowledge deficit, difficulty maintaining self-monitoring, and physical inactivity. In addition, she

Figure 1. Timeline



disclosed sporadic eating and overabundance of eating out as a result of chronic homelessness. Furthermore, of a 1-10 scale, with ten being severe, the client disclosed a perceived stress level of nine due to frequent relocating.

The timeline highlights the client's history, detailing her exposure to trauma, chronic homelessness, and prolonged time frame of blood plasma donations. Figure 2 demonstrates intervention and integrative pillars aligned during treatment. Figure 3 details follow-up visits and strategies.

Clinical Diagnosis

After multiple visits, clinical findings identified the major cause for mineral deficiencies to be both long-term duration of excessive blood plasma donations and inability to secure nutrient-dense food. Subsequent screening of

Figure 2. Therapeutic Recommendations and Integrative Treatment Pillars

Therapeutic Recommendations	Number of Times Intervention was Delivered													
	10/1	10/14	10/19	11/4	11/12	12/2	12/15	1/6	1/21	2/4	2/25	3/4	3/18	4/1
Dietary Intervention														
Magnesium and calcium supporting plant foods								✓		✓	✓	✓	✓	✓
Reduction of dairy								✓	✓	✓	✓	✓	✓	✓
Reduced intake of ultra-processed foods				✓						✓	✓	✓	✓	✓
Reduced intake of fast foods				✓						✓	✓	✓	✓	✓
Supplement Intervention														
Supplement Magnesium	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Integrative Intervention														
Food and Nutrition Education										✓	✓			✓
Establish Food Security			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Add Exercise						✓			✓	✓	✓	✓	✓	✓
Other Recommendations														
Continue with Specialists and PCPs	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Join Peer-led support groups								✓	✓	✓		✓		✓
Eliminate financial sourcing from blood plasma banks					✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Integrative Treatment Pillars														
Food and Nutrition Education														
During times of homelessness, clients have access to government funded programs. However, nutrition education and therapy are not included. Helping individuals with special needs and who are facing chronic homelessness understand the importance of eating a well balanced, nutrient-dense meal is imperative for improving patient knowledge to encourage positive food choices and reduction of nutrition-related diseases. Basic nutrition educational classes can help facilitate learning.														
Establish Food Security														
Government funded programs help homeless individuals acquire food from homeless shelters, food banks, food drives, and groceries with food programs. However, programs do not focus on the individual's ability to cook and store food items, which is limited amongst homeless populations. Establishing food security by finding stable housing with in-kitchen access can help secure food items and encourage building new nourishing habits such as cooking health-enhancing foods.														
Peer-Led Support Groups														
Peer-led recovery support groups are a new integrative tool being used to help individuals with mental health disorders. According to mental health focused government committees, these support groups are beneficial to those with literacy requirements such as individuals with autism spectrum disorders. Recovery is defined as a process of change through which individuals improve their health and wellness, live a self directed life, and strive to reach their full potential (SAMHSA, 2016). Peer-led recovery includes holistic body-mind-spirit practices, which is one of the 10 guiding principles of recovery. As well, one of SAMHSA's Recovery Support Strategic Initiatives (RSSI) is Health, overcoming or managing one's disease(s) or symptoms and making informed, healthy choices that support physical and emotional wellbeing. Since there is a lack of help and nutritional information available for people experiencing homelessness with autism spectrum disorders, attending these support groups are beneficial for helping to communicate and navigate services to this population.														

food frequency, symptoms frequency, food insecurity, and lifestyle recovery questionnaires determined contributing factors for the excessive blood plasma donations and food insecurities were continuing to subject the client to trauma and chronic homelessness. The nutrition diagnoses were NCPT codes NB-1.4, NB-1.1, NB-1.5, NB-1.7, NB-2.1 NB-2.4, NB- 3.2 and NB- 3.3; which relates as self-monitoring, food, and nutrition-related knowledge deficits, disordered eating pattern, undesirable food choices, physical inactivity, impaired ability to prepare foods/meals, and limited access to food/nutrition related supplies.

Therapeutic Intervention Recommendations

Based on the client's reported information and objective data from provided documentation, the following dietary and integrative interventions were recommended: magnesium and calcium supporting plant foods along with the reduced intake of dairy, fast foods, and ultra-processed foods; also establishing food security, nutrition education, exercise, and lifestyle recovery support groups.

Follow-up and Outcomes

Follow-up for food security and meal planning began approximately two weeks after the initial consultation, at which time the client disclosed an initial concern of inability to follow interventions due to the level of her

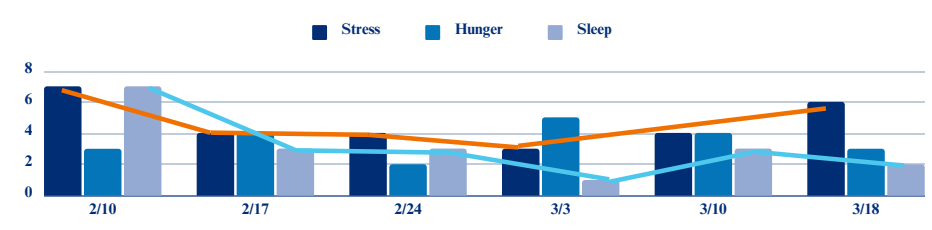
disability. Therefore, the continuation of PCP, psychologist, and special needs companion visits and prescriptions was recommended. Gathering provider contact information was difficult, however, was established within the first six weeks. Upon receiving subjective data about blood plasma donations, fulfilling required research, and understanding the client's sources of income, elimination of visits to blood banks was suggested. Subsequent visit priorities were establishing a residence that supports healthy living.

After securing residence, diet implementation and holistic lifestyle recovery support groups were initiated; and food insecurity (fiQ = 20) and holistic lifestyle recovery (htrQ = 29) clinical questionnaires were formed to help assist the client with informing the practitioner of her progress by comparing number of positive-yes responses (pyR) to the number of negative-no responses (nnR). The client attended one holistic lifestyle recovery support group consisting of four group sessions, to include: body-mind-spirit, self-care, exercise, and building relationships; and nutrition education classes (n = 3), which entailed reading food labels, food budgeting, know your plate, smart shopping options, cooking without a kitchen, and eating healthy while dining out. She further received nutrition counseling on magnesium and calcium deficit supporting foods, as well as understanding the nutritional risks of the excessiveness of donating blood plasma.

Figure 3. Charted Data From Weekly Check-Ins

Weekly Check-ins	Dates of Report									
Dietary Intervention	1/6	1/21	2/10	2/17	2/24	3/3	3/10	3/18	4/1	
Had access to food	Y	Y	Y	Y	Y	Y	Y	Y	Y	
Maintained magnesium and calcium supporting foods	N	Y	Y	Y	Y	Y	Y	N	N	
Reduced intake of ultra-processed foods	N	N	N	N	N	N	N	N	N	
Reduced intake of fast foods	N	N	Y	Y	Y	Y	Y	N	Y	
Supplement Intervention										
Supplemented Magnesium and Calcium	Y	Y	Y	Y	Y	Y	Y	Y	Y	
Integrative Intervention										
Exercise	0/wk	0/wk	5/wk	1/wk	3/wk	4/wk	3/wk	4/wk	3/wk	
Customized In-Clinic Case Questionnaires										
Holistic Lifestyle Recovery Questions					Food Insecurity Questions					
Do you: <ul style="list-style-type: none"> • have control of your life? • have poor perception and beliefs about your personal and health situation? • try to manage your stress? • practice breathing techniques to reduce stress? • have awareness of government services and resources that could help you? • practice mantra meditation? • practice mindfulness meditation? • practice mindful eating? • practice spirituality? • try to reconnect with life and meet new people? • have successful relationships that allowed you to move forward and make positive choices? • have a social network of people, such as people for meet up groups or family, to support you? • have friends that support you? • know the definition of recovery? • address your trauma? • know the definition of a traumatic lifestyle? • understand what perceived stress is? • understand how exposure traumatic lifestyles influence stress? • know the definition of peer-led support? • have a relapse prevention plan in place? • write down your thoughts in a journal? • practice natural, fluid movements as exercise? • practice forgiving yourself and others you blame? • hang around people that make you feel safe? • use the healing presence to understand how people feel around you? • have a vision statement? • use smart goals? • practice healthy eating habits? • have the courage to share your story? 					Do you: <ul style="list-style-type: none"> • have access to eating food daily? • take classes about food and nutrition? • eat less because you thought you couldn't afford to eat more? • cut your meals down to save food for another day? • ask someone to help you get food? • unsure of how to choose foods at grocers stores? • monitor your eating habits? • prepare your own meals? • prepare balanced meals? • cook your meal meals? • cook balanced meals? • help someone else cook, so you could learn? • have access to shopping? • have money to purchase foods? • get any electronic handouts teaching you how to prepare, cook foods, shop for foods, or learn which foods to eat... ever? • eat at fast food restaurants? • eat at healthy restaurants? • eat 3 daily meals? • have knowledge of food banks and free food access services? • use food banks and food access services? 					

The bar chart shows the reduction in the stress and improved sleep as the client participates peer-led holistic lifestyle support group. These results align with the remarkable increase in post-score percentage on the hlrQ (baseline $pyR = 6.89\%$, post $pyR = 79.31\%$). However, as shown on the bar chart the hunger scale staggers, supporting the slightly significant increase on the fiQ (baseline $pyR = 30\%$ and post $pyR = 50\%$).



During subsequent follow-ups, the client also described an expressed need for continuing nutrition education, peer-led recovery, and simplified easy-to-fill-out questionnaires. Continued engagement was agreed upon. Comparison of self-reported answers on baseline and post clinical fiQ and hlrQ questionnaires, was conducted. There was a remarkable increase in post-score percentage on the hlrQ (baseline $pyR = 6.89\%$, post $pyR = 79.31\%$). However, the fiQ increase was only slightly significant (baseline $pyR = 30\%$ and post $pyR = 50\%$). Upon final visit, the client had acquired increased knowledge of nutrition understanding and food budgeting, in-kitchen housing stability, food access, and successful management of nutrition-related health conditions.

Patient Perspective

I feel a lot more confident after taking the class. I'm learning good things to eat and recommending my practitioner to others would be most definite. My providers noticed that I'm a lot more exuberant with energy. Lifestyle recovery helped me. I'm learning ways to avoid hazardous relationships. I may not be completely good at it, but I have some ideas, and it was thanks to the classes.

Discussion

Blood Plasma Donations and Mineral Deficiencies

According to peer-reviewed articles, blood plasma donation centers are located in urban areas with high rates of impoverished individuals, in hopes people with economic hardship will be attracted to their incentives for donating.⁴ Plasma donations are associated with health

risks (i.e. acquiring HIV and hepatitis C), including the risk of physiological impairments,⁴ such as iron, magnesium and calcium deficits.^{4,6-8} Food insecurities due to homelessness add to these deficits.¹ This client had a long-term history of blood plasma donation visits, thyroid complications, physician diagnosed magnesium and calcium deficiencies, and reported iron issues.

Food Insecurity and Basic Nutrition Education

An interesting finding is the lack of peer-reviewed articles researching nutritional status of autistic individuals in homeless populations, as it is estimated that 13% of homeless people have ASD traits.² Individuals with ASD also have nutritional deficiencies due to food selectivity preferences along with challenges storing, preparing, and cooking foods, budgeting for groceries, and retaining basic nutrition knowledge.⁹ For many nutrition practitioners it can be challenging to maintain treatment plans and collection of data from homeless patients with communication difficulties and intellectual complications which further exacerbate their capability to maintain normal nutrition-related habits. Since clinical data from integrative nutrition practitioners is often collected from food and symptoms frequency questionnaires to help identify target core imbalances to personalize lifestyle and nutritional interventions, synthesizing additional customized in-clinic questionnaires to help retrieve more details can be very useful. See Figure 2 for clinical case questions.

Holistic Lifestyle Recovery

Lifestyle recovery is a process of change through which individuals improve their health and wellness, live a self-directed life, and strive to reach their full potential.⁷ Lifestyle recovery support groups are led by peers and support people with mental health disorders advocating for peers to develop support networks, replace toxic friendships, build healthy care habits, establish meaningful daily routines, and find living situations that use evidence-based relapse prevention strategies. The 'Holistic Lifestyle Recovery' support group encompasses the holistic approach of SAMHSA's ten principles of recovery (2016),⁷ using body-mind-spirit and community to help address self-care practices, services and supports, complementary and alternative services, spirituality, creativity, building relationships, addressing trauma, and building new social networks.⁷ This client was recommended to attend a holistic lifestyle recovery support group to build a foundation for lifestyle education; and afterward was able to form new solid relationships while utilizing current support networks to find housing stability that supports healthy living and food access.

Additional Considerations

Assessing the intake questionnaire led to the findings of three core imbalances in fundamental organizing systems: assimilation, biotransformation and elimination, and communication. The client reported various digestion and

absorption issues including experiencing acid reflux symptoms, heartburn, gastrointestinal aggravation from the consumption of spicy foods, and cramping in the lower abdominal region. These gastrointestinal imbalances may be the result of long-term exposure to fast-foods,¹ as well as ultra-processed packaged and canned foods provided from food banks, food drives, and charitable organizations.^{1,10} Furthermore, gastrointestinal dysfunction has been reported to play a significant role in reduced uptake of vital minerals and nutrition-related diseases, as such deficits are indicated in homeless populations.⁶⁻⁸

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Author Contributions

JBH conducted the initial proposal of the case report, acquisition of data, performed data analysis and literature reviews, authored the manuscript, created case intervention, prepared materials, and created figures and tables.

Conflict of Interest

None declared.

Ethics Approval and Patient Consent

IRB approval is not required for case reports. Signed informed consent was obtained and is on file.

Data Materials

Data materials are available upon request.

Funding

None declared.

Consent for Publication

The author approved the final case report as submitted and signed informed consent for publication was obtained and is on file.

References

1. Institute of Medicine (US) Committee on Scientific Evaluation of WIC Nutrition Risk Criteria. WIC Nutrition Risk Criteria: A Scientific Assessment. Washington (DC): National Academies Press (US); 1996. 7, Predisposing Nutrition Risk Criteria. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK232498/>
2. Churchard A, Ryder M, Greenhill A, Mandy W. The prevalence of autistic traits in a homeless population. *Autism*. 2019;23(3):665-676. doi:10.1177/1362361318768484
3. Chen X. Commercial plasma donation and individual health in impoverished rural China. *Health Econ Rev*. 2014;4(1):30. doi:10.1186/s13561-014-0030-6
4. Ochoa A, Shaefer HL, Grogan-Kaylor A. The interlinkage between blood plasma donation and poverty in the United States. *J Sociol Soc Welf*. 2021;48(2):4. <https://scholarworks.wmich.edu/jssw/vol48/iss2/4> doi:10.15453/0191-5096.4432
5. Towards 100% Voluntary Blood Donation: A Global Framework for Action. Geneva: World Health Organization; 2010. 2, Voluntary blood donation: foundation of a safe and sufficient blood supply. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK305666/>
6. Drake M. A. (1992). The nutritional status and dietary adequacy of single homeless women and their children in shelters. *Public health reports (Washington, D.C. : 1974)*, 107(3), 312-319.
7. Fogh-Andersen N, Altura BM, Altura BT, Siggaard-Andersen O. Changes in plasma ionized calcium and magnesium in blood donors after donation of 450 mL blood. Effects of hemodilution and Donnan equilibrium. *Scand J Clin Lab Invest Suppl*. 1996;224(sup224):245-250. doi:10.3109/00365519609088644
8. Qvist I, Abdulla M, Mathur A, Robertson B, Svensson S. Zinc, copper, magnesium, and calcium in blood and plasma after phlebotomy. *Scand J Haematol*. 1983;31(2):161-167. doi:10.1111/j.1600-0609.1983.tb01525.x
9. Shurack RH, Garcia JM, Brazendale K, Lee E. Brief Report: Feasibility and Acceptability of a Remote-Based Nutrition Education Program for Adolescents with Autism Spectrum Disorder: A COVID-19 Pilot Study. *J Autism Dev Disord*. 2022;52(10):4568-4574. doi:10.1007/s10803-021-05301-4
10. Luder, E., Boey, E., Buchalter, B., & Martinez-Weber, C. (1989). Assessment of the nutritional status of urban homeless adults. *Public health reports (Washington, D.C. : 1974)*, 104(5), 451-457.