

Dynamics of Nutrition in the American Prison Complex - Impact of Nutrition on Inmate Health and Response to Chiropractic Care: A Commentary

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INTRODUCTION

Each year, more than 650,000 people are released from state and federal prisons, equating to over 10,000 ex-prisoners entering local communities each week.¹ The number of people incarcerated in the United States was 1.8 million by mid 2020.² Considering these statistics it is likely that a chiropractic practitioner will interact with a patient with a history of incarceration, particularly if that practitioner serves an outreach clinic population of financially disadvantaged persons. This demographic of patients is more likely to have histories of physical and psychological trauma, poor sleep quality on steel beds, and inadequate nourishment, which can impact the quality and strength of soft tissues.³⁻⁴ The combination of trauma, inability to access structurally supportive areas to sleep and sit, and lack of access to quality nourishment may lead to slower than expected, or suboptimal response to chiropractic clinical care. Sarcopenia, characterized by the loss of strength and muscle mass that can occur because of poor nutrition⁴, was first described in 1989 and categorized as a distinctive ICD-10 coded disease in 2016. The incidences of sarcopenia in chiropractic and allied health settings are likely to rise, commensurate with an aging population and populations with a higher risk of malnutrition.⁵ Sarcopenia can decrease the ability for the patient to fully benefit from the chiropractic adjustment and may impact the reduction or elimination of the cycle of pain.⁶ Food and nutrition insecurity, a significant determinant of health, impacts people worldwide.⁷ Food insecurity is the limited or uncertain availability of nutritionally adequate and safe foods or limited or uncertain ability to acquire acceptable foods in socially acceptable ways, with possible consequences of

malnutrition and sarcopenia.⁷ Data is limited, but food insecurity among correctional populations may be among the highest of all populations, with an estimated 70-91% impact level.⁷ Providing meals at an institutional level within the justice system is problematic with high reliance on foods that are ultra-processed,⁸ a step beyond simple processing through heating, freezing or dicing, to those food products that are mostly or entirely from substances extracted from foods or derived from food constituents with little if any food intact. In addition, food workers exist within the system that lack appropriate food safety training.⁸ This commentary describes the nutritional challenges within the American Prison Complex, with respect to the food insecurity within that system,⁹ the incidence of preventable disease that results from such a system, and the necessary interventions and considerations to improve chiropractic clinical outcomes in post-incarceration patients.

DISCUSSION

There is a continuum between nourishment intake that is necessary for good health, necessary for survival, and that which creates poor health outcomes. Good health requires the intake of six nutrients for the body to function properly. These nutrients supply the energy, building blocks for repair and growth, and the substances to regulate necessary chemical processes.¹⁰ To more fully understand the impact of poor nutrition in incarcerated persons and its influence on chiropractic clinical care, a brief description of legal requirements to feed the incarcerated, application of the 8th amendment to prison nutrition and examples of prison meals and costs will be given. A concise overview of the basic elements of nutrients is also beneficial to illustrate the potential clinical impact of the poor nutrition common within this population.

From a legal standpoint, nutrition standards for the incarcerated are determined at a state and local level, in addition to court precedence and input from The American Correctional Association (ACA), which offers an accreditation process that is voluntary.⁹ Another main governing law regulating prison food is the Eighth Amendment that requires that correctional facilities must not deprive those incarcerated from the “basic necessities of life” to prohibit what would be considered cruel and unusual punishment of convicted prisoners.⁹ Criticism of prison meals that may cite the Eighth Amendment focus on food items of processed meat, canned fruits and vegetables and packaged bakery items that are devoid of nutritional value and fall short of adequate calorie and/or macro/micronutrient needs⁹. At an average price per meal of \$1.77 in the state of Georgia for example, adequate calorie and macro/micronutrient needs become supplemented through fortified drink mixes or other items that may go unconsumed.⁹ In addition, the Eighth Amendment is referenced due to deplorable conditions for food preparation and delivery that has led to those incarcerated to be six times more likely to become ill due to foodborne pathogens.⁹

Nutrient needs vary depending on activity level and total energy expenditure and should be separated into two distinct categories: the minimal intake of macronutrients and the flexible intake of additional calories, as needed.¹⁰ Macronutrients (made up of protein, carbohydrates, and fats) and micronutrients (made up of vitamins and minerals) are key providers of energy in the diet and are critical to maintaining health.¹⁰

Proteins comprise over twenty amino acids and are the most diverse of all macromolecules, with each cell containing several thousand different proteins performing a variety of functions, including: acting as the structural component of the cell and tissues, functioning in the transport and storage of small molecules (such as the transport of oxygen by hemoglobin), transmitting information between cells, and defending against infection through antibodies.¹¹ The most critical function of proteins is the ability to act as enzymes that catalyze nearly all chemical reactions in a biological system.¹¹ As a result, proteins direct nearly every activity in the cell.¹¹ Because the body does not store amino acids, it must create them by modifying existing amino acids, or by obtaining them in the diet.¹¹ Access to protein is an essential component to health. The National Academy of Medicine recommends adults get a minimum of 0.8 grams of protein for every kilogram of body weight per day, which equates to approximately 7 grams for every 20 pounds of body weight.¹² For a 200-pound person, a minimum of 70 grams of protein is needed per day for good health.¹² Inadequate intake of protein can cause loss of muscle mass, decrease in immune function, and weakening of the heart and respiratory systems.¹²

Carbohydrates are present in several forms, most often sugars, fibers, and starches.¹³ The healthiest sources of carbohydrates are unprocessed or minimally processed, such as sweet potatoes, beans, quinoa, and oats.¹³ Highly processed or refined foods, such as white bread, packaged cereals, pasta, and sweets, have had the most nutritious components of bran and germ removed, leaving them nearly devoid of beneficial nutrients.¹³ These carbohydrates are quick to digest, contribute to weight gain, make it harder to lose weight, and have been shown to contribute to heart disease and diabetes.¹³ While carbohydrates are an essential macronutrient, primary sources should be fruits, vegetables, and whole grains.¹³

Dietary fat is an important source of energy and aids in the absorption of specific vitamins and minerals, builds cell membranes, forms the sheath surrounding nerve cells,¹⁴ and is necessary for blood clotting and muscle movement.¹⁴ Some fats, such as olive oil, flaxseed oil, and omega-3 fatty acids, have been shown to lower levels of inflammation.¹⁴ The most readily available, least expensive, and commonly consumed fat in the United States is trans-fat (trans-unsaturated fatty acids).¹⁵ A byproduct of hydrogenation, trans fat converts healthy oils into solids to prevent rancidity. Trans fat has no health benefits or known safe levels of consumption.¹⁶ Consuming trans-fat raises the level of LDL cholesterol in the blood and increases the risk of developing heart disease, the leading cause of death in men and women in the U.S.¹⁶ These fats also create systemic inflammation and increase risk for heart disease, stroke, diabetes, and other chronic conditions.¹⁶

Micronutrients are vitamins and minerals required by the body for growth and development, disease prevention, and normal functioning of body systems. There are approximately 40 important micronutrients found primarily in fruits and vegetables. Deficiencies of iron, required for oxygen transport in the blood, can cause anemia, consequent fatigue, and reduced physical activity. Vitamin D plays a critical role in decreasing risks of developing chronic illness; persons with a deficiency are at greater risk for low bone density, autoimmune conditions, cancer, and cardiovascular diseases.⁹ Few foods contain Vitamin D other than fatty fish and fish liver oils; exposure to sunlight may provide some level of Vitamin D.⁹ Vitamin B12 is needed to create nerves, red blood cells, and DNA; deficiencies

of this nutrient can lead to depression, mental illness, joint pain, and many other negative health issues.¹⁷ Deficiency of Vitamin B12 is more common in those that are vegetarian/vegan, as it is primarily in animal products.¹⁷ Diets using soy in place of animal products do not make up for this lack of B12.¹⁸

The food provided to incarcerated persons in U.S. correctional facilities often fails to meet the nutritional requirements to sustain basic levels of health for its populations. Contributing factors include a lack of national standards for the food served and inconsistencies in correctional food service worker training, which increases foodborne illness, decreases food safety, and does not ensure adequate nutrition for each inmate.¹⁹

The Marshall Project, a “nonpartisan, nonprofit news organization that seeks to create and sustain a sense of national urgency about the U.S. criminal justice system”, discovered that nutritional standards at state and local facilities are governed by a patchwork of state laws, local policies, and inconsistent court mandates.¹⁹ An example of the inconsistencies is a Texas law that requires inmates be fed three times in 24-hours, but this only applies to county jail inmates and not state prisoners.²⁰ In addition, the American Correctional Association makes only a recommendation, not a requirement, that prisons offer inmates three meals a day, and makes no specifications on nutrient needs.²⁰ Further, a 2014 investigation by human rights attorneys of inmates at the Gordon County Jail in Calhoun, GA showed the inmates were deemed to be starving with only two meals per day of inadequate caloric levels.²⁰ Consequently, inmates reportedly resorted to eating toothpaste and toilet paper, licking syrup packets, and drinking excessive amounts of water to combat their hunger.¹⁹ To cut costs, some states have proposed reducing minimum required meals to two per day while others have outsourced food service to private industry companies to further cut associated costs.¹⁹

Often inmates are underfed or served food that is too high in sodium, sugar, cholesterol, and saturated fat from mostly processed food sources, with levels 2-3 times higher than USDA recommendations.⁷ Minimum daily suggested nutrients in the forms of fruits, vegetables, and proteins may not be provided, and when food is delivered, it carries a significant risk of causing food-borne illnesses.⁹ A 2017 study from the Centers for Disease Control and Prevention (CDC) determined that people in correctional facilities are approximately 6.4 times more likely to suffer from a food-borne illness than the general population, primarily from *Clostridium perfringens* and *Salmonella*.¹⁹ Tainted poultry was the most common single source of illness, followed by raw and undercooked meat, eggs, products made from milk, and seafood.¹⁹ Correctional facilities often lack the ability to properly execute food handling protocols and there are inconsistent processes in place to ensure improvements.¹⁹

Reporting by the CDC revealed that 80% of the formerly incarcerated said the food served was unappetizing in taste and smell, with 94% reporting they couldn't eat enough to feel full due to the quantity of food available.¹⁹ Sixty-six percent of respondents said they were served food with bugs or portions that were moldy or spoiled, including “weevils in grits, rocks in turnip greens, maggots in meat, a rat tail buried in a day's entrée, and oatmeal containing human hair, pieces of metal, or cockroaches.”⁸

Without access to nutritious food, those who are incarcerated are disproportionately at risk for developing chronic diseases, like diabetes and heart disease, or will experience a worsening of existing conditions.²¹ A malnourished person is often portrayed as emaciated, but someone can be both malnourished and overweight, even obese, if they consume an excess of calories that lack critical nutrients.²²

Chiropractic care of a formerly incarcerated person can be complicated by muscle wasting, or sarcopenia, as a consequence of inadequate protein intake, adding to the challenges of providing effective chiropractic interventions for these patients. Sarcopenia occurs in adult tissue when protein degradation rates exceeds protein synthesis.²³ Regulation of muscle mass and fiber size reflects protein turnover, or the balance between protein synthesis and degradation within the muscle fibers.²³ Catabolic conditions that exist include malnourishment/starvation, cancer, fasting, critical illness and forced/chosen caloric restriction.¹⁹ Muscle atrophy in any of the above situations results from shrinkage of myofibers due to a net loss of proteins, organelles, and cytoplasm, with a hyperactivation of cellular degradation pathways, including the ubiquitin-proteasome and autophagy-lysosome pathways.²⁵ Due to this catabolic process, muscle tissue becomes sinewy and contracted, leading to difficulty with supple and free motion.²³ The chiropractic adjustment may be successfully delivered utilizing a variety of techniques, but due to tissue stiffness and loss of tissue resiliency, change in adjusting technique may be required to accommodate for poor tissue quality.

The diagnosis of sarcopenia is centered on assessment of body composition and physical performance testing, including grip strength with dynamometry, gait speed and sit to stand time⁵, with analyses ideally incorporated into portal-of-entry healthcare settings. An additional assessment that may be used in the office is the SARC-F questionnaire (Table 1) that was first published in 2016 as an efficient and economical 5-item screening assessment for clinicians suspecting sarcopenia. Each item (Strength, Assistance, Rise, Climb, Fall) is scored 0-2, with higher cumulative scores (>4) suggesting consequences of sarcopenia. See Table 1.²³ In 2020, the Sarcopenia Definitions and Outcomes Consortium (SDOC) identified grip strength less than 35.5 kg in males and 20 kg in females, and gait speeds less than 0.8 meters/sec as key risk assessment findings tied to likelihood of disability, loss of mobility, falls and fractures and mortality in sarcopenic patients.²⁵

SARC-F Component_	Question (Patient Response)_	Score_
Strength_	How much difficulty do you have lifting and carrying 10 pounds? _	None = 0_ Some = 1_ A lot or inability = 2_ _
Assistance with walking_	How much difficulty do you have walking across a room? _	None = 0_ Some = 1_ A lot, uses aids, or inability = 2_ _
Rising from chair/seated_	How much difficulty do you have transferring from a chair or bed? _	None = 0_ Some = 1_ A lot or inability without help = 2_ _
Climbing stairs_	How much difficulty do you have climbing a flight of 10 stairs? _	None = 0_ Some = 1_ A lot or inability = 2_ _
Falls_	How many times have you fall in the last year? _	None = 0_ 1-3 falls = 1_ 4 or more falls = 2_ _

Table 1. SARC-F Questionnaire Items²³

SARC-F scores ≥ 4 suggests higher risks of sarcopenia-related complications and the need for more comprehensive examinations.

CONCLUSION

Chiropractic practitioners who may care for formerly incarcerated persons, or other persons at risk for malnutrition or sarcopenia, should be knowledgeable of the unique set of circumstances of nutritional deficit, of the possible poor tissue integrity, and of the psychosocial needs that exist for this demographic. A trauma-informed approach to diagnosis and clinical care that also provides supportive resources to encourage patient nutritional intake should be considered as a model for care. Patient resources may include basic nutritional information, aided by grocery shopping lists, food preparation information, daily food intake goals, and patient weight monitoring, particularly if the patient is cachexic. With these considerations, patients who have been released from a prison system and are seeking a better quality of life, a new life, can be supported and find a valuable resource in their chiropractic office.

COMPETING INTERESTS

The authors declare no competing interests.

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