

The Role of Nutrition in Substance Abuse Recovery: Addressing Nutritional Deficiencies for Improved Outcomes

Abstract

Background

Substance abuse negatively impacts physical and mental health, often leading to nutritional deficiencies such as thiamine, magnesium, and omega-3 fatty acids. These deficiencies contribute to cognitive impairments, mood instability, and organ damage, exacerbating recovery challenges. Despite evidence supporting the benefits of nutrition in recovery, its integration into treatment programs is limited. This study examines the role of nutrition in mitigating deficiencies, reducing substance-related damage, and enhancing recovery outcomes.

Method

A systematic literature review published between 2010 and 2023 was conducted using PubMed, Scopus, and Google Scholar. The review focused on studies addressing nutritional deficiencies, therapeutic micronutrient roles, and dietary interventions in substance abuse recovery. Observational studies, randomized controlled trials, and systematic reviews were analyzed, and data were thematically synthesized to evaluate strategies and barriers in incorporating nutrition into recovery programs.

Conclusion

Nutrition is essential in substance abuse recovery, addressing deficiencies, reducing oxidative stress, and improving mental resilience. Effective strategies like micronutrient supplementation and structured dietary interventions enhance recovery outcomes and lower relapse risks. However, challenges such as food insecurity and the lack of integrated nutritional support persist. Policymakers must prioritize incorporating nutrition into recovery frameworks, and further research is needed to assess long-term impacts and refine comprehensive strategies.

Keywords: Substance abuse recovery, nutritional deficiencies, dietary interventions, micronutrient supplementation, relapse prevention, addiction.

1 Introduction

Substance abuse refers to the harmful or hazardous use of psychoactive substances, including alcohol and illicit drugs. This behavior significantly impacts physical health, mental wellbeing, and social functioning, often leading to chronic illnesses, cognitive impairments, and fractured relationships (Santolaria-Fernández et al., 1995; Thomson & Marshall, 2006). Individuals who abuse substances are at heightened risk of nutritional deficiencies due to disrupted dietary habits, appetite suppression, and the physiological effects of the substances themselves (Virmani et al., 2006). These deficiencies not only exacerbate the physical and mental health complications of substance abuse but also hinder the recovery process, creating a cycle of poor health and addiction (Naren et al., 2022). Despite the profound implications of nutrition on recovery, the integration of nutritional strategies into substance abuse treatment programs remains limited (Jeynes & Gibson, 2017).

Nutrition plays a pivotal role in the recovery process, yet its significance is often overlooked in traditional addiction treatment (Chisom et al., 2022; Hovhannisyan et al., 2019). Deficiencies in key nutrients, such as thiamine, magnesium, and omega-3 fatty acids, can worsen health outcomes and impede recovery. For instance, thiamine deficiency, common in alcohol abuse, can lead to severe neurological impairments like Wernicke-Korsakoff syndrome (Thomson & Marshall, 2006). Similarly, deficiencies in antioxidants such as vitamins C and E heighten oxidative stress, intensifying organ damage and systemic inflammation (Mahboub et al., 2020). Omega-3 fatty acids, essential for brain health and mood regulation, are often lacking in individuals who abuse stimulants, leading to mood instability and increased vulnerability to relapse (Wiss, 2019). Addressing these deficiencies through targeted nutritional interventions not only improves physical health but also enhances mental resilience, offering a holistic approach to recovery (John et al., 2023; Parvaz et al., 2022).

This study aims to address the critical gap in understanding the role of nutrition in substance abuse recovery. Despite substantial evidence linking nutritional deficiencies to poor health outcomes in individuals who abuse substances, nutritional strategies remain underutilized in recovery programs (Grant et al., 2015; Nour et al., 2018; Faleti & Adesuyi, 2016). By exploring the impacts of nutritional deficiencies, the

therapeutic potential of micronutrients, and the barriers to accessing nutritional support, this study seeks to provide evidence-based recommendations for integrating nutrition into recovery programs. Such an approach could revolutionize addiction treatment by improving recovery outcomes, reducing relapse rates, and enhancing the overall wellbeing of individuals affected by substance abuse (Afzal et al. 2022).

2 Methodology

2.1 Search Strategy

The search strategy employed for this study involved a systematic and comprehensive approach to identify relevant literature on the role of nutrition in substance abuse recovery. Searches were conducted across three primary databases: PubMed, Scopus, and Google Scholar. These databases were selected for their extensive medical, public health, and social science literature coverage. PubMed, in particular, provided access to high-quality biomedical studies, while Scopus offered multidisciplinary insights, and Google Scholar captured gray literature and conference proceedings. Keywords such as "nutrition," "substance abuse recovery," "malnutrition," "rehabilitation diets," and "addiction treatment nutrition" were utilized to frame the search. Boolean operators (AND, OR) were applied to refine results and ensure inclusivity. For instance, "nutrition AND substance abuse recovery" retrieved articles addressing both concepts, while "nutrition OR malnutrition" broadened the scope. Advanced filters limited results to English-language studies published between 2010 and 2023, ensuring relevance and currency. To enhance search precision, quotation marks were used for exact phrases, and truncation symbols (e.g., "Nutri*") captured variations of keywords. The search process was meticulously documented to ensure transparency and replicability.

2.2 Selection Criteria

The inclusion and exclusion criteria were established to maintain the study's focus and ensure the selection of high-quality, relevant literature. Inclusion criteria comprised peer-reviewed articles published between and addressing the role of nutrition in substance abuse recovery, and presenting empirical evidence through methodologies such as observational studies, randomized controlled trials, or systematic reviews. Articles that explored topics like the impact of malnutrition on

recovery outcomes or the efficacy of nutritional interventions were prioritized. Exclusion criteria eliminated articles unrelated to nutrition or substance abuse recovery, non-English publications, and studies lacking empirical data, such as opinion pieces or editorials. The selection process involved two independent reviewers who screened titles and abstracts to identify eligible studies, with disagreements resolved through discussion or consultation with a third reviewer. This systematic approach ensured the inclusion of studies directly addressing the research objectives.

2.3 Data Extraction and Synthesis

Data extraction followed a structured approach to ensure consistency and reliability. Two independent reviewers used a standardized extraction form to collect detailed information from selected studies, including publication details, study design, geographical location, sample characteristics, and key findings. Particular attention was paid to results related to the prevalence of malnutrition among individuals in recovery, the effects of nutritional interventions, and barriers to implementing dietary support in substance abuse treatment. The extracted data were synthesized narratively, focusing on thematic organization. Themes such as the role of nutrition in mitigating withdrawal symptoms, the impact of diet on relapse rates, and socioeconomic influences on nutritional outcomes were identified and analyzed. This narrative synthesis allowed for a comprehensive exploration of the findings and provided a clear framework for identifying gaps in the existing literature and directions for future research.

Table 1: Review paper study strategy

Literature Search Strategy	
Literature Sources	PubMed, Scopus, Web of Science, Google Scholar
Keywords	"nutrition," "substance abuse recovery," "malnutrition," "rehabilitation diets," "addiction treatment nutrition," "nutritional deficiencies in addiction," "dietary interventions for substance abuse recovery," "withdrawal symptoms and nutrition," "relapse prevention through diet"
Boolean Operators	AND,OR
Selection Criteria	

Inclusion Criteria	<p>Studies on the role of nutrition in substance abuse recovery. Focus on topics such as malnutrition, rehabilitation diets, or nutritional interventions.</p> <p>Empirical studies published in peer-reviewed journals.</p> <p>Studies published between 2010 and 2023.</p> <p>Articles written in English.</p>
Exclusion Criteria	<p>Studies unrelated to nutrition or substance abuse recovery.</p> <p>Articles lacking empirical evidence, such as opinion pieces, editorials, and case reports.</p> <p>Non-English publications.</p> <p>Studies published before 2010</p>
Data Extraction and Synthesis	
Data Extraction	<p>Performed by two independent reviewers using Zotero; Discrepancies resolved through discussion</p> <p>Narrative synthesis method; Thematically organized results based on key themes.</p>
Result Synthesis	<p>Narrative synthesis method; results were thematically organized based on key areas such as the prevalence of malnutrition in substance abuse recovery, the impact of dietary interventions, and barriers to implementing nutritional programs.</p>

3 Results and Discussion:

3.1 Nutritional Deficiencies Among Individuals Who Abuse Substances

Nutritional deficiencies are a significant consequence of substance abuse, driven by both the physiological impacts of substances and associated lifestyle factors. Common deficiencies include thiamine, magnesium, zinc, and omega-3 fatty acids, which are critical in maintaining physical and mental health. Alcohol consumption, for example, depletes thiamine stores, leading to neurological complications such as Wernicke-Korsakoff syndrome (Martin, Singleton, and Hiller-Sturmhöfel, 2003; Thomson & Marshall, 2006). Similarly, magnesium deficiency, often observed in individuals who abuse alcohol and opioids, contributes to muscle weakness, cardiovascular issues, and anxiety (Mahboub et al., 2020). Stimulant use, such as methamphetamine and cocaine, suppresses appetite, resulting in prolonged dietary inadequacies, particularly for antioxidants like vitamins C and E, which protect cells from oxidative stress (Virmani et al., 2006). These deficiencies not only exacerbate the health risks associated with substance abuse but also hinder recovery efforts, as they impair the body's ability to heal and regulate essential functions.

The physiological mechanisms underlying these deficiencies are multifaceted. Substance abuse often leads to malabsorption, where the gastrointestinal system is unable to absorb nutrients effectively, further exacerbated by frequent gastrointestinal disturbances such as diarrhoea or vomiting (Grotzkyj-Giorgi, 2009). Additionally, substances like alcohol and opioids interfere with the metabolism of key nutrients, reducing their bioavailability even when dietary intake appears adequate (Wiss, 2019). Appetite suppression caused by stimulants often relies on nutrient-poor, high-sugar foods, depleting the body's reserves of essential vitamins and minerals (Mahboub et al., 2020). Studies consistently show high prevalence rates of these deficiencies among individuals who abuse substances, with one study reporting over 50% of participants showing significant deficiencies in thiamine, magnesium, and folate (Santolaria-Fernández et al., 1995). Addressing these deficiencies is critical, as adequate nutrition can mitigate the physiological harm caused by substance abuse and support the recovery process.

3.2 Role of Micronutrients in Addressing Damage Caused by Substance Abuse

Micronutrients play a vital therapeutic role in mitigating the damage caused by substance abuse, particularly through their antioxidant properties and role in reducing oxidative stress. Vitamins C and E, for example, are potent antioxidants that neutralize free radicals generated by chronic substance use, thereby protecting cells from oxidative damage (Virmani et al., 2006). Supplementation with vitamin C has been shown to enhance neurocognitive recovery in individuals who abuse stimulants, reducing the risk of long-term brain damage and improving cognitive outcomes (Jeynes & Gibson, 2017). Similarly, zinc plays a critical role in immune function and tissue repair, particularly in addressing alcohol-induced liver damage, as Santolaria-Fernández et al. (1995) highlighted. These nutrients work synergistically to repair cellular damage and restore the body's normal functioning, making them essential components of a recovery-focused nutritional plan.

Omega-3 fatty acids, essential for brain health and mood regulation, have also been shown to benefit individuals recovering from substance abuse significantly. Deficiencies in omega-3s are linked to impaired neurotransmitter production, particularly dopamine and serotonin, which are critical for mood stability and cognitive function (Wiss, 2019). Research has demonstrated that supplementation

with omega-3 fatty acids not only improves mood but also reduces impulsivity and aggression, which are often heightened in individuals with a history of substance abuse (Jeynes & Gibson, 2017). These findings underscore the potential of targeted micronutrient supplementation to address the physiological and psychological challenges of substance abuse, providing a pathway to improved recovery outcomes.

3.3 Effectiveness of Nutritional Interventions in Mitigating Harm from Substance Abuse

Nutritional interventions have emerged as effective strategies for mitigating the harm caused by substance abuse, with structured dietary programs demonstrating positive outcomes in recovery. Balanced diets rich in proteins, complex carbohydrates, and essential micronutrients help stabilize blood sugar levels, reduce cravings, and enhance overall physical health (Grant et al., 2004). Community-based programs that provide nutrient-dense meals have reported significant improvements in participants' energy levels, mental clarity, and adherence to harm-reduction strategies (Mahboub et al., 2020). For instance, programs incorporating meal replacement plans with fresh fruits, lean protein, and whole grains have shown measurable success in improving recovery outcomes, particularly among individuals recovering from alcohol and stimulant abuse (Grotzkyj-Giorgi, 2009).

Moreover, studies have highlighted the role of targeted supplementation in enhancing treatment adherence and reducing relapse rates. Thiamine supplementation in individuals who abuse alcohol has been shown to prevent severe neurological conditions such as Wernicke's encephalopathy, while folic acid supplementation has addressed anemia commonly observed in opioid users (Thomson & Marshall, 2006; Mahboub et al., 2020). These interventions improve immediate health outcomes and create a foundation for sustained recovery by addressing the underlying nutritional deficiencies that contribute to relapse. The success of these strategies emphasizes the importance of integrating nutritional interventions into substance abuse treatment programs to improve long-term recovery outcomes.

3.4 Barriers to Accessing Nutritional Support

Despite the proven benefits of nutritional interventions, several barriers limit their accessibility for individuals recovering from substance abuse. Socio-economic factors are among the most significant challenges, as individuals from marginalized communities often face food insecurity and limited access to nutritious foods (Grant et al., 2015). Additionally, many recovery programs lack the resources or expertise to provide comprehensive nutritional support, with dietitians and nutritionists often excluded from multidisciplinary treatment teams (Nour et al., 2018). These systemic gaps in care further worsen the health disparities faced by individuals who abuse substances, limiting their ability to address nutritional deficiencies and improve recovery outcomes.

Cultural stigmas surrounding substance abuse also act as barriers, discouraging individuals from seeking comprehensive care that includes nutritional support (Virmani et al., 2006). Furthermore, limited public health funding for addiction services often means that nutrition education and dietary programs are deprioritized in favor of more immediate medical or psychological interventions (Whatnall et al., 2021). Addressing these barriers requires targeted advocacy, increased funding for multidisciplinary recovery programs, and public health campaigns emphasizing the importance of nutrition in addiction recovery. Expanding access to nutritional support is essential for creating equitable and effective recovery systems that meet the needs of all individuals affected by substance abuse.

Table 2: Summary of Findings

Study Reference	Study Design	Population	Objective	Nutritional Focus	Key Findings	Intervention/Approach	Region/Setting	Strengths and Limitations
Jeynes& Gibson (2017).	Narrative Review	Adults recovering from SUDs	To evaluate the importance of nutrition in recovery	Omega-3s, vitamins C & E	Improved mood and reduced oxidative stress in recovery	Nutrition education and supplementation programs	UK	Comprehensive review but lacks clinical trials
Mahboub et al. (2020).	Systematic Review	Drug users in recovery	Assessing eating habits and nutritional status	Macronutrients, antioxidants	Poor dietary patterns linked to delayed recovery outcomes	Community-based dietary programs	Middle East	Small study populations; region-specific focus
Santolaria-Fernández et al. (1995)	Clinical Trial	Chronic alcohol users	Investigating the impact of alcohol on nutritional health	Thiamine, folate, magnesium	Severe deficiencies correlated with neurological damage	Thiamine supplementation trials	Spain	Strong design but limited diversity of population
Virmani et al. (2006)	Cross-Sectional Study	Drug users with metabolic issues	Exploring links between nutrition, drug abuse, and metabolism	Antioxidants, omega-3s	Deficiencies exacerbate metabolic syndrome risks	Antioxidant and fatty acid trials	USA	Solid biochemical data; limited behavioral insights
Grant et al. (2004).	Observational Study	Substance use treatment participants	Examining the impact of nutrition education on treatment	Macronutrients and balanced diets	Nutrition education improved treatment adherence	Structured meal planning	USA	Strong focus on education; limited dietary diversity
Wiss (2019)	Book Chapter	General population	Discussing the role of nutrition in addiction recovery	Broad dietary focus	Nutrition positively impacts physiological recovery	Diet modification and therapy	Global	The theoretical approach lacks empirical data

Study Reference	Study Design	Population	Objective	Nutritional Focus	Key Findings	Intervention/Approach	Region/Setting	Strengths and Limitations
Thomson & Marshall (2006).	Review	Chronic alcohol users	Exploring Wernicke's Encephalopathy and Nutritional Links	Thiamine and other B vitamins	Thiamine deficiency is critical in neurological impairments	Thiamine replacement therapy	UK	Focused on alcohol; limited broader SUD coverage
Nour et al. (2018).	Case Study	Drug addiction recovery patients	Evaluating education and nutrition interventions	Balanced diets, educational programs	Education-enhanced recovery outcomes	Nutrition workshops and support	Egypt	Limited scalability; region-specific context
Whatnall et al. (2021).	Systematic Review	Illicit substance users	Reviewing dietary interventions for SUD recovery	Dietary supplementation	Dietary plans improve physical recovery and adherence	Meal replacement programs	Australia	Strong evidence base; limited cultural diversity
Grotzkyj-Giorgi (2009)	Observational Study	Addiction recovery participants	Assessing the impact of dietary changes on recovery	Whole foods, antioxidant-rich diets	Improved recovery rates linked to balanced diets	Incorporating whole foods in recovery diets	Italy	Early study; limited long-term insights
Miki et al. (2016).	Cohort Study	Japanese employees	Exploring links between dietary fiber and mental health	High-fiber diets	High fiber intake reduced depressive symptoms	Dietary adjustments focusing on fiber	Japan	Focused on mental health; indirect link to SUDs
Grant et al. (2015).	Cross-Sectional Study	SUD populations	Examining DSM-5 alcohol use disorder and nutrition links	General deficiencies	Strong associations between alcohol use and deficiencies	Diagnostic surveys and nutritional screening	USA	Comprehensive population analysis; lacks depth

3.5 Policy Implications

The findings from this study underscore the critical need to integrate nutrition into substance use recovery programs. Policymakers should prioritize the inclusion of nutritionists and dietitians in multidisciplinary recovery teams, ensuring that nutritional support is a standard component of addiction treatment. Recovery programs should also incorporate structured dietary plans tailored to the specific needs of individuals based on the substances they use. For example, alcohol users may require thiamine supplementation to prevent neurological complications, while opioid users may benefit from calcium and vitamin D to address bone density loss.

Community-based initiatives should be scaled up to provide accessible, nutrient-dense food options for individuals undergoing recovery, particularly in marginalized populations where food insecurity is prevalent. Furthermore, funding should be allocated for public health campaigns emphasizing nutrition's importance in addiction recovery, targeting healthcare providers and the public. Education and training programs for addiction specialists should include modules on the role of nutrition, ensuring a holistic approach to recovery.

3.6 Limitations and Future Research

This study has several limitations. First, language bias may have influenced the findings, as only English-language studies were included in the review. This excludes potentially relevant research conducted in other languages. Second, publication bias is another limitation, as studies with significant results are more likely to be published and included in systematic reviews. This could lead to overestimating the effectiveness of nutritional interventions in recovery programs.

Future research should address these limitations by conducting multilingual and inclusive systematic reviews. There is also a pressing need for more qualitative and longitudinal studies to better understand the dynamic relationship between nutrition and recovery. Such studies could explore the lived experiences of individuals in recovery, focusing on how dietary changes impact their physical and psychological well-being over time. Additionally, randomized controlled trials are needed to

evaluate the long-term efficacy of specific nutritional interventions, such as omega-3 supplementation or high-fiber diets, in improving recovery outcomes.

4. Conclusion

This study highlights the profound impact of nutrition on recovery from substance use disorders. Nutritional deficiencies, common among individuals with substance use disorders (SUDs), intensify the physiological and psychological challenges of addiction. Micronutrient supplementation, structured dietary plans, and educational initiatives have proven to be effective harm-reduction strategies that support recovery and reduce the risk of relapse. However, barriers such as food insecurity, lack of awareness, and insufficient integration of nutrition into recovery programs limit the reach and effectiveness of these interventions.

Integrating nutrition into recovery programs is not merely a supplemental strategy but a vital component of holistic addiction treatment. Policymakers and stakeholders must collaborate to develop comprehensive policies that address these gaps, ensuring that individuals in recovery have access to the nutritional support they need. By doing so, recovery programs can improve treatment adherence, reduce relapse rates, and enhance the overall well-being of individuals struggling with substance use disorders.

Disclaimer (Artificial intelligence)

Option 1:

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

Reference

1. Grant, B. F., Goldstein, R. B., Saha, T. D., Chou, S. P., Jung, J., Zhang, H., Pickering, R. P., Ruan, W. J., Smith, S. M., Huang, B., & Hasin, D. S. (2015).

Epidemiology of DSM-5 Alcohol Use Disorder: Results from the National Epidemiologic Survey on Alcohol and Related Conditions III. *JAMA Psychiatry*, 72(8), 757–766. <https://doi.org/10.1001/jamapsychiatry.2015.0584>

2. Grant, L. P., Houghton, B., & Sachan, D. S. (2004). Nutrition education is positively associated with substance abuse treatment program outcomes. *Journal of the American Dietetic Association*, 104(4), 604–610. <https://doi.org/10.1016/j.jada.2004.01.008>
3. Grotzkyj □ Giorgi, M. (2009). Nutrition and addiction—Can dietary changes assist with recovery? *Drugs and Alcohol Today*, 9(2), 24–28. <https://doi.org/10.1108/17459265200900016>
4. Jeynes, K. D., & Gibson, E. L. (2017). The importance of nutrition in aiding recovery from substance use disorders: A review. *Drug and Alcohol Dependence*, 179, 229–239. <https://doi.org/10.1016/j.drugalcdep.2017.07.006>
5. Mahboub, N., Rizk, R., Karavetian, M., & de Vries, N. (2020). Nutritional status and eating habits of people who use drugs and/or are undergoing treatment for recovery: A narrative review. *Nutrition Reviews*, 79(6), 627–635. <https://doi.org/10.1093/nutrit/nuaa095>
6. Miki, T., Eguchi, M., Kurotani, K., Kochi, T., Kuwahara, K., Ito, R., Kimura, Y., Tsuruoka, H., Akter, S., Kashino, I., Kabe, I., Kawakami, N., & Mizoue, T. (2016). Dietary fiber intake and depressive symptoms in Japanese employees: The Furukawa Nutrition and Health Study. *Nutrition (Burbank, Los Angeles County, Calif.)*, 32(5), 584–589. <https://doi.org/10.1016/j.nut.2015.11.014>
7. Martin PR, Singleton CK, Hiller-Sturmhöfel S. The role of thiamine deficiency in alcoholic brain disease. *Alcohol Res Health*. 2003;27(2):134-42. PMID: 15303623; PMCID: PMC6668887.
8. Nour, S. F., Soliman, E. R., Al-Humaidi, S. A., & Abou-Rayan, M. A. (2018). Importance of Education and Nutrition Intervention on Drug Addiction Recovery. *Alexandria Science Exchange Journal*. <https://doi.org/10.21608/asejaiqjsae.2018.21874>
9. Afzal, A., Batool, Z., Sadir, S., Haider, S. (2022). Nutrition and Substance-Use Disorder. In: Mohamed, W., Kobeissy, F. (eds) *Nutrition and Psychiatric Disorders. Nutritional Neurosciences*. Springer, Singapore. https://doi.org/10.1007/978-981-19-5021-6_14
10. Santolaria-Fernández, F. J., Gómez-Sirvent, J. L., González-Reimers, C. E., Batista-López, J. N., Jorge-Hernández, J. A., Rodríguez-Moreno, F., Martínez-Riera, A., & Hernández-García, M. T. (1995). Nutritional assessment of drug addicts. *Drug and Alcohol Dependence*, 38(1), 11–18. [https://doi.org/10.1016/0376-8716\(94\)01088-3](https://doi.org/10.1016/0376-8716(94)01088-3)
11. Thomson, A. D., & Marshall, E. J. (2006). The natural history and pathophysiology of Wernicke’s Encephalopathy and Korsakoff’s Psychosis.

Alcohol and Alcoholism (Oxford, Oxfordshire), 41(2), 151–158.

<https://doi.org/10.1093/alcalc/agh249>

12. Virmani, A., Binienda, Z., Ali, S., & Gaetani, F. (2006). Links between Nutrition, Drug Abuse, and the Metabolic Syndrome. *Annals of the New York Academy of Sciences*, 1074(1), 303–314.
<https://doi.org/10.1196/annals.1369.027>
13. Whatnall, M. C., Skinner, J., Pursey, K., Brain, K., Collins, R., Hutchesson, M. J., & Burrows, T. L. (2021). Efficacy of dietary interventions in individuals with substance use disorders for illicit substances or illicit use of pharmaceutical substances: A systematic review. *Journal of Human Nutrition and Dietetics: The Official Journal of the British Dietetic Association*, 34(6), 981–993. <https://doi.org/10.1111/jhn.12871>
14. Wiss, D. A. (2019). Chapter 2 - The Role of Nutrition in Addiction Recovery: What We Know and What We Don't. In I. Danovitch & L. J. Mooney (Eds.), *The Assessment and Treatment of Addiction* (pp. 21–42). Elsevier.
<https://doi.org/10.1016/B978-0-323-54856-4.00002-X>
15. Chisom, H. I., Beatrice, O., Iyanuoluwa, O. O., & Oluwatoyin, B. (2022). Risk Factors Associated with Substance Abuse among Adolescents. *International Neuropsychiatric Disease Journal*, 18(1), 11–24.
16. John, M. L., Otene, I. J. J., & Antenyi, G. E. (2023). An Overview of Drug Abuse: Causes, Effects, and Control Measures. *Asian Journal of Medicine and Health*, 21(11), 263–268.
17. Hovhannisyan, K., Günther, M., Raffing, R., Wikström, M., Adami, J., & Tønnesen, H. (2019). Compliance with the Very Integrated Program (VIP) for smoking cessation, nutrition, physical activity and comorbidity education among patients in treatment for alcohol and drug addiction. *International Journal of Environmental Research and Public Health*, 16(13), 2285.
18. Parvaz, M. A., Rabin, R. A., Adams, F., & Goldstein, R. Z. (2022). Structural and functional brain recovery in individuals with substance use disorders during abstinence: A review of longitudinal neuroimaging studies. *Drug and alcohol dependence*, 232, 109319.
19. Faleti, D. D., & Adesuyi, O. E. (2016). The Effectiveness of Substance Abuse Management: Perspectives of Nurses in Neuropsychiatric Hospital, Aro, Abeokuta, Ogun State, Nigeria. *International Neuropsychiatric Disease Journal*, 8(2), 1–9.
20. Naren, T., Cook, J., Armstrong, F., & Manger, S. (2022). Lifestyle interventions in the management of substance use disorder. *Australian Journal of General Practice*, 51(8), 560-564.

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