

REVIEW

Assessing the Chemistry and Negative Impacts of Alcoholic and Non-Alcoholic Beverage Consumption in Nigeria: A Public Health and Socioeconomic Perspective

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Received: August 1, 2024;

Accepted: November 8, 2024;

Published: November 13, 2024.

Citation: Eberendu KO, Eze VC, Nlemchukwu BNC, et al. Assessing the Chemistry and Negative Impacts of Alcoholic and Non-Alcoholic Beverage Consumption in Nigeria: A Public Health and Socioeconomic Perspective. *Adv Health Behav*, 2024, 7(1): 302-311. <https://doi.org/10.25082/AHB.2024.01.002>

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Abstract: This review explores the negative impacts of alcoholic and non-alcoholic beverage consumption in Nigeria, focusing on health, socioeconomic, and environmental dimensions. Alcoholic beverages, widely consumed in both urban and rural settings, are linked to significant health challenges such as liver diseases, cardiovascular issues, and mental health disorders, as well as social problems like domestic violence and road traffic accidents. Non-alcoholic drinks, particularly sugary soft drinks and energy drinks, contribute to rising rates of obesity, diabetes, and dental caries, exacerbating the nation's public health burden. Additionally, the unregulated production and distribution of some beverages pose risks of contamination and toxic exposure. Socioeconomic impacts include the strain on healthcare systems and reduced productivity due to alcohol-related absenteeism and illnesses. Furthermore, beverage production contributes to environmental degradation, including water pollution and excessive waste generation from packaging materials. This review highlights the urgent need for comprehensive public health strategies, stricter regulatory policies, and community-level interventions to mitigate the adverse effects of beverage consumption in Nigeria. Future research and policy recommendations should prioritize sustainable practices, consumer education, and improved healthcare responses to address this multifaceted issue.

Keywords: alcoholic beverages, non-alcoholic drinks, public health, socioeconomic impacts, environmental degradation

1 Introduction

Nigeria's cultural, social, and economic landscape is deeply ingrained with the consumption of both alcoholic and non-alcoholic drinks. While alcoholic beverages, like beer, spirits, and locally brewed drinks like burukutu and palm wine, are often essential to traditional ceremonies, social gatherings, and leisure activities, non-alcoholic drinks, like carbonated soft drinks, fruit juices, and energy drinks, are widely consumed by all demographics due to their accessibility and aggressive marketing campaigns. From an economic standpoint, the beverage industry in Nigeria plays a significant role, contributing significantly to GDP through manufacturing, distribution, and sales, and employing millions of people [1]. Both local producers and major international beverage companies have established strong market presences, making the industry highly competitive. However, there are underlying effects of these drinks' broad availability and consumption that call for careful consideration. Notwithstanding the beverage industry's financial advantages, Nigeria's rising alcoholic and non-alcoholic drink consumption has created a number of complex problems. In terms of public health, non-alcoholic beverages with a high sugar content lead to obesity, diabetes, and other non-communicable diseases, while alcoholic beverages are associated with chronic illnesses such as liver disease, cardiovascular disorders, and mental health disorders [2, 3]. Alcohol use has a negative social impact on families and communities since it is frequently linked to crime, domestic violence, and decreased productivity [2, 3]. Nigeria's environmental problems are made worse by the environmental effects of beverage production, which include pollution, excessive water consumption, and problems with waste management from glass and plastic packaging [4]. These related problems show how urgently a thorough analysis of the detrimental effects of the beverage sector on the nation is needed. This study aims to: Examine the public health implications of alcoholic and non-alcoholic drinks in Nigeria; Explore the socioeconomic consequences, including economic costs, social challenges, and regulatory gaps; Investigate the environmental impacts of beverage production, packaging, and waste management and Provide evidence-based recommendations

to mitigate these negative impacts and promote sustainable practices within the industry. This study holds significance for a diverse group of stakeholders. By addressing these issues holistically, this study contributes to the larger goal of achieving a healthier, more equitable, and environmentally conscious society. Healthcare professionals can use the findings to design effective public awareness campaigns and interventions to curb harmful consumption patterns. Environmentalists can use the study to identify critical areas where sustainable practices can be implemented within the beverage industry. Policymakers can use the findings to craft regulations that address public health and environmental concerns without stifling economic growth.

1.1 Chemistry of Alcoholic and Non-Alcoholic Beverages in the human body

This involves their composition, metabolism, and physiological effects. A concise overview is given as follows:

1.1.1 Alcoholic Beverages

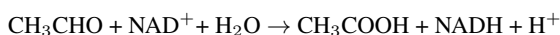
Primary Component: Ethanol (C₂H₅OH)

Ethanol is absorbed into the bloodstream through the stomach and small intestine. It is metabolized in the liver by enzymes. Alcohol dehydrogenase (ADH) converts ethanol into acetaldehyde.



NAD⁺ is Nicotinamide adenine dinucleotide (oxidized form), acts as an electron acceptor.

Aldehyde dehydrogenase (ALDH) converts acetaldehyde into acetic acid, which is further broken down into water and carbon dioxide for energy.



(1) Activation to Acetyl-CoA: CH₃COOH + CoA + ATP → CH₃CO-CoA + AMP + PPi

(2) Oxidation in the Krebs Cycle: 2CO₂ + H₂O + energy (ATP)

Ethanol acts on the central nervous system as a depressant, affecting neurotransmitter activity. Overconsumption can impair motor skills, memory, and judgment. Long-term excessive intake can damage the liver, brain, and other organs.

1.1.2 Non-Alcoholic Beverages

Usually made up of organic acids, water, sugars, caffeine (found in tea and coffee), and additional flavorings. Juices, sodas, teas, and mocktails are a few examples. In the small intestine, sugars (such as glucose and fructose) are absorbed and converted into energy through the citric acid cycle and glycolysis. Coffee and tea contain caffeine, which is processed in the liver and stimulates the central nervous system.

(1) Comparison of the Effects of Alcoholic and Non-alcoholic beverages – Alcoholic drinks mainly affect the nervous system and, if taken in excess, can be harmful. The main benefits of non-alcoholic beverages are hydration and energy, but if they contain excessive amounts of sugar or caffeine, they may cause health problems.

(2) Consumption trends of Beverages in Nigeria – Data on the use of alcoholic and non-alcoholic beverages. Based on current data, the following figures show how much alcohol and non-alcoholic beverages are consumed in Nigeria.

1.1.3 Alcoholic Drinks

Nigeria's alcoholic beverage industry was expected to generate \$31.76 billion in revenue in 2023, and between 2022 and 2025, it was expected to rise at an annual pace of 11.95%. In the first half of 2023, Nigerians spent more than ₦483.1 billion on alcoholic beverages, up from ₦379.2 billion in the same period in 2021. This expense was largely attributed to beer and malt beverages (Bing.com). Due to steady demand, Nigeria's per capita intake of pure alcohol for people 15 and older has increased somewhat in recent years [1, 5].

1.1.4 Non-Alcoholic Drinks

From 2022 to 2026, Nigeria's non-alcoholic beverage market grew at an annual rate of 16.54%, reaching \$34.75 billion in 2023. Fruit juices, malt beverages, and carbonated drinks fall under this group. According to Euromonitor International (2023) [7, 10], companies such as Nestle, who are well-known for brands like Milo and Nescafe, recorded sales of ₦90 billion

in the first half of 2023, up from ₦70.2 billion the year before. Notwithstanding economic obstacles like inflation and levies like the recently imposed sugar tax, these numbers demonstrate the substantial consumption and market growth in Nigeria's beverage industry [1,5].

1.2 Patterns of Alcohol Consumption and Addiction in Nigeria

In Nigeria, patterns of alcohol consumption range greatly by age, socioeconomic status, and geographic location. Because commercial alcoholic beverages are more widely available and marketed in urban areas, consumption rates are typically greater there. In rural areas, traditional alcoholic beverages like burukutu and ogogoro are still widely drunk, frequently in social or communal situations. However, severe episodic consumption and binge drinking are becoming more common, especially among young adults, and they are linked to addiction and associated health issues.

1.3 Popular Types of Beverages Consumed

Nigerians often drink one of two types of beverages: alcoholic or non-alcoholic.

1.3.1 Alcoholic Beverages

Beer: Star, Gulder, and Heineken are well-known brands. Nigeria's alcoholic beverage market is dominated by beer consumption.

Malt-based Alcoholic Drinks: Smirnoff Ice and Orijin, which target younger consumers, are two examples.

Spirits: Vodka, gin, and whisky are also frequently blended with non-alcoholic beverages and are drunk in large quantities.

Local Alcoholic Drinks: Both urban and rural communities traditionally drink burukutu and palm wine.

1.3.2 Non-Alcoholic Beverages

Soft Drinks: Fanta, Pepsi, and Coca-Cola are very well-liked by people of all ages.

Energy Drinks: Consumption of products like Red Bull, Power Horse, and Fearless has increased, particularly among young people.

Malt Drinks: In Nigerian homes, Maltina, Amstel Malta, and Malta Guinness are commonplace.

Fruit Juices: Natural fruit juice, Chivita, and Five Alive are consumed for their health benefits.

Traditional Non-Alcoholic Drinks: Kunu, a beverage made from millet or sorghum, and zobo, or hibiscus tea, are still staples of the native cuisine.

1.4 Public health impacts

1.4.1 Effects on the Body

In Nigeria, both alcoholic and non-alcoholic beverages have significant detrimental effects on the environment, socioeconomics, and health [6]. A complex strategy including business responsibility, community education, and government legislation is needed to address these issues. Nigeria may lessen the negative consequences of beverage consumption and promote a healthier, more sustainable future by placing a higher priority on sustainability and public health.

1.4.2 Alcoholic Drinks

(1) Prevalence of Alcohol-Related Health Conditions – In Nigeria, drinking alcohol is a major contributor to a number of health problems, especially long-term ailments like pancreatitis, liver cirrhosis, and cardiovascular disorders. Anxiety, depression, and alcohol dependence syndrome are among the mental health conditions that have been closely associated with excessive alcohol consumption. Nigeria is among the African nations with a high burden of alcohol-related harm, according to the World Health Organization (WHO), which has identified alcohol as a key contributor to early deaths and disabilities [1].

(2) Effects on Vulnerable Populations – Pregnant women and children are among the vulnerable categories who are more at risk from alcohol use. Peer pressure, aggressive marketing, and

the cultural acceptance of drinking are the main causes of youth alcohol exposure. Long-term addiction, dangerous behaviors, and early initiation of alcohol consumption are all influenced by this. Alcohol use during pregnancy increases the risk of fetal alcohol spectrum disorders (FASDs), which can cause physical, cognitive, and developmental deficits in the unborn child [7]. Furthermore, these public health problems are made worse by the absence of extensive initiatives to raise awareness of the dangers of alcohol.

1.4.3 Non-Alcoholic Drinks

(1) High Sugar Content and Its Link to Obesity, Diabetes, and Other Metabolic Disorders – Non-alcoholic beverages, especially fruit juices, energy drinks, and carbonated soft drinks, are frequently low in nutrients and heavy in sugar. Frequent use of these drinks raises calorie intake, which encourages obesity and associated metabolic diseases. Consumption of sugar-sweetened beverages is very common in Nigeria, particularly among urban people, and is strongly associated with an increase in type 2 diabetes and cardiovascular illnesses [8].

(2) Chemical Additives and Potential Health Risks – In addition to sugar, a lot of non-alcoholic drinks have chemical additives including artificial coloring, taste enhancers, and preservatives that have been linked to a number of health hazards. Concerns regarding possible connections to allergies, hormone abnormalities, and even cancer have been raised by prolonged exposure to some of these chemicals, such as aspartame or specific synthetic colors. In addition, the rising popularity of energy drinks among teenagers and young adults has been connected to negative side effects like insomnia, elevated blood pressure, and heart palpitations because of their high caffeine and stimulant content [9].

1.5 Socioeconomic Impacts

1.5.1 Alcoholic Drinks

(1) Contribution to Crime and Domestic Violence – In Nigeria, there is a clear correlation between higher rates of crime and domestic violence and alcohol use. Alcohol's intoxicating effects frequently cause poor judgment and a lack of self-control, which results in violent and aggressive behavior. Alcohol-fueled domestic violence is a widespread problem, especially in low-income households where alcohol abuse and financial stress coincide. Additionally, alcohol is linked to crimes like sexual assault, drunk driving, and assaults, which adds to the overall cost on society [9].

(2) Economic Costs of Alcohol-Related Health Care and Productivity Loss – Health problems associated with alcohol use have a significant economic cost. Nigeria's already meager health-care resources are strained by the expense of treating illnesses like liver diseases, mental health issues, and injuries sustained in alcohol-related accidents. Additionally, alcohol-related absenteeism, decreased productivity at work, and early mortality all result in financial costs for both individuals and the country. The absence of social safety nets and easily available rehabilitation programs for individuals battling alcoholism exacerbates these financial difficulties [9, 10].

1.5.2 Challenges in Regulating the Alcohol Industry

Nigeria's alcohol sector is difficult to regulate due to a number of factors, such as corruption, the influence of influential industry players, and lax enforcement of current regulations. Regulations pertaining to advertising, especially those that limit the sale of alcohol to minors, are frequently not carried out effectively. Furthermore, attempts to restrict the distribution and consumption of alcohol are made more difficult by the pervasiveness of illegal and unregulated alcohol, such as ogogoro. Because of these regulatory inadequacies, alcohol's detrimental socioeconomic effects continue unchecked [9, 10].

1.5.3 Non-Alcoholic Drinks

(1) Economic Burden of Managing Diet-Related Non-Communicable Diseases (NCDs) – The rising prevalence of diet-related NCDs, such as diabetes, hypertension, and cardiovascular diseases, is largely due to the consumption of non-alcoholic drinks that are high in sugar and artificial additives. For low-income households, the cost of managing chronic diseases can result in financial hardship, forcing families to make trade-offs between healthcare and other essential needs. The economic toll at the national level includes increased healthcare expenditures and productivity losses due to illness and premature death [10].

(2) Marketing Tactics Targeting Low-Income Populations – Beverage businesses frequently use aggressive marketing techniques to target low-income groups, taking advantage of their demand for reasonably priced luxury. Sugary drinks are often marketed as representations

of prosperity, happiness, and modernism, which makes them very tempting to susceptible populations. Despite their detrimental effects on health, these beverages are more widely consumed by lower-income consumers due to price reductions and reduced packing sizes. This exploitation prolongs cycles of poverty and illness and worsens health inequities [9].

1.6 Environmental Impacts

(1) Production Processes - Environmental Degradation from Beverage Production – The production of both alcoholic and non-alcoholic beverages in Nigeria puts a lot of strain on the environment. One major issue is the excessive use of water, which is necessary for manufacturing processes like brewing, distillation, and bottling. This excessive use of water can deplete resources, especially in areas where water is already scarce. Additionally, the production of beverages produces wastewater that contains organic and chemical pollutants that, if not properly treated, can contaminate water bodies and harm aquatic ecosystems. The extraction of raw materials, such as crops used to make alcohol (e.g., maize, sorghum), often results in soil degradation, deforestation, and biodiversity loss. All of these activities together contribute to the environmental degradation associated with the beverage industry [11].

(2) Packaging and Waste - Plastic and Glass Waste from Drink Packaging – In Nigeria, beverage packaging particularly single-use plastics and glass bottles contributes significantly to environmental pollution. Bottle, cap, and wrapper plastic debris frequently finds up in landfills, rivers, and cities, endangering public health and animals. Even while glass bottles can be reused in certain situations, they are usually thrown away incorrectly, which results in litter and an increase in waste. The issue is made worse by the lack of incentives for manufacturers to switch to ecologically friendly packaging options, as many businesses still use materials that are detrimental to the environment. Additional waste problems are caused by the informal and uncontrolled production of traditional beverages, which frequently avoids packaging regulations [11].

1.6.1 Challenges with Recycling Infrastructure in Nigeria

Nigeria still lacks adequate facilities to handle the massive amounts of garbage produced every day from beverage packaging, making its recycling system underdeveloped. The expanding issue cannot be adequately addressed by scavengers and small businesses engaging in informal recycling activities. Attempts to efficiently manage trash related to beverages are made more difficult by inadequate garbage collection systems and a lack of public knowledge regarding recycling [11].

1.6.2 Climate Change

Carbon Footprint of Beverage Manufacturing and Distribution – The transportation of beverages, frequently over long distances from manufacturing hubs to retail points, adds to the industry's carbon footprint, and the production of packaging materials, particularly plastics and glass, involves energy-intensive processes that further increase emissions. Both the production and distribution of alcoholic and non-alcoholic beverages contribute to greenhouse gas (GHG) emissions, which worsen climate change. Energy-intensive processes, such as brewing, distillation, and refrigeration, rely heavily on fossil fuels and release significant amounts of carbon dioxide into the atmosphere [12].

2 Case Studies/Empirical Data

Alcohol consumption is identified as a major risk factor for injuries and non-communicable diseases in Nigeria, which leads to hospitalizations. Additionally, because of increased rates of consumption and dangerous behaviors linked to alcohol use, young adults and men are disproportionately affected.

The relative prevalence of drug misuse in the northern portion of the country was 7.7% for cannabis, 19.9% for alcohol, 2.4% for heroin, 1.1% for cocaine, 0.26% for pethidine, 3.5% for amphetamine, and 8.7% for a variety of vaguely classified psychostimulants. Cannabis was 60.6%, alcohol was 15.6%, heroin was 40.3%, and cocaine was 23.7% in the southern centers. According to Ohaeri and Odejide (1993) [13], the majority of patients were young men from modest socioeconomic backgrounds.

Lasebikan et al. [14] used the AUDIT to examine the prevalence and determinants of harmful or hazardous alcohol use and potential dependency, which is known as a "likely alcohol use disorder" (AUD), in a population sample of 1119 customers of open-air drinking establishments

in Ibadan, Nigeria. The prevalence of likely AUD was 39.5% in the general population and 44.4% in the drinking population. Multivariate analysis revealed that cigarette smoking (OR = 1.81, 95% CI (1.37-2.40)) and living in a rural area (OR = 1.84, 95% CI (1.34-2.53)) were predictive of likely AUD, but Islamic faith was a negative predictor (OR = 0.13, 95% CI (0.06-0.26)). Because of the accompanying health hazards and injuries, the researchers came to the conclusion that drinking in public places has significant implications for public health.

A systematic review and meta-analysis of the effects of soft drink consumption on nutrition and health was conducted by Vartanian et al. [15]. The consumption of soft drinks has emerged as a prominent and contentious public health and policy concern, according to the findings. Soft drinks have been targeted as a way to help reduce the rising prevalence of obesity, especially among youngsters, because many people believe that they are a major contributor to obesity and related health issues.

Ndubuisi et al. [16] conducted a study on Intafact Beverages in Onitsha, Nigeria, focusing on the performance of beverage companies in the country and the sustainability of raw materials. The results indicated that the sustainability of raw material resources seems to have a greater impact on financial viability than on management model viability. Among other recommendations, it was stated that in order for an organization to be financially viable, it must consciously develop sustainable raw material resources that will enable cost and time efficiency in the value chain of its raw material resources through backward integration. Additionally, it was suggested that integrating the organization's value chain can improve the sustainability of raw material resources for manufacturing firms.

2.1 Policy and Regulation

2.1.1 Current Situation

Many federal, state, and municipal government laws, regulations, and regulatory organizations oversee the regulation of alcohol and beverages in Nigeria. These laws cover production, distribution, marketing, use, and taxation. Here is a summary:

2.1.2 Key Laws and Regulations

Liquor Licensing Laws, Standards and Quality Control, Taxation and Customs, Public Health and Safety Laws, and Islamic Law (Northern States of Nigeria)

(1) Licensing and Registration – Producers and Importers, Retailers and Distributors, and Exporters;

(2) Advertising and Marketing Regulations – Advertising Regulatory Council of Nigeria (ARCON), and NAFDAC Guidelines;

(3) Consumer Protection – Consumer Protection Council Act, and NAFDAC;

(4) Enforcement and Challenges – Illicit production and distribution of unregulated alcoholic beverages, Counterfeit products, and non-compliance with standards, and varying enforcement intensity across states;

(5) Recent Trends – To deter excessive consumption, alcoholic beverage excise taxes were raised, increasing support for stronger legislation to control alcohol availability, particularly for minors, and efforts to harmonize state and federal regulations for uniformity.

3 Discussion

3.1 Interconnections between Health, Socioeconomic, and Environmental Impacts

In Nigeria, the effects of alcoholic and non-alcoholic beverages on public health, the economy, and the environment are closely related, with each area affecting and exacerbating the others. For instance, the high rates of alcohol-related illnesses and diet-related non-communicable diseases put a greater financial strain on households and the hospital system, freeing up funds for more urgent requirements. In addition to causing cycles of ill health and decreased economic production, this makes poverty worse. Socioeconomic inequality makes these problems even worse. Both health hazards and environmental issues, such as inadequate waste management systems, disproportionately impact vulnerable groups, who are frequently the focus of aggressive marketing operations. Furthermore, damaged water sources, dirty cities, and higher greenhouse gas emissions all of which contribute to climate change are some of the ways that the environ-

mental damage brought on by beverage production and packaging waste exacerbates public health issues. These interconnected issues emphasize the need for all-encompassing solutions that address the root causes of suffering in all three dimensions. Ignoring one component could lead to a vicious cycle where failures in one area undermine progress in another.

3.2 Global Comparisons

Nigeria may learn a lot from other nations that have dealt with comparable issues in the beverage sector. For example:

(1) **Public Health:** To lower consumption and finance healthcare programs, nations like South Africa have imposed tougher laws on alcohol advertising and raised levies on sugar-filled beverages. Measurable decreases in alcohol-related violence and a move toward healthier beverage choices have resulted from these actions.

(2) **Socioeconomic Impact:** The state's monopoly on the sale of alcohol in Nordic nations guarantees stricter regulation of distribution and consumption while providing funds for public health initiatives. In a similar vein, Mexico's tax on beverages with added sugar has been associated with decreased consumption, especially among lower-income groups.

(3) **Environmental Impact:** European nations have implemented sophisticated recycling programs and extended producer responsibility (EPR) schemes, which mandate that beverage businesses oversee the packaging materials' lifecycle. As a result, recycling rates have grown and plastic waste has drastically decreased.

These instances show how comprehensive laws that are properly implemented can both improve public welfare and lessen the detrimental effects of the beverage business.

3.3 Policy Gaps and Weaknesses

(1) **Existing Policies in Nigeria and Their Limitations:** Nigeria has a number of policies to address the environmental, economical, and public health problems associated with the beverage sector, although many of them are either not fully complete or are not adequately enforced:

(2) **Public Health Policies:** Nigeria has passed legislation to control the sale of alcohol, including requirements for license and age limits, although enforcement is still lax. Furthermore, there is no strong legislation requiring more transparent nutritional labeling to inform customers or addressing the sugar content of non-alcoholic beverages.

(3) **Socioeconomic Policies:** Taxation and other measures to reduce the socioeconomic burden of alcohol and sugary drink use are insufficient. Because alcohol excise taxes are so low, they are less effective at deterring consumption or raising money for public health programs.

(4) **Environmental Policies:** Current waste management regulations are not designed to handle the unique problems associated with trash from beverage packaging. The majority of recycling programs are unofficial and do not have the institutional backing necessary to expand. Furthermore, there is no governmental system in place to hold manufacturers responsible for the packaging's environmental effects.

4 Recommendations

4.1 Public Health Policies

(1) **Strategies for Reducing Harmful Consumption and Promoting Awareness;**

(2) **Increase Taxes on Harmful Beverages:** Introduce higher excise taxes on alcoholic drinks and sugar-sweetened beverages. Revenue generated from these taxes can fund public health campaigns and healthcare initiatives;

(3) **Mandatory Health Warnings:** Require clear and prominent labeling on all alcoholic and non-alcoholic beverage packaging, detailing health risks such as alcohol-related diseases and high sugar content;

(4) **Public Awareness Campaigns:** Launch nationwide education programs to inform the public about the health risks associated with excessive alcohol and sugar consumption. Campaigns should focus on vulnerable groups, including youth, pregnant women, and low-income communities;

(5) **Expand Access to Treatment:** Improve the availability of rehabilitation services for

alcohol addiction and medical support for managing non-communicable diseases related to sugary drinks.

4.2 Socioeconomic Strategies

4.2.1 Economic Incentives for Healthier Alternatives

(1) **Subsidize Healthier Options:** Provide tax incentives or subsidies to manufacturers producing healthier beverage alternatives, such as low-sugar drinks or fortified beverages. This can encourage both production and consumption of healthier options.

(2) **Support Local Entrepreneurs:** Promote local, sustainable beverage producers who use traditional methods and natural ingredients, fostering economic growth while reducing reliance on imported sugary and alcoholic beverages.

4.2.2 Strengthening Regulations on Marketing and Distribution

(1) **Restrict Targeted Marketing:** Ban advertising and promotional campaigns for alcoholic and sugary drinks that target children, adolescents, and low-income groups. Introduce strict penalties for non-compliance.

(2) **Enforce Age Restrictions:** Strengthen the enforcement of age restrictions on alcohol sales through rigorous monitoring of retailers and severe penalties for violations.

(3) **Limit Accessibility:** Introduce zoning laws to regulate the proximity of alcohol outlets to schools, religious centers, and residential areas, reducing the availability of alcohol in vulnerable communities.

4.3 Environmental Solutions

4.3.1 Improving Waste Management and Encouraging Sustainable Packaging

(1) **Invest in Recycling Infrastructure:** Establish more recycling facilities and improve waste collection systems, particularly in urban centers. Develop formal recycling programs to reduce reliance on informal waste collection.

(2) **Promote Reusable Packaging:** Mandate or incentivize beverage producers to adopt reusable or biodegradable packaging materials. For example, encourage the returnable glass bottle model that some breweries already use.

(3) **Implement a Deposit-Refund System:** Introduce a deposit-refund scheme for beverage containers to encourage consumers to return bottles and cans for recycling.

4.3.2 Encouraging Corporate Responsibility in the Beverage Industry

(1) **Extended Producer Responsibility (EPR):** Enforce EPR policies requiring beverage manufacturers to take responsibility for the lifecycle of their packaging, including collection, recycling, and safe disposal.

(2) **Carbon Footprint Reduction:** Encourage beverage companies to adopt energy-efficient production methods and transition to renewable energy sources. Publicly disclose their carbon emissions and reduction targets.

(3) **Collaborative Efforts:** Foster partnerships between the private sector, government, and environmental NGOs to design and implement sustainable waste management and environmental protection programs.

4.4 Call to Action for Stakeholders

4.4.1 Government

(1) Implement and enforce stricter regulations on beverage production, marketing, and consumption.

(2) Increase investments in public health campaigns, waste management infrastructure, and support for sustainable industries.

(3) Collaborate with global organizations to adopt best practices and access technical and financial resources.

4.4.2 Private Sector

(1) Adopt corporate responsibility by prioritizing sustainable production practices, reducing the environmental footprint, and promoting healthier beverage options.

(2) Invest in research and development for alternative packaging solutions and low-sugar products.

(3) Partner with the government and civil society to create awareness and contribute to waste management initiatives.

4.4.3 Civil Society

(1) Advocate for stronger policies and accountability in the beverage industry.

(2) Educate communities on the health risks of excessive alcohol and sugar consumption and promote sustainable consumption practices.

(3) Mobilize grassroots efforts to improve recycling and reduce waste in local environments.

The collective effort of these stakeholders is essential to mitigating the adverse impacts of the beverage industry in Nigeria. By aligning their objectives and working collaboratively, they can create a healthier, more equitable, and environmentally sustainable future for the country.

5 Conclusions

The review emphasizes the various detrimental effects of both alcoholic and non-alcoholic beverages on Nigeria's environment, socioeconomic status, and public health. In terms of health, excessive alcohol use causes addiction, liver problems, and social dysfunction, whereas non-alcoholic drinks' high sugar content and chemical additives fuel metabolic diseases like diabetes and obesity. In terms of society, the cost of treating diseases linked to nutrition and alcohol depletes resources, makes poverty worse, and exacerbates inequality. Public wellbeing is further threatened by the environmental effects of beverage manufacturing and waste, which include pollution, resource depletion, and climate change. These results highlight how interrelated the issues are, with untreated public health emergencies contributing to environmental deterioration and socioeconomic stress, therefore causing harmful cycles. An integrated strategy that strikes a balance between environmental preservation, economic sustainability, and public health is needed to address these problems.

Declarations

Authors' contributions: KOE: initial writing/review, conceptualization/ visualization/ methodology; VCE: writing/ original draft preparation; review/ supervision, editing/data curation; BNCN: investigation/software, methodology/ validation; IEO: visualization, conceptualization/ methodology.

Conflicts of interest

No potential conflict of interest was reported.

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