UTILIZATION OF SOME THEORETICAL MODELS TO COMPREHEND CONSUMPTION OF EMPTY CALORIES

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Abstract

The objective of this paper is to describe the empty calories consumption using the application of some behavior change models (theories). The alarming rise in empty calories consumption, encompassing fast foods, junk foods, and ultra-processed foods, poses a significant threat to global public health. This review synthesizes existing literature on the prevalence, health implications, and determinants of empty calories consumption. Findings reveal a robust link between empty calories intake and various chronic diseases, including obesity, diabetes, cardiovascular disease, and certain cancers. The socio-ecological model (SEM) provides a framework for understanding the multifaceted influences on empty calories consumption, spanning individual, social, community, organizational, and policy levels. Other related theories are equally important in discerning empty calories consumption nowadays. This paper concludes by advocating for a multi-faceted approach to mitigate empty calories consumption, incorporating targeted interventions at individual, community, and policy levels.

Keywords: empty calories, fast foods, health consequences, junk foods, socio-ecological model, ultra-processed foods

1. Introduction

Nowadays, it is worrisome to promulgate that, diet related disorders and diseases are major cause of premature deaths or disabilities around the world. The disorders mostly elicited by duet-related cause that are threatening the world include, heart disease, stroke, cancer, obesity, diabetes, hypertension, dyslipidemia, etc (Lucan et al., 2010). For people to be healthy, they are supposed to be consuming right amounts of foodstuffs consisting of whole grains, vegetables, fruits, and relations, in order to succumb the forces of obesity, overweight, and other nutritional disorders (Lucan et al., 2010), Reedy et al. (2010) showed that, there was excess intake of empty calories far above the recommended dietary allowance, among young people (2-18yeras old) in the United States of America. Lane et al. (2024) conducted a review of about 45 unique analytic studies, and concluded that, empty calories consumption is generally linked to respiratory, mental, gastrointestinal, cardiovascular, and metabolic problems. Fardet et al. (2013) performed

a survey of dietary intake among French populations in the range of 1998-2015, and the results indicate that, decrease in physical activity, diet revegetation in youngsters and adults. There were also observed increase in obesity, overweight, and type 2 diabetes prevalence in French populations (consisting of adults). This trend indicates an unsustainable trend. Vaida (2013) revealed that, sex, economic level, were linked to empty calories intake; likewise, variety, brand, flavor, fast service, and availability are the most driving forces to empty calories in adolescents in Kashmir. Arya & Mishra (2013) in a review show that, empty calories like chips, biscuits, noodles, chocolates, are rampant among adolescents. Whereas, nutrition education and counselling were important to facilitate change. Cherian et al. (2021) assess the awareness of health effects of empty calories (junk foods) in secondary school students in Dehradun, and that, the study related very poor knowledge of effects of empty calories. Roja et al. (2022) in a review paper consider fast food, a form of empty calories as poison, stressing that frequent use of empty calories cause negative impacts on health. Das (2015) reviewed effects of fast foods in children, and outlined that, closeness to fast foods shops, economic status, working mother, quick service, are major links to children increased empty calories consumption. The stated effects include, obesity, dyslipidemia, hypertension, diabetes, and heat disease.

Empty calories are junk, fast, ultra-processed foodstuffs collectively known in the same group because they are unhealthy for human consumption especially when taken in excess. The general name is empty calories. Empty calories are containing excess amounts of sugar, sodium, saturated fats, trans fat, highly calorie dese, highly rich in free sugars, contain much preservatives, and therefore, unhealthy (WHO, 2021). UNICEF (2021) revealed that, people living with obesity or overweight are more susceptible to attack by infectious diseases, a part from non-infectious disease that may be more severe or incurable. UNICEF (2021) made it abundantly clear that, ultra-processed stuffs (so called foods) have a lifelong effects and consequences, increased risk of communicable diseases (such as heart disease, cancers, obesity, diabetes) and in turn increase morbidity and mortality. Many people who consume empty calories are living with psychological and psychosocial effects, like stigma, low self-esteem, depression, poor educational attainment, etc. In 2015 alone, an estimated USD 990 billion were expended annually due to obesity alone (UNICEF, 2021). The modern environment us making it increasingly difficult for many people to get healthy foods, coupled with widespread actions of powerful empty calories industry (such as marketing, branding), globalization (of foods and relations) social media; empty calories are currently more accessible, available, cheaper, and convenient, than ever (UNICEF, 2021). The objective of this paper is to describe the empty calories consumption using the application of some behavior change models (theories).

2. Literature Review and Research Method

Bashar (2025) describes empty calories as “Empty calories (ECs) is a name given to the stuffs such as beverages, that are containing added solid fats, or added sugar, or other harmful substances, but contained very minute nutrients, sometimes they contain nothing in terms of nutrients. Stuffs regarded as empty calories include, cakes, pastries, sodas, cheese, ice creams, pizza, sausages, hot dogs, donuts, etc. Added sugars present in empty calories are syrups or sugars incorporated in foods during processing by the, manufacturers; while solid fats are also types of deliberately added fats that exist as solids at room temperature. There are numerous stuffs that are empty calories and are consumed by people from all age groups, some of the empty calories are listed as follows:

- Candies
- Gums
- White bread, mustard
- Flavored drinks
- Cakes, chocolates, mayonnaise
- Fast foods, junk foods
- Soft drinks
- Alcoholic beverages
- Refined cereals" (Bashar, 2025).

Figure 1. Empty calories beverages or soft drinks; Source: adopted from Bashar, (2025)

Figure 2. Examples of ECs as adopted from Bashar, (2025)

However, the type of research methods applied in writing this manuscript is the literature review, whereby, the topic is tabled and surf was conducted among the sources of information relating to the topic of discussion.

3. Result and Discussion

3.1 Empty Calories

Empty calories are criticized for having too much salt, too much sugar (sweets), too much calories; in turn potentially leading to disorders (Bhagyalakshmi et al., 2022). They are also deficient in useful nutrients such as vitamin A, vitamin K, selenium, fibre, magnesium, folate, vitamin D, omega-3-fatty acid, and docosahexanoic acid, for instance (Mateljan, 2010; Barth et al., 2021). Because body functions require combinations of nutrients, persistent intake of empty calories elicit deficiency disorders. Deficiencies of vitamins B12, B6, and folate are linked to cardiovascular diseases; and diabetes is linked

to deficiency of vitamin E, biotin, magnesium, lipoic acid, and coenzyme Q (Matelja, 2010). Empty calories may cause adverse reactions such as anxiety, irritability, depression, foggy, fatigue, etc. failure of empty calories to have enough micronutrients (such as vitamins B5, B1, B3, B2, and B6, coenzyme Q, Fe, Mg, selenium) make it difficult for the enzymes to process the empty calories, hence the accumulation (obesity, overweight, diabetes may emerge). Thus, the body is faced with crises, namely, lack of micronutrients, excess accumulation of fuels (macronutrients), starving of tissues due to lack of proper metabolism, especially in the case of the brain, and shortage of antioxidants or phytochemicals (Mateljan, 2010). The liver and kidney as major metabolic players will be left with much xenobiotics to dealt with, in turn may poison the key vital organs of the body (Mateljan, 2010).

Empty calories are designated with various names depending on market name or social name or sometimes a certain feature. Fast foods are empty calories lacking nutrients (such as minerals and vitamins, amino acids, and fibre) and are usually prepared and consumed quickly at outlets called fast foods restaurants (Nayak, 2020). Junk foods are empty calories containing substances conferring taste, and are fashionable and convenient stuffs. The junk and fast foods are categorically containing dense amounts of sugars or fats or salt or combinations. Hamish &Angus (2019) defined fast foods as foods that are served readily to consume at fast. The words fast foods and junk foods are utilized interchangeably with empty calories. Ayed et al. (2023) defined junk food as one that is low in useful dietary calories. A stuff that possessed high calories, but contain no fiber, minerals, vitamins, and amino acids. The example of these stuffs include, pizza, soft drinks, burgers, bakery goods, beverages, sugar-sweetened drinks. Meena et al., (2023) reported that, fast food is a kind of food provided by restaurant without much preparation, and distributed to customers in takeaways. These foods or junks are unhealthy because of their low nutrients, and potential to cause obesity.

3.2 Reasons for Empty Calories Popularity

There are several reasons that spur empty calories acceptance and wide range utilization among the public and societies (Islam, 2020). Dynamisms of sensations is a factors causing empty calories to be popular. Aiman (2018) stressed that, empty calories possessed some characteristics that are making them popular. The empty calories are kinds of stuffs that have dynamic sensation in most cases in single items. For instance, one empty calorie stuff will have more than one taste or stimulus combined together to arouse consumers (Aiman, 2018).

Fast nature of empty calories is making them popular. Aiman (2018) disclosed that empty calories are rapidly prepared, consumed, and are easily digested, therefore, people demand for more. Kaur (2017) implicated lack of time, among the causes of increased intake of junk foods (empty calories) among the modern people. Zehra et al. (2018) cited that, the capacity of empty calories to rapidly meltdown inspire the consumers to take more.

Significance stimulation of sensory systems is another fact making empty calories popular nowadays. Empty calories strongly influence our sensory systems such as umami, sweet, sour, and other forms of flavor. The companies materialized the curiosity of humans to consume tasty foods and combined chemicals that arouse human taste system. Through the reward system of the brain, tasty stuffs such as empty calories confer a reward to elicit demand for more, and up-to a time when addiction is established (Aiman, 2018). Peng et al. (2018) disclosed that, humans need food to eat, as the most important

biological urge, in fact all living species need food. The significance of food could not be overemphasized, because all other functions of human body system (characteristics of life) could be lost if there is no nutrition or food (Peng et al., 2018). Zehra et al. (2018) stressed that, empty calories cause a decrease or numbing of usual brain receptors, therefore, demands for more before the usual reward could be alerted (released). Other theory signifies that, empty calories is designed so that consumers can take more of them before being satisfied (Zehra et al., 2018). Moreover, empty calories are designed to contain combination of tastes (stimulus), therefore one food can cause many sensations.

Social learning and peer pressure are among the major factors causing empty calories to be popular or prevalent among populations. Mostly, young people find it fascinating to consume empty calories with their peers or soulmates at events, birthdays dinners, celebrations, parties, homes, schools, and other societal activities (Kaur, 2017). Zehra et al. (2018) showed that, peer pressure correlates with intake of empty calories among young people at school or homes.

Civilization and modernization has been a driving force in empty calories prevalence. Because of contemporary behaviors of humans, married women or relations are losing roles, avoiding cooking due to labor or feminism, people are continuously busy, with no time to sit and cook; in turn turning to the consumption of fast, junk, and processed stuffs called empty calories (Kaur, 2017). Modernization has led to spring-of of peer pressure, television and other media forms, low-cost, and other characteristics that spur intake if empty calories to be more rampant (Kaur, 2017: WHO, 2021).

3.3 Significance of Heathy Diets or Local Foods

Every moment in the biological system requires energy, and having energy is due to proper metabolism, which is also due to proper nutrition (nutrients provided by foods). Metabolism is a series of processes burning energy in the body, but healthy metabolism is supported by healthy nutrition. The opposite of empty calories or unhealthy foods is the healthy foods or local foods or nutrient-rich or nutrient-dense foods, for instance; because they contain substances such as minerals, vitamins, phytochemicals, fiber, carbohydrates, antioxidants, omega-3-fatty acids, and relations, supporting health (Mateljan, 2010). Healthy foods contain about 40,000 phytochemicals that may help in conserving, protecting the body with macronutrients (fats, proteins, carbohydrates) needed for energy, and the required micronutrients (such as vitamins and minerals) for metabolizing fuels (macronutrients), otherwise, the fuels will accumulate and turn effects (Mateljan, 2010).

Healthy diets are mostly sourced from local foods, that are produced from farms through following organic processes and tenets, instead of the harmful ultra-processed stuffs “so called empty calories” Healthy diets are type of diets that provide macronutrients to be consumed in right proportions in order to support energetic and as well physiological needs of the body, and preventing the excess consumption, and as well provide enough micronutrients and hydration needed by the body for proper functioning (Cena & Calder, 2020). Nutrients are substances obtained from foods that provide nourishment to maintain life. The macronutrients provided by healthy diet include, proteins, carbohydrates, and fats; while the micronutrients include, vitamins, and minerals. Macronutrients are for physiological processes for daily functions, and micronutrients are required in minute quantities for normal growth, metabolism, development, and physiological activities (Mateljan, 2010; Mayo Clinic News Network, 2018; Cena & Calder, 2020).

Carbohydrates are compounds renown for containing carbon hydrogen, and oxygen, significantly providing energy for metabolism dealings. Carbohydrates include, cereals (such as corn, millet, rice, sorghum, wheat), roots and tubers (cocoyam, yam, cassava), starchy fruits (such as banana, and plantain), legumes (pigeon pea, pulses-cowpea, African yam bean) (Nnam, n.d.). Proteins possessed nitrogen, carbon, element hydrogen, and element oxygen. Other components may be present in proteins such as sulphur, but examples of proteins include, milk, fish, egg, nuts, etc. Proteins contain amino acids that required to synthesized active biomarkers such as enzymes, hormones, and body structures (Nnam, n.d.). Fats are heterogeneous kinds of substances soluble in organic solvents, but insoluble in inorganic solvents. Fats contain carbon, hydrogen, and oxygen elements. Some other constituents of fats may include phosphorus, and nitrogen. Fats provide much energy to the body, twice the carbohydrates, and are needed for fat soluble vitamins. Fat major sources include, palm oil, oil seeds (such as sesame, groundnut, soybean, melon seed, locust bean seed, pumpkin seed; vegetable oils, meta, etc (Potgieter, 2013). Minerals are elemental entities needed essentially for normal functioning of the body. Macroelements include, calcium, sodium, potassium, magnesium, etc, because they are needed in large amount. Microelements such as iodine, cobalt, iron, zinc, copper, selenium, manganese, molybdenum are required by the body in minute amounts related to their counterparts (Awuchi, 2020). Vitamins are described as certain organic compounds or substances required by the body in order to maintain normal growth and metabolic integrity, but the concentrations of vitamins have to be in very small quantities (amounts). Fats soluble vitamins include, A, E, K, D; and water soluble vitamins include, vitamin C, and as well vitamin B complex (Awuchi, 2020). Water is a fluid regarded as the most dominant in the body, accounting for 60-70%, serving as milieu of all chemical processes observed in the body, and as well participates in maintaining electrolyte balance, digesting foods, excreting waste materials, excreting toxic chemicals, and regulating body's temperature among other things (Awuchi, 2020). Additionally, healthy or local foods provide a wide range of other substances beneficial to the body. Phytochemicals are secondary metabolites produced for purposes other than nutritional or by plants and are consumed by humans (or animals) to protect the body. Phytochemicals include, antioxidants (lycopene for example), tannins, alkaloids, phytates, oxalates, saponins, etc (Lawrence & Worsley, 2007). Verily, nutrients are essential to the running of the human body, lack of nutrients may lead to effects, as revealed in Table 1.

TABLE 1. Some nutrients needed by the body and possible results of poor intake

No	Nutrients	Health use (function)	Possible indication of shortage in the body (consumption)
1	Biotin	Helps the ensure healthy skin, support nerves energy supply	Depression, memory problems, numbness
2	Carotenoids	Help in protection of cells against free radicals, promote lung and eye health, help immune system to function	Alcohol intake, smoking, low consumption of fruits and vegetables
3	Calcium	Help in maintaining healthy and strong bones, support nerve functioning	Numbness of feet and hands, tingling of hands and feet, muscle pain, spasms
4	Cysteine	Protects the cells from free radicals attack, helps in detoxification of heavy metals and chemicals, help in breaking down excess mucous present in the lung	frequent colds

5	Choline	Helps in protecting cell membrane functions, preventing homocysteine accumulation, assists communication of nerve-muscles	Fatigue, insomnia, nerve problems, fat accumulation
6	Copper	Helps in maintaining bones and connective tissues health, help in thyroid gland functions	Blood vessels rupturing, high sugar levels, high amount of cholesterol
7	Dietary fiber	Helps to aid bowel regularity, normal cholesterol and sugar levels, help in satiety, help in promoting weight loss	Constipation, high sugar levels, high cholesterol level, hemorrhoids
8	Flavonoids	Help in aiding to prevent excess inflammation, promote health of blood vessels, help in aiding the activity of vitamin C	Excess swelling after injury, easy bruising, frequent experience of cold, frequent nose bleeding, low intake vegetables and fruits
9	Iodine	Ensure proper thyroid functioning	Depression, goiter, poor academic performance, fatigue
10	Magnesium	Helps in preventing free radicals damage, help in strong bones	Insulin resistance and high sugar levels of the blood, reduced bone mineral density
11	Folic acid	Support cell making, support heart health, aid nerve functions	Depression, irritability, forgetfulness, insomnia, confusion
12	Manganese	Prevent free radical damage, help to keep bones strong and healthy	Insulin resistance, reduced bone mineral density, high blood sugar level
13	Glutamine	Help in maintaining intestinal tract, help in making glutathione, ensure acid-base balance, help in muscle mass maintenance	Intestinal dybiosis, frequent flu or cold
14	Zinc	Help in blood sugar level balance, support smell and taste functions	Frequent cold, depression, poor taste and smell detection
15	Vitamin D	Helps in keeping in bones, strong bones, and prevent inflammation	Thinning bones, frequent fracture, soft bones, bone deformities in kids, lack of exposure to sunlight
16	Vitamin E	Helps the cell against damage due to free radicals, protect skin from excess sunlight	Tingling or loss of arm sensation or hands or legs or feet; digestion problems
17	Vitamin C	Protect the cells against free radical attack, help in absorption iron from plant-based foods	Frequent colds, frequent infection, poor wound healing, lung-based problems
18	Phosphorus	Helps in bone and teeth making, and essential for making energy (production)	Weight loss, weakness, anxiety, increased incidence of hypertension
19	Protein	Helps in making healthy skin, nails, hair, and support functioning of immune system	Irritability, muscular weakness, confusion, diarrhea, heart problem, fatigue
20	Selenium	Protect cells against free radical, needed for making thyroid hormone	Weakness, pain in muscles, hair and skin discoloration, poor academic performance
21	Potassium	Maintain pH balance, lowering the risk of hypertension	Irritability, weakness; chronic diarrhea, confusion

Source: Mateljan (2010)

3.4 Health Consequences of Empty Calories in Humans

There are several consequences of empty calories on humans. Berkley (2023) reported that, empty calories affect physical health, psychological, and behavioral health of consumers. Psychologically, empty calories intake leads to mood swinging, irritability, disruption of normal sleep, and addiction. Sonawane (2024) in a review article derided that empty calories are deficient nutritionally and contain much amount of unhealthy substances (for instance, salt, sugar, saturated or trans fats, chemical preservatives); in turn leading to blood sugar level fluctuations, weakened immunity, heart disease, inflammation, respiratory effect, etc. Sheena (2020) disclosed that empty calories cause chronic illness, poor concentration, constant fatigue, effects on reproductive system, dental effect, and high blood pressure. Rajveer & Monika (2012) lampooned empty calories because they contain high salt, high sugar (such as biscuits, soft drinks, lollies), and high fat (such as pizza, hamburgers, fried chicken, chips). Saturated fats excess intake cause overweight, and obesity; likewise, intake of too much sugary stuffs cause obesity, and diabetes and related comorbidities (Rajveer & Monika, 2012). Empty calories are highly addictive, cause heart diseases, cancer, kidney disease, hypertension, hypoxia, asthma, and behavioral disorders (Rajveer & Monika, 2012). Nayak (2020) reiterated that, empty calories consumption is linked to hypertension, type 2 diabetes, dental caries, dyslipidemia, gastritis, impaired glucose tolerance, and cardiovascular diseases.

3.5 Socioecological Model (SEM)

The invariable effects of environments on food consumption is enormous. UNICEF (2021) stressed that, an unhealthy food environment is a place that has low food accessibility, desirability, affordability, and promotion of availability of unhealthy foodstuffs. Thus, an environment characterized with selling and buying of unhealthy foodstuffs such as empty calories impose the behavior of empty calories consumption on people and onward affects public health nutrition and public health. Berkley (2023) stressed in a study concerning impact of empty calories on children that, socioeconomic factors influence access and intake of empty calories in children and in turn leading to effects such as obesity. Based on study of Lawrence & Worsley (2007), it was disclosed that, public health nutrition, ecological, economic, and related circumstances determine in populations. Thus, the social, cultural has sociologically upstream component, with the belief that public health nutrition is determined by factors (determinants) unequally distributed in populations. Thus, the social, cultural, ecological, economic, and related circumstances determine public health nutrition. In this vein, the problem of nutrition is targeted through an intervention dealing with populations and provide an integrative approach towards dealing with foods problems facing the world and various communities (Lawrence & Worsley, 2007).

SEM is a type of model utilized in health education, public health, and public health nutrition, due to its multiple levels. SEM invariably looks at behavior change through multiple levels by viewing the relationship between man and his environment. In this model, five levels were accepted as elements affecting or influencing behaviors of people. The levels are as follows:

- Intrapersonal factors are characteristics of a person such as beliefs, awareness, self-concepts, and knowledge for instance. The utilization of efficient tool such as health education, advocacy, awareness creation, community participation, etc to elicit people to act positively is important at this level (Marzban & Masoomi, 2022). The interpersonal

factors of nutrition are affected by other aspects of the environment, but individuals can be elicited to take a personal stride aimed at halting empty calories unhealthy foodstuffs. There is involvement of downstream approach whereby, individuals attempt to alter lifestyle to better. An individual can take a wise decision by avoiding empty calories, substituting them with healthy foods, grains, fruits, vegetables, and relations, in a combination strategy. Likewise, an attempt to engage in agriculture by all-manner of people certainly encourage healthy nutrition in populations at large. Biologically, the nutrition of individuals or populations is tampered with by the biological deviations of the human body. Some people are born with diseases such as lactose intolerance, diabetes, iodine deficiency, etc; that problems could be approached through the parents especially, the mothers. Mothers that are well-fed will have babies who are healthy compared to mothers who suffer food insecurity, thus, in order to have better result of childhood nutrition should be improved initially by ensuring that mothers get proper nutrition and avoid empty calories at all cost (Lawrence & Worsley, 2007).

- Interpersonal processes include the social content of the environment inhabited by man, such as peers, family, friends, coworkers, and relations (Simpson, 2015; Marzban & Masoomi, 2022; Peng et al., 2018).
- Institutional or organizational factors are items such as churches, mosques, workplaces, and related social institutions that affect man's behavior. For instance, in Islam it is prohibited to take alcoholic beverages (very dangerous empty calories), therefore if Muslim laws are to be implemented, the consumption of alcoholic drinks empty calories will be decisively dealt with (Murphy et al., 2022). Community factors include the relationships between several organizations or institutions, therewith, issues like ethics, norms, culture, etc may come up (UNICEF, 2024).
- Public policies are policies or regulations related to healthy behaviors.

According to this SEM man's behaviors are affected or influenced by several factors involved at different levels, some factors may sum-up to give a behavior, and some factors may act individually to bring about a behavior change.

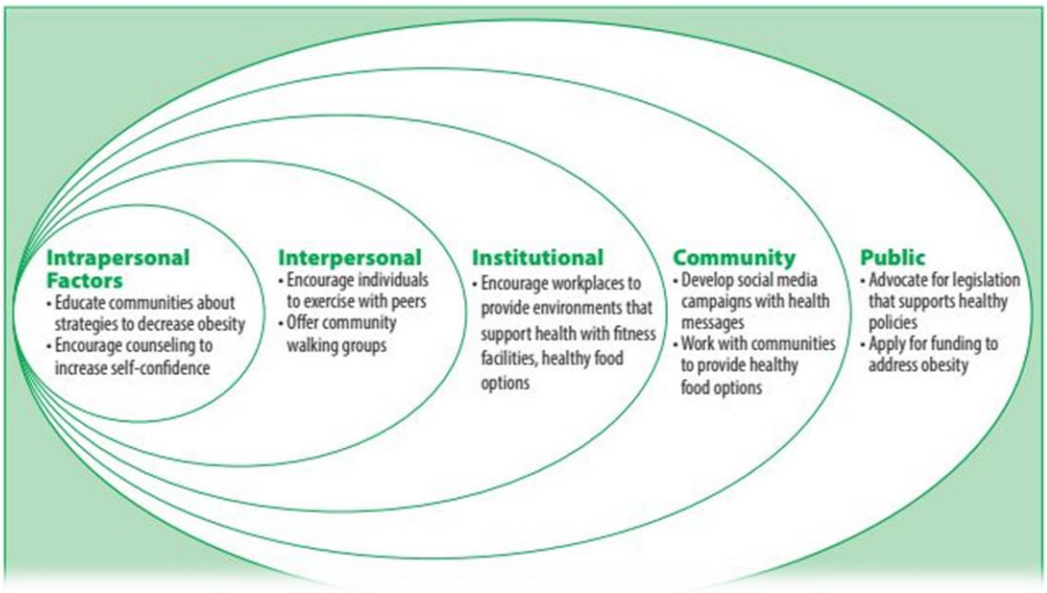

Figure 3. The basic components of SEM; Source: Simpson (2015)

3.6 Health Belief Model (HBM)

A healthy diet is inevitable for human growth and development. Ayed et al. (2023) in a study among children regarding empty calories (junk foods), involving a sample of 100; the study revealed that, a designed program intervention imparting knowledge on the participants and suggested use of informed programs to teach children at schools about the harmful nature of empty calories and ways to abscond them. Aiman (2018) disclosed in a reviewed study that, empty calories (junk foods) are more consumed due to poor knowledge, therefore, stressing the need for health education about healthy eating habits, effects of unhealthy foods. Collador-soler et al. (2023) in a systematic review of nutrition programs in high school students, found that, the programs improve knowledge, improved physical activities, and improved eating behaviors as well. Health belief Model (HBM) is a model considering man's behavior according to major items, namely, perceived susceptibility, perceived severity, perceived benefits, and perceived barriers. Perceived susceptibility describe the belief on whether the man can be affected by a diseases or problem (Glick et al., 2024). A person who think that how will be affected by diabetes as a result of consumption of empty calories is more likely to shun or reduce the intake of these stuffs. The perception could be elicited through education (in a classroom), awareness, social learning, or other means. Perceived severity are beliefs on whether the problem or diseases is severe (serious) or not. Considers the level or extent of severity of the disease. A person who believed the overweight people suffering from diabetes, obesity, cancer or other diet related disorders are suffering seriously are more elicited to change and avoid or halt empty calories at all cost (Simpson, 2015).

Perceived benefits refers to the benefit or importance that a man perceived to get for stopping or engaging in a certain behavior. If a person is made to perceived that consumption of health foods such as fruits, vegetables, whole grains and serials is healthy and beneficial, such as by providing the body with enough and important nutrients needed for growth heath, and development; the person involved may act more likely in a positive direction by halting empty calories and embracing the consumption of heath foods (local or organic or minimally processed food materials) (Mateljan, 2010). Perceived barriers are perceived set of obstacles that can prevent a man from engaging in a certain behavior. A person who believes on three things, viz (1) he can be affected by effects of empty calories such as diabetes, cancer, heart attack (etc); (2) the effects will be severe, (3) there are benefits such as long-life, health, avoiding spending for healthcare (such as in dialysis or seeking for organ transplant), etc will likely act positively to shun empty calories, advocate against empty calories, and impart k knowledge or influence upon others about the effects of empty calories consumption (Bakhtiar et al., 2024). However, cues to action are important in HBM, they are events that elicitor help man to carry out an action. Self-efficacy is the ability of man to engage in a behavior (Jones et al., 2015). Cues to actions are items that support someone in engaging in healthy behaviors of avoiding empty calories and taking healthy foods, usually the local or organic foods. The cues for instance may be a medical or professional advices, media information, family, and friends, among others (Glick et al., 2024).

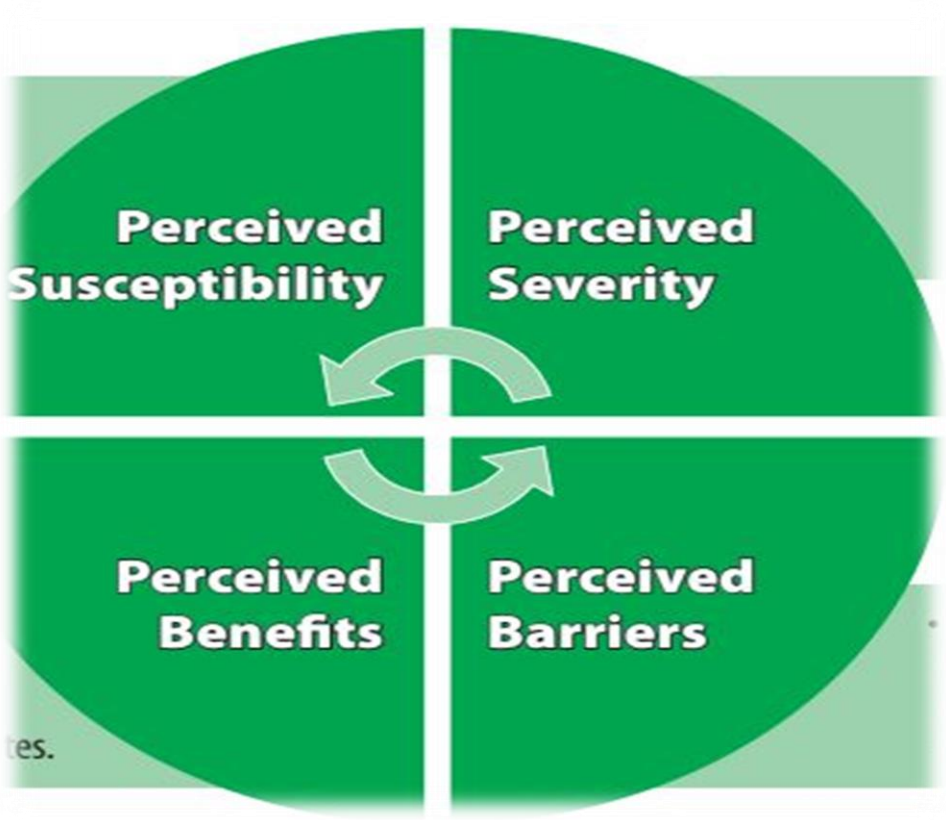

Figure 4. Basis of HBM; Source: Simpson (2015)

3.7 Trans-theoretical Model (TTM)

TTM condoned that changing from one behavior to other by a man occurs through following a plan of processes. The process or steps or stages involved in this model (TTM) are as follows: Figure 4: Basis of HBM; Source: Simpson (2015)

- Pre-contemplation stage- at this point the person possessed no nay intention to carry out a behavior or change initial behavior within the next six months. This stage could be due to poor knowledge or complete absence of awareness. Educating the public or individuals through mean of awareness creation such as formal and non-formal education, community participation, social media, mass media will make a good impact by stimulating the people to have a rethink about dangers of empty calories.
- Contemplation stage-This stage involves a phase whereby the person involved has started to consider changing a behavior in the next coming six months. Awareness or education stimulates the person involved to move to the next positive stage of behavior change (Nakabayashi et al., 2020).
- Preparation stage is a phase whereby the person involved has started to imbibe steps towards carrying-out a change in the next 30days.

Action stage is the phase whereby the behavior change is performed within the six months or something like that.

- Maintenance is a stage whereby continued to carry out the behavior in the six months to come. The TTM may be terminated at this stage or follow a circle (Simpson, 2015: Murphy et al., 2020).

3.8 Modern Nutritional Challenges

Currently, the world is facing several challenges, out of which nutritional problems are among the major concerns. The public health nutrition challenges affecting large number of people are mostly due to malnutrition. Malnutrition refers to lack of rightly needed nutrients to meet the body seed. Malnutrition is cause of poor health and diseases among many people nowadays (Whiteland, 2023). Malnutrition many take forms of undernutrition and over nutrition. Undernutrition is a situation whereby the person involved is taking insufficient energy and nutrients to meet the need of the body; over nutrition is the over-intake of certain nutrients (for example, fats, carbohydrate, and proteins) (Sarkingobir, 2025). Currently, there are about 795 million people malnourished around the world, out of which in every four children are one is malnourished (Mateljan, 2010).

Overnutrition Leads to Diseases

The major cause of overnutrition is poor nutrition, in turn leading to chronic disorders. Overnutrition is a pattern characterized with consumption of excess nutrients or energy needed by the body. The challenge pose by overnutrition is enormous, because it is a great risk that lads to noncommunicable diseases (chronic illnesses) or disorders such as overweight, obesity, type 2 diabetes, cancers, chronic respiratory diseases, and cardiovascular diseases (UNICEF, 2019; Sheena, 2020; Michigan WIC Program, 2022).

Food Insecurity

Food insecurity is a major factor that leads to malnutrition among various populations of the world. Some causes of food insecurity include, the malfunctions of the food system such as food deserts. Food deserts are areas where it is difficult to get access to local foods (healthy foods) within shirt distance. Food deserts healthy food markets or stores or vendors located at very distant areas (points), instead there is preponderance presence of stores that sell obesogenic (unhealthy foodstuffs) to the public. Food insecurity has been described as a multidimensional concept that envisages essential components, namely, food availability, food access, food utilization, and availability. Availability facilitates access, affordability, and utilization of foods. Food availability is the amount of food found in a country or region through internal production, imports, and aid or relations. Access to foods envisages economic, physical, and social courses of obtaining foods. Utilization of foods refers to the way households are getting and preparing foods for consumption, and the utilization of foods by the biological system. Stability component of food security involves the fact that, access, availability and utilization are stable. Factors that impose food insecurity may include, poverty, modernization, unemployment, financial hardship, culture, etc (Michigan WIC Program, 2022).

Rurality Factor

Rural areas describe remote settlements away from the towns. Mostly, rural people may have fields and farms to produce healthy foods, but the issue of the rural areas are that, the inhabitants mostly have poor health literacy (thereby affecting their ability to combine needed food groups, such as fruits, grains, vegetables, etc) and in turn leading to malnutrition. Another effect of rurality is poverty, which may affect the ability of people to buy diverse food groups required for healthy living (Michigan WIC Program, 2022).

Urbanization Factor

Urban people are category of people living in the cities and towns, albeit, the level of urbanity is relative, some urban ara4s are more urban than others. Urban areas face problems of having food deserts (areas with poor availability of stores or markets selling healthy foods to the public), food swamps (areas having congested stores or markets selling obesogenic or empty calories stuffs to the public), expensiveness of healthy food materials; sedentary lifestyles (leading to poor utilization of consumed foods by the body), tight-schedules (hence relying on fast foods), rampant unhealthy foods marketing, and high cost of healthy foods (Michigan WIC Program, 2022).

3.9 Strategies to Improve Ecological (Environmental) Food Problems

The context of the environment where every person dwell greatly affects food security or food consumption, therefore is not lightly. Some of the strategies to help in increasing access to healthy food are as follows:

Urban Agriculture

Often rural areas are settlements set-out for agricultural purposes. Mostly, the rural areas may be having agricultural (farming, grazing, fishing, hunting) as the basic sources of survival. But, urban areas engage in industrial activities and educational activities. Mostly, urban areas relied on rural areas for foods and other materials of trade (raw materials). Urban areas may not have conditions for framing (such as good soil, water, workers, manure, etc) because they have traversed evolutionary course leading to expiation of conditions suitable for farming (Borges, & Mathiesen, 2024). Urban agriculture is a strategy that involves all methods of embracing farming in urban areas. For instance, schools, churches, and other organizations are encouraged to reserved and farm spaces in their organizations. Other initiatives include attempts that proliferate stagnant farmers markets, mobile farmers markets, to increase access to healthy foods production. Other initiatives in towns include community garden (a public garden for food supply) (Abera et al., 2017; Maulana et al., 2023). Raised-bed agriculture uplifts the ground bed above the ordinary contaminated soil. Aeroponics involves growing plants in air or mist system. Aquaponics involves growing fish and plants in an integrated fashion. Hydroponics are controlled methods of growing plants in sand or gravel (or float) in a nutrient-laden water. Vertical farming involves growing crops in controlled indoor avenue like shipping containers, warehouses, spare rooms in a home; therewith, light, temperature, and nutrients are monitored (controlled) (Abera et al., 2017; Priney et al., 2022; Maulana et al., 2023: Vitalyst Health Foundation, 2024).

Livestock Farming

Livestock framing is system or strategy of keeping and harvesting domesticated (or semi domesticated) animals for foods, provision of income, provision of raw materials for industrial purposes (Saini et al., 2018). The animals that can be kept include, horses, camels, goats, cattle, rabbit, sheep, ducks. The animal keeping provide income to upgrade standard of living of many, especially women, and peasants; and as well provide better sources of foods such as milk, meat, and eggs. The strategy of animal keeping can be materialized into two different forms, namely, nomadic grazing, and domesticated methods. Domestication involves keeping the animals at home or warehouse. While, nomadic grazing involves keeping the animals through shuttling from one bush or grass area to another allowing the animals to feed on vast pasture and other green plants (Oyelani et al., 2017; Koroma et al., 2022).

Crops farming

Normally, agriculture has been a major sector of human development hat is inevitable and needs to be maintain sustainably for human sustainable future. Crop farming, a form of agriculture ensures provision of sufficient, harmless, and nutritious foods to support human life, and sustain other organism on earth. Agriculture provides job, industrial resources, environmental protection, and source of economic gains to humans all over the universe (United States Department of Agriculture, 2015). Humans over the years have invented methods and strategies to farm crops. Shifting cultivation or bush fallowing involves cultivating a land for a number of years, and ultimately allowing the land a respite to regenerate nutrients, controlled grazing is a system done to prevent overgrazing by ensuring that all animals grazing in a land are not overwhelming the capacity of the land (Bashar, 2025). Cover cropping is a system of planting cover drops such as legumes, potatoes; along with crops that stay for long before harvesting (such as rubber, coffee, oil palm). The cover crops yield food and protection to the soil environment. Afforestation is a process of planting forest tress in a given lad; therewith, the plants planted provide environmental benefits, and provide food crops for preventing food insecurity. Irrigation farming is an oldest method of framing characterized with supplying water to crops through human aid, such as basin irrigation, canal irrigation, well irrigation, tank irrigation, etc. Intercropping is a strategy of planting pants that can be harvested over long period and those that can be harvested over short period in the same rows (Chidanandan et al., 2021). However, crop farming may be importantly categorized into two forms, namely, subsistence and intensive (commercial or extensive) agriculture. In subsistence farming, usually, household (s) or small group of people carry out the farming activities largely for the purpose of feeding the family. This system is mostly done during rainy reason, in small land, with crude instruments and may have low yield; but it certainly provides employment, raise economic status, and yield healthy food to families and to the world. The intensive or extensive farming is practiced in large land, money-demanding, require large workforce, profit-oriented, mostly done all-over the year, and applied modern tools or implements (Priney, 2022; Baa-Poku et al., 2020).

Diffusion of Innovation

According to “Diffusion of Innovation Theory (DIT)” there are4 stages needed to be followed in order to facilitate the transfer of gainful information from one place to other. It is important to pay much attention to disseminate innovative and healthy methods of providing and consuming foods through the utilization of social media. The stages relevant to disseminate healthy eating tips according to DIT include, knowledge (understanding), persuasion (inciting a positive attitude), decision (considering the benefits of changing to the better), implementation (carrying out healthy tips such as avoiding empty calories, embracing urban farming strategies, utilization of traditional farming methods), and as well as confirmation (reinforcement of beneficial or positive outcomes evolving from implementation) (Raingruber, 2010; Abdel Rahman, 2024).

4. Conclusion

The objective of this paper is to describe the empty calories consumption using the application of some behavior change models (theories). The consumption of empty calories, including fast foods, junk foods, and ultra-processed foods, has become a significant public health concern globally. This paper reviews the literature on the

prevalence, health consequences, and factors influencing the consumption of empty calories. The findings indicate that empty calories consumption is linked to various health problems, including obesity, diabetes, heart disease, and certain types of cancer. The socio-ecological model (SEM) is used to explain the multiple levels of influence on empty calories consumption, including intrapersonal, interpersonal, community, organizational, and policy factors. Other models are equally applicable in understanding empty calories consumption in nowadays societies. The paper concludes by emphasizing the need for a comprehensive approach to address the issue of empty calories consumption, involving individual, community, and policy-level interventions.

5. Recommendations

The public should be informed to imbibe the behavior of consuming healthy foods, and additionally engaging in small-scale framing to enrich food systems with healthy foods instead of the unhealthy stuffs.

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References

Abdel Rahman, B. (2024). The impact of religious texts (Quran and Sunnah) in building learners abilities-intermediate education as a model. *AL-MEYAR*, *2*(15), 1-16.

Abera, A., Tadesse, G., & Belayneh, M. (2017). Practices, roles and challenges of urban agriculture in South Western part of Ethiopia: The case of Bedelle Town. *International Journal of Scientific and Research Publications*, *7*(5), 610-617.

Aiman, Z., Farah, S., & Iqra, B. (2018). Junk food and associated health hazards. *International Journal of advance Research in Science and Engineering*, *7*(4), 975-980.

Arya, G. & Mishra, S. (2013). Effects of junk food and beverages on adolescents health- a review article. *IOSR Journal of Nursing and Health Science*, 1(6), 26-32.

Awuchi, C.G. (2020). Health benefits of micronutrients (vitamins and minerals) and their associated deficiency diseases: a systematic review. *International Journal of Food Sciences*, *3*(1), 1-32.

Ayed, M.M.A., Atia, R.R.A., Abu-Almakarem, A.S., Alagamy, Z.G.A., Gomaa, A., El-Sheihk DY., & Muhammad YA. (2023). Effect of designed nursing program regarding junk food on school-age children's awareness and their growth. *Egyptian Journal of Health Care*, *14*(2), 26-42.

Baa-Poku, F., Ayivor, J.S., & Ofori, B.D. (2020). Changing agricultural practices and indigenous crops in the upper Afram Basin of Ghana. *Ghana Journal of Agriculture*, *55*(10, 65-74.

Bakhtiar, H.S., Nasir, S., & Thaha, R.M. (2024). The health belief model on fast food consumption. *International Journal of Chemical and Biochemical Sciences*, *25*(14), 214-219.

Barth, M.M., Bell, R.A., & Grimmer, K. (2021). Public health nutrition. Rural, urban, and global community-based practice. Springer Publishing Company, LLC, United States of America.

Bashar, T.A.(2025). Reversing the Tide of Empty Calories: Lessons from Local Food Systems in Gwadabawa *Ribat. Kashf Joyrnal of Multidisciplainary Resaerch, 2*(2), 40-54.

Berkley, M. (2023). The impact of children consuming junk food: A detailed analysis. *Journal of Childhood Obesity*, *8*(15), 015-016.

Bhagyalakshmi, U., Kumar, A. & Kumari A. (2022). Factors associated with frequent consumption of fast food and its effect on health among fast food venders and school or college going teenage consumers with a view to develop an informational booklet. *International Journal of Medical Research: K Interdisciplinary, 20*(8), 1-5.

Borges, L.A. & Mathiesen, H. (2024). Urban agriculture for a resilient future.

Cena, H. & Calder, PC. (2020). Defining a healthy diet: Evidence for the role of contemporary dietary patterns in health and disease. *Nutrients*, *12*(3340), 1-15.

Cherian, B., Chaudhary, P., & Raudhawa, R. (2021). A study to assess the level of knowledge regarding health hazards related to junk food consumption among higher secondary school students, SGRRR Public school, Patel Nagar. Dehradun. *International Journal of Research Culture Society*, *5*(11), 97-100.

Chidananda, S., Keshava, N., Kavya, D.S., & Banu, S.I. (2021). Documentation of traditional agricultural practices with some scientific relevances in selected villages of Chitradurga district Karnataka India. *International journal of Creative Research Thoughts*, *9*(2), 2318-2342.

Collado-soler, R., Alferez,-Pastor, M., Trigueros, R. & Aguillar-Parra, J.(2023). A systematic review of the effects of nutrition programs in high schools. *Revista Latinoamerican de psicologia,* 55, 169-182.

Das, J.C. (2015). Fast food consumption in children: A review. *Medical and Clinical Reviews*, *1*(1), 1-4.

Fardet, A., Thivel, D., Gerband, L. & Rock, E. (2021). A sustainable and global health perspective of the dietary pattern of French population dietary pattern of 2015 period from INCA surveys. *Sustainability*, *13*(7433), 1-13.

Glick, A.A., Winham D, M., Hier, M.M., Mack, C.S.I.I, & Hutchins, AM. (2024). Health belief model predicts likelihood of eating nutrient-rich foods among US adults. *Nutrients*, *16*(2335), 1-13.

Hamish, M. & Angus, C. (2019). Evaluation of fast foods consumption among children and teenagers. *IAA Journal of Scientific Research*, *5*(1), 6-113.

Islam, S. (2020). The impact of fast food on our life: A study on food habits of Bangladesh people. *Global Journal of Medical Research: K interdisciplinary*, *20*(8), 1-5.

Jones, C.L., Jensen, J.D., Scherr, C.L., Brwon, N.R., Chisty, K, & Weaver, J. (2015). The health belief model as an explanatory framework in communication research: Exploring parallel, serial, and moderated mediation. *Health Communication*, *30*(60), 566-576.

Kaur, (2017). Effect of fast foods on human health. *International Journal of Science and Technology and Management*, *6*(30), 163-165.

Koroma, S.M., Boyle-Remer, A., Bandable, T., Samuel, FK., & Yillah D.S. (2022). Livestock systems and forage resources of small ruminant farms in some selected districts in Sierra Leone. *International Journal of Environment Agriculture and Biotechnology*, *7*(60), 76-83.

Lane, M., Gamagr, E., On, S., Ashtrrr, D.N. et al., (2024). Ultra processed food exposure and adverse health outcomes. Umbrella Review of Epidemiological Meta-analysis. *BMJ*, *384*(077310), 1-16.

Lawrence M. & Worsley, T. (2007). Public health nutrition from principles to practice. https://doi.org/10.4324/9781003116929.

Lucan, S.C., Karpyn, A., & Sherma, S. (2010). Storing empty calories and chronic disease risk: snack-food products, nutritive content, and manufacturers in Philadelphia corner stores. *Journal of Urban Health*, *87*(3), 394-409.

Marzban A. & Mesoomi S. (2024). Socioecological factors related to eating behavior and obesity in students. *Journal of Nutrition and Food Security*, *7*(1), 1-3.

Mateljan, G. (2010). Healthy weight loss without dieting.

Maulana, INH., Pratama AHS., Sukurdi, Nurhayati H., Putri DA., Wardah TF. (2023). Understanding urban farming as food security for community resilience: A study in Malang City. *Ecoplan*, *6*(2), 130-144.

Mayo Clinic News Network (2018). Does your diet contain empty calories? https://medical xpress.com/news/2018-oi-diet-calorirs.c.im/

Meena, P., Nath, F. & David, F.J. (2023). Hazards of junk foods among adolescents. International *Journal of Trend in Scientific Research and Development*, *7*(1), 115-119.

Michigan WIC Program (2022). Nutrition education. Staff training basic nutrition module. www.michigan,gov/.

Murphy, M., Contreras-urbina, I.R., Spearing M., & Swaine, A. (2022). Socioelogical framework for drivers of conflict and post-conflict violence against women and girls. *Violence Against Women*, *0*(0), 1-22.

Nakabayashi J., Melo, GR., & Toral N. (2020). Transtheoretical Model-based nutritional interventions in adolescents; A systematic review. *BMC Public Health*, *20*(1543), 1-14.

Nayak, R.K. (2020). Pattern of fast or junk food consumption song medical students of north Karnataka - a cross-sectional study. *Intentional Journal of Community Medicine and Public Health*, *7*(5), 1839-1842

Nnam, M.N.(n.d.). Adequate nutrition for good health-is our environment nutrition friendly? A paper presented at an Inaugural Lecture at University of Nigeria, Nsukka.

Oyelani, B.A., Eniola, O., Osiicabor, B., Abegunrin, O.O., Ogunwale OGG., & Adeyanju, O. (2017). Assessment of rural dwellers involvement in livestock farming as a means of livelihood in Afijio Local Government Area of Oyo State, *Nigerian Journal of Animal Production*, *44*(2), 68-78.

Peng, W., Dermini, S., & Berry, E.M. (2018). Coping with food insecurity using sociotype ecological framework. *Frontiers in Nutrition*, *5*(107), 1-10.

Potgieter, S. (2013). Sport nutrition: a review of the latest guidelines for exercise and sport nutrition from the American College of Sport Nutrition, the International Olympic Committee and the International Society for Sports and Nutrition. *South African Journal of Clinical Nutrition*, *26*(1), 6-16.

Priney, D. (2022). A comparative study of modern and traditional agricultural system in India. *International Journal of Novel Research and Development*, *7*(8),830-834.

Raingruber, B. (2010). Health promotion theories. Joes and Barlette Learning, LLC.

Rajveer, B. & Monika O. (2012). Junk food impact on health. *Journal of drug Delivery and Therapeutics*, *2*(3), 67-73.

Reedy, J., Susan, M., & Krebs-Smith, (2010). Dietary sources of energy, solid fats, and added sugars among children and adolescents in the United States. *Journal of the American Dietetic association*, 110, 14777-1484.

Roja, L.D., Ngamellesh, CS., & Navyashri, C. (2022). Fast food: Slow poison. *International Journal of Trend in Scientific Research and Development*, *6*(5), 214-218.

Saini, K.P.S., Roy, B., Goutan, V.N., Thakur, D., Yadav, D.S., & Parihar SS. I. (2018). Organic livestock farming. *Journal of Entomology and Zoology Studies*, *6*(2), 199-207.

Sarkingobir, Y. (2025). Perception: Food challenges, other factors hinder students of rural areas in some Sokoto North-eastern local government areas from proceeding to higher institutions. *Journal Plus Education*, *XXXVII*(1), 396-407.

Sheena, (2020). Harmful impact of junk food on teenager's health in Haryana. *Journal of Emerging Technologies and Innovation Research*,*7*(9),496-503.

Sonawane, U. (2024). A study on the impact of fast food on human health and to promote healthy eating habits. *International Journal of Creative Research Thoughts*, *12*(6), a577-a580.

UNICEF (2019). The state of the worlds children 2019. Children, food and nutrition: Growing well in a changing world. UNICEF, New York.

UNICEF (2021). Marketing of unhealthy foods and non-alcoholic beverages to children.

UNICEF (2024). Brief on the social ecological model.

United States Department of Agriculture (2015). What are empty calories. Choose.Myplate.ov.

Vaida, N. (2013). Prevalence of fast food intake among urban adolescents students. *The International Journal of Engineering and Science*, *2*(1),353-359.

Vitalyts Health Foundation (2024). Urban farming. An introduction ton urban farming, from types and benefits to strategies and regulations.

Whiteland, L. (2023). The harmful effects of serving processed food at schools. California State University.

Zehra, A., Shafiq, F. & Bashir, I. (2018). Junk food and associated health hazards. *International Journal of Advance Research in Science and Engineering*, *7*(4),975-980.