**Effects of processed food consumption on obesity**

**Abstract**

The increasing consumption of processed foods, including snacks, confectionery, and sugar-sweetened beverages, has contributed significantly to rising obesity rates and associated health risks. This review examines the impact of food processing on dietary patterns, nutritional quality, and health outcomes, with a focus on obesity and related non-communicable diseases in the Indian context. Processed and ultra-processed foods, characterized by high sugar, unhealthy fats, and low fiber content, are widely consumed in India, influencing dietary habits and increasing risks of cardiovascular diseases, type 2 diabetes, and obesity. Epidemiological data indicate a rising prevalence of obesity in urban areas, with an increase in overweight and obesity rates among women of reproductive age. Dairy consumption, while nutritionally rich, also plays a role in weight gain due to its calorie density and fat content. Additionally, the growing preference for high-calorie snacks and beverages exacerbates obesity risks, particularly among younger populations. This paper also explores the association between dietary patterns and metabolic disorders, highlighting studies that demonstrate a link between processed food intake and increased energy consumption, insulin resistance, and metabolic dysregulation. Furthermore, the concept of food addiction and its contribution to obesity is discussed, emphasizing the role of highly palatable, processed foods in reinforcing overeating behaviors. Addressing these dietary concerns requires effective public health strategies, consumer awareness, and policy interventions to promote healthier eating habits and mitigate the adverse health effects of processed food consumption in India.

**Keywords:** obesity, processed food, public health, snacks, dairy and beverages

**Introduction**

Nearly all foods undergo some form of processing, even if it is merely for preservation purposes. Consequently, it is not particularly constructive to label foods as 'processed.' To elaborate on this idea, various classifications of food have been developed that specifically focus on the different types of processing involved[32]. At present, our society consumes processed food and non-processed food/ minimally processed food. For example, minimally processed foods retain most of their natural state and nutritional value, typically undergoing processes like washing, freezing, or fermentation. In contrast, ultra-processed or processed foods are industrial formulations loaded with additives, preservatives, and artificial ingredients. This difference in processing is evident in consumer behavior; indeed, India consumes a high quantity of snacks, confectionery, beverages, sweets, and dairy products[24]. Just as important is the fact that each of this category contains high level of sugar, unhealthy fats, refined carbohydrates, and preservatives. These dietary patterns have serious health implication like obesity and overweight, which are measured by BMI(Body Mass Index), if BMI ≥ 25Kg/m², it indicates overweight and if BMI is ≥ 30Kg/m², it indicates obesity. Supporting these concerns, according to research and survey covered by National Family Health Survey(NFHS), data analysis shows that, there is 13.6% increasement in cases in men and 11.6% increasement in cases in women and 25% of India population is caused by obesity[3]. Categories like snacks, confectionery, beverages, sweets, and dairy products are highly consumed in India. Reflecting market dynamics, The Compound Annual Growth Rate(CAGR) of India 2023 was 8.94%, reflecting the growth of market[2]. Moreover, these consumption habits are linked with serious health risks, with increased risks of cardiovascular diseases, type 2 diabetes, and certain cancers. Notably, 41% of body mass index-related deaths and 34% of related disability-adjusted life-years are attributed to cardiovascular conditions among obese individuals[20]. Looking area wise, Urban areas exhibit higher obesity rates compared to rural regions, with the disparity widening from 13.0% to 14.6% over a decade. Additionally, the prevalence of overweight and obesity among women of reproductive age increased from 23% in 2005–06 to 33% in 2019–21[41].

Processed foods are generally characterized by high caloric density, elevated levels of added sugars and unhealthy fats, and a low fiber content, all of which contribute to increased energy intake and weight gain. Such foods are significant part of many diets and studies have shown that ultra-processed foods contribute to 50%–60% of total daily energy intake in many high-income countries, a factor directly linked to rising obesity rates. In light of these findings, the low fiber content in ultra-processed foods can lead to reduced satiety, prompting overconsumption and further contributing to obesity[11].

A study by[26] found that people consuming ultra-processed based food consumed approximately 500 more calories/day than those on unprocessed food, leading to significant weight gain over a two-week period. Moreover, the low fiber content and high palatability of these foods may reduce satiety, prompting overeating. Additionally, the rapid digestibility of processed foods can cause a rise in blood glucose and insulin levels, potentially resulting in insulin resistance and metabolic dysregulation[26]. All these factors leading to an obesity, to overcome these problems, it is necessary to understand the impact of this dietary patterns for developing effective public health strategies and relate noncommunicable diseases in Indian contest.

**Dairy consumption and overweight**

Dairy products are not only high in calories but also provide essential nutrients like protein, vitamins, and calcium. Their combination of fats and sugars provides high calories on consumption. Dairy products include:

Table 1 Dairy products

|  |  |
| --- | --- |
| **Classification of product** | **Examples of product** |
| **Milk** | Milk, scalded milk, condensed milk, evaporated milk, baked milk, malai, powdered milk, khoa, infant formula, whey, butter milk, milk skin |
| **Cream** | Single cream, double cream, whipped cream, clotted cream, kaymak, sour cream |
| **Butter** | Butter, ghee, anhydrous milkfat (clarified butter) |
| **Fermented** | Soured milk, soured cream, cultured buttermilk, clabber, viili, kefir, kumis |
| **Yogurt** | Yogurt, lassi, acidophiline, matzoon, strained yogurt, doogh, leben |
| **cheese** | Cheese, rennet coagulated cheese (blue cheese, brined cheese, washed rind cheese), sour milk cheese (fresh cheese, paneer, cream cheese) |
| **Whey cheese** | Ricotta, brown cheese |
| **Custard** | Custard, imitation custard |
| **Frozen** | Ice cream, gelato, ice milk, frozen custard, frozen yogurt |
| **Casein** | casein |

India comes under medium-consumption countries, which consumers 30 kilograms (66 lb.) to 150 kg per capita per year. Whereas countries like Argentina, Australia, Israel, Canada consume more than 150kg per capita per year[1]. In 2024, the domestic consumption of India reached over 210 million tons, which is increased by 3 million metric tons from precious year (Minhas, domestic consumption of milk india 2019-2024, 2025) (table 1).

A survey was conducted in November 2023( they covered 222 districts in India and over 10,735 respondents are recorded) regarding consumption of sweets, according to survey, respondents consume them one to twice a month, wherein 8% of them consume daily[30,31].

**Nutrient content of dairy**

Table 2 Nutrient content of dairy product, highly used in India

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **S no.** | **Name of product** | **Energy**  **(kcal)** | **Protein**  **(g)** | **Carbohydrates**  **(g)** | **Sugars**  **(g)** | **Fat**  **(g)** | **Saturated fat (g)** | **Calcium**  **(mg)** | **Sodium**  **(mg)** |
| **1.** | Whole milk | 63 | 3.4 | 4.6 | 4.6 | 3.6 | 2.3 | 120 | 42 |
| **2.** | Malai | 250 | 2 | 3 | 0 | 25 | 15 | 50 | 40 |
| **3.** | Khoa (mawa) | 450 | 18 | 25 | 0 | 30 | 19 | 700 | 100 |
| **4.** | Butter milk | 40 | 3.3 | 4.8 | 4.8 | 0.9 | 0.5 | 116 | 105 |
| **5.** | Whey | 27 | 0.9 | 5.1 | 5.1 | 0.3 | 0.2 | 47 | 55 |
| **6.** | Single cream | 195 | 2.6 | 3.0 | 3.0 | 19.1 | 12.2 | 70 | 30 |
| **7.** | Double cream | 445 | 1.6 | 1.6 | 1.6 | 48 | 30 | 50 | 25 |
| **8.** | Butter | 740 | 0.5 | 0.8 | 0.6 | 82 | 51 | 24 | 11 |
| **9.** | Ghee | 900 | 0 | 0 |  | 100 | 62 | 4 | 2 |
| **10.** | Cultured butter milk | 40 | 3.3 | 4.8 | 4.8 | 0.9 | 0.5 | 116 |  |
| **11.** | Yogurt | 61 | 3.5 | 4.7 | 4.7 | 3.3 | 2.1 | 121 | 46 |
| **12.** | Lassi | 75 | 3.1 | 10.5 | 10.5 | 2.0 | 1.3 | 100 | 50 |
| **13.** | Cheese | 403 | 24.9 | 1.3 | 0.5 | 33.1 | 21.1 | 721 | 621 |
| **14.** | Paneer | 265 | 18.9 | 1.2 | 1.2 | 20.8 | 13.1 | 480 | 22 |
| **15.** | Cream cheese | 342 | 5.99 | 4.1 | 3.8 | 34.2 | 20.2 | 97 | 321 |
| **16.** | Brown cheese | 466 | 10 | 35 | 35 | 32 | 21 | 500 | 800 |
| **17.** | Custard | 105 | 3.5 | 15.5 | 13 | 3 | 1.5 | 130 | 60 |
| **18.** | Ice cream(vanilla) | 207 | 3.5 | 23.6 | 21.2 | 11 | 6.8 | 128 | 50 |
| **19.** | Ice milk | 130 | 4 | 22 | 20 | 3 | 1.8 | 140 | 60 |
| **20.** | Casein | 352 | 85 |  |  |  |  |  |  |

Source of calcium is a key factor to define dairy products like milk, yoghurt, cheese etc ( not including butter)(U.S. Department of Health and Human Services and U.S. Department of Agriculture, 2015). Above mentioned (table 2) are the products which can be made in dairy, which are highly consumed all over world and are classified with different factors like energy, protein, carbohydrates, sugars, fat, saturated fat, calcium and sodium. And every of these are manufactured in market by processing them. Dairy products contain different types of vitamins ( B2, B12, and K2), minerals like calcium, potassium, phosphorus, saturated fat and added sugars[42]. Out of these dairy products, ghee, butter, cheese contains high level of saturated fat (table2).

**Epidemiology**

Objective of epidemiology is to understand risk factors affecting that specific disease. For dairy and cardiometabolic disease, cohort studies are carried out. It is observational study which follows group of research participants over a period of time, where characters and activities of participants are collected, after the consumption of every diet. By, observing and analyzing these data, researchers can build an understanding the factors increasing or developing disease. Guidelines were also made to prevent these diseases (cardiovascular disease, obesity, cancer)[10].

**Impact of dairy consumption on obesity and health**

As milk and dairy is highly consumable because of its nutritive content. It contains calcium, iodine, magnesium, phosphorus, vitamin B12, proteins, oligosaccharides, amino acid, flavonoids, saturated fatty acids, branched chain fatty, probiotics etc.

**Dairy foods and type 2 diabetes**

Several cohort studies indicates a link between dairy foods consumption and type 2 diabetes. Summarization of these cohort analysis showed inverse relation between intake of low-fat dairy and full-fat dairy and yoghurt with type 2 diabetes[21, 43,45,5]. A cohort showed the result how cheese can have moderately lower rise in T2DM and reduction in rise of T2DM by yoghurt consumption[18]. According to Soedamah-Muthu and De Goede (2018),consumption of 200g/day of total dairy is strongly linked with 3% lower risk of T2DM (I² =60%) and relative risk (RR) is 0.86 by consumption of yogurt (80g/day) as compared with 0g consumption per day (which is having heterogeneity ( I²) = 69%). Having 60 to 69% heterogeneity in these metanalyses of milk, cheese and high-fat dairy consumption displayed no significant relation with incident T2DM. These were few metanalysis of yoghurt, milk, and high-fat dairy food consumption, but butter was not included because of its distinct nutritional content. A study found that, some saturated fatty acids like palmitic acid and stearic acids can result to higher risk of type-2 diabetes. Whereas, biomarkers like pentadecanoic acid, heptadecanoic acid and trans-palmitoleic acid can play as protective role in type-2 diabetes risk[28]. Talking about its exact mechanism, its is clear yet, but study by[27] can explain its mechanism.

**Dairy food and coronary heart disease**

There are different cohort studies done which provide good evidence of relation between dairy milk consumption and risk of coronary heart disease[25, 43,17, 33, 14, 4]. Investigating metaanalyses of these studies, it is showed that, there is no association with consumption of low-fat diary, milk, cheese and yoghurt and risk of coronary heart disease. Other then these, butter is also a diary food, but because of its different nutritional content, it is not included with cohort studies of other dairy foods. No significant association of coronary heart disease with butter intake of 14g/day was found in a cohort study[37].

Association of dairy food intake with type-2 diabetes, coronary heart disease, stroke was found in many metaanalyses of cohort studies, but association between dairy intake and cardiometabolic disease are still not clear. According to[17], cardiometabolic risk factors were lipid concentration, inflammation, insulin resistance, blood pressure and vascular function.

**Snacks and confectionery**

**Consumption**

Snacks are small servings of food or drink usually eaten between main meals to satisfy hunger or provide quick energy. Regular consumption of high-calorie, low-nutrient snacks contributes to an energy imbalance where caloric intake exceeds expenditure. Snacks often include sweet or savory options and are available in various forms, such as chips, biscuits, chocolates, candies, nuts, and energy bars.

Table 3 Snacks types and their example

|  |  |
| --- | --- |
| **Snacks type** | **Example** |
| **Sweet snacks** | Chocolates, candies, cookies, pastries, doughnuts, and ice cream. |
| **Savory snacks** | Potato chips, crackers, popcorn, fried namkeen, and salted nuts. |
| **confectionery** | Chewing gum, ice cream, biscuits, cookies, chocolate |

In 2020, the sales value of sweet and savory snacks in the Indian packaged foods market reached 5.78 billion USD and over 2021, it turned up to 12 billion USD[13]. In overall population, urban consumers consume 50-60% of snacks daily, while rural areas see a slightly figure due to improved market penetration. But as looking at age categorization, children and teenagers make up to majority of consumers. In India, snacking habits have been greatly impacted by urbanization, nuclear families, dual-income households, globalization, changes in lifestyle, and technological improvements and more people are affected by this and cause a serious disease in this generation obesity. Greater reliance on on-the-go snacks has resulted from longer commutes and working hours, as well as an increase in the desire for quick, ready-to-eat meals (table 3).

**Nutrient content**

Table 4 Nutritional content of snacks and confectionery which are highly used in India

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **S no.** | **Name of product** | **Calories**  **(kcal)** | **Carbohydrate**  **(g)** | **Sugars**  **(g)** | **Protein (g)** | **Fat**  **(g)** | **Saturated fat (g)** | **Sodium**  **(mg)** |
| **1.** | Parle-G biscuit | 450 | 78 | 35 | 7 | 10 | 5 | 500 |
| **2.** | Haldiram’s aloo bhujia | 550 | 45 | 2 | 10 | 35 | 15 | 1200 |
| **3.** | Kurkure masala munch | 530 | 63 | 2 | 6 | 28 | 12 | 1050 |
| **4.** | Britannia good day cookies | 500 | 67 | 30 | 6 | 22 | 10 | 400 |
| **5.** | Lay’s classic salted chips | 540 | 53 | 0.5 | 6 | 35 | 10 | 600 |
| **6.** | Maggi noodles | 420 | 60 | 2 | 10 | 15 | 7 | 1200 |
| **7.** | Cadbury dairy milk | 530 | 57 | 56 | 7 | 30 | 18 | 80 |
| **8.** | Bingo mad angles | 520 | 60 | 2 | 6 | 28 | 12 | 950 |
| **9.** | Sunfeast dark fantasy Choco fills | 520 | 65 | 35 | 6 | 25 | 12 | 300 |
| **10.** | Bourbon biscuits | 480 | 72 | 35 | 5 | 18 | 8 | 300 |
| **11.** | Hide & seek fab | 510 | 70 | 30 | 5 | 22 | 90 | 350 |
| **12.** | perk | 500 | 63 | 50 | 6 | 24 | 14 | 100 |
| **13.** | 5 star | 515 | 60 | 48 | 5 | 27 | 15 | 150 |
| **14.** | munch | 520 | 66 | 40 | 5 | 24 | 12 | 180 |
| **15.** | Little Debbie Swiss roll | 480 | 64 | 40 | 6 | 22 | 10 | 250 |
| **16.** | Unibic Choco chip cookies | 520 | 68 | 32 | 6 | 24 | 12 | 200 |
| **17.** | Too yumm! | 480 | 65 | 5 | 8 | 18 | 7 | 750 |
| **18.** | Britannia treat biscuits | 490 | 71 | 38 | 6 | 20 | 9 | 270 |
| **19.** | Top ramen instant noodles | 460 | 60 | 3 | 8 | 18 | 9 | 1400 |

**Impact of snacks on obesity**

The risk of obesity is increased by unhealthy eating habits. A well-known worldwide health concern is obesity. In recent decades, obesity prevalence has dramatically increased across all age categories. A number of factors, such as bad eating habits like consuming energy-dense snacks high in fat and sugar, raise the risk of obesity. Snack eating has been connected to a higher risk of obesity. According to earlier research, university students in India gain excess weight during their first few years there (26.8% and 10.7%)[36]. One of the primary causes of obesity in the world is thought to be physical inactivity. Around the world, university students' early adult physical activity levels have decreased[44].

There are frequently more than three snacks during the day, with the final one being right before bed. Throughout time, an emotion has emerged that snacking is beneficial, which benefits businesses. Producing and marketing snack foods goes directly against how your body is meant to perform. Regretfully, nutrition schools also teach this, but it just does not align with how your body functions. There are even claims that this will lower your daily caloric intake, but research contradicts this, and We are all aware of that, calorie monitoring is challenging and offers no long-term advantages. It is now widely acknowledged that obesity is caused by a persistently high amount of insulin. Insulin has a major role in the hormonal issue of obesity (Elder, 2020) .This hormone is responsible for storing fat. Individuals receiving insulin injections or tablets for the treatment of Type 2 Diabetes tend to gain weight. a verified fact. People with type 1 diabetes, whose pancreas is unable to produce enough insulin, lose weight quickly and would perish unless they receive insulin. Individuals who experience high amounts of stress on a regular basis build up cortisol levels, which raise insulin levels and typically result in weight gain. a verified fact. Individuals on insulin-raising medications have a significant risk of developing obesity. The food we consume can causes our bodies to produce more insulin, which is then released to control blood glucose levels. According to research, the mere thought of eating can cause the release of insulin. Due to nibbling on top of three or four meals a day, those who eat continually throughout the day have consistently elevated insulin levels[46]. The body uses hormones as chemical messengers, and they often work in waves. To prevent the body from growing acclimated to a high level, The level increases to trigger an activity and is then periodically lowered or turned off. The body can adapt during this time off from the hormone's function, ensuring that it will still be responsive to the hormone when it is produced again. The body becomes "adapted" to the hormone in the absence of this variance in exposure, which lowers its sensitivity. This may have happened to people before with other substances like drugs, alcohol, sweets, salt, chiles, sunlight, etc. Over time, prolonged high exposure reduces the body's sensitivity, requiring a higher dose in the future to achieve the same effect. In the past, your grandparents probably consumed meals less often than we do today. In order to replenish our blood sugar, this promotes munching, which leads to the development of a frequent snacking habit[7]. Additionally, this trend is supported by the readily available snacks from cafes, bars, coffee shops, and vending machines. If people look at what's in the boxes next to the grocery checkout, they see a lot of snack foods that are made of sugar and grains, easily packaged in smaller portions, sweetened to taste, and available for purchase for any time when they feel the tiniest need for more energy. Weaning kids off of animal-based diets in favor of ultra-processed carbohydrates like rice, sweet yoghurt, cereals, and fruit purée won't help, unfortunately. They are being taught to anticipate sweet food rather than to eat incredibly nourishing foods. By using sweet sweets as rewards, this sweet craving is further developed. More insulin is secreted in response to these sweet foods than to fats or proteins. Both conditions are required when insulin levels remain consistently high, and your body gradually adjusts to the increased insulin level[6]. Consequently, the quantity required to attain the required chemical communication within your body needs to be increased. The required level is further raised as a result of this higher level. This change can occur over a period of years, such as ten or twenty years, during which the insulin level simply rises in a viscous cycle. This might not matter if high levels of insulin were not harmful to the body and did not encourage obesity. However, it contributes to and promotes obesity. This is commonly referred to as "insulin resistance." Type-2 diabetes is frequently the end result for obese people, and heart disease, blindness, Alzheimer's disease (Type-3 diabetes), and amputations are frequently the end result for diabetics[22]. There are several indicators that this illness is progressing. If your stomach circumference is greater than half of your height, it may be the easiest to spot, whether you're a man or a woman. Assuming you are 170 cm (5' 7") tall, if your waist circumference is greater than 85 cm (34"), you are Presumed developing insulin resistance and may be on the path to Type-2 diabetes. Skin tags, black spots beneath your arms, neck, or between your fingers (Acanthosis Nigricans), or red spots on your skin (rosacea) can all be indicators. Women with insulin resistance may also have higher levels of androgens, or male hormones, which can lead to increased acne and hairiness. Additionally, it increases the chance of PCOS (polycystic ovarian syndrome), which contributes to women's decreased fertility and is a primary cause of erectile dysfunction in males. This issue can be lessened in whatever method you can limit your exposure to too much insulin. To allow your body to spend at least half of the day with reduced insulin levels. you should ideally change when and what you eat. Regretfully, it becomes more challenging to reverse the longer you have been exposed to this issue[47] (fig. 1).

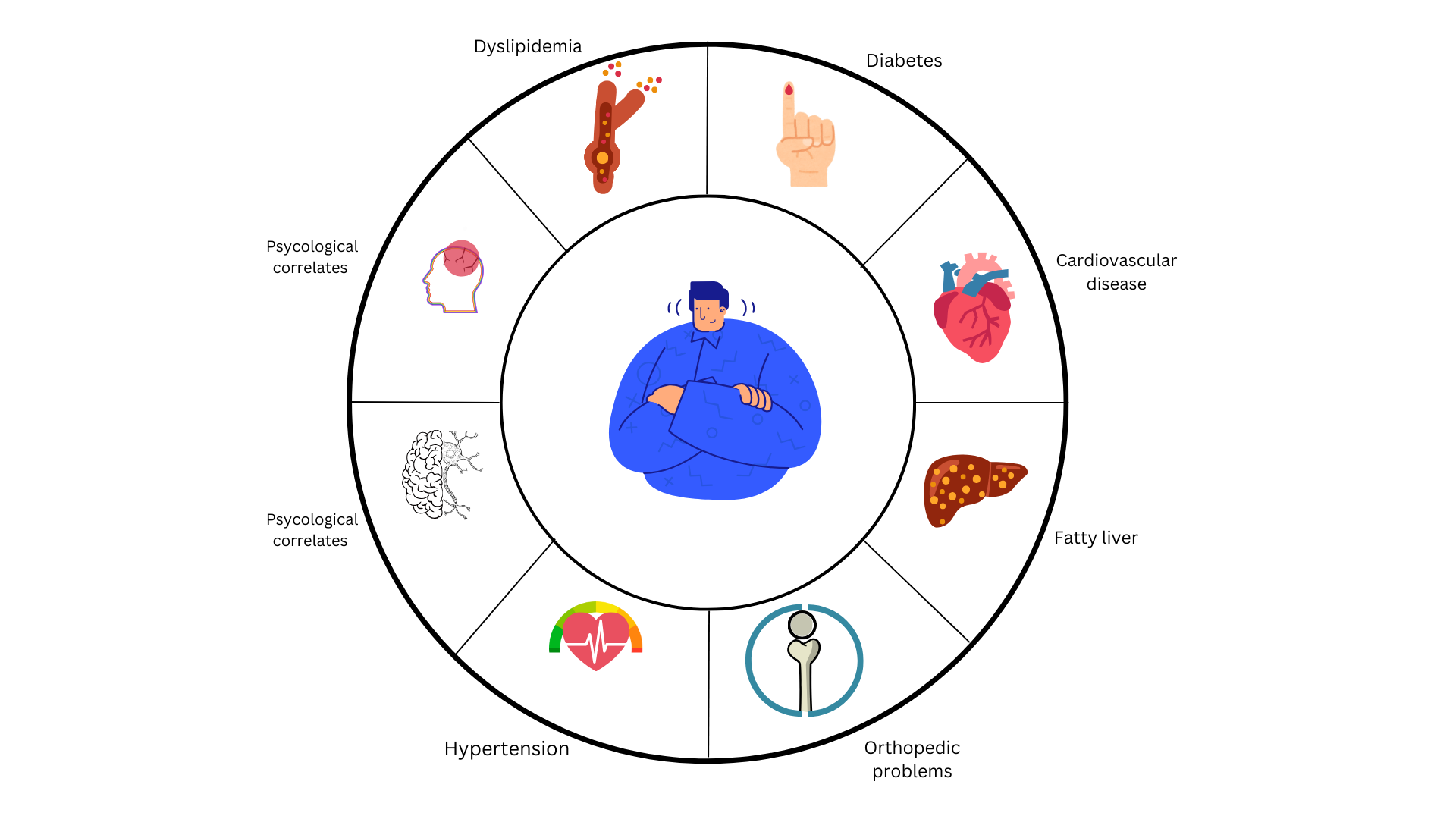


Fig. 1 Impact of obesity in human

**Consumption of beverages**

A beverage is any liquid that is consumed to hydrate, nourish, or refresh the body.

Table 5 Types of beverages and their example

|  |  |
| --- | --- |
| **Beverages types** | **Examples of product** |
| **Non-Alcoholic** | |
| 1. Refreshing drinks | Fruit juices, soft drinks |
| 1. Stimulating drinks | Tea, coffee, drinking chocolate |
| 1. Nourishing drinks | Malted milk, milkshakes, lassi |
| **Alcoholic** | |
| 1. Fermented | Beer, wine, cider, perry |
| 1. Distilled | Whisky, gin, vodka, rum, brandy, tequila, other spirits |

1.5 trillion liters of packed beverage was consumed globally in 2023. In India also, market goes high in beverage consumption, which was estimated 53.5 billion liters. Over looking at global alcohol consumption trend in 2022, wine overtakes spirit on sales by 0.13 billion cases[39] (table 5).

Nutrient content

Table 6 Nutrient content of beverages

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **S no.** | **Name of product** | **Calories**  **(kcal)** | **Fat**  **(g)** | **Carbohydrate**  **(g)** | **Protein**  **(g)** | **Caffeine**  **(mg)** |
| **1.** | Fruit juices(orange, apple) | 110-150 | 0 | 28-36 | 1 | 0 |
| **2.** | Coffee | 2-5 | 0 | 0 | 0 | 95 |
| **3.** | Tea | 2 | 0 | 0 | 0 | 30-70 |
| **4.** | Milk | 150 | 8 | 12 | 8 | 0 |
| **5.** | Almond milk | 30-40 | 2-3 | 1-2 | 1 | 0 |
| **6.** | Sodas | 150 | 0 | 39 | 0 | 0 |
| **7.** | Beer | 150 | 0 | 12 | 1 | 0 |
| **8.** | Wine | 120-130 | 0 | 4 | 0 | 0 |
| **9.** | Coca-Cola | 140 | 0 | 39 | 0 | 32 |
| **10.** | Pepsi co | 120 | 0 | 33 | 0 | 38 |
| **11.** | Tropicana | 90 | 0 | 22 | 1 | 0 |
| **12.** | Paper boat | 60-80 | 0 | 15-20 | 0 | 0 |
| **13.** | Amul chocolate milk | 150-180 | 6-8 | 20-25 | 4-5 | 0 |
| **14.** | Buttermilk | 40-60 | 2-3 | 5-7 | 2-3 | 0 |
| **15.** | Lassi | 150-250 | 6-8 | 20-30 | 4-6 | 0 |
| **16.** | Sugarcane juice | 180-220 | 0 | 45-50 | 0 | 0 |
| **17** | Jaljeera | 50-70 | 1-2 | 12-15 | 0 | 0 |
| **18** | Red bull | 100-200 | 0 | 25-65 | 0 | 80-150 |
| **19.** | Milkshake, smoothies | 200-250 | 7-10 | 35-50 | 5-7 | 0 |

By highlighting the various nutritional profiles of beverages, this data assists customers in making well-informed decisions regarding their dietary requirements. A serving of fruit juices has 110–150 kcal and 28–36 g of carbohydrates, whereas a serving of milk has 150 kcal, 8g of fat, 12g of carbohydrates, and 8g of protein. Although tea and coffee are low in calories, they contain 30-70 mg and 95 mg of caffeine, respectively. Coca-Cola and Pepsi are examples of soft drinks that have 120–140 kcal and 30-39g of carbohydrates, whereas Pepsi has 38 mg of caffeine. Dairy-based beverages, such as milkshakes, buttermilk, and lassi, are high in fat and protein. For example, lassi has 150–250 kcal, 6–8g fat, and 20–30g carbohydrates. Energy drinks such as Red Bull are very stimulating due to their high caffeine content (80–150 mg), 100–200 kcal, and 25–65g carbohydrates. Sugarcane juice has a lot of calories (180–220 kcal) and carbohydrates (45–50g), however jaljeera has fewer calories (50–70 kcal) and 12–15g of carbohydrates (3.2).

Customers can make better dietary decisions if they are aware of the many beverage varieties and their nutritional characteristics. Soft drinks and energy drinks are strong in sugar and caffeine, which may have negative health effects, whereas fruit juices, milk, and nutritious drinks offer vital nutrients. The necessity for a balanced and knowledgeable approach to beverage consumption is highlighted by the rising demand for beverages both internationally and in India, which reflects shifting consumer behaviors.

**Impact of beverages on obesity**

Drinking unsweetened tea or coffee may help lower the risk of developing diabetes, while adding sugar to these beverages does not seem to have a significant effect either way. This makes sense, given that added sugar is a major part of sweet drinks like milkshakes and flavored milk, which are now a leading source of excess sugar worldwide. Interestingly, people who consume artificially sweetened beverages (ASB) tend to have a increses the risk of developing type 2 diabetes. However, this could be because individuals who are already overweight or at risk for diabetes may choose ASBs more often. Studies also show that ASB drinkers are more likely to be classified as obese. On the other hand, drinking 100% fruit juice does not seem to increase or decrease diabetes risk. Meanwhile, sugar-sweetened beverages (SSBs), like soft drinks and flavored milk, are well-known contributors to the diabetes crisis, prompting health experts to encourage cutting back on them. While finding better drink choices is essential, replacing sugary drinks with options like water, milk, ASBs, and coffee—but not tea—could help lower diabetes risk. Some research suggests that switching from SSBs to ASBs might be a step in the right direction. However, the most effective strategy may be to reduce the intake of sugary drinks altogether—Especially sugary beverages like soft drinks and sweetened milk-choose water, unsweetened tea, or coffee instead to help fight the growing diabetes epidemic( O’Connor and Imamura, 2015).

Drinking sugary beverages can contribute to obesity in a few ways. These drinks are high in calories but do not make you feel full so it is easy to consume extra calories without realizing it. On top of that, your body does not always adjust by eating less, which later on, can lead to an overall higher calorie intake. The large amounts of fast-digesting sugars in these drinks can also cause problems beyond just weight gain. They may increase the risk of insulin resistance, make it harder for the pancreas to produce insulin, trigger inflammation, promote belly fat, and contribute to other metabolic issues over time[38].

Sugary drinks contribute to weight gain because they are high in added sugar, don’t keep stomach full, and can lead to consuming more calories overall. They are also packed with fast-digesting carbohydrates, like sugar And high-fructose corn syrup (HFCS), which may increase the risk of Type 2 diabetes.even for individuals who aren’t overweight. This is because they increase the body’s glycemic load, leading to inflammation, insulin resistance, and problems with insulin production. Beyond weight gain, fructose from sugar or HFCS can also raise blood pressure, promote belly fat, and cause unhealthy fat buildup in the liver and other organs. Research in both humans and animals has shown that the liver tends to turn fructose into fat, increasing triglyceride levels, which are linked to insulin resistance and a higher risk of heart disease[29].

**Food Addiction**

Food addiction is viewed as a contentious diagnosis. When control and attention to nutritional balance are prioritized, most people will perceive food addiction as an impractical possibility. However, for some people, food addiction is their reality, characterized by overindulgence in junk food, processed meals, and foods heavy in fat, salt, and sugar. Similar to other addictions, food addiction starts with first use, where trigger foods may have been used in excess to cope with stress, satisfy cravings, or just maintain an unmanageable lifestyle. After consuming trigger foods, the brain will get dependent on their synthetic dopamine and serotonin levels, which will cause the reward system to go into overdrive. Similar to drug misuse, many people become fixated on the pleasant benefits of junk food on their mood, making it difficult to refrain from consuming it. When there is tolerance and pre-existing harm to the body, brain, wellbeing, weight, and fitness, the process of recovering from a food addiction will parallel that of substance misuse. This alone demonstrates the seriousness of food addiction because, even in the face of penalties, withdrawal and ending the cycle can be difficult. continuous consumption of harmful foods is experienced, it is simple to understand how a food addiction could manifest into higher obesity ratings. The presence of food addiction can be harmful to an individual who is already clinically defined as fat, posing serious health risks with an emphasis on the body's key organs and functions. This demonstrates unequivocally the negative association between food addiction and obesity, which can exacerbate an already difficult lifestyle. On the opposite end of the spectrum, obesity by itself might make a food addiction worse. After all, eating meals high in calories is prevalent among fat people, and this might exacerbate the symptoms of food addiction. On the surface, food addiction and obesity lead to similar behaviours. However, food addiction is uncontrollable due to brain connectivity, whereas obesity is typically caused by intentional health choices. The risks associated with this association include the fact that obese people already exhibit behaviours similar to those of food addicts. The uncontrollable behaviours of their junk food preoccupation will be reflected in their diets and lifestyles. Because the negative effects of excessive and uncontrollable junk food intake can lead to serious health problems including diabetes, depression, eating disorders, and cardiovascular concerns, it is also important to consider how food addiction affects general wellbeing and mental health[48].

**Conclusion**

Increased consuming of processed foods, like sweets, snacks, beverages, milk, is a prime driver of escalating levels of noncommunicable diseases and obesity in India. Ultra-processed foods, which consist of unhealthy fats, added sugars, and refined carbohydrates, lead to unhealthy lifestyles, which in turn lead to Metabolic disorders, including heart disease and Type 2 diabetes, and obesity. Epidemiological studies have a straightforward relationship between intake of processed foods and risk factors, so there is a pressing need for public health policy and dietary strategies for managing escalating levels of obesity.

Dairy foods, rich in such vital nutrients as calcium, proteins, and vitamins, increase saturated fat and sugar content. Dairy consumption is shown in certain studies to minimum chance of type 2 diabetes and coronary heart disease, although excessive consumption of some of these foods, for example, butter, ghee, and cheese, they increase weight gain and metabolic derangements. The epidemiological evidence of dairy consumption is in support of moderation in intake combined with a preference for healthier sources of dairy foods in balancing nutritional intake against potential adverse outcomes on health. Whereas, snacks and sweets, which enjoy widespread usage in India, have a tendency to be rich in calories and short of necessary nutrients, which leads to increased intake of body fat and energy. The widespread pattern of snacking, in particular among urban residents and younger generation, further leads to the epidemic of obesity. The endocrinological implications of constant snacking, in particular, insulin resistance caused by constant spikes in glucose, necessitate controlling snacking in a bid to prevent metabolic diseases. Beverages, in this case artificially sweetened and sweetened with sugar, contribute heavily toward obesity caused by excessive calorie intake and metabolic dysfunctions. Present evidence indicates frequent sugary drink intake is associated with an increase in risk for fat deposition, inflammation, and insulin resistance, all of which lead toward obesity and its related medical comorbidities. Although healthier drink choices, like water, unsweetened tea, and coffee, can decrease these risk factors, there is a need for greater consumer awareness and regulatory efforts in managing sugary drink intake.

Food addiction is another key contributor to worsen obesity, since dependency on highly processed, highly palatable foods interferes with normal satiety signals and leads to compulsive patterns of eating. This process of addiction-like reactivity toward processed foods is similar to drug dependency, perpetuating unhealthy eating patterns and making it easier for excessive weight to accumulate. Behavioral treatments, nutrition education, and policy efforts must combat food addiction in efforts to combat obesity.

Widely consumed processed foods in India have serious public health implications, which necessitate urgent public health action against related diseases and obesity. Policymakers, physicians, and citizens have a collective responsibility in supporting healthier diets, improved nutrition education, and regulatory efforts in minimizing ultra-processed foods. Promotion of minimal processing, nutrient-rich foods and public awareness of negative results of excessive processing of foods is an imperative process in securing healthy well-being in the long term.

Disclaimer (Artificial intelligence)

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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.

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Details of the AI usage are given below:

1.

2.

3.

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