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# Jaggery (Guda/Gur): A Better Paediatric Sweetener Alternative - A Narrative Review

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Sugar and Jaggery are both sweeteners used in cooking and baking. While the belief that sugar causes hyperactivity in children has been widely debated. Jaggery has a lower glycemic index compared to sugar, causing a slower rise in blood sugar levels. Jaggery contains various minerals and vitamins, such as iron, calcium, magnesium, and potassium, which are essential for children's growth and development. It is reported that by 2050, obese people will constitute the majority of the population and sugar will be responsible for it. Gud (Jaggery) is mentioned in various textbooks i.e., Sushrut Samhita, Charak Samhita, Ashtanga Hridayam, Bhavprakasha, and Raja Nighantu etc. It helps to treats Anemia, Jaundice, Asthma and allergies in children through the active action on Rasavaha, Raktavaha, Mansavaha, Medovaha and Pranavaha Strotas. Jaggery also offers different properties depending upon Anupana (vehicle). Acharyas mentioned that jaggery at least one year old is good for the heart and should be consumed as Rasayana. Freshly prepared jaggery vitiates dosha. Jaggery offering a complex flavour and natural nutrients, while sugar is neutral and lacks additional nutrients. This review explores the role of jaggery in a child's diet, particularly through the lens of Ayurveda, examining its health benefits, nutritional profile, and potential inclusion in modern diets.

**Keywords:** Guda, Rasayana, Jaggery, Anupana, Pediatric, Low glycemic, Minerals

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# Introduction

In Ayurveda, diet is considered one of the cornerstones of health, and it has long emphasized the use of natural, wholesome foods to promote balance and well-being. Jaggery is a nutritious non-centrifugal sugar (NCS) that is widely utilized in many Asian and African countries. Jaggery-based value-added food products are now widely used in daily meals, drinks, and sweets around the globe. Gur, or Guda, is the Indian term for jaggery, and it has been used as a sweetener in Ayurvedic medicine for over 3000 years. However, the name jaggery comes from the Portuguese word *'Jagara'*, which implies coarse brown sugar.**[1]** Jaggery is an unprocessed sugar made mostly from sugarcane or palm sap.It has been utilized in Ayurvedic medicine for years for its multiple health benefits.

During the 1960s, the average per capita consumption of overall sweeteners was 20.0 kg per year, with jaggery and khandsari products accounting for 15.2 kg. However, usage of these sweeteners has gradually decreased since 1960, with per capita consumption of jaggery and khandsari estimated to be only 4.1 kg/year in 2018-19.**[2]** This demonstrates the societal trend of increasing acceptance of white sugar, despite the fact that the negative effects of its use have recently been discovered. People, particularly the younger generation, choose fast foods, desserts, and cold drinks containing refined white sugar.

In terms of children's nutrition, jaggery has numerous benefits, ranging from digestive health to immune booster. Jaggery contains a variety of minerals and vitamins, including iron, calcium, magnesium, and potassium, which are required for children's growth and development. While there is widespread dispute about whether sugar promotes hyperactivity in children, scientific evidence has not consistently proven a causal link between sugar and hyperactivity. A new WHO guideline proposes that adults and children limit their daily intake of free sugars to less than 10% of their overall calorie consumption. A further reduction to less than 5%, or approximately 25 grams (6 teaspoons) per day, might bring significant health benefits.**[3]**

**Effect of Consuming Refined Sugar**

**1. Addiction:** Sugar increases the release of dopamine, the brain's "feel-good" neurotransmitter. As we ingest sugar, our bodies produce more dopamine receptors, which causes us to seek more sugar, creating a vicious cycle of sugar consumption.**[4]**

**2. Damage to Immune system:** Sugar undermines the immune system and our ability to fight disease and infection by reducing the effectiveness of white blood cells for hours at a time after consumption.**[5]**

**3. Non-nutritive:** Sugar not only contains empty calories with little to no nutrition, but it also depletesbody's essential elements. Sugar removes important minerals from the body, including salt, potassium, magnesium, and calcium. This can weaken the teeth and bones, resulting in tooth decay and disorders like osteoporosis.**[6]**

**4. Carcinogens:** Consuming too much sugar leads our systems to create an excess of insulin, which promotes cell development - which is beneficial for healthy cells but invasive to cancer cells. Consumption of added sugars has been linked to an increased risk of a number of chronic diseases, including obesity, cardiovascular disease, diabetes, non-alcoholic fatty liver disease (NAFLD), cognitive decline, and even some malignancies.**[7]**

**5. Effect on liver:** Refined sugar has half glucose and half fructose. The liver is the only organ capable of metabolizing fructose. When too much fructose enters the liver, it is converted into fat, which can accumulate over time and eventually lead to disease. High sugar consumption reduces levels of "good" HDL cholesterol, which helps remove LDL, or "bad" cholesterol, from artery walls, and has been shown to raise levels of triglycerides, a form of fat found in the blood that increases the risk of heart disease.**[8]**

**6. Premature ageing:** Sugar can bind to proteins in the bloodstream, forming AGEs (Advanced Glycation End Products) that harm collagen and elastin formation, which are important for skin elasticity.**[9]**

**7. Hyperactivity In Children:** Refined sweets quickly enter the blood, causing blood sugar levels to rise and fall fast. This can lead to an increase in adrenaline, making children more energetic.**[10-12]**

**8. Low Glycemic Value:** Jaggery has a low glycemic index (GI), which causes a steady rise in blood sugar levels.

Sugar has a high GI, which causes high blood sugar levels. It can cause serious conditions including type 2 diabetes and obesity.**[13]**

**Review on *Guda***

Jaggery is commonly utilized in several Indian cuisines and Ayurvedic remedies. Jaggery is known as *Guda, Gud, Gula, Gulam* in Ayurveda, *Bellam* (Telugu), *Vellam* (Tamil), *Sharkara* (Malayalam), *Bella* (Kannada), and *Gul* in Marathi. Synonyms for *Guda* include *Sisupriya* - because it is popular among children, *Rasapakaja* - because it is formed by boiling cane juice, *Ikshurasa* - because it is primarily made from sugarcane juice, *Aruna* - because it turns reddish brown when cane juice is boiled, *Madhura* - because it has a sweet taste, and *Rasaja* - because it is made from juice. Jaggery is a pure, nutritious, unprocessed sugar rich in minerals and vitamins derived from sugarcane (Saccharum officinarum) or date juice. The juice is concentrated by heating and molasses is not removed while concentrating it.

The final result is brownish yellow solid jaggery blocks. It also comes in semisolid form. It contains calcium, phosphorus, magnesium, potassium, iron, and trace amounts of zinc and copper.

The vitamin content includes Vitamin A,Vit. B-complex, Vit C, D2, E etc. While refined sugar mainly consists of glucose and fructose, jaggery contains glucose and sucrose. Jaggery is a healthy substitute for white refined sugar. Jaggery is an unrefined natural sugar that is made without using any chemicals.

**Ayurvedic properties and qualities of Jaggery:**

*Guda* (Jaggery) is described as *Ikshuvargha***[14-15]** in *Bhavprakasha* and *Sodhala Nighantu; Karavirahadivargha***[16]** in *Dhanvantari Nighantu*; *Ausadhivargha***[17]** in *Kaiyadev Nighantu*; *Ikshuvadivargha***[18]** in *Madanpal Nighantu*; and *Dravavargh***[19]** in *Priya Nighantu*. Different varieties of Guda are explained in many classical literatures such as *Naveena Guda, Purana Guda, Prapurana Guda, Dauta Guda,* and *Adauta Guda* etc.

**General properties of *Guda:* [14-22]**

| Properties (Guna)[22] | SS[20] | BP | MPN | DN | KN | SN | YR[21] | PN |
|---|---|---|---|---|---|---|---|---|
| Madhur (Sweet) | + | | + | + | + | | + | + |
| Kshara (Slightly Alkaline) | + | | + | + | + | | + | |
| Katu (Pungent) | | | | | + | | | |
| Tikshna (Bitter) | | | | | + | | | |
| Snigdhah (Sliminess/Unctuousness) | + | + | + | | | | | + |
| Guru (Heaviness) | | + | + | + | + | | | + |
| Sara (Instability/Mobility) | | | + | | | | | |
| Ushna Virya (Hot Potency) | | | | + | + | | + | |
| Madhur Vipaka (Bio-Transformed intoSweet) | | | | | + | | | |
| Na-Ati-Shita (Not Very Coolant) | + | | | | | | | |
| Na-Ati-Pittahara (Slightly Decreases Pitta) | + | + | | | | | | + |
| Kaphakar/ Sheleshmakar (Vitiate Kapha) | | + | + | + | | | + | |
| Vatapittakar (Vitiate Vatapitta) | | | + | + | | | | |
| Kaphapittakar (Vitiate Kaphapitta) | | | | | | | | + |
| Vatasaman (Pacify Vata) | | + | | | | | | + |
| Kaphavatahar (Vitiate Kaphavata) | | | | + | | | | |
| Balaya (Increase Strength) | + | + | + | | | | | + |
| Vrishya (Vitality) | + | + | | | | | | + |
| Brimhana (Optimal Nourishing) | | | | | + | | | |
| Agnikrut/Agnideepan (Increase in Power of Agni) | | | + | | | | | |
| Mutrasodhaka (Purifying Bladder and Urine) | + | + | + | | | | | |
| Raktasodhaka (Cleanses & Purifies Blood) | + | | + | | | | | |
| Raktavarddhaka (Increase in Rakta, Quantitative- Increase in Volume) | + | | | | | | | |
| Medovarddhaka (Increase in Medo) | + | + | | | | | | |
| Mamsavarddhaka (Increase in Muscle Tissue) | + | | | | | | | |
| Majjavarddhaka (Increase in Bone Marrow) | + | | | | | | | |
| Sthaulyakar (Increase Obesity) | | | | | | | | + |
| Krimikar /Krimijanan (Worm Manifesatation) | | + | + | | | | | + |

**Properties of *Nav Guda* (Fresh Jaggery):[14-22]**

| Properties (Guna)[22] | SS[20] | BP | MPN | DN | KN | SN | YR[21] | PN |
|---|---|---|---|---|---|---|---|---|
| Madhurav (Sweet) | | | | | + | | | |
| Sleshmakar (Vitiate Kapha) | + | + | | | | + | | |
| Vatapittakara (Vitiate Vatapitta) | | | | | + | | | |
| Agnisadanakar (Increase in Power of Agni) | + | + | | | | + | | |
| Agnideepan (Increase in Power of Agni) | | + | | | + | | | |
| Balaya (Increase in Strength) | | | | | + | | | |
| Swasakara (Manifest Respiratory Disease) | | + | | | | | | |
| Kasakara (Manifest Cough) | | + | | | | | | |
| Krimikrut (Worm Manifesatation) | | + | | | | | | |
| Raktasodhaka (Cleanses & Purifies Blood) | | | | | + | | | |
| Mutrasodhaka (Purifying Bladder and Urine) | | | | | + | | | |
| Raktavarddhaka (Increase in Rakta, Quantitative- Increase in Volume) | | | | | + | | | |
| Medovarddhaka (Increase in Medo) | | | | | + | | | |
| Mamsavarddhaka (Increase in Muscle Tissue) | | | | | + | | | |
| Majjavarddhaka (Increase in Bone Marrow) | | | | | + | | | |
| Shukrakrut (Increase in Shukra) | | | | | + | | | |

**Properties of *Purana Guda*: [14-21]**

| Properties (Guna)[22] | SS[20] | BP | MPN | DN | KN | SN | YR[21] | PN |
|---|---|---|---|---|---|---|---|---|
| Madhur (Sweet) | | + | | | + | | + | + |
| Laghu (Lightness to Body) | | + | + | | + | | + | + |
| Snigdha (Sliminess/Unctuousness) | | | | | | | + | |
| Anabhishyandi (Nonlimy & Not Heavy in Nature;) | | + | + | | + | | | |
| Tridoshahara (Pacify All Dosha) | | | | | | | + | |
| Pittaghna (Pacify Pitta) | | + | | | | | + | |
| Vataghna (Pacify Pitta) | | + | | | | | + | + |
| Rasayana (Rejuvenation) | | | | + | | | + | |
| Vrishya (Vitality) | | + | + | | | | | |
| Hridya (Pleasant) | + | | + | | + | | + | |
| Pathya (Wholesome Diet) | | + | | | + | | + | |
| Ruchya (Increases Taste Perceptions) | | | | | + | | + | |
| Balaya (Increase in Strength) | + | | | | | | | + |
| Sramahara (Removing Fatigue) | | | | | | | + | |
| Agnipustikara (Support to Digestive Fire) | | + | + | | + | | | + |
| Raktaprasadana (Increasing Blood) | | + | | | | | | |

SS - Sushruta Samhita; BP- *Bhavaprakasha*; MPN - *Madanapala Nighantu*; DN - *Dhanwanthari Nighantu*; RN - *Raja Nighantu*; KN - *Kaiyadeva Nighantu*; SN - *Sodhala Nighantu*; YR - *Yoga ratnakara*; PN - *Priya Nighantu*

**Properties of Jaggery according to the different *Anupaan:***

If jaggery is consumed with ginger, it destroys *Kapha* (phlegm) quickly and if consumed with *Haritaki* (*Terminalia chebula Retz*), it removes *Pitta* and if consumed with dry ginger, it removes all the *Vata* related disorders.

In this way jaggery is the best among medicines as it removes all the three doshas.**[14]**

**Nutritional Components in Jaggery:[23]**

| Nutritional components of jaggery/100g | | | |
|---|---|---|---|
| pH | | 5.8–6.4 | |
| Sucrose | | 70–85g | |
| Reducing sugars (glucose and fructose) | | 7–10g | |
| Protein | | 0.35–0.45g | |
| Fats | | 0.500–0.750g | |
| Ash | | 0.5–1.0g | |
| **Vitamins in Jaggery** | | **Minerals in Jaggery** | |
| Vitamin A | 3.8 mg | Calcium | 40-100 mg |
| Vitamin B1 | 0.01 mg | Magnesium | 70-90 mg |
| Vitamin B2 | 0.06 mg | Phosphorus | 20-90 mg |
| Vitamin B5 | 0.01 mg | Potassium | 10-56 mg |
| Vitamin B6 | 0.01 mg | Sodium | 19-30 mg |
| Vitamin C | 7.0 mg | Iron | 10-13 mg |
| Vitamin D2 | 6.50mg | Chloride | 5.3mg |
| Vitamin E | 111.3 mg | Zinc | 0.2-0.4 mg |
| Vitamin PP | 7.00mg | Manganese | 0.2–0.5mg |
| | | Copper | 0.1-0.9 mg |

## Discussion

This paper discusses the importance and extent of value addition and fortification in jaggery, which is an eco-friendly nutritive sweetener and prospective substitute for sucrose. Nutraceutical, functional, or fortified foods not only enhance the diet, but also help to develop immunity and prevent disease.

As a result, in addition to nutritional value, it gives medicinal benefits. Individual health and diet are currently gaining a great deal of attention. Food products that are nutritious, safe, and simple to prepare are in high demand. A lot of emphasis has been placed on food products with additional health benefits. Jaggery is a traditional sweetener high in minerals such as calcium, phosphorus, and iron, and it is widely regarded as the most nutritious sweetener available.**[24]**

Jaggery can be blended and fortified with beneficial natural spices (turmeric, black pepper, fennel, caraway, etc.) and medicinally proven health-supportive herbs (holy basil, *giloy,* mint, *triphala, amla*, etc.) to create even better antioxidant, detoxifier, digestive, and immunity booster products with potential functional and nutraceutical value. **[25]**

Jaggery maintains electrolyte balance and prevents water retention, whereas sugar causes rapid blood sugar surges that lead to weight gain. Jaggery also contains minerals, folic acid, and B-complex vitamins, which refined sugar lacks. Aside from being a good source of energy, it also prevents rheumatic diseases, bile disorders, fatigue, muscle, nerve, and blood vessel relaxation, blood pressure maintenance, water retention reduction, haemoglobin level increase, and anaemia prevention. Around six antioxidants (Syringaresinol, Medioresinol, Coniferyl alcohol, sinapyl alcohol, and 3-hydroxy-1-(4-hydroxy-3,5 dimethoxy phenyl)-1 propanone, etc.) from*Kokuto*(Japanese jaggery). **[26]**

Magnesium boosts the neurological system, potassium is essential for maintaining acid-base balance in cells, and jaggery is high in iron, which prevents anaemia.**[27,28]**

An experiment revealed that rats treated with jaggery had increased coal particle translocation from the lungs to the tracheobronchial lymph nodes. Jaggery's ability to prevent smoke-induced lung lesions suggests that it could be used as a protective agent for workers in dusty and smoke-filled settings.**[29]**

Traditional recommended spices and herbs like dry ginger, turmeric (0.03–0.11mg/100g antioxidant), black pepper, holy basil (39.67mmol/100g antioxidant), cinnamon (120.18mmol/100g antioxidant), triphala (706.25mmol/100g antioxidant), brahmi (10.40mmol/100g antioxidant), licorice, long pepper, cardamom, giloy (250µg/mL, flavanoids), gooseberry (301.14mmol/100g antioxidant) are important not only for boosting immunity but also for preserving good well-being in today’s stressful lifestyle.

These spices and herbs contain natural ascorbic acid, lycopene alkaloids, terpenoids, lignans and carotene, bioactive components, polyphenols, phytochemicals, flavonoids camphene, geranial, zingiberene, curcumin, and some uniquechemicals. These beneficial spices and herbs, when combined with a non-centrifugal sweetener like jaggery in the right proportions, not only make the product delicious to consume, but they also act as an antioxidant, detoxifier, anti-inflammatory, antibacterial, antiseptic, and antiviral, aiding digestion and treating cough, flu, and infections.**[30]**

## Conclusion

Jaggery, with its outstanding nutritional profile and health advantages, is a crucial part ofdiet. It not only contains necessary nutrients, but it also assists digestion, improves immunity, increases energy levels, supports respiratory health, and promotes good skin and cognitive function. Jaggery contains minerals such as calcium, phosphorus, magnesium, potassium, and iron, as well as trace amounts of zinc and copper and various vitamins.

Aside from being a good source of energy, it also prevents rheumatic diseases, bile disorders, fatigue, muscle, nerve, and blood vessel relaxation, blood pressure maintenance, water retention reduction, haemoglobin level increase, and anaemia prevention.Understanding the multiple benefits of jaggery allows parents to make informed dietary choices that contribute to their children's growth and development, helping they stay strong, healthy, and energetic.

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