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Review Article

THREE DEADLY WHITES: A REVIEW

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ABSTRACT

Introduction: Food, which once considered as survival need; has now come up as a pursuit of pleasure for taste buds. In past few decades, food and food industry has undergone a drastic change with very devastating impact at every front; be it ecological, social, psychological, economical or biological. Urbanization, modernization and mere copying the west has given rise to ready to eat and on-the-go food. This changed practice of food is widely consumed in the form of three main whites namely: white flour, white salt and white sugar. These processed and refined food articles introduced in human diet few centuries ago have badly impacted the human health and given rise to many non-communicable diseases (NCDs) also known as life-style disorders. The objective of this study is to put light on the health effects of these refined food articles.

Methods: Various available Ayurveda literature, books and relevant research papers were thoroughly searched for the classical description, processing technique and health effects of white flour, white salt and white sugar.

Results: It was found that white flour, white salt and white sugar not only reduce the nutritional value of the food but also their processing cause increase of cost by many folds, hence affecting the financial structure. White flour and white salt available in its natural form don't cause that much harm to the human health.

Conclusion: This 'self-poisoning' is no way beneficial for human. Fortification and substituting these food articles with the naturally and locally available ones can cut the cost of food and make diet healthy.

Keywords: life-style disorders, non-communicable diseases, white flour, white salt, white sugar.

INTRODUCTION:

Food is basic prerequisite to sustain life. It has vital effect not only on physical growth and development but also required for maintenance of normal body functions and carry out day-to-day physical body activities. The changing diet and lifestyle of people both in rural and urban has diversely altered the food choices. Food is no longer just a means to quell hunger but it is more focused on pleasure of taste buds or reflects the lavish life-style of elite class. The shift from traditional to modern food as ready-to-eat, processed food, junk food, beverages is now a billion-dollar industry. This modern-day food mainly contains three whites: white flour, white salt and white sugar. Symbol of globalization, urbanization and modernization, introduced few decades ago; this poison triad has caused ill-effects on human health. The major health impact due to these food articles has resulted in non-communicable diseases (NCDs) also known as life-style disorders. NCDs kill 41 million people each year, equivalent to 71% of all deaths across the globe [1] and a substantial proportion of these deaths is associated with the use of these white poisons. Dietary habits influence many risk factors for cardio-metabolic health, including heart disease, stroke and type-2 diabetes, which collectively pose substantial health and economic burdens [2]. 135 million Indians who are overweight or obese are at risk for non-communicable diseases such as high blood pressure, heart disease and diabetes [3][4]. As per a study on Association Between Dietary Factors and Mortality From Heart Disease, Stroke, and Type 2 Diabetes in the United States, the highest proportion of deaths was estimated to be related to excess salt intake (9.5%), followed by low intake of nuts/seeds (8.5%), high intake of processed meats (8.2%), low seafood omega-3 fats (7.8%), low intake of vegetables (7.6%) and fruits (7.5%), high sugar-sweetened beverages(7.4%), low intake of whole grains (5.9%) and polyunsaturated fats (2.3%).[5]

OBJECTIVE:

The objective of this study is to explore the origin and properties of naturally available white flour, white salt and white sugar along with the ones which are refined by chemical processing. The role of these refined food items in causing various NCDs or other health impacts is to be ascertained through this study.

MATERIAL AND METHOD:

The material for the presented study has been taken from various *Ayurvedic* literature, text books, reference books, relevant articles published in national and international journals, authenticated websites.

REVIEW AND DISCUSSION:

White flour (*Maida*):

Description:

Maida is the name of a popular "wheat dish" similar to *Samita*, as described in the 16th century ayurveda literature *Bhavaprakasha* and 17th century *Bhojanakutuhalam*. According to these literatures dealing with dietetics and culinary art, white grains of wheat that are washed, pounded, dried, sprinkled with water and converted into flour by passing through a mill are called *Samita* (*maida)*[6][7].

Maida is popular now a day as the finely milled, refined and bleached wheat. This bleaching is done either naturally due to atmospheric oxygen or using other chemical bleaches. Chemically bleached wheat (*maida*) contains traces of several chemicals undesirable to health. *Maida* is used extensively in making dairy, ready-to-eat, junk food and many more. It causes several health problems. But the usage of naturally processed wheat (*samita*) is not at all harmful.[8]

Process of wheat milling [9]

White flour is made from whole wheat grains having three layers:

- The Bran, which has most of the fibre.
- The Germ: nutrient dense embryo that will sprout into a new wheat plant.
- The Endosperm: largest part of the grain and White flour is made from the endosperm only.

The all-purpose white flour comes in two forms:

Unbleached flour is bleached naturally therefore does not have the color of "white" flour. Historically, flour whitening was done 'naturally' by allowing the freshly-milled wheat to sit for 1-2 months and get exposed to oxygen. That process became impractical due to required investment in time, space and contamination prevention.[10]

Bleached flour has been chemically treated and is whiter than the unbleached flour as bleaching removes yellow xanthophyll and other pigments from milled grains to produce whiter, finer-grain flour suitable for high ratio cakes, cookies and quick breads. Flour bleaching agents are added directly to the freshly-milled flour. Powder bleaching agents such as benzoyl peroxide are mixed directly with the flour.[11] Whitening is often completed in two days. Gaseous bleaching agents such as nitrogen peroxide and chlorine are fed into a bin containing the freshly-milled flour. Bleached flour is more economical than the unbleached due to its ease

of production. A few of the chemical bleaching agents used are: Azodicarbonamide, Chlorine Dioxide, Nitrogen Dioxide, Potassium Bromate, Calcium and benzoyl peroxides.

Bromating: Bromated flour is treated with potassium bromate to improve the dough elasticity and produce a higher rise. Bromate is undesirable because it is a suspected human carcinogen therefore has been banned in most of the developed countries.

Major health impacts[12]

As all necessary nutrients are lost during processing of White flour, foods made from it utilize nutrients from the body for absorption. As a result, our body gets depleted of vitamins and minerals. Few manufacturers attract customers by labeling their products as 'enriched flour', which is nothing, but adding 3-4 vitamins at the cost of 10 lost vitamins during processing.

White flour is tasty but not healthy: Though foods made from White flour are very tempting and tasty however, at the same time, consequences cannot be ignored.

White flour raises glucose/sugar in body: Whenever food made from White flour is consumed, it releases sugar into bloodstream quickly. Because of high Glycemic index (GI), White flour spikes up sugar levels. To match up with the sugar spike, Pancreas has to over work to release insulin in sufficient quantity. If White flour consumption is once in a while, then Pancreas can manage it however, in case of frequent consumption, insulin production will reduce gradually, finally making the person Diabetic. Many bleaching agents also form a by-product called alloxan, a chemical compound that increases the risk of developing type 2 diabetes.

As glucose loiters into blood, it gets attached to proteins, which is called Glycation which cause inflammation in the body and lead to many diseases like Arthritis, Cataract, heart diseases and the list goes on.

White flour causes obesity & raises LDL level in body: Eating White flour also raises LDL resulting in weight gain, high blood pressure, mood swings. It has high carbohydrate that increases secretion of insulin. Too much consumption of white flour & its products leads to weight gain and person soon progress towards obesity.

White Flour is Acidic: During refining process, all nutrients are removed and flour becomes acidic in nature. As per research, diet high in acidic foods (e.g. Pizza, Pasta, Burger & other white flour products) forces the body to pull calcium from bones causing reduced bone density. Over-acidity is one of the major causes of chronic inflammation, and a major cause of arthritis and other chronic illnesses.

White flour creates digestive issues: White flour has been called the "glue of the gut". Breakfast food, snacks, pasta, bread, cereal etc contain white flour. It is without fiber and glues to intestine congesting the system. It slows down digestion creating a sluggish metabolism resulting in weight gain, stress, headaches and migraines.

White flour creates respiratory issues: Bleaching agent used in white flour for whitening, Azodicarbonamide is believed to be a potential cause for respiratory issues like asthma.

White flour impacts the antioxidant status of the body: Chlorine dioxide used in bleaching the flour adversely impacts the nutritional qualities of the flour by removing Vitamin E from it. Benzoyl peroxide, another commonly used bleaching agent, is typically considered safe but studies show that they may break down essential fatty acids and adversely impact the antioxidant status of the body.

White flour may be carcinogenic: Bleached flour is more pocket friendly than its unbleached counterpart. International Agency on Research for Cancer (IARC) revealed that bleaching agent Potassium bromate was a possible carcinogen and its consumption could cause cancer in humans. Likewise, studies conducted on laboratory animals also suggest that potassium bromate is a potential cause for different kinds of kidney diseases including cancerous tumors. As a result, several countries including the European Union, Argentina, Brazil, Canada, and Nigeria have declared it illegal but is still being used in many parts of the world.

White salt (*Samudra lavana*)

Latin Name: *Sodii mura;* Chemical composition: NaCl (Sodium chloride); apart from NaCl, it also contains Potassium, Magnesium, Calcium and sulphates.

Properties: *Samudra lavana* is slightly sweet in taste and the one that is originated from the water of eastern sea *(Pamsuja)* possesses bitter and pungent taste.[13]

Samudra lavana is described by all three authors as:

Susruta [13]	*Caraka* [14]	*Vagbhata* [15]
- sweet in post –digestion - not too hot - nonirritant - laxative - slightly unctuous - cures colic - not too provocative of *Pitta*	- slightly sweet	- sweet in post digestion - heavy - provocative

Samudra lavana, also called sea salt or common salt as described in ayurvedic texts is light for digestion, conducive for heart, causes graying of hair and burning sensation, vitiates blood, quickly aggravates the *pitta*, alleviates *kapha* and *vata*, stimulates the digestive fire and imparts taste.[16]

In general, all the salts are useful for increasing the taste of the food, promote digestion, act as laxative and alleviate *Vata*.[14]

Salt, in general, is sodium-chloride, a mineral required by our body to carry out several functions like transporting and absorbing nutrients, maintaining blood pressure and transmitting nerve signals.[17] White salt or table salt is generally iodized to overcome the deficiency of iodine for preventing diseases like goitre and thyroid. After being extracted, it goes through an anti-caking, bleaching and several other processes and hence, most of natural minerals are stripped away.[18]

Processing of salt:

The seawater is canalized and sun-dried. Mined out from the underground salt deposits, it is further processed and refined to remove excess minerals and impart white colour. Fortified with iodine, table salt may have small amounts of aluminum calcium silicate, calcium silicate, magnesium silicate, tricalcium silicate, magnesium carbonate, or tricalcium phosphate added to keep it free-flowing. Iodized salt has potassium iodide added. In some countries yellow prussiate of soda, to prevent caking, is added in minute amounts as regulated by the government.[19]

Today there are three main methods for obtaining salt [20]

1. Evaporation from sea water- Most common table salts are a product of salt brines, while specialty or gourmet salts are still produced via evaporation of seawater; salts used for industrial purposes are obtained through mining.
2. Mining salt from the earth- Rock salt (also known as halite) is present in the rocky under layers of the Earth's surface and can be extracted through deep-shaft mining. These large deposits of salt are the result of ancient underground waterways that have long since dried up. Rock salt is extracted through dynamite. Once it is brought to the Earth's surface, it is crushed and used for industrial and other non-food purposes. This type of salt contains many minerals and other impurities.
3. Creating salt brines- While the ocean is a natural salt brine, hydraulic mining (or solution mining) of salt involves pumping water below the earth's surface to dissolve salt deposits and create a salt brine. This brine is then pumped to the surface and evaporated to create salt. The salty brine may be treated prior to evaporation to reduce mineral content, yielding a nearly pure sodium chloride crystal. Most table salt is produced with this method.

Typical table salt is heavily processed, bleached and heated. This high heat changes the chemical structure of sodium chloride, transforming it into a state that is no longer natural and different from what our bodies are designed to digest and use. An additive called calcium silicate is then added to prevent clumping imparting a "sharper" flavor than kosher or sea salt.[21]

Sodium ferrocyanide, also known as yellow prussiate of soda, is sometimes added to salt as an anticaking agent. Such anticaking agents have been added since long when magnesium carbonate was first added to salt to make it flow more freely. Other anticaking agents sometimes used include tricalcium phosphate, calcium or magnesium carbonates, fatty acid salts (acid salts), magnesium oxide, silicon dioxide, calcium silicate, sodium aluminosilicate and calcium aluminosilicate.[22]

Major health impacts of White salt:

Salt is present in most foods. It is often added to processed foods (such as canned foods and especially salted foods, pickled foods, and snack foods or other convenience foods), where it functions as both a preservative and a flavoring. Dairy salt is used in the preparation of butter and cheese products.[23] As a flavoring, salt enhances the taste of other foods by suppressing the bitterness of those foods making them more palatable and relatively sweeter.[24] The main sources of salt in the Western diet, apart from direct use of sodium chloride, are bread and cereal products, meat products and milk and dairy products.[25] In many East Asian cultures, salt is used as condiments such as soy sauce, fish sauce and oyster sauce that tend to have a high sodium content and fill a similar role to table salt in western cultures. Table salt is made up of just under 40% sodium by weight, so a 6 g serving (1 teaspoon) contains about 2,400 mg of sodium.[26] The World Health Organization recommends that adults should consume less than 2,000 mg of sodium (which is contained in 5 g of salt) per day.[27]

Sodium serves a vital purpose in the human body: via its role as an electrolyte, it helps nerves and muscles to function correctly, and it is one factor involved in the osmotic regulation of water content in body organs (fluid balance).[28] Most of the sodium in the Western diet comes from salt. As we consume more than the recommended quantity of sodium in many forms; it is the quantity that is more harmful rather than the processing.

Too much salt can contribute to several health conditions, including:

- **Hypertension, heart disease and stroke-** Sodium helps regulate fluid balance in the body. Where sodium goes, water goes. If there's too much salt in the blood, there's too much fluid. And when there's too much fluid in a small space we have high blood pressure, also known as hypertension. High sodium intake can also double our risk of heart failure, increase our risk for obesity and even raise the risk of

developing Type 2 diabetes. A reduction in sodium intake by 1,000 mg per day may reduce cardiovascular disease by about 30 percent.[29][30]

- **Neurological diseases**-Some of these common anti-caking agents contain aluminum, which is potentially carcinogenic and can accumulate in the brain, leading to neurological diseases such as Alzheimer's.[31]
- **Auto-immune diseases-** salt can promote autoimmune disease by increasing pro-inflammatory macrophages, increase Th17 cell potency and Il-17 function, as well as impairing the cell function.[32][33]
- **Higher Risk of Osteoporosis-** The more salt you eat, the more calcium your body loses through urination. And unfortunately, if you don't have enough calcium in your diet, the body will take it from your bones, increasing the risk for bone problems, like osteoporosis. [34]
- **May Increase Risk for Stomach Cancer:** There's also evidence suggesting that a high-salt diet increases the risk for stomach cancer.[35][36] Exactly how or why this happens is not well understood, but several theories exist:

Growth of bacteria: High salt intake may increase the growth of *Helicobacter pylori*, a bacteria that can lead to inflammation and gastric ulcers. This may increase the risk of stomach cancer.

Damage to stomach lining: A diet high in salt may damage and inflame the stomach lining, thus exposing it to carcinogens.

White Sugar:

Description:

The one which is like sand in consistency and white in colour is called as *Sharkara* or *Sita. Sharkara* (white sugar) is *Madhura* (sweet in taste), *Vatapittaraktashamaaka* (alleviate *Vata* and *Pitta Dosha* and *Rakta*), *Chhardihara* (prevents vomiting), *Vrishya* (aphrodisiac), *Murchhajwarahara* (beneficial in unconsciousness and fever).[37]

White sugar, also called table sugar, granulated sugar or regular sugar, is a commonly used type of sugar, made either of beet sugar or cane sugar, which has undergone a refining process. The refining process completely removes the molasses to give the white sugar, sucrose. It has purity higher than 99.7%.[38] Its molecular formula is $C_{12}H_{22}O_{11}$.

Processing of Sugar:

The manufacturing of white sugar consists of two major steps:[39]

1. Raw sugar production

2. Refining of raw sugar.

The modern sugar industry has adopted the use of sulphur dioxide in production of white sugar; first, while boiling the sugarcane juice (for clarification of the juice) and second, during crystallization process (for bleaching purpose). This is called as double sulphitation process. Majority of soluble sulfur compounds get drained along with molasses, but a little bit are left within the final product. Sulfur, when consumed more than the requirement of the body is known to cause various respiratory diseases, e.g. sneezing, sore throat, tightness of chest, suffocation, bronchitis, asthma, bronchitis, asthma, shortness of breath, irritation of upper respiratory tract, etc.[40]

The maximum permissible limit for SO2 according to Bureau of Indian Standard is 70 ppm. According to International standards, it is 10 ppm. The sugar industries claim to be the amount of SO2 in white sugar is 20-70 ppm.[41] If the amount of sulphur exceeds the permissible limits, it is highly toxic and accounts for the defamation of white sugar. The modern process involves refining of raw sugar which along with the impurities also removes molasses; thereby rendering sugar devoid of any nutrition.

Major health impacts of White sugar

From ketchup, to yogurt, to bread, white sugar hides in many foods, even ones that look healthy. White sugar tantalizes our taste buds, but is bad for health. For years the finger pointed at saturated fat as the culprit behind our steeply declining health, but recently more experts are shining a light on refined sugar's negative role.

Sugar depresses the immune system

Eating refined sugar affects bacteria-fighting white blood cells for at least five hours after consumption.[42] The immune cells were found sluggish on their job. More recent research suggests that the mechanism by which sugar harms the immune system is through insulin resistance which then weakens the immune system.[43]

White sugar is bad news for blood glucose

Sugar is thought to cause chronic inflammation and weight gain**.** Obesity is also a risk factor for chronic inflammation. The more sugar we eat, the more weight we gain and the more disease causing inflammation happens. It's a never ending cycle that feeds on itself.[44] Blood sugar levels jump high after eating white sugar, and the blood sugar crash that follows can cause mood swings and fatigue**.** Sugar may be linked to obesity and then Type 2 diabetes, in part because it dulls the part of our brain that tells us to stop eating.[45][46][47].

In a 2015 study, rats fed pure white sugar had much higher blood sugar levels than rats given maple syrup.[48] High blood glucose levels can even lead to deteriorating blood vessels and heart disease.[49]

Sugar causes heart disease

In August 2016, the American Heart Association finally agreed and issued a warning that sugar increases cardiovascular risk in children and recommended ZERO added sugars for children under two.[50] Added sugar is correlated with high triglycerides and lower HDL cholesterol (both major heart health risks).[51] A study in JAMA internal medicine found a significant relationship between added sugars and cardiovascular disease.[52] The more sugar someone eats, the more likely they are to have heart disease.[53]

Sugar may increase cancers risk

A large research study from the Netherlands discredits the idea sugar is linked to cancer**,** however, this was a cohort study, not a placebo-controlled study, and it only looked at colon cancer.[54]

A report that analyzed the link between cancer and sugar found that those who ate more sugar were more likely to have cancer in the small intestine and esophagus**.** They were also more likely to have secondary cancers where the cancer cells have spread to other parts of the body**.**[55]

White sugar is addictive

Refined, white sugar acts more like a drug than a food in our system**.** The sugar cane and beet plant in nature come complete with vitamins, minerals, fiber, and phytochemicals like any other plant. And they have carbohydrates like any other plant in the form of sucrose. When sugar is refined they strip the sugar cane plant or beet plant of all its natural components**,** except the sucrose. When sucrose is part of the whole food it acts like a food in your body, entering our system calmly, breaking down slowly and providing a range of nutrients in addition to energy. When sucrose is isolated, sugar acts like a drug in your body. Too much refined sugar creates a cycle of intense highs and lows, keeping our blood sugar, hormones and neurotransmitters out of balance.**[**56] Eating sugar gives us a hit of dopamine because it feels good, and that dopamine makes us want more**.** White sugar may not be physiologically addicting, but the process of eating it is. Sugar cravings are related to stress and self-sustaining.

Sugar affects mental health

Many times when we feel sad, lonely, or worried and find turning to the "comfort" of sweet foods. It's obvious our brains and mental health are linked to sugar in some way:

- Sugar may lead to ADHD-like symptoms or learning disorders[57]
- Studied in adolescent rats, large amounts of sugar may negatively impact long-term memory and metabolism and cause neuro-inflammation[58]

Sugar and the depression link [59]

Sugary drinks, especially artificially sweetened diet versions, were found to increase depression. Those who ate a lot of processed and sugary foods had a greater chance of developing depression after 5 years of unhealthy eating habits. Those who ate whole foods, low in processed sugar were much less likely to develop depression.

Sugar increases wrinkles [60]

In this study, women who ate the most carbohydrates and added sugars had more wrinkles than the women who followed a low sugar diet. Reactions between sugar and proteins in the body cause advanced glycation end products (or AGE) to form. These AGE compounds are thought to speed up skin aging and wrinkles. Scientists point to emerging evidence that shows AGEs can cause organ, heart, and brain damage.

Sugar reduces fertility [61]

When there is too much sugar in blood, livers turn the excess into a lipid, which then shuts down a gene called Sex Hormone Binding Globulin (SHBG)**,** which reduces the amount of SHGB protein in the body. This particular protein plays an important role in the amounts of testosterone and estrogen available for the body to use. It also depletes vitamin B which is an essential nutrient for fertility and ovulation**.**

CONCLUSION:

Food security is identified as one of the main challenges for the 21st century and White flour, white salt, white sugar-the poison triad are barriers to achieve food and nutrition security. Consumption of these refined food items invite various health problems. The habit of taking refined food items can be avoided by strong will power and awareness of the side effects associated with them.

REFERENCES:

1. https://www.who.int/news-room/fact-sheets/detail/noncommunicable-diseases [accessed on 21-09-2021]
2. Mozaffarian D. Dietary and policy priorities for cardiovascular disease, diabetes, and obesity: a comprehensive review. *Circulation*. 2016;133(2):187-225.PubMed Google Scholar [Crossref]
3. https://eatrightindia.gov.in/whyeat-right.jsp [accessed on 21-09-2021]
4. Ahirwar R, Mondal PR. Prevalence of obesity in India: A systematic review. Diabetes Metab Syndr. 2019 Jan-Feb;13(1):318-321. doi: 10.1016/j.dsx.2018.08.032. Epub 2018 Sep 21. PMID: 30641719.
5. Micha R, Peñalvo JL, Cudhea F, Imamura F, Rehm CD, Mozaffarian D. Association Between Dietary Factors and Mortality From Heart Disease, Stroke, and Type 2 Diabetes in the United States. *JAMA.* 2017;317(9):912–924. doi:10.1001/jama.2017.0947
6. Bhavaprakasa of Sribhava Misra, Vidyptini hindi commentary by Sri Brahmasankara Misra, Part First; Edition:Reprint 2020; Krittana varga:23, p875; Chaukhamba Sanskrit Bhawan:Varanasi.
7. Bhojanakutuhalam by Raghunatha Suri, Edited with English translation (2012); CTF, I-AIM, Foodstuffs; p49
8. https://www.wisdomlib.org/definition/maida [accessed on 21-09-2021]
9. https://www.britannica.com/plant/wheat
10. Vita Giaccone, Gaetano Cammilleri, Vita Di Stefano, Rosa Pitonzo, Antonio Vella, Andrea Pulvirenti, Gianluigi Maria Lo Dico, Vincenzo Ferrantelli, Andrea Macaluso, "First report on the presence of Alloxan in bleached flour"Journal of Cereal Science,Volume 77, 2017, Pages 120-125, ISSN 0733-5210, https://doi.org/10.1016/j.jcs.2017.06.015.

11. "British Food Journal Volume 13 Issue 5 1911", *British Food Journal*, Vol. 13 No. 5, pp. 81-100. https://doi.org/10.1108/eb010995
12. Ganga, S; Mathiyoli, P M; Naachimuthu, K P. Indian Journal of Health and Wellbeing; Hisar Vol. 11, Iss. 1-3, (Mar 2020): 100-105. DOI:10.15614/IJHW.v11i01.20
13. Sushruta samhita of Maharsi – Susruta, with Hindi commentary By Kaviraja Ambidakutta Shastri Chaukhambha Sanskrit Sansthan, Varanasi – 1, 3rd Edition 1972 Sutrasthana 46: 315 – 322
14. The Caraka samhita by Agnivesa ….revised by Caraka and Dridhabala….with…..commentary of Cakrapanidatta, Edited by Vaidya Jadavaji Trikamji Acharya, 3rd Edition, Publ. by Satyabhamabai Pandurang…..Bombay 1941, Sutrasthana 27 : 300 – 304
15. The Astanga hridaya, A Compendium.. composed by Vagbhata, with the commentaries by Hemadri, collated by Anna Moreswar Kunte…. Edited by Bhisagacharya Harisastri Paradkar Vaidya Akola – Berar, Published by Pandurang Jawaji, Bombay 1939 Sutrasthana 6 : 143 –144
16. Rajanighantu Chapter:6
17. La Touche : Bibliography of Indian Geology, Vol. II, lexica : "Mineral Waters", (P. 372 –388), Calcutta (1917).
18. Kaunitz H. : Causes and Consequences of Salt Consumption, Nature 178, 1141 – 44 (1956).
19. https://en.wikipedia.org/wiki/Sea_salt
20. https://www.thespruceeats.com/how-is-salt-made-1328618
21. https://www.britannica.com/science/salt/Use-of-artificial-heat
22. https://www.medicalnewstoday.com/articles/326519#intake-recommendations
23. Pieters, A.J.; Flint, D.; Garriott, E.B.; Wickson, E.J.; Lamson-Scribner, F.; Brackett, G.B.; Atwater, H.W.; Alvord, H.E.; Withcombe, J.; Howard, L.O. (1899). Bread and the Principles of Bread Making. U.S. Department of Agriculture. pp. 28–30.
24. Breslin, P.A.S.; Beauchamp, G. K. (5 June 1997). "Salt enhances flavour by suppressing bitterness". *Nature*. 387 (6633):563. Bibcode:1997Natur.387..563B. doi:10.1038/42388. PMID 9177340. S2CID 205030709.
25. Buss, David; Robertson, Jean (1973). *Manual of Nutrition*. Her Majesty's Stationery Office. pp. 37–38. ISBN 978-0-11-241112-3.
26. *"National Nutrient Database for Standard Reference, Basic Report: 02047, Salt, table". Agricultural Research Service, National Nutrient Database for Standard Reference. United States Department of Agriculture.*
27. "WHO issues new guidance on dietary salt and potassium". World Health Organization. 31 January 2013.
28. https://medlineplus.gov/sodium.html
29. https://www.cdc.gov/vitalsigns/children-sodium/index.html
30. https://www.ahajournals.org/doi/10.1161/HYPERTENSIONAHA.118.12074
31. Krewski, Daniel et al. "Human health risk assessment for aluminium, aluminium oxide, and aluminium hydroxide." *Journal of toxicology and environmental health. Part B, Critical reviews* vol. 10 Suppl 1,Suppl 1 (2007): 1-269. doi:10.1080/10937400701597766
32. Manzel, A., Muller, D.N., Hafler, D.A. *et al.* Role of "Western Diet" in Inflammatory Autoimmune Diseases. *Curr Allergy Asthma Rep* 14, 404 (2014). https://doi.org/10.1007/s11882-013-0404-6
33. Kleinewietfeld, M., Manzel, A., Titze, J. *et al.* Sodium chloride drives autoimmune disease by the induction of pathogenic T_H17 cells. *Nature* 496, 518–522 (2013). https://doi.org/10.1038/nature11868
34. Robert P. Heaney (2006) Role of Dietary Sodium in Osteoporosis, Journal of the American College of Nutrition, 25:sup3, 271S-276S, DOI: 10.1080/07315724.2006.10719577
35. Peleteiro B, Lopes C, Figueiredo C, Lunet N. Salt intake and gastric cancer risk according to Helicobacter pylori infection, smoking, tumour site and histological type. Br J Cancer. 2011 Jan 4;104(1):198-207. doi: 10.1038/sj.bjc.6605993. Epub 2010 Nov 16. PMID: 21081930; PMCID: PMC3039805.
36. D'Elia L, Galletti F, Strazzullo P. Dietary salt intake and risk of gastric cancer. Cancer Treat Res. 2014;159:83-95. doi: 10.1007/978-3-642-38007-5_6. PMID: 24114476.
37. Prof. K.C.Chunekar, commentator, (Ist Reprint edn, 2013). Bhavaprakash Nighantu of Bhavmishra, Ikshu Varga, Verse 30, Varanasi: Chaukhambha Bharati Academy; p. 780
38. https://en.wikipedia.org/wiki/White_sugar
39. GAPS Guidelines. GAP. 17.23.2.6. A Publication of Global Asset Protection Services LLC. SUGAR PROCESSING. Available from: xlcatlin.com/~/media/gaps/hn26_0.pdf
40. Gupta D, Agrawal SK, Sharma KK. A Critical Analysis of Sugarcane Based Sweeteners and Their Health Effects. Int J Ayurveda & Med Sc 2017; 2(3): 68-70.
41. Dr S C Ray, Eminent Sugar expert [HEALTH HAZARDS OF 'SULPHUR' IN SUGAR- eHealth Magazine]: Jan 15, 2014. Available from: ehealth.eletsonline.com/2014/01/health-hazards-of-sulphur-insugar/
42. Sanchez, A., Reeser, J. L., Lau, H. S., Yahiku, P. Y., Willard, R. E., Mcmillan, P. J., . . . Register, U. D. (1973). Role of sugars in human neutrophilic phagocytosis. *The American Journal of Clinical Nutrition, 26*(11), 1180-1184. doi:10.1093/ajcn/26.11.1180
43. Yu, S., Zhang, G., & Jin, L. H. (2018). A high-sugar diet affects cellular and humoral immune responses in Drosophila. *Experimental Cell Research, 368*(2), 215-224. doi:10.1016/j.yexcr.2018.04.032
44. Caporuscio, J. (2019, September 19). Does sugar cause inflammation? What the research says. https://www.medicalnewstoday.com/articles/326386.php

45. Mullins, L. (Producer). (2015, January 07). *Is Sugar More Addictive Than Cocaine?* [Audio podcast]. http://www.radiolab.org/story/91518-goat-on-a-cow/.
46. Li, Y., Hruby, A., Bernstein, A. M., Ley, S. H., Wang, D. D., Chiuve, S. E., . . . Hu, F. B. (2015). Saturated Fats Compared With Unsaturated Fats and Sources of Carbohydrates in Relation to Risk of Coronary Heart Disease. *Journal of the American College of Cardiology, 66*(14), 1538-1548. doi:10.1016/j.jacc.2015.07.055
47. DiSalvo, D. (2012, April 27). What Eating Too Much Sugar Does to Your Brain. https://www.psychologytoday.com/us/blog/neuronarrative/201204/what-eating-too-much-sugar-does-your-brain
48. Li, T., Ni, L., Liu, X., Wang, Z., & Liu, C. (2016). High glucose induces the expression of osteopontin in blood vessels in vitro and in vivo. *Biochemical and Biophysical Research Communications, 480*(2), 201-207. doi:10.1016/j.bbrc.2016.10.027
49. Nagai, N., Yamamoto, T., Tanabe, W., Ito, Y., Kurabuchi, S., Mitamura, K., & Taga, A. (2015). Changes in Plasma Glucose in Otsuka Long-Evans Tokushima Fatty Rats After Oral Administration of Maple Syrup. *Journal of Oleo Science, 64*(3), 331-335. doi:10.5650/jos.ess14075
50. Anderson, C., Munos, J., Johnson, R., Vos, M. B., Kaar, J. L., Welsh, J. A., Xanthakos, S. A. (2016, August 22). Added Sugars and Cardiovascular Disease Risk in Children: A Scientific Statement From the American Heart Association. from https://www.ahajournals.org/doi/10.1161/CIR.0000000000000439
51. Kam, K. (2011, August 29). Sugar Health Effects: Is Refined Sugar Bad For You? from https://www.webmd.com/food-recipes/features/health-effects-of-sugar
52. Yang, Q., Zhang, Z., Gregg, E. W., Flanders, W. D., Merritt, R., & Hu, F. B. (2014). Added Sugar Intake and Cardiovascular Diseases Mortality Among US Adults. *JAMA Internal Medicine, 174*(4), 516. doi:10.1001/jamainternmed.2013.13563
53. Anderson, C., Munos, J., Johnson, R., Vos, M. B., Kaar, J. L., Welsh, J. A., Xanthakos, S. A. (2016, August 22). Added Sugars and Cardiovascular Disease Risk in Children: A Scientific Statement From the American Heart Association. Retrieved June 22, 2020, from https://www.ahajournals.org/doi/10.1161/CIR.0000000000000439
54. Weijenberg, M. P., Mullie, P. F., Brants, H. A., Heinen, M. M., Goldbohm, R. A., & Brandt, P. A. (2007). Dietary glycemic load, glycemic index and colorectal cancer risk: Results from the Netherlands Cohort Study. *International Journal of Cancer, 122*(3), 620-629. doi:10.1002/ijc.23110
55. Tasevska, N., Jiao, L., Cross, A. J., Kipnis, V., Subar, A. F., Hollenbeck, A., . . . Potischman, N. (2011). Sugars in diet and risk of cancer in the NIH-AARP Diet and Health Study. *International Journal of Cancer, 130*(1), 159-169. doi:10.1002/ijc.25990
56. Byrne, L. (n.d.). *Break The Sugar Habit*. http://www.wellgroundedlife.com/wp-content/uploads/2016/11/Break-the-Sugar-Habit-Workbook-2017.pdf
57. Del-Ponte, B., Anselmi, L., Assunção, M. C., Tovo-Rodrigues, L., Munhoz, T. N., Matijasevich, A., Santos, I. S. (2019). Sugar consumption and attention-deficit/hyperactivity disorder (ADHD): A birth cohort study. *Journal of Affective Disorders, 243*, 290-296. doi:10.1016/j.jad.2018.09.051
58. Hsu, T. M., Konanur, V. R., Taing, L., Usui, R., Kayser, B. D., Goran, M. I., & Kanoski, S. E. (2014). Effects of sucrose and high fructose corn syrup consumption on spatial memory function and hippocampal neuroinflammation in adolescent rats. *Hippocampus, 25*(2), 227-239. doi:10.1002/hipo.22368
59. DiSalvo, D. (2012, April 27). What Eating Too Much Sugar Does to Your Brain. from https://www.psychologytoday.com/us/blog/neuronarrative/201204/what-eating-too-much-sugar-does-your-brain
60. Danby FW. Nutrition and aging skin: sugar and glycation. Clin Dermatol. 2010 Jul-Aug;28(4):409-11. doi: 10.1016/j.clindermatol.2010.03.018. PMID: 20620757.
61. Panth, Neelima et al. "The Influence of Diet on Fertility and the Implications for Public Health Nutrition in the United States." *Frontiers in public health* vol. 6 211. 31 Jul. 2018, doi:10.3389/fpubh.2018.00211