Artificial Sweeteners in India

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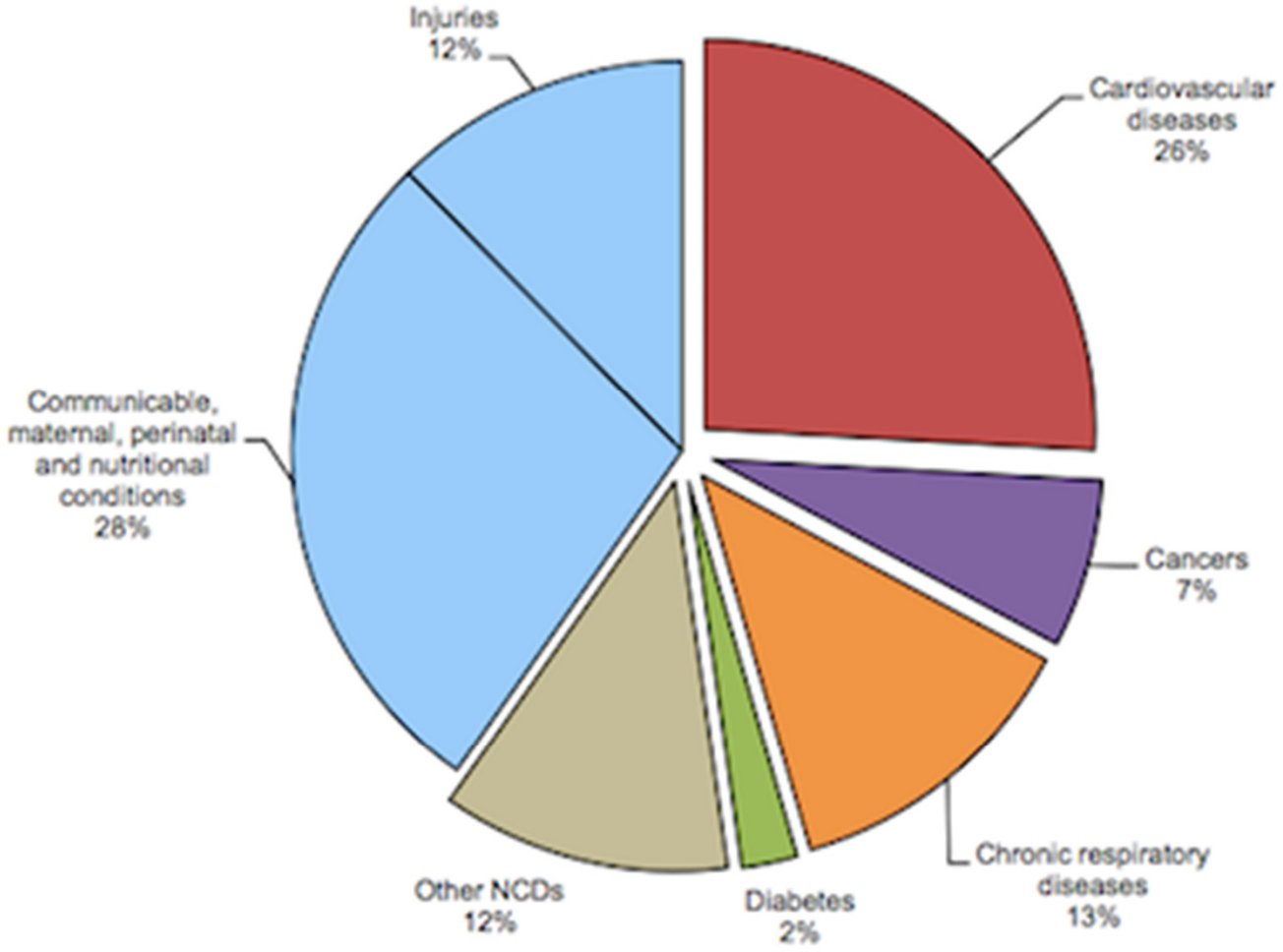
Percentage of population living in urban areas: 31.3%
Population proportion between ages 30 and 70 years: 40.1%

WHO 2013

Proportional mortality (% of total deaths, all ages, both sexes)*



Total deaths: 9,816,000
NCDs are estimated to account for 60% of total deaths.

INDIA

Public Health concerns

- Rapid increase in the incidence and prevalence of Obesity, overweight and their consequences both in urban and rural India.
- High energy diets with low levels of physical activity

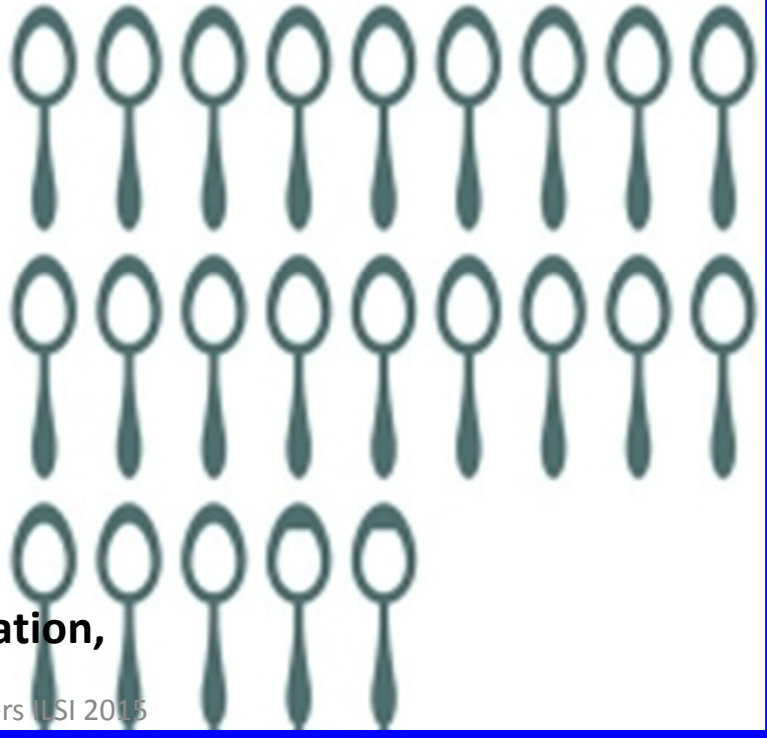
Public Health concerns ..

- A high intake of free sugars
- Energy density of foods is related to the quantity of free sugars as well as fat.
- WHO has strongly recommended that the free sugar intakes should be reduced to less than 10% of the total daily energy intakes and if possible lower it further to 5%.

Women limit added sugar to 100 calories per day or about 6 teaspoons

Men limit added sugar to 150 calories per day or about 9 teaspoons

The average American actually consumes 365 calories per day or about 23 teaspoons



Average Indian ?

(Guideline: Sugars intake for adults and children. Geneva. World Health Organization, 2015

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Free sugars

- Include mono(Glucose and Fructose) and disaccharides(Sucrose, Lactose and Maltose) added to foods and beverages by the manufacturer, cooks or consumers

(Guideline: Sugars intake for adults and children. Geneva. World Health Organization, 2015

Free sugars

- Sugars naturally present in honey, syrups, fruit juices and fruit juice concentrates.

- Increase or decrease in consumption of free sugars is associated with a parallel change in body weights.

- **(Guideline: Sugars intake for adults and children. Geneva. World Health Organization, 2015)**

(Guideline: Sugars intake for adults and children. Geneva. World Health Organization, 2015)

- Even in individuals with inadequate energy intakes, increasing the free sugar content of their food is not recommended.

- This excludes therapeutic diets for Severe Acute Malnutrition(SAM) and Moderate Acute Malnutrition (MAM).

Consequences of lowering sugar in food

- Reducing free sugars in foods will greatly impact taste
- Lack of taste is the biggest impediment to compliance for reducing energy intakes.
- If free sugar intakes have to be brought down there is a need for artificial sweeteners

Consequences of lowering sugar in food..

- Sugar substitutes will come into foods which hitherto had free sugars as ingredients
- eg Beverages, traditional sweets, chocolates, candies, ice creams, bakery products and the home use of sugar
- Artificial sweeteners are one type of sugar substitutes.

Definition and types of sugar substitutes

- Sugar substitutes are anything that is used instead of sugar.
- They are of the following categories

1. Artificial sweeteners- Acesulfame, Aspartame, Neotame, Saccharin, Sucralose

2. Sugar Alcohols- Erythritol, Isomalt, Maltitol, Xylitol, Sorbitol

Sugar substitutes...

- 3. Novel sweeteners- Stevia, Tagatose, Trehalose

- 4. Natural Sweeteners (caloric sweeteners)- Agave nectar, Date sugar, Fruit juice concentrate, Honey, Maple syrup, Molasses.

Saccharin

- Oldest artificial sweetener(discovered in 1878) and has been used for over 100 yrs.
- Initial rat experiments- urinary bladder tumors not found in any other species nor any human reports.
- About 300 times sweeter than sugar - sometimes gives a bitter after taste.

Saccharin..

- Saccharin has been declared as safe by American Cancer Society, AMA and academy of nutrition & dietetics.
- Not affected by heat and hence an advantage in baked foods.
- JECFA, ADI is 5 mg/kg of body weight
- Approved in more than 100 countries.

FSSAI permits saccharin in ..

- Carbonated water: 100 ppm
- Chocolates & Indian traditional sweets: 500 ppm
- Sugar based/sugar-free confectionery & chewing gum/bubble gum; 3000 ppm .

Cyclamates

- Discovered in 1937.
- Three different compounds-Cyclamic acid, calcium cyclamate and sodium cyclamate.
- It is a low calorie sweetener.
- ADI set by JECFA is 11mg / Kg B wt.
- It is 30 times sweeter than sucrose. It is used in over 100 countries.
- Not approved under the FSSAI.

Aspartame

- Discovered in 1965.
- 200 times as sweet as sugar.
- More than 500 studies were reviewed and it was found to be safe except in phenylketonurics.(inherited inability to metabolize phenylalanine- brain and nerve damage)

Aspartame permitted by FSSAI

- Carbonated water: 700 ppm,
- Non carbonated water based beverages: 600 ppm,
- Biscuit, bread, cakes: 2200 ppm
- Indian sweets: 200 ppm
- Jams jellies: 1000 ppm
- Sugar based/free confectionery: 10000
- Chocolates: 2000 ppm
- Ice cream: 1000 ppm, flavored milk: 600 ppm, RTE cereal: 1000 ppm, still beverages:600 ppm

Labeling requirement if Aspartame is added

- " not recommended for children and in phenylketonurics".
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- It has two amino acids phenylalanine and aspartic acid.
- It gets hydrolyzed into the two amino acids and a small amount of methanol, which is metabolized and is much less than the amount of methanol generated from other sources.
- More than 500 studies have been carried out on Aspartame and has been declared safe by all regulations.
- EFSA permits its use even in pregnant women and children – ADI is 40-50mg/ Kg B wt.

Neotame

- Similar to aspartame about 7000- 13000 times sweeter than sugar.
- There are more than 100 studies establishing its safety.
- FSSAI has permitted its use in soft drinks at a maximum limit of 33 ppm.
- ADI according to JECFA is 2 mg/ Kg B wt.

Acesulfame potassium (ACE-K)

- It was discovered in 1967.
- 600 times sweeter than sugar.
- Used in a large variety of foods in over 90 countries .
- ADI is 15mg/Kg

Permitted by FSSAI

- in Carbonated water and non carbonated water based beverages: 300 ppm,
- Biscuits, cakes etc. :1000 ppm
- Indian sweets: 500 ppm
- Sugar based/free confectionery: 3500 ppm,
- Still beverages 300 ppm
- Ready to serve tea and coffee based beverages: 600 ppm

Sucralose

- It was discovered in 1976.
- It is derived from sucrose and 600 times sweeter.
- It is used in a wide variety of foods. In over 80 countries.
- It does not elevate blood glucose levels.
- ADI is 0-15 mg/ Kg. There are no reported safety concerns.

Permitted by FSSAI

- in Carbonated water & non carbonated water based beverages: 300 ppm
- Biscuits, cakes; 750 ppm
- Indian sweets:750 ppm
- Still beverages: 300 ppm
- Jams jellies: 450 ppm
- Ready to serve tea and coffee based beverages: 600 ppm
- Ice lollies/candies: 800 ppm
- Confectionery: 800 ppm-1500 ppm

Steviol Glycosides

- Recently (June 2015) been approved by FSSAI. Approved by JECFA in 2009.
- They are natural constituents of the leaves of stevia rebaudiana.
- They are 200 to 400 times sweeter than sugar.

Steviol Glycosides..

- Stevia glycosides- rebaudiside A, Stevioside- Rebaudiside D, Steviol glycoside. Mixtures with rebaudiside A and / or stevioside are all sweeteners.
- Stevia sweeteners are approved as table top sweetener and for addition to food and beverages in approximately 49 countries including U.S., Japan, Brazil, Paraguay and EU .

Steviol Glycosides…

- The use of stevia leaf and crude extract are not approved by USFDA.
- JECFA has approved an ADI value for steviol glycosides expressed as 4 mg of steviol equivalents per kg body weight per day .
- Approximately 12 mg of high purity stevia extracts per kg body weight per day [1]

Sugar Alcohols

- They are calorific but do not get completely absorbed.
- Many of them are less sweet than sugar and need to be used in larger quantities.
- Due to inadequate absorption they have a laxative effect.
- They are naturally present in fruits and vegetables but can be synthesized.

Sugar Alcohols..

- > 50 gm of sorbitol and 20 Gm of mannitol per day may cause diarrhea.
- Erythritol is absorbed fully and excreted.
- Oral bacteria do not grow on them hence they cannot contribute to caries.
- Sugar alcohols or polyols include Sorbitol, Mannitol, Xylitol, Isomalt, Lactitol and Maltitol.

Sugar Alcohols or Polyols

	Calories per gram	Approximate Sweetness (sucrose =100%)	Typical Food Applications
Sorbitol	2.6	50 - 70%	Sugar-free candies, chewing gums, frozen desserts and baked goods
Xylitol	2.4	100%	Chewing gum, gum drops and hard candy, pharmaceuticals and oral health products, such as throat lozenges, cough syrups, children's chewable multivitamins, toothpastes and mouthwashes; used in foods for special dietary purposes
Maltitol	2.1	75%	Hard candies, chewing gum, chocolates, baked goods and ice cream
Isomalt	2.0	45 - 65%	Candies, toffee, lollipops, fudge, wafers, cough drops, throat lozenges
Lactitol	2.0	30 - 40%	Chocolate, some baked goods (cookies and cakes), hard and soft candy and frozen dairy desserts
Mannitol	1.6	50 - 70%	Dusting powder for chewing gum, ingredient in chocolate-flavored coating agents for ice cream and confections
Erythritol	0 - 0.2*	60 - 80%	Bulk sweetener in low calorie foods
Hydrogenated Starch Hydrolysates (HSH)	3	25 - 50%	Bulk sweetener in low calorie foods, provide sweetness, texture and bulk to a variety of sugarless products

Label requirement for artificial sweeteners when used in products (FSSAI)

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- “This food XXXXX (name of food) contains YYY (name of artificial sweetener)”
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- “ Not recommended for children”
- Quantity of sugar added …. g/ 100g or
- No sugar added

Label requirement for artificial sweetener when used in products (FSSAI)..

- “Not for phenylketonurics” (if aspartame is added)
- In addition it should state – Contains artificial sweeteners and for calorie conscious.
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- **Label declaration fo polyols**
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- Polyols may have laxative effect.

What is the FDA's Acceptable Daily Intake for Various Sugar Substitutes?

Sweetener	ADI(mg/kg(50kg#))	Avg in 330 ml can of diet soda	Avg in packet of sweetener
Acesulfame K	15(750)	40*	50
Aspartame	50 (2500)	200	35
Sucralose	5(250)	70	5

* Average amount as Acesulfame-K is usually mixed with 90 mg aspartame

Sources: Guide to Medical Nutrition Therapy for Diabetes. American Diabetes Association. Chicago, IL; 2005.

ADI about 1/100 0f lowest adverse effect level

#- Calculated for a 50Kg B wt person

Conclusion

- Artificial sweeteners now have a major role in reducing the burden of non communicable diseases.
- They are very extensively studied for their safety and only then approved for long term consumption.
- They help in compliance of consumers who are advised not to take sugar in their diets and thus assists in long term survival despite obesity and type2 DM.

Thank you