

SUGAR AND NUTRITION

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The increasing public awareness of health and nutrition and its effect on sugar consumption are highlighted. The nutritional value of sugar and its role in a balanced diet is discussed. Current literature concerning the role of sugar in the development of disease is reviewed.

Sugar, Nutrition and Health - What is Sugar's Role?

The "Health" Phenomenon of the 1970's & 1980's

The concept of health, what it means, why it is desirable and how to attain it, has received increasing attention in the last decade, so that almost all spheres of life have been affected, including commerce and industry. For those involved in the promotion of health, this has had many benefits, because it has increased the level of awareness and therefore receptiveness to the available information. However, this greater awareness of health has disadvantages. Irresponsible communication of health-related concepts together with unqualified opinions has led to confusion, misunderstandings and fanaticism.

Nutrition has been focused upon in the promotion of health, probably because everyone can relate to food. However, nutrition has also been the subject of many erroneous claims and promotion of misinformation. This has been emphasised by the lack of conclusive evidence about many nutrition issues thus making it difficult for nutritionists to make definitive statements or recommendations. Sugar has been subjected to these complexities and is involved in a simultaneous fight against the promotion of un- or half-truths relating to nutrition and health in general.

The result is that the image of sugar tends to be negative. An attitudinal survey carried out in this country recently showed that sugar is increasingly believed to be unhealthy and the cause of a number of diseases.³⁷

This negative attitude towards sugar has been reflected in sugar consumption figures as shown in Table 1.

In most countries, sugar consumption peaked during the early 1970's and has subsequently declined to a more or less steady level.²⁶

How did the anti-sugar propaganda begin?

To try to identify the causes of the increased incidence of certain diseases in the Western world, diet was investigated. Increasing Westernisation has led to changes in diet and it seemed logical to link diet with the development of many diseases. Dietary factors that were identified include decreased intake of complex carbohydrate and fibre; increased intake of fat, salt and sugar. Certain researchers attribute the development of diseases such as diabetes, coronary heart disease and dental caries to a high sugar intake,^{10, 43, 44} basing their conclusions largely on epidemiological studies in which comparisons are drawn between the incidence of disease and sugar consumption. These conclusions have been publicised by the popular press in particular, and sugar has been commonly referred to as "pure, white and deadly" or "sweet and dangerous".^{43, 44}

Table 1

Total Sugar Consumption Per Capita

Year	SA	UK	W Germany	France	Australia
1957	34,8	53,4	29,4	30,8	—
1967	34,6	48,3	29,2	33,3	50,0
1977	40,3	42,6	33,7	34,6	49,7
1980/81	37,1	39,0	35,9	35,6	48,2
1983/84	37,7	39,1	34,7	34,4	43,8

Sources

- (a) Oosthuizen, FJC (1980). Trends in the demand for sugar in South Africa and in selected developed countries. Unpublished D.Com. Thesis, Univ of SA, Pretoria.
- (b) Survey 1985. Comité Europeen des Fabricants de sucre. (Figures available from the SA Sugar Association).

Sugar and Health - Current Opinions

Sugar's role in a balanced diet

The nutritional value of sugar: Sugar, being almost pure carbohydrate, yields 17 kJ (4 Cal) per g and is therefore primarily a source of energy.

It does contain small quantities of certain minerals and brown sugar in particular contains a variety of minerals, but these are insignificant compared with the amounts obtained from other food sources.¹⁴

As a cheap, easily available source of energy, sugar is particularly important in impoverished communities where an energy deficit is a major contributor towards the development of protein-energy malnutrition.²

Does sugar have a place in our diet? Many anti-sugar lobbyists recommend the total exclusion of sugar from the diet.⁴³ However, besides being a cheap, readily metabolised source of energy, sugar has other important functions in the diet. Its versatility makes it an indispensable ingredient in many of our most popular foods. It contributes texture, colour and also functions as a preservative.¹⁶ Another most important contribution is its palatability. Those who recommend its exclusion ignore the fact that food has many other functions apart from satisfying hunger.³³ The enjoyment of food is an important part of any culture and it is unrealistic to ignore this when working in the field of nutrition. It is also important to remember that food does not have a nutritional value until it is eaten. Sugar makes a wide variety of foods taste good, and for this reason alone plays an important role in our diet. It is not essential - but neither is any other particular food (except possibly milk in infancy). What is required and recommended is a balanced diet consisting of reasonable amounts of a wide variety of foods, of which one is sugar.^{25, 40}

"Empty Calories": Because sugar's principal contribution to the diet is in the form of energy, it has been accused of providing "empty calories". The accusation is that if a substantial portion of a person's total energy intake is obtained from a food which lacks other nutrients, this may have the effect of "crowding out" of the diet other foods which may be good sources of these nutrients. However, it seems that this is unjustified. Contrary to popular opinion, sugar consumption has remained stable during the past few years and

is even declining in some countries.²⁶ Recent surveys do not show a decrease in intake of various nutrients.¹⁹ Moreover, there is no evidence that nutrient deficiencies are more common in high-sugar consumers than in low-sugar consumers,⁴¹ since in countries where the percentage of total kJ from sugar is high, the supply of essential nutrients from other foods is more than adequate.¹

Sugar and disease

Diabetes mellitus: Diabetes is a metabolic disorder characterised by a chronically raised blood glucose (sugar) level, resulting from an inability of the pancreas to manufacture the hormone insulin. Two issues which need clarification are sugar's role as a possible causative factor in diabetes and sugar's role in the diet of confirmed diabetics.

● Does sugar cause diabetes?

The exact cause of diabetes is not known, but it is generally accepted that several factors are involved including genetic inheritance and a possible viral link.⁸

Epidemiological evidence does not support any direct relationship between national sugar consumption and diabetes prevalence and it has even been claimed that the data show an inverse relationship between diabetes risk and carbohydrate and sugar consumption.⁵

● Can sugar be eaten by diabetics?

The diabetic diet has been studied by nutritionists around the world, particularly as it has undergone considerable changes since the early recommendations were made.

Because the diabetic condition results in an impairment in the body's ability to metabolise carbohydrate, initial recommendations emphasized the need to cut down on intake of all carbohydrate foods. However, when it became apparent that cutting down on carbohydrate meant a corresponding increase in fat intake (which is undesirable because of complications such as coronary heart disease), the recommendations were altered to allow for a greater carbohydrate intake. This was further supported by evidence showing that dietary fibre (which is included under carbohydrate) had a beneficial effect.¹¹ Still further evidence has shown that in well-controlled diabetics, a limited percentage of the total carbohydrate intake can be in the form of simple sugars, with no ill-effect.^{3, 31}

Coronary Heart Disease: Coronary heart disease is an important cause of death in most Western populations and particularly in South Africa where there is the highest incidence of this disease in the world.¹⁸

The exact cause is not known, but several so-called "risk factors" have been identified. The most important of these are age, high blood lipid (fat) level, high blood pressure and smoking. Diet has been incriminated in that it has been claimed that a high sugar intake raises blood fat levels.^{10, 43, 44} Two types of fats are involved, cholesterol and triglycerides. Numerous studies from various parts of the world have failed to provide conclusive evidence that sugar ingestion does in fact lead to a raised blood cholesterol level. Reiser and co-workers³⁰ have demonstrated an increase in triglyceride levels in certain subjects following sucrose ingestion, but this effect has subsequently been found either not to occur¹⁵ or if it does occur, to be transitory.⁶ Epidemiological evidence from numerous accredited sources further demonstrates that there is no firm correlation between sugar consumption and coronary heart disease.^{13, 24, 27} The Royal College of Physicians and the British Cardiac Society confirmed this in a report published in 1976.²⁸

Obesity: One of the commonest beliefs about sugar is that it is "fattening". Seen as a concentrated source of energy, it

has acquired an almost unique position as a food to be avoided by the weight-conscious individual.

However, there is a considerable amount of evidence showing that "sugar consumption is actually lower in fat people than in lean".⁵ Overweight is caused by an imbalance between energy intake (from food) and energy output (from activity). The source of the additional energy (kJ) is inconsequential because no one food specifically promotes obesity.

It is therefore feasible to maintain and even lose weight while continuing to eat sugar, provided the balance between energy intake and output is maintained.

In addition, the value of substituting artificial sweeteners for sugar as an aid to weight loss is questionable, because there is "little or no evidence that people using artificial sweeteners succeed in losing weight as a result of sweeteners".³⁴

Dental Caries: Dental caries is a disease of microbial origin. Diet is significant because carbohydrates are absorbed by bacterial plaques which adhere to the teeth, and are broken down to form organic acids. These acids lower the pH at the tooth surface, leading to the development of a carious lesion.⁸ Sugar intake is therefore one of the contributory causes of tooth decay but other factors such as bacterial flora in the mouth, fluoride in water supplies and genetic factors are also involved. Moreover, it is not total sugar consumption that is most important but mode and frequency of sugar intake. This is borne out by epidemiological evidence showing that comparisons of populations consuming high and low sugar intakes respectively show only slight differences in prevalences of tooth decay³¹ and the incidence of dental caries is declining in many developed nations despite minimal changes in diet.³⁸

A considerable amount of research is being conducted in this area, with one of the major objectives being to isolate "high risk" individuals who may require specific recommendations.

Hypoglycaemia: "In recent years, hypoglycaemia (low blood sugar) seems to have acquired popular status as a 'disease'."²² Most authorities, however, believe it to be rare and frequently misdiagnosed.³⁸

There are two main types of hypoglycaemia. The first, "reactive" hypoglycaemia is an unusual condition which occurs in isolated individuals as a result of oversecretion of insulin in response to elevated blood sugar levels after eating.^{22, 23} Symptoms can be produced by a variety of foods ranging from sugar to starchy foods including bread.²³

The second type of hypoglycaemia ("non-reactive" hypoglycaemia) is generally the result of an underlying disorder of one of the major organs such as the pancreas, liver or stomach.^{22, 23} Hypoglycaemia can also occur in diabetics, as a result of an excessive insulin dose, skipped meals or illness.

Hypoglycaemia or low blood sugar is a rare condition resulting from a metabolic defect, is overdiagnosed, and symptoms ascribed to it are often simply the result of anxiety reactions.

Behavioural Problems: Probably because it is newsworthy, a possible role of sugar in the development of behavioural problems has been publicised recently. Diets with a high sugar content have been reputed to cause hyperactivity, juvenile delinquency and even criminal behaviour. In the United States the issue became so serious that the National Council Against Health Fraud published a paper in 1984 in which the role of diet in criminal behaviour is denied, and emphasis placed on the possible harmful effects of "inappropriate dietary treatment based on unfounded beliefs".²⁸

This paper was later endorsed by the American Dietetic Association.

It has been suggested that sugar causes behavioural problems either because of the ensuing hypoglycaemia, or through its influence on neurotransmitters. However, hypoglycaemia is a rare disorder and, there is no conclusive evidence to show that hypoglycaemia causes behavioural problems. This was also stated in the paper mentioned above. With regard to the effect of sugar on neurotransmitters, it has been shown that blood levels of certain substances involved in the synthesis of neurotransmitters increase when dietary carbohydrates are increased.^{17,42} However, one of the behaviours in which these particular substances are involved is sleep; therefore, although the role of diet in influencing behaviour is not yet clear, it is possible that sugar may have a calming rather than a stimulatory effect.

Attempts to show a definite link between sugar intake and behavioural problems, including hyperactivity, have failed. Those studies that have claimed to show this have subsequently been shown to be "subjective evidence presented by believers".²⁸ Properly designed and conducted trials have not demonstrated an increase in antisocial or aggressive behaviour following the intake of sugar, and it has even been shown that the intake of sugar led to a decrease in activity levels.^{4,8} In addition, epidemiological evidence also fails to support a correlation between sugar intake and behavioural abnormality.³⁶

Certain individuals may display allergic symptoms related to sugar intake, but this also applies to many other foods⁷ and is not common.

Sugar in the treatment of disease

Oral rehydration mixtures: Sugar is an important ingredient in the routine "Salt-and-sugar water" treatment of gastro-enteritis,²⁰ which is a common cause of death in young children, particularly in this country.

Wound Healing: Since 1976 a number of cases of successful treatment of wounds using sugar have been reported from countries such as Argentina,⁹ Italy,²⁹ USA,²¹ UK¹² and France.³⁹ Wounds treated include burns,^{21, 29} abscesses,¹² frost-bite,²¹ amputations,²¹ diabetic leg ulcers²⁹ and wounds following cardiac surgery.³⁹ Sugar was either applied directly or mixed to a paste using a lubricating agent.^{12, 29}

Advantages of using sugar for wound healing include low cost, safety and availability. Advantages to the patient include painless administration, decreased swelling and possibly less scarring.²¹

Summary

Increasing interest in health and nutrition has focused on sugar and in particular, its role in the development of certain diseases. A careful examination of the medical and scientific literature shows, however, that a promotive role for sugar has only been substantiated in the case of dental caries. In the words of the special committee appointed by the USA Food & Drug Administration to examine sugar's role on the generally regarded as safe (GRAS) list "other than the contribution made to dental caries, the Select Committee found no clear evidence in the available information on sucrose that demonstrates a safety hazard to the public when sucrose is used at current levels and in the manner now practiced."

Sugar is a cheap, highly palatable source of energy and an important constituent of many of our most popular foods. It is thus part of a balanced diet and provided it is not eaten to excess, will not contribute to the development of ill-health or disease.

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