

## An observational study of “food safety levels” of salt, fat and sugar of soups consumed in Trinidad

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**ABSTRACT:** The objective of the present study is to provide up-to-date information on the food safety levels of salt, fat and sugar in processed foods, in particular soups. Soups surveyed in Trinidad revealed varying levels of salt, fat and sugar. Soups contributed to more than 15% of the diets of adults and children. Thus soups may be significant sources of nutrients in the diet. Analysis of nutrient contents declared on product labels as well as chemical analysis revealed that soups had low levels of fat (3g or less per 100 g) and sugar (2 g or less per 100 g), but high levels of salt (greater than 0.5 g per 100 g). This high level of salt may pose a possible silent health risk to susceptible individuals such as the young, old, pregnant, and immunocompromised and those afflicted with hypertension, heart disease, kidney disease and strokes that may increase their susceptibility to cardiovascular disease and recurrent strokes. The high intake of salt as a result of consuming soups was 12.16 g per person per day, which is considerably higher than the recommended maximum daily intake of 6 g per person per day, may be linked to heart disease and strokes thus providing the necessary impetus to encourage and adopt proactive measures such as salt reduction in manufacture of soups through reformulation, the use of warning labels and greater consumer food safety education.

**Key words:** Food safety levels, salt, fat, sugar, strokes, heart disease, silent health risk

### INTRODUCTION

The definition of silent health risk is any factor that can intentionally or unintentionally pose a challenge to human health and well being (Pattron, 2004). A silent health risk may go undetected mainly due to lack of knowledge, poverty, and/or negligence. Over time silent risk factors may manifest as full-blown health problems that may cause serious public health concerns (Pattron, 2004). Salt, fat and sugar are some of the modern day nutrients that are associated with silent health risks (Alderman, Cohen & Madhavan, 1998; Brown, 1995; Department of Health, 1994; Townsend, 2005; Vitanen & Aro, 1994; Whitney & Rolfes, 1996).

Salt (diet), chemical compound, sodium chloride (NaCl), a vital constituent of the human body. Salt is used to enhance the flavor of foods and to preserve foods. It typically enters the diet from processed foods, or from adding salt to food during preparation, cooking, and at the table. Salt contains no calories, proteins, or carbohydrates, although unrefined salt does contain traces of other minerals (Brown, 1995; Whitney & Rolfes, 1996).

Salt is necessary to human life. The sodium and chloride of salt, along with potassium, are electrolytes, which help the kidneys regulate the body's fluid levels and the balance of acids and bases (Brown, 1995; Whitney & Rolfes, 1996).

In recent years, medical researchers have linked the excessive consumption of sodium (which makes up approximately 40 percent of salt) to hypertension (high blood pressure) in humans (Jurgens & Graudal, 2004; Hooper et al., 2002). Hypertension can lead to death through heart, kidney diseases and stroke (Townsend et al., 2005; Jurgens & Graudal, 2004). The bulk of salt in the diet may not be coming from the salt shaker, but from processed foods such as soups. It has been reported that too much salt in the diet is prematurely killing roughly 150,000 people in America each year, according to the Center for Science in the Public Interest (CSPI, 2005). Presently, Food and Drugs Administration classifies salt as GRAS, or Generally Recognized as Safe, which means that it is not closely regulated (CSPI, 2005).

It is estimated that Americans spend more than \$15 billion each year on drugs to treat hypertension, yet it is believed that not enough is being done to curb or reduce salt consumption (CSPI, 2005). A similar situation exists in Trinidad (Patron, 2004; Patron, 2005) but the exact cost to society is difficult to ascertain. Trinidad has a population of 1.26 million (Tradeport, 2003), with a rapid developing low and middle class for convenience foods such as soups. Excessive amounts of salt consumed in the diet can work synergistically with fat and sugar and lead to hypertension, heart and kidney diseases and strokes (Department of Health, 1994; Whitney & Rolfes, 1996; Kaplan, 2000; Virtanen & Aro, 1994).

Fats, which provide 9 calories of energy per gram, are the most concentrated of the energy-producing nutrients, so our bodies need only very small amounts. Fats play an important role in building the membranes that surround our cells and in helping blood to clot. Once digested and absorbed, fats help the body absorb certain vitamins. Fat stored in the body cushions vital organs and protects us from extreme cold and heat (Brown, 1995; Whitney & Rolfes, 1996).

Fat consists of fatty acids attached to a substance called glycerol. Dietary fats are classified as saturated, monounsaturated and polyunsaturated according to the structure of their fatty acids (Brown, 1995). Animal fats from eggs, dairy products, and meats are high in saturated fats and cholesterol, a chemical substance found in all animal fat. Vegetable fats found, for example, in avocados, olives, some nuts, and certain vegetable oils are rich in monounsaturated and polyunsaturated fat. A high intake of saturated fats can be unhealthy (Brown, 1995; Whitney & Rolfes, 1996).

To understand the problem with eating too much saturated fat, we must examine its relationship to cholesterol. High levels of cholesterol in the blood have been linked to the development of heart disease, strokes, and other health problems. Despite its bad reputation, our bodies need cholesterol, which is used to build cell membranes, to protect nerve fibers, and to produce vitamin D and some hormones, chemical messengers that help coordinate the body's functions. We just do not need cholesterol in our diet. The liver, and to a lesser extent the small intestine, manufacture all the cholesterol we require. When we eat cholesterol

from foods that contain saturated fatty acids, we increase the level of a cholesterol-carrying substance in our blood that harms our health (Whitney & Rolfes, 1996).

Cholesterol, like fat, is a lipid, an organic compound that is not soluble in water. In order to travel through blood, cholesterol therefore must be transported through the body in special carriers, called lipoproteins. High-density lipoproteins (HDLs) remove cholesterol from the walls of arteries, return it to the liver, and help the liver excrete it as bile, a liquid acid essential to fat digestion. For this reason, HDL is called "good" cholesterol (Patron, 2004; Whitney & Rolfes, 1996).

Low-density lipoproteins (LDLs) and very-low-density lipoproteins (VLDLs) are considered "bad" cholesterol. Both LDLs and VLDLs transport cholesterol from the liver to the cells. As they work, LDLs and VLDLs leave plaque-forming cholesterol in the walls of the arteries, clogging the artery walls and setting the stage for heart disease. Almost 70 percent of the cholesterol in our bodies is carried by LDLs and VLDLs, and the remainder is transported by HDLs. For this reason, we need to consume dietary fats that increase our HDLs and decrease our LDL and VLDL levels (Brown, 1995; Whitney & Rolfes, 1996).

Most Americans obtain 15 to 50 percent of their daily calories from fats (Whitney & Rolfes, 1996). Health experts consider diets with more than 30 percent of calories from fat to be unsafe, increasing the risk of heart disease. High-fat diets also contribute to obesity, which is linked to high blood pressure and diabetes mellitus. A diet high in both saturated and unsaturated fats has also been associated with greater risk of developing cancers of the colon, prostate, breast, and uterus. Choosing a diet that is low in fat and cholesterol is critical to maintaining health and reducing the risk of life-threatening disease (Scientific Advisory Committee on Nutrition, 2003; Department of Health, 1994).

Carbohydrates are the human body's key source of energy, providing 4 calories of energy per gram. When carbohydrates are broken down by the body, the sugar glucose is produced; glucose is critical to help maintain tissue protein, metabolize fat, and fuel the central nervous system (Brown, 1995).

Glucose is absorbed into the bloodstream through the intestinal wall. Some of this glucose goes straight to work in our brain cells and red blood cells, while the rest makes its way to the liver and muscles, where it is stored as glycogen (animal starch), and to fat cells, where it is stored as fat. Glycogen is the body's auxiliary energy source, tapped and converted back into glucose when we need more energy. Although stored fat can also serve as a backup source of energy, it is never converted into glucose. Fructose and galactose, other sugar products resulting from the breakdown of carbohydrates, go straight to the liver, where they are converted into glucose (Clarke, 1997).

Starches and sugars are the major carbohydrates. Our bodies digest and absorb complex carbohydrates at a rate that helps maintain the healthful levels of glucose already in the blood (Whitney & Rolfes, 1996).

In contrast, simple sugars, refined from naturally occurring sugars and added to processed foods, require little digestion and are quickly absorbed by the body, triggering an unhealthy chain of events (Clarke, 1997). The body's rapid absorption of simple sugars elevates the levels of glucose in the blood, which triggers the release of the hormone insulin. Insulin reins in the body's rising glucose levels, but at a price: Glucose levels may fall so low within one to two hours after eating foods high in simple sugars, such as candy, that the body responds by releasing chemicals known as anti-insulin hormones. This surge in chemicals can leave a person feeling irritable and nervous (Vitanen & Aro, 1994).

Many processed foods not only contain high levels of added simple sugars, they also tend to be high in fat and salt, often lacking in vitamins and minerals (Clarke, 1997; Henderson, Gregory & Swan, 2002). The exact contribution of salt, sugar and fat in soups to the diet and safe levels of these nutrients are unknown in Trinidad. It is perceived that there may be an increase in consumption of soups containing unhealthy levels of salt, sugar and fat. The present study will survey the levels and consumption of salt, sugar and fat in soups and to provide recommendations on ways to reduce the same, in order to prevent health risks associated with these nutrients in susceptible individuals. This is done as a proactive measure to safeguard

Trinidad's economy by reducing or eliminating the increased cost for treating avoidable diseases and in the decline in productivity and loss of employability.

Many diseases are preventable through healthy living, and a primary public health goal is to educate the general public about how to prevent non-communicable diseases associated with food (Patron, 1994). Public health campaigns and consumer food safety teach people about the value of avoiding sugary, salty and fatty foods, getting treatment for high blood pressure, avoiding foods high in cholesterol, and maintaining a healthy body weight (Patron, 2004; Whitney & Rolfes, 1996).

## **METHODOLOGY**

### **Sampling**

The survey was done according to established ethical and scientific standards (Mann, 1998). Thirty soup samples were purchased from retailers throughout Trinidad. These samples represent a "snap shot" of the soup market. It covers the main types on sale and including a selection of the top selling products. The absence of a particular brand means that the brand has not been included in the survey. The samples were grouped into three categories based on the conditions of storage: (i) ambient canned soup, (ii) dried individual cup/ sachet soup and (iii) fresh chilled soup. Additionally, questionnaires were randomly distributed to 250 households throughout Trinidad. The questionnaire contained statements such as common foods consumed in the diet, types of soups consumed and the amount of soups consumed per person per day, socio-economic factors and demographics. Questionnaires were collected and returned to the Food and Drugs Inspectorate, Ministry of Health for analysis. This resulted in 100 % return response rate of completed questionnaires.

### **Chemical Analysis**

Six samples of each soup were bought from retail outlets throughout Trinidad, stored and transported under appropriate condition of temperature in sealed sterile containers and taken to the Government laboratory for analysis within 48 h of collection. Saturated fat and cholesterol levels were determined using previously

established methods according to Kirk & Sawyer (1991) and AOAC 32.1.14; 32.2.07; 41.1.45 (1995).

### **Data Compilation & Analysis**

The nutrient contents as declared on product labels as well as those analyzed via chemical tests were recorded and described using standard statistical analysis (Mann, 1998).

## **RESULTS**

### **Snap Shot of Soups Surveyed in Trinidad**

Soups surveyed in Trinidad included the following:

- (i). BBQ Bean & Bacon Soup.
- (ii). Beef Chili Soup.
- (iii). Clam Chowder Soup.
- (iv). Cajun Soup.
- (v). Chicken Chili Soup.
- (vi). Chicken Soup.
- (vii). Beef Soup.
- (viii). Creamy Butternut Soup.
- (ix). Creamy Turkey & Wild Rice Soup.
- (x). Duck Soup.
- (xi). Pumpkin Soup.
- (xii). Roasted Corn & Shrimp Soup.
- (xiii). Roasted Vegetable Soup.
- (xiv). Sausage & Bean Soup.
- (xv). Vegetarian Three Bean Soup.
- (xvi). Vegetarian Split Peas Soup.
- (xvii). Vegetarian Tomato Bisque.
- (xviii). Baked Stuffed Potato Soup.
- (xix). Chicken Soup with White & Wild Rice.
- (xx). Pig Tail Soup with Split Peas.
- (xxi). Ox Tail Soup.
- (xxii). Tomato Basil with Raviolini.
- (xxiii). Beef & Beans Soup.
- (xxiv). Homestyle Chicken Noodle Soup.
- (xxv). French Onion Soup.
- (xxvi). Garden Vegetable Soup.
- (xxvii). Broccoli & Cheese Soup.
- (xxviii). Tortilla Soup.
- (xxix). Potato Soup.
- (xxx). Vegetarian Chili Soup.

### **Ambient Canned Soup**

Of the soups surveyed 65 % were of the ambient canned soup type. These canned soups (75 %) had the lowest levels of salt, sugar and fat when compared to the dried and fresh chilled soups.

### **Dried Individual Cup/Sachet Soup**

Dried soups consisted of 15 % of the soups surveyed. These soups (65 %) had the highest

levels of salt, sugar and fat when compared to the ambient and fresh chilled soups.

### **Fresh Chilled Soups**

Fresh soups consisted of 10 % of the soups surveyed. These soups (58 %) tend to have intermediate levels of salt, sugar and fat between those of the ambient canned and dried soups.

### **Salt Levels in Soups**

Of the soups surveyed, 100 % of soups contained over 0.5 g per 100 g, which is classified as having a lot of salt. Soups on average contained 3.04 g salt and were consumed at a rate of at least 4 servings per person per day. This accounted for 12.16 g salt per person per day, which is considerably higher than the recommended maximum daily intake of 6 g per person per day. Soups provided significant sources of salt in the diet according to the Scientific Committee on Nutrition (2003).

### **Total Fat levels in Soups**

Of the soups surveyed, 60 % of soups contained between 4g and 19 g fat; 30 % contained less than or equal to 3 g; 10 % contained over 20 g fat. Soups in general contained an average of 3.87 g fat. Based on the current rate of consumption of at least 4 servings per person per day, this accounted for 15.48 g fat per person per day. These soups contained some fat but, it did not exceed the recommended maximum daily intake of 83 g per person per day (Scientific Committee on Nutrition, 2003). Soups were not significant sources of fat in the diet.

### **Saturated Fats in Soups**

Laboratory results revealed that soups surveyed contained an average of 1.44 g saturated fat. At a consumption rate of 4 serving per day, this accounted for 5.76 g saturated fat per person per day. But, these amounts of saturated fat present in soups were not significant sources of saturated fats since it was less than the daily reference value of 20 g (Scientific Committee on Nutrition, 2003).

### **Cholesterol in Soups**

Soups surveyed contained on average 15.63 mg cholesterol per serving. At the current consumption rate this accounted for 62.52 mg cholesterol per person per day. This value was less than the daily reference value of 300 mg

(Whitney & Rolfes, 1996). Soups did not contain significant sources of cholesterol.

### **Sugar Levels in Soups**

Of the soups surveyed, 54 % of soups contained 3-5 g sugar; 24 % contained 6-7 g sugar; 22 % contained 2 g or less sugar. Soups generally provided low levels of sugar between 0.44 g and 3.08 g. Since soups are consumed at a rate of at least 4 serving per day, then this accounted for 1.76 g to 12.32 g sugar per person per day. These soups provided some sugar in the diet, but it did not exceed the recommended maximum daily intake of 60 g per person per day (Scientific Committee on Nutrition, 2003).

### **Common Sources of Salt, Fat and Sugar in the Diet**

The survey showed that processed foods provided 80 % of salt, fat and sugar in the diet. Other sources of these nutrients were either naturally occurring (12 %), added during home cooking (3 %) or added while eating (5 %).

### **Common Foods Consumed in the Diet in Trinidad**

The survey revealed that soups (15 %) constituted the third highest food consumed in the diet, followed by cereals (11 %), fruits (10 %), vegetables (4 %) and others (2 %). The only two food groups that surpassed soups were meat (40 %) and fish (18 %). The survey also revealed that soups were consumed at a rate of 4 servings per person per day. One serving was equivalent to 8 oz or 227 g. Foreign soups (67 %) were the preferred choice when compared to locally made soups (33 %). Of the three types of soups surveyed canned ambient soups (45 %) were often selected over dried (18 %) and chilled soups (37 %).

### **Demography of Food Types Consumed in Trinidad**

The survey showed that soups were more often consumed by people in rural areas (76 %) when compared to the urban areas (24 %). Soups were consumed by people belonging to all age groups, ethnic groups and cultures and included the young, old, pregnant and immunocompromised people.

### **Socio-economic Characteristic of People who Consumed Soups in Trinidad**

The low (56 %) and mid (23 %) income earners tend to buy more soups and to include them in their diets than high (21 %) income earners.

### **DISCUSSION**

Soups provide a readily available, relatively cheap source of proteins, carbohydrates, fats, vitamins, minerals and water in the diet. Of the foods commonly consumed in the diet soups constitute 15 %. Further investigation into the composition of soups revealed that they are high in salt (greater than 0.5 g per 100 g), low in saturated fat (less than 20 g), cholesterol (less than 300 mg) and sugar (less than 60 g). Repeated or excessive consumption of soups due to preference or choice, economic, social or other reasons may pose a potential health risk to susceptible consumers (Brown, 1995; Kaplan, 2000; Whitney & Rolfes, 1996).

In Trinidad cardiovascular disease is highest-ranking cause of death, causing over 3,000 deaths per year (Patron, 2005; Population & Vital Statistics Report, 2004). Some of the major risk factors associated with cardiovascular disease are high blood pressure or hypertension and diabetes (Jurgens & Graudal, 2004; Population & Vital Statistics Report, 2004). High salt levels have been associated with high blood pressure, heart diseases, kidney failure and strokes (Alderman, Cohen & Madhavan, 1998; Intersalt Cooperative Research Group, 1998; Kaplan, 2000; Townsend, 2005). Based on the recommended maximum daily salt intake of 6 g per person per day, (Scientific Advisory Committee on Nutrition, 2003) the present study has shown that the current salt intake as a result of consuming soups is 12.16 g. The poor, low income earners and the underprivileged were the most susceptible to this health risk, particularly in the rural areas in Trinidad.

Salt is an important source of mineral in the diet, namely sodium and chloride. Despite the benefits of salt particularly in maintaining the correct concentration of body fluids, chloride is also required for the production of hydrochloric acid in the gastric juice of the stomach (Brown, 1995; Whitney & Rolfes, 1996).

Sodium in the form of sodium chloride is added to many processed foods such as soups that serve mainly as a Class I preservative, and flavor enhancer. Other sources of sodium in soups may

come from monosodium glutamate, sodium bicarbonate and sodium nitrite (Food and Drugs Act and Regulations, 1960).

High salt intake may be regarded as a silent food safety risk factor and for this reason salt intake should be tightly regulated in the diet (Brown, 1995; Duyff, 2000). The present study has shown that soups are classified as high salt foods and there is a need to educate the public and consumers on the possible health risks of consuming excess salt whether added or part of the ingredients in soups.

Salt reduction is therefore recommended in order to minimize the potential risk of heart disease, kidney failure strokes leading to premature death (Scientific Advisory Committee on Nutrition, 2003) and loss of human potential that perpetuates the cycle of poverty and leads to economic burden. If this cycle is allowed to continue it can place severe strain on an already fragile health care system in Trinidad. But how can salt reduction be achieved?

Salt reduction may be achieved if the following is adopted and implemented:

- Consumer Health Education.
- Mandatory labeling requirements.
- Effective surveillance and testing by the Food and Drugs Inspectorate.
- Reformulation.
- Setting mandatory salt limits for food processors and manufacturers by the Food and Drugs Inspectorate.
- Reduction in salt intake by avoiding foods high (0.5 g or greater salt in 100 g) in salt.
- Substituting foods high in salt for foods low in salt.
- Reduction in the amount of salt added to cooked and chilled soups.
- Reduction in the number and amount of foods eaten that have salt added as part of their processing.
- Eating a variety of foods rich in nutrients that are available.
- Making representation to the CODEX on the possible public health concerns about the use of salt in processed foods as a “generally regarded as safe substance”. This classification should be more appropriately modified to reflect the level of food safety and public health concerns.

Soups in addition to containing salt also contained saturated fats, cholesterol and sugar. Fats are important in the diet since it provides a convenient and concentrated source of energy, supplying more energy than the same weight of carbohydrates or protein. Fats provide a source of the fat-soluble vitamins, A, D, E and K. Foods containing fat provide a feeling of fullness after a meal, as fat digestion is slow (Brown, 1995; Whitney & Rolfes, 1996).

Despite the apparent benefits of eating fats, it should be emphasized that the right types of fats should be included in the diet, namely unsaturated fats which may help to reduce the risk of developing heart disease (Whitney & Rolfes, 1996). Reducing the consumption of fats may be achieved through the use of low fat products, or reducing the consumption of soups, or by reducing the number of servings or serving size or by using alternative food sources. Research has shown that diets rich in saturated fat may raise the level of cholesterol in the blood. High blood cholesterol (greater than 200 mg/dl) levels are linked to the development of coronary heart disease (Duyff, 2000; Hooper et al., 2002).

Cholesterol is found in soups and is also made in the body by the liver, mainly from saturated fatty acids which are also found in soups. If cholesterol is oxidized it can be deposited in the linings of the coronary arteries over a period of time, which eventually becomes blocked in susceptible individuals and lead to coronary thrombosis, cardiac arrest and premature death (Brown, 1995; Duyff, 2000).

Sugar belongs to the group of nutrients called carbohydrates. Although soups contribute low levels of sugar in the diet (greater than 2 %), their intake in the diet should be carefully monitored and controlled to avoid diabetes (Virtanen & Aro, 1994). The high prevalence of diabetes and obesity in Trinidad has provided elevated levels of public health and food safety concerns on the use and levels of various nutrients in processed foods. Soups are no different, because of its high consumption in Trinidad, and its ubiquitous presence as a convenience food may attract further consumer selection and use. Soups may be classified as moderate sources of sugar, with the disaccharide, namely sucrose and the polysaccharide, namely starch, most likely added during processing or manufacturer (Clarke, 1997).

The purpose of the present study was to determine food safety levels of salt, fat and sugar in soups consumed in Trinidad. It was found that soups were consumed at least four times per day in Trinidad. The intake of these nutrients may pose a silent risk factor to susceptible individuals, particularly the poor and the underprivileged to cardiovascular disease, the highest-ranking cause of morbidity and mortality in Trinidad (Patron, 2005; Population & Vital Statistics Report, 2004). Reducing preventable morbidity and mortality by promoting life style changes through reformulation, enactment and enforcement of legislation and better nutritional labeling may lead to healthier selection of foods and reduction in silent health risk factors in a relatively small Trinidad-Tobago population of just 1.3 M people (Tradeport, 2003).

#### IMPLICATIONS OF STUDY

- To present to the scientific community, the public and consumers information on the levels of salt, fat and sugar in soups as a matter of urgent public health and food safety concern.
- To encourage the reduction of salt, fat and sugar in processed foods through product reformulation and mandatory regulatory guidelines and enforcement by the Food and Drugs Inspectorate.
- To educate the public and consumers about the silent health risks of consuming foods high in salt, fat and sugar in order to avert future health problems in susceptible individuals.
- This study and other similar studies will serve to add to the body of knowledge that would seek to review the apparent misleading concept of salt being “generally regarded as safe”.
- Warning labels should be used to indicate the levels of salt, fat and sugar in processed foods.
- The present study represents a “snap shot” of the soups consumed in Trinidad at this point in time and does not represent soups undergoing reformulation or modification in any form.
- The present study did not deal with other nutrients in the diet. This will be the subject of another study in the future.

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