

Consumption Of Oil, Sugar And Its Health Effects On Adults

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Abstract:

INTRODUCTION: Oil and sugar are essential nutrients for humans. Oil is concentrated source of energy and it supply's essential fatty acids. The most common sugar in body is glucose which is required for brain, major organs and muscles to function properly.

PURPOSE AND OBJECTIVE: The purpose of the study is to find out the relationship between excess consumption of oil, sugar and its health effects on adults (male and female). The objective of study is to understand consumption pattern of oil and sugar and their health problems.

METHODS: The sample of 100 subjects (50 male and 50 female) was selected between the aged of 20 to 60 years in Thane city. The required information for this survey based study is taken by using both open and close-ended type of questionnaire. The result were statistically analysed by using standard statistical methods.

RESULT: Females having health related problems were high compared to males who were consuming 1 litre and/or more than 1 litre oil/ month & 1 kg and/or more than 1 kg sugar/ month.

CONCLUSION: There was prevalence of weight related problems and liver problems in males who were consuming more than 1 kg sugar and more than 1 litre of oil/ month. And in females, there was prevalence of cardiac disease, metabolic syndrome, respiratory diseases, autoimmune diseases, & cancer who consumed more than 1 kg sugar and more than 1 litre of oil/ month. So, it is better to consume less than 1 litre of oil and less than 1 kg of sugar per month per person.

Keywords: Oil, Sugar, Male, Female, Diseases, Health Problem

Introduction:

Oil and sugar are an important component of diet and serve a number of functions in the body. Oil provide most concentrated source of energy, contribute greatly to the feeling of satiety after eating, are carriers for the fat soluble vitamins, and serve to make foods more palatable, and supply essential fatty acids. Fatty acids are composed of carbon chains containing a methyl group at one end and a carboxyl group at the other. The methyl group is termed the omega (ω) and the carbon atom situated next to the carboxyl group is termed the " α " carbon, followed by the " β " carbon. Saturated fatty acids are saturated with hydrogen, and most are straight hydrocarbon chains with an even number of carbon atoms. The most common fatty acids contain 12–22 carbon atoms (Dr Johnson S & Dr Saikia N, 2009). A fat is made of two kinds of smaller molecules: glycerol and fatty acids. Fats are made of long chains of carbon atoms. Some carbon atoms are linked by single bonds and others are linked by double bonds (Jane R, Neil C, 2002). Monounsaturated fatty acids (MUFA) contain one carbon-carbon double bond, which can be found at different positions throughout the fatty acid chain. The majority of monounsaturated fatty acids are between 16 and 22 carbons in length. Polyunsaturated fatty acids (PUFA) contain more than one double bond. When the first double bond is situated between the third and fourth or sixth and seventh carbon atoms from the carbon-oxygen bond, they are referred to as ω -3 and ω -6 fatty acids, respectively. Polyunsaturated fatty acids are produced only by plants and phytoplankton, and are essential to all higher organisms (Dr Johnson S & Dr Saikia N, 2009). Trans fat, also called trans-unsaturated fatty acids or trans fatty acids, is a type of unsaturated fat that occurs in small amounts in nature (Fahmy BGA, 2016).

Sugar is a natural ingredient that has been part of our diet for thousands of years. A sugar is carbohydrates that provide energy for the body. The most common sugar in the body is glucose which your brain, major organs and muscles need to function properly. The word Monosaccharide comes from mono, meaning 'one', and saccharide, meaning 'sugar'. Common monosaccharides are glucose (also called dextrose), fructose, and galactose. Disaccharides means 'two sugars' are commonly found in nature as sucrose, lactose, and maltose. The general formula of disaccharide is $C_{12}H_{22}O_{11}$. Disaccharides are formed by the combination of two monosaccharide molecules with the exclusion of a molecule of water. They are a type of carbohydrate which is typically high on glycemic index, which means that, when digested, they cause the rapid rise in blood-glucose levels. The term oligosaccharides are derived from 'oligo' meaning, a few and 'saccharide' meaning, sugar and oligosaccharides are a complex carbohydrate containing three to six units of monosaccharides. Most of the few naturally occurring oligosaccharides are found in plants. Important oligosaccharides are Raffinose and Stachyose. Most natural carbohydrates are polysaccharides. Like oligosaccharides, polysaccharides are also complex carbohydrates. The storage polysaccharides are starch and glycogen (Rao E & et al, 2017).

Added sugars are sugar carbohydrates (caloric sweeteners) added to food and beverages during their production (industrial processing). This type of sugar is chemically indistinguishable from naturally occurring sugars, but the term "added sugar" has become increasingly used in nutrition and medicine to help identify foods characterized by added energy. Added sugars have no nutritional value, only adding "empty calories". Consumption of added sugar is positively correlated with high calorie intake. (Bernstein J T & et al, 2016)

The consumption of oils and sugar has substantially increased in the past century and has become a growing public health concern. They are important for health, as a good source of energy, but may cause health problems if consumed in excess. (Dasgupta R, Pillai R & et al, 2015). It is important to understand related risk factors for oil and sugar intake as the processing, quantity, and types of oil & sugar and cooking pattern may lead to non-communicable diseases (NCDs) such as obesity, diabetes, hypertension, cardiovascular diseases and other diseases (Gulati S & Mishra A, 2017). However, the impact of sugar, oil intake and adverse health outcomes is still controversial (Rippe JM & Angelopoulos T, 2015).

Objectives:

1. To understand consumption pattern of oil and sugar.
2. To understand cooking methods.
3. To study the health effects associated by excess consumption of oil and sugar on adults (male and female).
4. To find out the prevalence of various diseases caused by excess consumption of oil and sugar in adults (male and female).

Methods & materials:

The study was conducted among 100 subjects of which 50 were male and 50 were female between the aged of 20 to 60 years in thane city. The required information for this survey based study is taken by using both restricted and unrestricted type of questionnaire and materials such as non-stretchable tape to measure height, weighting scale. A questionnaire was categorized into sections comprising general information, anthropometric measurements, activity pattern, consumption pattern of oil and sugar, health related questions and 24 hour dietary recall. In order to get reliable and valid data, both primary as well as secondary source of information were used. The primary data was collected by using a detailed questionnaire, personal interview, which was administered to the sample of 100 subjects. The secondary data was collected from published thesis, articles, journals, books and related websites.

Statistical analysis:

The data was analysed using the Statistical Package for Social Sciences (SPSS) software (version 20, SPSS Inc. Chicago, IL, USA). All descriptive data were expressed as mean \pm SD (standard deviation) for quantitative variables. Pearson's chi-square test were used to examine the relationship between the variables like gender wise physical activity pattern, oil using per month/ person (litre), Factors consideration while choosing cooking oil, consumption of oil, use of types of sugar, consumption of sugar at household level, health related problems. Student t-test were used to study gender wise anthropometric measurements, consumption of type of cooking oil, Use of sugar, 24 hr. dietary recall, oil consumption and health problems, sugar consumption and health problems. P-value less than 0.05 ($p < 0.05$) were considered statistically significant.

Results:

Consumption of oil- It included monthly oil consumption, use of blended oil, duration of use of oil, reuse of heated oil, and techniques of using cooking oil according to gender.

Table 1: Monthly Oil Consumption of the Study Participants

| Oil/month/person | Male | Female | χ^2 | p-value |
|------------------|---------|---------|----------|---------|
| ½ litre | 2%(3) | 4%(3) | 2.708 | 0.608 |
| 1 litre | 46%(45) | 44%(45) | | |
| 1 ½ litre | 46%(43) | 40%(43) | | |
| 2 litre | 6%(7) | 8%(7) | | |
| 2 ½ litre | 0%(2) | 4%(2) | | |
| 3 litre | 0%(0) | 0%(0) | | |
| >3 litre | 0%(0) | 0%(0) | | |

*p-value<0.05

According to **Table 1**, the 1 litre & 1 ½ litre of oil consumption/month was high in males compared to females. The ½ litre, 2 litre & 2 ½ litre of oil consumption/month was high in females compared to males. There was no participant who consumed more than 3 litres of oil/ month. There was no statistical significance ($p>0.05$) found between oil use/ month/ person and gender.

Table 2: Consumption of Oil of the Study Participants

| OIL CONSUMPTION | | Male | Female | χ^2 | p value |
|---------------------------------|-----------------------------------|-------------|-------------|-------------------|---------|
| Use of blended oil | Blended oil consumption | 52%(49) | 46.9%(49) | 0.254 | 0.615 |
| | Commercial blended oil consuming | 87.5%(42) | 87.5%(42) | 0.00 ^a | 1.00 |
| | Homemade blended oil consuming | 12.5%(6) | 12.5%(6) | | |
| Duration of use of oil | Same oil consuming for lifetime | 6%(7) | 8%(7) | 0.154 | 0.695 |
| | Heating cooking oil at high temp. | 84%(87) | 90%(87) | 0.796 | 0.372 |
| Reuse of heated oil | Reusing of heated oil | 98%(96) | 94%(96) | 1.042 | 0.307 |
| | For deep frying | 44.4%(35) | 52.8%(35) | 1.150 | 0.284 |
| Techniques of using cooking oil | Baking | 49% (49) | 50% (49) | 5.613 | 0.468 |
| | Shallow-fry | 49.47% (95) | 50.53% (95) | 2.891 | 0.576 |
| | Deep-fry | 50.53% (95) | 49.47% (95) | 3.656 | 0.455 |

*p-value<0.05

According to **Table 2**, Out of 49 adults, males who consumed blended oil were high compared to females. Out of 42 adults, same number of males and females were consumed commercial blended oil. Out of 6 adults, same number of males and females were consumed homemade blended oil. There was no statistically significant association ($p>0.05$) in consumption of blended oil of males and females. Out of 7 adults, females who consumed same oil for lifetime were higher compared to males. There was no statistical significant association ($p>0.05$) in males and females who consumed same oil for lifetime.

Out of 87 adults, females who heated cooking oil at high temperature were high compared to males. There was no statistical significant association ($p>0.05$) in males and females who heated cooking oil at high temperature in males and females.

Out of 86 adults, males who reused heated oil for preparation of vegetable were high than females. Out of 35 adults, males who reused heated oil for deep frying were low than females. There was no statistical significant association ($p>0.05$) between males and females, who were reusing heated oil for deep frying. However, reusing of heated oil for vegetables was constant.

The females who used cooking oil for baking & shallow-frying were high compared to males. The females who used cooking oil for deep-frying were low compared to males. There was no statistical significant association ($p>0.05$) in males and females who incorporate some techniques of using cooking oil at household level according to gender.

Consumption of sugar- It included use of sugar in kg/ month/ person and per family, use of sugar at household level in different food preparations according to gender.

Table 3: Use of Sugar

| SUGAR CONSUMPTION | Male (n=50) | Female (n=50) | t-value | P-value |
|---------------------------|--------------|---------------|---------|---------|
| Sugar/ month/ family (kg) | 4.72 ± 1.262 | 4.54 ± 1.669 | 0.608 | 0.544 |
| Sugar/ month/ person (kg) | 1.44 ± 0.501 | 1.26 ± 0.443 | 1.0902 | 0.060 |

Data presented as Mean ± SD

*p-value<0.05

According to **Table 3**, there was no statistical significant association ($p<0.05$) in consumption of sugar/ month/ person according to gender. The mean of sugar/month/family in male and female study participants was 4.72 ± 1.262 and 4.54 ± 1.669 , respectively. The mean of sugar/month/person in male and female study participants was 1.44 ± 0.501 and 1.26 ± 0.443 , respectively.

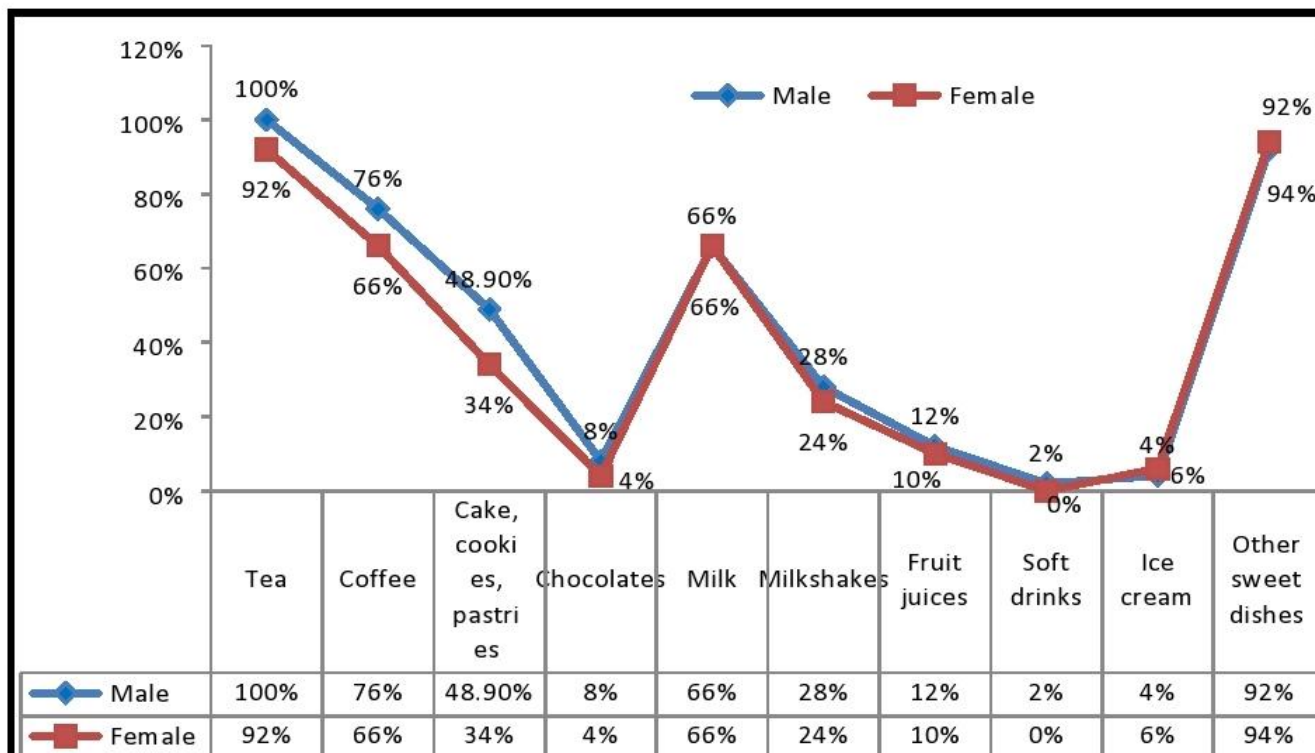


Figure 1: Consumption of Sugar at Household Level in the Different Food Preparation

As seen in **Figure 1**, Most of male and female participants were using sugar in tea & other sweet dishes. And very few male and female participants were using sugar in chocolate, fruit juices, soft drinks & ice-cream. There was statistical significant association ($p<0.05$) in

male and female using sugar in tea. However, no statistical significant association in males and females using sugar in coffee, cake-cookies-pastries, chocolate, milk, milkshakes, fruit juices, soft drinks, ice-cream, & other sweet dishes.

Health problems- It included relationship of oil, sugar consumption and health problems. Health problems included such as weight related problems, diseases related cardiac condition, liver, GI diseases, metabolic syndromes, pancreas, respiratory diseases, autoimmune diseases, and cancer.

Table 4: Oil Consumption and Health Problems

| Oil consumption and health problems | | Oil consumption/ person/ month (litre) | | | | | Total | t-value | P-value |
|-------------------------------------|--------|--|----|-----|---|-----|---------|--------------------|---------|
| | | ½ | 1 | 1 ½ | 2 | 2 ½ | | | |
| Weight related problems | Male | 1 | 4 | 10 | 1 | 0 | 16 (31) | 8.031 ^a | 0.236 |
| | Female | 0 | 7 | 7 | 1 | 0 | 15 (31) | | |
| Cardiac disease | Male | 0 | 1 | 4 | 1 | 0 | 6 (14) | 5.542 | 0.785 |
| | Female | 0 | 2 | 4 | 0 | 2 | 8 (14) | | |
| Liver problem | Male | 0 | 3 | 4 | 1 | 0 | 8 (10) | 7.500 ^a | 0.823 |
| | Female | 0 | 1 | 0 | 0 | 1 | 2 (10) | | |
| GI problem | Male | 0 | 1 | 2 | 0 | 0 | 3 (6) | 2.000 ^a | 0.368 |
| | Female | 0 | 2 | 1 | 0 | 0 | 3 (6) | | |
| Metabolic syndrome | Male | 0 | 8 | 8 | 0 | 0 | 16 (36) | 4.554 ^a | 0.602 |
| | Female | 0 | 7 | 11 | 1 | 1 | 20 (36) | | |
| Respiratory diseases | Male | 0 | 0 | 0 | 1 | 0 | 1 (5) | 0.833 ^a | 0.659 |
| | Female | 0 | 3 | 1 | 0 | 0 | 4 (5) | | |
| Cancer | Male | 0 | 1 | 0 | 0 | 0 | 1 (3) | 0.750 ^a | 0.386 |
| | Female | 0 | 1 | 1 | 0 | 0 | 2 (3) | | |
| | Total | 2 | 43 | 53 | 6 | 4 | 108 | | |

*p-value<0.05

According to **Table 4**, the adults who consumed 1litre and more than 1 litre of oil/person /month were having high health problems compared to adults consumed ½ litre of oil/person/month. In adults, males were having higher weight and liver problems compared to females who consumed 1litre and more than 1 litre of oil/person /month. In adults, males were having low cardiac disease, metabolic syndrome, respiratory disease, and cancer compared to females who consumed 1litre and more than 1 litre of oil/person /month. The males and females were having same number of GI & pancreas problem who consumed more than 1 litre of oil/month. There was a female consumed ½ litre oil/month was having autoimmune disease. There was no participant who have brain related disorders. There was no statistical significant association ($p>0.05$) between oil consumption and health problems (Weight related problems, Cardiac disease, Liver problem, GI problem, Metabolic syndrome, Respiratory diseases, Cancer) in males and females. However, pancreas problem and autoimmune diseases were constant.

Cardiovascular disease (CVD) is one of the leading major causes of morbidity and mortality worldwide. It may result from the interactions between multiple genetic and environmental factors including sedentary lifestyle and dietary habits. The quality of dietary oils and fats has been widely recognised to be inextricably linked to the pathogenesis of CVD. Vegetable oil is one of the essential dietary components in daily food consumption. However, the benefits of vegetable oil can be deteriorated by repeated heating that leads to lipid oxidation. The practice of using repeatedly heated cooking oil is not uncommon as it will reduce the cost of food preparation. Thermal oxidation yields new functional groups which may be potentially hazardous to cardiovascular health. Prolonged consumption of the repeatedly heated oil shown that, there was an increase blood pressure and total cholesterol, cause vascular inflammation as well as vascular changes which predispose to atherosclerosis. (Ng CY, Leong X & et al, 2014).

Repeated heating of vegetable oils at high temperatures during cooking is a very common cooking practice. Repeated heating of edible oils can generate a number of compounds, including polycyclic aromatic hydrocarbons (PAH), some of which have been reported to have carcinogenic potential. Consumption of these repeatedly heated oils can pose a serious health hazard. There was a genotoxic and carcinogenic risks associated with the consumption of repeatedly heated coconut oil (RCO), which is one of the commonly consumed cooking and frying medium. There was a presence of certain PAH, known to possess carcinogenic potential, in RCO when compared with SCO-single heated cooking oil. There was a significant decrease in the levels of antioxidant enzymes such as superoxide dismutase and catalase with a concurrent increase in reactive oxygen species and lipid peroxidation in the liver. A study was concluded that the dietary consumption of RCO can cause a genotoxic and preneoplastic change in the liver. (Srivastava S, Singh M & et al, 2010).

The researchers have summarized a number of studies performed during the past decade in their laboratories suggesting that dietary fat and individual fatty acids may play a role in the development of obesity. (Bray GA, Lovejoy JC & et al, 2002).

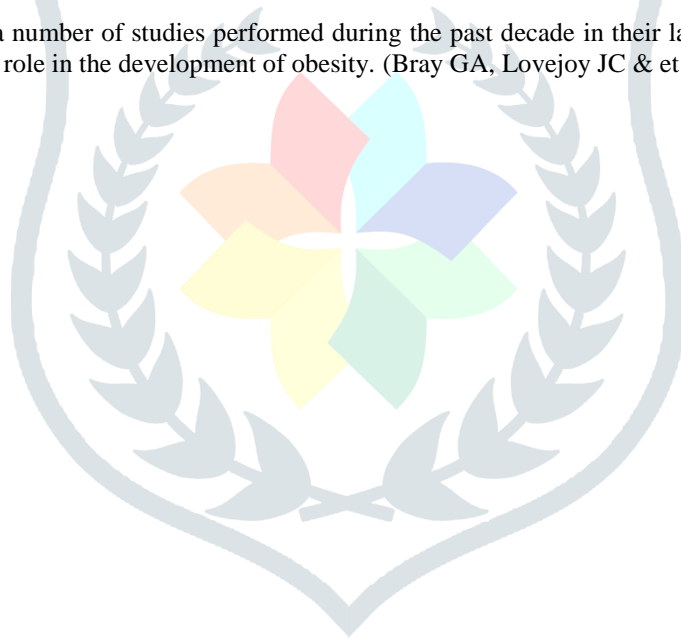


Table 5: Sugar Consumption and Health Problems

| Sugar consumption and health problems | | Sugar consumption/ person/ month (kg) | | total | t-value | P-value |
|---------------------------------------|--------|---------------------------------------|----|---------|--------------------|---------|
| | | 1 | 2 | | | |
| Weight related problems | Male | 5 | 11 | 16 (31) | 2.457 ^a | 0.293 |
| | Female | 10 | 5 | 15 (31) | | |
| Cardiac disease | Male | 1 | 5 | 6 (14) | 2.500 ^a | 0.475 |
| | Female | 6 | 2 | 8 (14) | | |
| Liver problem | Male | 4 | 4 | 8 (10) | 4.667 ^a | 0.323 |
| | Female | 1 | 1 | 2 (10) | | |
| GI problem | Male | 2 | 1 | 3 (6) | 0.600 ^a | 0.741 |
| | Female | 3 | 0 | 3 (6) | | |
| Metabolic syndrome | Male | 8 | 8 | 16 (36) | 1.652 ^a | 0.438 |
| | Female | 15 | 5 | 20 (36) | | |
| Respiratory diseases | Male | 0 | 1 | 1 (5) | 0.833 ^a | 0.361 |
| | Female | 3 | 1 | 4 (5) | | |
| Cancer | Male | 0 | 1 | 1 (3) | 0.750 ^a | 0.386 |
| | Female | 2 | 0 | 2 (3) | | |
| Total | | 63 | 45 | 108 | | |

*p-value<0.05

According to **Table 5**, the adults who consumed 1kg and more than 1kg sugar/person/month were having high health problems compared to adults consumed less than 1kg sugar/person/month. In adults, male were having high weight and liver problems compared to female who consumed 1kg and more than 1kg sugar/person/month. In adults, males were having low cardiac disease, metabolic syndrome, respiratory disease, and cancer compared to females who consumed 1kg and more than 1kg sugar/person/month. The male and female having same number of GI & pancreas problem who consumed more than 1kg and more than 1kg sugar/person/month. There was a female consumed 1kg sugar/person/month was having autoimmune disease. There was no participant who have brain related disorders in males and females. There was no statistical significant association ($p>0.05$) between sugar consumption and health problems (Weight related problems, Cardiac disease, Liver problem, GI problem, Metabolic syndrome, Respiratory diseases, Cancer) in males and females. However, pancreas problem and autoimmune diseases were constant.

A large prospective cohort study of women showed that there was a small and no significant association between consumption of artificially sweetened beverages and risk of CHD after multivariate adjustment. (Fung T & et al, 2009)

Non-alcoholic fatty liver disease (NAFLD) is the hepatic manifestation of metabolic syndrome; its rising prevalence parallels the rise in obesity and diabetes. Historically thought to result from over nutrition and a sedentary lifestyle suggests that diets high in sugar (from sucrose and/or high-fructose corn syrup) not only increase the risk of Non-alcoholic fatty liver disease, but also non-alcoholic steatohepatitis. The review of experimental and clinical evidence showed that fructose precipitates fat accumulation in the liver, due to both increased lipogenesis and impaired fat oxidation. Recent evidence suggested that predisposition to fatty liver is linked to the metabolism of fructose by fructokinase C, which results in ATP consumption, nucleotide turnover and uric acid generation that mediate fat accumulation. Alterations to gut permeability, the microbiome, and associated endotoxemia contribute to the risk of Non-alcoholic fatty liver disease and non-alcoholic steatohepatitis. (Jensen T, Abdelmalek M & et al, 2018)

Several studies have found an association between sugar-sweetened beverages and incidence of obesity in children. In one study, the odds ratio of becoming obese increased 1.6 times for each additional sugar-sweetened drink consumed every day. Increased diet soda consumption was negatively associated with childhood obesity. (Apovian C M, 2004)

Sugar sweetened beverages intake is a significant contributor to weight gain and can lead to increased risk of T2DM and cardiovascular disease. Sugar sweetened beverages are the greatest contributor to added-sugar intake in the United States and are thought to promote weight gain in part because of incomplete compensation for liquid calories at subsequent meals. They may also increase T2DM and cardiovascular risk independently of obesity as a potential contributor to a high dietary glucose and increased fructose metabolism, leading to inflammation, insulin resistance, impaired β -cell function, and high blood pressure, as well as accumulation of visceral adiposity and atherogenic dyslipidemia. (Malik VS, Popkin BM & et al, 2010)

Conclusion:

The study concluded that there was prevalence of weight related problems and liver problems in males who were consuming more than 1kg sugar and more than 1litre of oil/ month. And in females, there was prevalence of cardiac disease, metabolic syndrome, respiratory diseases, autoimmune diseases, & cancer who consumed more than 1kg sugar and more than 1litre of oil/ month. So, it is better to consume less than 1 litre of oil and less than 1 kg of sugar per month per person.

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