Health Hazards of Popularly Consumed Brands of Cold Drinks

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Abstract

Soft drinks are being consumed daily by the youngsters. The increased consumption of soft drinks is due to its affordability and taste. The low cost to prepare it, leads to use of additives containing contaminants which may lead to health hazards. Some of the basic components used in it may also cause bad effects due to regular consumption. The presence of certain components were studied in cold drinks popular in the market and which are frequently consumed. The cold drink samples were screened for the presence of Glucose, Carbon dioxide and Phosphate while its pH, Conductivity, Nitrates, Sulphates, Alkalinity, Chlorides and Caffeine were analysed. The results reveal that some parameters are above the permissible limits and the cold drinks, if consumed on regular basis, may lead to serious health hazards.

Keywords : **Soft Drinks, carbonated non-alcoholic beverages, health hazards, contaminants.**

Introduction

Carbonated soft drinks are known as sugar-sweetened beverages which contain water, sweetener, flavouring agents, colouring agents, preservatives and also caffeine[2]. These contents give the drink a characteristic taste and flavour. The consumption of these soft drinks has been drastically increased due to easy availability, cheap rates and bombarding advertisements. This may lead to various health hazards like weight gain, diabetes 2, risk of osteoporosis, dental caries, kidney damage and also increased blood pressure[1,3]. Considering all these reasons the study was undertaken to analyse few parameters from the cold drink and check their permissible levels in it.

Experimental

The cold drinks which are only popularly consumed by youth were considered for the present study and purchased from a local vendor. Estimation of CO_2, Sugar and Phosphate in the samples is done by using standard procedures of AOAC[4].

2.1 Qualitative Analysis :

2.1.1 Test for CO_2 : CO_2 concentration in the (cold drink) samples were analysed using lime water test.

Lime water test : 5ml of sample is taken in a test tube and few drops of lime water are added to it. The solution turns lime water milky due to presence of CO_2.

2.1.2 Test for sugar : Presence of Glucose in the cold drink is detected by using Benedict's reagent. For this test 3ml of sample of different brands were taken into a test tube and 2ml of Benedict reagent was added. The test tube was heated in a water bath for 5 min and the formation of reddish colour is observed which shows a presence of sugar.

2.1.3 Test for Phosphate: 3ml of sample of each brand of soft drinks was taken in separate test tubes. 2ml of ammonium molybdate followed by 2ml of concentrated nitric acid (HNO_3) was added. The solution was heated in a water bath for 10 min and appearance of canary –yellow precipitate confirms the presence of phosphate ions in soft drinks.

2.2 Quantitative analysis:

The cold drink samples were quantitatively analysed using standard procedures by APHA (American Public Health Association)[5] used for the following parameters.

2.2.1 pH : Measurement of pH is done with the help of digital pH meter (Equiptronics

model no. EQ-615). The standardization of pH meter (APHA) is done using 0.05M potassium hydrogen phthalate. The pH of six branded samples of cold drinks is measured using the standardized digital pH meter. 50ml of each cold drink sample is taken in a beaker and pH of the sample is measured by dipping the glass electrode.

2.2.2 Conductivity : The conductivity of the samples is measured with digital conductometer (Equiptronics model no. EQ-665). The standardization of conductometer is done using standard operating procedure (APHA). The conductance of all branded samples is measured using the standardized digital conductometer in the range of µmho/cm. The 50ml of each sample is taken in a beaker and conductance is measured using conductivity cell.

2.2.3 Chlorides : The concentration of chlorides present in the sample is measured using Argentiometric titration method[4] using potassium dichromate indicator. The cold drinks are analyzed for the chloride content by taking 25ml of sample in a conical flask, 2-3 drops of potassium dichromate indicator and it is titrated against 0.01M Silver nitrate till the solution changes colour from yellow to brick red colour.

2.2.4 Nitrates: The concentration of nitrates in the cold drink samples is detected spectrophotometerically at 220nm. Detection of nitrates from cold drinks is analyzed by taking 10ml of sample in a test tube, 1ml of 1N HCl is added to it and absorbance of the solution is noted at 220nm using a spectrophotometer (Spectrascan UV-2600).

2.2.5 Sulphates: The concentration of sulphates in the cold drink samples is detected spectrophotometerically at 420nm. Detection of sulphates from cold drinks is analyzed by taking 10ml of sample in a test tube, 1g of $BaSO_4$ is added to it and absorbance of the solution is noted at 420nm using a spectrophotometer (Spectrascan UV-2600).

2.2.6 Caffeine: The amount of caffeine present in the samples was extracted using a simple solvent extraction method[5]. The extraction using an organic solvent dichloromethane was performed where the cold drink was mixed with dichloromethane and caffeine having a high solubility in it was separated using a separating funnel. The solvent was distilled out and caffeine was then separated and weighed.

Results and Discussion

The cold drink samples were qualitatively and quantitatively analysed for CO_2, sugar and phosphate concentration. Table.3.1 shows the presence of CO_2, sugar and phosphate in the six brands indicated below. The * (Asterisk) sign in the table indicates concentration level of the parameters. The study of the results obtained during the analysis of below cold drink brands reveals the presence of CO_2, sugar and phosphate in all of the samples. The levels of CO_2 were found to be highest in the brands 4&5, a medium level was observed in brands 1&6 and a low level was found in the brands 2&3. A high level of sugar was observed in brands 3&5 while, brands 1, 2, 4 & 6 showed a moderate level of sugar. The phosphate levels were found to be abundant in brands 2&3, a low level of phosphate is seen in 1, 4, 5& 6 brands of the cold drinks.

The quantitative analysis of few parameters of the 6 different brands of cold drinks creating various health hazards was done using standard procedures and the results are compared with the permissible limits of various agencies[6,7,8] mentioned in the table 3.2 (BIS, WHO and CPCB).

The pH of all 6 brands of cold drinks was found to be highly acidic ranging from 1.70-2.62 and all readings far low below the permissible limits (6.5-8.5). The lower value of pH can have serious effects on health. Conductivity levels for the cold drink brands are all below the permissible limit of 2000 µS. Their values are found to be ranging from 520-1300 µS. Chlorides have a permissible limit of 250 mg/L and brands 1, 4&5 show chloride concentration below the permissible limit and brands 2, 3& 6 show chloride concentration above the permissible limit. Lowest chlorides are seen in brand 5 and highest chloride contents are seen in brand 2.

All brands of cold drinks shows nitrates above 100mg/L, from which highest level in

Table 3.1: Qualitative analysis of Cold drinks of various brands

Parameters	CO_2	Sugar	Phosphates
Brand 1 (Pepsi)	***	***	**
Brand 2 (Mountain dew)	**	***	*****
Brand 3 (Miranda)	**	*****	*****
Brand 4 (Thumps-Up)	****	***	**
Brand 5 (Coco-Cola)	****	*****	**
Brand 6 (Sprite)	***	***	**

*Present; **low level; ***Moderate level; *****high level

Table 3.2: Quantitative analysis of different parameters of various Cold drink brands

	pH	Conductivity (µmho/cm)	Chlorides (ppm)	Nitrates (ppm)	Sulphates (ppm)	Caffeine (mg/300ml)
Permissible limits	6.5-8.5 BIS, CPCB	2000 BIS, CPCB	250 BIS, WHO	50-100 BIS, WHO	150-400 BIS, CPCB	80-250 (mg/300ml(can)) FSSAI
Brand 1 (Pepsi)	1.73	1130	99.4	309.04	1980	330
Brand 2 (Mountain dew)	2.2	520	454.4	299.28	582	120
Brand 3 (Miranda)	2.07	600	355.0	298.33	2202	270
Brand 4 (Thumps-Up)	1.7	1300	71.0	303.09	3159	300
Brand 5 (Coco-Cola)	1.81	1220	42.0	257.14	2340	520
Brand 6 (Sprite)	2.62	530	312.4	147.38	111	520

*WHO-World Health Organization, *BIS-Bureau of Indian Standards, *Central Pollution Control Board of India.

brand 1 and lowest level in brand 6. Sulphate concentration was less than 400mg/L in brand 6 and brands 1-5 have sulphate concentration higher than 400mg/L the permissible limit. Caffeine intake from non-alcoholic beverages varies from 75-150mg per can, while in some it drastically varies from 300-500mg per can[5]. The cold drink brands analysed in the study shows a variation of a minimum of 120mg/can in brand 2 to a maximum of 520 mg/can in brands 5&6. All brands except brand 2 show a high level of caffeine than the permissible limit. An overall review of the results found in the analysis performed for all 6 brands shows that brand 6

has all the parameters in the minimum range as compared to other brands except the caffeine content.

The results presented in the tables 3.1 and 3.2 above for all 6 popular brands with respect to different parameters and when compared with their permissible limit reveal risk in their increased intake[9]. Different contents when consumed above a certain limit can cause various health hazards. Sugars used in soft drinks are processed white sugars which increase the level of insulin in blood, weight gain and can lead to diabetes. Cold drinks are usually acidic in nature due to presence of Phosphoric acid which gives it a tangy taste as well as acts as a preservative in it. The high phosphate content in soft drink leads to displacement of calcium in bones, lowering the bone density. Phosphoric acid and hydrochloric acid in stomach leads to indigestion. Soft drinks are acidic in nature and different brands show different pH values due to variation in their contents. The cold drinks having pH value less than 3 can lead to brain damage. High chloride concentration in water or cold drink can give a detectable taste but no special effects are observed due to it. Nitrates if consumed above the permissible limit may cause methemoglobinemia or blue baby disease in pregnant women. Caffeine[10] can cause restlessness, tension, high blood pressure and gastrointestinal disturbance.

Conclusion

The increased intake of beverages in recent years may lead to rising rates of obesity, osteoporotic bones, a risk of cardiovascular diseases and ultimately high medical expenditure. Thus, for a healthy life-cycle it is better not to consume more than one soft drink a day. The bad effects of soft drinks on human health should reach today's youth is our sincere aim and this is a small effort made by us.

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