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A study on milk quality testing and awareness of science and non science students on milk adulteration

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ABSTRACT

Increased global demand for milk has made it prone to massive levels of adulteration. The aims of this study were to analyze the quality of milk samples and also to assess the awareness of science and non-science students on milk adulteration. A total of 100 milk samples [unbranded (n=50) and branded (n=50)] were randomly collected from different areas of Hyderabad and were chemically analyzed to detect the presence of adulterants using standard procedures. A pre-tested questionnaire was used to assess the knowledge of students (sciences and non-sciences) on milk adulteration. It was observed from the chemical analysis that the unbranded milk samples (n=50) and branded milk samples (n=50) were found to be adulterated with water, cane sugar, urea, detergent, skimmed milk powder and formalin with their extent being 82%, 24%, 12%, 36%, 26%, 22% and 6%, 2%, 0%, 0%, 36%, 28% respectively. It was found from a microbiological examination that 92% of branded milk samples were in good quality, 2% were in fair quality and 6% were in poor quality and all the unbranded milk samples were found to be of poor quality. A significant difference ($p < 0.05$) was observed on the awareness of milk adulteration between Science and Non-Science student respondents. It can be concluded that milk quality is not as per standards. To eradicate this Malpractice, having a quality control system is necessary which could regularly check to ensure good quality milk is sold.

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1. Introduction

Adulteration is defined as “the process that the quality or the nature of a given substance is reduced by adding a foreign or an inferior substance or by removing vital vitamins”(1).

According to PFA-1954 (Prevention Food Adulteration Act) definition, “Milk is the normal mammary secretion derived from complete milking of healthy milch animal without either addition there to or excretion there from. The adulteration is defined as “the fraudulent, intentional substitution or addition of a substance in a product for the purpose of increasing the apparent values of the product or reducing the cost of its production (2).

Milk adulteration has been extremely reported in developing countries such as India, Pakistan, Brazil, China, etc (3-5). Adulteration of milk depends on the economic principle of demand and supply of milk. As there is rapid growth of population and urbanization, milk consumption is increased but not the milk supply. Though the milk is produced throughout the year, milk production will be reduced during summer months due to heat stress and scarcity of fodder (6).

To increase the shelf life of Milk, dirty ice and some chemicals like hydrogen peroxide, carbonates, bicarbonates, antibiotics, caustic soda and even the most lethal chemical formalin are being used (7). Some unethical activities are usually adopted to prevent the financial losses due to the spoilage of milk during its transportation and sale, for instance, some chemicals such as formalin, hydrogen peroxide, carbonate, bicarbonates, antibiotics and caustic soda would be

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added to increase the shelf life of milk. And detergents may be used to enhance the cosmetic nature of milk which diminishes foamy appearance and whitening of milk or calcium thioglycolate/ potassium thioglycolate and urea maybe added for whitening of milk and gives a genuine look (8). Soap is added to milk to increase the foaming of milk and thus to have thick milk. Addition of such chemicals will cause health problem especially related to stomach and kidneys (9).

The objectives of this study were to collect the branded milk and unbranded milk samples from different areas of Hyderabad city to identify presence of adulterants like formalin, starch, cane sugar, urea, pulverized soap, glucose, detergent, skimmed milk powder, borax in collected milk samples using standard procedures FSSAI, 2015, to estimate the microbial quality of milk by performing Methylene blue reductase test and to elicit knowledge and awareness of students [Science (n=50) and Non-Science (n=50)] regarding milk adulteration.

2. Materials and Methods

A total 100 Milk samples [Branded (n=50) and Unbranded (n=50)] were collected from different localities of Hyderabad city for the study. All the milk samples were screened for the presence of commonly used adulterants by using standard procedures given by FSSAI, 2015 (10). The tests included were Lactometer test, Starch test, Cane sugar test, Urea test, Detergent test, Pulverized soap test, Skimmed milk powder test, Formalin test, Boric acid test and Glucose test.

The quality of milk samples was analyzed using Methylene blue reductase test (MBRT) and the samples of Milk were graded into the categories of good quality, fair quality and poor quality as per Bureau of Indian Standards (BIS) criterion, 1997.

The comparative study, aimed to assess the knowledge of students of science and non-science background regarding milk adulteration was conducted at Madina Degree and PG College for Women, Himayathnagar,

Hyderabad, Telengana. The subjects between the age group 18-20 years pursuing BSc or B com were selected. A pretested well-structured questionnaire was used to elicit the knowledge of students on milk adulteration, types of adulterants and ill effects of having adulterated milk. Data collected from the sample was statistically analyzed. Summary statistics such as percentages, mean, standard deviation were calculated. Chi square test was applied to observe significance between Science and Non-Science students on the awareness of milk adulteration.

3. Results

3.1. Adulteration of milk

Table 1: Percentage of various adulterants detected in branded (n=50) and unbranded (n=50) milk samples randomly collected from different areas of Hyderabad city

ADULTERANT	BRANDED MILK SAMPLES [n=50 (100%)]	UNBRANDED MILK SAMPLES [n=50(100%)]
Water	3(6)	41(82)
Starch	0(0)	0(0)
Cane sugar	1(2)	12(24)
Urea	0(0)	6(12)
Detergent	0(0)	18(36)
Pulverized soap	0(0)	0(0)
Skimmed milk powder	18(36)	13(26)
Formalin	15 (30)	11(22)
Boric acid	0(0)	0(0)
Glucose	0(0)	0(0)

Figures in the Parenthesis (()) are percentages.

3.1.1. Results of chemical analysis

As it is evident from the table 2, the unbranded milk samples tested positive for water, cane sugar, urea, detergent, skimmed milk powder and formalin with their extent being 82%, 24%, 12%, 36%, 26% and 22% respectively.

The branded milk samples tested positive for water, cane sugar, skimmed milk powder and formalin with their extent being 6%, 2%, 36% and 30% respectively.

3.1.2 Analysis of Microbial quality of milk

The microbiological quality of branded (n=50) and unbranded (n=50) milk was analysed by using Methylene blue reductase test. The results of Methylene blue reductase test showed that 92% of branded milk samples were of good quality, 2% were of fair quality and 6% were of poor quality.

3.2. Results on the awareness of the students (Science and Non-Science) (n=100) on the adulteration of milk

The comparison about the awareness on milk adulteration between science and non-science students (n=100) assessed. The awareness about the milk adulteration was observed to be more in Science students (90%) than in Non Science students (70%). It was also observed from the data collected that the awareness on adulterants such as water, sugar, detergent and chemical adulterants was found to be 48% ,2% ,2%,2% among science students and 46% ,4% ,4% ,6% among non science students while 34% of science students 12% of non-science students were aware of all the adulterants. The awareness on the health risks of consuming adulterated milk was 62% among science students while it was only 20% among non science students. When further asked about the illness caused by the use of adulterants, it was found that 12% of science students knew about typhoid, 44% were aware of intestinal problems caused by adulteration, 2% were aware of Tuberculosis , 4% were aware of cancers caused by use of adulterants. Among non science students 4% were aware of typhoid, 80% were aware of intestinal problems, 2% were aware of Tuberculosis and 4% were aware of cancers.

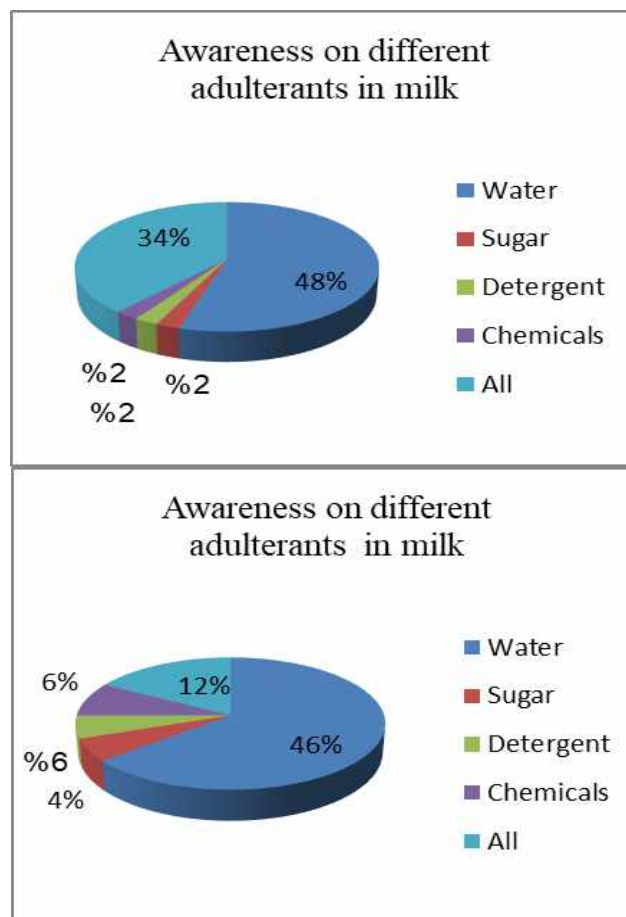


Figure 1: Awareness of science and non-science students on milk adulteration

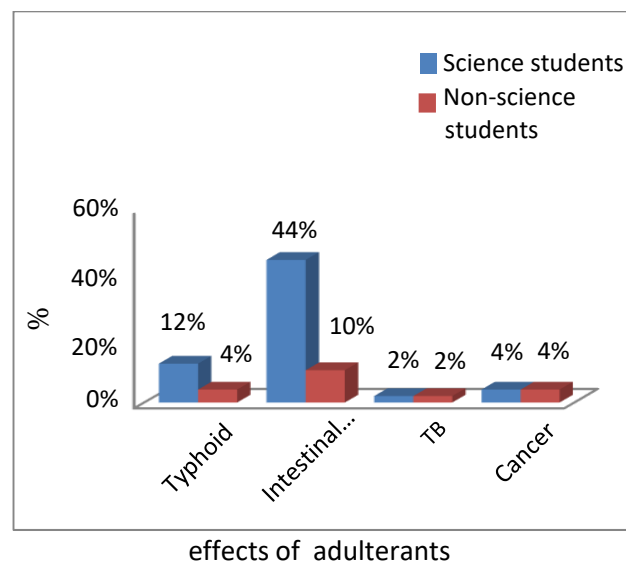


Figure 2: Awareness of science and on-science students on the ill effects of adulterants on human health.

4. Discussion

Thus, this study shows that adulteration of milk is very common. The most frequently observed adulterants were water, cane sugar, detergent, skimmed milk powder and formalin. From the present study it was revealed that the unbranded milk samples were adulterated with water, cane sugar, urea, detergent, skimmed milk powder and formalin. The branded milk samples were found to be adulterated with water, cane sugar, skimmed milk powder and formalin. Similar observations were noted by Faraz et al., 2013; Ghulam Shabir et al., 2014; Gupta N and Patiyal A, 2014; Brototi Roy et al., 2017; AwaisMemon et al., 2018. These results clearly suggest that the unbranded milk samples had majority of adulterants when compared with the branded milk samples. Water was the most common adulterant found in majority of unbranded samples followed by detergent and skimmed milk powder. In branded milk samples, the maximum adulteration was skimmed milk powder followed by formalin. The methylene blue reductase test revealed that microbial quality of majority of the milk samples was not up to mark.

On the other hand, the comparison about the awareness on milk adulteration between Science and Non Science students (n=100) assessed showed that there is significant difference ($p < 0.05$) was observed on the awareness of milk adulteration between science and non science student respondents.

5. Conclusion

The results of milk adulteration clearly showed that the milk sold at these places was extensively put to malpractices such as skimming and adulteration of milk with water, detergent, formalin and cane sugar. The findings of this study highlights that, there is an urgent need to implement the hygiene practices and it is important to have a quality control system that regularly checks and ensures that only good quality milk is sold. There is also a need to create awareness among the consumers and local milk vendors about the unethical malpractices in the milk supply chain which may cause health hazard to consumers.

Conflict of interest

Authors have no conflict of interest.

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