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To Detect Adulterants Present in Different Milk Samples Available in the Market of Patna

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Abstract : Milk is a perishable commodity and it gets spoiled soon during summer season. Hence, to keep milk temporarily fresh and to increase its shelf-life it is adulterated with adulterants like water, urea, formalin, added sugar, skimmed milk powder, detergent, etc. Our study was aimed to detect the adulterants present in the locally available milk samples from three different localities of Patna. Total of 8 samples were taken for the study in which 2 were packaged milk and 6 samples were collected from the local vendors. Among those 8 milk samples, 62.5% of the samples were adulterated with water, 25% with formalin, 25% with detergent, 25% with added sugar and 25% with skimmed milk powder. The finding of the study highlighted that majority of the milk samples were adulterated with water which reduces the quality of milk. Hence there is urgent need for creating awareness among the consumers and the local milk vendors about unethical malpractices in the milk supplying chain which may cause health hazards to consumers.

Key words : Milk adulteration, packaged milk, milk from vendors, public health risk.

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Introduction :

Milk in its natural form has high food value. Milk is the cheapest and perfect food which can be easily digested and absorbed (Ghulam et. al., 2014). It provides body building protein, bone forming minerals and health giving vitamins and furnishes energy giving lactose and milk fat and other food item (Neumann et.al., 2012).

As the milk is a perishable commodity and it can easily be spoiled during summer seasons when weather becomes very hot (Tipu et. al., 2007). Adulteration in milk is considered to reduce the quality and to increase the quantity of milk. Adulteration means substitution of cheaper ingredients to impress the buyer to think that the product is more valuable or of better quality (Kandpa et. al., 2012).

Adulterants are mainly added to increase the shelf-life of milk. To meet the demand of milk and to keep temporarily fresh, some unethical activities are usually adopted to prevent the financial losses due to the spoilage of milk during its transportation

and sale. For instance, the addition of water to increase the volume of milk, thickening agents like starch, flour, skimmed milk powder, whey powder or other ingredients to counter the dilution and extend the solid contents of milk.Synthetic milk is produced by blending urea, cooking oil, detergent, caustic soda, sugar and skimmed milk powder in order to make more profit (Bansal and Bansal, 1997).Vegetable oil, sugarcane or urea are added to compensate the fat, carbohydrate or protein content of diluted milk some chemicals such as hydrogen peroxide, carbonates, bicarbonates, antibiotics, caustic soda and even the most lethal chemical formalin to increase the storage period of milk, ice to enhance the shelf-life of milk; detergents to enhance the cosmetic nature of milk which gives it foamy appearance and whitening of milk and urea for whitening of milk and giving it a genuine look (Abdul et. al.,2014).

Adulteration of milk not only reduces the quality of milk but can even make it hazardous and is banned due to the illeffects. Most of the chemicals used as adulterants are harmful and cause health hazards. The Indian Council of Medical Research, in one of its reports, states detergents cause food poisoning and gastro-intestinal complications.The immediate effect of drinking adultered milk containing urea, caustic soda and formalin is gastroenteritis, but the long term effects are known to be far serious.

The hydrogen peroxide disturbs the antioxidants in the body disturbing the natural immunity hence increasing ageing. Chloride in the milk disturbs the acid-base balance in the body and blood pH. Ammonia in milk develops regression, loss of acquired speech and sensory disturbances (Muhammad et. al.,2007).

The addition of formalin causes more severe damage to the body like liver damage .The detergent contains sodium, can act as slow poison for those suffering from hypertension and heat ailments. The addition of urea in milk causes vomiting, nausea and gastritis. Starch and other synthetic compounds cause stomach diseases and impair the functioning of various organs of the body.

The main objective of this research project is to detect the pH and various adulterants present in the milk samples available in the market of Patna.

Materials and Methods :

In order to detect adulterants present in the milk samples available in the market of Patna, the samples were collected from the both stakeholders and some common packaged milk available in the local market. Stakeholders (vendors) were our main suppliers as most of the people, in the areas surveyed, consumed milk taken from vendors.We mainly took the most common packaged milk available in the market. They were 'Sudha Cow milk' as Sample 1, 'Raj Fresh Cow milk' as Sample 2.

The vendor's milk werecollected from Kankarbagh, Gandhi Maidan and Saguna More area. Two samples each were collected from these localities. They were named as sample 3-8.

For detecting the adulterants present in the collected milk samples various chemical tests were performed in the college laboratory. From these tests performed, we found out whether the milk was safe to drink or not and also whether the nutrition was well provided by the milk or not.

The milk samples collected from different localities and also the packaged milk samples were instantly tested for the pH by the pH meter. Normally the pH range of cow milk ranges around 6.5 – 6.9, which alters with the age of the sample. The pH of aged milk is likely to be very low due to fermentation of milk after a certain period of time.

The lactometer was used to check the purity of milk. It measures the specific gravity (relative density) of liquids—the ratio of the density of liquid to the density of water.

In order to know the possible trends of adulteration practiced in the given area and also to know about the side effects of consuming the adultered milk, a survey was conducted among three age groups consuming milk i.e. mothers of infants, the youth aged between 15-30 years and older people.

In most of these areas surveyed, people got their regular supply of milk from the local vendors and very few preferred packaged milk.

Results and Discussion :

Normally the pH range of cow milk is slightly acidic i.e. ranges around 6.5-6.9, which alters with the age of sample or by the presence of adulterants in it. Through our tests we concluded that the pH of the samples varied from 6.96- 7.23. Changes were nominal from the standard pH value (Table 1).

Table 1. pH value determination

S. No.	Samples	pH value obtained	pH value standard
1.	SAMPLE 1	7.10	
2.	SAMPLE 2	7.23	
3.	SAMPLE 3	7.08	
4.	SAMPLE 4	7.16	6.5-6.9
5.	SAMPLE 5	6.98	
6.	SAMPLE 6	7.12	
7.	SAMPLE 7	7.19	
8.	SAMPLE 8	6.96	

Table 2. Results obtained from 8 samples collected from different localities of Patna.

S.NO	AREA	SAMPLES	ADULTERANTS				
			WATER	FORMALIN	DETERGENT	VANASPATI	ADDED SUGAR
1.		SUDHA COW MILK(SAMPLE 1)	0%	+	+	–	+
2.		RAJ FRESH COW MILK(SAMPLE 2)	0%	+	+	–	+
3.	KANKARBAGHAREA	VENDOR(SAMPLE 3)	25%	–	–	–	–
4.		VENDOR(SAMPLE 4)	25%	–	–	–	–
5.	GANDHI MAIDAN AREA	VENDOR(SAMPLE 5)	0%	–	–	–	–
6.		VENDOR(SAMPLE 6)	12.5%	–	–	–	–
7.	SAGUNA MORE AREA	VENDOR(SAMPLE 7)	25%	–	–	–	–
8.		VENDOR(SAMPLE 8)	12.5%	–	–	–	–

The samples were taken from three different localities in Patna to test the adulterants in milk. Table 2 shows that sample 1 and sample 2 gave negative result for the presence of water. Sample 3 and sample 4 were taken from Kankarbagh area in which 25% water was detected. Sample 5 and sample 6 were taken from GandhiMaidan area. Sample 5 gave negative result and sample 6 was detected with 12.5% of water. Sample 7 and sample 8 were taken from Saguna more area and were detected with 25% and 12.5% water as adulterant respectively.

Sample 1 and 2 gave positive results and sample 3-8 gave negative results when they were tested for detergent, formalin, and added sugar.

Table 3. Results obtained from 8 samples collected from different localities of Patna.

S.NO	AREA	SAMPLES	ADULTERANTS					
			STARCH	SOAP	SKIMMED MILK POWDER	ADDED GLUCOSE	AMMONIUM SULPHATE	BORIC ACID
1.		SUDHA COW MILK(SAMPLE 1)	–	–	+	–	–	–
2.		RAJ FRESH COW MILK(SAMPLE 2)	-	-	+	–	–	–
3.	KANKARBAGHAREA	VENDOR(SAMPLE 3)	–	–	–	–	–	–
4.		VENDOR(SAMPLE 4)	–	–	–	–	–	–
5.	GANDHI MAIDAN AREA	VENDOR(SAMPLE 5)	–	–	–	–	–	–
6.		VENDOR(SAMPLE 6)	–	–	–	–	–	–
7.	SAGUNA MORE AREA	VENDOR(SAMPLE 7)	–	–	–	–	–	–
8.		VENDOR(SAMPLE 8)	–	–	–	–	–	–

All the sample,tested for the presence of starch, soap, ammonium sulphate, boric acid and added glucose, gave negative results.

Sample 1 and sample 2 gave positive results for skimmed milk powder and sample 3 to 8 gave negative results (Table 3).

Table 4. Survey on milk procuration and awareness level regarding adulteration practices.

S.NO.	AREA	% OF PEOPLE	MILK SOURCE	ANY ADULTERATION PERCEPTION	WILL YOU COMPLAIN ANY AUTHORITY AFTER GETTING PROOF OF ADULTERATION
1.	GANDHI MAIDAN AREA	48%	VENDOR'S	WATER	NO
2.		28%	VENDOR'S	NONE	NO
3.		12%	VENDOR'S	WATER	NO
4.		12%	PACKAGED	NONE	YES
5.	KANKARBAGH AREA	40%	VENDOR'S	NONE	NO
6.		36%	VENDOR'S	NONE	YES
7.		20%	PACKAGED	NONE	NO
8.		4%	VENDOR'S	WATER	YES
9.	SAGUNA MORE AREA	52%	VENDOR'S	WATER	NO
10.		20%	PACKAGED	NONE	YES
11.		20%	VENDOR'S	NONE	NO
12.		8%	PACKAGED	NONE	YES

From Table 4 which was prepared on the survey conducted around 25 members from each locality regarding their milk procuration and awareness of the adulteration practices in milk, we concluded that most people perceived water as an adulterant in the milk they consumed. A majority of members were consuming vendor's milk and they were almost unaware about any adulteration laws.

Table 5. Survey on possible health issues regarding consumption of adulterated milk

S. NO.	AGE GROUP	PERCENTAGE OF INDIVIDUALS	SIDE EFFECTS/ HEALTH ISSUES
1.	INFANT'SMOTHER		60% NONE
2.		16%	INDIGESTION
3.		16%	REFUSAL TO EAT/DRINK
4.		8%	IRRITABILITY
5.	15-35 YEARS	88%	NONE
6.		12%	INDIGESTION
7.	ABOVE 50 YEARS	80%	NONE
8.		4%	INDIGESTION
9.		8%	STOMACH ACHE
10.		8%	NAUSEA

A survey was conducted among different age groups in the three localities of Patna regarding any possible health issues on consumption of milk. Table 5 showed that 16% of the infants showed indigestion and another 16% showed refusal to eat/drink. 8% of the infants showed mild irritability while 60% of the surveyed infants remained unaffected.

12% of the individuals between age 15-35 years showed indigestion as a common symptom and 88% remained unaffected by the consumption of milk.

At the age above 50 years 8% of individuals showed stomach ache while the other 8% showed nausea. 4% of individuals showed indigestion and the rest 80% did not complain of any health issues. These days milk is being adultered with harmful substances which enhance its quantity and characteristics but reduces its quality. Adulterants are mainly added to increase the shelf-life of milk.

We mainly concluded that the most common adulterants added to milk was water and it was added in high ratio. Few packaged milk samples also had skimmed milk powder, detergent, added sugar and also few milk samples were found adultered with formalin. Formalin is generally used as a preservative but it usually causes very severe health effects one of which is liver damage.

The survey concluded that most of the samples were adulterated with water. Addition of water not only reduces nutritious value of milk but contaminated water causes many health problems. This survey also indicated that some samples were also adulterated with detergent which can cause severe damage to heart, eyes and lungs.

Conclusion :

Milk is an important source of nutrient required for growth in infants and children and for maintenance of health in adults. Milk is a perfect food, readily digested and absorbed. It is a sole natural food for infants and children. But these days it is being adulterated with harmful substances which enhance its quantity and characteristics but reduces its quality.

Through our survey and tests it is clear that milk is not adulterated to a great extent but it is not as it should be there for the consumers. It is being adulterated with water, skim milk powder, detergents, formalin which have harmful impact on human health. With the complete analysis of the scenario we can conclude that public health is an important issue but adulteration in food is commonly practiced in the market. Consumers are unaware of this and government is doing less to bring it into notice.

But with proper awareness among the people understanding the criticality of the issue, adulteration can be prevented. If consumers known about the adulteration practices and proper techniques to avoid them, the practice of adulteration would itself be minimized.

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