RESEARCH ARTICLE

AN ASSESSMENT OF BEHAVIOUR CHANGE REGARDING MILK CONSUMPTION IN FAMILIES CONSUMING UNPASTEURIZED MILK FROM STREET VENDORS IN SLUM AREAS OF INDORE DISTRICT

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ABSTRACT

Background: Consumption of unpasteurized milk is fairly common in Indian society which may lead to various health problems like Brucellosis, anthrax etc.

Aims & Objective: To educate and motivate people for use of packed and pasteurized milk.

Materials and Methods: This was cross sectional study done in urban slums of Indore. The study done in 120 families, 30 families were selected randomly from each slum who used milk from street vendors. Milk samples were collected from these families for quality testing. Educational intervention regarding advantages of pasteurized milk was given and repeat survey after one month was done to observe behaviour change. Statistical analysis done by chi square test, Mac Nemar test with p value <0.05 was considered significant.

Results: Unawareness about benefits of pasteurized milk (84%) and flexibility of making payment to the street vendors were the major causes for purchase of milk from street vendors. Gerber test and corrected lactometer test revealed 50% and 73% samples were moderate to grossly dilute. Standard plate count for bacteriological analysis revealed all samples (100%) to be good (E. coli count < 10,00,000/ml) but none of them was very good (< 2,00,000/ml) . boiled milk samples had better quality , chi square p < 0.0001. Educational intervention resulted in behaviour change of 27(22.5%) families which was significant, Mac Nemar p <0.0001.

Conclusion: Educational intervention had significant effect on behaviour change of people and the families who continued to take milk from street vendors even after educational intervention had no specific reason for it.

Key Words: Behaviour; Infections; Intervention; Pasteurization; Quality

Introduction

Milk is an important food for pregnant mother, growing children, adolescents, adults, healthy and patients. Though fresh milk from a healthy animal is either harmless or beneficial but, rapid changes in the health of an animal, or the milk handler, or contaminants from polluted water, dirt, manure or cuts and wounds can make raw milk potentially dangerous.[1]

In India, it is estimated that 20% of deaths among children under five are caused by diarrheal disease (WHO 2006)[2,3], 70% of these being associated with unsafe food or water (Unnevehr & Hirschhorn, 2000)[2,4]. A recent internet discussion pointed out that regulation isn't working, adulteration is widespread, testing inadequate, corruption rampant, rules not effective or followed and there are major hygiene and safety problems in all areas of food production and retailing (Solution Exchange, 2008).[2,5]

According to Indian dairy market report and forecasts 2012-17 around 49% of the total milk produced in the country is consumed as liquid milk and the rest is converted into milk products. Among the liquid milk consumers most of the liquid milk is boiled one or several times before use, and sometimes consumed as raw milk directly. Consumption of raw milk is dangerous as it may contain pathogens such as salmonella, Listeria monocytogens, Campylobacter and disease causing strains of Escherichia coli, which can lead to serious illness[1]. Also the presence of staphylococcus aureus indicates a potential health hazard is highly correlated to the capacity to produce entero-toxins harmful to the tissues of the contaminated host.[6] Boiling kills the microorganisms but adversely affect the quality, taste and flavour of milk, as milk constituents are heat-labile.[7,8]

To maintain the nutritive value of milk, people should use pasteurized milk instead purchasing raw milk and boiling it vigorously losing its nutritive value. This study has been conducted with aim to motivate the people for use of pasteurized milk rather than purchasing it from street milk vendors who very often add unsafe water in sake of getting more profit.

Pasteurization: Named after scientist Louis Pasteur, it is the process of application of heat to destroy human pathogens in food. Pasteurization involves rapidly heating milk (to less than the boiling point), maintaining it uniformly over a definite period and rapidly cooling it. This destroys most of the pathogenic microorganisms, reduces the total quantity of all the microorganisms without

affecting its inherent qualities (taste and flavour). The different methods of pasteurization are Holder (Vat) method, Continuous Flow Method, High Temperature Short Time (HTST) Method, Ultra high temperature (UHT) Method and Pasteurization in Bottles. The theoretical risk of contamination after pasteurization is entirely eliminated.[9]

Quality assurance of milk: Quality refers to a combination of characteristics that enhance the acceptability of a product. Quality control of milk is classified as *(1) Compositional quality:* Gerber routine test and corrected lactometer reading test determine and extra dilution of the milk. Gerber test measures the quantity of fat in the milk sample and lactometer assesses the added water in milk sample.[10] (Table 1) *(2) Bacteriological quality[10]:* for assessing bacteriological quality there are tests like direct microscopic count, plate count, methylene blue reduction time (MBRT), One hour Resazurin test (RRT), Thermoderic Count etc. (Table 2)

Table-1: standards for different classes* and designation* of milk in India[10]

Class of Milk	Designation	Minimum % Milk Fat
Buffalo Milk	Raw, Pasteurized, boiled,	6.0
Cow Milk	Raw, Pasteurized, boiled,	3.5
Goat or Sheep milk	Raw, Pasteurized, boiled,	3.0

* Prevention of Food Adulteration (PFA) rules 1976

Table-2: Bacteriological quality of milk[10]

Count per ml (standard plate count)	Quality / grade
Less than 2,00,000	Very good
2,00,000 to 1 million	Good
1-5 million	Fair
More than 5 million	Poor

Materials and Methods

Setting/Study Population: The study was carried out among residents of slum dwellings of Indore city. There are around 539 slums in Indore city, out of which 225 slums are included in the official list.[11] Four slums were selected randomly for the study. The people residing in these areas were mostly less educated, engaged in unskilled or semiskilled works.

Study Design/Sampling: a cross sectional study with educational intervention. Since quality of milk had to be tested in an accredited dairy firm, we had restricted our sample size to 120 (30 respondents from each dwelling). To select the respondents a preliminary survey of each slum area was done and the families taking milk from street vendors were included in the study using consecutive/ sequential random sampling till the sample size reached to 30 subjects in each slum. Samples of milk from each family included in the study were collected in a 50 ml size collecting bottles provided from the Saanchi dairy farm, Mangliya, Indore.

Instrument Description: Interview of the family heads/ housewives were done regarding awareness of milk hygiene, pasteurization of milk, dangers of consuming raw milk/ milk from street vendors reason for purchasing milk from street vendors was taken using a semi-structured questionnaire. Milk samples collected from these families and were taken to lab. Only one slum area was covered at a time for milk sample collection to avoid undue delay in collection and transport process which may provide time for bacterial growth. A written consent and permission was taken from manager, Saanchi dairy farm mangliya, Indore to carry out laboratory tests to of quality of milk samples. The families were reassessed in the next 4-5 days with reports of milk quality tests and educational pamphlets with details of pasteurization of milk, its benefits and were explained about benefits of pasteurized milk and were motivated for its use. A post interventional survey of the families was done to see the behaviour change i.e. purchase of packed pasteurized milk instead of purchasing milk from street vendors.

Statistics: data was collected and entered into work spread sheets. Analysis of the data was done using SPSS software (statistical package for social science). Quantitative variables were summarized using appropriate measures of location and variability, whereas categorical variables were presented as frequencies and percentages. The Chi-square test was used to test for significant associations between categorical variables. $P \leq 0.05$ was considered statistically significant.

Results

Among 120 families selected for the study 100 respondents were females and 20 were males. None were aware of the process of pasteurization. All the respondents agreed that the milk from street vendors is diluted raw milk and need urgent boiling. 88 respondents (18 males and 70 females) know that consuming raw milk is harmful but none were able to describe this harms. 50% (12 males and 48 females) respondents know about packed milk Sanchi and AMUL but think it costlier. None of the respondent was aware of the government schemes related to marketing of Sanchi milk, and types of milk marketed at Saanchi milk outlets. The reasons for purchasing milk from street vendors were mostly unawareness of the benefits of pasteurized milk, regular supply / easy availability of the milk from street vendors and Flexibility of making payment to the street vendors. (Figure 1)

Table-3: Gerber test

Quality of Milk Samples (Gerber test- fat content in %)		Raw Milk	Boiled Milk	Total	%
Diluted	Gross (0.1-1.9%)	24	00	24	20
	Moderate (2.0-3.9%)	33	3	36	30
	Mild (4.0-4.9%)	35	7	42	35
Subtotal-diluted*		92	10	102	85
Undiluted /acceptable*: (5-6.9%)		4	14	18	15
Total		96	24	120	100

*More number of raw milk samples was diluted as compare to the boiled milk samples and the different was significant ($\chi 2$ value: 40.037, p value: < 0.0001)

Table-4: Corrected lactometer reading

Quality of Milk Samples (corrected lactometer test- CLR reading)		Raw Milk	Boiled Milk	Total	%
Diluted	Gross (5-14)	10	00	10	8
	Moderate (15-24)	71	5	76	64
	Mild (25-29)	14	10	24	20
Subtotal-diluted*		95	15	110	92
Undiluted (acceptable)* 30-35		01	9	10	08
Total		96	24	120	100

* Most of raw milk samples were diluted as compared to boiled milk samples (and the difference was found to significant ($\chi 2$ value: 31.865, p value: < 0.0001)

Table-5: Standard plate count

Count per ml (standard plate count)	No. of samples	Quality / grade
Less than 2,00,000	00	Very good
2,00,000 to 1 million	120	Good
1-5 million	00	Fair
More than 5 million	00	Poor

Table 6: Levels of contamination

Levels of contamination (SPC)	Raw Milk	Boiled Milk	Total	%
Grossly contaminated (650,000-10,00,000)	48	00	48	40
Moderately contaminated (450,000-650,000)	46	8	54	45
Mildly contaminated (350,000-450,000)	02	16	18	15
Total	**96**	**24**	**120**	**100**

Table-7: Behaviour change in people/ families

Use of milk type	Pre-intervention	Post-intervention	P value
Unpasteurized, from local venders	120	93	<0.0001
Pasteurized packed milk	00	27	
Total	120	120	

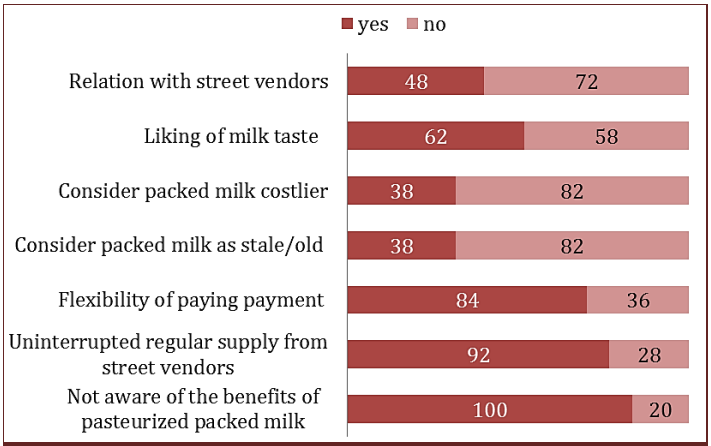

Figure-1: Factors responsible for purchase of milk from street vendors (pre interventional survey)

Results of the lab tests done on milk samples: among 120 milk samples collected for the quality testing 96 were raw and 24 were boiled once. None of the sample was repeatedly boiled. The milk samples were passed through three quality tests, Gerber test and corrected lactometer reading test and standard plate count.

Compositional quality tests: Gerber test revealed that 102 (85 %) of the samples were mild to grossly diluted i.e. these samples were added water somewhere from site of production to the distribution. The number of diluted milk samples increased to 110 (92%) on taking corrected lactometer reading test which is more sensitive test than Gerber test. (Table 3 & 4)

Bacteriological quality test: All milk samples had bacterial contamination in the range of 2 Lacs to 1 million (good and acceptable) counts per ml but none of the samples had cont below 2 Lacs count per ml (very good) i.e. the maximum upper limit value permitted for pasteurized packed milk (Table 5). Though all the samples were of good quality as per their standard plate count and guidelines of national dairy development board, but the samples had bacterial contamination much above the acceptable count fixed for pasteurized and packed milk (Table 6).

Behaviour change: In post interventional survey that 27 (22.5%) families started consuming pasteurized milk (Saanchi packed milk) significant change in behaviour (Mac Nemar test P value <0.0001) (Table 6 & Figure 2).

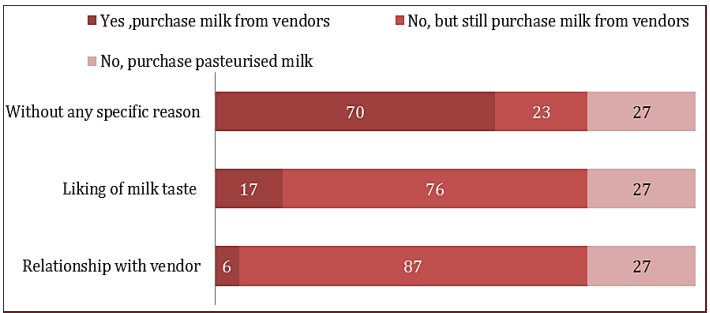

Figure-2: Factors responsible for unchanged behaviour (post intervention)

Discussion

Purchasing milk from street vendors is common in our society due to unawareness regarding pasteurized milk. It is more common in the villages and urban slums as people are unaware of the pasteurized milk and its benefits. Increasing awareness through educational intervention had significant impact in this behaviour change as seen in our study, (22.5% Mac Nemar p<0.0001) Table 7. Also the unavailability of pasteurized milk parlours/ booths and distributers in villages and slums, favours people to use open, unpasteurized milk from street vendors (76% families in our study) figure 3.

According to A. Kumar et al[12] study, in spite of growing

presence of modern milk supply chains in the Indian milk market, the traditional milk supply chain is still dominant. Its dominance is even more pronounced in less-developed states like Bihar. Street vendors usually purchase the milk from individual small dairy farms. Study by Anu George et al[13] shown that addition of water in milk by small dairy farmers for getting benefits is common and dangerous for health of the people. Milk is a good culture for growth of bacteria if get contaminated by these people.

The unawareness, poor education, poor socioeconomic status, milk price, milk taste are the major reasons for purchasing milk from street vendors. This had also been seen in the study by Kumar A et al[12] who found that education, milk price, milk test and presence of cooperative milk collection centres in the villages have a significant positive influence on famers' decision to integrate with modern formal milk marketing supply chain. According to a study done by Yuen et al[14], the bacteriological quality for most raw milk samples from individual farmers was poor, with a total plate count exceeding 106 CFU/ml

The difference in the quality of boiled and raw milk is significant and shows that boiling improves the compositional and bacteriological quality of milk Table 3, 4, and 6. This is contrast to study by de Oliveira et al[6], who found no Statistically significant differences between raw milk and the pasteurized milk, ($p>0.05$). But in our study we found that quality of the milk from street vendors did not improves to the acceptable label even after boiling. It has been found that 62% of the boiled milk samples were diluted by corrected lactometer reading test which indicates that how grossly these samples would have been diluted in raw condition Table 4. 33% of the boiled milk samples were found moderate bacterial contamination which indicates poor awareness/practice of milk hygiene among these families Table 6.

Boiling milk kills the microorganisms but is likely to adversely affect the quality, taste and flavour of milk, as milk constituents are heat-labile so to maintain the nutritive value of milk people should use pasteurized milk instead purchasing raw milk and boiling it vigorously losing its nutritive value.[7,8] This study has been conducted with aim to motivate the people for use of pasteurized milk rather than purchasing it from street milk vendors who very often add unsafe water in sake of getting more profit.

According to Dr. Pawan Gupta, endocrinologist, and project associate of the Indian Medical Academy, said, "Boiling and re-boiling milk at high temperature for a long time affects the nutritional content of the milk, particularly the B group (B1, B2, B12) of vitamins. These vitamins evaporate as heat increases.[7] As shown by the study by Delia Grace et al[2] Participatory risk analysis posits that building on indigenous knowledge will be more effective than top-down solutions and we looked at indigenous risk management that is the existing practices that reduce risk. We in our study had involved the people by house to house survey, explained the quality of the milk they used and motivated them to use packed and pasteurised milk and be on the safer zone. We were able to get behaviour change in more than 20% of families.

Conclusion

Milk is one food commodity and there can be adverse effect on its quality if proper care is not taken during production, procurement and transit. Use of pasteurized milk helps to maintain the nutritional quality along with its microbial quality. It is not easy to keep watch on the dairy farmers and street vendors to stop adding water or other adulterants in milk so people should better educated and motivated to take hygienic and safe pasteurized packed milk from the private or state owned cooperative milk societies. The factors like unawareness regarding pasteurization and attitude of people can be changed with adequate and repeated educational interventions. Pasteurized milk should be made available within the reach of all people by opening more number of outlets. The cooperative milk firms should make flexible plans for payment of costs and government may give some concessions to poor and marginalized population on state owned cooperative milk firms like Sanchi.

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