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Research Paper

Quality analysis of commercially marketed milk in Kathmandu Valley

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Abstract: Milk is a complete and highly nutritious source of food for human beings. However, in many developing countries, including Nepal, the quality of milk products has become a major health concern for consumers, particularly for infants and children. Therefore, the aim of the present study was to assess the quality of raw and pasteurized milk sold in Kathmandu valley, Nepal. A laboratory-based cross-sectional study was conducted on 57 (30 raw and 27 pasteurized) milk samples. Where samples were collected from the market using a simple random sampling technique. Both milk samples were placed for alcohol, acidity, fat, Total solid and Solid not fat tests and were 8 (26.67%), 11 (40.74%) positive for alcohol test, Acidity (43.33%, 59.26%) higher, fat content (51.85%, 60%) were below 3%, Total solid (50%, 92.59%) below 12%, and solid not fat (46.67%, 92.59%) less than 8% respectively for raw and pasteurized milk samples. Among three adulterants tested sugar and soda was found most commonly used adulterants than starch. Mesophilic count was found more in raw milk than pasteurized milk. Where coliform count was high in pasteurized milk. The milk samples were detected with 8 different bacteria with majoring *Staphyloccocus aureus* followed by *Bacillus* spp. and *E. coli* in both milk samples. Based on the findings of this study, the quality of raw and pasteurized milk was poor as per the milk quality standards. This may cause significant public health-related problems. Therefore, an appropriate intervention should be conducted to improve milk quality.

Keywords: SNF, Adulteration, Coliform, Bacterial count, Acidity.

Introduction:

Milk is defined as fresh, whole, and clean lacteal secretion of mammary glands of mammals. It is primary source of nutrition for young mammals, including breastfeed human infants before they can digest solid foods. It's practically free from colostrum obtained by complete milking of one or more healthy cows, 5 days after and 15 days

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before parturition, which contains not less than 8.5 % solid-non-fat and not less than 3.5% milk fat (U.S. Public Health Services, 1965).

Milk is a good sources of many essential nutrients food which includes protein, water, solid, fat, milk sugar or lactose. It is rich in vitamins, calcium and it's highly moisture. Due to high nutrients milk favors the growth and many bacteria, even when pasteurized or refrigerated. It is a good medium for practically all microorganisms. Some disease transmitted by consumption of contaminated milk includes tuberculosis, typhoid, fever, sore throat, gastroenteritis, food poisoning, dysentery etc. (Arjyal *et. al*., 2004).

Pasteurization in milk is a process where milk products are heated to decontaminate it for safe drinking (Kevine, 2016). Some of the psychotropic bacteria can be isolated from pasteurized milk such as *Bacillus, Clostridium, Streptococcus, Escherichia coli* etc. (Credit Carol *et. al.,* 1972). Thermo tolerant bacteria found in milk that may survive pasteurization includes *Mycobacterium, Micrococcus, Bacillus, Clostridium, Streptococcus,* etc. (Thomas *et. al.,* 1967).

When milk is drawn from udder of healthy animal, milk contains organism from teat canal. They are mechanically flushed out during milking. The number present at the time of milking has been reported to be in range of several hundred to several thousand per milliliter. Milking under hygienic condition with strict attention to sanitary practices will result in a product with low bacterial content and good keeping quality. But if maintained under conditions that permit bacterial growth, then the raw milk develops a sour flavor. This is due to fermentation of lactose to lactic acid (Pelczar *et. al*., 2013).

Raw milk is milk from cows, goats, sheep, or other animals that has not been heated to more than 40°C nor undergone any treatment with the same effect. Some of the contaminating microorganisms found in raw milk are: *Escherichia coli, Listeria monocytogens, Campylobacter* spp., *Cryptosporidium, Salmonella, Staphylococcus aureus, Brucella abortus, Bacillus cereus* (Chyle *et. al*., 2004)**.**

Material and Method:

The 57 raw and pasteurized milk samples were collected from different place of Kathmandu valley. A cross-sectional study was carried out in the department of Microbiology, D.A.V. College from 15th February 2022 to 20th April 2022. All of the collected Raw and Pasteurized milk samples were placed for physiochemical analysis (alcohol test, acidity test, Fat, Total Solid and Solid Not Fat), adulteration test (starch, sugar, soda) and microbial analysis (bacterial count, coliform count) by following the standard laboratory manual as suggested by Marth (1978).

Result:

Physiochemical analysis of the milk samples revealed that both raw milk and pasteurized milk samples were found with 8 (26.67%), 11 (40.74%) positive for alcohol test, Acidity (43.33%, 59.26%) higher, fat content (51.85%, 60%) were below 3%, Total solid (50%, 92.59%) below 12%, and solid not fat (46.67%, 92.59%) less than 8% respectively (Table 1).

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Table: 1. physiochemical analysis of pasteurized milk.

Sample	Alcohol test		Acidity test		Fat		Total solid		Solid not fat		total
	Positive	negative	>0.16	≤0.16	≥3 %	< 3 %	≥ 12.5%	< 12.5 %	≥ 8 %	< 8 %	
Raw	8 (26.67%)	22(73.33 %)	13(43.33 %)	17(56.67 %)	12(40 %)	18 (60 %)	15(50 %)	15(50%)	16 (53.33 %)	14 (46.67 %)	30
Pasteurized	11(40.74 %)	16(59.26 %)	16(59.26 %)	11(40.74 %)	13(48.15 %)	14 (51.85 %)	2(7.41 %)	25(92.59 %)	2(7.41 %)	25 (92.59 %)	27

The milk samples were tested for adulterants such as starch, sugar and soda where sugar was found commonly used adulterant in pasteurized milk than raw milk. (Table 2)

Table: 2. Adulteration test of milk for starch, sugar, and soda.

Adulterant	Raw milk		Pasteurized milk	
	Positive	Negative	Positive	Negative
Starch	8(26.67%)	22(73.33%)		27(100%)
Sugar	14(46.67%)	16(53.33%)	18(66.67%)	9(33.33%)
Soda	11(36.67%)	19(63.33%)	19(70.37%)	8(29.63%)

Among the tested milk samples, Raw milk showed 50% mesophilic count (≤105) whereas only 14.81% in case of pasteurized milk. Presence of coliforms in raw milk was 26.67% while 40.74% in pasteurized milk (Table 3).

Table: 3. Microbial analysis of milk samples.

Samples	Samples with total mesophilic count		Coliform count		Total
	$\leq 10^2$ cfu/ml	$>10^2$ cfu/ml	Present	Absent	
Raw	15(50%)	15(50%)	8(26.67%)	22(73.33%)	30(100%)
Pasteurized	23(85.19%)	4(14.81%)	11(40.74%)	16(59.26%)	27(100%)

Among the coliform, *E. coli* was found to be most predominant organism followed by *Klebsiella* spp. And *Enterobacter* spp. in both sample.

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Table: 4. Bacteria distribution in milk sample.

Sample	Raw milk		Pasteurized milk	
	No	%	No	%
Escherichia Coli	3	10	4	14.81
Staphylococcus aureus	8	26.67	5	18.52
Proteus mirabilis	3	10		
Klebsiella pneumonia	1	3.33		
Lactobacillus lactis	3	10		
Bacillus spp.			5	18.52
Enterobacter spp.			2	7.40
Pseudomonas spp.			2	`7.40

Discussion:

This research work was conducted to assess milk quality of Kathmandu valley where total 57milk samples were collected from market and were subjected to physiochemical test, adulteration test and microbiological test.

According to the study, the acidity of milk sample, highest acidity was observed in 59.26% pasteurized milk sample with >0.16 while 11(40.74%) showed acidity<_0.16. similarly 13(43.33%) raw milk samples showed acidity higher than 0.16 and 17 (56.67%) was lower or equal to 0.16 which is in accordance with the study carried out in Limuru by Kabui (2012). And it suggests that milk with lower acidity as fresher than the one with higher acidity increases the risk of microbial contamination. This may be due to less presence of lactic acid bacteria in milk sample. 26.67% raw milk and 40.74% pasteurized milk samples showed precipitation of alcohol and 22 (73.33%), 16 (59.26%) raw and pasteurized milk samples showed no precipitation of alcohol. The present finding is more than that reported by Haile (2015). This may be due to increase amount of Ca and Mg than the amount and may be due to increased levels of albumen (colostrum milk) and salt concentration (mastitis).

National Dairy Development Corporation (NDDC), Nepal recommended a minimum of 3% fat in milk and in our study, 51.85% of raw milk was detected with less than 3% fat where as 60% of pasteurized milk were less fat content than recommended unlike the study showed by Teklemickeal (2012) who reported higher fat content of 3.86% and 3.79% in average of their tested milk samples respectively. The fat content was significantly affected by the factor such as feed, parity, and stage of lactation. The SNF of raw milk samples was tested with 50% less than 12% where as 92.59% of pasteurized milk sample showed total solid less than 12%. The SNF content of milk in this study is less than the finding of Debebe (2010) who reported a minimum (8.3 ± 0.30) and maximum (8.7 ± 0.36). According to NDDB, the SNF of milk should be 8%. The low SNF of the samples could have been attributed to a variety of factors including the feed, genetics, season of the year, stage of lactation and disease. The average total solid (TS) content of milk was found to be 10%. This value is less than the finding of Tekelemichael (2012) who

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reported TS of 12.58%. According to European Union, a recognized quality standard for total solids content of cow milk should not to be less than 12.5%. The variation could be due to difference in breed, feeding and management practices which have important effect on milk composition quality.

Similarly, adulteration test was carried out as quality of milk is often decreased by this parameter as well. Adulteration analysis determined were starch, sugar and soda. It was found that only raw milk samples showed presence of adulteration of starch. Starch may be expensive, difficult to be homogenized and can be detected and discovered by the consumers as report by Bastola, 2016. Among the tested samples, 46.67% of raw milk samples was found to be adulterated with sugar while 53.33% samples were not adulterated with sugar. Similarly, 66.67% of pasteurized milk was adulterated with sugar. Sugar as an adulterant obtained in the present study was more than that reported by Bastola (2016) .Soda as an adulterant obtained in the present study was more than that reported by Bastola (2016). It was done to increase the sweetness of milk that may or may not harm healthy person but may affect diabetic person. This indicated that quality of milk is good in terms of chemical parameters as well.

In this study, bacterial examination was carried out for all collected sample by pour-plate method in various media and after successive incubation, identification of bacteria was also carried out. Growth was observed in all 50% of raw milk samples with greater than $>10^2$ cfu/ml out of 30 samples. While only 14.81% of pasteurized milk showed growth of mesophilic bacteria greater than $>10^2$ cfu/ml which was observed from PCA plates. Then, subculture of colonies was performed in nutrient agar and inoculation to VRBA agar was done for isolation of indicator organism. Moreover, various biochemical test was performed for identification of general microorganism present in milk sample.

The highest bacterial load was found in most of raw milk than pasteurized milk within the acceptable value of 1×10^5 bacteria of milk (O'Connor, 1994). This difference in bacterial count might be due to unsatisfactory hygiene of workers, farmers and use of improperly cleaned equipment's in handling of milk in dairy industries. Total bacterial count is a good indicator for monitoring the sanitary condition practiced during production and handling. Likewise, coliform load was also performed. Out of 15 samples, 6 sample showed the growth of coliform. The highest coliform growth in pasteurized milk were 5.5×10^2 cfu/ml respectively. The higher coliform count observed in the current study might be attributed to initial contamination of the milk through the milkers, milk containers and milking environment.

Analysis of bacterial load and coliform count in sample concluded that pasteurized milk detected with higher coliform count than raw milk samples which may be due to inadequate sanitary practice among the employees, maybe due to contamination in water, chilling may be due to some problem in plate coolers, chiller and pasteurized tank. The microorganism isolates from this study were *Staphylococcus aureus, E. Coli, Enterobacter* spp., *Bacillus* spp., *Pseudomonas* spp. *Staphylococcus aureus* causes food born intoxication, and *Escherichia coli*, *Enterobacter* spp. and *Pseudomonas* spp. cause gastro-intestinal disorder like diarrhea.

Conclusion:

The physiochemical and adulteration properties of milk samples should be

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maintained within the standard limits and should be maintained to sustain the milk quality. To control the microbial contamination pasteurized milk hygienic should be maintained. It is concluded that analysis of milk should be done regularly which helps to enhance their quality. This indicates heating to boiling of milk should be done before consumption.

Recommendation:

Milk should be boiled before consumption. The water quality should be checked regularly by the technicians in dairy plants. Good hygienic practices should be applied throughout production so that milk and milk products are safe and suitable for use. Government should include legal requirement of adulteration test and quality control test of milk considering Nepalese situation. In dairy industry, workers should be aware about personal hygiene while handling and processing milk.

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References:

U.S. Public Health Services (1995) Grade A Pasteurize milk ordinance, U. S. Department of Public Health Education and Welfare Service, P. I.

Arjyal, C., Dahal, N., Khadka, B., (June 2004) Microbial quality of milk available in Kathmandu valley; Journal of Nepal medical Association, 43, 137-140.

Kevine, (2016) Dairy Technologist. Retrieved 2018, from Dairy Technologist: we exist to help you to be better dairy technologist:http://dairytechnologist.com/milk-pasteurization/

Thomas, R. L., Sheard, R. W. and Moyer, J. R. (1967) Comparison of conventional and automated procedures for nitrogen, phosphorus, and potassium analysis of plant material using a single digestion. Agron. J. 59, 240-243.

Pelczar, M. J., Chan, E. and Krieg, N (2013) Microbiology. McGraw Hill Education (India) Private limited, pp 620.

Chyle, F. Y., Abdullah, A. and Ayob, M. K. (2004) Bacteriological quality and safety of raw milk in Malaysia. Food Microbiology 21, 535-541

Marth, E. H. (1978) Standard Methods for the Examinations of Dairy Products. American Public Health Association, Washington, DC. pp416.

Kabui, K. K. (2012) Assessment of milk quality and the potential of a quality-based payment system in small holde farms in Limuru and Eldoret, Kenya.

Haile, S. (2005) Quality assessment of cattle milk in adea berga and Ejerie district of west Shoa zone, Ethiopia. Haramaya University, Haramaya.

Teklemichael T. (2012) Quality and Safety of Raw and Pasteurized Cow Milk Produced and Marketed in Dire Dawa Town, M. Sc.Thesis. Haramaya University, Ethiopia

Debebe, W. (2010) Physiochemical Properties and Safety of Street- Vended milk in and around Addis Ababa city (kotebe Bishoftu and Chancho). M.Sc. Thesis, Haramaya University, Haramaya

Bastola, K. P. (2012) Quality of raw milk supplied to organized milk collection centers of western Chitwan.

O'Connor, C. B. (1994) Rural Dairy Technology. ILRI Training Manual No. 1. International Livestock Research Institute (ILRI), Addis Ababa, Ethiopia. pp133.