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Adulteration and Microbiological Quality of Milk (A Review)

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Abstract: Milk is very valuable food, readily digested and absorbed. It consists of nutrients, which are needed for proper growth and maintenance of body. Milk and milk products form a significant part of the diet and a substantial amount of our food expenditures goes on milk and other dairy products. In Pakistan, milk is transported from the point of production to consumers and processing plants by middlemen called "Gawalas". They don't maintain proper hygienic conditions during this transport, which leads to increase the total viable bacterial count. They also adulterate milk to increase their profit margin by several chemicals like urea, starch, flour, cane sugar, vegetable oils, detergents etc. Various preservatives like formalin and some antibiotics are also added in milk to increase its shelf life. This addition decreases the nutritive value of milk. These adulterants, preservatives and drugs in milk cause very serious health related problems.

Key words: Adulteration, milk, microbiology

INTRODUCTION

Milk is defined as the whole, fresh, clean, lacteal secretion obtained by complete milking of one or more healthy animals excluding that obtained within fifteen days before or five days after calving or such periods as may be necessary to render milk practically colostrum free and containing the minimum prescribed percentage of milk fat (3.5%) and solids not fat (8.5%) (Goff and Hill, 1993). Milk, if present in its natural form has high food value. It supplies nutrients like good quality proteins, fat, carbohydrates, vitamins and minerals in significant amount than any other single food (Neumann *et al*., 2002). Besides its general need for human health, milk proteins supply those amino acids which are needed for proper growth of adults and infants (Espinosa *et al*., 1992). Buffalo and cow milk contains 7.6 and 4.5% fat, 3.8 and 3.8% protein, 4.9 and 4.9% lactose 0.78 and 0.72% ash, 17 and 13.9% total solids respectively (Khan *et al*., 2005).

Nature has blessed Pakistan with those animals which have genetically high production potential such as Nilli Ravi buffaloes and Sahiwal cows. Annual milk production in Pakistan is 45 million tons. Most of the farmers in villages derive about 30-40% of their income from livestock. Punjab province accounts about 49% in total milk production. There are 31 million buffaloes and 34 million cattle. Buffaloes are the major milk producing animals contributing about 62% in total milk production (Bhatti *et al*., 2010). There are 28 million sheep and 60 million goats. Sheep are producing 3.6 million tons and goats 7.3 million tons milk. Livestock is contributing 53.2% in the income obtained from agriculture sector and 11.4% in total GDP (Anonymous, 2009-10).

With the help of modern science, various aspects of milk quality are being continuously explored to bring more facts to the surface. Quality deterioration of milk starts just after milking, when it is carried out under unhygienic conditions. The main sources that affect the quality of milk at farm are animal mishandling, unhygienic milking, transportation equipments and poor storage conditions (Oliveria *et al*., 1999). All such practices results in poor quality of milk in terms of its compositional and bacterial quality (Rizvi, 2002).

Pakistan is the fourth largest milk producing country in the world after the United States, Russia and India. In spite of having good ranking among milk producing countries, our milk production and distribution systems are still very traditional and underdeveloped (Anonymous, 2009-10). In Pakistan the modern dairy sector is relatively small and only 3% of the total milk produced is processed (FAO, 2002). Due to lack of proper facilities the quality of milk is very poor regarding to the health of consumers.

Milk production in relation to seasonal fluctuations: Although milk is produced throughout the year yet the supply and demand of milk are related to the seasonal fluctuations in Pakistan. Milk production is usually high in winter season from January to April while its demand is less during this season.

On the other hand, milk production is less during the summer season from May to August. It is also the period of fodder shortage in Pakistan. In this season the consumption of milk and milk products increases due to high temperature. It is estimated that the overall supply of milk decreases up to one half in the mid June and the

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demand of milk is at its highest point in this season (Umm e Zia, 2006). So to compensate this gap between demand and supply the people adulterate milk by adding water and then after its dilution various chemical substances are added to maintain its compositional parameters. These substances include starch, urea and cane sugar. Along with this to increase the shelf life of milk preservatives like formalin, hydrogen peroxide, boric acid and various antibiotics are added (Tipu *et al*., 2007).

Milk supply chain in Pakistan: According to Raja (2005), milk marketing chain in the Pakistan includes the following intermediaries:

Rural milk traders: Rural milk traders, commonly called "Katcha Dodhies" act as the most important middlemen in the transportation of milk. They collect milk from small milk producers in the villages. Mostly they act independently but some are also connected to larger high way collectors. In those areas where there is strong competition to get milk, "Katcha Dodhies" have contract with milk producers to get milk regularly so that their customers have not to face any problem. Milk producers usually give pure milk but these middlemen, to prevent the deterioration during collection and sale of milk, add ice cubes to lower down the temperature.

High way milk collectors: They also called "Pacca Dodhies" collect milk from rural milk suppliers "Katcha Dodhies". The collection centers are present near or along the main road. Before purchase they check milk quality by visual examination, fat, solids-not-fat contents and its volume. Before supplying milk to the next middleman, more ice is added in milk particularly in summer months. Preservatives like hydrogen peroxide, formalin and various antibiotics are also added to preserve milk (Tariq *et al*., 2008).

Urban vendors and processors: High way milk collectors supply milk to urban milk vendors or to processors. Urban milk vendors sell milk to their consumers living at different areas in the cities. Milk processors take milk to their plants where they treat it further and then supply it to market for sale.

Some milk producers directly supply milk to the consumers without the involvement of the middlemen. The final milkmen in raw milk marketing are the dairy milk shops. They also adulterate milk to some extent as after separation of milk fat they add vegetable oils in it. Urea, starch and cane sugar are also added to increase the solids-not-fat contents after addition of water (Zia, 2007).

Milk adulteration: Adulteration is an act of intentionally debasing the quality of food offered for sale either by admixture or substitution of inferior substances or by the removal of some valuable ingredients (Food and Drug Administration, 1995). Adulterated food is dangerous for health as it may contain various toxic chemicals, it may be deprived of nutrients required for proper growth and development of human body (Marcus, 1979). Pathogenic microorganisms like those of tuberculosis and hepatitis are naturally present in milk (Zehner *et al*., 1986). In addition, Gawalas also have a major role in the adulteration of milk (Naz, 2000). In Pakistan problem is not only adulteration but also of dirty adulteration (Rizvi, 2002). Milk used by the people for consumption is adulterated to such an extent that there is very less nutritive value in it and may also be toxic for public health (Loudon and Irvine, 1986). Milk dealers can maximize their profit margin by three ways dilution, extraction of valuable components like milk fat which is removed as cream, addition of cheap substances like starch to increase the value of total solids up to a level which is acceptable by the consumers. In our country raw milk is distributed by a traditional system which involves middlemen called Gawalas. These middlemen (Gawalas) used to adulterate milk to maximize their profit (Lateef *et al*., 2009).

Milk adulteration, poor hygiene, malpractices, lack of preservation technology, cooling facilities and sanitation conditions are the main causes of losses in quantity and poor quality of milk (Haasnoot *et al*., 2004). In Pakistan adulteration of milk is the most pressing public health issue. Adulteration of milk is done to increase its volume and then starch and other reconstituted milk powders are added to increase its viscosity. 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 is also being used. Urea adulterated milk is very harmful to the girls as it hastens up the process of puberty (Tariq, 2001).

Some adulterants like detergents are used to enhance the cosmetic nature of milk. When water is added in milk its foamy appearance diminishes, so to give milk a foamy appearance artificially detergents are added in it. Hair removing powders and urea are added for whitening milk and giving it a genuine look. Only few grams of urea are enough to bring milk in its original state (Walker *et al*., 2004). Hydrogen peroxide to preserve milk is usually used in summer season when environmental temperature is very high. This unethical activity is usually adapted to prevent the financial losses due to the spoilage of milk during its transportation and sale (Naz, 2000).

Seed cakes and cotton seed meals which are used as animal feed in Pakistan usually come from the crops which are subjected to different insecticide and pesticide sprays. Traces of these chemicals along with milk enter into the body of the consumers (Liaska, 1968). It is notable that in developed countries milk is second to

sugar that cause major food induced illness despite high standard of hygiene, sanitation and handling (Raja, 2005).

Physical examination, chemical composition, hygienic status and adulteration of milk supplied to the canteens of various hospitals in Faisalabad city were determined by using standard techniques. The physical examination of these milk samples showed that 33.33% samples were clear, 66.66% showed presence of dirt, 23.33% samples showed normal, 63.33% very mild and 13.33% cowey odour; 83.33% samples showed white colour of milk, 6.66% light yellow and 10% bloody; 16.66% samples had normal while 83.33% showed thin consistency; 46.66% samples had no sediments while 53.33% showed sediments. The chemical examination of these samples showed that the amount of protein was 1.20±0.17%, fat 1.52±0.08%, solid not fat 4.98±0.26, total solids 6.54±0.20, acidity 0.07±0.00% and average specific gravity 1.02±0.01. These results showed that milk sold to these canteens did not fulfill the required standards of its composition and are injurious to health. The adulteration of milk with water, urea, formalin, hydrogen peroxide and cane sugar was observed in 93.33, 86.66, 46.66, 13.33 and 93.33% samples (Lateef *et al*., 2009).

In Faisalabad (District of Punjab, Pakistan) a study was conducted in which milk samples from five species of mammal sheep, goat, cattle, buffalo and camels were evaluated for the presence of Aflatoxin M1 (AFM1). For this purpose High Performance Liquid Chromatography having specific columns for detection called fluorescent immuno-affinity columns was used. The principle of this technique was same as that of affinity chromatography. Out of 169 samples analyzed 34.5%, 37.55%, 20% and 16.75% samples were found positive (Hussain *et al*., 2010).

Status of milk adulteration in some other countries: Milk adulteration is not only the problem of Pakistan but some other countries are also suffering from this unethical activity. In China milk dealers water down milk due to high demand and limited supply. Then add synthetic powders to increase the protein value, Hydrogen peroxide and gentamycin as preservatives, Vegetable oils to increase the fat value. Microbial contamination of milk was also high because only 20% of the small scale backyard farmers use disinfectants priorer to milking. This decreases the shelf life of milk. This adulterated milk increased the number of patients with kidney stones (Gale and Hu, 2007).

Three hundred milk samples were collected from three different localities in Sudan and observed for adulteration with water, starch and the values of their total solids were also determined. It was found that more than 95% samples were found adulterated with water, 35.5% for starch. None of milk sample has total solids according to standard values (Ahmad, 2009).

Milk sold in a state of Turkey was analyzed for microbiological and chemical properties. Microbiological examination includes total viable bacterial count and chemical examination includes pH, solids not fat and density. All milk samples contained high number of bacteria than normal. Some milk samples contained coagulase positive *S. aureus*. This indicates very poor hygienic status of milk. pH of milk samples were within normal range, while SNF and density were not according to required standards. 4% samples had additional milk powder, 30% water and 6% added water and removed fat (Tasci, 2011)

In Kenya pasteurized and raw milk samples were analyzed for adulteration of antibiotics and hydrogen peroxide. 23.5% pasteurized milk samples were found positive for H_2O_2 and 23.7% for antibiotics. In raw milk samples 5.58% for H_2O_2 and 19.3% for antibiotics positive (Wangala and Wafula, 2007).

Milk transportation utensils: In Pakistan transportation of milk is usually done with the help of motorcycles, vans, animal carts and most commonly by bicycles are used. The gawalas (milkmen) use drums for the transportation of milk that had already been used for the transportation of other chemicals like (hydrochloric acid, phosphorus, toluene, liquid ammonia, solvent oils and other poisonous chemicals). They do not wash these drums properly before their use. So the traces of these chemicals with milk enter into the body. The main reason for using these drums for transportation of milk is that in a large plastic drum, 200 liter of milk can be filled that can be easily transported through motorcycles. Besides being light weighted, these are easily available. Milk sellers clean these drums by using washing powders or soaps which are not sufficient for cleaning. Government has banded to use these drums for eatables since long time, because traces of chemicals or acids gets mixed with products kept in them and cause hepatitis, tuberculosis, stomach ulcer, anemia and other serious diseases. Other utensils being used for the transportation of milk are old and rusted. No proper attention is taken towards their maintenance and cleaning before use (CRCP, 2003).

Milk is an excellent food for humans and same is true for bacteria also. The unprocessed and unchilled raw milk has very short shelf life and usually gets sour within 4 to 6 hours due to bacterial growth. Clean milk production, handling and transport are thus very important. While it is essential that animal, particularly its udder and teats are cleaned before milking and milkman washes its own hands, cleaning of utensils used in milking, storage and transport are of utmost importance in clean milk production and supply. Various utensils are used for the purpose but buckets and cans are more commonly used (Afzal, 2010).

Milk adulteration and health of consumers: The chemicals which are being used as adulterants in milk have the following effects on the health of consumers; Formalin causes vomiting, diarrhea and abdominal pain. Larger doses may cause decreased body temp, shallow respiration, weak irregular pulse and unconscious. It also affects the optic nerve and cause blindness. It is one of the potent carcinogens (Gwin *et al*., 2009). Hydrogen peroxide damages the stomach cells, which can lead to gastritis and inflammation of the intestine and bloody diarrhea (Murthy *et al*., 1981). Octylphenol and nonylphenol parts of detergents cause breast cancer. They also decrease the
sperm production from testicles (Ali *et al*., 2005). Urea causes pain in lower abdomen, irregular heart beat, muscle cramps, numbness and weakness in hands and feet, chills and shivering fever. Urea also causes increase in bleeding from uterus. Appearance of unnecessary hairs on face especially of women and children (Baumgartner *et al*., 2005).
High amounts of starch may cause diarrhea due to the effects of undigested starch in colon. Its accumulation in the body may prove very fatal for the diabetic patients. High amounts of carbonates/bicarbonates in the body potentially disrupt hormones signals that regulate development and reproduction (Rideout *et al*., 2008). Boric Acid causes nausea, vomiting, diarrhea, kidney damage, acute failure of circulatory system and even death (See *et al*., 2010).

Physicochemical characteristics of milk: Milk is an important source of nutrients required for growth, maintenance and proper functioning of bodies of mammals including human beings. Milk consumed by humans is usually obtained from five different species of mammals as cattle, buffalo, sheep, goat and camels. Milk is also used for preparation of various products like ghee, yogurt, butter, cream, sour milk, etc. (Webb *et al*., 1974; Hassan, 2005). Milk and milk products having good nutritional value, acceptable physical appearance, enhanced biological potential and free from all toxic chemicals are the demand of people (Khan and Zeb, 2007; Rahman *et al*., 2006).
Fats, carbohydrates, proteins, water, minerals, enzymes, vitamins and organic acids are the major chemical components of milk the amount of these components is different in milk of different species of animals. To analyze the quality of milk, different types of milk samples like raw milk (unprocessed), powdered milk, different infant milk formulas and processed milk were collected from various countries like Poland, USA, UK, Pakistan and Nigeria were collected and studied for all the parameters of their chemical composition (Ikem *et al*., 2002; Dobrzanski *et al*., 2005). Raw milk samples which were collected from Silesian region, Poland were studied for 38 micro and trace elements by Dobrzanski *et al*. (2005). It was found that the amount of micro and trace elements in milk depends upon the geographical location of animals. Ikem *et al*. (2002) studied the infant milk formulas which were being used in USA, UK and Nigeria for different essential and non essential elements. They concluded that those infant formulas which were soy based had high elements levels than those formulas which were milk based. Some brands were found to have low nutritional values than the recommended Dietary References (DRIs) and Dietary Allowances (RDAs) of North America.
Different compositional parameters of milk samples like protein, fat, solid not fat and total soluble solids were analyzed in Peshawar (Pakistan), 82 milk samples were collected during summer and same number of milk samples were collected during winter season from milk producers and bulk samples from retail outlets. Results showed that not even a single sample reached the required compositional quality accepted as standard (Khan *et al*., 1999).
Jaffar *et al*. (2004) studied the level of 12 different metals in nineteen different imported brands of milk which included both expired and unexpired milk samples collected from Karachi City Pakistan. It was found that these metals were present in the following order (Ca>Na>K>Mg>Fe>Zn>Cr>Pb>Cu>Ni>Cd>Mn). Hussain *et al*. (2006) analyzed both processed and unprocessed milk samples for the presence of vitamin C in Pakistan. The highest amount of vitamin C was found in powder milk followed by processed milk packs and lowest amount was found in fresh raw milk samples. Rehman and Salaria (2005) studied the effect of storage time and heat on the nutritional quality of (UHT) processed milk. They found that the nutritional quality of milk decreases with the increase in temperature and storage time.
The physical and chemical properties of milk having great importance for every person related with milk business like farmers, milk processing units and dealers. There are four different methods by which the composition of milk can be altered; these include dairy processing technologies, nutrition of the dairy animals, management practices and genetics of the animals. Milk fat is inversely related with the amount of starch in the concentrates. Starch disturbs the lipogenic to glucogenic VFA production in the rumen. The percentage of fat in milk also depends upon the concentration of poly unsaturated fat in ration. If its concentration is high milk fat will decreased and if it is low then milk fat will increased. So poly unsaturated fat and starch concentration in milk samples should be kept minimum to increase the fat in milk (Walker *et al*., 2004).

Bacteriological quality of milk: Milk after its synthesis in mammary glands is secreted into the next part of the udder called alveoli. At this stage it is usually sterile and free from all types of bacteria (Tolle, 1980). After that

bacterial contamination of milk starts. The main sources for the bacterial contamination of milk are: interior of the udder as in case of mastitis, outer surface of the udder, milk handling and storage equipments, milking and housing environment, health status and hygienic conditions of the animal (Bramley and McKinnon, 1990). Temperature and time of storage also effect microbial quality of milk.

Different sources which lead to increase per ml bacterial load in milk are:

Interior of udder: Milk, when drawn from the udder of a healthy cow, contains less number of microbes. Usually less than 1,000 bacteria per ml of milk, in case of healthy animals have been observed (Kurweil and Busse, 1973; Hayes *et al*., 2001). A variety of microorganisms naturally colonized in the teat cistern, teat canal and the apex of the teat in the healthy animals. These microbes are actually the natural flora, so they do not contribute significantly to increase the bacterial load.

Milk from healthy animals does not contribute significantly to increase the bacterial load of bulk milk. While milk of animals suffering from some udder diseases like mastitis contains a large number of bacteria. Number of bacteria in milk of diseased animals depends upon strain of causative agent, stage of infection and number of infected animals. It has been observed that animals suffering from some udder infection usually shed 10^7 bacteria per ml of milk. If this milk is 1% of the total bulk milk, then disregarding the other sources, the total bacterial count of the bulk tank milk would be 10^5 per ml (Bramley and McKinnon, 1990). All the bacterial species which are involved in mastitis do not have a potential to increase the total bacterial count of the bulk milk e.g some *Streptococcus* sp., like *S. agalactiae* and *S. uberis* were found to increase the total bacterial count significantly (Bramley *et al*., 1984; Bramley and McKinnon, 1990; Gonzalez *et al*., 1986; Jeffrey and Wilson, 1987). While *Staphylococcus aureus* has very less influence on the total bacterial count. In some studies counts as high as 6×10^4/ml have been found in case of *Staphylococcus aureus* (Gonzalez *et al*., 1986). These bacteria can also enter in milk from other sources like uncleaned milking equipments and from the body of the animal. It is mostly observed in case of *Streptococcus* sp. (Fenlon *et al*., 1995).

There is a very poor correlation between environment mastitis organisms (*Streptococci*, coliform and coagulase-negative *Staphy aureus* sp.) and somatic cell count. These organisms are naturally present in the environment of the animals that's why they have non significant contribution in the total bacterial count of milk (Bramley, 1982; Zehner *et al*., 1986). *Strep agalactiae* and *Staph aureus* are mostly derived from infected cows because they cannot grow on contaminated milking equipments and under conditions of marginal and poor cooling (Bramley and McKinnon, 1990; Gonzalez *et al*., 1986).

Exterior of the udder: The bacteria which are naturally present on the skin of animal enter into milk from the surface of the udder and teats; these also include the bacteria which are present in milking and housing places of animals. These are actually the natural flora so, they have less contribution in the composite milk and most of these bacteria do not grow competitively in milk. More important are the microbes which entered into milk from teats soiled with manure, bedding, feed or mud. Udder and teats of the animals become soiled when they are lying in stalls and muddy barnyards. Similarly, used bedding harbor a lot of microorganisms like (*Staphylococcus* sp., *Streptococcus* sp., spore-forming bacteria, coliforms and Gram-negative bacteria). A total count of 10^8-10^9 per gram had been observed in from used beddings (Bramley, 1982; Bramley and McKinnon, 1990; Hogan *et al*., 1989; Zehner *et al*., 1986). Both thermoduric and psychrotrophic bacteria were found on the surface of udder and teats (Bramley and McKinnon, 1990) influence the Preliminary Incubation Counts (PICs) and Lab Pasteurization Counts (LPCs).

Washing procedures and the extent of soiling the teat surface influence the total bacterial count. Milking of heavily soiled animals result in bulk milk count of more than 10^4 bacteria per ml of milk. Several studies have investigated the relationship between total bacterial count of milk and pre milking udder hygiene (Galton *et al*., 1984; McKinnon *et al*., 1990; Pankey, 1989; Bramley and McKinnon, 1990). The results of these studies showed that thorough washing of the teats by a sanitizing agent and their drying are effective in reducing the number of microorganisms. High coliform count in milk is associated with manure, used bedding and barnyard mud.

Milking equipments: The cleanliness of milking equipments influence the total bulk milk bacterial count more than any other factor. Milk drops left on the surface of milking equipments act as excellent media for the growth of a variety of bacteria. The organisms which grow on the surface of milking equipments are different from those which are naturally found on the skin, teat canal and apex (i.e., *S. agalactiae*). However certain strains of bacteria which are associated with environmental mastitis (i.e., coliforms) have the ability to grow, same is the case environmental contaminant bacteria found in bedding, manure and feed. Water used at the farm is also containing a variety of microorganisms which have the ability to grow on the surfaces of milking equipments (Bramley and McKinnon, 1990).

Degree of cleanliness of our milking equipments depends on the procedure which is adopted for cleaning and sanitizing. For example there will be less number of resistant and thermoduric bacteria on the surface of equipments which are washed with hot water. If in spite of hot water cleaning some milk residue left behind growth of these types of organisms will be slow but persist. Effective use of sanitizing agents like chlorine and iodine reduced the number of psychrotrophic bacteria which are the result of the neglect of proper cleaning, sanitizing and inefficient refrigeration. In case cracked milking equipments large number of bacteria enter and grow in the cracks, are difficult to clean (Thomas *et al*., 1966).

Storage temperature and time: Keeping the raw milk for longer period of time before processing will increase the number of psychrotrophic bacteria. If milk is kept at 4.4°C (40°F) there will be less growth of bacteria as compared to milk which is kept at 7.2°C (45°F). Although milk produced under ideal conditions may have an initial psychrotroph population of less than 10% of the total bulk tank count, psychrotrophic bacteria can become the dominant microflora after two to three days at 4.4°C (40°F) (Gehringer, 1980), resulting in a significant influence on PICs. Colder temperatures of 1-2°C (34-36°F) will delay this shift, although not indefinitely.

In case of poor cooling conditions where temperature is greater than 7.2°C (45°F) psychrotrophic bacteria will grow rapidly and they will become the dominant bacteria of the bulk milk after some period of time. Fluctuations in temperature are usually observed during transportation, this result in the growth of bacteria like *Streptococci* which appeared as rods or chains of cocci on microscopic examination of milk smear (Atherton and Dodge, 1970). As a result of the growth of these bacteria pH of milk is decreased and it becomes sour. Some sp. of *Streptococci* produces a malty defect which can easily be detected with the help of the odour of milk. Poor cooling/refrigeration conditions result in the growth of those bacteria that are not commonly observed when these conditions are proper, particularly these are psychrotrophic bacteria which grow due to this fault of temperature. The types of bacteria that grow and become significant will depend on the initial microflora of milk (Bramley and McKinnon, 1990).

Conclusion: The quality of milk in our region especially in countries like India, Pakistan and Bangladesh is very poor. Quality deterioration of milk starts just after milking, when it is carried out under unhygienic conditions. The main contributory factors on the farm are animal mishandling, feeding, unhygienic milking, transportation and poor storage conditions. In different regions of Pakistan and in some other countries milk samples which were collected from milk producers and bulk samples from retail outlets, analyzed for their compositional parameters (protein, fat, solids not fat and total soluble solids), different adulterants (urea, formalin, detergents, starch, carbonates/bicarbonates and boric) and for microbiological quality. It was concluded that very less number of samples reached the required compositional quality accepted as standard. But rather they were found adulterated by non milk proteins, vegetable oils and some toxic chemicals like urea, formalin, detergents boric acid etc. Similarly the microbiological quality of milk samples was found very poor; the main factors responsible for the deterioration of the microbiological quality were mastitis, faecal contamination of milking and storage equipments, lack of proper sanitization conditions before milking and unhygienic handling of milk during transportation. Some factors like health, age, breed of animals, seasonal variations, food or feed given to animals were also found responsible for changes in compositional quality of milk. Finally drinking of this lower quality milk is very dangerous for human health.

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