STUDY OF
COMPOSITION,
ADULTERATION AND
HYGIENIC STATUS OF
MILK IN MANDI
TOWN AND
SURROUNDING
VILLAGES

RITISH RANA, HARKARAN SINGH, ABHINAV SINGH, SURENDRA ANURAGI
IN CONJUNCTION WITH Dr. RAMNA AND Dr. P.C. RAVIKUMAR
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Team Members-

Harkaran Singh                       Ritish Rana
B11060                                 B11027

Surendra Anuragi                     Abhinav Singh
B11036                                B11051
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</table>
Executive Summary

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. Adulterants are mainly added to increase the shelf life of milk.

To study on the practice of milk adulteration, the following were our objectives:

- To determine the chemical composition of the milk available in local Markets including checking the hygienic status of market milk, and testing to detect various adulterants in the milk.
- To map and evaluate the trend of adulteration followed in the market.
- To design an awareness campaign to make people and administration aware about this problem.

As for result most common adulterant added to milk was water and was added in high ratio. Besides water, we found other adulterants like milk powder, detergent, salt in few samples. One sample even indicated the presence of urea. Adulteration was being practiced in the market openly. Vendor were reducing the quality of milk to enhance their profits. Consumers were willing to report against the adulteration if government take appropriate steps and imply schemes.

We have also concluded some suggestions to solve the problem. First and the most important one is that government should spread awareness and conduct milk sample tests regularly so that the consumers should know and should be insured by the quality of milk they drink.

A technical intervention to this can be a milk adulteration test kit that can be offered at consumer level and available in market at cheap price. By this way people will become self-reliant and can avoid in taking adulterants

With proper awareness among the people and understanding the criticality of the issue, adulteration can be prevented. If consumers know about the adulteration practices and proper techniques to avoid them, the practice of adulteration would itself be minimized.
Chapter 1

Introduction

Adulteration in milk is considered to reduce the quality and to increase the quantity of milk. Adulterants are mainly added to increase the shelf life of milk. When consumers buy milk they have the right to assume that it will be pure and unadulterated. But, unfortunately, this is not always the case. It is sad to note that most Indians are resigned to drinking milk diluted with water which not only reduces the nutritious value of the beverage but also poses risk to health. Delhi Chief Minister Sheila Dixit says: “We have a huge challenge before us. We need more laboratories to test milk. India being largely a vegetarian society relies on milk rather than meat for its nutritional needs.” A glass of unadulterated whole milk will give around 146 kcals: 8gms of fat and protein with 257mg of calcium. Calcium and other vitamins and minerals in milk make it an important part of a healthful diet for Indian people of all ages. The benefits of drinking milk include strengthening bones, improved cardiovascular and oral health.

Normally, the adulteration in food is done either for financial gain or lack of proper hygienic conditions of processing, storing, transportation and marketing. This ultimately leads to the stage that the consumer is either cheated or becomes victim of diseases. Such types of adulteration are quite common in developing countries. It is equally important for the consumer to know the common adulterants and their effects on health. Milk is produced throughout the year. However, milk production is greatly reduced during summer months due to heat stress and scarcity of fodder. Milk is transported from point of production to cities mainly through middlemen called “dudh valla”. Such milk is watered/ skimmed to increase profit. To maintain its composition, materials like starch, flour, urea, cane sugar and vegetable oil are added as adulterants. Milk is a perishable commodity so during summer months, it is likely to be spoiled during transportation. The middlemen therefore add chemical preservatives such as penicillin, streptopenicillin, formaldehyde, hydrogen peroxide, sodium bicarbonate. The public consumes fluid milk which has been adulterated and diluted to an extent that there is very little nutritive value left in it, resulting, to a great extent, to general public health concerns and malnutrition.
In order to successfully complete this project, our goal is to make people aware about milk adulteration. And also take a strict action to reduce the milk adulteration in Mandi and adjoining villages as it could have an adverse effect on health of people of all ages. And spread awareness among people and if possible find a technical solution to this problem.

The following are our objectives for this project:

- To determine the chemical composition of the milk available in local market.
- To check the hygienic status of market milk.
- To detect various adulterants in market milk.
- The trend of adulteration followed in the market.
- To make people and administration aware about this problem.

In order to successfully meet our goal, we will collect milk samples supplied in different parts of Mandi and simply test the milk for any kind of adulterants. If some adulterants are found, then we will send the sample to laboratories for exact ratio of different adulterants in milk. Our goal is also to make people aware about these kinds of adulterants and the diseases caused by them through newspaper articles as milk is the basic need of all people.
Chapter 2

Literature Review

The adulteration of food products is a significant problem in the food production. This is how fraudulent producers try to cheat consumers and authorities. The adulteration affects all commodities in the food processing. Most frequently, such products are adulterated that are produced in big quantities and further, the expensive products whose adulteration brings a profit. Finally, we explore the different kinds of adulterants in milk usually added.

2.1 History

In a study conducted by Faraz. A. et al on milk adulterations, the authors conclude that the results of the physical examination, chemical composition, physio-chemical properties and milk adulteration clearly showed that the milk sold at the places surveyed by them was extensively put to the malpractices such as skimming and adulteration of milk with water, urea, formalin, hydrogen peroxide and cane sugar which was carried out during the handling of milk starting from milking till the receiving by end consumer.

"Milk and kids" are virtually synonymous in our culture with "good health." But that wasn't always the case. Until the early 1900s, milk was often adulterated with foreign substances, taken from sick cows, or mishandled during milking and storage. As a result, it was often host to tuberculosis, cholera, typhoid fever, and other life-threatening diseases. But few people knew that the milk made them sick. It wasn't until the late 19th century, when scientists began to understand germ theory, that they realized diseases were being transferred through milk -and that they could do something to eliminate the hazard. (Miss Cellania, Monday, January 17, 2011 at 5:02 AM)

2.2 Identification of substances used in Adulteration

An adulterant is a substance found within other substances although not allowed for legal or other reasons. The addition of adulterants is called adulteration. The adulterants/preservatives assume the proportion of health hazards for end consumers, particularly infants Suppliers of milk appear to have found three ways to increase their margin from the sale of milk: (i)dilution (ii)
extraction of valuable components, i.e. milk fat removed as cream, and (iii) a combination of (i) and (ii) with the addition of cheap (and sometimes potentially harmful) bulking additives, such as low quality flour, to bring the total solids to a level which is acceptable to consumers. Some of the chemicals, adulterants and malpractices results in public health concern and malnutrition.

### Table 2.1

**Injurious Adulterants/Contaminants and their types in Foods and their Health Effects**

<table>
<thead>
<tr>
<th>S.No</th>
<th>Adulterant</th>
<th>Foods Commonly Involved</th>
<th>Diseases or Health Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Adulterants in food</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Argemone seeds, Argemone oil</td>
<td>Mustard seeds, Edible oils and fats</td>
<td>Epidemic dropsy, Glaucoma, Cardiac arrest</td>
</tr>
<tr>
<td>2</td>
<td>Foreign leaves or exhausted tea leaves, saw dust artificially colored</td>
<td>Tea</td>
<td>Injurious to health, cancer</td>
</tr>
<tr>
<td><strong>Chemical Contamination</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Mineral oil (white oil, petroleum fractions)</td>
<td>Edible oils and fats, Black pepper</td>
<td>Cancer</td>
</tr>
<tr>
<td>4</td>
<td>Lead chromate</td>
<td>Turmeric whole and powdered, mixed spices</td>
<td>Anemia, abortion, paralysis, brain damage</td>
</tr>
<tr>
<td>5</td>
<td>Methanol</td>
<td>Alcoholic liquors</td>
<td>Blurred vision, blindness, death</td>
</tr>
<tr>
<td>6</td>
<td>Arsenic</td>
<td>Fruits such as apples sprayed over with lead arsenate</td>
<td>Dizziness, chills, cramps, paralysis, death</td>
</tr>
<tr>
<td><strong>Bacterial contamination</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Bacillus cereus</td>
<td>Cereal products, custards, puddings, sauces</td>
<td>Food infection (nausea, vomiting, abdominal pain, diarrhoea)</td>
</tr>
<tr>
<td>8</td>
<td>Brominated vegetable oils</td>
<td>Cold drinks</td>
<td>Anemia, enlargement of heart</td>
</tr>
<tr>
<td><strong>Fungal contamination</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Aflatoxins</td>
<td>Aspergillus flavus-contaminated foods such as groundnuts, cottonseed, etc.</td>
<td>Liver damage and cancer</td>
</tr>
<tr>
<td>10</td>
<td>Toxins from Fusarium sporotrichioides</td>
<td>Grains (millet, wheat, oats, rye, etc)</td>
<td>Alimentary toxic aleukia(ATA) (epidemic panmyelotoxicosis)</td>
</tr>
</tbody>
</table>
| 11 | Toxins from Fusarium | Moist grains | Urov disease (Kaschin-
The above table gives the health effects and diseases caused by these kinds of adulterants in foods. Now we see the kinds of adulterants that can be present in milk or milk made products. And also the diseases that can be caused by them. Milk is most commonly diluted with water - this not only reduces its nutritional value, but contaminated water can also cause additional health problems. The other adulterants used are mainly starch, sodium hydroxide (caustic soda), sugar, urea, hydrated lime, sodium carbonate, formalin, and ammonium sulfate.

The Indian Council of Medical Research has reported that “milk adulterants have hazardous health effects. The detergent in milk can cause food poisoning and other gastrointestinal complications. Its high alkaline level can also damage body tissue and destroy proteins. Other synthetic components can cause impairments, heart problems, cancer or even death. While the immediate effect of drinking milk adulterated with urea, caustic soda and formalin is gastroenteritis, the long-term effects are far more serious. “Urea can lead to vomiting, nausea and gastritis. Urea is particularly harmful for the kidneys, and caustic soda can be dangerous for people suffering from hypertension and heart ailments.

Formalin can cause more severe damage to the body like liver damage. The health impact of drinking milk adulterated with these chemicals is worse for children. Caustic soda harms the mucosa of the food pipe, especially in kids. The chemical which contains sodium, can act as slow poison for those suffering from hypertension and heart ailments.
### Table 2.2

**Common Adulterants in milk**

<table>
<thead>
<tr>
<th>Adulterant</th>
<th>Diseases caused</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water dilution</td>
<td>This not only reduces its nutritional value, but contaminated water can also cause additional health problems.</td>
</tr>
<tr>
<td>Urea</td>
<td>Vomiting, nausea and gastritis.</td>
</tr>
<tr>
<td>Starch</td>
<td>Solid milk paste can cause stomach diseases</td>
</tr>
<tr>
<td>Detergent</td>
<td>The detergent contains sodium, can act as slow poison for those suffering from hypertension and heart ailments.</td>
</tr>
<tr>
<td>Caustic Soda</td>
<td>Dangerous for people suffering from hypertension and heart ailments. Harms the mucosa of the food pipe, especially in kids</td>
</tr>
<tr>
<td>Cane Sugar</td>
<td>Decreases the nutritious value of the milk</td>
</tr>
<tr>
<td>Formalin</td>
<td>Causes more severe damage to the body like liver damage</td>
</tr>
<tr>
<td>Oil</td>
<td>Gives creamy texture to the milk but at the same time is very bad for consumption</td>
</tr>
<tr>
<td>Other synthetic compounds</td>
<td>The other synthetic compounds impair the functioning of various organs of the body, cause heart problems, cancer, and sometimes death.</td>
</tr>
</tbody>
</table>
2.3. Site description

Generally in Himachal Pradesh vendors add water to milk for increasing the quantity which not only reduce nutritious value also causes many diseases. Many other adulterants are also added and we can get a better idea of them after completing our survey.

The Himachal Pradesh government also consider milk adulteration an important issue in the society and offends this practice. Our surveyed report will further bring in notice to the Himachal government about the issue and taking appropriate action which includes both preventing this practice and aware people about the matter.
2.4 Stakeholders

Since our project related to milk and the kinds of adulterants added to the milk, so stakeholders would be the suppliers of milk and the consumers of the milk who are badly effected by adulteration. For our project consumers are positive stakeholders and fraudulent producers or suppliers are negative stakeholders.

The main reason for milk adulteration is to make profit. Fraudulent produces or suppliers uses unfair means to make more profit which causes bad effects to consumers’ health. A delicate balance between supply and demand is also the cause for adulteration of milk. The shelf-life of milk is very short, the entire process of collection, quality check, registration and supply to nearby chilling Centre or dairy has to be completed in record time, so some people takes advantage of this and adulterate milk to prevent this and makes profit out of this.

Rising demand for milk and milk products, and very little increase in supply, force many people to adulterate milk to increase the quantity which ultimately decreases its quality and nutritious value. Also in India, there is no regular check on milk supplied to markets, therefore many people take advantage of this for profit making, without even thinking how badly it can effect consumers’ health.

2.5 Relevant case studies

2.5.1 Tainted milk: Unravelling China’s melamine scandal

The 2008 Chinese milk scandal was a food safety incident in China, involving milk and infant formula, and other food materials and components, adulterated with melamine which is usually used in plastics. Melamine produces stones in kidney and causes other damages to kidney. China reported an estimated 300,000 victims, with six infants dying from kidney stones and 13 infants from malnutrition. Since melamine is rich in nitrogen, so it can be used for fooling protein level in milk. The issue raised concerns about food safety and political corruption in China. A number of criminal prosecutions occurred, with two people being executed, another given a suspended death penalty, three others receiving life imprisonment, two receiving 15-year jail terms, and seven local government officials, as well as the Director of the Administration of Quality
Supervision, Inspection and Quarantine (AQSIQ) being fired or forced to resign. This incident help Chinese government to bring new food safety laws and regular checks on companies involved in food business.

2.5.2 The National Survey on Milk Adulteration 2011

The National Survey on Milk Adulteration 2011 was conducted by the Food Safety and Standards Authority of India (FSSAI) to ascertain the quality of milk and identify different type of adulteration in the liquid milk throughout the country. The survey was carried out by the Regional Offices of the FSSAI. The objectives of this survey were to identify the common adulterants in milk in rural and urban areas of different states of India and to find out the non-conforming samples in loose and packed milk. They collected various samples from different states and union territories of India and sent them to the govt. laboratories. This 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 detergents which can cause severe damage to heart, eyes, and lungs.

2.6 Summary

In this literature review, we have defined Adulteration, its type, common adulterants in different food and the diseases caused by the adulterants. We also saw the common adulterants in milk and their health effects. Also the Brief history about milk adulteration and the stakeholder for our project.
Chapter 3

Methodology

Study of Composition, Adulteration and Hygienic status of Milk Supplied in Mandi town and surrounding villages. In order to achieve our project goals, the following are our objectives:

- To determine the chemical composition of the milk available in local Markets including checking the hygienic status of market milk, and testing to detect various adulterants in the milk.
- To map and evaluate the trend of adulteration followed in the market.
- To design an awareness campaign to make people and administration aware about this problem.

3.1 Objective 1: To determine the chemical composition of the milk available in local Markets including checking the hygienic status of market milk, and testing to detect various adulterants in the milk.

To achieve this objective to determine the chemical composition of milk in local market, we will collect the milk samples and find its chemical composition through various chemical tests and also sending the milk samples to laboratories for exact composition.

From the chemical composition of milk, we will find the hygienic status of milk i.e. whether the milk is safe to drink or not and also whether the nutrition is well provided by the milk or not.

Chemical composition also tells us the various adulterants present in those samples of milk. From this we can find the harmful effect of consuming these adulterants through milk.
3.1.1 Testing of common adulterants in milk

Test for detection of water- Lactometer is used to check the water dilution. Measured value is compared with the standard value.

Test for detection of urea- Take 5 ml milk in a test tube + 5 ml dimethyl amino benzaldehyde solution, shaken well Yellow color develops. It shows the presence of added urea.

Test for detection of formalin - Take 10 ml of milk in a test tube. Add 5 ml conc. sulphuric acid through the sides of the test tube without shaking. If a violet or blue ring appears at the intersection of the two layers, it shows the presence of formalin.

Test for detection of detergent- Take 5 ml milk + few drops of bromocresol purple solution appearance of faint violet color indicates the presence of detergent in milk.

Test for detection of skimmed milk- If the addition of nitric acid drop by drop in to the test milk sample results in the development of orange color, it indicates the milk is adulterated with skim milk powder. Samples with out skim milk powder shows yellow color.

Test for detection of starch- Take 5ml milk in test tube, boil than cool and added 1 to 2 drops of iodine solution appearance of blue color which indicates the presence of starch.

Test for detection of salt- 5 ml of silver nitrate reagent is taken in a test tube. Add 2-3 drops of potassium dichromate reagent. Add 1 ml of milk in the above test tube and mix thoroughly. If the contents of the testtube turn yellow in color, then milk contains salt. If it turns to chocolate or reddish brown in color, the milk sample is free from salt.

3.2 Objective 2: To find the trend of adulteration followed in the study area

To fulfill this objective, we will collect samples and after testing those samples we’ll find out that what type of adulteration trend is there in a particular area.
3.3 Objective 3: To make people and administration aware about this problem.

The most important objective of our project is to spread awareness. In order to achieve this objective, if some harmful adulterants are found in the milk sample we can aware the people of Mandi about these adulterants and the diseases caused by these adulterants through newspaper articles.

The strategies that we have discussed in the methodology section will aid us in uncovering the appropriate data about different types of adulterations present in milk supplied in Mandi and nearby villages. With this data we can aware the administration and people about the harmful effects of those adulterants in milk so that an appropriate step can be taken.

**Figure 3.1 Project timeline Gantt chart**

<table>
<thead>
<tr>
<th>12-Mar</th>
<th>22-Mar</th>
<th>01-Apr</th>
<th>11-Apr</th>
<th>21-Apr</th>
<th>01-May</th>
<th>11-May</th>
<th>21-May</th>
<th>31-May</th>
<th>10-Jun</th>
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</thead>
<tbody>
<tr>
<td>proposal report</td>
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<tr>
<td>collect chemical</td>
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<td></td>
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<tr>
<td>collect milk samples</td>
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<td>send samples to lab</td>
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<tr>
<td>publish articles</td>
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<tr>
<td>concluding from data</td>
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<tr>
<td>final report</td>
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</tr>
</tbody>
</table>
Areas to be surveyed and milk samples to be collected from:

**Mandi**
- Suval sar hostel(iit Mandi)
- Paddal locality
- Samkheter
- Palace colony
- Jail Road
- Bhuli
- Purani Mandi
- Khaliar

**Kamand**
- Hostels
- Mess
- Canteen
- Faculty quarters
- Parashari dhaba
4.1 Survey Data Collected

In most of the areas surveyed, households get their regular supply of milk from the local vendors and very less prefer the packaged milk. The vendors get the milk from local farmers and some have their own poultry farms. Since most of the milk supplied is by vendors, so adulteration practices are possibly high.

The chemicals required for testing basic adulterants has been short-listed. Some of them are available at the campus chemistry lab, and order for others has been placed. As milk has low shelf life, so will collect samples only when we have needed chemicals.

In the coming week when all chemicals and testing equipment will be available, we will start collecting fresh milk samples from the mentioned areas and will do the test as under our first objective. Samples will be collected from households or their respective suppliers.

We are also looking forward to do a little survey at local hospitals to see that if there are any medical cases due milk adulteration.
4.2 Questionnaire framed which is to be done when collecting samples

**To people:**

- From where you get your milk?
  1. Packaged milk
  2. From vendors
  3. Any other source

- How much milk you buy on daily basis?
  1. < 1 liters
  2. 2-3 liters
  3. > 3 liters

- Are they satisfied with the quality of milk they are supplied?
  1. Yes
  2. No
  3. Don’t care

- What do you think the milk you are drinking adulterated with?
  1. Water
  2. Powder milk
  3. Any other product

- After getting proof for adulteration in your milk, will you complain to any authority?

**To vendors:**

- At what scale you supply milk?
  1. To limited houses or shops
  2. To a mohalla
  3. To many parts in the town
• Do you practice water in milk?
  1. yes
  2. no
  3. to some extent
  4. can’t say

• Have consumers complained about the poor quality of milk?
  1. No
  2. Very few
  3. Quite often

• Do you know about the government laws against milk adulteration?
  1. Yes
  2. No
  3. Are not afraid of

Answer to these questions will help us to know how much people are aware about the milk adulteration practices. This data will help us to see the trend of adulteration in the local market which is our second objective.

The combined data from the surveys and the tests will conclude us to the final results and we will use them to create awareness among the people. If the situation comes out to be very critical we will bring it in notice of local administration and see to the possible technical solutions that can be introduced at the lowest level. This will fulfill our third objective.

The survey at hospitals can lead to know about the diseases reported due to adulteration and we can counter check it with our tests reports and surveyed data to get best idea about the whole scenario and thus making our final report.
Chapter 5

RESULTS

The second phase of our project has been completed. After performing our questionnaire survey in Mandi town to various consumers and vendors, we obtained the following information:

Table 5.1

Survey Data Collected

<table>
<thead>
<tr>
<th>S.no</th>
<th>Total number of members</th>
<th>Area</th>
<th>Milk source</th>
<th>Milk quantity (per day)</th>
<th>Satisfaction</th>
<th>Any Adulteration perception</th>
<th>Any complaint registered</th>
<th>Will you complaint any authority after Getting proof of adulteration?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>10</td>
<td>Palace colony</td>
<td>Vendor</td>
<td>&gt;3</td>
<td>Yes</td>
<td>Water</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
<td>Bhoothnath Bazar</td>
<td>Vendor</td>
<td>2-3</td>
<td>No</td>
<td>Water</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>3</td>
<td>5</td>
<td>Palace colony</td>
<td>Vendor</td>
<td>&gt;3</td>
<td>Yes</td>
<td>Water</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td>Post office Road</td>
<td>Vendor</td>
<td>2-3</td>
<td>Yes</td>
<td>Water</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>Gandhi chowk</td>
<td>Vendor</td>
<td>&gt;3</td>
<td>No</td>
<td>Water</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>6</td>
<td>5</td>
<td>Upper Samkheter</td>
<td>Vendor</td>
<td>&gt;3</td>
<td>Yes</td>
<td>Water</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>7</td>
<td>2</td>
<td>Jail Road</td>
<td>Vendor</td>
<td>2-3</td>
<td>Yes</td>
<td>Nothing</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>8</td>
<td>5</td>
<td>Paddal Road</td>
<td>Vendor</td>
<td>&gt;3</td>
<td>Don’t Care</td>
<td>Nothing</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>9</td>
<td>2</td>
<td>Mangawai</td>
<td>Vendor</td>
<td>&lt;1</td>
<td>Yes</td>
<td>Any other products</td>
<td>Never thought</td>
<td>Yes</td>
</tr>
<tr>
<td>10</td>
<td>4</td>
<td>Upper khalian</td>
<td>Vendor and packet</td>
<td>2-3</td>
<td>No</td>
<td>Water</td>
<td>Never thought</td>
<td>Yes</td>
</tr>
<tr>
<td>11</td>
<td>5</td>
<td>Purani Mandi</td>
<td>Vendor</td>
<td>2-3</td>
<td>Yes</td>
<td>Nothing</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>12</td>
<td>3</td>
<td>Semkheter</td>
<td>Vendor</td>
<td>2-3</td>
<td>No</td>
<td>Water</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>13</td>
<td>3</td>
<td>Bhuli</td>
<td>Vendor</td>
<td>2-3</td>
<td>No</td>
<td>Water</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>14</td>
<td>6</td>
<td>Semkheter</td>
<td>Vendor</td>
<td>&gt;3</td>
<td>Yes</td>
<td>Water</td>
<td>Never thought</td>
<td>Yes</td>
</tr>
</tbody>
</table>
5.1 Pictorial representation of the Results:

**Figure 5.1.1**
FROM WHERE YOU GET YOUR MILK?
- Vendors: 93%
- Packet milk: 7%

**Figure 5.1.2**
ARE YOU SATISFIED WITH QUALITY OF MILK SUPPLIED?
- Yes: 57%
- No: 36%
- Don’t care: 7%

**Figure 5.1.3**
ANY ADULTERANT PERCEPTION?
- Water: 72%
- Milk powder: 21%
- Nothing: 0%
- Any other: 7%

**Figure 5.1.4**
TO WHOM YOY HAVE COMPLAINED ABOUT THE POOR QUALITY OF MILK?
- Vendors: 50%
- Administration: 29%
- No one: 21%
From this information we can infer that:

- Most of the Consumers buy their milk from vendors
- More than half of them are satisfied with the quality of milk
- In most of the cases consumers perceive that only water is added to the milk
- Consumers will complain the authority if any harmful adulterant found

We have approached towards the objectives of our project as mentioned in the Methodology Section. We have obtained the following results:

**Objective 1: To determine the chemical composition of the milk available in local Markets including checking the hygienic status of market milk, and testing to detect various adulterants in the milk.**

As mentioned in our survey data analysis, we have collected the fresh milk samples from the areas mentioned above. We did various chemical tests (under methodology) on these samples to determine their chemical composition as well indication for various milk adulterants like water, urea, detergent milk, powder, formalin, starch and salt. Following results were obtained:
Table 5.2

Results obtained from 12 samples collected from Mandi Town

<table>
<thead>
<tr>
<th>s.no</th>
<th>area</th>
<th>Water test</th>
<th>Urea test</th>
<th>Starch test</th>
<th>Formalin test</th>
<th>Salt test</th>
<th>Milk powder</th>
<th>detergent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Samkhter Sample 1</td>
<td>50%</td>
<td>No color change (-ve)</td>
<td>No blue color (-ve)</td>
<td>No ring(-ve)</td>
<td>Choco brown color (-ve)</td>
<td>No orange Color (-ve)</td>
<td>Dark violet (+ve)</td>
</tr>
<tr>
<td>2.</td>
<td>Samkhter Sample 2</td>
<td>50%</td>
<td>No color change (-ve)</td>
<td>No blue color (-ve)</td>
<td>No ring(-ve)</td>
<td>Choco brown color (-ve)</td>
<td>Light orange Color (+ve)</td>
<td>Light violet (+ve)</td>
</tr>
<tr>
<td>3.</td>
<td>Palace Colony Sample 1</td>
<td>37.5%</td>
<td>No color change (-ve)</td>
<td>No blue color (-ve)</td>
<td>Light brown ring (-ve)</td>
<td>Choco brown color (-ve)</td>
<td>No orange Color (-ve)</td>
<td>Yellowish green (-ve)</td>
</tr>
<tr>
<td>4.</td>
<td>Palace Colony Sample 2</td>
<td>50%</td>
<td>Yellow color appear (+ve)</td>
<td>No blue color (-ve)</td>
<td>Light brown ring (-ve)</td>
<td>Choco brown color (-ve)</td>
<td>Light orange Color (+ve)</td>
<td>Yellowish green (-ve)</td>
</tr>
<tr>
<td>5.</td>
<td>Paddal</td>
<td>25%</td>
<td>No color change (-ve)</td>
<td>No blue color (-ve)</td>
<td>No ring(-ve)</td>
<td>Choco brown color (-ve)</td>
<td>Light orange Color (+ve)</td>
<td>Yellowish green (-ve)</td>
</tr>
<tr>
<td>6.</td>
<td>Bhuli Bridge</td>
<td>25%</td>
<td>No color change (-ve)</td>
<td>No blue color (-ve)</td>
<td>Medium brown ring (-ve)</td>
<td>Choco brown color (-ve)</td>
<td>No orange Color (-ve)</td>
<td>Light violet (+ve)</td>
</tr>
<tr>
<td>7.</td>
<td>Jail Road</td>
<td>62.5%</td>
<td>No color change (-ve)</td>
<td>No blue color (-ve)</td>
<td>No ring(-ve)</td>
<td>Choco brown color (-ve)</td>
<td>Medium orange Color (+ve)</td>
<td>Yellowish green (-ve)</td>
</tr>
<tr>
<td>8.</td>
<td>Suvalsar Hostel</td>
<td>50%</td>
<td>No color change (-ve)</td>
<td>No blue color (-ve)</td>
<td>Light brown ring (-ve)</td>
<td>Choco brown color (-ve)</td>
<td>No orange Color (-ve)</td>
<td>Yellowish green (-ve)</td>
</tr>
<tr>
<td>9.</td>
<td>Khaliar</td>
<td>50%</td>
<td>No color change (-ve)</td>
<td>No blue color (-ve)</td>
<td>Medium brown ring (-ve)</td>
<td>Choco brown color (-ve)</td>
<td>Light orange Color (+ve)</td>
<td>Yellowish green (-ve)</td>
</tr>
<tr>
<td>10.</td>
<td>Ghandhi Chowk</td>
<td>75%</td>
<td>No color change (-ve)</td>
<td>No blue color (-ve)</td>
<td>Light brown ring (-ve)</td>
<td>Yellow color appear (+ve)</td>
<td>Dark orange Color (+ve)</td>
<td>Yellowish green (-ve)</td>
</tr>
</tbody>
</table>
Figure 5.2.1

ADULTERATION WITH WATER

- 25% water
- 33% water
- 40-50% water

Figure 5.2.2

ADULTERATION WITH UREA

- Positive indication
- Negative indication

Figure 5.2.3

ADULTERATION WITH SKIM MILK POWDER

- Positive indication
- Negative indication

Figure 5.2.4

ADULTERATION WITH SALT

- Positive indication
- Negative indication
Figure 5.2.5

ADULTERATION WITH STARCH

- Positive indication: 0%
- Negative indication: 100%

Figure 5.2.6

ADULTERATION WITH FORMALIN

- Positive indication: 0%
- Negative indication: 100%

Figure 5.2.7

Adulteration with detergent

- Positive indication: 50%
- Negative indication: 50%
From this information we can infer that-

- Most common adulterant added to milk is water and is added in high ratio
- Besides water, we found other adulterants like milk powder, detergent, salt in few samples
- One sample even indicated the presence of urea

**Table 5.3**

Results obtained from 4 samples collected from Kamand

<table>
<thead>
<tr>
<th>s.no</th>
<th>sample</th>
<th>Water test</th>
<th>Urea test</th>
<th>Starch test</th>
<th>Formalin test</th>
<th>Salt test</th>
<th>Milk powder</th>
<th>detergent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Sample1</td>
<td>30%</td>
<td>No color change (-ve)</td>
<td>No blue color (-ve)</td>
<td>No ring(-ve)</td>
<td>Choco brown color (-ve)</td>
<td>No orange Color (-ve)</td>
<td>Dark violet (+ve)</td>
</tr>
<tr>
<td>2.</td>
<td>Sample2</td>
<td>10%</td>
<td>No color change (-ve)</td>
<td>No blue color (-ve)</td>
<td>No ring(-ve)</td>
<td>Choco brown color (-ve)</td>
<td>No orange Color (-ve)</td>
<td>Light yellowish green color (-ve)</td>
</tr>
<tr>
<td>3.</td>
<td>Sample3</td>
<td>40%</td>
<td>No color change (-ve)</td>
<td>No blue color (-ve)</td>
<td>No ring(-ve)</td>
<td>Choco brown color (-ve)</td>
<td>No orange Color (-ve)</td>
<td>Light yellowish green color (-ve)</td>
</tr>
<tr>
<td>4.</td>
<td>Sample4</td>
<td>25%</td>
<td>No color change (-ve)</td>
<td>No blue color (-ve)</td>
<td>No blue color (-ve)</td>
<td>Choco brown color (-ve)</td>
<td>No orange Color (-ve)</td>
<td>Light yellowish green color (-ve)</td>
</tr>
</tbody>
</table>
Objective 2: To find the trend of adulteration followed in the study area.

After recording the observations for samples from each area, we analyzed it in the form of histogram chart to see the relative area-wise adulteration trend.

![Area wise Milk Adulteration in Mandi Town](image)
This graph infers that:

- Adulteration practices are high in samkheter region of Mandi
- Excessive adulteration was also found in Gandhi chowk sample
- The sample from suvalsar hostel (IIT Mandi) was free from any harmful adulterants
- Urea was indicated in a sample from palace colony

**Objective 3: To make people and administration aware about this problem.**

The results we got from our tests were eye opening. We can infer from our observations that the adulteration is practiced fearlessly in the market by the vendors and the suppliers. So people and administration need to know about the whole case and its vulnerability so that their health is not compromised.

For creating awareness among the consumers, we are informing those houses from where we collected samples if any harmful adulterant is found that possess risk to their health.

We are even looking forward to send a copy of our report to DC of Mandi, so that this case study can come into notice of administration. Observations our report can aid government to conduct surveys and collect samples from different areas and do tests for adulteration. Legal proof can help government to take strict actions.
Chapter 6

Recommendation and Conclusion

6.1 Recommendations

After surveying and testing the milk samples, the results were quite shocking. People only expected water to be present as an adulterant in their consumed milk but for some cases tests indicated the presence of other adulterants that are harmful for health. Therefore this contradictory information shows that consumers are unaware of these adulteration practices. So spreading the awareness among the people about different types of adulterants that can be present in milk and harmful effects on their health can be an appropriate recommendation in this case.

From the vocal opinion of the consumers gathered, administration is very lenient in this case. So the government should periodically collect samples and do tests to make sure the quality of the milk supplied and consumed by the people.

6.2 Technical Interventions

A technical approach towards this problem can be a small portable and economical milk test kit. The kit should have simple tests that the consumers can do to check the quality of their milk. The kit should be affordable and easily available in the market and should be subsidized by the government. It should have a lactometer for testing the percentage of water in milk and few other chemical for other basic tests like powder milk, detergent, and urea.

With such a method, consumers can check the quality of milk before buying them from vendors. Vendors selling adulterated milk should be interrogated and his practices should be banned.
Test Kit

Milk adulteration test kit prepared by our team along with the kit manual. The kit costs approximate Rs.500

6.3 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’s clear that milk is not as it should be there for the consumers. It is being adulterated with water, skim milk powder, detergents, salt, urea 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 very 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 know about the adulteration practices and proper techniques to avoid them, the practice of adulteration would itself be minimized.
References


[http://thinkbusiness.nus.edu/articles/item/118-tainted-milk-unravelling-china%E2%80%99s-melamine-scandal]


[http://www.cseindia.org/content/adulterated-milk-what-indians-are-drinking]
Appendix 1

Images

Team members performing various tests on collected milk samples
Collected milk samples from Mandi and Kamand region
(Sealed with covers)

Detergent test

Violet color indicates the presence of detergent in the milk sample
Salt test

Yellow color indicates the presence of salt in the milk sample.
Skimmed-milk test

Light orange color indicates the presence
Of skimmed milk

Urea test

Yellow color indicates the presence of urea