Chapter-V
Discussion

The results of present study have been depicted in earlier chapter. In the present chapter information provided by respondents has been discussed in detail and their observation about various food adulteration and food practices were validated by doing experiments in laboratory of selected regions in Varanasi area. In addition the hypothesis fabricated was tested with the help of statistical tools and depending upon consequences they were accepted or rejected as per situations.

5.1 Demographic profile &socioeconomic status of respondents

In the survey total 300 respondents were selected for the study out of which 140 respondents were male and 160 respondents were female. The characteristic under study are age, educational status, religion, type of family, economical status, marital status attitude and practices toward food safety with their legal awareness about food practices.

Data (table 4.1 & pie chart fig. 4a2) shows that Hindu is present in the majority and is 85% of total populations while Muslims are 12% and other represents only 2.3 %. Data reveals that out of 85% (two third) total Hindu, male population are about 87.8% and female population are 83 %. Contributions of other religion such as Muslims are low in total populations (11% male and 13% female) while others are only less than 3% (3% female and 1.5% male). Statistically data found to be strongly insignificant ($P>0.05$) which may be due to chance factor. The mean and SD observed were 46.7± 66.4, 53.3± 69.51 for male and female while total mean and SD was 100± 135.9. Statistically observed chi ($\chi^2$) for both male (0.89) and female (0.782) respondents are less than expected ($\chi^2$, 5.99) on the basis null hypothesis is accepted that majority of population in selected area belongs to hindu.

For Data collection respondents of different age group were selected ranging from
16 years to 56 years. Data in Table 4b and result in fig. 4b shows majority of the age group (35%) involved in study are age range 26—35 (one third) while people of age range >35 are 21% while age range from 16-25 and >56 are in equal percentage 23%. Statistically data are insignificant (p>0.05). It may be due to tradition pattern in the family which follows to occur in joint family. But in nuclear family this trends breaks and thus age may vary.

Mean and SD calculated for male and female was 28±17.3 and 32±16 while total man and SD was 60±32.6. Mean difference between male and female is not much different. Statistically observed chi (χ2) for both male (3.2) and female (2.8) respondents are less than expected (DF4 χ2, 9.48) on the basis null hypothesis is accepted which proves the hypothesis that majority of population in urban area is young.

Data reveals that young female (16-35) populations are about 59% while, middle aged women are 35-45 are 19%, while other represent only minor percentage (17, and 4.5% respectively). Young Male population makes major contributions in buying the food from market (Williams et al. 1992). In over 90% of households in India, it is the women who are involved in the preparation of meals (NIN, 2006). Earlier studies conducted on adults have indicated that food safety knowledge tends to increase with age and practice: (Bruhn & Schutz, 1999; Unusan, 2007).

Data collected to know Educational Status of respondents are ranging from illiterate to post graduate in the joint and nuclear family. Data in Table 4C (result in fig. 4C) shows majority of the educated people (44%) were graduate out of which male are approx 48% and female 40%. Percentages of post graduate and intermediate are low (almost similar 13-14% in both male and female).

Percentage of high school educated female were higher (42%) than male (26%) while illiterate were only 6-7%. Statistically data were insignificant (p>0.05). It means that food practices are still can’t be linked with literacy means beside education in both male and female population they still are not following the required food practices.

Mean difference are almost very less (4±1.5) which shows almost both men and women are equally educated and at least 47% male and 40% male have better education
up to graduate level. Illiterate population is very low (8-11% only) P>0.05 which may be due to other factor such as income, and family structure. Statistically observed chi ($\chi^2$) for both male (1.724) and female (1.508) respondents are less than expected (DF4 $\chi^2$, 9.48) on the basis null hypothesis is accepted that majority of the female are educated.

In one study it is found that well-educated people are generally belong to high income group (Neuman 1994, Subba Rao, 2007; Sudershan, 2008). In many societies women are more informed about appropriate methods of food handling and storage than men. Better educated consumers often recognize the importance of food safety and younger respondents have shown the greatest need for additional education on food safety (Bruhn & Schutz, 1999; Li-Cohen & Bruhn, 2002; Sudershan et al., 2007). Baker (2003) found that women, having higher education level and members of households with young children were the most likely to have an extreme risk avoidance response. Food mishandling is thought to be more acute for young adult men and individuals with an educational level beyond high school than other groups (Altekruse, Yang, Timbo, & Angulo, 1999). It was observed that women, more so those with higher educational levels, were more likely to check food labels than men (FSAI, 2003; Yang et al., 2000).

In a previous study of the food-handling practices and food safety knowledge of 4th- and 5th-grade students in west-central Illinois, a need for education in safe food handling in the primary grades was identified (Barclay et al., 2001).

Table 4d and fig. 4d pie chart and graph portrayed the marital status of respondents. Data shows majority of the people (71%) were married out of which male are approx 95% and female 48%. Percentage of unmarried was only 29% out of which 4% male was unmarried while 51% female were unmarried. Statistically data were found to be highly significant (p<0.05). Also it means that effect of marital status is significantly linked with food practices. The mean difference of marital status is also good (10) which show that most of the families have good number of married people. Statistically observed chi ($\chi^2$) for both male (42.373) and female (37.076) respondents
are more than expected (DF1 $\chi^2$, 3.84) on the basis null hypothesis is rejected that most of the female get married at early stages.

The data of family structure have been depicted in table 4 E. Data shows majority of the people in urban population of Varanasi (75%) were belong to nuclear family out of which male are approx 81% and female 70% (Pie chart fig. 4 E). Percentage of joint family was low (only 25% out of which 18% male and 30% female). Statistically data were found to be significant (p<0.05) with good mean difference of 10. This means that type of family structure has significant effect over food practices. It is expected that joint family has lesser option of good food practices and thus nuclear family has significant contribution in following good food practices. It is understood that bigger family run by customs and often health factors are omitted because of making budget to make food available for all the family members. Also in bigger family often less people are linked with earning most of the children and females are dependent on earning members for their other needs.

Statistically observed chi ($\chi^2$) for both male (2.799) and female (2.449) respondents are less than expected (DF1 $\chi^2$, 3.84) while total observed value are greater than expected on the basis null hypothesis is rejected that food practices changes with family structure. It can be evident from next discussion about economical status of the family.

Economical statuses of family are tabulated in Table 4F and results are shown in fig. 4f. Economical background are classified as LIG (income <1000 pm) MIG (100-3000 pm) while income more than >3,000 pm were classified as HIG .

Data shows majority of the people were belong to MIG (70%) out of which male are approx 64% and female 76%. Percentage of HIG comes next (20% out of which 31% male and 11% female). Statistically data were found to be highly significant (p<0.05). It means pattern of food practices is highly linked with family income. It is obvious since branded items are costly due to following many food standards and norms. Also income helps in managing the food item properly and according to individual need of different family members due to various household facilities. Income is also linked with education.
More educated will be people more hope will be to learn and follow the good food practices as is shown previously by chi $\chi^2$ value ($3.2 < 9.48$ df 4). Statistically observed chi ($\chi^2$) for both male (11.489) and female (10.053) respondents are more than expected (DF2 $\chi^2$, 5.99) while total observed value (21.542) are also greater than expected on the basis null hypothesis is rejected that income have indirect effect over following good food practices.

According to Zugarramurdi (2003), people are increasingly concerned about nutrition, food safety at a reasonable cost According to Nidhi and Priti (2009), education, family income and occupation are major factor that effect extent of awareness but overall education has highest impact. Kathy Hamilton (2009) concluded that there are connections between the poverty narrative and the family decision making individual control in purchasing and budgeting decisions.

Therefore now we will focus on the food practices really followed by the urban people of Varanasi where people in majority are Hindu, mostly have income range medium and lives in nuclear family and male and female have 40-50% education. The young people are there in majority and linked with mostly buying of food materials not directly linked with handling of food materials as is evident by $\chi^2$ obs. $6 < \chi^2$exp. 9.48 at df 4 ($>0.05$).

### 5.2 Food choice and practices

#### 5.2.1 Food choice

Data of the essential in food like tasty food, healthy food, unadulterated food or the every essential attribute in the food are shown in table 4.2.1 & fig. 4.2.1. Data shows majority of the people like tasty food (36.3%) out of which male are approx 32% and female 40%. Percentage of healthy choice in food comes next (32% out of which are 43% male and 23% female) while choice of unadulterated food was low (5%).

Statistically data were found to be moderately significant ($p<0.05$). This means that food choice is directly linked with good food practices. It is understood that rotten food and spoiled food can’t be tasty.
Statistically observed chi ($\chi^2$) for female (6.828) respondents are less than expected (DF3 $\chi^2$, 7.8) while it was equal for male respondents (7.803) but total observed value (14.6) were greater than expected on the basis null hypothesis was rejected that tasty food are always healthy. It means that for people health is of secondary importance and they really don’t mean it. Also it indicates low awareness about the linkage between food practices and health. This also reflects that majority of young people living in the nuclear family are linked with major importance to food taste. It means that whatever tasty food is available they will consume giving less importance to their health. Many food are available that are less tasty than adulterated food in fact many adulteration are done to reduce the actual cost without taking care of health. Product maker are well aware of that and thus constantly they are avoiding the good manufacturing practices also.

There are reports of foodborne illness associated with the consumption of fruit juices at several places in India and elsewhere (Parish 1997; Sandeep et al. 2001). A study conducted during the period September 2002 to August 2003 in Hyderabad, India, revealed that a total of 42 outbreaks were reported with 1,008 people being affected. Some of the foods involved were kheer, lemon rice and khoa, and the organisms involved were *Staphylococcus aureus* and *Bacillus cereus* (Bhat 2004).

### 5.2.2 Purchasing Behavior of food materials

Table 4.2 & fig. 4.2.2, depicts data of purchasing Behavior of respondents regarding food materials. Data shows majority of the people (42%) like to purchase from stockiest out of which male are approx 45% and female 38%. Percentage of buying choice from retailers comes next (26% out of which are 26% male and 27% female) while others have their own farm house (24%) out of which 25% male and 23% female have their own farm house. Choice based on availability was low (8%).

Statistically data were found to be moderately insignificant ($p>0.05$). This may be due to that product choice which is affected by various factors like income family budget and experience of adulterations. Product bought from stockiest always not up to food safety norms and people are buying in bulk so stockiest have more chance of avoiding
good food products. It is also evident by chi ($\chi^2$) data observed for both male respondents (3.251) and female (2.845) respondents that is less than expected (DF3 $\chi^2$, 7.8) which means that buying practices of food material from stockiest is followed by both neglecting good food practices which is reflected by chi ($\chi^2$) total observed value (14.6) was also more than expected on the basis null hypothesis was rejected that stockiest provide adulterated free products.

**5.2.3 Purchasing quality**

From table 4.3 & fig. 4.2.3, it is evident that majority of the people (98%) like to purchase food item based on quality out of which male are approx 99% and female 97%. Statistically data were found to be moderately insignificant (p>0.05) which reflects that though people preference is of getting good food products but there are some barrier due to which it can’t be converted into reality. But whenever they get chance they used to buy good quality products since purchasing quality is also not directly linked with people’s choice, it is also linked with good quality food availability. It also indicate that yet people choose good quality products but there may be misbranding and other tricky option due to which they don’t get quality products.

This is also reflected by the chi ($\chi^2$) for both male respondents (1.181) and female (1.033) respondents which was less than expected (DF1 $\chi^2$, 3.8) which means that people understand the meaning of good quality products which has direct link with health. Since $\chi^2$ total observed value (2.214) $< \chi^2$, 3.8 thus hypothesis is accepted that good food has direct link with health. It also reflects that most consumers had a positive attitude toward food safety. Other causes may be due to consumer’s choice which appears to be more interested in convenience and saving time than in proper food handling and preparation. Mass production, environmental factors and inadequate knowledge on the part of food handlers have contributed to increased contamination of primary foodstuffs (Kaferstein et al. 1997).

**5.2.3 Causes of choice for food quality**

Data in table 4.4 & fig. 4.2.4 shows that majority of the people (56%) like to
include all the factors for better food quality out of which male were approx 54% and female 57%. While (23%) feel that quality is essential while only 10% of all feel that cleanliness is essential or for safety from adulterations (9%).

Statistically data were found to be moderately insignificant (p>0.05) which mean that there is not proper understanding of the food practices among the people. They also confused about the proper food and quality food products. Statistically observed chi (χ2) for both male respondents (1.487) and female (1.301) respondents were less than expected (DF4 χ2, 9.48) which means that still they don’t understand the proper meaning but their overall choice is of good and quality food which is also evident by (χ2) total observed value (2.787) was also less than expected on the basis null hypothesis was accepted that people need good quality food products.

Their choice of good quality food products may be due to spread of food born disease at mass scale or as the case of dropsy. People understand well that most of the local shopkeepers are adding harmful adulterants to make money at their life at risk. Therefore, majority of people first choice is food quality (56%) since they can’t check the food adulteration at home and they are totally dependent on food product makers on getting good food products. Overall in summary it can be stated that people understand that food quality is essential which can be increased by proper clean packaging materials and supplying pure products.

5.2.4 Studies of different food commodities

a. Cereals

Studies were done to know about the cereal choice of people and the adulterants observed by them. Data in Table 4.5 & fig. 4.2.5, shows that majority of the people (57%) found all type of adulterations in cereals out of which male are approx 51% and female 61%. While (21%) feel that there was inferior quality cereals mixed with good one while 18% of all found that there was stone in cereals (23% male and 14% female). Only 4-5% reported about worst polishing of cereals.

Statistically data were found to be moderately insignificant (p>0.05) which may be
due to difference in buying practices of people due to various factor such as income, age, and family structure as has been discussed earlier. Observed chi ($\chi^2$) for both male respondents (2.947) and female (2.947) and total observed value (5.525) (DF3 $\chi^2$, 7.8) reveals that hypothesis is accepted that majority of the cereal available in the market are fortified with all type of adulteration which has direct linked with people’s health. Data also reveals that though people want good quality food products but they are not getting it due to malpractice done by the product sellers. It also reflects that government people are not performing checking operations or people have not taken any steps to check them and thus though they are well aware of the malpractices but they had learned to live with such vicious menace to human being.

Similar observation has been done by Neelkanta and Anand (1992) which commented sadly that people prefer to absorb and endure the wrong done to them rather than fight against injustice. This is because consumers do not know the ways and means of facing them confidently. In this regard other survey was conducted related to method of their identification of adulteration regarding cereals. In another word, it may be due to variation in buying practices which is effected by various factors like income, age, education and availability. Since, buying practices involves the determination by market agencies of kind, qualities and quantities of goods, desired by consumer. Buyer has to find out the desired qualities of goods sold at satisfactory prices. Effective buying requires a specialized knowledge of content of goods, their resources and their use (Kotler, 1990).

Table 4.6 & fig. 4.2.6, it is clearly evident from result that shows majority of the people (95%) detect adulteration in cereals by seeing external feature of cereals out of which male are approx 98% and female are 91%. While rest detects cereal adulteration after cooking (3%) or during washing of cereals just before cooking 1.3%. Other only 1% was unable to detect adulteration. Statistically data were found to be moderately significant ($<0.05$). It means that without going to much test people can identify the presence of adulterants in cereals on the basis of external features. It also means that identification behavior is similar in most of the people without involving other factor.
such as age education, mode of family structure, or religion.

Statistically observed chi ($\chi^2$) for both male respondents (4.645) and female (4.064) respondents were less than expected (DF3 $\chi^2$, 7.8) which means that adulteration have direct effect over health and food practices. It is also evident by $\chi^2$, total observed value (8.70) which was greater than expected (on the basis null hypothesis was rejected that people can’t detect adulteration in cereals. People actually know about adulteration practices, but they are not directly responsible for the cause.

Malpractices like adulteration, short weights and measures, high prices, false and deceitful advertisement and packaging are pervading the market even when government of India claim to have passed maximum legal laws protecting consumers than any other country in the world. Though government has passed several acts and laws to protect consumers and seek redressal of their grievances they are not in a position to utilize their knowledge or are simply ignorant of these (Gupta and Ogale, 1988). Validation result displayed in fig. 4.3. 1 Physical test show different type of rice was adulterated with stone in all the sample tested.

b. Pulses

To confirm the hypothesis that there is adulteration in every type of other grains were also surveyed. Data in Table 4.7 fig. 4.2.7, it is clearly shows majority of the people purchase pulses from shop (59%) out of which male are approx 68% and female are 51%. While, rest obtained it from their own form, (21%) or from based on suitability (20%). Statistically data were found to be moderately insignificant (>0.05). This may be due to difference in buying practices of people. It is understood that before reaching grains to buyers they undergo various hands and under various people related with market. So the source of obtaining cereal is via shops which are for making profit and they are totally taking advantage of neutral law enforcement agencies. Also people often buy cheap products not branded one which has more chance of adulteration. This hypothesis is also supported by observed chi ($\chi^2$) for both male respondents (8.826) and female (7.723) respondents were higher than expected (DF2 $\chi^2$, 5.9) and total observed
value (16.5) was also much greater than expected on the basis null hypothesis was rejected that people are always buying branded products. This was confirmed by another survey.

In Table 4.8 & fig. 4.2.8, it is clearly evident from result that majority of the people found adulteration in pulses obtained from shop (96%) out of which male were 100% and female were 96%. While rest (4%) feels that there was no adulteration in pulses bought from shop. Statistically data were found to be moderately significant (<0.05). Statistically observed chi ($\chi^2$) for both male respondents (2.857) and female (2.5) respondents were less than expected (DF1 $\chi^2$, 3.84) but total observed value (5.3) was greater than expected on the basis null hypothesis was rejected that every type of pulses are adulterated. Which means that there is great difference between practices followed by consumer and product seller and thus effecting majority of people which are dependent on shop for food products?

Therefore, it was hypothesized that adulteration malpractices may be linked with heavy demands of specific pulses. So, Respondents were asked about uses among different pulses like Arahar dal, Channa/matar dal, Urad dal, Mung, or Masoor dal from the shop.

Data (table 4.9, fig. 4.2.9) shows majority of the people (47%) uses Arahar dal among different pulses out of which male were 37% and female were 54%, while other (23%) uses Urad dal (26% female and 21% male) after Arahar while other pulses were less preferred by respondents; Mung (16%), Masoor (12%), and least of all were Chana/Matar dal (2%). Statistically data were found to be moderately significant (<0.05). Statistically observed chi ($\chi^2$) for both male respondents (5.229) and female (4.576) respondents were less than expected (DF4 $\chi^2$, 9.48) but total observed value (9.805) was greater than expected on the basis null hypothesis was rejected that adulteration are linked with specific pulses.

Table 4.10 & fig. 4.2.10 shows data about presence of adulterants in Arhar dal. It is clearly evident that majority of the people (35%) experienced of mixing of all type of adulterants in Arhar dal while (28%) feel that there was mixing of lathyrous and (20%)
feel that there was yellow color in Arahar dal. For all type of adulterants male were 39% and female were 31%. While other (35%) female and (21%) male observed mixing of lathyrous in Arahar dal. Statistically data were found to be moderately insignificant (>0.05). This may be due to absence of clear identification instruments for checking adulterations in pulses.

Statistically observed chi ($\chi^2$) for both male respondents (3.860) and female (3.377) respondents were less than expected (DF3 $\chi^2$, 7.8) but total observed value (7.23) was also less than expected on the basis null hypothesis was accepted that adulteration is directly related with choice of consumer and heavy demand and less availability may be one factor that directly effecting the practices of shopkeeper.

Data presented in table 4.11 and fig. 4.2.11 shows majority of the people (93%) can detect adulteration by just preliminary observations in Arahar dal (male 97% female 89%) while (6%) detected adulterants after washing of Arahar dal (3% male and 8% female) and only 1-2% respondents were able to detect after cooking. Statistically data were found to be just insignificant (>0.05) which may be due to people don’t have any specific measures for detection of adulterants in pulses. Statistically observed chi ($\chi^2$) for both male respondents (4.075) and female (3.566) respondents were less than expected (DF3 $\chi^2$, 7.8) but total observed value (7.641) was also less than expected on the basis null hypothesis was accepted that people can detect adulteration in arahar dal. Since people health are directly dependent on quality of pulses since pulses is the major source by which vegetarians gets the protein essential for majority of people of every age specially for growing and studying children’s.

**Validation result displayed in** Fig 4.3.2-4 show pulses contain inferior pulses, synthetic colour, lathyrous and stone in the entire sample tested

**c. Edible oils**

Data are tabulated in 4.12 and results are depicted in 4.2.12 which shows majority of the people (52%) uses all type of oil for different purposes out of which male were 59% female 46%) while (32%) were using mustard oil (26% male and 37% female) and
only 8% respondents were using other oil for cooking. Statistically data were found to be moderately significant (<0.05). It means that good health are significantly linked with the quality of edible oils used at home which is clearly evidenced by some instances of food adulteration especially that of edible oils with argemone (Argemone Mexicana) oil leading to deaths of hundreds of people (Singh et al., 2000).

Statistically observed chi ($\chi^2$) for both male respondents (4.491) and female (3.929) respondents were less than expected (DF3 $\chi^2$, 7.8) but total observed value (8.420) was more than expected on the basis null hypothesis was rejected that people are getting using good quality edible oils. It means that though there is some cases of death due to adulteration, but whatever the product has been supplied by the manufacturer are harmful and can lead to such incidence again.

In table 4.13 and fig. 4.2.13 Data shows majority of the people observed adulteration in mustard oil (41%) out of which both male and female were 41% ) while (27%) observed adulteration in all edible oil (24% male and 30% female) and other 27% respondents observed adulteration ghee (31% male and 22% female). Only 5% respondent’s adulteration in refined oil.

Statistically data were found to be moderately insignificant (>0.05). This may be linked with heavy use of edible oil or choice of people for buying cheap products which for making profit often fortified with other inferior oil having same color or physical property.

Statistically observed chi ($\chi^2$) for both male respondents (2.240) and female (1.960) respondents were less than expected (DF3 $\chi^2$, 7.8) but total observed value (4.201) was also less than expected on the basis null hypothesis was accepted that there is malpractices in edible oil and almost every oil is found to be adulterated with inferior quality oil.

This hypothesis get strengthen by data shown in table 4.14 and fig. 4.2.14 that shows that there is adulteration in mustard oil and pure ghee and majority of the people (97%) observed adulteration in mustard oil and ghee out of which 99% male and (96%) female observed adulteration in mustard oil. Only 3-4% respondent’s observed absence
of any adulteration. Statistically data were found to be significant (<0.05).

Statistically observed chi ($\chi^2$) for both male respondents (2.056) and female (1.799) respondents were less than expected (DF1 $\chi^2$, 3.84) but total observed value (3.855) was more than expected which shows that there is meaningful difference and thus null hypothesis was rejected that only some specific oil are found to be adulterated. It means adulteration malpractice has become routine of the life of the people and both manufacturer as well as shopkeeper are following it ruthlessly.

Therefore in further table 4.15, its impact on people health was observed which shows that majority of the people (97%) observed illness due to adulteration in mustard oil and ghee. Only 3% respondent’s observed absence of any illness due to adulteration. Statistically data were found to be highly insignificant (>0.05). Which may be linked with other factor such as people’s negligence of hygiene practices and food using and handling practices.

Statistically observed chi ($\chi^2$) for both male respondents (0.010) and female (0.009) respondents were less than expected (DF1 $\chi^2$, 3.84) but total observed value (0.018) was also less than expected on the basis null hypothesis was accepted that adulteration had direct linked with health of people.

Future it was survey that how people are detecting the adulterants in pure ghee. The data are tabulated in table 4.16 and results are portrait in fig. 4.2.16. Data shows majority [37% (male 22% female 51%)] of the people can detect adulterants in ghee by smelling while other observed after eating 38% (male 51% female 26%). Only 15-18% respondent’s observed adulteration after cooking. Statistically data were found to be highly significant (<0.05). It means those females are well aware of the good practices and able to identify the adulterated oil in ghee and other oil. Statistically observed chi ($\chi^2$) for both male respondents (15.507) and female (13.568) respondents were more than expected (DF3 $\chi^2$, 7.8) but total observed value (29.075) was also much higher than expected on the basis null hypothesis was rejected that only some oil such as mustard oil are adulterated. This fact is well strengthen by the data represented in Table 4.17 about adulterants in pure ghee.
Data shows majority of the people [62% (male 59% female 63%)] observed that Vegetable oil are mostly mixed with ghee while other feel that animal fat are mixed 35% (male 37% female 32%). Only 4% respondent’s feel that ghee is adulterated with other adulterants. Statistically data were found to be highly insignificant (>0.05) which may be unavailability of any direct measures on the basis they can test these facts. Statistically observed chi (χ2) for both male respondents (0.380) and female (0.332) respondents were less than expected (DF2 χ2, 5.99) but total observed value (0.712) was also much lower than expected on the basis null hypothesis was accepted that difference is not significant and fact that ghee is adulterated with many type of adulterants and directly effecting the health of the peoples. Validation result displayed in Fig. 4.3. 2 show Deshi ghee adulterated with vegetable oil. Fig 4.3.6-7 test show vegetable oil contains castor oil and argemone in all samples. FIG. 4.3. 3 show adulteration of starch in Paneer in all samples

d. Spices

Adulterants in spices were included in the survey and results are given in Table 4.18. Data shows that majority 98% (male 99% female 97%) of the people feel there is adulterants in spices, while only 2% respondent’s feel that there are no adulterants in spices. Statistically data were found to be highly insignificant (>0.05) which may be due to chance factor. Spices are generally used to give taste in the food, therefore their cost is high. To make them cheaper adulteration malpractice is followed. Statistically observed chi (χ2) for both male respondents (0.775) and female (0.678) respondents were less than expected (DF1 χ2, 3.84) but total observed value (1.453) was also much lower than expected on the basis null hypothesis was accepted that there is adulteration in the spices.

Table 4.19 and fig. 4.2.19 shows result of adulterants in coriander powder. Data shows majority of the people [58% (male 63% and female 52%)] observed there was horse dung as adulterants in coriander, while leaf powder was observed by 24% respondent’s (male 20% and female 28%) while 5-7% respondent observed soil as adulterants in coriander. Only 13% respondents observed that there was no adulterant in
coriander. Statistically data were found to be just insignificant (>0.05) which may be due to difference in buying practices of people which is effected by various factors such as age, income and education and choice of shop. This hypothesis is again evident by statistically observed chi ($\chi^2$) for both male respondents (3.933) and female (3.441) respondents were less than expected (DF3 $\chi^2$, 7.8) but total observed value (7.374) was also much lower than expected on the basis null hypothesis was accepted that coriander are adulterated.

TABLE 4.20 and fig. 4.2.20 shows presence of adulterants in red chili powder. Data shows majority of the people 85% observed there was brick powder as adulterants in red chili powder (male 44% and female 41%) while sand was observed by 6% respondent’s (male 1% and female 5%) while 8% respondent observed that there was no adulterant in red chili powder Statistically data were found to be highly significant (<0.05) which means that there is significant adulteration in every component of spices. Statistically observed chi ($\chi^2$) for male respondents (8.075) were more than expected while female (7.066) respondents were less than expected (DF3 $\chi^2$, 7.8) while total observed value (15.141) was also much higher than expected on the basis null hypothesis was rejected that only few component of the spices may be adulterated.

Further another major component of food was surveyed that if turmeric powder is also adulterated? Data shows majority of the people (99%) observed that there is adulterants in turmeric powder (male 100% and female 97%). Only 1.3% respondents observed that there was no adulterant in turmeric powder. Statistically data were found to be just insignificant (>0.05) which means that it may be due to choice variation for specific manufacturer. Some local manufacturer may adopt these practices due to lack of testing by government officials while good manufacturer may not follow this practices.

Statistically observed chi ($\chi^2$) for both male respondents (1.892) and female (1.655) respondents were less than expected (DF1 $\chi^2$, 3.84) while total observed value (3.547) was also much less than expected on the basis null hypothesis was accepted that there is adulterants in all type of item present in shop. Therefore, next survey was concentrated on query that which type of adulterants is present in the turmeric powder.
Data in table 4.22 and fig. 4.22 shows majority of the people (78%) observed there was addition of yellow colour as adulterants in turmeric powder (male 81% and female 75%) while other respondents observed (11%) observed that there was mixing of ararote in turmeric powder (male 13% and female 9%) while other (7%) observed that there was soil in the turmeric powder. Only 3% respondents observed that there was no adulterant in turmeric powder. Statistically data were found to be just insignificant (>0.05) which again indicate that this deviation is due to lack of specific testing tool that can quantitatively or qualitatively predict about the adulteration.

Statistically observed chi ($\chi^2$) for both male respondents (3.415) and female (3.903) respondents were less than expected (DF3 $\chi^2$, 7.8) while total observed value (7.317) was also much less than expected on the basis null hypothesis was accepted that there is synthetic colour used in the turmeric.

The variety of synthetic colours, developed in the middle of the nineteenth century, were a reliable and economical method of partly restoring the original shade of the foods (that would otherwise be virtually dull) and also were used as a competitive substitute to the natural colourants (but were more expensive) (Achaya, 1984; Rao, 1990). Turmeric is the basic ingredient of all our Indian cooking. Any Indian dish is not complete without it, but it may be adulterated with, Lead chromate. Lead chromate; it is one of the most toxic salts of lead. It can cause anemia, paralyses, mental retardation and brain damage in children and abortion in pregnant women (Wikipedia). Validation result displayed in Fig. 4.3. 4 show adulteration of horse dung / foreign particle in coriander in all samples. Fig. 4.3. 5 show adulteration of synthetic colour in red chili in all samples. FIG. 4.3.10- 6 show adulteration of Ararote and synthetic colour in Turmeric in all samples.

e. Food behaviors

Respondents were asked about their choice as vegetarian or non-vegetarian. Data in Table 4.23 shows majority of the people (66%) were vegetarian while only 34% respondents were non vegetarian. Statistically data were found to be highly significant.
Statistically observed chi ($\chi^2$) for both male respondents (5.409) and female (4.733) respondents was higher than expected (DF1 $\chi^2$, 3.84) while total observed value (10.142) was also higher than expected on the basis null hypothesis was rejected that most people are non-vegetarians.

Further it was surveyed that how many people eat eggs and they use in which form. Data in Table 4.24, shows majority of the people (43%) were purchasing raw egg from the market (30% male and 55% female), while 31% respondents were having no interest in buying egg (29% male and 33% female). 10% respondents were buying egg randomly without any specific choice while 7% respondents were using egg as omelet. Statistically data were found to be highly significant (<0.05).

Statistically observed chi ($\chi^2$) for both male respondents (20.268) and female (17.735) respondents was higher than expected (DF4 $\chi^2$, 9.484) while total observed value (38.003) was also higher than expected on the basis null hypothesis was rejected that people follow bad food practices in eating egg.

f. RTE foods

Respondents were asked about adulteration in ready to eat food. Data in TABLE 4.25 and fig. 4.2.25 shows majority of the people (49%) were agree that there is adulteration in RTE food (66% male and 34% female), while 40% respondents having no idea about RTE food (17% male and 60% female). 11% respondents not agree about adulteration in RTE food. Statistically data were found to be highly significant (<0.05).

Statistically observed chi ($\chi^2$) for both male respondents (31.070) and female (27.186) respondents was higher than expected (DF 2 $\chi^2$, 5.99) while total observed value (31.070) was also higher than expected on the basis null hypothesis was rejected that RTE food are not adulterated.

Further data in table 4.26 type of adulterants present in RTE Food. Data shows majority of the people (52%) were having no idea about the type of adulteration in RTE food (47% male and 56% female), while 43% respondents agreed that inferior quality of
meat was there in RTE food (48% male and 38% female). While rest of the respondents 5% respondents agrees that there was contaminated supply of RTE food. Statistically data were found to be just insignificant (>0.05) which may be due to choice in quality of RTE.

Statistically observed chi ($\chi^2$) for both male respondents (1.853) and female (1.622) respondents was lower than expected (DF 2 $\chi^2$, 5.99) while total observed value (3.475) was also lower than expected on the basis null hypothesis was accepted that majority of people RTE food are adulterated.

Rapid urbanization and sociological changes had also increases the impact on the life-style of a large segment of the population due to enhanced demand for pre-packaged and re-cooked ready-to-eat (RTE) foods. RTE foods produced in the non-industrial sector, including bakery products like bread, biscuits, cakes, and other RTE foods such as potato chips, are two to three times that produced in the industrial sector (Agarwal, 1990, 1994; Alagh, 1990; Chowdhry, 1990; Sharma & Sharma, 1994). It has been suggested that the consumption of such foods could sometimes lead to harmful effects (NIN, 1994, annual report).

g. Fruits and Vegetables

Vegetable group constitutes part of core Indian diet. Vegetables are the second largest production in the worldwide. Significant production is in urban and pre urban areas. Many studies reveal contamination of vegetables with heavy metals and pesticides. The main source of contamination to vegetables crops are the air, water, soil, pesticides (pre harvesting) from which these are taken up by the roots or foliage. During transport, marketing and retailing (post-harvesting), vegetables are gradually becomes polluted because of rapid urbanization and industrialization (Lokhande, 1999).

Data about adulteration in fruits and vegetable are shown in Table-4.27 and result are displayed in fig. 4.2.27 which shows majority of the people (66%) were agree that there was adulteration in Fruits And Vegetables (73% male and 61% female), while 34% respondents don’t believe that there is any adulteration in Fruits And Vegetables (27% male and 39% female). Statistically data were found to be highly significant (<0.05).
Statistically observed chi ($\chi^2$) for both male respondents (2.668) and female (2.335) respondents was lower than expected (DF 1 $\chi^2$, 3.84) while total observed value (5.003) was higher than expected on the basis null hypothesis was rejected that fruits and vegetable are not adulterated.

Further to know which type of adulteration has been observed by people data were collected and are shown in table 4.28 and portrait in fig. 4.2.28. Data shows majority of the people (95%) were agree that there was pesticide as adulteration in Fruits and Vegetables (98% male and 93% female), while 5% respondents don’t believe that there is any adulteration in Fruits and Vegetables (2.1% male and 7% female). Statistically data were found to be slightly insignificant (>0.05). this may be due fact that not only pesticide are present but also there are other chemicals present during pre-harvesting and post harvesting to give them fresh look and used to increase their self life.

Statistically observed chi ($\chi^2$) for both male respondents (2.004) and female (1.754) respondents was lower than expected (DF 1 $\chi^2$, 3.84) while total observed value (3.758) was lower than expected on the basis null hypothesis was accepted that fruits and vegetables adulterated with other chemicals.

Table-4.29 shows study of cause of high availability of fruits and vegetables. Data shows majority of the people (45%) accept that there is every type of adulteration in Fruits and Vegetables (50% male and 40% female), while 28% respondents agree on presence of oxytocin in Fruits and Vegetables (31% male and 26% female). Statistically data were found to be moderately insignificant (>0.05) which has been discussed earlier. Statistically observed chi ($\chi^2$) for both male respondents (4.734) and female (4.142) respondents was lower than expected (DF 3 $\chi^2$, 7.84) while total observed value (8.875) was higher than expected on the basis null hypothesis was rejected that fruits and vegetables are naturally available.

Data in Table-4.30 and result in fig. 4.2.30 shows majority of the people (88%) detect adulteration in Fruits and Vegetables (98% male and 78% female) by seeing, while 7% respondents detect adulteration by smelling in Fruits and Vegetables, while rest of respondents detect by washing fruit and vegetables. Statistically data were found to be
highly significant (<0.05) which show significant linkage with adulteration of fruits and vegetables. It has been often seen that effect can be minimized by washing after detection of chemical adulterants applied generally over fruits and vegetables but how much it is not certified yet.

Statistically observed chi ($\chi^2$) for both male respondents (15.536) and female (13.594) respondents was lower than expected (DF 3 $\chi^2$, 7.84) while total observed value (29.129) was higher than expected on the basis null hypothesis was rejected that adulterants applied over fruits and vegetables are undetectable.

h. Cane sugar

Data are shown in Table 4.31 and result are displayed in fig. 4.2.31 shows majority of the people (59%) observed adulteration of wheat flour in cane sugar (58% male and 59% female), while 26% respondent’s detected soil in cane sugar, while rest of respondents (9%) detected addition of ararote in cane sugar or have no idea (6%) of adulteration in cane sugar. Statistically data were found to be slightly insignificant (>0.05) which may be due to difference in buying practices and choice of products.

Statistically observed chi ($\chi^2$) for both male respondents (4.001) and female (3.501) respondents was lower than expected (DF 3 $\chi^2$, 7.84) while total observed value (7.503) was lower than expected on the basis null hypothesis was accepted that there is adulteration in cane sugar also.

TABLE 4.32 shows detection of adulterants in cane sugar. Data shows majority of the people (65%) detected adulteration by taste in cane sugar, while 19% respondent’s detected by smell in cane sugar (12% male, 25% female), while rest of respondents (16%) detect adulteration by seeing the cane sugar.

Statistically data were found to be highly significant (<0.05). Statistically observed chi ($\chi^2$) for both male respondents (7.579) and female (6.632) respondents was higher than expected (DF 2 $\chi^2$, 5.99) while total observed value (14.211) was higher than expected on the basis null hypothesis was rejected that adulteration in cane sugar is undetectable.
i. Milk & Milk products

Table 4.33 shows majority of the people (60%) observed water in the milk (69% male, 51% female), while 36% respondent’s observed presence of some chemical in milk (27% male, 48% female), while rest of respondents (4%) reported there may be addition of soy milk. Statistically data were found to be highly significant (<0.05). Statistically observed chi (χ2) for both male respondents (6.159) and female (5.389) respondents was lower than expected (DF 3 χ2, 7.8) while total observed value (11.547) was higher than expected on the basis null hypothesis was rejected that milk has no adulterants beside water. There are many adulterants added by sellers with chemicals such as urea, soap, artificial sweeteners

Table 4.34 shows which types of adulterants are generally observed by respondents. Data shows majority of the people (74%) reported there was ararote as adulterants in packed milk (66% male, 81% female), while 26% respondent’s observed no ararote as adulterants in packed milk (33% male, 19% female). Statistically data were found to be highly significant (<0.05).

Statistically observed chi (χ2) for both male respondents (4.585) and female (4.012) respondents was higher than expected (DF 1 χ2, 3.84) while total observed value (8.597) was much higher than expected on the basis null hypothesis was rejected that packed milk are not adulterated.

Table 4.35 shows type of adulterants in packed milk. Data shows majority of the people (51%) reported there was fat removal in packed milk (31% male, 68% female), while 34% respondent’s observed no idea of any adulterants in packed milk (52% male, 19% female) while some of respondent reported presence of either ararote (7%) or soya milk (8%) . Statistically data were found to be highly significant (<0.05). Statistically observed chi (χ2) for both male respondents (24.638) and female (21.558) respondents was higher than expected (DF 3 χ2, 7.84) while total observed value (46.196) was much higher than expected on the basis null hypothesis was rejected that milk supplied in packet have few adulterants.
Further study was to know that milk products are safe. Table 4.36 shows data about adulterants in Paneer. Data shows majority of the people (80%) observed adulteration in Paneer (82% male, 79% female), while 20% respondent’s observed no adulteration in Paneer (17% male, 12% female). Statistically data were found to be highly insignificant (>0.05) which may be due to absence of any analytical tool or difference in buying practices since many good quality milk product cost higher. Statistically observed chi ($\chi^2$) for both male respondents (0.290) and female (0.254) respondents was lower than expected (DF 1 $\chi^2$, 3.84) while total observed value (0.544) was also lower than expected on the basis null hypothesis was accepted that milk products are also adulterated.

**J. Impact on health**

Respondents were asked about possibility of any illness in family due to food adulteration. Data shows majority of the people (83%) reported that there was fat removal in packed milk (78% male, 86% female), while rest 17% respondent’s observed no idea of any adulterants in packed milk (22% male, 13% female) Statistically data were found to be moderately significant (<0.05). Statistically observed chi ($\chi^2$) for both male respondents (2.260) and female (1.978) respondents was higher than expected (DF1 $\chi^2$, 3.84) while total observed value (4.238) was much higher than expected on the basis null hypothesis was rejected that adulteration are not only cause of illness.

Data in Table 4.38 shows that majority of the people (80%) reported stomach problem (74% male, 86% female), while rest 3% respondent’s observed skin and 1% reported about some physical problem, while other 16% were having no idea of adulteration. Statistically data were found to be just insignificant (>0.05) which may be due to illness because of various other bad practices such as bad quality water uses, bad practices of food handling and lack of knowledge of good food practices. This fact is supported by statistically observed chi ($\chi^2$) for both male respondents (3.871) and female (3.387) respondents was lower than expected (DF3 $\chi^2$, 7.84) while total observed value (7.258) was also lower than expected on the basis null hypothesis was accepted that food
adulteration is only cause of bad impact and major illness.

Bad food practices often linked with various food borne diseases. Those at greatest risk for food borne illnesses are the elderly, pregnant women, infants and young children, and those with compromised immune systems (Mead et al. 1999; Fischer et al. 2005). One in every five individuals in the U.S.A. falls into one of these at-risk categories. The elderly are a group particularly vulnerable to foodborne illnesses and death (Smith 1998), such as morbidity and mortality from foodborne-induced gastroenteritis. Many elderly live in assisted living facilities where food is provided by caregivers. As described by Linton et al. (1998), there are many food handling errors that can cause food borne illness in food retail establishments, including poor personal hygiene and cross-contamination.

k. legal awareness

Data shows in Table 4.39 majority of the people (96%) agreed that they can complain against adulteration as a consumer (96% male, 96% female), while rest 4% respondent’s was not sure about it. Statistically data were found to be moderately significant (<0.05). Statistically observed chi ($\chi^2$) for both male respondents (0.004) and female (0.003) respondents was lower than expected (DF1 $\chi^2$, 3.84) while total observed value (0.007) was also lower than expected on the basis null hypothesis was accepted that people are well aware of food adulteration law.

Further table 4.40 shows majority of the people (94%) agreed that they known about consumer protection (92% male, 95% female), while rest 6% respondent’s was not sure about it. Statistically data were found to be moderately insignificant (>0.05) which means that whatever they know all is under food protection and they are not pretty sure about it. Statistically observed chi ($\chi^2$) for both male respondents (0.548) and female (0.479) respondents was lower than expected (DF1 $\chi^2$, 3.84) while total observed value (1.027) was also lower than expected on the basis null hypothesis was accepted that people are well aware of the consumer protection law.

This fact get strengthen by another survey results depicted in table 4.41 which
shows majority of the people (94%) agreed that they known about consumer forum (92% male, 95% female), while rest 6% respondent’s was not sure about it. Statistically data were found to be moderately insignificant (>0.05) which may be due to variation in good food practices. Statistically observed chi ($\chi^2$) for both male respondents (0.548) and female (0.479) respondents was lower than expected (DF1 $\chi^2$, 3.84) while total observed value (1.027) was also lower than expected on the basis null hypothesis was accepted that people are well aware of about consumer forum and difference is due to difference in food practices law made for checking food adulteration.

Further table 4.42 shows respondents knowledge about consumer forum work. Data shows majority of the people (88%) accept that Consumer forum work for consumer (88% male, 88% female), while rest 5% respondent’s told Consumer forum work for shopkeeper. Rest 6% respondent were having no knowledge about it. Statistically data were found to be highly insignificant (>0.05) which may be due to difference in knowledge and practices of people. Statistically observed chi ($\chi^2$) for both male respondents (1.501) and female (1.314) respondents was lower than expected (DF3 $\chi^2$, 7.84) while total observed value (2.815) was also lower than expected on the basis null hypothesis was accepted that there is difference in knowledge and practices of people.

This was observed by another survey on complaint in consumer. Data in table 4.43 shows majority of the people (89%) responded that oneself can complain in consumer forum (87% male, 90% female), while other 4% respondent’s told that lawyer can do it. Rest 6% respondent were not sure about it. Statistically data were found to be highly insignificant (>0.05) which may again due to knowledge practices. Statistically observed chi ($\chi^2$) for both male respondents (0.871) and female (0.762) respondents was lower than expected (DF3 $\chi^2$, 7.84) while total observed value (1.634) was also lower than expected on the basis null hypothesis was accepted that people neglect consumers law.

It is well evident in another data presented in table 4.44 Data shows majority of the people (86%) responded that they never filed any complaint against the shopkeeper
(73% male, 97% female), while other 14% respondent’s positively (male 27%, female 3%). Rest 6% respondent were not sure about it. Statistically data were found to be highly significant (<0.05). Statistically observed chi ($\chi^2$) for both male respondents (18.708) and female (16.370) respondents was higher than expected (DF3 $\chi^2$, 7.84) while total observed value (35.078) was also higher than expected on the basis null hypothesis was rejected that respondents are well practicing the food adulteration laws.

Instead new finding was observed that (table 4.45 & fig. 4.2.45) majority of the people (79%) never took action against shopkeeper for adulteration instead they Took other food in exchange (78% male, 81% female), while 12% respondent’s returned the food (male 11%, female 12%). Rest 6% took action and other 3% given warning only. Statistically data were found to be moderately insignificant (>0.05) which may be due to difference in knowledge practices and awareness perception. Statistically observed chi ($\chi^2$) for both male respondents (2.725) and female (2.384) respondents was lower than expected (DF3 $\chi^2$, 7.84) while total observed value (5.110) was also lower than expected on the basis null hypothesis was accepted that people attitude towards food adulteration is of ignorance. It may be due to lack of proper food safety knowledge.

TABLE 4.46 shows majority of the people (71%) know about it from TV (71% male, 71% female), while 14% respondent’s know it from news paper (male 21%, female 8%). Rest 11% from people and other 4% from other sources. Statistically data were found to be highly significant (<0.05). Statistically observed chi ($\chi^2$) for both male respondents (8.592) was higher than expected and female (7.518) respondents was lower than expected (DF3 $\chi^2$, 7.84) while total observed value (16.109) was much higher than expected on the basis null hypothesis was rejected people are lacking sufficient knowledge of food safety behavior.

According to Howes et al., (1996), Attitudes, is an important factor besides knowledge which ensures trend of food borne illnesses. A number of studies (Howes et al., 1996; Powell, Attwell, & Massey, 1997) have indicated that although training may bring about an increased knowledge of food safety this does not always result in a positive change in food handling behavior. It has been suggested that this disparity
between knowledge and practice occurs because much of the existing training, particularly formal certificated training, is designed using the KAP model (Rennie, 1995). This approach assumes that an individual’s behavior or practice (P) is dependent on their knowledge (K) and suggests that the mere provision of information will lead directly to a change in attitude (A) and consequently a change in behaviour. It has been suggested that this model is flawed in its assumption that knowledge is the main precursor to behavioral change (Ehiri, Morris, & McEwen, 1997).

1. Role of media

Table 4.47 shows majority of the people (83%) see TV program “JAGO GRAHAK JAGO” (81% male, 85% female), while 17% respondent’s don’t see it (male 19%, female 15%). Statistically data were found to be highly insignificant (>0.05) which may be due to their shift in interest to see such program due to their negligence attitude. Statistically observed chi (χ²) for both male respondents (0.518) and female (0.454) respondents was lower than expected (DF1 χ², 3.84) while total observed value (0.972) was much lower than expected on the basis null hypothesis was accepted that people are watching TV program “JAGO GRAHAK JAGO”.

Further analysis was done about the Effect of watching “Jago Grahak Jago” program. Data in Table 4.48 shows majority of the people (65%) know about it from TV (68% male, 61% female), while 15% respondent’s about all the factor , Rest 14% responded that it was beneficial (12% male and 16% female) and other 7% get various knowledge about it. Statistically data were found to be highly insignificant (>0.05) which may be due to difference in attitude or unavailability of resources to know the details of the facts. Also this may be liked to complexity of laws and unsupportive behavior of the food authorities which are part of the society and silently observing the malpractices for some personal benefits.

Statistically observed chi (χ²) for both male respondents (1.272) and female (1.113) respondents was lower than expected (DF3 χ², 7.84) while total observed value (2.385) was much lower than expected on the basis null hypothesis was accepted that
there is little effect of watching “Jago Grahak Jago” program telecast on TV. The reason may be majority of them was lack of time or facility such as TV or electricity and no interest in joining them, as it will yield no results. According to Kishtwaria, et al (2006) which concluded that mass media can effectively be used to promote information and awareness especially to educated respondents belonging to middle income group. Mass-media can also play an effective role for masses belonging to different socio-economic categories also. Parameshwar (1988) analyzed that unless consumer awareness’ is created, the efforts of the government and voluntary organizations can’t achieve the desired results.

m. food standards

Table 4.49 shows majority of the people (83%) food standards (81% male, 85% female), while 17% respondent’s don’t know it (male 19%, female 19%). Statistically data were found to be highly insignificant (>0.05). It may be due to difference in socioeconomic status and education of people. Statistically observed chi ($\chi^2$) for both male respondents (0.420) and female (0.367) respondents was lower than expected ($DF_1 \chi^2$, 3.84) while total observed value (0.787) was much lower than expected on the basis null hypothesis was accepted that people know about different food standards.

Further in table 4.50 and fig. 4.2.50 shows majority of the people (72%) know that ISI is main Indian food standard (80% male, 64% female), while 18% respondent’s about FAO (male 13%, female 22%). Rest 7% responded about AGMARK and 3% responded all of the above. Statistically data were found to be highly significant (<0.05). Statistically observed chi ($\chi^2$) for both male respondents (4.905) and female (4.291) respondents was lower than expected ($DF_3 \chi^2$, 7.84) while total observed value (9.196) was higher than expected on the basis null hypothesis was rejected that people have good understanding about the food standards.