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Assessment of student knowledge and effectiveness of intervention regarding adulteration of food

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Abstract

Adequate nutrition is a key towards good health but when food gets adulterated; its beneficial effects are depressed, which on long term indications to mortality and high morbidity. Food adulteration is a mutual malpractice and an age-old problem which causes serious effects on well-being of people. Food adulteration is considered as a crime because it is harmful for human being. In spite of strict measures against food adulteration, it is still practiced just for profit putting human lives in danger. Globalization has countless impact on food consumption, health and nutrition of young people. With this view the study was undertaken to assess student's knowledge about common food adulterants. The study design was based on before and after evaluation. Instructional systems and educational technology have been getting great attention from educators in order to enrich students' learning. Educational technologies presentations through multimedia are becoming common place. An educational programme through multimedia about food adulteration was designed and implemented. A questionnaire was used to conduct survey and the responses were evaluated on a scale. The finding of the study revealed that the respondents before the educational programme had less knowledge about food adulteration which increased after the implementation of the programme. The study concluded that multimedia educational programme had a positive effect to increase knowledge of students about food adulteration.

Keywords: Student knowledge, effectiveness, intervention regarding adulteration, food

Introduction

Food is the basic necessity of life. Often people are not sure of safety of the food in terms of contamination with extraneous material or intentional adulteration. There is a danger of consuming poisonous dyes, sawdust, soapstone, industrial starch, aluminum foil and so on which are added to our daily food and endanger our health. Adulteration of food can lead to lot of physical problems including damage of organs. Food adulteration is the addition or removal of any substances to or from food, so that the natural composition and quality is affected. Adulterated food is impure, unsafe and not wholesome (Aamna *et al.* 2016)^[1]. Inappropriate food handling and packaging methods can also result in adulteration (Sudershan, 2013). Intentional food adulteration is usually done for financial gain, whereas natural adulteration occurs due to the presence of certain chemicals, organic compounds or radicals naturally occurring in foods which are injurious to health and are not added to the foods intentionally or unintentionally (Zarina S, 2010). Examples include - milk is mixed with water and vanaspathi is used as an adulterant for ghee. Some of the common adulteration practices are - ergot is assorted in cereals, chalk powder in flour, chicory and tamarind seed powder is mixed in coffee powder, papaya seeds in pepper, brick-powder is added to chili powder, Metanil yellow is added in turmeric for bright color and wood powder to dhaniya powder, the list is endless. (Lakshmi V, 2012)^[4]

Adverse health effects of adulterants range from acute symptoms such as vomiting, abdominal pain, allergy, asthma, and headache and to even mental retardation, cardiac arrest and cancer. (Alauddin, 2012)^[2] In spite of strict measures against adulteration, it is still practiced just for profit putting human lives in danger (Singh N, 2012)^[3] Any person whether by himself or any other person manufactures a food article with the knowledge of selling it to the consumer, sells unsafe food which can injure the person or lead to the death of the person shall be liable to pay the fine which may exceed to ten lakh rupees and may be imprisonment for not less than seven years (Subba R, 2013)^[7]

Objectives

1. To study the buying practices of the food products among the respondent families
2. To know the knowledge of students about food adulteration and to see effect of educational programme on student’s knowledge about food adulteration.

Methodology

The study was exploratory and the sample for the study consisted of school students i.e. girls and boys in the age group of 13 to 15 years. Random sample was drawn from the private and government schools of Hyderabad. All the samples responded for every question so all the 120 respondents are valid. This segment of population was selected due to their adoption because children and adolescents are increasingly the target group for different forms of marketing practices used for food products. The data were collected using a structured questionnaire. Questionnaires were handed over to them with a request to choose the respective option. Due care has been taken to reduce possible biases in selecting the young consumers for the purpose of data collection by way of asking few questions to them in relation with their buying practices and demographic profile.

Review of Literature

Shreedevi and Renuka (2014) [6] carried a study on knowledge of rural high school students on consumerism in dharwad taluka. The result of intervention programme revealed that lecture cum demonstration was found to be more significant

when compared to folder for imparting the knowledge regarding selected aspects of consumerism.

Radha Rani and Renuka (2012) [5] carried a study on consumer education through multimedia- an evaluation study. The study reported that, respondents gained high level of knowledge on food adulteration through multimedia package. Bhatt Shuchi *et al*, (2012) [3] carried out a study on impact of media and evaluation on food practices in urban area of Varanasi, India. Results revealed that regardless of age, income and religion, all the groups under study were well aware about food adulteration and educated people were less prone to the effect. The study through light on the fact that there is lag in following the food practices by all the ages in spite of having good media awareness Programme and knowledge of food practices.

Thakur *et.al*, (2009) [9] performed a study on Impact of health education package on knowledge and practices of women regarding food adulteration; the quasi-experimental study was conducted in DMC. UT. Chandigarh, The finding revealed that after the intervention significant gain in the knowledge of the subjects regarding different adulterants, related health hazards, detection by physical and chemical method were observed.

Results and Discussions

Back ground information

Sample group is heterogeneous group that is 60 girls and 60 boys from private and government school pursuing 9th class. All the samples are from Hyderabad. Sample age group is from 13-15 years.

Table 1: Mostly consumed/preferred food type by respondent’s family n=120

| Preferred items | Private school | | Government school | | Total |
|--------------------------------------|----------------|---------|-------------------|---------|----------|
| | Girls | Boys | Girls | Boys | |
| Homemade food | 29(97) | 26(87) | 30(100) | 30(100) | 115(96) |
| Hotel/ Dhaba/Canteen/ Swagraha foods | - | 1(3) | - | - | 1(1) |
| Packed and branded foods | 1(3) | 3(10) | - | - | 4(3) |
| Total | 30(100) | 30(100) | 30(100) | 30(100) | 120(100) |

(Figures in parenthesis indicate percentages)

The above table 1 furnish that 96 per cent of the respondents prefer homemade food. Very few (3 per cent) respondents prefer packed and branded food items and surprising only 1

per cent of the respondents prefer hotel/Dhaba/canteen/ Swagraha food items.

Table 2: Place of purchase used by the respondent families n=120

| Place of purchase | Private school | | Government school | | Total |
|---------------------------|----------------|--------|-------------------|--------|--------|
| | Girls | Boys | Girls | Boys | |
| Retail shop | 21(70) | 21(70) | 27(90) | 27(90) | 96(80) |
| Wholesale shop | 19(63) | 19(63) | 20(67) | 19(63) | 77(64) |
| Super markets | 19(63) | 14(47) | 2(7) | 8(27) | 43(36) |
| Malls | 3(10) | 1(3) | - | 6(20) | 10(8) |
| Online | 2(7) | 4(13) | - | - | 6(5) |
| Wholesale cum retail shop | 2(7) | 1(3) | 1(3) | 1(3) | 5(4) |
| Departmental stores | 1(3) | - | - | - | 1(1) |
| Any other(specify) | - | - | - | - | - |

(Figures in parenthesis indicate percentages)

It can be observed from table 2 that a high percentage (80) of the respondents, buys food items from retail shop. The next highest 64 per cent buy from wholesale shop, while 36 per cent of the respondents buy from super market. Very few 8

per cent buy from malls and 5 per cent buy from online and 4 per cent buy from wholesale cum retail shops. Only 1 per cent of the respondent buy from departmental stores.

Table 3: Criteria selected for judging the quality of food items

| Criteria for judging the quality of food items | Private school | | Government school | | Total |
|--|----------------|------|-------------------|------|-------|
| | Girls | Boys | Girls | Boys | |
| Date of manufacturer | 220 | 209 | 282 | 263 | 974 |
| Brand name | 262 | 259 | 220 | 203 | 944 |
| Trade mark | 173 | 301 | 152 | 169 | 795 |
| Certification marks | 201 | 167 | 172 | 200 | 740 |
| Packaging | 166 | 178 | 174 | 188 | 706 |
| Physical texture | 150 | 162 | 175 | 175 | 662 |
| Freedom from bad odour | 152 | 123 | 147 | 162 | 584 |
| Manufacturer name/ reputation | 147 | 141 | 121 | 156 | 565 |
| Labeling | 136 | 120 | 139 | 149 | 544 |
| Any other, specify | 53 | 64 | 62 | 55 | 234 |

(Figures in parenthesis indicate percentages)

The above table 3 presents the distribution of respondents as per the criteria taken into consideration, while judging the quality of food items purchased. The highest score of 220, 209, 282 and 263 (1st rank) by the respondents was given to checking date of manufacture. The next highest score (2nd rank) was allotted to Brand name. Trade mark and

certification marks were given third and fourth ranks followed by packaging (5th rank), physical texture (6th rank) and freedom from bad order (7th rank), manufacture name or reputation(8th rank) and labeling(9th rank). A low weightage (10th rank) was given to any other such as smell, taste, appearance, place of manufacture etc.

Table 4: Knowledge of the respondents on food adulteration

| Knowing about food adulteration | Private school | | Government school | | Total |
|--|----------------|---------|-------------------|---------|----------|
| | Girls | Boys | Girls | Boys | |
| Yes | 19(63) | 15(50) | 16(53) | 24(80) | 74(62) |
| No | 11(37) | 15(50) | 14(47) | 6(20) | 46(38) |
| Total | 30 | 30 | 30 | 30 | 120(100) |
| Food adulteration meaning | | | | | |
| Number of students answered correct | 10(33) | 3(10) | 4(13) | 12(40) | 29(24) |
| Number of students answered in-correct | 20(67) | 27(90) | 26(87) | 18(60) | 91(76) |
| Total | 30(100) | 30(100) | 30(100) | 30(100) | 120(100) |

(Figures in parenthesis indicate percentages)

Table 4 shows that total majority of the respondents 62 per cent of the respondents were aware of food adulteration and 38 per cent were not aware of food adulteration. More than three fourth per cent of the respondents were not

able give the meaning of food adulteration. Nearly one fourth per cent were able to give the correct meaning of food adulteration.

Table 5: Source of awareness about food adulteration

| Source of information | Private school | | Government school | | Total |
|-----------------------|----------------|--------|-------------------|--------|---------|
| | Girls | Boys | Girls | Boys | |
| Personal experience | 15(50) | 13(43) | 5(17) | 17(57) | 50(42) |
| Family members | 26(87) | 24(80) | 28(93) | 22(73) | 100(83) |
| Friends | 22(73) | 20(67) | 24(80) | 19(63) | 85(71) |
| Neighbors | 21(70) | 16(53) | 4(13) | 19(63) | 60(50) |
| Shopkeepers | 8(27) | 12(40) | 3(10) | 8(27) | 31(26) |
| Consumer societies | 9(30) | 15(50) | 4(13) | 5(17) | 33(27) |
| Social organizations | 15(50) | 18(60) | 4(13) | 5(17) | 42(35) |
| Mass media | 16(53) | 17(57) | 21(70) | 20(67) | 74(62) |
| Doctors | 20(67) | 21(70) | 9(30) | 1(3) | 51(43) |
| Labels | 6(20) | 9(30) | 2(7) | 3(10) | 20(17) |
| School syllabus | 16(53) | 17(57) | 10(33) | 5(17) | 48(40) |
| Any other | 4(13) | 13(43) | 5(17) | 1(3) | 23(19) |

(Figures in parenthesis indicate percentages)

It is clear from Table 5 that Family members were the main source of information regarding food adulteration to 83 per cent of the students followed by Friends (71%), Mass media (62%) such as TV, Newspaper and You tube, Neighbors

(50%), Doctors (43%), Personal experience (42%), School syllabus (40%), Social Organisation (35%), Consumer societies (27%), shopkeepers (26%), labels (17%) and other (19%)

Table 6: Prioritized reasons for traders to resort to food adulteration

| Reasons for adulterating food items | Private school | | Government school | | Total |
|-------------------------------------|----------------|------|-------------------|------|-------|
| | Girls | Boys | Girls | Boys | |
| Profit motive of traders | 167 | 160 | 150 | 176 | 653 |
| High population demands | 143 | 108 | 147 | 120 | 518 |
| Increased urbanization | 140 | 127 | 115 | 131 | 513 |
| Illiteracy of general public | 121 | 118 | 120 | 116 | 475 |
| Food insecurity | 121 | 22 | 126 | 119 | 388 |
| Lack of effective food laws | 78 | 107 | 95 | 97 | 377 |
| Lack of government initiative | 73 | 76 | 77 | 87 | 313 |

(Figures in parenthesis indicate percentages)

The reasons for traders resorting to food adulteration as stated by the respondents are listed in the table 6. From the total it can be inferred that majority of the respondents mentioned that it is profit motive of traders. Another highest score 518 was given to 'high population demand'. Next highest score

513 was given to the 'increased urbanization'. The reason 'illiteracy of general public was given score 475. Another score of 388 was given to the reason 'food insecurity. Lack of effective food laws was given score 377. Least score i.e. 313 was given to the reason lack of government initiatives.

Table 7: Prioritized measures that can be adopted in order to control the food adulteration

| Measures | Private school | | Government school | | Total |
|--|----------------|------|-------------------|------|-------|
| | Girls | Boys | Girls | Boys | |
| Purchasing food items from reputed shops or co-operative stores | 107 | 113 | 97 | 115 | 432 |
| Careful supervision of products by responsible authorities | 95 | 95 | 111 | 113 | 414 |
| Implementing strict food laws and punishments against unscrupulous traders | 74 | 97 | 73 | 93 | 337 |
| Frequent checking of food products by responsible authorities | 86 | 79 | 85 | 76 | 326 |
| Educational/awareness program can be given to consumers and manufactures | 91 | 68 | 93 | 53 | 305 |

(Figures in parenthesis indicate percentages)

It can be inferred from the table 7 that, the highest score (1st rank) in total was allotted by respondents to the measure suggesting 'purchasing food items from reputed shops or co-operative stores. The next highest score 414 (2nd rank) was given to 'Careful supervision of products by responsible authorities' followed by implementing strict food laws and punishments against unscrupulous traders (3rd rank) with the score of 337, Frequent checking of food products by responsible authorities (4th rank) with 326 score, Educational/awareness program can be given to consumers and manufactures (5th rank) with 305 score.

Knowledge on food adulteration

Development of standardized knowledge test

Standard tests are more commonly used because they are considered more reliable, more valid and more objective than the unstandardized tests. Fundamental purpose of standardizing a test is to establish its reliability and validity at high level as possible.

Collection of test items

An item pool of knowledge questions was prepared by referring different textbooks, journals on food adulteration. Thirty items were selected and carried out for developing a standardized knowledge test after framing the items in an appropriate form and pre-testing them as detailed below.

Framing of test items

The 60 items selected for the construction of knowledge test on consumer issues were all framed in the objective form of questions. It comprised 11 correct and incorrect types, 9 multiple-choice types and 10 fill in the blanks. For content validity of knowledge test, statements were given to the faculty of home science. It was concluded that all the 30 statements were relevant for knowledge test.

Pre-testing

The items for knowledge test were pre-tested by administering the items to 9th class students i.e. 30 girls and 30 boys each of private school and government school. Care was taken to see that students selected for this purpose were outside the main sample selected for the study.

Intervention

Educational intervention was imparted on the identified areas using educational aids developed for the purpose

Post-test

Same group of respondents were given education through multimedia regarding food adulteration. Post-test was conducted to see the change in awareness and knowledge level of respondents.

Instructions for scoring

The correct response to each statement out of a total of 30 statements was given score of '1' and incorrect response was given a score of '0'. The total number of answered statements, i.e. correct responses given by a respondent out of 30 items was the knowledge score obtained by her/him. Thus the maximum and minimum possible score for each respondent was 30 and 0 respectively.

Respondents were classified in the following three categories based on equal interval method. This includes the formation of definite equal intervals based on the obtained scores.

| Knowledge Level | Score Range |
|-----------------|-------------|
| Low | 0-10 |
| Medium | 11-20 |
| High | 21-30 |

The results obtained through this test are presented in table.

Table 8: Knowledge test items on food adulteration

| Knowledge questions and answers | Private school | | | | Government school | | | |
|--|----------------|-------------|------------|------------|-------------------|-------------|-------------|------------|
| | Girls | | Boys | | Girls | | Boys | |
| | Pre-test | Post-test | Pre-test | Post-test | Pre-test | Post-test | Pre-test | Post-test |
| Consumers need to be highly conscious about the food adulteration.(correct) | 13 (43) | 23(77) | 15 (50) | 21 (70) | 8 (27) | 27 (90) | 18 (60) | 26 (87) |
| The process of adding a harmful substance intentionally that affects the nature and quality of food is called food adulteration.(correct) | 23 (77) | 30 (100) | 23 (77) | 29 (97) | 28 (93) | 27 (90) | 24 (80) | 26 (87) |
| Food ingredients which are adulterated are injurious to health.(correct) | 15 (50) | 27 (90) | 15 (50) | 22 (73) | 24 (80) | 30 (100) | 20 (67) | 24 (80) |
| The chances of adulteration are high in loosely sold items when compared to the packed items.(correct) | 20 (67) | 27 (90) | 21 (70) | 27 (90) | 22 (73) | 22 (73) | 20 (67) | 25 (83) |
| Food products/ingredients which are in powder or paste form are more adulterated than those which are in solid form.(correct) | 15 (50) | 26 (87) | 9 (30) | 21 (70) | 8 (27) | 22 (73) | 19 (63) | 28 (93) |
| Urea is added in milk to increase the shelf-life of it.(correct) | 19 (63) | 29 (97) | 21 (70) | 26 (87) | 16 (53) | 25 (83) | 20 (67) | 29 (97) |
| Adulterants are added to the food products/ingredients to increase their colour and appearance.(correct) | 25 (83) | 29 (97) | 21 (70) | 27 (90) | 19 (63) | 26 (87) | 25 (83) | 29 (97) |
| Food adulteration may lead to extra expenditure for a family to spend money for unexpected health treatments.(correct) | 21 (70) | 28 (93) | 22 (73) | 28 (93) | 22 (73) | 26 (87) | 25 (83) | 28 (93) |
| A seller/manufacturer does food adulteration to earn more profits.(correct) | 18 (60) | 27 (90) | 27 (90) | 29 (97) | 21 (70) | 29 (97) | 26 (87) | 29 (97) |
| Inadequate knowledge about food safety and its associated consequences leads to health problems.(correct) | 21 (70) | 28 (93) | 23 (77) | 27 (90) | 26 (87) | 26 (87) | 30 (100) | 27 (90) |
| Imparting education about food adulteration can make the consumers become aware and safeguard themselves from the negative effects of it.(correct) | 20 (66) | 25 (83) | 19 (63) | 25 (83) | 24 (80) | 26 (87) | 19 (63) | 24 (80) |

| Knowledge questions and answers | Private school | | | | Government school | | | |
|--|----------------|------------|------------|-------------|-------------------|------------|------------|------------|
| | Girls | | Boys | | Girls | | Boys | |
| | Pre-test | Post-test | Pre-test | Post-test | Pre-test | Post-test | Pre-test | Post-test |
| During which stage, the Adulteration takes place (production stage, distribution stage and retailing stage) | 15 (50) | 24 (80) | 12 (40) | 23 (77) | 23 (77) | 28 (93) | 9 (30) | 28 (93) |
| Presence of papaya seeds in black pepper can be detected by (physical test) | 5 (17) | 28 (93) | 5 (17) | 30 (100) | 6 (20) | 27 (90) | 3 (10) | 25 (83) |
| The type of adulteration in which sugar syrup is added to honey is an example of (Intentional adulteration) | 19 (63) | 29 (97) | 15 (50) | 27 (90) | 9 (30) | 23 (77) | 4 (13) | 27 (90) |
| Consuming Adulterated milk may lead to(Cancer) | 16 (53) | 20 (67) | 11 (37) | 20 (67) | 6 (20) | 25 (83) | 4 (13) | 24 (80) |
| Which one of the following is used as an adulterant in turmeric powder (Metanil) | 17 (57) | 23 (77) | 11 (37) | 25 (83) | 23 (77) | 29 (97) | 21 (70) | 26 (87) |
| Which one of the following is added to adulterate butter(Margarine) | 11 (37) | 24 (80) | 5 (17) | 29 (97) | 7 (23) | 23 (77) | 13 (43) | 25 (83) |
| Following the consumer roles and responsibilities will (decrease the rate of food adulteration) | 6 (20) | 17 (57) | 15 (50) | 16 (53) | 7 (23) | 22 (73) | 13 (43) | 24 (80) |
| Food adulteration Act came into existence in the year(1954) | 2 (7) | 14 (47) | 5 (17) | 21 (70) | 13 (43) | 25 (83) | 8 (27) | 25 (83) |
| Food safety and standard Act was passed in the year(2006) | 5 (17) | 17 (57) | 13 (43) | 18 (60) | 12 (40) | 22 (73) | 2 (7) | 25 (83) |
| The argemone oil used to adulterate cooking oil is highly toxic which causes a disease known as(Epidemic dropsy) | 1 (3) | 6 (20) | 1 (3) | 10 (33) | 1 (3) | 12 (40) | 2 (7) | 15 (50) |
| _____ is used as an adulterant in milk.(Starch, water) | 17 (57) | 29 (97) | 17 (57) | 29 (97) | 25 (83) | 28 (93) | 21 (70) | 26 (86) |
| Iron fillings are used to adulterate.(Tea powder) | 5 (17) | 26 (87) | 3 (10) | 28 (93) | - | 21 (70) | 2 (7) | 25 (83) |
| _____ is used as an adulterant in honey.(Sugar syrup) | 10 (33) | 28 (93) | 12 (40) | 27 (90) | 21 (70) | 26 (87) | 12 (40) | 27 (90) |
| _____ is used as an adulterant in ice candy.(Rhodamine B) | 3 (10) | 6 (20) | 9 (30) | 10 (33) | 1 (3) | 19 (63) | 4 (13) | 20 (67) |

| Knowledge questions and answers | Private school | | | | Government school | | | |
|--|----------------|------------|----------|------------|-------------------|------------|----------|------------|
| | Girls | | Boys | | Girls | | Boys | |
| | Pre-test | Post-test | Pre-test | Post-test | Pre-test | Post-test | Pre-test | Post-test |
| Formalin is used in _____ to keep them fresh and is injurious to health.(Milk) | - | 22 (73) | - | 23 (77) | - | 23 (77) | - | 23 (77) |
| Dates seed powder mixed with coffee powder can | - | 14 | 4 | 16 | 1 | 7 | - | 16 |

| | | | | | | | | |
|--|------------|------------|-----------|------------|-----|------------|-----------|------------|
| cause. (diarrhea) | | (47) | (13) | (53) | (3) | (23) | | (53) |
| Arsenic sprayed on _____ can cause dizziness and paralysis.(Fruits and vegetables) | - | 23 (77) | 1 (3) | 25 (83) | - | 21 (70) | 7 (23) | 24 (80) |
| _____sheets are used on sweets instead of a silver foil.(Aluminum sheets) | 11 (37) | 22 (73) | 4 (13) | 23 (77) | - | 20 (67) | - | 18 (60) |
| In iodine test _____colour indicates the presence of starch.(Blue colour) | 11 (37) | 21 (70) | 5 (17) | 25 (83) | - | 24 (80) | 8 (27) | 22 (73) |

(Figures in parenthesis indicate percentages)

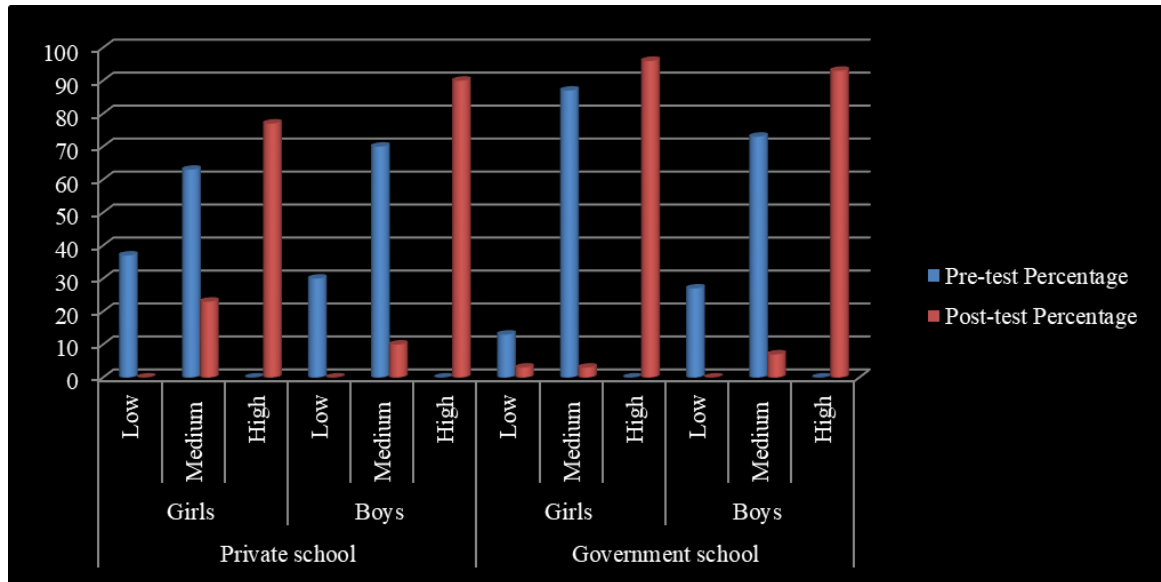


Fig 1: knowledge level of respondents according to the categories

After intervention, correct response rate increased by the respondents. It was stated that intervention provides knowledge. Vast difference in knowledge level was noticed between pre and post-intervention evaluation.

Figure 1 explains that the knowledge gain through multimedia intervention among respondents can be seen from table. Before intervention, most 63 per cent of the private school girls exhibited medium knowledge and 37 per cent low level of knowledge. Almost 70 per cent of private school boys exhibited medium knowledge while 30 per cent low level of knowledge. Majority (87%) of government school girls had medium level of knowledge and 13% had low level of knowledge. Nearly 73 per cent of government school boys exhibited medium knowledge while 27 per cent low level of knowledge.

After the post exposure of intervention, private girls exhibited medium (23%) and high (77%) level of knowledge. Among private school boys 90 per cent gained high knowledge and 10 per cent medium level of knowledge. Majority 94 per cent of girls from government school exhibited high level of knowledge, 3 per cent medium, 3 per cent low. Another 93 per cent of government boys gained high knowledge and 7 per cent medium knowledge.

Conclusion

It can be concluded that majority of the respondents prefer homemade food, they look at manufacture date and buy from retail shop, most of them were aware of food adulteration. The source of information about food adulteration was family, friends and mass media to most of the respondents. The results of the study revealed that student’s knowledge was low and medium before educational program. The well-structured and implemented educational programme through multimedia on food adulteration was very effective to increase the knowledge regarding food adulteration.

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