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Public Awareness and Perceptions on Food Adulteration and Safety: A Comprehensive Survey

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KEYWORDS

Food Adulteration, Food Safety, Public Awareness, Health, Knowledge

ABSTRACT:

Food adulteration means addition of substances intentionally or unintentionally that might be harmful to the human health and providing food that is free from harmful chemicals and doesn't affect the consumer is called food safety. In present-day Food adulteration and safety has become a concerning factor for human health. In order to reduce the effect of adulteration government has taken initiatives yet most of the consumers are not aware of this. This paper explores the knowledge, perceptions and attitude of the public towards understanding, practicing and awareness on Food safety and adulteration. An online survey was conducted and the results are as follows, most of the respondents know about the food adulteration and the most adulterated foods. They believe that making Food adulteration and safety awareness program and adding into the school curriculum may create a difference in selecting the right food. The survey highlights a disparity between consumer awareness and action. Further through statistical analysis it is evident that the that age and place of residence had a significant association between Knowledge on awareness of food adulteration and safety and knowledge on Specific Food commodities respectively. The other variables such as gender, education level, occupation, field of study and residence type did not have any significant association concluding that these factors did not impact the awareness levels on Food adulteration.

1. Introduction

The idea of food safety states that when food is consumed as intended, it doesn't harm the human. (ISO 22000, 2005). Anything that is hygienic and does not spread disease is considered as food hygiene (CAC, 2003). Providing consumers with safe food in increasingly competitive global markets is one of the main concerns. Food-borne viruses and chemicals that cause food-borne mishaps are the main causes of this increased focus on food safety. In the majority of underdeveloped nations, the impact of contamination-related food-borne illnesses has been overlooked. More than 1000 million cases of acute diarrhea in children under five occur annually in poor nations, according to WHO estimates (WHO, 2008).Food analysis plays a crucial role in determining the safety and quality of food materials intended for human consumption. Standardized test protocols and methods are recommended worldwide for evaluating various food components and parameters, and most analytical methods are updated with the advent of technology for precise and accurate measurement.

Over the past 20 years, there has been a significant advancement in instrumentation, mainly due to electronics and material science. In order to comply with the regulations, a food material must be tested and certified in an approved food laboratory. As a result of these advancements, researchers are investigating new food testing techniques to meet consumer and regulatory standards (Singam Suranjoy Singh & K. V. Ragavan). Stricter sanitary and phytosanitary regulations, enhanced international product standards, and evolving food safety standards necessitate strengthening a nation's legal

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framework based on the Hazard Analysis Critical Control Point (HACCP) codex.

The processed food sector faces a serious danger to its existence and expansion due to the numerous rules in the majority of emerging countries. In India, this region was under the jurisdiction of nine separate ministries. In order to deliberately and scientifically reorient the food processing and manufacturing industry from regulation to self-compliance, the Food Safety and Standards Act was created to combine India's food safety legislation. Any national food safety control system must adhere to the fundamentals of food hygiene and Good Manufacturing Practice (GMP) as outlined by Codex (Seema Shukla et al.,2014).

Food colors, which can be pigments, dyes, or any other compounds that give color to the substances to which they are added, are added to edibles to make them look more appealing. In recent years, it has become clear that consumers place a great deal of importance on the color and appearance of any food item or spices (Yadav DS et al.,2016). Food may be improved or made more enticing and appealing by adding certain colors. Food colorants may be either authorized or nonpermitted (Khanna SK et al.,2007). Even when allowed, they shouldn't be introduced in excess of what is allowed. In any case, a number of studies that have been published thus far demonstrate the highest level of sample adulteration with either prohibited or permissible colors that beyond the recommended threshold (Nath PP et al., 2015). Metanil yellow (MY) and rhodamine B are two of the most often used prohibited colors in food adulteration (Downham A et al., 2000). Diphenylamine and diazotized metanilic acid are the ingredients of MY, a yellow azo dye. [Khanna SK et al., 1991] Wool, nylon, silk, paper, ink, aluminum, detergent, and other materials are typically colored with it in the industrial sector. Even though MY is only meant for industrial application, it has been shown to be applied to a variety of foods and spices, particularly turmeric, to improve their color and appearance. [Alves SP et al.,2008] In any case, research shows that MY is a strong chemical that can have a number of harmful impacts on many bodily systems, even when taken in little doses over an extended period of time. [Alves SP et al.,2008 & Choi H et at., 2012] It has been shown to induce degenerative alterations in the liver, kidneys, and stomach lining.

In December 2008, melamine contamination in milk and infant formula caused at least six infant deaths in China and 294,000 kidney stones and other urinary problems in another 294,000 infants. In India, there have also been cases of children becoming ill after eating contaminated midday meals and adulterating Kuttu flour during festival season. Foodborne illness can harm trade and tourism and result in lost income, unemployment, and legal action. The World Trade Organization's (WTO) Technical Barrier to Trade (TBT) agreement provides equal opportunities for all nations to trade while also requiring all members to have the same food standards as defined by the Codex Alimentarius Commission. Trade restrictions have been lifted, and exporting nations must meet the minimal standards. The signatory nation is in charge of ensuring that food is safe. Food safety is the responsibility of all parties involved in a food chain, including growers and farmers, manufacturers and processors, food handlers, and consumers. Contamination can occur anywhere along the food chain. A key control method for ensuring food safety compliance is the national food regulatory model. The focus of the FAO guidelines (FAO/WHO, 2003) on "Strengthening national food control systems" is on capacity building and self-evaluation by government agencies and food control authorities. Six components form the basis of the evaluation: food control management, food laws, food inspection, official food control labs, and information, education, and communication on food safety and quality. This study examines the Indian food regulatory model, which has experienced a change from regulating food adulteration to enacting proactive food safety laws focused on the reduction of hazards, mainly under the six FAO-defined criteria (FAO/WHO, 2006). A model based on risk assessment is put forth for the efficient administration of the national food control program after identifying the program's internal strengths and weaknesses as well as external opportunities and threats. Food and nutrition security is a widespread problem that requires immediate worldwide attention. This problem is exacerbated by a variety of variables and impacts a wide range of populations globally. A comprehensive, interdisciplinary approach is required to achieve sustainable food and nutrition security for communities and smallholders, which calls for cooperation between specialists in different sectors. In order to overcome current obstacles,

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tackling this complicated issue calls for creative, nontraditional solutions. In order to make meaningful development, obstacles such a lack of resources, poor infrastructure, and restricted market access must be removed. Finding the current building blocks across many sectors is essential to overcoming these obstacles. Making use of these building blocks can help us get toward a comprehensive systems vision by opening the door for an incremental progress strategy (Amit Kumar et al., 2024).

In order to meet the demand for food on a worldwide scale, a number of interrelated factors come together, including the population's exponential growth, shifting demographics, societal changes, the pervasive impact of climate change, growing urbanization, and the rapid advancement of technology. These elements work together in a complex causal chain to produce the cumulative effects of the megatrends outlined above (Kappenthuler and Seeger, 2019). The observable influence of megatrends is apparent in a dynamic global setting, but the precise and predictable consequences are still unknown. For example, although it is evident that the world's population is aging, specifics about how this is affecting the agricultural system need more clarification. The world's food production will surely be under a lot of strain as a result of this demographic upheaval. Megatrends also exhibit long-term consequences at enormous sizes, although their global ramifications and severity vary. Significant regional and agricultural system differences are evident in the expected effects of climate change, with low-income nations—especially those with a preponderance of small-scale producers—and industrialized agricultural regions exhibiting unique dynamics and variability (Ewert et al., 2015). Exponential population growth presents numerous issues for the food system, impacting nutrition goals, food production, and the environment, ultimately leading to new demands for food security and supply (Loboguerrero et al., 2020). As the population grows, so does exposure to chemicals, and the effects of climate change and international food transportation further compound this problem. From food production to storage and consumption, chemical dangers can enter the food chain at any stage, and their persistence makes the issue more complicated. Agrochemicals, industrial and environmental pollutants, contaminants from processing or storage, contaminants from contact materials, and biotoxins are some examples of these contaminants (King et al., 2017).

2. Objectives

- To assess the public's understanding of food adulteration
- To investigate public awareness of regulatory measures
- To identify consumer practices related to food safety
- To gauge public attitudes and perceptions on the issue

3. Methodology

An online survey was conducted as a part of the project titled “A Multi- disciplinary approach for testing, analyzing and creating awareness on Food Safety (Adulteration and Preservation)”. A Google form questionnaire consisting of 24 questions based on Food adulteration and safety, understanding perceptions and beliefs on Food was given for survey using Knowledge, Attitude and Practice (KAP method) along with demographic details. The questions were framed as Multiple Choice Questions, Multi answer select type questions and Dichotomous type. And the responses were collected through the email responses. Further the collected data was subjected to Statistical Analysis (F test, Chi-sqauare test) to know the association between the KAP and the demographic variables using SPSS software.

Data Collection:

Online platforms such as Emails, Whatsapp groups were used for collecting the data. A total of 400 responses have been received.

Inclusion criteria: Age above 18 with any Educational background and the residents of Urban, Semi-Urban and Rural areas were included.

Exclusion criteria: Age below 18.

4. Key Findings

Knowledge and Perception of Food Adulteration

The results of the survey indicate that the general public is aware about what food adulteration is. The "addition of harmful substances" is how most people define it.

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"Mixing low-quality ingredients" and "using artificial color/preservatives" were two other noteworthy replies. Just a small percentage of respondents said they didn't know anything about the subject. The possible health effects are also well known; most people think that eating adulterated food can result in food poisoning.

Identification of Adulterated Food Items and Substances

Several food categories were noted by respondents as being especially vulnerable to adulteration. The most often found adulterants were milk and dairy products (74.5%), oils, and ghee (61.1%). A noteworthy 78.2% of respondents said that artificial coloring was the most prevalent adulterant in spices. Nearly half of the respondents (49.7%) think that urea, water, and detergent are used in milk. The most commonly reported adulterant for pulses was synthetic color (60.5%), whereas 64.2% of respondents recognized calcium carbide as the substance used to artificially ripen fruits.

Consumer Practices and Awareness

The poll focuses on consumers' basic food safety practices and typical techniques for spotting adulteration. "Smell or taste testing" (50%) and "checking for certification marks or labels" (46.5%) are the next most popular methods, behind "visual inspection" (55.7%). The most popular method for guaranteeing food safety at home is "washing fruits/vegetables" (72.8%). Additional strategies include "avoiding street food" (38.3%), "buying organic food" (57.6%), and "checking FSSAI certification" (55.1%). 56.3% of respondents "always" examine food labels before making a purchase, which is a noteworthy statistic.

Attitudes and Perceptions on Food Adulteration

The results of the study indicate that there is broad public agreement regarding the gravity of food adulteration and the necessity of taking action. The vast majority of respondents (73.9%) "strongly agree" and 19.4% "agree" that food adulteration is a severe problem. The government (50%), retailers/vendors (44.9%), and consumers themselves (24.4%) are the next most frequently held accountable parties, after food manufacturers (71.3%). Additionally, 67.7% of respondents "very agree" and 20.4% "agree" that the government should adopt more stringent measures to prevent food adulteration. Additionally, the majority of the public (92.3%) supports making food safety education "obligatory" in the school curriculum.

Consumer Trust and Storage Practices

Customers' apprehension of food from local markets is another finding of the survey. Just 26.7% of those surveyed said they "always" trusted the food from their local markets. Significantly, 26.2% indicated they "occasionally" trust it, and 47.1% said they are "doubtful." In terms of household habits, using a refrigerator is the most popular way to store perishable food items (64.7%). Additional techniques include covering but not refrigerating products (17.9%), exposing them to open air (22.5%), and utilizing airtight containers (29.9%).

Consumer Actions and Reporting

The survey highlights a disparity between consumer awareness and action. While 76.5% of people reported that they have stopped buying a product after they learned it was adulterated, a large majority (61%) have never reported a case of suspected food adulteration to the authorities. This suggests that while consumers are willing to change their purchasing habits, there's a significant reluctance to formally report such issues.

Public Opinion on Food Safety Education

The survey indicates strong public support for formal food safety education. An overwhelming 92.3% of respondents believe that food safety education should be a mandatory part of the school curriculum. This finding points to a public perception that systematic education is a key long-term strategy for combating food adulteration.

Trust in the Food Supply Chain

The findings reveal a general lack of trust in the local food supply. Only 26.7% of respondents reported that they "always" trust the food they buy from local markets. A majority of people either stated they "sometimes" trust it (26.2%) or are "doubtful" (47.1%). This widespread skepticism highlights a need for greater transparency and improved safety standards at the local level.

5. Results and Discussion

The demographic characteristics of the 400 respondents are presented in this section. The analysis revealed a diverse sample with a concentration of participants in key age, educational, and occupational groups.

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The age distribution showed that a majority of the participants were between 26-35 years old, accounting for 50.0% of the total sample (n=200). This was followed by the 18-25 years age group, which comprised 24.5% (n=98) of the respondents, and the 36-45 years age group, making up 18.5% (n=74). The remaining age groups (below 18, 46-55, and above 55) represented a smaller portion of the sample, totaling 7.1%.

In terms of gender, the sample was fairly balanced, with 52.0% (n=208) of the respondents being female and 48.0% (n=192) being male.

The educational profile of the respondents indicated a high level of academic attainment. The largest group of respondents (54.8%, n=219) held a graduate degree, while 38.5% (n=154) had a postgraduate or higher degree. A smaller percentage of respondents had a secondary (6.0%, n=24) or primary (0.8%, n=3) education level.

Regarding occupation, a significant portion of the respondents (41.5%, n=166) were private sector employees. Other notable occupational groups included students (20.3%, n=81) and individuals in other fields (13.0%, n=52). Farmers, government employees, homemakers, and business persons constituted the remaining groups. The field of study of the respondents was dominated by the arts (33.0%, n=132), followed by engineering (14.8%, n=59) and agriculture (13.8%, n=55).

Finally, the geographical distribution of the respondents showed that a majority lived in rural areas (52.0%, n=208), while 38.8% (n=155) resided in urban areas and 9.3% (n=37) in semi-urban areas. The most represented locations were Andhra Pradesh (65 respondents) and various cities within Andhra Pradesh, highlighting a regional focus for the survey.

Association Between Knowledge on awareness of food adulteration and safety and Demographic variable. N=400

S.no.	Demographic variables		Knowledge on awareness of food adulteration and safety				Chi square
			Average		Good		P val (<0.05)
			F	%	F	%	
1.	Age	Below 18	0	0.0%	3	0.8%	**0.03 (S)**
		18-25	17	4.2%	81	20.2%	
		26-35	20	5%	180	45%	
		36-45	2	0.5%	72	18%	
		46-55	1	0.2%	13	3.2%	
		Above 55	0	0%	11	2.7%	
2.	Gender	Male	15	3.7%	177	44.2%	0.16 (NS)
		Female	25	6.2%	183	45.7%	
3.	Education level	Primary (upto 5th grade)	0	0%	3	0.75%	0.12 (NS)
		Secondary (6th – 12th grade)	0	0%	24	6%	
		Graduate	28	7%	191	47.7%	
		Postgraduate & above	12	3%	142	35.5%	
4.	Occupation	Student	8	2%	73	18.2%	
		Homemaker	2	0.5%	18	4.5%	

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S.no.	Demographic variables		Knowledge on awareness of food adulteration and safety				Chi square
			Average		Good		P val (<0.05)
			F	%	F	%	
		Private sector employee	16	4%	150	37.5%	0.46 (NS)
		Government employee	2	0.5%	23	5.7%	
		Business person	3	0.7%	13	3.2%	
		Others	1	0.2%	39	9.7%	
		Farmer	8	2%	44	11%	
5.	Field of study	Agriculture	6	1.5%	49	12.2%	0.37 (NS)
		Arts	10	2.5%	122	30.5%	
		Engineering	11	2.8%	48	12%	
		Farmer	3	0.8%	29	7.2%	
		Food Technology	4	1%	33	8.2%	
		Lecturer	0	0%	10	2.5%	
		Medicine	3	0.8%	26	6.5%	
		Science	3	0.8%	43	10.8%	
6.	Residence type	Urban	19	4.8%	136	34%	0.27 (NS)
		Semi-Urban	5	1.2%	32	8%	
		Rural	16	4%	192	48%	
7.	Location	Anakapalli, AP	0	0%	2	0.5%	0.63 (NS)
		Anantapur, AP	3	0.8%	20	5%	
		AP	5	1.2%	60	15%	
		Bangalore, Karnataka	0	0%	10	2.5%	
		Dehradun, Uttarakhand	0	0%	1	0.2%	
		Eluru, AP	2	0.5%	14	3.5%	
		Guntur, AP	2	0.5%	16	4%	
		Haridwar, Uttarakhand	0	0%	2	0.5%	
		Hyderabad,Telangana	3	0.8%	21	5.2%	
		Kadapa, AP	0	0%	4	1%	
		kakinada, AP	3	0.8%	36	9%	
		Kuppam, AP	0	0%	10	2.5%	
		Kurnool, AP	1	0.2%	8	2%	

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S.no.	Demographic variables		Knowledge on awareness of food adulteration and safety				Chi square
			Average		Good		P val (<0.05)
			F	%	F	%	
		Nandyal, AP	0	0%	13	3.2%	
		Nellore, AP	2	0.5%	8	2%	
		Ongole, AP	1	0.2%	5	1.2%	
		Prakasam, AP	2	0.5%	4	1%	
		Rajahmundry, AP	0	0%	6	1.5%	
		Rayachoty, AP	0	0%	3	0.8%	
		Rishikesh, Uttarakhand	1	0.2%	7	1.8%	
		Srikakulam, AP	7	1.8%	17	4.2%	
		Tirupati, AP	4	1%	38	9.5%	
		Tiruvallur, Tamil Nadu	0	0%	3	0.8%	
		UP	0	0%	2	0.5%	
		USA	0	0%	1	0.2%	
		Vijayawada, AP	2	0.5%	19	4.8%	
		Visakhapatnam, AP	2	0.5%	30	7.5%	

The table reveals that there was **significant** between the awareness of food adulteration and safety and **age** of the respondents. Here p value is **0.03** less than p value (0.05) for the demographic variable of age.

Association Between Knowledge on Specific Food Commodities and Demographic variable. N=400

S.no.	Demographic variables		Knowledge on Specific Food Commodities						Chi square
			Poor		Average		Good		P val (<0.05)
			F	%	F	%	F	%	
1.	Age	Below 18	0	0%	1	0.2%	2	0.5%	0.54 (NS)
		18-25	0	0%	41	10.2%	57	14.2%	
		26-35	6	1.5%	69	17.2%	125	31.2%	
		36-45	4	1%	31	7.8%	39	9.8%	
		46-55	0	0%	7	1.8%	7	1.8%	
		Above 55	0	0%	4	1%	7	1.8%	
2.	Gender	Male	7	1.8%	71	17.8%	114	28.5%	0.35 (NS)
		Female	3	0.8%	82	20.5%	123	30.8%	

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S.no.	Demographic variables		Knowledge on Specific Food Commodities						Chi square
			Poor		Average		Good		P val (<0.05)
			F	%	F	%	F	%	
3.	Education level	Primary (upto 5th grade)	0	0%	2	0.5%	1	0.2%	0.69 (NS)
		Secondary (6th – 12th grade)	1	0.2%	8	2%	15	3.8%	
		Graduate	5	1.2%	91	22.8%	123	30.8%	
		Postgraduate & above	4	1%	52	13%	98	24.5%	
4.	Occupation	Student	1	0.2%	28	7%	52	13%	0.392 (NS)
		Homemaker	1	0.2%	6	1.5%	13	3.2%	
		Private sector employee	4	1%	65	16.2%	97	24.2%	
		Government employee	0	0%	12	3%	13	3.2%	
		Business person	2	0.5%	7	1.8%	7	1.8%	
		Others	0	0%	14	3.5%	26	6.5%	
		Farmer	2	0.5%	21	5.2%	29	7.2%	
5.	Field of study	Agriculture	0	0%	21	5.2%	34	8.5%	0.395 (NS)
		Arts	4	1%	59	14.8%	69	17.2%	
		Engineering	1	0.2%	15	3.8%	43	10.8%	
		Farmer	1	0.2%	11	2.8%	20	5%	
		Food Technology	1	0.2%	11	2.8%	25	6.2%	
		Lecturer	0	0%	6	1.5%	4	1%	
		Medicine	2	0.5%	12	3%	15	3.8%	
		Science	1	0.2%	18	4.5%	27	6.8%	
6.	Residence type	Urban	4	1%	55	13.8%	96	24%	0.92 (NS)
		Semi-Urban	1	0.2%	14	3.5%	22	5.5%	
		Rural	5	1.2%	84	21%	119	29.8%	
7.	Location	Anakapalli, AP	0	0%	2	0.5%	0	0%	**0.007 (S)**
		Anantapur, AP	0	0%	9	2.2%	14	3.5%	
		AP	3	0.8%	22	5.5%	40	10%	
		Bangalore, Karnataka	0	0%	2	0.5%	8	2%	
		Dehradun, Uttarakhand	1	0.2%	0	0%	0	0%	

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S.no.	Demographic variables		Knowledge on Specific Food Commodities						Chi square
			Poor		Average		Good		P val (<0.05)
			F	%	F	%	F	%	
		Eluru, AP	0	0%	7	1.8%	9	2.2%	
		Guntur, AP	0	0%	10	2.5%	8	2%	
		Haridwar, Uttarakhand	0	0%	0	0%	2	0.5%	
		Hyderabad,Telangana	0	0%	8	2%	16	4%	
		Kadapa, AP	0	0%	4	1%	0	0%	
		kakinada, AP	1	0.2%	15	3.8%	23	5.8%	
		Kuppam, AP	0	0%	4	1%	6	1.5%	
		Kurnool, AP	0	0%	4	1%	5	1.2%	
		Nandyal, AP	0	0%	2	0.5%	11	2.8%	
		Nellore, AP	1	0.2%	4	1%	5	1.2%	
		Ongole, AP	0	0%	3	0.8%	3	0.8%	
		Prakasam, AP	0	0%	2	0.5%	4	1%	
		Rajahmundry, AP	0	0%	2	0.5%	4	1%	
		Rayachoty, AP	0	0%	1	0.2%	2	0.5%	
		Rishikesh, Uttarakhand	0	0%	2	0.5%	6	1.5%	
		Srikakulam, AP	0	0%	11	2.8%	13	3.2%	
		Tirupati, AP	2	0.5%	19	4.8%	21	5.2%	
		Tiruvallur, Tamil Nadu	0	0%	0	0%	3	0.8%	
		UP	0	0%	0	0%	2	0.5%	
		USA	0	0%	0	0%	1	0.2%	
		Vijayawada, AP	1	0.2%	12	3%	8	2%	
		Visakhapatnam, AP	1	0.2%	8	2%	23	5.8%	

The table reveals that there was **significant correlation** between the knowledge on Specific Food Commodities and **Location** of the respondents. Here p value is **0.007** less than p value (0.05) for the demographic variable of location.

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Association Between Attitude to understand perceptions and beliefs and Demographic variable. N=400

S.no.	Demographic variables		Attitude to understand perceptions and beliefs				Chi square
			Average		Good		P val (<0.05)
			F	%	F	%	
1.	Age	Below 18	0	0%	3	0.8%	0.77 (NS)
		18-25	6	1.5%	92	23%	
		26-35	9	2.2%	191	47.8%	
		36-45	2	0.5%	72	18%	
		46-55	0	0%	14	3.5%	
		Above 55	1	0.2%	10	2.5%	
2.	Gender	Male	6	1.5%	186	46.5%	0.20 (NS)
		Female	12	3%	196	49%	
3.	Education level	Primary (upto 5th grade)	0	0%	3	0.8%	0.59 (NS)
		Secondary (6th – 12th grade)	0	0%	24	6%	
		Graduate	12	3%	207	51.7%	
		Postgraduate & above	6	1.5%	148	37%	
4.	Occupation	Student	5	1.2%	76	19%	0.68 (NS)
		Homemaker	0	0%	20	5%	
		Private sector employee	8	2%	158	39.5%	
		Government employee	1	0.2%	24	6%	
		Business person	0	0%	16	4%	
		Others	3	0.8%	37	9.2%	
		Farmer	1	0.2%	51	12.8%	
5.	Field of study	Agriculture	1	0.2%	54	13.5%	0.38 (NS)
		Arts	7	1.8%	125	31.2%	
		Engineering	3	0.8%	56	14%	
		Farmer	0	0%	32	8%	
		Food Technology	4	1%	33	8.2%	
		Lecturer	1	0.2%	9	2.2%	
		Medicine	1	0.2%	28	7%	
		Science	1	0.2%	45	11.2%	

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S.no.	Demographic variables		Attitude to understand perceptions and beliefs				Chi square
			Average		Good		P val (<0.05)
			F	%	F	%	
6.	Residence type	Urban	8	2%	147	36.8%	0.79 (NS)
		Semi-Urban	1	0.2%	36	9%	
		Rural	9	2.2%	199	49.8%	
7.	Location	Anakapalli, AP	0	0%	2	0.5%	0.74 (NS)
		Anantapur, AP	1	0.2%	22	5.5%	
		AP	2	0.5%	63	15.8%	
		Bangalore, Karnataka	0	0%	10	2.5%	
		Dehradun, Uttarakhand	0	0%	1	0.2%	
		Eluru, AP	1	0.2%	15	3.8%	
		Guntur, AP	1	0.2%	17	4.2%	
		Haridwar, Uttarakhand	0	0%	2	0.5%	
		Hyderabad,Telangana	0	0%	24	6%	
		Kadapa, AP	0	0%	4	1%	
		kakinada, AP	4	1%	35	8.8%	
		Kuppam, AP	2	0.5%	8	2%	
		Kurnool, AP	0	0%	9	2.2%	
		Nandyal, AP	0	0%	13	3.2%	
		Nellore, AP	0	0%	10	2.5%	
		Ongole, AP	0	0%	6	1.5%	
		Prakasam, AP	0	0%	6	1.5%	
		Rajahmundry, AP	0	0%	6	1.5%	
		Rayachoty, AP	1	0.2%	2	0.5%	
		Rishikesh, Uttarakhand	0	0%	8	2%	
		Srikakulam, AP	2	0.5%	22	5.5%	
		Tirupati, AP	2	0.5%	40	10%	
		Tiruvallur, Tamil Nadu	0	0%	3	0.8%	
		UP	0	0%	2	0.5%	
		USA	0	0%	1	0.2%	
		Vijayawada, AP	1	0.2%	20	5%	
		Visakhapatnam, AP	1	0.2%	31	7.8%	

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The table reveals that there was **no significant correlation** between Attitude to understand perceptions and beliefs and Demographic variable of the respondents.

Association Between Practice to assess behaviour and habits and Demographic variable. N=400

S.no.	Demographic variables		Practice to assess behaviour and habits				Chi square
			Average		Good		P val (<0.05)
			F	%	F	%	
1.	Age	Below 18	0	0%	3	0.8%	0.33 (NS)
		18-25	10	2.5%	88	22%	
		26-35	9	2.2%	191	47.8%	
		36-45	5	1.2%	69	17.2%	
		46-55	0	0%	14	3.5%	
		Above 55	0	0%	11	2.8%	
2.	Gender	Male	12	3%	180	45%	0.84 (NS)
		Female	12	3%	196	48%	
3.	Education level	Primary (upto 5th grade)	1	0.2%	2	0.5%	0.24 (NS)
		Secondary (6th – 12th grade)	1	0.2%	23	5.8%	
		Graduate	13	3.2%	206	51.5%	
		Postgraduate & above	9	2.2%	145	36.2%	
4.	Occupation	Student	5	1.2%	76	19%	0.40 (NS)
		Homemaker	3	0.8%	17	4.2%	
		Private sector employee	9	0.2%	157	39.2%	
		Government employee	3	0.8%	22	5.5%	
		Business person	1	0.2%	15	3.8%	
		Others	2	0.5%	38	9.5%	
		Farmer	1	0.2%	51	12.8%	
5.	Field of study	Agriculture	3	0.8%	52	13%	0.60 (NS)
		Arts	7	1.8%	125	31.2%	
		Engineering	5	1.2%	54	13.5%	
		Farmer	0	0%	32	8%	
		Food Technology	2	0.5%	35	8.8%	
		Lecturer	0	0%	10	2.5%	
		Medicine	2	0.5%	27	6.8%	
		Science	5	1.2%	41	10.2%	

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S.no.	Demographic variables		Practice to assess behaviour and habits				Chi square
			Average		Good		P val (<0.05)
			F	%	F	%	
6.	Residence type	Urban	7	1.8%	148	37%	0.11 (NS)
		Semi-Urban	5	1.2%	32	8%	
		Rural	12	3%	196	49%	
7.	Location	Anakapalli, AP	0	0%	2	0.5%	0.65 (NS)
		Anantapur, AP	1	0.2%	22	5.5%	
		AP	5	1.2%	60	15%	
		Bangalore, Karnataka	1	0.2%	9	2.2%	
		Dehradun, Uttarakhand	0	0%	1	0.2%	
		Eluru, AP	1	0.2%	15	3.8%	
		Guntur, AP	1	0.2%	17	4.2%	
		Haridwar, Uttarakhand	0	0%	2	0.5%	
		Hyderabad,Telangana	2	0.5%	22	5.5%	
		Kadapa, AP	0	0%	4	1%	
		kakinada, AP	1	0.2%	38	9.5%	
		Kuppam, AP	1	0.2%	9	2.2%	
		Kurnool, AP	1	0.2%	8	2%	
		Nandyal, AP	3	0.8%	10	2.5%	
		Nellore, AP	0	0%	10	2.5%	
		Ongole, AP	0	0%	6	1.5%	
		Prakasam, AP	1	0.2%	5	1.2%	
		Rajahmundry, AP	0	0%	6	1.5%	
		Rayachoty, AP	0	0%	3	0.8%	
		Rishikesh, Uttarakhand	0	0%	8	2%	
		Srikakulam, AP	3	0.8%	21	5.2%	
		Tirupati, AP	2	0.5%	40	10%	
		Tiruvallur, Tamil Nadu	1	0.2%	2	0.5%	
		UP	0	0%	2	0.5%	
		USA	0	0%	1	0.2%	
		Vijayawada, AP	0	0%	21	5.2%	
		Visakhapatnam, AP	0	0%	32	8%	

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The table reveals that there was **no significant correlation** between Practice to assess behavior and habits and Demographic variable of the respondents.

6. Summary

The survey reveals a significant association between Knowledge on awareness of food Adulteration and age group of the participants ($p= 0.03$, $p < 0.05$). The data reveals the age group of 25-35years had better awareness and understanding of Food Adulteration and safety with 45% when compared to other age groups. However, the data revealed that there was no significant association found between Knowledge and awareness of Food Adulteration.

A significant association was found between respondents place of residence and their level of Knowledge on specific food commodities ($p= 0.007$, $p< 0.05$). Among the respondents from Andhra Pradesh a higher percentage of respondents from Kakinada (5.8%), Visakhapatnam (5.8%) and Tirupati (5.2%) had good knowledge levels on specific food commodities compared to other districts.

The other factors such as gender, education levels and occupation have no influence on knowledge on specific food commodities.

There was no significance association established between any demographic variable and Attitude to understand perceptions and beliefs on Food adulteration and safety.

7. Conclusion

The current study was conducted to assess the association between various demographic variables and knowledge levels, awareness and practices regarding food adulteration and safety among 400 respondents. The survey revealed that age and place of residence had a significant association between Knowledge on awareness of food adulteration and safety and knowledge on Specific Food commodities respectively. The other variables such as gender, education level, occupation, field of study and residence type did not have any significant association concluding that these factors did not impact the awareness levels on Food adulteration.

Participants aged 26-35 years exhibit good understanding of Food Adulteration and safety. Notably residents in smart cities namely Tirupati, Kakinada and Visakhapatnam exhibited better awareness on specific commodities in Food safety and adulteration.

These findings help us to understand the importance of awareness campaigns for younger age groups below 26 and older age groups too. Improving public awareness through community outreach and educational interventions can help to reduce the risks associated with food adulteration and promote a safer, healthier society.

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