ORIGINAL ARTICLE

KAP Analysis on Food Safety among University Students of South India

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ABSTRACT Food-borne diseases represent a growing worldwide public health problem. Young adults have been reported to have inadequate food safety knowledge, poor attitude and inappropriate behavior. The present study was taken up to assess the level of food safety characteristics and investigate the association between the living status and knowledge, attitude and practices of the South Indian University students. A quantitative online questionnaire was used to collect the data from the 4 different university students of South India. The online questionnaire was shared with students via different social media groups and E-mail. 465 students from various institutions in south India has responded for the food safety questionnaire, among them 211 students are day scholars, 53 students stay as paying guest and 201 are staying at hostels. Comparison of food safety knowledge among living status of students (Day Scholar, Hosteller and Paying Guest) was performed using X2 test and ANOVA. The study reports indicate that the students living status has influence on the knowledge towards food safety ($p< 0.000$), students living as paying guest (Wt. Mean = 1.41) scored well on knowledge comparatively with day scholars (Wt.Mean = 1.37) and hostellers (Wt. Mean = 1.34). However there is no considerable difference among students towards attitude and practices of food safety ($p>0.000$).The study results indicated that majority of the students irrespective of their living status have positive attitude towards food safety and have good practices. Therefore, the findings of the present study indicate that educational interventions in the form of courses and workshops can be effective in improving food safety knowledge in students especially among the hostlers.

Keywords: Food safety, University students, Knowledge, Attitude

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BACKGROUND

Food borne diseases (FBD) comprises a broad spectrum of illnesses and arises due to consumption of unsafe food or water contaminated with toxic chemicals and harmful microorganisms. Food borne diseases represents a growing global public health problem causing more than 200 diseases ranging from severe diarrhea to cancer [1,2]. Food borne diseases may lead to miscarriage in pregnant women, long-lasting disability and death of both adults and new born babies. Enterohaemorrhagic *Escherichia coli*, *Salmonella sps.*, *Listeria sp.* *Vibrio cholera* and Campylobacter sp, are some of the common food borne bacterial pathogens that affect millions of people annually across the world. According to WHO 2017 statics, an estimated 600 million people (1 in 10 people) fall ill due to consumption of contaminated food and of which, 420000 die each year with a total loss of 33 million healthy life years

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(DALYs). A surveillance study conducted on food borne illness from 2009-2018 suggests that 2688 food borne outbreaks were reported in India[3]. An estimated 100 million cases of food borne illness and 120000 associated deaths occur each year in India. As per the reports of Integrated Disease Surveillance Project (IDSP) of India, 40% of all the reported outbreaks in India during 2011-2017 are diarrheal diseases[4,5]. Food safety and hygiene are major determinants of food borne illness and the contamination of food may occur at any stage of food production, i.e., farm to plate. The manifold reasons for food contamination includes poor sanitation, inadequate food storage facilities, use of unclean water for food preparation, dearth of drinking water, lack of personal hygiene, improper handling and absence of education on food safety[6].

Although exhaustive research has been done in the food safety area and several control and preventive measures implemented in the food industry, a very high levels of food borne diseases have been reported[7]. Several studies conducted among the University students found that the food safety knowledge, practices and attitude of the university students is of great concern as their health is at risk from food borne diseases due to inadequate knowledge, poor attitude and unhygienic practices of food safety[8, 9]. A very few studies have been conducted on the self-reported practices, attitude and food safety knowledge among the Indian students of higher education[10-13]. Several previous questionnaire based studies conducted on food safety knowledge and practices of the university students reported/explored the influence of age, gender, place of living, cooking habits, year of study, educational level, type of diet and previous food poisoning experience[9, 14-17]. However, no study has been conducted on the association or impact of living status on the food safety knowledge and practices of the university students. Hence, the present study aimed at understanding the university student's food safety knowledge, attitude and practices using structured questionnaire to identify the gaps in food safety education and to strengthen the food safety interventions. Further, the study also explored or analyzed the association of living status of the university students and food safety knowledge and practices. Findings of the study would be useful in designing appropriate tools to improve the food safety knowledge and rectify the inappropriate food handling practices or believes among the university students.

MATERIALS AND METHODS

Study Design, Data Collection

A cross sectional study was conducted from February 2020 to August 2021 to understand the levels of food safety knowledge, attitudes and practices of the University students. The study participants consisted of students from 5 universities including Vikrama Simhapuri University, NTR Health University, and Acharya NG Ranga Agricultural University from Andhra Pradesh, Reva University, Bangalore, Karnataka and Central University, Assam. Data from the students was collected through an online questionnaire. Online questionnaire was initially validated in a pilot study taken up involving a cohort of 20 students randomly. Then the questionnaire was shared with the faculty of the concerned universities after briefing about significance, objectives and protocol of the KAP study. Faculty shared the online questionnaire link as an open link through Google form via different social media groups such as WhatsApp and Face book and asked students to participate in the study voluntarily. The inclusion criteria for study participants were a registered student of the university and willing to participate in the study.

About the Questionnaire

The questionnaire comprised of four sections with questions pertaining to demographic profiles, knowledge, attitude and practices. The first section consists of 13 questions pertaining demographic information. Apart from the demographic data, questions pertaining to cooking habits and food poisoning experience. One question was asked whether students pay attention to the food safety information. Second section focused on the food safety knowledge of students and comprised of 12 statements where the answer could be either true or false. The total food safety knowledge score of the students was calculated by adding all the correct responses of the 12 knowledge questions. Responses to the attitude questions were recorded as 3 point Likert-type scale with agree, disagree and not sure as choice of options. 4th section consisted of 10 open ended questions with always, sometimes and never as answer choices.

Statistical Analysis

The primary data collected from the respondents was analyzed using SPSS version 20.0 package. The responses were entered into SPSS software as a categorical variable, wrong answer was given the score of 0 and all right answers were assigned score of 1. The students were categorized based on their living status such as day scholars, hostellers and paying guest. Chi Square test was employed to examine the influence of living status of university students on their knowledge, attitude and practices towards food safety.

RESULTS AND DISCUSSION

The responses of the students to the food safety knowledge questions are presented in Table 1. 465 students from various institutions in south India has responded for the food safety

Table 1: Responses Towards Food Safety Knowledge

Knowledge of Respondents	Day Scholars		Paying Guest		Hostellers		Total		X^2 p-value
	True n (%)	False n (%)	True n (%)	False n (%)	True n (%)	False n (%)	True n (%)	False n (%)	
It is important to wash hands before handling food.	211	0	53 (11.4)	0	200	1	464	1	0.518
	-45.4	0		0	-43	-0.2	-99.8	-0.2	
Food can be kept in the refrigerator for a long time	29	182	5	48	39	162	73	392	0.119
	-6.2	-39.1	-1.1	-10.3	-8.4	-34.8	-15.7	-84.3	
Cooked food or leftovers do not need to be thoroughly heated before eating	63	148	21	32	77	124	161	304	0.142
	-13.5	-31.8	-4.5	-6.9	-16.6	-26.7	-34.6	-85.4	
Food born diseases are infectious or toxic	183	28	49	4	174	27	406	59	0.489
	-39.4	-6	-10.5	-0.9	-37.4	-5.8	-87.3	-12.7	
Washing fruits and vegetables with salt removes pesticide residues	202	9	50	3	192	9	444	21	0.908
	-43.4	-1.9	-10.8	-0.6	-41.3	-1.9	-95.5	-4.5	
Food with bad smell, appearance or taste are suitable for consumption	35	176	2	51	49	152	86	379	0.002
	-7.5	-37.8	-0.4	-11	-10.5	-32.7	-18.5	-81.5	
"Shelf life" means the length of time that food can be Kept	163	48	29	24	157	44	349	116	0.001
	-35.1	-10.3	-6.2	-5.2	-33.8	-9.5	-75.1	-24.9	
The Food Safety and Standards Act (FSS), 2006 is the primary law for regulation of food products	197	14	49	4	183	18	429	36	0.677
	-42.5	-3	-10.5	-0.9	-39.4	-3.9	-92.3	-7.7	
Consumption of contaminated food or water can cause food borne diseases	194	17	50	3	186	14	430	34	0.813
	-41.8	-3.7	-10.8	-0.6	-40.1	-3	-92.7	-7.3	
Personal hygiene can't prevent food borne diseases	92	119	22	31	95	106	209	256	0.656
	-19.8	-25.6	-4.7	-6.7	-20.4	-22.8	-44.9	-55.1	
Wearing jewellery or watches allows food to be contaminated	56	155	4	49	81	120	141	324	0
	-12	-33.3	-0.9	-10.5	-17.4	-25.8	-30.3	-69.7	
Storing uncooked food and cooked food can cause cross contamination	146	65	38	15	153	48	337	128	0.288
	-31.4	-14	-8.2	-3.2	-32.9	-10.3	-72.5	-27.5	

Table 2: Responses on Attitude Towards Food Safety

Attitude	Day Scholars			Paying Guest			Hostellers			Total			X^2 p-value
	Disagree	Not Sure	Agree	Disagree	Not Sure	Agree	Disagree	Not Sure	Agree	Disagree	Not Sure	Agree	
Everyone has responsibility for food safety in our country	12	12	187	1	0	52	12	10	179	25	22	418	0.313
	-2.6	-2.6	-40.2	-0.2	0	-11.2	-2.6	-2.2	-38.5	-5.4	-4.7	-89.9	
It is important to check the expiry date when you buy the food material	2	0	209	0	0	53	4	0	197	6	0	459	0.436
	-0.4	0	-44.9	0	0	-11.4	-0.9	0	-42.4	-1.3	0	-98.7	
Pesticides residues in fruits & vegetables and antibiotics or drugs used in poultry affect the health of the consumer.	21	31	159	2	13	38	24	36	141	47	80	338	0.227
	-4.5	-6.7	-34.2	-0.4	-2.8	-8.2	-5.2	-7.7	-30.3	-10.1	-17.2	-72.7	
Consuming too much monosodium glutamate is bad for your health	9	48	154	3	16	34	15	48	138	27	112	326	0.498
	-1.9	-10.3	-33.1	-0.6	-3.4	-7.3	-3.2	-10.3	-29.7	-5.8	-24.1	-70.1	
Plasticizers in food containers and packaging materials may pose risk to your health	8	20	183	1	5	47	14	18	169	23	43	399	0.493
	-1.7	-4.3	-39.4	-0.2	-1.1	-10.1	-3	-3.9	-36.3	-4.9	-9.2	-85.8	
Improving knowledge on food safety and regular training will reduce the food contamination	8	17	186	2	3	48	10	12	179	20	32	413	0.881
	-1.7	-3.7	-40	-0.4	-0.6	-10.3	-2.2	-2.6	-38.5	-4.3	-6.9	-88.8	
Bacteria multiply at room temperature	28	54	129	5	14	34	25	44	132	58	112	295	0.816
	-6	-11.6	-27.7	-1.1	-3	-7.3	-5.4	-9.5	-28.4	-12.5	-24.1	-63.4	
Improper storage of food may pose risk to your health.	5	6	200	1	2	49	4	7	190	10	16	439	0.896
	-1.1	-1.3	-43	-0.2	-0.6	-10.5	-0.9	-1.5	-40.9	-2.2	-3.4	-94.4	
it is better to keep away from cooking if you have wounds, bruises or injuries	12	18	181	6	6	41	22	16	163	40	40	385	0.302
	-2.6	-3.9	-38.9	-1.3	-1.3	-8.8	-4.7	-3.4	-35.1	-8.6	-8.6	-82.8	
Hot food packed in *plastic bags* has adverse effects on your *health*.	5	7	199	3	1	49	12	8	181	20	16	429	0.391
	-1.1	-1.5	-42.8	-0.6	-0.2	-10.5	-2.6	-1.7	-38.9	-4.3	-3.4	-92.3	

Table 3: Responses to Food Safety Practices

Practices	Day Scholars			Paying Guest			Hostellers			Total			X^2 p-value
	Never	Sometimes	Always	Never	Sometimes	Always	Never	Sometimes	Always	Never	Sometimes	Always	
Do you wash your hands before food preparation or washing?	0	17	194	0	1	52	0	12	189	0	30	435	0.246
	0	-3.7	-41.7	0	-0.2	-11.2	0	-2.6	-40.6	0	-6.5	-93.5	
Do you check and throw away food beyond its expiry date.	5	23	183	1	6	46	5	24	172	11	53	401	0.996
	-1.1	-4.9	-39.4	-0.2	-1.3	-9.8	-1.1	-5.2	-37	-2.4	-11.4	-86.2	
Do you wash fruits and vegetables with clean water before consuming	0	12	199	0	4	49	0	22	179	0	38	427	0.148
	0	-2.6	-42.8	0	-0.9	-10.5	0	-4.7	-38.5	0	-8.2	-91.8	
Do you read information on the food labels when buying them?	2	89	120	1	24	28	8	86	107	11	199	255	0.349
	-0.4	-19.1	-25.8	-0.2	-5.2	-6	-1.7	-18.5	-23	-2.4	-42.8	-54.8	
Do you store raw food separately from cooked food	10	47	154	3	12	38	14	60	127	27	119	319	0.296
	-2.2	-10.1	-33.1	-0.6	-2.6	-8.2	-3	-12.9	-27.3	-5.8	-25.6	-68.6	
I separate raw and cooked food during storage.	7	42	162	2	12	39	14	44	143	23	98	344	0.457
	-1.5	-9	-34.8	-0.4	-2.6	-8.4	-3	-9.5	-30.8	-4.9	-21.1	-74	
Do you save the leftovers in the refrigerator?	40	133	38	11	31	11	48	112	41	99	276	90	0.648
	-8.6	-28.6	-8.2	-2.4	-6.7	-2.4	-10.3	-24.1	-8.8	-21.3	-59.4	-19.4	
Do you guide your parents regarding food safety practices	11	74	126	2	16	35	8	68	125	21	158	286	0.907
	-2.4	-15.9	-27.1	-0.4	-3.4	-7.5	-1.7	-14.6	-26.9	-4.5	-34	-61.5	
Do you buy food from small restaurants and street peddlers?	20	158	33	4	38	11	19	147	35	43	343	79	0.917
	-4.3	-34	-7.1	-0.9	-8.2	-2.4	-4.1	-31.6	-7.5	-9.2	-73.8	-17	
Do you use detergents for washing hands?	73	42	96	19	19	15	42	71	88	134	132	199	0
	-15.7	-9	-20.6	-4.1	-4.1	-3.2	-9	-15.3	-18.9	-28.8	-28.4	-42.8	

Table 4: Correlation Between Knowledge, Attitude, and Practice Toward Food Safety

Variables	Living Status	Count	Mean	F value	Significance
Knowledge	Day Scholar	211	1.3795	8.367	0
	Paying Guest	53	1.4151		
	Hosteller	201	1.3421		
Attitude	Day Scholar	211	2.5972	0.883	0.414
	Paying Guest	53	2.5472		
	Hosteller	201	2.5124		
Practices	Day Scholar	211	1.8246	0.161	0.851
	Paying Guest	53	1.8302		
	Hosteller	201	1.791		

questionnaire, among them 211 students are day scholars, 53 students stay as paying guest and 201 are staying at hostels. The study findings indicate that majority of students have knowledge of washing hands before handling food (94%) regardless of living status ($p>0.05$). Majority of the student have similar opinion that food should not be kept in the refrigerator for a long time (84.3%, $p>0.05$). Considerable number of students opines that cooked food or leftovers need to be thoroughly heated before eating (85.4%, $p>0.05$). Significant number of students are in the knowledge that food born diseases are infectious (87.3 %, $p>0.05$). Regardless of living status, majority of the students have knowledge of washing fruits and vegetables with salt removes pesticide and residues (95.8%, $p>0.05$).

Even though majority students have opined that food with bad smell, appearance or taste are not suitable for consumption, further students have difference in opinion ($p<0.05$), interestingly considerable number of day scholar exhibited this opinion (37.8%). Significant number of students have knowledge about "shelf life", means length of time that food can be kept (75.1%), however the student groups have difference in opinion ($p<0.05$), comparatively day scholars have the knowledge of shelf life (35.1%). Majority of the students have knowledge that Food Safety and Standards Act (FSS), 2006 is the primary law for regulation of food products (92.3%, $p>0.05$). Regardless of living status, significant number of students knows that consumption of contaminated food or water cause food born diseases (92.7%, $p>0.05$). The study reports that students have knowledge about storing uncooked food and cooked food can cause cross contamination (72.5%, $p>0.05$).

Contrary to the above results, students have given mixed opinion that personal hygiene can't prevent food borne diseases; considerable number of students does not have knowledge that personal hygiene can prevent food borne diseases (55.1%, $p>0.05$). The students have significant difference on knowledge that wearing jewellery or watches allows food to be contaminated; further the significant numbers of students are in opinion that wearing jewellery or watches doesn't contaminate food (69.7%, $p<0.05$).

The study results indicated that majority of the students irrespective of their living status have positive attitude towards food safety (Table 2). When students were asked about responsibility towards food safety majority agreed that they are responsible towards food safety, further, the test results indicate indifference in opinion on responsibility of food safety among day scholars, hostellers and paying guest students ($p>0.05$). The students exhibited strong agreement on checking the expiry of food material before purchase, further; the three groups were indifferent in agreement ($p>0.05$). Majority of the students groups agreed that pesticides on fruits and vegetables; drugs used in poultry will affect their health. Majority of the student groups exhibited agreement on consuming too much monosodium glutamate is bad for health with indifference in their opinion ($p>0.05$).

Regardless of living status, majority of students have opined that plasticizers in food containers and packaging materials may pose risk to health ($p>0.05$). The degree of agreement is high among students that improving knowledge on food safety and regular training will reduce the food contamination ($p>0.05$). Students exhibited mixed opinion on whether bacteria will multiply at room temperature; further the opinions among student groups were indifferent. Regardless of living status, students exhibited a stronger agreement that improper storage of food may pose risk to your health ($p>0.05$). Majority of students are in opinion to keep away from cooking during wounds, bruises or injuries on the body ($p>0.05$) (Table 3). Students exhibited strong agreement that

h*ot food* packed in *plastic bags* have adverse effects on *health* ($p>0.05$). The study reports indicate that the students living status has influence on the knowledge towards food safety ($p<0.000$), students living as paying guest (Wt. Mean = 1.41) scored well on knowledge comparatively with day scholars (Wt. Mean = 1.37) and hostellers (Wt. Mean = 1.34. However there is no considerable difference among students towards attitude and practices of food safety ($p>0.000$) (Table 4).

CONCLUSION

The present study assessed the knowledge, attitude and practices towards food safety among the university students of South India. The study findings report that the students are fairly knowledgeable, have good attitude and appropriate practices. Further, the students living status has influence on the knowledge towards food safety, students living as paying guest scored well on knowledge comparatively with day scholars and hostellers. However, there is no considerable difference among students towards attitude and practices of food safety. The present study findings indicate the necessity or importance of creating awareness about the food safety among university students.

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