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Extending the KAP framework: Food safety knowledge, attitudes, practices, and pathogen awareness among hotel service personnel

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Abstract: Foodborne illnesses are a serious public health issue affecting millions of people worldwide every year. This problem is largely rooted in a lack of knowledge regarding food safety and errors made in practice. Frequency analyses, Pearson correlation, one-way ANOVA, regression, and mediation analyses were employed to examine relationships among food safety knowledge, attitudes, practices, training status, and pathogenic microorganism knowledge. Results indicated that food safety training was associated with significant differences across all measured variables. While food safety knowledge significantly predicted both attitudes and practices, attitudes did not significantly predict practices and did not mediate the knowledge–practice relationship. Pathogenic microorganism knowledge was also found to positively and significantly influence food safety practices. These findings highlight the importance of both general food safety knowledge and microbiological awareness in promoting safe food handling behaviours and suggest that comprehensive theoretical and practical training programmes are essential for hotel food and beverage personnel.

Keywords: Food and beverage; food safety; foodborne diseases; hospitality industry; service personnel

1 Introduction

Foodborne diseases have represented a persistent and escalating public health concern worldwide. The World Health Organisation (WHO) has estimated that approximately 600 million people—nearly one in ten globally—fall ill each year because of consuming contaminated food (Food and Agriculture Organization, 2019). The number of foodborne disease outbreaks recorded in the European Union in 2021 reached 4,005; this figure represents a striking increase of approximately 30% compared to the previous year (European Food Safety Authority [EFSA], 2022). This increase, which indicates that problems in food safety persist, is not merely statistical. Most cases relate to establishments serving food and drink. Indeed, 61% of cases in Europe and 78% in the United States are linked to food consumption in such settings (Ahmed et al., 2021; Centers for Disease Control and Prevention, 2018; EFSA, 2022). This proportion clearly demonstrates the decisive role that food processing procedures in these establishments play in public health.

When examining the root causes of illness cases in food service environments, it becomes apparent that the problem stems largely from unsuitable conditions during the preparation and storage stages. Inadequate temperature control, the risk of cross-contamination, poor personal hygiene, and the use of contaminated equipment are among the key factors highlighted in this context (Michaels et al., 2004; Siddiqi et al., 2022). A key factor that further exacerbates this risk relates to the level of food safety knowledge among food handlers. Numerous studies in the literature consistently demonstrate that these individuals' knowledge of food safety is inadequate and identify this deficiency as one of the primary causes of unsafe practices (Adikari et al., 2016; Badrie et al., 2006; Hashanuzzaman et al., 2020; Jevšnik et al., 2008; Sirichokchatchawan et al., 2021; Veiros et al., 2009). However, this situation is not merely a matter

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of individuals lacking information. Foodborne illnesses are caused by a variety of factors. Examples include inadequate food safety inspections, problems within the supply chain, and the limited scope of food risk assessment processes.

Food safety is treated as a separate issue in the tourism sector. Especially in recent years, food safety has become a key criterion in destination selection. Tourists directly associate a clean and safe food experience with satisfaction (Lee et al., 2019). Hotels are also critically important in this regard, as they host many guests and provide food and beverage services. Especially in today's competitive environment, hotel businesses must offer guests safe and high-quality food and beverage services (Gomes et al., 2014). Since hotels are among the establishments in the tourism sector where foodborne illnesses are most common (Ceylan & Sezgin, 2021; Tutu & Anfu, 2019), food safety is a priority criterion for both businesses and guests. Hygiene of the service environment, personal hygiene of service personnel, regular maintenance of serving utensils, and storage of food under appropriate conditions constitute the components of food safety (Sariisik, 2016). No individual involved in the supply and service processes can be exempted from food safety responsibility. Negligence at any stage not only endangers human health but also can lead to environmental consequences due to food waste (Kasza et al., 2019; Sanlier & Tunç, 2008). Despite all these risks being known, the literature mostly focuses on kitchen staff (Jevšnik et al., 2008; Moreb, 2017; Sanlier & Konaklıoğlu, 2012), consumers (Bolek, 2020; Medeiros et al., 2004; Patil et al., 2005), and students (Haapala & Pobart, 2004; Lazou et al., 2012). Studies concerning service personnel who have direct contact with food have not been sufficiently addressed. This study aims to fill this gap in the literature. The food safety knowledge, attitudes, and practices of service personnel in hotel establishments were examined within the framework of the Knowledge-Attitude-Practice (KAP) model. The knowledge of service personnel regarding pathogenic microorganisms was also examined. Thus, the study seeks to highlight the importance of food safety from the perspectives of both public health and the hospitality sector, whilst also identifying specific knowledge gaps that could inform the design of targeted training programmes. The following research questions guide the study:

RQ1: What are the food safety knowledge, attitudes, and practices and pathogen knowledge levels of hotel service personnel?

RQ2: Do food safety knowledge, attitudes, and practices and pathogen knowledge levels differ according to

food safety status and demographic characteristics of hotel service personnel?

RQ3: Does food safety knowledge significantly predict food safety attitudes and practices among hotel service personnel?

RQ4: Do attitudes mediate the relationship between food safety knowledge and food safety practices?

RQ5: Does pathogen knowledge significantly influence food safety practices among hotel service personnel?

2 Literature review

2.1 KAP model

The KAP model posits that knowledge influences an individual's attitude in a positive way, and that attitude, in turn, shapes behavioural practices (Kwol et al., 2020). Frequently preferred by researchers due to its simple design, capacity to generate measurable data, and clear interpretability of results (Launiala, 2009), this model has also become a widely used framework for examining food safety issues at various stages of the food production and value chain (Elsahoryi et al., 2024). In this regard, Baş et al. (2006) demonstrated that employees in Turkish food businesses have significant gaps in their knowledge of basic food hygiene and that training these employees is an urgent necessity. Ahmed et al. (2021), on the other hand, reported that food safety knowledge has a significant effect on employees' attitudes and practices, and that this relationship varies between moderate and strong levels. However, the translation of knowledge into behaviour does not always occur directly. Ko (2013) found that knowledge alone is insufficient to change either attitudes or food processing practices; however, a significant correlation exists between knowledge, attitudes, and hazard analysis and critical control point (HACCP) practices, with attitude acting as a mediator in this relationship. Meher et al. (2022) also found that an acceptable level of knowledge did not translate into good hygiene practices in food processing and sales processes; Nawawi et al. (2022), meanwhile, emphasised the decisive role of training in improving practices and stated that the KAP assessment serves as a fundamental starting point for identifying areas requiring intervention. Food handlers are identified as the most critical factor in the prevention of foodborne illnesses in accommodation establishments. Baş

et al. (2006) noted that staff can become carriers of pathogens due to poor personal hygiene and cross-contamination, and that inappropriate staff behaviour contributes to approximately 97% of foodborne illnesses. Ahmed et al. (2021) also emphasised that food handlers can pose a serious public health risk if appropriate practices are not adopted. In addition to general food safety knowledge, awareness regarding pathogenic microorganisms constitutes an important dimension of food safety knowledge among food handlers, since insufficient microbiological awareness may increase contamination risks and unsafe food handling practices. In line with this literature, the present study aims to assess the food safety knowledge, attitudes, and practices of hotel service staff through the KAP framework. The knowledge and hygiene practices of staff directly involved in processes such as food preparation, service, storage, and the prevention of cross-contamination are of critical importance to public health. In addition to examining classical KAP relationships, the present study also aims to determine whether awareness regarding pathogenic microorganisms influences food safety practices among hotel service personnel. Based on the literature, the following hypotheses were developed:

H₁: Food safety knowledge positively affects food safety attitudes.

H₂: Food safety knowledge positively affects food safety practices.

H₃: Food safety attitudes positively affect food safety practices.

H₄: Pathogen microorganism knowledge positively affects food safety practices.

H₅: Food safety attitudes mediate the relationship between food safety knowledge and food safety practices.

3 Methodology

3.1 Research design

The purposes of this study were to determine the level of food safety knowledge of service personnel working in hotel businesses and to reveal the importance of food safety for hotel businesses. For these purposes, a quantitative approach was used in this study. Quantitative research is a research approach that aims to answer

research questions through the collection of numerical data and statistical analysis. This approach was also used to test the accuracy of hypotheses, examine the relationships between variables, and reach generalisations (Creswell, 2013).

3.2 Study area: Ankara, Turkey

Ankara, located in the northwest of Central Anatolia, was designated the capital city of the Republic of Turkey in a law enacted by Mustafa Kemal Atatürk on October 13, 1923 (Ankara Provincial Ministry of Culture and Tourism, 2024a). It is the second-most populous city of Turkey, with a population of 5,803,482 (TUIK, 2024). It has become a cultural, congress, and health tourism destination for domestic and foreign tourists (Ministry of Culture and Tourism, 2024). It hosted 2,980,263 domestic tourists and 511,486 foreign tourists in 2023 (Ankara Provincial Ministry of Culture and Tourism, 2024b).

3.3 Sample and participants

The research population consisted of service personnel working in 4- and 5-star hotel businesses operating in Ankara. The reason for choosing 4- and 5-star hotel businesses was that these businesses serve food to their customers in accordance with International Customer Service Standards. This issue was considered important in terms of obtaining reliable data and increasing the generalisability of the research findings. According to the data of the Ankara Provincial Directorate of Culture and Tourism, there were 91 hotel establishments with 4 or 5 stars in Ankara at the time of the study (Ankara Provincial Directorate of Culture and Tourism, 2024b). During the data collection process, 57 hotel establishments were contacted and invited to participate in the study. Survey could only be conducted in 18 hotel establishments, as some properties either declined to participate or did not respond. Therefore, the hotel participation rate was 31.6%. Convenience sampling was employed due to accessibility constraints and voluntary participation in the study. A total of 267 surveys were collected from service personnel working in the participating hotels. Prior to the analyses, the data were screened for missing values, inconsistent responses, and improperly completed surveys. Following the data cleaning process, 18 surveys were excluded, and the analyses were conducted with 249 valid surveys. Hotel managers were interviewed by having an appointment and/or obtaining

permission to interview each participant. The confidentiality of the surveyed hotels and interviewees was ensured. Ethical approval for this study was obtained from the Scientific Ethics and Evaluation Committee of Selçuk University Faculty of Tourism (Decision No: 105, Date: 04/05/2022). The study was approved as appropriate for the use of survey instruments in research. All participants were informed about the purpose of the study and provided voluntary informed consent prior to participation.

3.4 Instrument development and data collection

The survey instrument used in this study was adapted and refined based on the food safety scale developed by Manes et al. (2014). Expert opinions from academics specialising in food safety and hospitality management were incorporated to improve the clarity, content relevance, and contextual suitability of the survey for hotel service personnel. In addition, cognitive interviews were conducted with Turkish-speaking service employees to evaluate item comprehensibility and wording appropriateness. Following the completion of the expert review and cognitive pre-test phases, a pilot study was conducted to assess the comprehensibility and feasibility of the survey items. The final survey was structured under 3 main dimensions based on the KAP framework: food safety knowledge (10 questions), food safety attitude (5 questions), and food safety practices (33 questions). In addition, 5 questions on knowledge of pathogenic microorganisms were included in the survey. Since the questions regarding pathogenic microorganisms were categorical, a pathogenic microorganism knowledge score was calculated. Furthermore, negative statements were included in the survey to increase consistency and limit response bias. Negative statements were reverse coded during the analysis process.

3.5 Validity and reliability analysis

Exploratory Factor Analysis (EFA), reliability analysis, and normality tests were conducted to assess the validity and reliability of the measurement model. Kaiser-Meyer-Olkin (KMO) values were calculated as .791 for the knowledge dimension, .810 for attitude, and .888 for application; all three values were well above the recommended threshold of .60 for factor analysis. This result indicates that the sample is adequate for factor analysis. Looking at the

factor loadings, all items exceeded the acceptable lower limit of 0.40. The loadings range from 0.611 to 0.973 for the knowledge dimension, 0.611 to 0.850 for the attitude dimension, and 0.611 to 0.871 for the application dimension. This distribution provides strong evidence that the items adequately represent the relevant latent structures. Internal consistency was assessed using Cronbach's alpha coefficients. The coefficients obtained—0.818 for the knowledge dimension, 0.824 for the attitude dimension, and 0.868 for the application dimension—all exceed the 0.70 threshold; this demonstrates that the scales are reliable at a satisfactory level. Assumptions of normality were examined using skewness and kurtosis values. When using the ± 1.5 criterion, it was observed that all dimensions exhibited acceptable characteristics of a normal distribution. Skewness values ranged from -0.036 to 0.196 , whilst kurtosis values ranged from 0.764 to -1.017 . Considering these findings, it was accepted that the data followed a normal distribution, and parametric analyses were conducted (Table 1).

3.6 Statistical analysis

The data were analysed using IBM SPSS Statistics 26.0. During this process, descriptive statistics, frequency analyses, Pearson's correlation analysis, one-way ANOVA, regression analysis, and mediation analysis were applied. One-way ANOVA was chosen to identify differences between the educational groups; eta-squared (η^2) values were used to determine effect sizes. Eta-squared values of .01, .06, and .14 were interpreted as small, medium, and large effect sizes, respectively. Mediation analysis was conducted using PROCESS Macro v4.2 for SPSS (Model 4) developed by Hayes (2022). Bootstrap confidence intervals were estimated using 5,000 bootstrap samples with a 95% confidence interval.

4 Results

4.1 Demographic characteristics of participants

Table 2 presents the demographic characteristics of the participants. Most participants were between 20 and 40 years of age (66.7%), followed by those aged 40 and above (17.7%) and those under 20 years of age (15.7%). In terms of gender, male participants constituted most of the sample (58.6%), while female participants accounted for

Table 1: Validity, reliability, and normality results

Dimension / Items	Factor Loadings	Cronbach's Alpha	KMO	Skewness	Kurtosis
Knowledge		.818	.791	.196	-1.017
K1	.876				
K2	.973				
K3	.645				
K4	.777				
K5	.656				
K6	.695				
K7	.796				
K8	.871				
K9	.809				
K10	.781				
Attitude		.824	.810	.143	-.925
A1	.830				
A2	.848				
A3	.850				
A4	.611				
A5	.675				
Practice		.868	.888	-.036	-.764
P1	.692				
P2	.761				
P3	.689				
P4	.764				
P5	.626				
P6	.699				
P7	.680				
P8	.724				
P9	.652				
P10	.708				
P11	.789				
P12	.753				
P13	.638				
P14	.611				
P15	.726				
P16	.856				
P17	.791				
P18	.785				
P19	.560				
P20	.773				
P21	.649				
P22	.661				
P23	.849				
P24	.813				
P25	.771				
P26	.667				
P27	.665				
P28	.639				
P29	.670				
P30	.639				
P31	.680				
P32	.692				
P33	.633				

Table 2: Demographic characteristics of participants (N = 249)

Variable	Category	n	%
Age	Under 20 years old	39	15.7
	20–40 years old	166	66.7
	40 years and above	44	17.7
Gender	Male	146	58.6
	Female	103	41.4
Marital Status	Married	81	32.5
	Single	146	58.6
	Divorced	22	8.8
Education Level	Primary school	9	3.6
	Secondary school	44	17.7
	High school	111	44.6
	Associate degree	43	17.3
	Bachelor's degree	38	15.3
Position	Graduate degree	4	1.6
	Head waiter	15	6.0
	Captain waiter	19	7.6
	Waiter	145	58.2
	Other	70	28.1
Professional Experience	Less than 1 year	36	14.5
	1–5 years	86	34.5
	5–10 years	84	33.7
Food Safety Training	More than 10 years	43	17.3
	Yes	103	41.4
	Partially	37	14.9
Food Safety Certificate	No	109	43.8
	Yes	87	34.9
	No	162	65.1
Service Training	Yes	119	47.8
	Partially	35	14.1
	No	95	38.2

41.4%. Regarding marital status, more than half of the participants were single (58.6%), followed by married (32.5%) and divorced (8.8%) individuals. In terms of educational background, the largest proportion held a high school degree (44.6%), followed by secondary school graduates (17.7%), associate degree holders (17.3%), bachelor's degree holders (15.3%), primary school graduates (3.6%), and graduate degree holders (1.6%). With respect to occupational role, most participants were employed as waiters (58.2%), while 28.1% were classified under other positions; captain waiters and head waiters accounted for 7.6% and 6.0% of the sample, respectively. Concerning professional experience, the largest proportion reported between 1 and 5 years of experience (34.5%), followed by those

with 5 to 10 years (33.7%), more than 10 years (17.3%), and less than 1 year (14.5%). Regarding food safety education, 43.8% of the participants reported having received no food safety training, while 41.4% indicated that they had. Additionally, only 34.9% of the participants reported holding a food safety certificate, whereas 65.1% did not. Finally, 47.8% of the participants reported having received service training, while 38.2% indicated that they had not.

4.2 Relationships and differences among food safety knowledge, attitude, and practice dimensions

Table 3 displays the correlation analysis results among the knowledge, attitude, and practice dimensions. Statistically significant positive relationships were identified among all dimensions ($p < .001$). A strong positive relationship was observed between knowledge and attitude ($r = .761$), indicating that participants with higher food safety knowledge tended to exhibit more positive attitudes toward food safety. Knowledge was similarly strongly associated with practice ($r = .671$), suggesting that higher knowledge levels were related to better food safety practices. A moderate positive relationship was additionally identified between attitude and practice ($r = .473$). These findings indicate that food safety knowledge and attitudes play an important role in shaping food safety practices among hotel service personnel.

Table 4 reports the ANOVA results examining differences in knowledge, attitude, and practice dimensions according to food safety training status. Statistically significant differences were identified among the groups across all dimensions ($p < .05$). For the knowledge dimension, participants who had received food safety training demonstrated significantly higher knowledge scores than both those who had received partial training and those who had received none. Participants who had received partial training also demonstrated significantly higher knowledge levels than untrained participants. The effect size for the knowledge dimension was large ($\eta^2 = .45$). Regarding the attitude dimension, statistically significant differences

Table 3: Correlation analysis results

Variables	Mean	SD	1	2	3
1. Knowledge	3.5249	.68382	1		
2. Attitude	3.1719	.96035	.761**	1	
3. Practice	3.9843	.36941	.671**	.473**	1

Table 4: ANOVA results according to food safety training

Variable	Group	N	$\bar{X}$	Ss	Source of Variance	SS	df	MS	F	η^2	p	Post-Hoc
Knowledge	Yes	103	4.0068	.52585	Between Groups	52.209	2	26.104	100.722	.45	.000	1-2; 1-3; 2-3
	Partially	37	3.6649	.49622	Within Groups	63.757	246	.259				
	No	109	3.0220	.49709	Total	115.966	248					
Attitude	Yes	103	3.6757	.73837	Between Groups	65.431	2	32.716	49.286	.29	.000	1-3; 2-3
	Partially	37	3.4649	.72886	Within Groups	163.292	246	.664				
	No	109	2.5963	.90553	Total	228.723	248					
Practice	Yes	103	4.1586	.35416	Between Groups	5.473	2	2.736	23.727	.16	.000	1-2; 1-3
	Partially	37	3.9140	.34951	Within Groups	28.370	246	.115				
	No	109	3.8435	.32172	Total	33.842	248					

were observed between participants who had received training and those who had not, as well as between partially trained and untrained participants; however, no significant difference was found between the trained and partially trained groups. The effect size was similarly large ($\eta^2 = .29$). Significant differences were also observed in the practice dimension, with trained participants exhibiting significantly higher practice scores than the other groups, although no statistically significant difference was found between the partially trained and untrained groups. The effect size for the practice dimension was likewise large ($\eta^2 = .16$).

4.3 Knowledge of pathogenic microorganisms

Table 5 shows the findings regarding participants' knowledge of pathogenic microorganisms and microbiological food safety issues. Overall, the results indicated relatively low levels of pathogen-related knowledge among hotel service personnel. The highest correct response rate was observed for the item examining how bacteria causing food poisoning can enter the kitchen environment (43.8%), while the lowest was recorded for the item concerning bacterial behaviour at body temperature (16.5%). Similarly, only 16.9% of the participants correctly identified *Staphylococcus aureus* as the bacterium commonly found around the nose and mouth, and only 22.9% correctly identified *Salmonella* and *Campylobacter* as the most common bacteria associated with poultry products. Furthermore, only 28.9% correctly recognised all listed microorganisms as foodborne pathogens. These findings indicate substantial deficiencies in participants' microbiological food safety knowledge, particularly with

respect to pathogenic microorganisms and contamination mechanisms.

Table 6 illustrates the differences in pathogen microorganism knowledge levels according to food safety training status. A statistically significant difference was identified among the groups ($F = 97.810$, $p = .000$). Participants who had received food safety training demonstrated the highest pathogen knowledge scores ($\bar{X} = 2.43$), followed by those who had received partial training ($\bar{X} = 1.08$), while participants who had received no training recorded the lowest scores ($\bar{X} = 0.28$). Post-hoc analysis indicated statistically significant differences between all groups. The eta-squared value ($\eta^2 = .443$) reflected a very large effect size, indicating that food safety training accounted for approximately 44.3% of the variance in pathogen microorganism knowledge levels.

4.4 Mediation analysis results

Table 7 presents the mediation analysis examining the relationships among food safety knowledge, attitudes, and food safety practices. Food safety knowledge significantly and positively affected attitudes ($\beta = .761$, $p = .000$), supporting H1. Food safety knowledge also exerted a significant positive effect on food safety practices ($\beta = .741$, $p = .000$), supporting H2. These findings indicate that employees with higher levels of food safety knowledge tend to demonstrate better food safety practices. However, attitudes did not significantly predict food safety practices ($\beta = -.091$, $p = .210$), and H3 was not supported. Similarly, the indirect effect of food safety knowledge on food safety practices through attitudes was not statistically significant, as the bootstrap confidence interval included zero (BootLLCI = $-.098$; BootULCI = $.021$). Accordingly,

Table 5: Pathogen microorganism knowledge results

Question	Correct Answer	Correct n	Correct %
Which bacteria most commonly cause illness in poultry products?	<i>Salmonella / Campylobacter</i>	57	22.9
Which microorganism causes foodborne illness-es?	All of the above	72	28.9
Which bacterium is most commonly found around the nose, nostrils, and mouth?	<i>Staphylococcus aureus</i>	42	16.9
How can bacteria causing food poisoning enter the kitchen environment?	All of the above	109	43.8
What happens to food poisoning bacteria at body temperature?	Rapidly multiply	41	16.5

Table 6: Differences in pathogen knowledge by food safety training

Variable	Group	N	$\bar{X}$	Ss	Source of Variance	SS	df	MS	F	p	Post-Hoc
Pathogen Knowledge	Yes	103	2.43	1.47	Between Groups	245.037	2	122.518			
	Partially	37	1.08	1.16	Within Groups	308.144	246	1.253	97.810	.443	.000
	No	109	0.28	0.61	Total	553.181	248				1-2; 1-3; 2-3

Table 7: Mediation analysis results

Path	B	SE	β	t	p	LLCI	ULCI
Knowledge → Attitude	1.069	.058	.761	18.441	.000	.955	1.183
Knowledge → Practice	.400	.039	.741	10.200	.000	.323	.477
Attitude → Practice	-.035	.028	-.091	-1.256	.210	-.090	.020
Pathogen Knowledge → Practice	.086	0.15	.348	5.760	.000	.057	.116
Knowledge → Attitude → Practice	-.038	.030	-.069	—	—	-.098	.021

Bootstrap sample size = 5,000. R^2 (Attitude) = .579; R^2 (Practice) = .454

attitudes did not mediate the relationship between food safety knowledge and food safety practices, and H5 was not supported. Pathogen microorganism knowledge, by contrast, significantly and positively predicted food safety practices ($\beta = .348$, $p = .000$), supporting H4. This finding suggests that employees with greater awareness of pathogenic microorganisms are more likely to demonstrate appropriate food safety practices.

5 Discussion

The findings of this study provide insights into the food safety knowledge, attitudes, and practices and pathogen awareness of hotel service personnel within the KAP framework. Food safety knowledge had a significant positive effect on attitudes, whereas attitudes did not significantly predict practices. However, it has been observed that general food safety knowledge and knowledge of pathogens have a direct and positive impact on practices. Whilst this finding partially supports the KAP model, it

also highlights the existence of certain limitations regarding the translation of attitudes into concrete hygienic behaviour.

The positive relationship observed between food safety knowledge and attitudes aligns with the KAP framework, which posits that knowledge shapes attitudes, and attitudes in turn shape behaviour. The fact that employees with a relatively high level of knowledge demonstrate a more constructive attitude towards food safety reinforces existing evidence that knowledge significantly influences both the attitudes and daily practices of food handlers (Ahmed et al., 2021; Kwol et al., 2020). Although food safety knowledge shapes attitudes towards food safety, it is noteworthy that food safety attitudes do not shape food safety practices. The literature also shows that attitudes cannot reliably facilitate behavioural change (Ko, 2013). A similar pattern emerges in nearly half of the studies examined: It has been reported that the knowledge and positive attitudes gained following food safety training do not sufficiently translate into daily practice (Zanin et al., 2017). At this point, organisational and environmental

factors emerge as the primary barriers to food safety behaviours (da Cunha et al., 2022).

This lack of a meaningful relationship between attitude and practice is most likely due to the specific conditions of hotel food service environments. Practical constraints such as heavy workloads, time pressures, inadequate supervision, and ingrained habits can pose a significant barrier to staff reflecting their positive attitudes in their daily behaviour.

These findings are also consistent with critical approaches to the KAP model. It has previously been argued that the model's assumption of a linear knowledge-attitude-practice chain oversimplifies food safety behaviour, and that KAP surveys fail to adequately reflect the contextual complexity present in the field (Launiala, 2009). The current findings provide concrete evidence to support these criticisms. The direct impact of knowledge about pathogens on food safety practices is consistent with previous research. It has previously been demonstrated that a lack of microbiological knowledge creates significant gaps in the necessary attention paid to pathogens, cross-contamination, and critical temperature ranges, and that this increases the risk of foodborne illness (Ahmed et al., 2021; Baş et al., 2006).

The finding that staff with high microbiological awareness exhibit healthier hygiene behaviours stands out as a notable result. This suggests that knowledge of pathogens can have a more direct and behaviour-focused effect beyond general attitudinal dimensions; in other words, it operates through mechanisms that bypass attitudinal mediation.

The lack of information regarding pathogenic microorganisms is generally consistent with the literature (Elsahoryi et al., 2024; Meher et al., 2022). Therefore, the inadequacy of current food safety training indicates that microbiology-based food safety training should be central to improving food safety awareness. These findings highlight the critical role of education (Baş et al., 2006; Wan Nawawi et al., 2022).

6 Conclusions

The findings indicate that knowledge of food safety shapes attitudes in a meaningful and positive direction; both general food safety knowledge and pathogen awareness directly influence practices. However, it has also emerged that attitudes do not predict practices to a significant degree and do not act as a mediating factor in the knowledge-practice relationship. This result suggests that whilst staff develop positive attitudes towards

food safety, these attitudes do not translate into consistent hygiene behaviour under operational conditions. In contrast, staff's direct level of knowledge, particularly their awareness of pathogenic microorganisms, plays a far more decisive role in shaping food safety behaviour. The study also identified significant gaps in participants' microbiological knowledge; bacterial growth conditions, transmission mechanisms, and foodborne pathogens were the main areas where these gaps were most pronounced. Furthermore, the findings indicate that employees who have received formal training achieved significantly higher scores in terms of pathogen knowledge compared to their colleagues who had received partial training or no training at all. Taken as a whole, these findings clearly demonstrate that approaches to food safety interventions which focus solely on changing attitudes are insufficient. The integration of systematic microbiology content into training programmes for hotel service staff emerges as a critical need in this regard.

6.1 Theoretical implications

This study extends the classical KAP framework by incorporating knowledge of pathogenic microorganisms as a separate explanatory dimension, thereby making an original contribution to the food safety literature. Traditional KAP studies are largely based on a linear relationship between knowledge, attitudes, and practices. However, current findings indicate that microbiological awareness regarding pathogens can directly influence hygienic behaviour by bypassing attitudinal mechanisms. Another significant theoretical contribution of the study stems from the finding that attitudes do not play a mediating role between knowledge and practices. This result lends support to the growing criticism in recent years that the classical KAP model oversimplifies the complexity underlying food safety behaviour. The findings reveal that food safety behaviour cannot be explained solely by cognitive and attitudinal processes; operational, organisational, and contextual factors also carry decisive weight in determining employees' hygienic practices. Finally, this study is also of particular value in that it contributes to a rather limited body of literature focusing on hotel service staff. The vast majority of previous studies have treated kitchen staff or food handlers as a general category. This study, however, aims to fill this gap in the literature by specifically examining hotel service staff who come into direct contact with food during the service process.

6.2 Practical implications

The findings of this study offer a number of concrete implications for hotel managers and food safety specialists. First and foremost, the significant impact of food safety knowledge and pathogen awareness on hygiene practices highlights the indispensability of continuous, specialist-led training programmes in hotel operations. These programmes should not merely convey general hygiene rules; they must also cover microbiological content such as pathogenic microorganisms, bacterial growth conditions, cross-contamination mechanisms, and critical temperature control.

Secondly, the limited impact of attitudes on practices demonstrates that a positive attitude alone is insufficient to guarantee safe food handling behaviour. Therefore, hotel management must establish an infrastructure that supports staff practices through operational monitoring systems, regular inspections, corporate food safety policies, and practical hygiene control mechanisms.

Thirdly, the low pathogen knowledge scores identified in the study clearly highlight the need for more practical and scientifically grounded microbiological training programmes for hotel service staff. Tools such as visual hygiene reminders, infection prevention guidelines, interactive training modules, and temperature control charts have the potential to enhance staff awareness of food safety and behavioural compliance.

6.3 Limitations and future research

Despite all these contributions, certain limitations of the study should be borne in mind. Firstly, the research was conducted exclusively with staff working in 4- and 5-star hotels in Ankara. This makes it difficult to generalise the findings regarding different tourist destinations, hotel categories, or the catering sector. Secondly, the study is limited to self-reported survey data. This method carries the risk of social desirability and response bias; it suggests that participants may have reported more positive attitudes and practices than their actual behaviour under operational conditions. Third, the cross-sectional design of the study limits the ability to establish causal relationships between variables over time. Future studies may employ longitudinal or experimental research designs to better examine the stability of food safety behaviours and training effects. Future research may also expand the KAP framework by incorporating additional variables such as food safety culture, organisational support, managerial supervision, work pressure, risk perception,

and behavioural control. Furthermore, observational studies examining actual hygiene behaviours in operational environments may provide more objective insights into the relationship between food safety knowledge and practices.

Bionotes

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Conflicts of Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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