

Knowledge and Attitudes as Determinants of Hygiene–Sanitation Practices Among Food Handlers in Food Stalls Around the Campus Area

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ABSTRACT

Knowledge and attitudes among food handlers are assumed to influence their behavioral practices in implementing food hygiene and sanitation. However, in real settings, hygienic behavior does not always align with the level of knowledge and attitudes possessed by individuals. This study aimed to analyze the relationship between knowledge and attitudes and the hygiene–sanitation behavior of food handlers operating around Muhadi Setiabudi University. An analytical observational method with a cross-sectional design was employed. The study involved 59 food handlers selected through purposive sampling. Data were collected using questionnaires and observation sheets, and subsequently analyzed using the Chi-square test. The findings indicate that 26 respondents (44.1%) had good knowledge, while 33 respondents (55.9%) demonstrated poor knowledge. A total of 54 respondents (91.5%) exhibited positive attitudes, whereas 5 respondents (8.5%) showed negative attitudes. Good hygiene–sanitation behavior was observed in 26 respondents (44.1%), while 33 respondents (55.9%) displayed poor behavior. The Chi-square analysis revealed no significant association between knowledge and behavior ($p = 0.809$), nor between attitudes and behavior ($p = 0.848$). The study concludes that knowledge and attitudes are not significantly related to hygiene–sanitation behavior among food handlers, suggesting the need for more comprehensive and context-specific intervention strategies.

Keywords: hygiene–sanitation; knowledge; attitude; behavior; food handlers

INTRODUCTION

Food safety is a critical public-health concern that directly affects population well-being and everyday quality of life. In Indonesia, food-borne poisoning remains relatively common, particularly those originating from ready-to-eat foods and meals prepared outside the household. According to the 2023 report of the National Agency of Drug and Food Control (BPOM), approximately 31% of all documented food-poisoning incidents occurred within educational environments, including eateries surrounding campus areas. This pattern indicates that food establishments serving students continue to represent vulnerable points within the national food-safety system, especially when hygiene and sanitation management are not optimally implemented. Hygiene and sanitation constitute essential components of the food-service chain, encompassing raw-material selection, food processing, and final serving. Each stage carries inherent risks of cross-contamination that may endanger consumers if not properly controlled. Food handlers serve as the frontline actors responsible for ensuring food safety, and their behaviors are strongly shaped by their level of knowledge and attitudes toward hygienic practices. Nevertheless, numerous studies have documented persistent shortcomings in hygiene practices in real settings, ranging from inadequate handwashing to improper food-storage procedures [1,2]. These findings raise concerns about the effectiveness of existing monitoring systems and educational efforts aimed at improving food-handler compliance.

Several empirical studies have demonstrated that food handlers' knowledge and attitudes exert significant influence on their behavioral adherence to hygiene and sanitation standards. For instance, food handlers with negative attitudes toward hygiene practices were found to have a 6.5-fold higher likelihood of committing sanitation violations compared with those who held positive attitudes [3]. Despite such evidence, gaps remain in understanding how knowledge and attitudes interact to shape hygienic behavior simultaneously, particularly within informal food-service settings such as small food stalls around university campuses.

A notable research gap also exists in the local context, where few studies have explored the relationships among these variables in small food establishments serving students. Most prior research has focused on large restaurants or industrial catering services. In contrast, campus-area food stalls constitute primary consumption sites for students and academic staff, making them strategic locations for hygiene-improvement interventions. The limited availability of context-specific data further complicates the development of evidence-based policies for food-safety oversight in educational environments. Universitas Muhadi Setiabudi (UMUS) in Brebes, Central Java, is surrounded by at least 142 food stalls identified by the Brebes Office of Cooperatives, Micro Enterprises, and Trade. Preliminary observations indicate that most of these culinary businesses have not yet met ideal hygiene–sanitation standards. This environment represents a critical setting for investigation, given the high level of interaction between the academic community and these food establishments. Therefore, it is essential to conduct research that examines the relationship between knowledge and attitudes and the hygiene–sanitation behavior of food handlers operating in food stalls around UMUS.

The primary objective of this study is to empirically analyze the relationship between knowledge, attitudes, and food-handler behavior in the implementation of hygiene and sanitation practices in food stalls surrounding Universitas Muhadi Setiabudi. This study is expected to contribute theoretically by expanding the behavioral literature on food handlers in informal sectors and to offer practical implications in the form of policy recommendations or training programs aimed at improving food-safety quality. The findings may also serve as a foundation for more effective and context-specific public-health interventions within campus environments and their surrounding communities.

METHODS

This study employed a quantitative approach with a cross-sectional design, in which measurements of the independent and dependent variables were conducted simultaneously at a single point in time. The design was selected to examine the relationship between knowledge and attitudes and the hygiene–sanitation behavior of food handlers working in food stalls surrounding Universitas Muhadi Setiabudi, Brebes, Central Java. The research was carried out from May to June 2025.

The study population consisted of all food handlers employed in food stalls located around Universitas Muhadi Setiabudi. A purposive sampling technique was applied, with inclusion criteria comprising: (1) active food handlers directly involved in food preparation or serving; (2) willingness

to participate, indicated by signing an informed-consent form; and (3) ability to communicate effectively. Exclusion criteria included food handlers who could not be reached after three consecutive visits or those who were ill during data collection. The sample size was calculated using a proportion formula for cross-sectional studies with a 95% confidence level and a 5% margin of error. The minimum required sample size was 52 respondents. In practice, 59 respondents met the eligibility criteria, and this number was considered adequate for the intended analyses.

The independent variables in this study were food handlers' knowledge and attitudes regarding hygiene and sanitation. The dependent variable was the food handlers' behavior in applying hygiene–sanitation principles during food preparation and service. Data collection was conducted using a structured questionnaire consisting of five components: (1) informed-consent form, (2) respondent-characteristics questionnaire, (3) knowledge questionnaire, (4) attitude questionnaire, and (5) behavior questionnaire. The knowledge questionnaire comprised 15 multiple-choice items scored 1 for correct answers and 0 for incorrect answers. The attitude questionnaire contained 10 statements rated on a four-point Likert scale (strongly agree–disagree). The behavior questionnaire included 12 statements assessing daily hygiene–sanitation practices.

The research instruments underwent content-validity assessment through expert judgement by the academic supervisor. Construct validity was tested using item-total correlation (Pearson Product Moment), with the criterion of r -value $>$ r -table at a significance level of 0.05. All items met the validity criteria. Reliability testing was conducted using Cronbach's alpha, yielding coefficients of 0.78 for knowledge, 0.81 for attitudes, and 0.76 for behavior. All instruments were deemed reliable, as each exceeded the minimum threshold of Cronbach's alpha $>$ 0.70.

Primary data were obtained through individual interviews using the structured questionnaire. Interviews were conducted during respondents' break periods, with each session lasting approximately 15–20 minutes. Secondary data were sourced from the Office of Cooperatives, Micro Enterprises, and Trade of Brebes Regency, specifically regarding the number and distribution of food stalls in the study area.

Data analysis was performed using the Statistical Package for the Social Sciences (SPSS). Univariate analysis was used to describe respondent characteristics and the distribution of knowledge, attitudes, and behavior in the form of frequencies and percentages. Bivariate analysis was conducted using the Chi-square (χ^2) test to determine the relationship between the independent variables (knowledge and attitudes) and the dependent variable (hygiene–sanitation behavior). The significance level was set at $\alpha = 0.05$ with a 95% confidence interval. Because no variable yielded a p -value $<$ 0.25 in the bivariate analysis, multivariate analysis was not performed in this study.

RESULTS

Based on the sex distribution, the majority of food handlers in this study were male, totaling 35 individuals (59.3%), while female food handlers accounted for 24 individuals (40.7%). In terms of age, most respondents were within the 31–40-year range, comprising 19 individuals (32.2%), followed by those aged above 50 years and those in the 41–50-year category.

From the perspective of educational attainment, the largest proportion of respondents had completed junior high school (SMP), totaling 23 individuals (39%). This was followed by senior high school graduates (30.5%), while the remaining respondents ranged from those with no formal education to those with tertiary-level qualifications. Regarding work experience, most food handlers had been employed for less than 10 years, totaling 33 individuals (55.9%), indicating that the majority were still in the early to intermediate stages of their professional experience.

In terms of income, 55.9% of respondents earned wages below the regional minimum wage (UMR), whereas 44.1% earned wages equal to or above the UMR. These findings suggest that most respondents fall within the lower-income category.

The relationship between food handlers' hygiene knowledge and their hygiene behavior in food stalls around Universitas Muhadi Setiabudi is presented in Table 2. Based on the analysis of 59 food handlers, no significant association was found between knowledge level and hygiene behavior ($p = 0.809 > 0.05$).

Although some respondents demonstrated good knowledge, many of them did not exhibit corresponding hygienic practices. This indicates that knowledge does not necessarily translate into proper hygiene behavior in real-world settings.

Table 3 presents the relationship between attitudes and hygiene behavior. The results indicate no significant association between attitudes and hygiene behavior among food handlers ($p = 0.848 > 0.05$). Although the majority of respondents exhibited positive attitudes, only 44.4% demonstrated corresponding hygienic behavior. This finding suggests that positive attitudes are not always reflected in daily practice, and therefore the null hypothesis (H_0) cannot be rejected. Based on the results of the bivariate analysis, the knowledge variable yielded a p -value of 0.809, while the attitude variable produced a p -value of 0.848. Both values are substantially above the significance threshold of 0.05, indicating that neither knowledge nor attitudes are statistically associated with hygiene behavior among food handlers. Consequently, multivariate analysis was not conducted, as no variables met the inclusion criterion of $p < 0.25$.

DISCUSSION

The findings indicate that there is no statistically significant relationship between knowledge and hygiene–sanitation behavior among food handlers. This result aligns with the study conducted at PT. Ryan Katering Jakarta, which reported that beyond knowledge, other factors such as attitudes, work experience, and the availability of facilities also influence hygiene behavior among food handlers [4]. These findings suggest that knowledge alone may not serve as the primary determinant in shaping hygienic practices. A similar conclusion was reported in a recent study in Aceh, which found no significant association between knowledge and attitudes with hygiene–sanitation practices among food handlers in small food establishments [16], reinforcing the notion that contextual factors may exert a stronger influence than cognitive aspects alone. Research

Table 1. Demographic characteristics of food handler

Age	Frequency	Percentage
17–25 years	5	6.75
26–35 years	40	54.6
36–45 years	29	39.19

Table 2. Relationship between knowledge and hygiene behavior

Knowledge	Behavior				p
	Good		Poor		
	Frequency	Percentage	Frequency	Percentage	
Good	11	42.3	15	57.7	0.809
Poor	15	45.5	18	54.5	

Table 3. Relationship between attitude and hygiene behavior

Attitude	Behavior				p
	Good		Poor		
	Frequency	Percentage	Frequency	Percentage	
Positive	24	44.4	30	55.6	0.848
Negative	2	40.0	3	60.0	

conducted around the ITEKES Cendekia Utama Kudus campus also demonstrated that although some food handlers possessed adequate basic knowledge, hygiene–sanitation practices were not consistently implemented in daily operations [23].

Nevertheless, the findings of this study differ from those reported in food establishments in Pauh District, Padang City, and in the UNESA Ketintang Food Court, where significant associations between knowledge and hygiene behavior were observed [5]. These discrepancies may be attributed to variations in respondents' demographic characteristics, such as educational level, age, and work experience, as well as differences in workplace context and the availability of sanitation facilities. A study in Malang City similarly reported a significant relationship between food handlers' knowledge and standardized hygiene–sanitation scores, although inconsistencies remained in certain aspects of personal hygiene [20]. Research in Sekayu District also found that knowledge and attitudes were significantly associated with hygiene–sanitation behavior, particularly when supported by adequate educational backgrounds and the availability of sanitation facilities [18]. These findings collectively suggest that the effect of knowledge on behavior may become significant when structural factors are sufficiently supportive.

Based on the distribution, most food handlers in this study demonstrated inadequate knowledge regarding food hygiene and sanitation compared with those who possessed good knowledge. Interview results corroborated this finding, revealing that many respondents lacked comprehensive understanding of proper hygiene implementation. However, basic knowledge, such as the importance of handwashing before and after food preparation and the selection of fresh ingredients was relatively well understood. This indicates that while foundational knowledge is present, it has not been accompanied by more comprehensive and applicable understanding. Similar findings were reported in a study conducted around Poltekkes Surabaya, which identified a gap between knowledge levels and the implementation of hygiene–sanitation behavior in daily practice [21].

The questionnaire instrument in this study was designed to assess understanding of various aspects of hygiene and sanitation, ranging from the use of protective attributes to appropriate conduct during food handling. The results showed that comprehension of specific conditions, such as appropriate actions when food handlers are ill remained low. This highlights a gap between general knowledge and situational application. Research conducted in food establishments in Anjatan also found a significant relationship between knowledge and hygiene–sanitation practices [7], suggesting that in certain contexts, knowledge may play a more substantial role.

Although the study at PT. Ryan Katering Jakarta reported a strong correlation between knowledge levels and hygiene–sanitation practices [4], the present study did not find a significant association. These differences may be influenced by workplace environment, organizational culture, supervision intensity, and facility availability. Recent research in Jakarta further emphasized that the availability of handwashing facilities, the use of clean work uniforms, and routine supervision were more strongly associated with personal hygiene behavior than knowledge alone [17]. This conclusion is reinforced by findings from catering services in Cikarang–Bekasi, which showed that the use of personal protective equipment (PPE) and supportive workplace facilities were dominant factors shaping hygiene behavior among food handlers [19]. Additionally, limitations in measuring environmental factors directly and the relatively modest sample size may have influenced the statistical outcomes of this study.

The relationship between attitudes and hygiene behavior in this study was also not statistically significant. Nevertheless, positive attitudes remain an important predisposing factor that may influence behavior. Previous studies have demonstrated strong correlations between attitudes and hygiene practices, showing that food handlers with positive attitudes tend to exhibit better hygienic behavior [4]. This finding is supported by research indicating that attitudes formed through awareness and positive habits can shape work behaviors that promote public health [8].

The most food handlers demonstrated positive attitudes toward the implementation of food hygiene and sanitation. Interview and questionnaire responses revealed a predominance of “Strongly Agree” and “Agree” selections for statements such as refraining from coughing or spitting in the kitchen and covering the mouth when sneezing, reflecting high awareness of hygienic principles. These findings are consistent with research conducted among food handlers in Tapos District, Depok, which reported a relationship between attitudes and personal hygiene behavior [9].

However, these positive attitudes were not fully reflected in all aspects of hygiene practice. The use of protective equipment such as aprons and masks received “Disagree” responses from some respondents. Additionally, some respondents still approved of touching food directly with bare hands. These findings indicate a degree of tolerance toward practices that do not meet hygiene standards. Research in Padang Pasir Village also showed that demographic factors and business-environment conditions contributed differently to hygiene behavior across study locations [22]. A study in the UNESA Ketintang Food Court similarly reported a significant correlation between positive attitudes and good hygiene behavior [5], suggesting that contextual factors and variations in field implementation may explain the differing results of the present study.

Negative attitudes toward clearly inappropriate hygiene practices, such as spitting or smoking while handling food were rejected by most respondents. This reflects the presence of social norms and workplace culture that support hygienic behavior. Research in Adiwerna traditional market, Tegal, demonstrated that social control plays a substantial role in shaping attitudes toward hygiene practices [10]. Thus, although respondents' attitudes were generally positive, further interventions are needed to ensure consistency between attitudes and actual practices.

Field observations revealed that hygienic behavior was relatively good during food serving and delivery stages but remained weak in the use of protective attributes during food preparation. These findings are similar to research conducted in catering services in Bandung City, which reported low use of protective equipment during preparation despite good behavior during food delivery [11].

Several studies emphasize that hygienic behavior is complex and influenced by more than knowledge and attitudes. Research at Gandorih Beach, Pariaman, found a significant relationship between attitudes and behavior but not between knowledge and behavior [12]. Studies on street food handlers also reported that poor hygiene behavior was influenced by limited facilities, weak social reinforcement, and indifferent attitudes toward cleanliness across various food-processing stages [13]. These findings underscore the multidimensional nature of hygienic behavior and the interplay of multiple influencing factors.

To improve consistency in hygiene–sanitation behavior, the implementation of standard operating procedures (SOPs), regular training, and systematic supervision is essential. Providing supportive facilities and educating food handlers on the importance of using protective attributes such as aprons and masks are crucial components of behavior improvement. This approach aligns with research indicating that educational interventions combined with environmental improvements are effective in enhancing food-safety practices [13].

In quantitative analysis, independent variables are typically selected for multivariate analysis when they have p -values < 0.25 in bivariate testing [14]. However, in this study, no variables met this criterion, and therefore multivariate analysis was not conducted because the resulting model would likely be unstable and statistically insignificant. This study reinforces the conclusion that good knowledge and positive attitudes do not necessarily translate into appropriate hygiene behavior. Similar findings were reported in PT. Ryan Katering Jakarta [4] and in the University of Andalas canteen, where contextual factors continued to play an important role in shaping behavior despite significant associations between cognitive variables and practice [15].

Overall, the findings of this study indicate that improving knowledge and attitudes must be accompanied by more comprehensive and context-specific interventions. Future research is recommended to incorporate environmental variables, workplace culture, supervision quality,

and facility availability. A mixed-methods approach combining quantitative and qualitative techniques may also provide a more holistic understanding of the factors influencing food-handler hygiene and sanitation behavior.

CONCLUSION

This study demonstrates that there is no statistically significant relationship between knowledge and behavior, nor between attitudes and behavior, in the implementation of hygiene and sanitation practices among food handlers working in food stalls around Universitas Muhadi Setiabudi. Although a portion of the respondents possessed relatively good levels of knowledge and positive attitudes, these cognitive and affective attributes were not consistently reflected in their hygienic practices.

These findings suggest that hygiene–sanitation behavior is likely shaped by factors beyond cognitive understanding and attitudinal disposition. Elements such as the work environment, availability of sanitation facilities, supervisory mechanisms, and workplace culture may exert stronger and more direct influence on daily hygienic practices. Consequently, interventions aimed at improving hygiene–sanitation behavior cannot rely solely on enhancing knowledge and attitudes. Instead, they must be accompanied by more comprehensive and context-specific approaches that address structural, environmental, and behavioral determinants simultaneously.

Ethical consideration, competing interest and source of funding

-All research procedures adhered to the principles of informed consent, confidentiality, and institutional ethical approval.

-There is no conflict of interest related to this publication.

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REFERENCES

1. Fitriah AH, Heranisa A, Winarni S. The evaluation of knowledge and behavior in hygiene sanitation of food handlers at Aji Santoso International Football Academy. *Hearty: Jurnal Kesehatan Masyarakat*. 2024;12(1):133–138.
2. Herawati C, Endayani H, Indragiri S, Kristanti I, Supriatin, Wahyuni NT, et al. Sanitary hygiene and behavior of food handlers in the presence of *Escherichia coli* bacteria. *Journal of Pure and Applied Microbiology*. 2023;17(4):2098–2103.
3. Priyambodho OH, Astuti D. Factors associated with personal hygiene and sanitation behavior of food handlers. *Contagion: Scientific Periodical Journal of Public Health and Coastal Health*. 2023;5(4):1395–1405.
4. Hartini S. Hubungan tingkat pengetahuan higiene sanitasi dan sikap penjamah makanan dengan praktik higiene sanitasi. *Nutrition Research and Development Journal*. 2022;2(2):16–26.
5. Setyaningrum ER, Soeyono RD. Hubungan pengetahuan dan sikap dengan perilaku higiene sanitasi penjamah makanan pada food court Baseball UNESA Ketintang. *Jurnal Ilmu Kesehatan dan Gizi*. 2024;3(1):26–36.
6. Yusminatati. Hubungan pengetahuan dan sikap dengan perilaku penjamah makanan dalam penerapan higiene sanitasi makanan pada rumah makan di Kecamatan Pauh Kota Padang tahun 2020. Universitas Perintis Indonesia; 2021.
7. Desandri S, Rahmawati A, Nurbaeti TS. Hubungan pengetahuan dan sikap penjamah makanan dengan penerapan higiene sanitasi makanan pada rumah makan di wilayah Anjatan tahun 2024. *Jurnal Ilmiah Gizi dan Kesehatan*. 2024;6(1):56–63.
8. Kuswatim FS. Hubungan pengetahuan hygiene dan sanitasi makanan dengan perilaku penjamah makanan di kantin UIN Syarif Hidayatullah Jakarta. Universitas Islam Negeri Syarif Hidayatullah; 2018.
9. Putri RM, Fayasari A. Hubungan pengetahuan dan sikap hygiene sanitasi dengan perilaku personal hygiene pada penjamah makanan kaki lima di Kecamatan Tapos Kota Depok. *Journal of Nutrition College*. 2023;12(3):238–245.
10. Farkhati DU, Mulasari SA, Sulistyawati. Faktor risiko higiene dan sanitasi penjamah makanan di warung makan pasar tradisional Adiwerna Kabupaten Tegal. 2022;7(12):17320–17339.
11. Nurhayati IS, Nikmawati EE, Setiawati T. Penerapan personal hygiene penjamah makanan di salah satu catering di Kota Bandung. *Media Pendidikan Gizi dan Kuliner*. 2020;9(2):35–43.
12. Wusqa ASU, Nur E, Lindawati, Gusto A, Wijayantono. Faktor yang berhubungan dengan perilaku penjamah makanan jajanan di Pantai Gandorah Pariaman. *Jurnal Kesehatan Lingkungan Mandiri*. 2025;3(2):93–102.
13. Permatasari I, Handajani S, Sulandjari S, Faidah M. Faktor perilaku higiene sanitasi makanan pada penjamah makanan pedagang kaki lima. *Jurnal Tata Boga*. 2021;10(2):223–233.
14. Hosmer DW, Lemeshow S, Sturdivant RX. *Applied logistic regression*. 3rd ed. Wiley; 2013. 1–233 p.
15. Firdani F. Knowledge, attitudes and practices of hygiene and sanitation implementation on food handlers. *Jurnal Kesehatan Lingkungan Indonesia*. 2022;21(2):131–136.
16. Pertiwi S, Turrahmi N. Hubungan pengetahuan dan sikap terhadap hygiene sanitasi petugas penjamah makanan di warung makan. *Journal of Health and Therapy*. 2024;3(2):11–18.
17. Avifah S, Fitria L. Determinants of personal hygiene behavior amongst food handlers in fast food restaurants in South Jakarta, Indonesia. *Berita Kedokteran Masyarakat*. 2025;41(03):1–5.
18. Andini P, Hidayati F, Fitri A, Lesmana OS, Dharmawan H. Faktor-faktor yang berhubungan dengan perilaku penerapan higiene sanitasi makanan pada rumah makan di Kecamatan Sekayu. *PubHealth: Jurnal Kesehatan Masyarakat*. 2025;4(2):164–170.
19. Helmi R, Endarti AT, Prahastuti BS. Factors influencing the hygiene behavior of food handlers in Cikarang Bekasi Catering Services. *Jurnal Kesehatan Masyarakat Perkotaan*. 2025;5(1):12–26.
20. Aulia N, Budiningsari D, Lestari LA. Food handlers' knowledge and practices and the relationship with appropriate sanitation hygiene scores in Malang City. *Jurnal Gizi Indonesia*. 2024;13(1):52–62.
21. Oriana A, Mujayanto M, Taufiqurrahman, Intiyati A. Knowledge, attitudes, and hygiene sanitation behavior of food handlers in stalls around the Health Polytechnic of the Ministry of Health Surabaya. *Journal of Nutrition Explorations*. 2025;3(6):9–17.
22. Sari WA, Sarli D, Alkafi. Faktor-faktor yang berhubungan dengan perilaku penjamah makanan dalam penerapan hygiene sanitasi makanan di rumah makan Kelurahan Padang Pasir. *Gudang Jurnal Ilmu Kesehatan*. 2025;4(1):323–329.
23. Caesar DL, Yunawati A. Analisis higiene penjamah makanan dan sanitasi rumah makan di sekitar kampus ITEKES Cendekia Utama Kudus. *Jurnal Ilmiah Gizi Kesehatan*. 2023;4(2):40–44.