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The Relationship Between Slaughterhouse Officers' Knowledge, Attitudes and *Salmonella sp.* Contamination of Beef in Slaughterhouses of Jember Regency

(HUBUNGAN ANTARA PENGETAHUAN, SIKAP PETUGAS RUMAH POTONG HEWAN KABUPATEN JEMBER DAN KONTAMINASI *SALMONELLA SP.*, PADA DAGING SAPI)

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ABSTRACT

Beef is a primary source of animal protein widely consumed by the Indonesian population. Beef consumption must be supported by maintaining its quality and safety, especially during the slaughtering process at slaughterhouses. *Salmonella* sp., a bacterial contaminant, can cause diseases such as typhoid fever. The Indonesian National Standard stipulates that beef must be free from *Salmonella* sp., contamination. Bacterial contamination is often caused by slaughterhouse personnel's non-compliance with Standard Operating Procedures (SOP), closely related to their knowledge and attitudes. This study was aimed to analyze the relationship between the knowledge and attitudes of slaughterhouse personnel regarding *Salmonella* sp., and beef contamination at slaughterhouses in Jember Regency, East Java Province. Using an analytical observational design, the study involved slaughterhouse personnel and beef samples. Data analysis was conducted using Fisher's exact test. The results showed a p-value of 0.417 for the relationship between knowledge and contamination and a p-value of 1 for the relationship between attitudes and contamination. No significant relationship was found between the knowledge or attitudes of slaughterhouse personnel and beef contamination by *Salmonella* sp.

Keywords : bacterial contamination; beef; *Salmonella* sp.; slaughterhouse personnel

ABSTRAK

Daging sapi adalah sumber protein hewani utama yang banyak dikonsumsi masyarakat Indonesia. Konsumsi daging sapi harus didukung dengan menjaga kualitas dan keamanannya, terutama selama proses penyembelihan di rumah potong hewan. *Salmonella* sp., salah satu kontaminan bakteri, dapat menyebabkan penyakit seperti demam tifoid. Standar Nasional Indonesia (SNI) menetapkan bahwa daging sapi tidak diperbolehkan terkontaminasi bakteri *Salmonella* sp., Kontaminasi bakteri sering kali disebabkan oleh ketidakpatuhan petugas Rumah Potong Hewan terhadap Prosedur Operasional Standar yang berkaitan dengan tingkat pengetahuan dan sikap mereka. Penelitian ini bertujuan menganalisis hubungan antara pengetahuan dan sikap petugas RPH terhadap *Salmonella* sp., dengan kontaminasi daging sapi di RPH Kabupaten Jembe, Jawa Timurr. Menggunakan desain observasional analitik, penelitian melibatkan petugas RPH dan sampel daging sapi. Analisis data dilakukan dengan uji Fisher's *exact test*. Hasil menunjukkan nilai p sebesar 0,417 untuk hubungan antara pengetahuan dengan kontaminasi, dan p sebesar 1 untuk hubungan antara sikap dengan kontaminasi. Tidak ditemukan hubungan signifikan antara pengetahuan maupun sikap petugas RPH terhadap kontaminasi daging sapi oleh *Salmonella* sp.

Kata-kata kunci: kontaminasi bakteri; daging sapi; *Salmonella* sp.; petugas RPH

INTRODUCTION

Beef is one of the primary sources of animal protein widely consumed in Indonesia, primarily due to its versatility in various culinary preparations. Between 2018 and 2022, Indonesia's per capita beef consumption showed an average annual increase of 0.28%, with a peak consumption of 2.67 kg/capita/ year in 2022. In 2023, with a population of over 278.84 million, national beef consumption was projected to reach 816.79 thousand tons, with Java contributing the largest regional consumption of 583.36 thousand tons (Badan Standarisasi Nasional, 2009). However, maintaining the quality and safety of beef is essential, particularly during slaughterhouse processing.

Indonesian Council of Ulama has established Halal Assurance System guidelines for slaughterhouses to ensure halal certification (Sucipto *et al*., 2018). Antemortem and postmortem inspections are crucial to ensuring beef quality. These inspections aim to detect potential contamination, particularly by bacteria like *Salmonella* sp., a known causative agent of typhoid fever and other gastrointestinal diseases (Mufidah *et al*., 2021). Globally, *Salmonella* sp. is responsible for millions of infections annually, with significant morbidity and mortality rates. In Indonesia, the prevalence of typhoid fever reached 900,000 cases in 2019, with East Java reporting 163,235 cases a notable increase from 2018 (Nur-Laila *et al*., 2022). Contamination with *Salmonella sp*. is primarily transmitted through contaminated food or water, emphasizing the importance of stringent hygiene practices at slaughterhouses (Wibisono and Wibisono, 2020).

Previous research has identified that non-compliance with Standard Operating Procedures (SOPs) in slaughterhouses contributes significantly to contamination. Factors such as insufficient handling before and after slaughter and unhygienic environmental conditions play critical roles (Sucipto *et al.*, 2018). This non-compliance often correlates with the knowledge and attitudes of slaughterhouse personnel (Indriyani *et al*., 2019). This study was aimed to analyze the relationship between the knowledge and attitudes of slaughterhouse personnel regarding *Salmonella sp*. and its contamination in beef at slaughterhouses in Jember Regency, East Java Province. By exploring this rela-tionship, this research provides novel insights into the

role of human factors in ensuring meat safety and contributes to developing targeted interventions to reduce contamination risks.

RESEARCH METHODS

The type of research used is descry-ptive-analytical research with a cross-sectional design. The research was conducted at nine slaughterhouses in Jember Regency from October 2024 to January 2025. The population in this study consists of all staff from the nine slaughterhouses. The respon-dents in this study totalled 35 samples. Meanwhile, the number of beef samples was nine.

The type of data used in this research is primary data. Primary data is information obtained directly from the research object. The primary data sources collected in this study include the results of *Salmonella sp*. bacterial contamination testing and interviews with respondents based on questionnaires covering sociodemographic characteristics, knowledge levels and attitudes of slaughterhouse staff.

RESULTS AND DISCUSSION

This research was conducted from October 2024 to January 2025 at nine slaughterhouses. The study involved all slaughterhouse officers and included beef samples. The results include the relationship between the level of knowledge and attitudes about *Salmonella sp.* bacteria and the contamination of *Salmonella sp.* bacteria in beef.

The Sociodemographic Characteristics of The Sample

The total sample used in this study was 35 slaughterhouse officers spread across nine slaughterhouses in the Jember Regency. The sample characteristics include the location of the slaughterhouses where the samples were taken, age, education level and work experience of the slaughterhouse officers. Jember Regency has the highest number of slaughterhouses in East Java. The slaughterhouse number 5 has the largest number of officers among all slaughterhouses in the Jember Regency, with 10 officers, or 28.6%. The majority of officers are in the 36-45 years age range, with 12 officers, or 34.3%. Regarding education, most officers are high school/vocational school graduates, with 14 officers, or 40%. Additionally, 23 officers, or 65.7%, have over five years of work experience. The characteristics of the sample was presented in Table 1.

The analysis of the demographic characteristics of slaughterhouse officers shows that all of the officers are male (100%). This result is consistent with previous studies (Andanawari *et al*., 2023; Pitaloka *et al*., 2023; Tadesse *et al*., 2024), which link male dominance in this profession to social norms and perceptions regarding physical strength.

Regarding age, the majority of officers (34.3%) are in the 36-45 age range, categorized as late adulthood by the Ministry of Health. This finding aligns with studies conducted in slaughterhouses in the Jakarta Province (Sidablok *et al.* 2019), in Marrakech (Bahir *et al*., 2022), and Ethiopia (Tadesse *et al*., 2024), which show that many slaughterhouse officers are in adulthood. Older age is often associated with more work experience, as explained by Pitaloka *et al.* (2023), which enables officers to perform complex tasks more efficiently.

The highest level of education among slaughterhouse officers is predominantly high school/vocational school (40%). This result differs from the study by Matchawe (2019) in a slaughterhouse in Cameroon, which showed a lower level of education. This difference may be due to varying policies and management at each slaughterhouse, as explained by Wahyuni *et al*. (2019).

The study results indicate that most slaughterhouse officers (65.7%) have worked for over five years. This finding is consistent with previous research (Sidabalok, 2018; Bahir *et al*., 2022; Tadesse *et al*., 2024). According to Nurmayanti (2018), more extended work experience is often associated with work stability and

Table 1. Sociodemographic Characteristics of Respondents

Characteristics of Respondent	Total (N)	Percentagr (%)
Location		
Slaughterhouse 1	3	8,6
Slaughterhouse 2	4	11,4
Slaughterhouse 3	3	8,6
Slaughterhouse 4	3	8,6
Slaughterhouse 5	10	28,6
Slaughterhouse 6	3	8,6
Slaughterhouse 7	3	8,6
Slaughterhouse 8	4	11,4
Slaughterhouse 9	2	5,7
Age		
15-25 years	4	11,4
26-35 years	10	28,6
36-45 years	12	34,3
>46 years	9	25,7
Man	35	100
Education		
Unschooled	1	2,9
Elementary school	11	31,4
Junior high school	6	17,1
Senior high school	14	40
College	3	8,6
Employeed for		
≤ 5 years	12	34,3
> 5 years	23	65,7
Total	35	100

comfort and the potential for improved performance due to the accumulation of experience and knowledge related to the complex tasks involved in animal slaughtering processes.

Slaughterhouse Officers' Knowledge

Analysis of the questionnaire data shows that the level of knowledge among slaughterhouse officers varies across slaughterhouses. Slaughterhouses 3 and 5 have the highest mean knowledge scores, indicating that most officers have good knowledge about bacterial contamination. In contrast, slaugh-terhouses 6 and 8 have the lowest mean scores. The details of the distribution of slaugh-terhouse officers' knowledge scores was presented in Table 2.

The results of this study show that slaughterhouse officers' knowledge of *Salmonella sp*. bacteria falls under the "poor" category. This finding is consistent with research conducted in slaughterhouses in Cameroon, which reported that the knowledge of slaughterhouse officers was also in the "poor" category (Matchawe *et al*., 2019). This study is in line with rese-arch which was repoted by Bahir (2022), whose findings also indicated that the knowledge level was categorized as poor. According to Bahir (2022), the poor knowledge level is due to slaughterhouse officers lacking training experience in hygiene and meat handling. This finding aligns with the results of this study, which show that 51.4% of officers have no training experience. Therefore, the lack of training experience is one of the factors contributing to the low knowledge level of slaughterhouse officers.

The Attitude of the Slaughterhouse Officer

Slaughterhouse 5 has the highest number of officers with a positive attitude, totaling nine officers. Meanwhile, slaugh-terhouse 8 has the highest number of officers with a negative attitude, totaling four officers. The distribution of positive and negative attitude categories among slaughterhouse officers was presented in Table 3.

This study shows that the attitude of slaughterhouse officers in Jember Regency falls under the positive category. "Positive" in this context means that most slaugh-terhouse officers know the importance of the risk of bacterial contamination. The attitude questionnaire revealed that 60% of officers strongly agreed on washing

Table 2. The knowledge level of officers based on slaughterhouses

Slaughterhouse	N	The knowledge level of slaughterhouse officers			
		Lower score	Highest score	Mean	Category
Slaughterhouse 1	3	20	40	20	Poor
Slaughterhouse 2	4	0	80	35	Poor
Slaughterhouse 3	3	60	100	73,3	Good
Slaughterhouse 4	3	20	40	20	Poor
Slaughterhouse 5	10	0	80	52	Good
Slaughterhouse 6	3	0	0	0	Poor
Slaughterhouse 7	3	0	40	26,67	Poor
Slaughterhouse 8	4	0	40	10	Poor
Slaughterhouse 9	2	20	20	20	Poor

Table 3.The attitude of slaughterhouse officers

Slaughterhouse	Attitude		Respondents	
	Positive	Negative	N	%
Slaughterhouse 1	2	1	3	8,57
Slaughterhouse 2	2	2	4	11,43
Slaughterhouse 3	3	0	3	8,57
Slaughterhouse 4	2	1	3	8,57
Slaughterhouse 5	9	1	10	28,57
Slaughterhouse 6	2	1	3	8,57
Slaughterhouse 7	0	3	3	8,57
Slaughterhouse 8	0	4	4	11,43
Slaughterhouse 9	1	1	2	5,72
Total	21	14	35	100

Table 4. The distribution of *Salmonella sp*. contamination

Slaughterhouse	Total	
	Pos	Neg
Slaughterhouse 1		1
Slaughterhouse 2		1
Slaughterhouse 3	1	
Slaughterhouse 4		1
Slaughterhouse 5		1
Slaughterhouse 6		1
Slaughterhouse 7	1	
Slaughterhouse 8		1
Slaughterhouse 9		1
Total sample	2	7 (77,8%)

(22,2%)

Notes: P0s= positive; Neg= negative

twice daily to reduce bacterial contamination risk. The results align with the study by Bahir (2022), which found that the majority of officers were in a positive category, as evidenced by 80% of officers agreeing that washing hands with disinfectant after using the toilet is mandatory and 88% agreeing that health checks must be conducted before handling meat.

Table 5**.** Analysis of knowledge level

No	Knowledge	Contamination *Salmonella sp.*				*P value*
		Positive		Negative		
		N	**%**	**N**	**%**	
1	Good	1	50.00	1	50.00	0.417
2	Poor	1	14.30	6	85.70	

Table 6. Analysis of attitude level

No	Attitude	Contamination *Salmonella sp.*				*P value*
		Positive		Negative		
		N	%	N	%	
1	Positive	1	20	4	80	1,000
2	Negative	1	25	3	75	

According to Hasan (2024), positive attitudes among slaughterhouse officers indicate a significant relationship with age groups. Respondents with higher secondary education had the highest average attitude scores toward the attitude statements. This finding is consistent with this study's results, where most slaughterhouse officers fall under the higher secondary education category. Therefore, slaughterhouse officers tend to display positive attitudes influenced by their age background.

Prevalence of *Sal-monella sp*.
Contamination

The results of the distribution of *Salmonella* sp., bacterial contamination show that out of the nine beef samples obtained from each slaughterhouse, two samples (22.2%) were contaminated with *Salmonella* sp., bacteria or tested positive based on laboratory tests. The positive samples were found at the 3 and 7 slaughterhouses. The distribution data of *Salmonella* sp., bacterial contamination was presented in the Table 4.

The study results show that 22.2% of the beef samples were contaminated with *Salmonella* sp., bacteria. According to the beef quality standards set by the National Standardization Agency, *Salmonella* sp., contamination is not permitted. The contamination percentage in this study is higher compared to previous research conducted by Indriyani *et al.* (2019) in slaughterhouses in Banyuwangi Regency, which reported a *Salmonella* sp., isolation rate of 3.1%. In a study conducted at Hawassa slaughterhouse, South Ethiopia, two beef samples (18%) out of 11 were positive for *Salmonella* sp., contamination. The results of Tedesse's (2024) study, conducted at a slaughterhouse in Ethiopia with 312 beef samples from three parts of the cattle body, revealed a higher contamination rate of 25%. The contamination was distributed as follows: 10 samples (9.6%) from the abdomen, seven samples (6.7%) from the neck, and eight samples (7.7%) from the hind legs.

The Relationship Between the Knowledge and Attitude of Slaughterhouse Officers and *Salmonella sp*. Contamination in Beef

The results of the mean knowledge score calculation of slaughterhouse officers regarding *Salmonella* sp., contamination were tested using Fisher's exact test with a significance level of $\alpha < 0.05$. From this analysis, a *P-value* of 0.417 was obtained. These results indicate that there is no relationship between the knowledge of slaughterhouse officers about *Salmonella* sp., bacteria and *Salmonella sp*., contamination. The analysis of the knowledge level was presented in the Table 5.

The results for the attitude variable show no relationship between the two variables (*p-value*=1.000). Therefore, the hypothesis of a relati-onship between the attitude of slaughter-house officers toward *Salmonella* sp., bacteria and *Salmonella* sp., contami-nation is rejected. The Table 6 displays the findings of the correlation test be-tween these two variables.

The analysis results testing the relationship between slaughterhouse officers' knowledge of *Salmonella* sp., bacteria and *Salmonella* sp., contamination show a p-value of 0.417 (p-value > 0.05). Similarly, the results of the analysis testing the relationship between the officers' attitudes toward *Salmonella* sp., bacteria and *Salmonella* sp., contamination show a *p-value* of 1.000 (p-value > 0.05), indicating that there is no relationship between the officers' knowledge and attitude about *Salmonella* sp., bacteria

And *Salmonella* sp., contamination. This is supported by the questionnaire data, where the "poor" knowledge category contained six samples that were not contaminated. These findings illustrate that whether the officers' knowledge is good or poor does not always correlate with the level of bacterial contamination.

The results for uncontaminated samples were similar in the positive and negative attitude questionnaires. This finding concludes that knowledge and attitude are not the only factors contributing to bacterial contamination. *Salmonella* sp., contamination in slaughterhouses, according to Bahir (2022), is influenced by various factors, including equipment and environmental conditions. His study found that 50% of *Salmonella* sp., was present on the ground surface, 30% onthe officers' hands, 30% on knife surfaces, 40% on the officers' clothing, and 10% on hooks.

A non-hygienic slaughterhouse environment, particularly contaminated surfaces, is the primary source of contamination. Meat handlers, such as butchers working in slaughterhouses, can be the primary vectors of meat contamination and act as asymptomatic reservoirs of foodborne microorganisms (Bahir *et al*., 2022). Therefore, it can be concluded that *Salmonella* sp., contamination in meat is a complex issue influenced by various factors, including knowledge, attitude, environmental conditions, and work practices don’t applicable Standard Operating Procedures

CONCLUSION

Based on the data analysis and discussions conducted, this study concludes that there is no relationship between the level of knowledge and attitudes of slaughterhouse officers regarding *Salmonella* sp., bacteria and the contamination of *Salmonella* sp., bacteria in beef at the slaughterhouses in Jember Regency.

SUGGESTION

Future research is expected to increase the sample size so that the results obtained are more representative and adjust the meat samples being studied by the samples processed by the officers.

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